Section 3.1 Geology

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3.1 Geology

Geologic maps of the area, along with recent investigative field activities, form the basis for the current understanding of the regional and site-specific geology. The following section summarizes the geology of the region and the features of the Site.

3.1.1 Regional Geology

The Site is located within a regional bedrock structural feature referred to as a graben. A graben is defined as a bedrock block that has moved downward relative to the rock on either side of the block. The Site is located near the north end of the graben, which is mapped with the northernmost extent just north of Silver Bow Creek (Derkey and Bartholomew, 1988). A schematic representation of the graben is shown in Figure 3.1-1 and a bedrock geology map (Elliott and McDonald, 2009), which shows the spatial location of the graben, is shown in Figure 3.1-2.

The graben is approximately 4.5 miles wide and oriented north-south, paralleling the Divide Creek Valley. The east and west sides of the graben are bounded by the Rocker Fault and West Fault, respectively (*see* Figure 3.1-2). The graben basin has been partially filled with Tertiary sediment eroded from the surrounding highlands, which were partially consolidated following deposition (Derkey and Bartholomew, 1988). The Tertiary sediment is referred to as the Melrose Basin Sequence south of Silver Bow Creek (Ruppel et al., 1993) and is labeled as “Ts – Valley-fill sediment, undivided” on the map (Figure 3.1-2). To the north of Silver Bow Creek, the Tertiary sediment has also been mapped as filling the north end of the Divide Creek Valley (Lewis, 1998). Low-lying areas receiving sediment are typically called basins. However, to avoid confusion with the tailing basin at the Site, the sediment filling the graben will henceforth be referred to as "graben-fill" rather than the more customary geologic term "basin-fill" (Ruppel et al., 1993; Lewis, 1998).

The thickness of the graben-fill sequence is unknown over most of its aerial extent, although the graben appears to be asymmetric, with much thicker deposits in the east, near Rocker, Montana, than on the west, near Miles Crossing (Weight, 1998). The sequence also appears to thicken to the south with sediment thicknesses ranging from less than 500 feet near Rocker, Montana to nearly 10,000 feet near Grasshopper Creek, south of Dillon, Montana. Near the Site, the graben-fill consists of poorly consolidated gravel, sand, silt, and clay and may include lenses of bentonite, lignite, and hot springs tufa. These types of sediments are deposited in lakes, streams, mudflows, and on alluvial fans (Ross et al., 1955).

The basement rock at the Site consists of Cretaceous intrusive igneous rocks of the Boulder Batholith (shown as "Kgt – Granite" on Figure 3.1-2), which, in some areas, may be overlain by Tertiary volcanics [Montana Bureau of Mines and Geology (MBMG), 1978; Derkey and Bartholomew, 1988; Elliot and McDonald, 2009].

3.1.1.1 Tectonics and Structure

Seismic hazards are minimal for the Site, which is located on the west side of the Intermountain Seismic Zone. Seismic maps of the region (Figure 3.1-3) indicate that there is a 10% probability that the peak acceleration will exceed approximately 12% of the acceleration due to gravity in the next 50 years (MBMG, 2005). Earthquakes in the area west of Butte tend to have magnitudes less than 3.5 on the Richter Scale. The Silver Bow Site is in an area considered to be at the lower end of mid-range seismic risk (MBMG, 2005). The Rocker Fault, which bounds the east edge of the graben approximately 3.5 miles east of the Silver Bow Site, is the nearest potentially active fault (Ruppel et al., 1993; Lewis, 1998; USGS, 2005). It is a high angle, down to the west, range front normal fault, as shown on Figure 3.1-2. The average slip-rate of the fault is less than 0.2 millimeters per year and the most recent deformation appear to have occurred during the Pleistocene, about 1.6 million years ago. Due to the slow slip rate and large amount of time since the last deformation event, the risk of an earthquake is very low and it is possible that the fault is no longer active (Haller, 2005). The fault that bounds the west side of the graben is reported as inactive (USGS, 2005).

3.1.1.2 Economic Deposits

The Site is located in one of the world's major mining areas. A 2,000 square mile area surrounding the Site contains metal and mineral deposits mined for copper, gold, silver, lead, tungsten, phosphate, and talc (Alt and Hyndman, 1997). The area also has uranium deposits, including one located approximately three miles southwest of the Site (Merewether, 1960). Associated with these mining activities are many mineral concentration mills and smelters. Within a two-mile radius of the Site, there are seven mines or claims, shown on Figure 3.1-4, which extracted gold, silver, fluorine, aluminum, beryllium, and clay. All of the mines within two-miles of the Site are listed as abandoned and inactive. The original dataset incorrectly identified that there was a phosphate mine at the Silver Bow Site (Montana Natural Resource Information System, 2004). The raw materials used at the Silver Bow Site were not mined at the Site, and there is no information indicating that commercial mining ever occurred on the Site.

3.1.2 Site Geology

Area geology consists predominantly of graben-fill deposits, which make up the uppermost geologic unit over most of the Site. Based on regional information, the graben-fill deposits are underlain by igneous bedrock and are covered in place by alluvial deposits associated with Sheep Gulch and Silver Bow Creek. The topography has been altered by construction of the tailing basin and the placement of the slag piles.

Geologic cross sections of the Site were prepared using available logs of production wells and borings advanced at the Site. A cross section location map (Figure 3.1-5) identifies the locations of cross section A-A' through cross section I-I' (Figures 3.1-6 through 3.1-14). From the cross sections, available logs, and field observations, a discussion of the Site geology is provided below.

3.1.2.1 Sheep Gulch Alluvial Deposits

Sheep Gulch is normally dry from its upper reaches to just south of the tailing basin. Surface flows are observed only during snowmelt, heavy rainfall events, or periods when the REC Silicon plant located south of the Site discharges sufficient water to a branch of Sheep Gulch. The tailing basin was constructed over a portion of the former Sheep Gulch channel and its associated alluvial deposits. A number of borings and monitoring wells have been completed in the alluvial deposits at the Site. The 2006 Site investigation work included placement of two monitoring well nests within the Sheep Gulch alluvial deposits. Nested monitoring wells MW-06-7, MW-06-8, and MW-06-9 were installed near the center of the tailing basin, with MW-06-8 completed in the Sheep Gulch alluvial deposits. Nested wells MW-06-5 and MW-06-6 were installed south of the tailing basin, near the upstream Rhodia property boundary, with MW-06-5 completed in the Sheep Gulch alluvial deposits. Monitoring well logs are provided in Appendix 3.1-A, and monitoring well locations are shown on Figure 3.1-5. Soil sampling completed during the well installation verified the presence of the Sheep Gulch sediment beneath the tailing basin and identified the vertical extent of those deposits at about 10 feet thick. Sand, clayey sand, and organic soils were observed in the Sheep Gulch sediment samples. The sediments collected in the former stream channel, where the tailing basin is located, were indicative of a stream with low sinuosity, and possibly moderately braided in some areas. The soil sampling also shows a deposit of clayey organic soil above the Sheep Gulch sediment. This material was likely deposited during the early years of plant operations, as a phosphate ore-washing unit was used to wash the clayey soil from the ore and the wash water and soil were conveyed to the tailing basin.

Cross-sections A-A', B-B', C-C', D-D' and F-F' (Figures 3.1-6 through 3.1-9 and 3.1-11) transect the current and former location of Sheep Gulch and show Sheep Gulch alluvial deposits. These sediments were deposited within its floodplain over the years, and the main channel bed consists of sand and gravel. Along the sides of the main channel, sediments are typically interbedded sand deposits and fine-grained over-bank deposits with limited amounts organic soils. Boring logs completed by others found similar alluvial materials beneath the stretch of Sheep Gulch on adjacent property to the south (*see* REC boring logs in Appendix 3.1-A). Beneath the Sheep Gulch alluvial deposits, the sediment is characteristic of the graben-fill deposits.

3.1.3 Graben-Fill Deposits

The graben-fill deposits were separated into two groups, upper and lower, based on sediment composition and the degree of consolidation. Although there are some geologic differences observed with depth at the Site as discussed below, the upper and lower portions of the graben-fill deposits are hydraulically connected based on the data available and behave as a single hydrostratigraphic unit (*see* Section 3.2 for additional discussion). Well logs for the onsite production wells show the upper graben-fill deposits extend to depths of at least 100 to 200 feet below the ground surface (Appendix 3.1-A). Based on deep borings completed for the facility production wells, the lower graben-fill deposits extend to a depth of at least 400 feet in the northeastern portion of the Site. Igneous rocks (which would indicate the lower limit of the graben-fill deposits) were encountered at depths of 197 and 208 feet in the southern portion of the Site.

The upper graben-fill material beneath the Site consists primarily of fine-grained silt and clay deposits with interbedded silty sand layers. The cross sections show the western portion of the upper zone are predominantly fine-grained silty sands, clay and silt with some interbedded sand, silty sand, and poorly consolidated clays and silts. The eastern portions of the upper zone contain fine-grained clays and silts with interbedded layers of sand and silty sand occurring more frequently and near the surface. In general, sediments observed in the eastern portion of the Site tend to be coarser grained in nature compared to the sediment in the western portion of the Site.

In contrast, the lower graben-fill deposits include layers of loosely consolidated shale, mudstone, siltstone, and silty sandstone. Chert-filled veins of hydrothermal origin have also been observed in numerous borings at various depths. Erosion by surface water flow in Sheep Gulch has exposed the chert veins at several locations along the gulch south and west of the tailing basin.

3.1.4 Geophysical Surveys

Three geophysical surveys were conducted in the Site area and provide information on bedrock in the area. In 1998, a Field Methods class from Montana Tech completed a gravity and magnetics survey along a transect that crossed the southern portion of the Site and concluded that faulting may exist in the central region of the valley floor (Borduin, 1999). The location of the 1998 survey line is shown on Figure 3.1-15.

Montana Tech students performed seismic, gravity and magnetic geophysical surveys in 2008. The report is provide in Appendix 3.1-B. The report identified a bedrock ridge trending northeast/southwest across the Site area and the estimated depth to the bedrock ridge ranged from 200 meters to 600 meters. The 2008 transect line ran from southwest to northeast across the Site (Figure 3.1-15) between two outcrops of Butte Quartz Monzonite (Appendix 3.1-B).

A third gravity survey was performed by Montana Tech students in 2009 and the report is provided in Appendix 3.1-C. The gravity survey consisted of five east-west transect lines (*see* Figure 3.1-15) that covered the majority of the Site area. The gravity data were used to develop a model of bedrock topography (*see* Appendix 3.1-C).

In general, the geophysical surveys have resulted in a similar conclusion – that there is an apparent bedrock ridge located in the west-central portion of the Site that trends from southwest to northeast. The reports do not provide specific information on the depth of the bedrock ridge below the ground surface. Interpretation of Figure 13 from the report in Appendix 3.1-C suggests that the bedrock ridge may be located approximately 100 meters beneath the surface. Figure 3.1-15 shows the locations of deep borings that have been completed on or near the Site. Igneous rocks have been encountered in four borings at depths ranging from 80 to 225 feet. The minimum depth to igneous bedrock in borings completed at the Site is 197 feet at boring BSB-4. Igneous rocks were encountered during the drilling of production well RP-W-1A at a depth of 225 feet, but not in any of the other deep borings advanced for the facility production wells, which extended to depths of up to 400 feet. Production well RP-W-1 is adjacent to RP-W-1A; the log for RP-W-1 shows a well depth of 225 feet, but does not list any geological information so it is unknown if igneous rocks were encountered when drilling this well.

3.1.5 Summary of Site Geology

Area geology consists predominantly of heterogeneous graben-fill deposits, which make up the uppermost geologic unit over most of the Site. Based on regional information, the graben-fill

deposits are underlain by igneous bedrock of the Lowland Creek Volcanics and Boulder Batholith. Geophysical surveys completed at the Site suggest that a bedrock ridge may be located in the west-central portion of the Site and trend northeast/southwest. The depth and extent of the bedrock ridge site investigations have identified alluvial deposits associated with Sheep Gulch and Silver Bow Creek overlying the graben-fill deposits. The topography has been altered by construction of the tailing basin and the placement of the slag piles, as indicated on the cross sections.

3.1.6 References

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United States Geological Survey. 2005. USGS Earthquake Hazards Program. Fault and Fold Database: Partial Report for Rocker Fault Class A No. 669) Primary author is Kathleen Haller. Web address: http://qfaults.cr.usgs.gov

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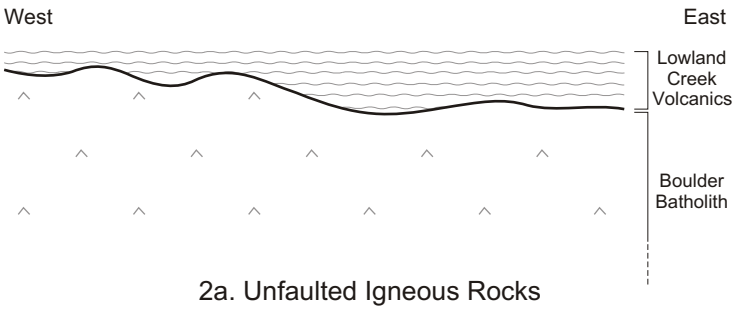
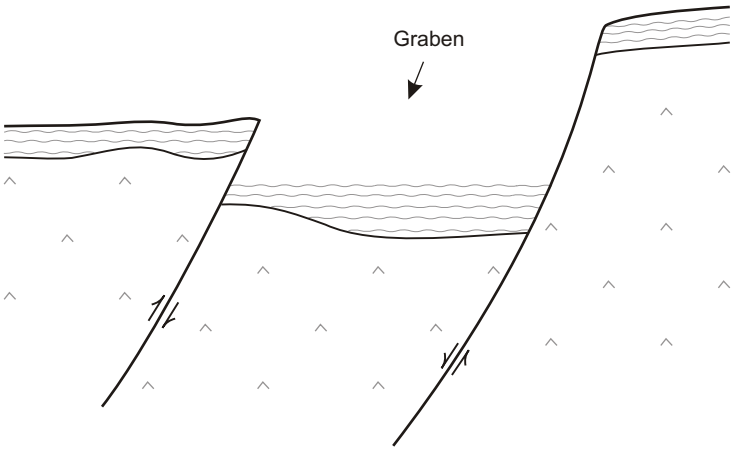
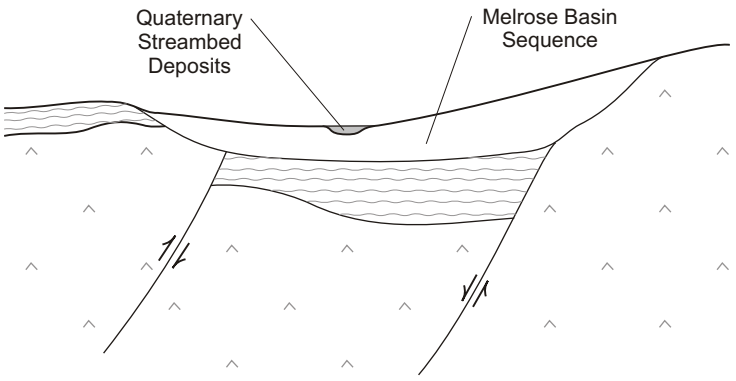
Figures



2a. Unfaulted Igneous Rocks



2b. Faulted Igneous Rocks



2c. Erosion and Filling of the Graben

Figure 3.1-1

SCHEMATIC CROSS SECTIONS SHOWING
DEVELOPMENT OF THE REGIONAL GEOLOGY

Rhodia Silver Bow Plant, Montana

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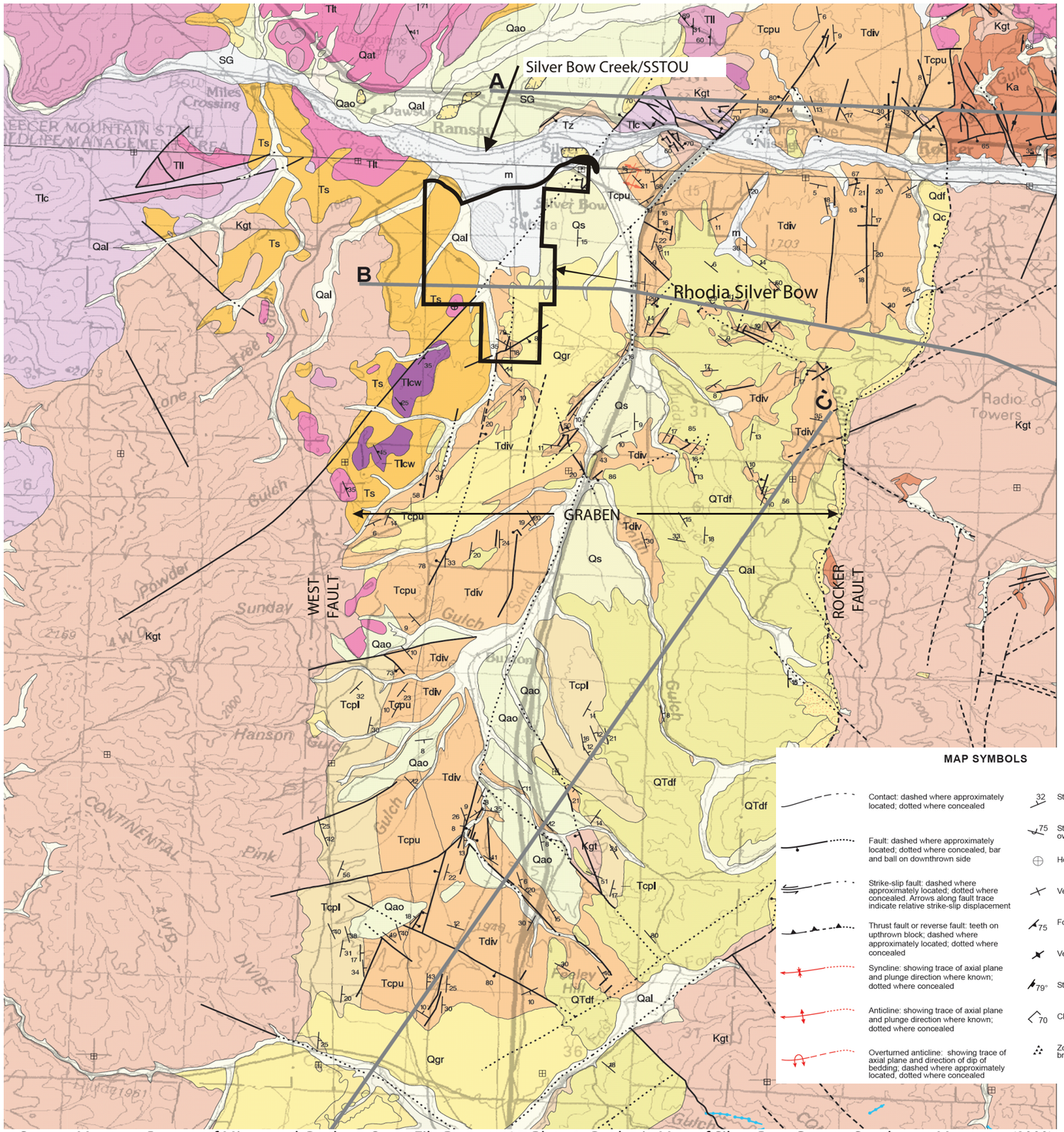


MAP SYMBOLS

- Contact: dashed where approximately located; dotted where concealed
- Fault: dashed where approximately located; dotted where concealed, bar and ball on downthrown side
- Strike-slip fault: dashed where approximately located; dotted where concealed. Arrows along fault trace indicate relative strike-slip displacement
- Thrust fault or reverse fault: teeth on upthrown block; dashed where approximately located; dotted where concealed
- Syncline: showing trace of axial plane and plunge direction where known; dotted where concealed
- Anticline: showing trace of axial plane and plunge direction where known; dotted where concealed
- Overturned anticline: showing trace of axial plane and direction of dip of bedding; dashed where approximately located, dotted where concealed
- 32 Strike and dip of inclined beds
- 75 Strike and dip of overturned bedding
- Horizontal bedding
- Vertical bedding
- 75 Foliation
- Vertical foliation
- 79° Strike and dip of joints
- 70 Cleavage
- Zone of tectonic brecciation or brecciation and shearing

Source: Montana Bureau of Mines and Geology Open File Report 585, Plate 1, Geologic Map of Silver Bow County, Southwest Montana (2009)

KILOMETERS 1 0 1 2 3 4 5

MILES 1 0 1 2 3 4 5

MAP UNITS

Qal	Alluvium of modern channels and flood plains
Qaf	Alluvial fan deposit
Qc	Colluvium
Qac	Alluvium and colluvium, undivided
Qgr	Gravel
Qta	Talus deposit
Qls	Landslide deposit
Qdf	Debris flow deposit
Qs	Surficial deposits, undivided
Qr	Rock glaciers and related deposits
Qg	Glacial deposits, undivided
Qat	Alluvial terrace deposit
Qato	Older alluvial terrace deposit
Qao	Older alluvium
QTls	Older landslide deposit
QTdf	Older debris flow deposit
QTal	Older gravel alluvium
Tcg	Conglomerate
Tat	Alluvial terrace deposit
Tme	Melrose informal map unit
Ttc	Tucker Creek informal map unit
Tdiv	Divide informal map unit
Tpb	Parrot Bench informal map unit
Tcpu	Cabbage Patch Member of the Renova Formation, upper unit
Tcpl	Cabbage Patch Member of the Renova Formation, lower unit
Tca	Climbing Arrow Formation
Ts	Valley-fill sediment, undivided
Tz	Zenith Mine informal map unit
Tlc	Lowland Creek Volcanics, undivided
Tlb	Volcanic breccia of Lowland Creek Volcanics
Tlcw	Welded tuff of Lowland Creek Volcanics
Tll	Lava flows of Lowland Creek Volcanics
Tlt	Tuff of Lowland Creek Volcanics
Ti	Intrusive rocks, undivided
Kem	Elkhorn Mountains Volcanics
Kl	Intrusive rocks, undivided
Ka	Aplite intrusive rock
Kgt	Granite
Kbl	Blackleaf Formation
Kk	Kootenai Formation
Ksm	Cretaceous rocks, metamorphosed
Td	Dinwoody Formation
Mzu	Mesozoic rocks, undivided
Js	Jurassic rocks, undivided
Pp	Phosphoria Formation
Pq	Quadrant Formation
PMsr	Snowcrest Range Group
PMqs	Snowcrest Range Group and Quadrant Formation, undivided
Mm	Madison Group, undivided
Mmc	Mission Canyon Limestone
Ml	Lodgepole Limestone
Mdt	Three Forks Formation
Dj	Jefferson Formation
MDs	Three Forks, Jefferson, and Maywood Formations, undivided
DCmr	Maywood and Red Lion Formations, undivided
Crh	Red Lion and Hasmark Formations, undivided
Csf	Silver Hill and Flathead Formations, undivided
Cs	Sedimentary rocks, undivided
Csm	Cambrian rock, metamorphosed
CYq	Quartzite, undivided
Ym4	formation 4, Missoula Group
Ym3	formation 3, Missoula Group
Ym2	formation 2, Missoula Group
Ym1	formation 1, Missoula Group
Yboq	Quartzite of the metamorphosed Bonner Formation
Yhe	Helena and Empire Formations, undivided
Ys	Spokane Formation
Yg	Greyson Formation
Ygq	Quartzite of the Greyson Formation
Yn	Newland Formation
Ync	Calcareous rocks of the Newland Formation
Ymo	Moose Formation
Ytu	Table Mountain Formation, upper
Ytl	Table Mountain Formation, lower
Ylh	LaHood Formation
Ylhc	Conglomerate of the LaHood Formation
Xgn	Gneiss
XAgb	Garnet-biotite gneiss
W	Water

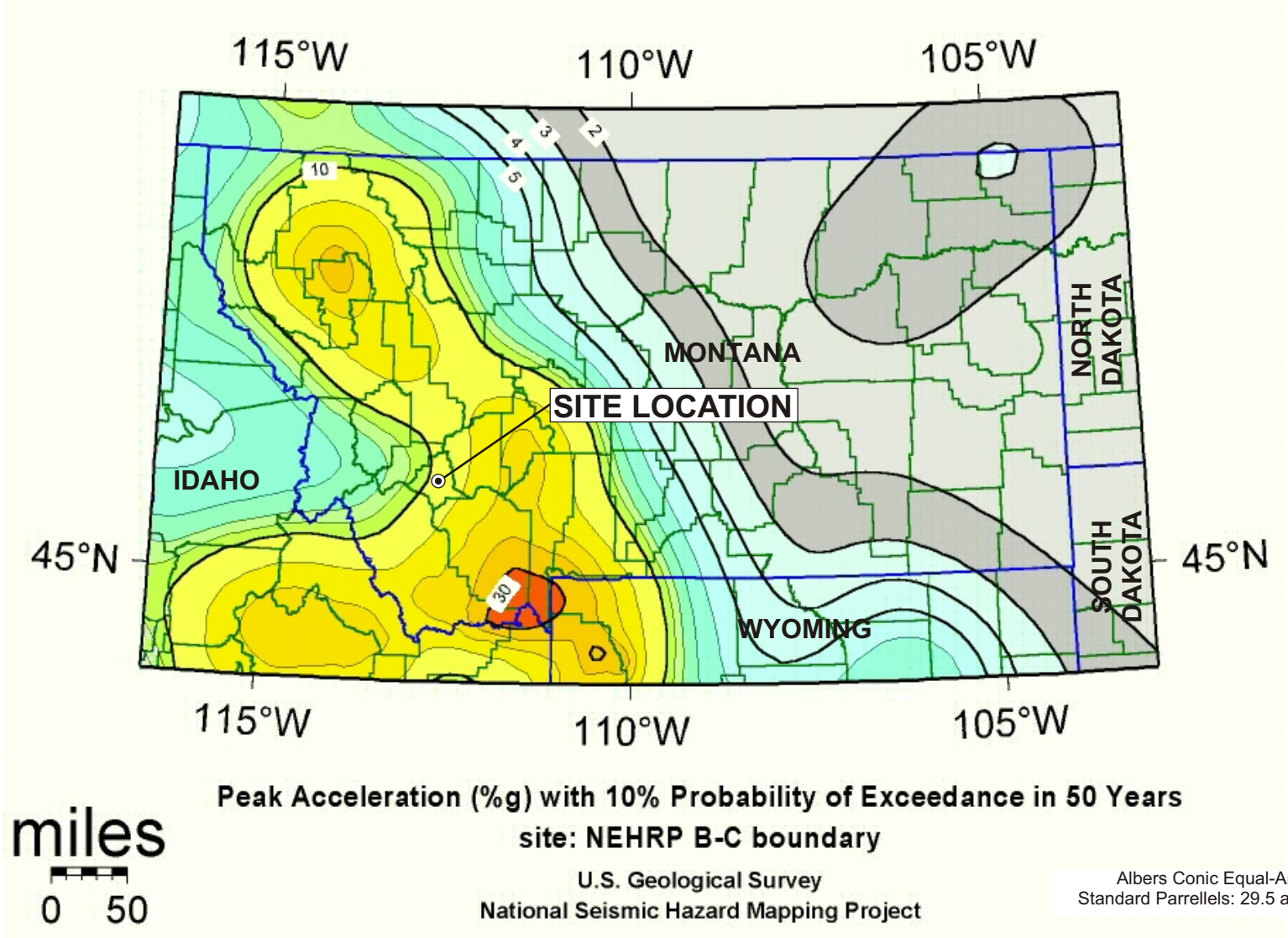
m	Areas modified by man. The flood plain of Silver Bow Creek has been reconstructed and all original deposits removed or covered.
t	Mine dumps and tailings
SG	Sand and gravel pit
ht	Hydrothermally altered rock—sedimentary, volcanic, and metamorphic rock of Proterozoic through Cretaceous age that have been silificified and altered by hydrothermal fluids.
	Quartz veins
	Ductile shear zone
	Dike/sill

N

Scale 1: 50,000

Figure 3.1-2

REGIONAL BEDROCK GEOLOGY
Rhodia Silver Bow Plant, Montana



Source:
MBMG - Montana Seismic Hazard Map, from MBMG - Earthquake Station Office.
(http:/mbmgquake.mtech.edu/seismicity_in_montana.html)

Figure 3.1-3

MONTANA SEISMIC HAZARD MAP

Rhodia Silver Bow Plant, Montana

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▲ Mines - Abandoned and Inactive Mines
(Montana Bureau of Mines and Geology, 2004)

⬡ Mines
(US Bureau of Mines, 1992)

▭ Mining District Boundary

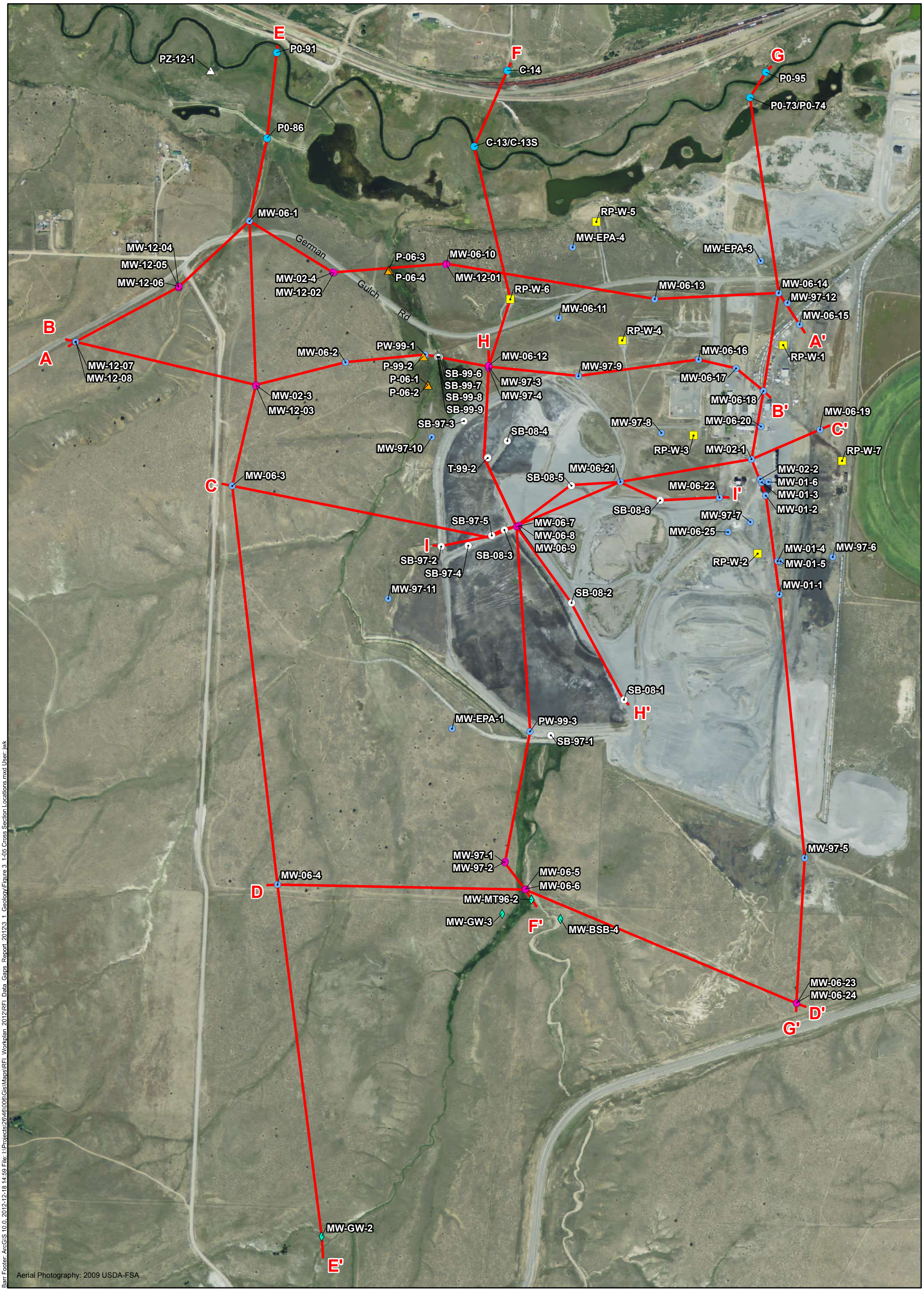
Label Text:
Mine Name (if known)
Mineral Resource

N

Feet
5,000 0 5,000

Figure 3.1-4

MINES WITHIN 2 MILES OF
RHODIA SILVER BOW PLANT
Rhodia Silver Bow Plant
Montana



Barr Footer: ArcGIS 10.0, 2012-12-18 14:59 File: I:\Projects\26\46\006\Gis\Maps\RFI_Workplan_2012\RFI_Data_Gaps_Report_20123_1_Geology\Figure 3_1-05 Cross Section Locations.mxd User: jwk

Cross-section Line

Soil Boring

Groundwater Wells & Piezometers

- Monitoring Well
- Production Well
- Monitoring Well Nest
- REC Plant Monitoring Well
- Piezometer Nest
- Piezometer
- SSTOU - Monitoring Well

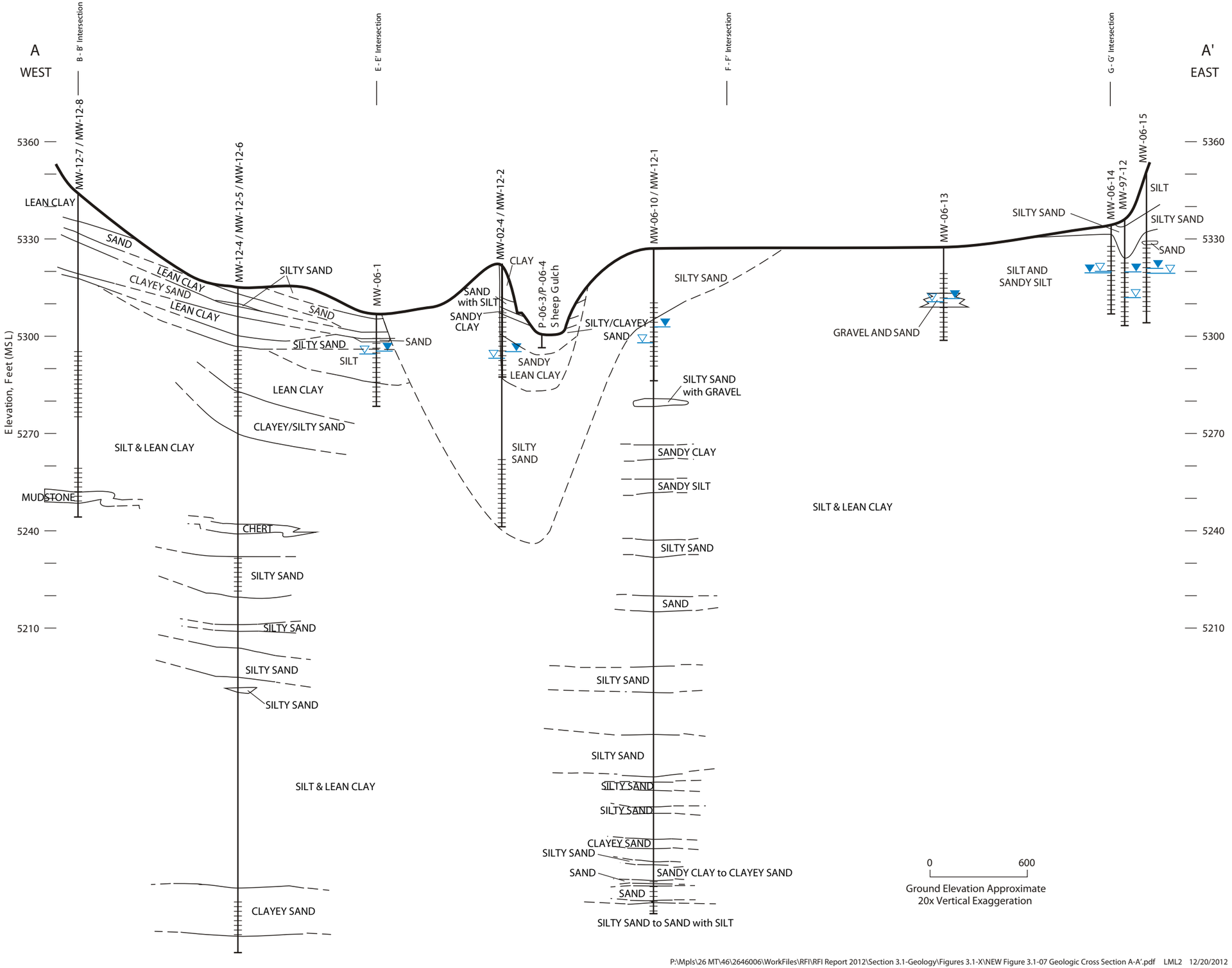
N

Feet

750 0 750

Figure 3.1-5

CROSS SECTION LOCATIONS
Rhodia Silver Bow Plant
Montana



P:\Mpls\26 MT\46\2646006\WorkFiles\RFI\RFI Report 2012\Section 3.1-Geology\Figures 3.1-X\NEW Figure 3.1-07 Geologic Cross Section A-A'.pdf LML2 12/20/2012

Figure 3.1-6

GEOLOGIC CROSS SECTION A-A'
Rhodia Silver Bow Plant, Montana

B
WEST

B'
EAST

A - A' Interesection
E - E' Interesection
H-H' and F - F' Interesection
G - G' Interesection

MW-12-7 / MW-12-8
MW-02-3 / MW-12-3
MW-06-2
MW-06-12 / MW-97-3 / MW-93-4
MW-97-9
MW-06-16
MW-06-17
MW-06-18
SB-99-9
SB-99-8 / PW-99-1
SB-99-7 / P-99-2
SB-99-6

LEAN CLAY
SAND
LEAN CLAY
CLAYEY SAND
SAND
LEAN CLAY
SILTY SAND
SILTY SAND with layers of SAND with SILT
SILTY SAND
SILT & CLAY
CLAY/SILT to SANDY CLAY/SILT
SAND
CLAYEY/SILTY SAND to SANDY CLAY
SAND
GRAVEL with SAND
SANDY SILT
SILT
MUDSTONE
CLAY to SANDY CLAY
SILT and CLAY
CLAY/SHALE
SILT
CLAY
FILL
SAND
SILTY SAND
SILT
CLAYEY GRAVEL
SANDY SILT
SILTY SAND with layers of SAND with SILT
CLAYEY SAND
SILT
SAND
SILT
SLAG
SILT
CLAYEY SAND
SILT
SAND
SILT
CLAY

Elevation, Feet (MSL)

5390
5360
5330
5300
5270
5240
5210
5180
5150
5120

0 600
Ground Elevation Approximate
20x Vertical Exaggeration

LEGEND

- Geologic Contact (Dashed where inferred)
- Water Level July 2010 (water level from deepest screened interval shown for nested wells)
- Saturated Conditions Encountered While Drilling
- Boring
- Screened Interval

*Nested Wells are represented as installed in one boring

Figure 3.1-7

GEOLOGIC CROSS SECTION B-B'
Rhodia Silver Bow Plant, Montana

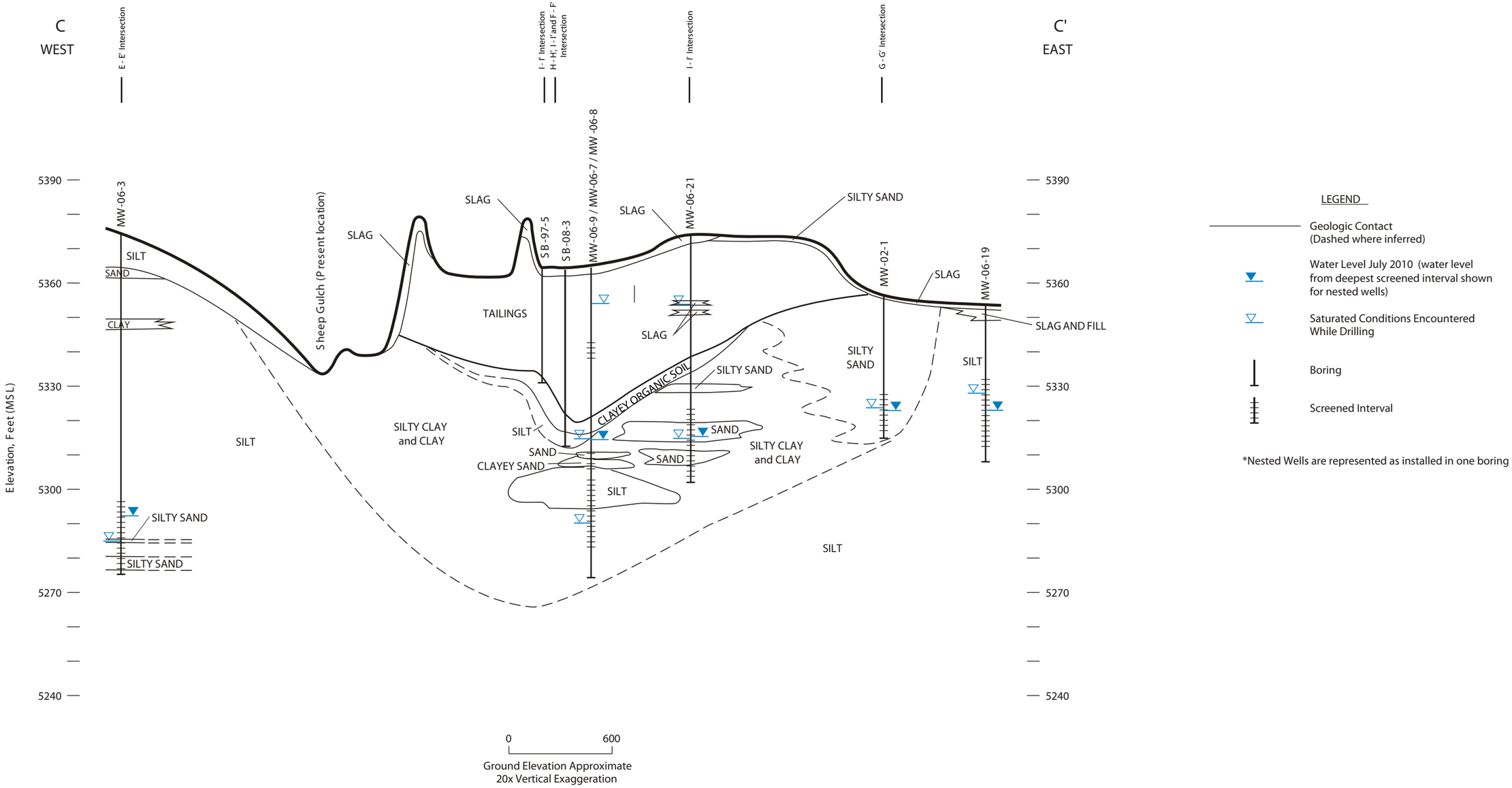


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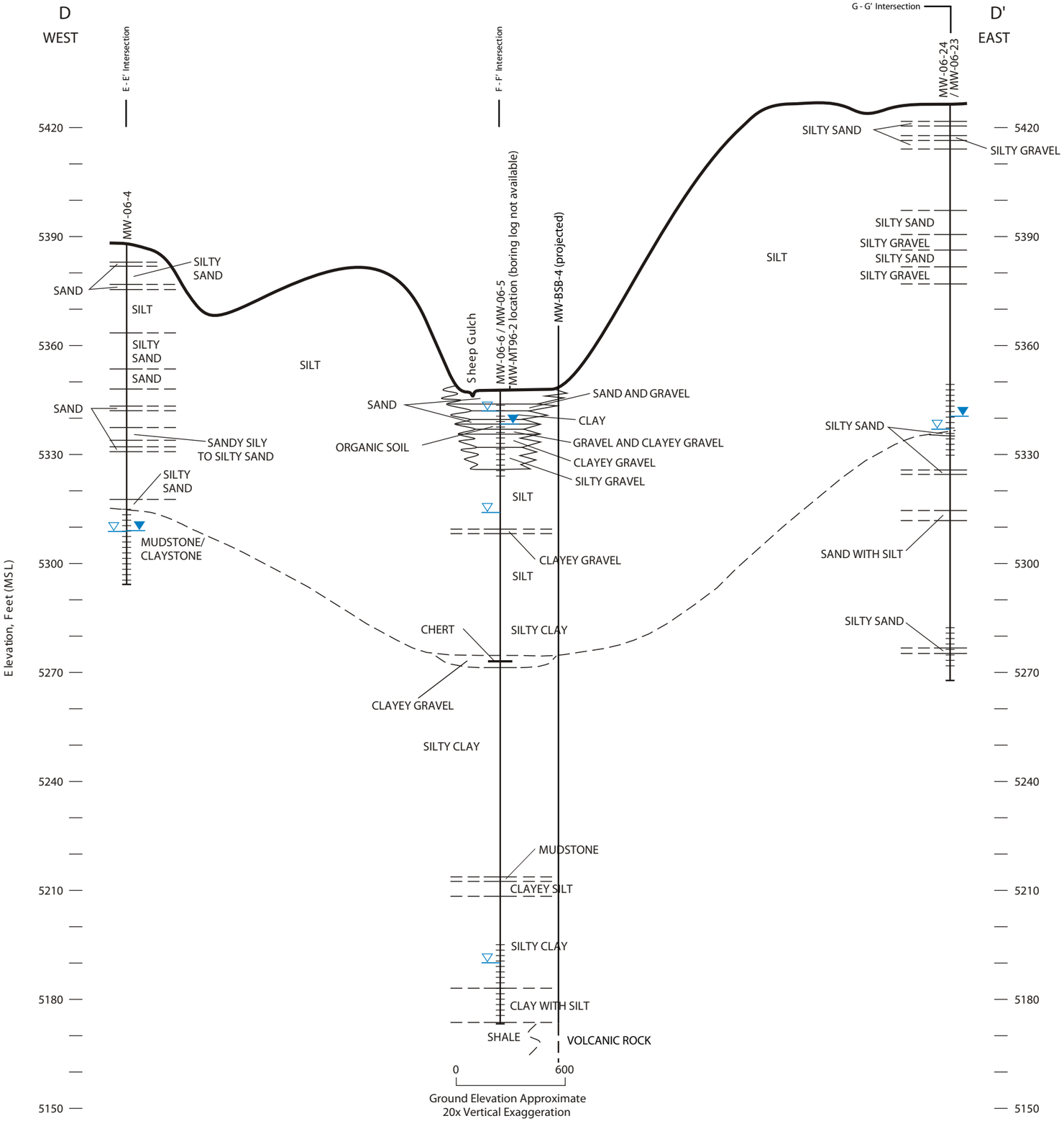
Figure 3.1-8

GEOLOGIC CROSS SECTION C-C'
Rhodia Silver Bow Plant, Montana



LEGEND

- Geologic Contact (Dashed where inferred)
- Water Level July 2010 (water level from deepest screened interval shown for nested wells)
- Saturated Conditions Encountered While Drilling
- Boring
- Screened Interval

*Nested Wells are represented as installed in one boring

Figure 3.1-9

GEOLOGIC CROSS SECTION D-D'
Rhodia Silver Bow Plant, Montana

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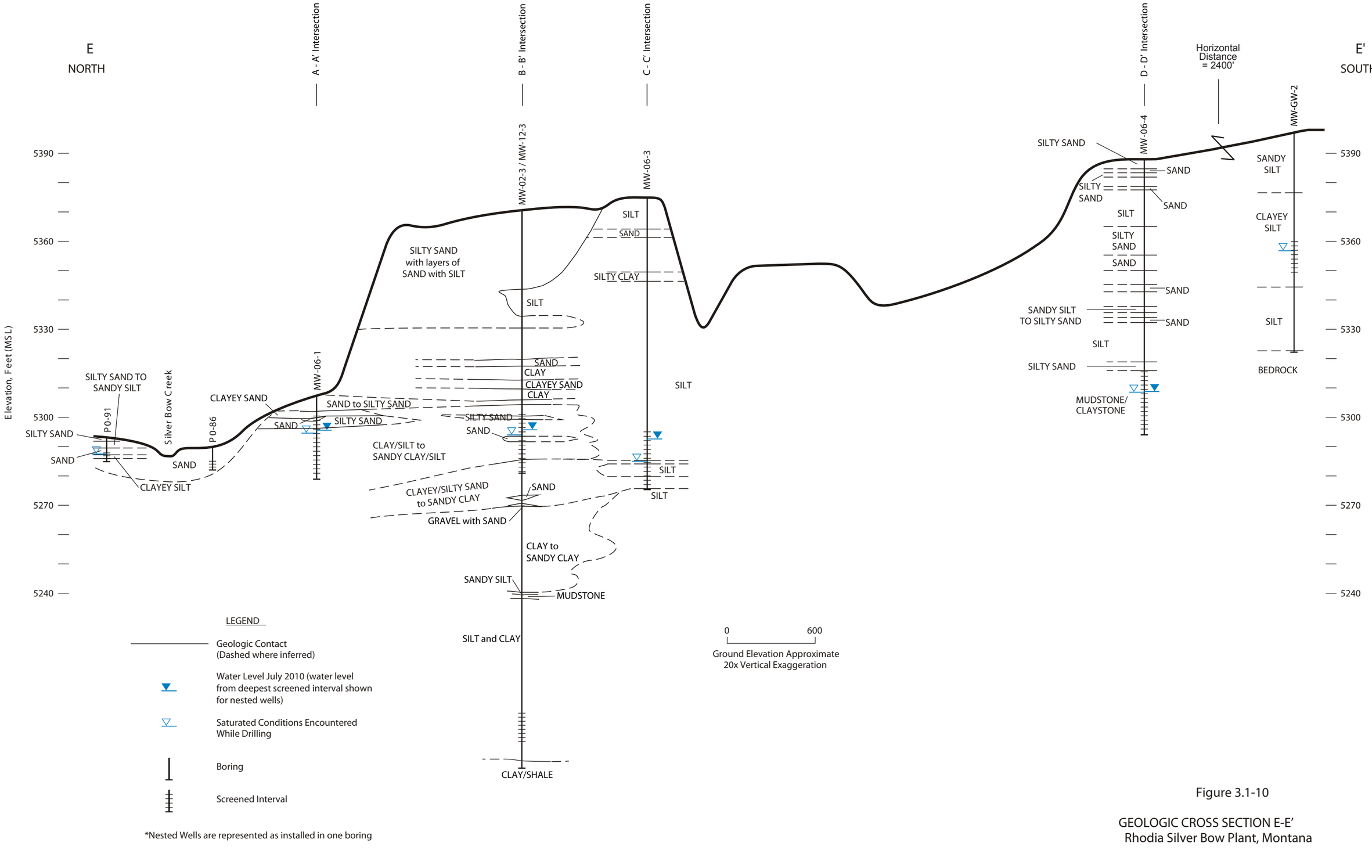

*Nested Wells are represented as installed in one boring

Figure 3.1-10

GEOLOGIC CROSS SECTION E-E'
Rhodia Silver Bow Plant, Montana

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F

NORTH

F'

SOUTH

Elevation, Feet (MSL)

5390
5360
5330
5300
5270
5240
5210
5180
5150
5120

A - A' Intersection

B - B' and H - H' Intersection

H - H' Intersection

H - H', I - I' and C - C' Intersection

D - D' Intersection

MW-06-9 / MW-06-7 / MW -06-8
SB-08-3 (Projected)
SB-97-5 (Projected)

PW-99-3
/SB-99-1 (Projected)
/SB-97-1 (Projected)

MW-97-2 / MW-97-1

Sheep Gulch
MW-06-6
/ MW-06-5
MW-MT96-2 (boring log not available)

C14

Silver Bow Creek

C13
C135

RP-W-6

T-99-2

MW-06-12
/ MW-97-3 / MW-93-4

SLAG

SILTY SAND

SAND WITH CLAY AND SILT

SILTY SAND

SAND

SAND

SILT

CLAYEY SAND AND GRAVEL

SANDY CLAY AND SILT

SILTY SAND

SILT

TAILINGS

SILT

SILT

CLAY

SAND

CLAYEY SAND

SILT

CLAY

CLAYEY GRAVEL

SILTY CLAY TO CLAYEY SILT

SILTY CLAY

CLAY

SAND

SILT

CLAY

SILTY SAND AND CLAY

TAILINGS

ORGANIC SOIL AND CLAY

SILTY CLAY

Sheep Gulch

SAND

CLAY

ORGANIC SOIL

GRAVEL & CLAYEY GRAVEL

CLAYEY GRAVEL

SAND AND GRAVEL

SAND

SILTY GRAVEL

SILT

CLAYEY GRAVEL

CLAYEY GRAVEL

CHERT

SILTY CLAY

MUDSTONE

CLAYEY SILT

SILTY CLAY

CLAY WITH SILT

SHALE

LEGEND

Geologic Contact
(Dashed where inferred)

Water Level July 2010 (water level from deepest screened interval shown for nested wells)

Saturated Conditions Encountered While Drilling

Boring

Screened Interval

*Nested Wells are represented as installed in one boring

0 600

Ground Elevation Approximate
20x Vertical Exaggeration

Figure 3.1-11

GEOLOGIC CROSS SECTION F-F'
Rhodia Silver Bow Plant, Montana

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G
NORTH

G'
SOUTH

A - A'Intersection
B- B'Intersection
C- C'Intersection
D- D'Intersection

Slag Stockpile

PO-95
PO-74 / PO-73
Silver Bow Creek
MW-EPA-3 (Projected)
MW-06-14
MW-97-12 (Projected)
MW-06-18
MW-06-20
MW-02-1
MW-02-2
MW-01-3
MW-01-6
MW-01-2
RP W-2 (Projected)
MW-01-4 / MW-01-5
MW-01-1
MW-97-5
MW-06-24
MW-06-23

SAND
CLAY TO SAND
SAND TO GRAVEL
SILTY SAND
SILT
SAND
SILTY SAND
CLAYEY SAND
SAND
SILTY SAND
WITH CLAY
SLAG
CLAY
CLAYEY
SAND
SILT
SAND WITH SILT
FILL
SAND
SILTY SAND
SAND
SILTY SAND TO SAND
WITH CLAY AND GRAVEL
SLAG
SILTY SAND
SAND WITH SILT
SILTY
SAND
SANDY
SILT
SILTY
SAND
SAND
SILTY SAND
SILTY
GRAVEL
SILTY SAND
SILTY SAND
SILTY GRAVEL
SILTY SAND
SILTY GRAVEL
SILT
SILTY SAND
SAND WITH SILT
SILT
SAND WITH SILT
CLAY WITH GRAVEL,
SAND AND SILT
SILTY SAND
SAND
GRAVEL

Elevation, Feet (MS L)

5420
5390
5360
5330
5300
5270
5240
5210
5180
5150

LEGEND

Geologic Contact
(Dashed where inferred)

Water Level July 2010 (water level from deepest screened interval shown for nested wells)

Saturated Conditions Encountered While Drilling

Boring

Screened Interval

*Nested Wells are represented as installed in one boring

0 600

Ground Elevation Approximate
20x Vertical Exaggeration

Figure 3.1-12

GEOLOGIC CROSS SECTION G-G'
Rhodia Silver Bow Plant, Montana

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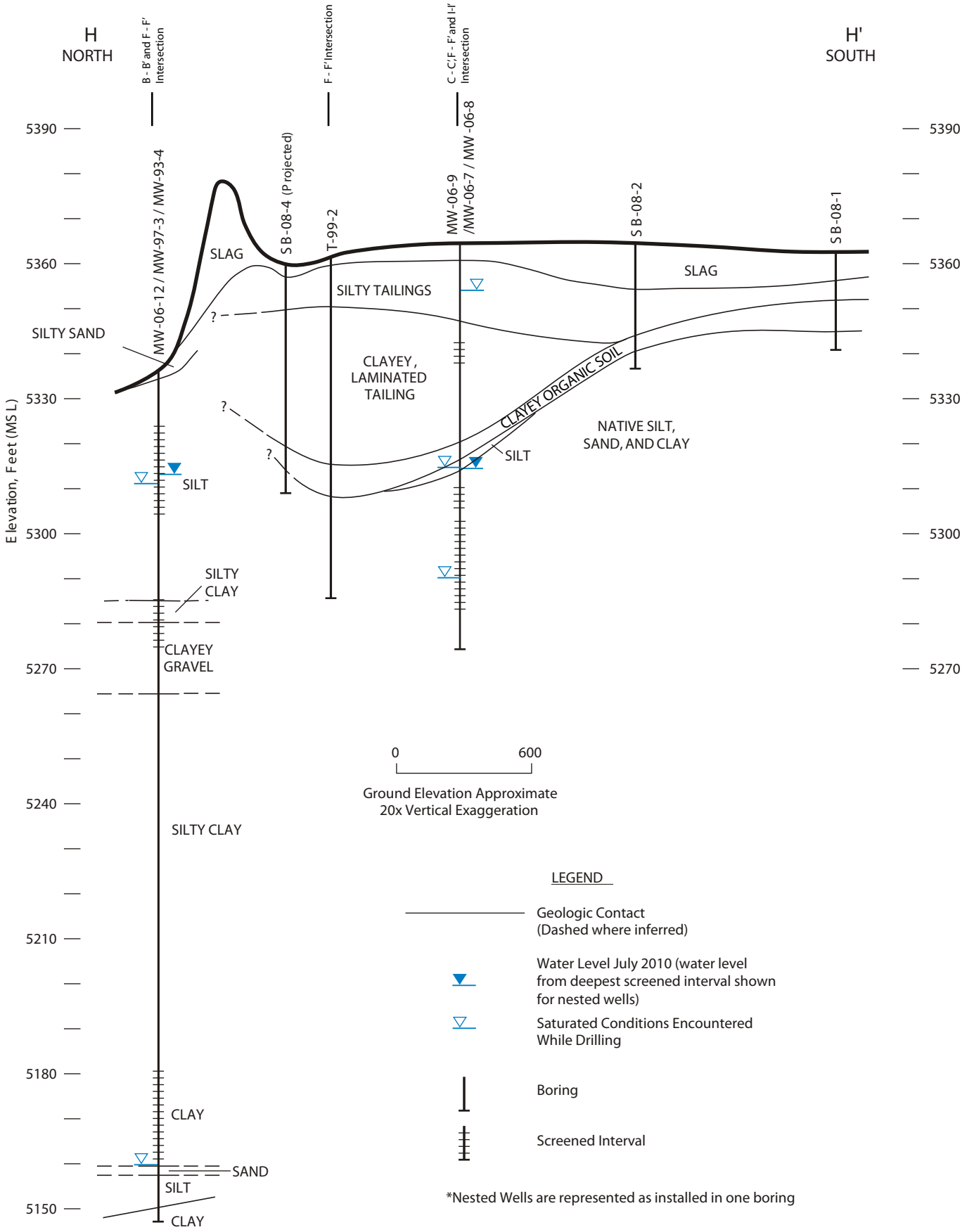

Figure 3.1-13

GEOLOGIC CROSS SECTION H-H'
Rhodia Silver Bow Plant, Montana

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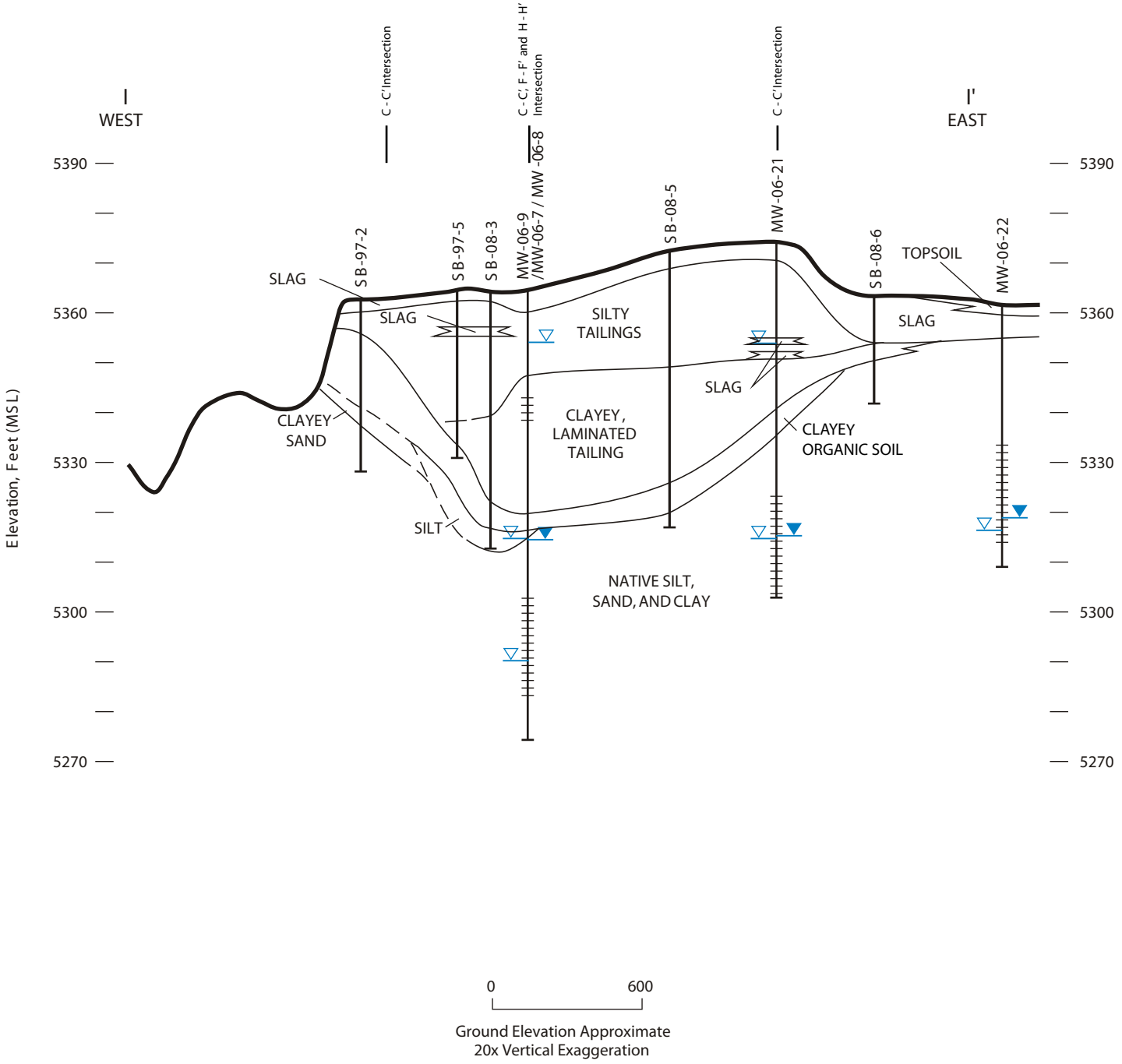


LEGEND

Geologic Contact
(Dashed where inferred)

Water Level July 2010 (water level from deepest screened interval shown for nested wells)

Saturated Conditions Encountered While Drilling

Boring

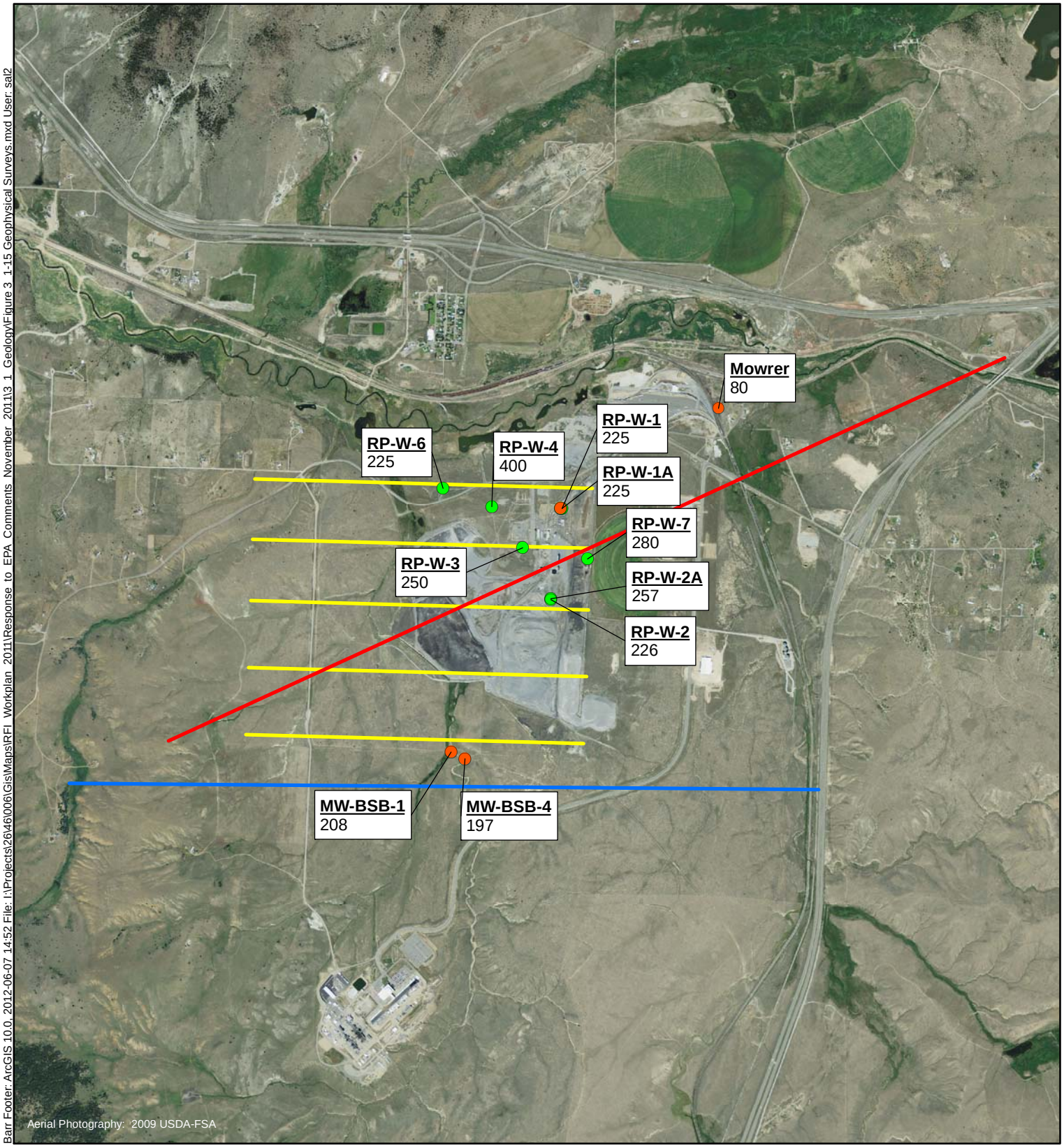
Screened Interval

*Nested Wells are represented as installed in one boring

Figure 3.1-14

GEOLOGIC CROSS SECTION I-I'
Rhodia Silver Bow Plant, Montana

P:\Mpls\26 MT\46\2646006\WorkFiles\RFI\RFI Report 2012\Section 3.0\Section 3.1-Geology\Figures 3.1-X\Figure 3.1-14 Geologic Cross Section I-I'.AI LML2 07-3-12



Deep Borings - No Igneous Rocks (Boring Depth)

Deep Borings - Igneous Rocks (Depth of Igneous Rocks)

Approximate Transect Locations

Montana Tech 1998

Montana Tech 2008

Montana Tech 2009

N

Feet

2,000 0 2,000

Figure 3.1-15

GEOPHYSICAL SURVEY LINES
Rhodia Silver Bow Plant
Montana

Barr Footer: ArcGIS 10.0, 2012-06-07 14:52 File: I:\Projects\26\46\006\GisMaps\RFI_Workplan_2011\Response_to_EPA_Comments_November_2011\3_1_Geology\Figure 3_1-15 Geophysical Surveys.mxd User: sal2

Appendices

Appendix 3.1-A

Well and Boring Logs

1997 Boring Logs

HOLE NO. SB-97-1

Barr Engineering Company

DRILLING LOG

SHEET 1 OF 2 SHEETS

PROJECT NAME/NO. SILVER BOW / 26/46-003 JSL	SIZE AND TYPE OF BIT 4 1/4 HSA
LOCATION (Coordinates or Station) SEE FIGURE	DATUM FOR ELEV. SHOWN MSL
DRILLING AGENCY O'KEEFE DRILLING	MANUFACTURERS DESIGNATION OF DRILL MOBILE B-61
HOLE NO. SB-97-1	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER DAVE CROWLEY	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN NA	DATE HOLE: 10/31/97 Started 10/31/97 Completed
DEPTH DRILLED INTO ROCK NA	ELEV. TOP OF HOLE 5,360.4
TOTAL DEPTH OF HOLE 28.0	SIGNATURE OF INSPECTOR

SAMPLE	DEPTH		CLASSIFICATION OF MATERIALS (Description)	RECOV-ERY	N.	REMARKS
SS	1	23 28 46 19	SLAG - COARSE GRAVEL TO COBBLE SIZE (GP) GREY, MOIST (SLAG) 2.0' (5,358.4)	15"		TEMP F° / PEN / TOR 44° / NP / NP 50°/2.5/4 STANDARD PENETRATION TEST SPLIT SPOON SAMPLING WAS CONDUCTED W/ A 140 Lb HAMMER DROPPED 30-INCHES. SPLIT SPOON SAMPLERS USED ARE 2-INCH DIAMETER.
SS	3	? 10 11 10	SILTY SAND W/ CLAY (SM/SM-SC) FINE GRAINED W/ SOME GRAVEL BROWN (10YR5/3) MOIST W/ MICA FLAKES	20"		
SS	5	4 8 10 6	WET IN ZONES BELOW 7-FEET	18"		48°/1.5/3.5
SS	8	3 3 5 9	(SOIL FILL) (5351.2) 9.2'	12"		50°/1/2
SS	10	3 4 8 14	SILTY LEAN CLAY (CL-ML) GREENISH GREY WET IN ZONES	24"		50°/3.5/6
SS	13	6 9 13 12	(SOIL FILL)	24"		50°/3.5/5.5
SS	15	7 10 12 12	18-18.6' LAYER OF: FINE TAILINGS	24"		50°/2.5/5
SS	18	6 6 9 11	SILT (MH / CL-ML) LIGHT BROWNISH GREY (10YR 6/2) WET (FINE - TAILINGS)	23"		48°/3.5/6 V.S. 19 - 19.5'

HOLE NO. SB-97-1

Barr Engineering Company

DRILLING LOG

SHEET 2 OF 2 SHEETS

PROJECT NAME/NO. SILVER BOW / 23146-003 JSL	SIZE AND TYPE OF BIT
LOCATION (Coordinates or Station) SEE FIGURE	DATUM FOR ELEV. SHOWN
DRILLING AGENCY	MANUFACTURERS DESIGNATION OF DRILL
HOLE NO. SB-97-1	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN	DATE HOLE: ____ Started ____ Completed
DEPTH DRILLED INTO ROCK	ELEV. TOP OF HOLE 5360.4
TOTAL DEPTH OF HOLE 28.0	SIGNATURE OF INSPECTOR

SAMPLE	DEPTH		CLASSIFICATION OF MATERIALS (Description)	RECOV-ERY	N	REMARKS
SS	21	3 3 3 4	SAME AS ABOVE – WET BELOW 19-FEET – GREEN STAINS ADJACENT TO FINE TAILINGS	18"		45°/1/2
	22		22' (5338.4)			
SS	23	5 6 4 5	SILTY SAND W/ CLAY (SM/SM-OH) SLIGHTLY ORGANIC FINE GRAINED DARK GREY (10YR 4/1) MOIST W/ <1% PLANT PARTS (ALLUVIUM)	20"		42°/1.5/2.5
	24					
TW	25					THIN WALL 24½ – 27 FEET
X	26	X		X		
	27					
	28		28.0 EOB (5332.4)			VS -27-28'
	29					
	30					
	31					
	32					
	33					
	34					
	35					
	36					
	37					
	38					
	39					

HOLE NO. SB-97-2

Barr Engineering Company

DRILLING LOG

SHEET 1 OF 2 SHEETS

PROJECT NAME/NO. SILVER BOW / ZL/46-003 JSL	SIZE AND TYPE OF BIT 4 1/4 HSA
LOCATION (Coordinates or Station) SEE FIGURE	DATUM FOR ELEV. SHOWN MSL
DRILLING AGENCY O'KEEFE DRILLING	MANUFACTURERS DESIGNATION OF DRILL MOBILE B-61
HOLE NO. SB-97-2	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER DAVE CROWLEY	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN NA	DATE HOLE: 10/31/97 Started 10/31/97 Completed
DEPTH DRILLED INTO ROCK NA	ELEV. TOP OF HOLE 5362.9
TOTAL DEPTH OF HOLE 34.5	SIGNATURE OF INSPECTOR

SAMPLE	DEPTH		CLASSIFICATION OF MATERIALS (Description)	RECOV-ERY	N	REMARKS
SS	1	12 10 20 17	SLAG - COARSE GRAVEL TO COBBLE SIZE (GP) GREY, MOIST 5361.9	3"		TEMP F°/PEN/TOR
			1.0			52°/1.5/3
SS	2 3	7 26 22 19	TAILINGS (SLUDGE) SILT (MH/CL-ML) LIGHT BROWNISH GREY (10YR 6/2) (FINE TAILINGS) WET 5358.7	18"		STANDARD PENETRATION TEST SPLIT SPOON SAMPLING WAS CONDUCTED W/ a 140 Lb hammer dropped 30-inches. SPLIT SPOON SAMPLERS USED ARE 2-INCH DIAMETER.
	4		4.2			
SS	5 6	8 11 14 14	SILTY LEAN CLAY (CL/CL-ML) PALE OLIVE (5Y 6/4) MOIST (SOIL FILL)	24"		52°/2/6
SS	7 8 9	5 6 6 8		24"		52°/2/3
SS	10 11 12	6 6 6 7	SOME CLASTS of SHALE IN SOIL - HARDENED SOIL	24"		52°/0.5/2
SS	13 14	4 5 5 4		24"		48°/2.5/4
SS	15 16 17	4 5 8 8		24"		50°/2.5/4
SS	18 19	4 5 6 6	(SOIL FILL)	24"		48°/1.7/3.5
						V-SHEAR 300/800+/

HOLE NO. SB-97-2

Barr Engineering Company

DRILLING LOG

SHEET 2 OF 2 SHEETS

PROJECT NAME/NO. SILVER BAY / 23146-003 JSL	SIZE AND TYPE OF BIT
LOCATION (Coordinates or Station) SEE FIGURE	DATUM FOR ELEV. SHOWN
DRILLING AGENCY	MANUFACTURERS DESIGNATION OF DRILL
HOLE NO. SB-97-2	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN	DATE HOLE: ____ Started ____ Completed
DEPTH DRILLED INTO ROCK	ELEV. TOP OF HOLE 5362.9
TOTAL DEPTH OF HOLE 34.5	SIGNATURE OF INSPECTOR

SAMPLE	DEPTH		CLASSIFICATION OF MATERIALS (Description)	RECOV-ERY	N	REMARKS
SS	21	12 19 8 8	SAME AS ABOVE LENS OF: POORLY GRADED SAND (SP) MEDIUM GRAINED GREY (10YR6/1) MOIST	24		48°/1.5/2.5
	22		20.5 - 21'			
SS	23	10 12 13 13	22.0' 5340.9 CLAYEY SAND (SC) FINE GRAINED W/ SOME GRAVEL OLIVE (10YR 5/3) MOIST	23"		45°/2.5/2.5
	24		(SOIL FILL)			
SS	25	4 9 12	24.2 5338.7 SILTY SAND W/ CLAY (SM/SM-CL) FINE GRAINED PALE OLIVE (5Y/6/4) MOIST	23"		45°/7+/2.5
	26	16				
	27					
SS	28	5 6 8 0		20"		45°/2/3 ±5°
	29					
SS	30	3 4 7 7		24"		45°/1.5/3.5 ±5°
	31					
	32					V.S. 32-32.5
TW	33		SOME CLASTS OF SHALE IN SOIL - HARDENED SOIL	P 1.5 R 1.5		
	34		(ALLUVIUM)			
	35		5328.4 34.5' EOB			
	36					
	37					
	38					
	39					

HOLE NO. SB-97-3

Barr Engineering Company

DRILLING LOG

SHEET 1 OF 3 SHEETS

PROJECT NAME/NO. SILVER BOW / 26/46-003 JSL	SIZE AND TYPE OF BIT 4¼ HSA
LOCATION (Coordinates or Station) SEE FIGURE	DATUM FOR ELEV. SHOWN MSL
DRILLING AGENCY O'KEEFE	MANUFACTURERS DESIGNATION OF DRILL MOBILE B-61
HOLE NO. SB-97-3	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER DAVE CROWLEY	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN NA	DATE HOLE: 10/29/97 Started 10/ /97 Completed
DEPTH DRILLED INTO ROCK NA	ELEV. TOP OF HOLE 5361.4
TOTAL DEPTH OF HOLE 57.0	SIGNATURE OF INSPECTOR

SAMPLE	DEPTH		CLASSIFICATION OF MATERIALS (Description)	RECOV-ERY	N	REMARKS
						TEMP F°/ pen/ TOR
HSA	1		SLAG - COARSE GRAVEL TO - COBBLE SIZED (GP) GREY MOIST			
	2		(SLAG) 5360.5			52°/0.5/0.5 STANDARD PENETRATION TEST SPLIT SPOON SAMPLING WAS CONDUCTED W/ A 140 LB HAMMER DROPPED 30-INCHES. SPLIT SPOON SAMPLERS USED ARE 2-INCH DIAMETER.
			0.5'			
SS	3	14 11 7 13	SILT (ML) VERY DARK GREYISH BROWN (10YR 3/2) MOIST	14"		
	4					
SS	5	3 4 8 50/5	(TAILINGS)	20"		60°/0.75/1.5
		50	5.5 5355.91			
	7		SLAG - SAME AS ABOVE			
SS	8	28 17 22 23	W/ 6" LAYERS OF FINE SLAG - POORLY GRADED SAND (SP)	12"		60°/1.5/NP
	9		MEDIUM GRAINED GREY MOIST			ODOR BEGIN 2 - FEET
SS	10	20 42 32 21		20"		54°/2.5/NP
	11					
	12					
SS	13	23 27 27 50	(SLAG)	14"		60°/4.5+/NP
	14		14.2 5347.2			
SS	15	5 3 3 3	CLAYEY SAND (SC) FINE-GRAINED W/ GRAVEL YELLOWISH BROWN (10YR 5/6) MOIST	12"		50°/2.0/2.0
	16					
	17					
SS	18	2 2 2 3	(SOIL FILL) W/ MICA FLAKES	23"		45°/0.5/1.2
	19		WET IN ZONES BELOW 17 - FEET.			

HOLE NO. SB-97-3

Barr Engineering Company

DRILLING LOG

SHEET 2 OF 3 SHEETS

PROJECT NAME/NO. SILVER BAY/23146-003 JSL	SIZE AND TYPE OF BIT
LOCATION (Coordinates or Station) SEE FIGURE	DATUM FOR ELEV. SHOWN
DRILLING AGENCY	MANUFACTURERS DESIGNATION OF DRILL
HOLE NO. SB-97-3	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN	DATE HOLE: ____ Started ____ Completed
DEPTH DRILLED INTO ROCK	ELEV. TOP OF HOLE 5361.4
TOTAL DEPTH OF HOLE 57.0	SIGNATURE OF INSPECTOR

SAMPLE	DEPTH		CLASSIFICATION OF MATERIALS (Description)	RECOV-ERY	N	REMARKS
SS	21	2 2 2 4	SAME AS ABOVE COLOR CHANGE TO: GREENISH GREY (5GY 5/1) BELOW 18-FEET W/ MICA FLAKES (SOIL FILL)	24"		48°/1.0/1.5
SS	22 23 24	5 5 6 8		22"		48°/1.0/1.7
SS	25 26	3 2 2 5	26.0' 5335.4 SILTY LEAN CLAY (CL-ML) GREYISH GREEN MOIST WET IN ZONES (SOIL FILL)	24"		44°/1.5/1.7
SS	27 28	3 3 3 3	28.0 5333.4 MIXED SOIL FILL, MOSTLY:	24"		48°/0.7/2.0
SS	29 30 31	5 12 12 20	CLAYEY SAND (SC) FINE TO MEDIUM GRAINED W/ GRAVEL OLIVE GREY (5Y 5/2) WET	20"		50°/1.0/NP
SS	32 33 34	9 12 8 5	32-33' LAYER OF:	24"		48°/1.5/2.0
SS	35 36 37	4 4 4 5	POORLY GRADED SAND (SP/SP-SM) MEDIUM GRAINED W/ SOME GRAVEL GREYISH BROWN (10YR 5/2) MOIST	22"		48°/1.5/2.0
SS	38 39	4 3 5 7	(SOIL FILL)	24"		48°/1.0/2.5
			39.2 5322.2 (FINE TAILINGS) SILT (MH/CL-ML) *			* LIGHT BROWNISH GREY (10YR 6/2) WET

HOLE NO. SB 97 3

Barr Engineering Company

DRILLING LOG

SHEET 3 OF 3 SHEETS

PROJECT NAME/NO. SILVER BOW/26/96-003.TSK	SIZE AND TYPE OF BIT
LOCATION (Coordinates or Station) SEE SKETCH	DATUM FOR ELEV. SHOWN
DRILLING AGENCY	MANUFACTURERS DESIGNATION OF DRILL
HOLE NO. SB 97 3	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN	DATE HOLE: 10/29/97 Started ____ Completed
DEPTH DRILLED INTO ROCK	ELEV. TOP OF HOLE 5361.4
TOTAL DEPTH OF HOLE 57.0	SIGNATURE OF INSPECTOR

SAMPLE	DEPTH		CLASSIFICATION OF MATERIALS (Description)	RECOV-ERY	N	REMARKS
SS	41	3 4 6 9	SAME AS ABOVE	12"		50°/0.5/1.0
	42		(FINE TAILINGS)			
SS	43	4 7 4 6	43.0 5318.4	0		NO RECOVERY
	44		CLAYEY SAND (SC) FINE TO MEDIUM GRAINED W/ GRAVEL OLIVE GREY (5Y 5/2) WET			
SS	45 46	3 3 5 7		24"		52°/1.5/1.5
	47		COLOR VARIES: OLIVE GREY TO LIGHT OLIVE BROWN (2.5Y 5/4)			MICA FLAKES PRESENT IN "SOIL FILL"
SS	48 49	4 4 10 14	(SOIL FILL) 50.0' 5311.4	24"		50°/1.5/2.5
SS	50 51	3 5 10 12	(FINE TAILINGS) SILT (MH/CL-ML) SAME AS ABOVE 51.7 5309.7	23"		50°/3.5/7.5
SS	52 53 54	5 7 10 13	SILTY LEAN CLAY (CL/ML-OH) SLIGHTLY ORGANIC VERY DARK GREY (10YR 3/1)	23		50°/2.0/9.0
TW	55 56 57		W/ <1% PLANT PARTS (ALLUVIUM) EOB 57.0' 5304.4	P. 2'6" R. 2'3"		50°/2.5/7.5
	58 59					▽ 39.0' BGS 8 AM 10/30 IN HSA

HOLE NO. SB-97-4

Barr Engineering Company

DRILLING LOG

SHEET 1 OF 2 SHEETS

PROJECT NAME/NO. SILVER BOW / ZL/46-003 JSL	SIZE AND TYPE OF BIT 6.5/8 HSA
LOCATION (Coordinates or Station) SEE FIGURE	DATUM FOR ELEV. SHOWN MSL
DRILLING AGENCY OKEEFE DRILLING	MANUFACTURERS DESIGNATION OF DRILL MOBIL B-61
HOLE NO. SB-97-4	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER DAVE CROWLEY	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN NA	DATE HOLE: 10/3/97 Started 10/ /97 Completed
DEPTH DRILLED INTO ROCK NA	ELEV. TOP OF HOLE 5363.5
TOTAL DEPTH OF HOLE 24.5'	SIGNATURE OF INSPECTOR

SAMPLE	DEPTH	N	CLASSIFICATION OF MATERIALS (Description)	RECOV-ERY	REMARKS
HSA	1–2		SLAG - COARSE GRAVEL TO COBBLE SIZED, GREY, MOIST (SLAG) 2.0' 5361.5		TEMP F°/ PEN / TOR
SS	2–4	18 26 33 21	TAILINGS (SM-ML) VERY DARK GREY-BROWN (10YR 3/2), MOIST (TAILINGS) 4.2 5359.3	22"	50°/2/3.5 STANDARD PENETRATION TEST SPLIT SPOON SAMPLING WAS CONDUCTED W/ A 140 Lb HAMMER DROPPED 30-INCHES. SPLIT SPOON SAMPLERS USED ARE 2-INCH DIAMETER.
SS	5–6	40 48 12 6	MIXED FINE & COARSE SLAG GREY, MOIST (SLAG) 6.2 5357.3	12"	- NO TEST
SS	7–9	3 5 11 12	TAILINGS SILT W/ SAND (SM-ML) VERY DARK GREYISH BROWN (10YR 3/2)	24"	50°/2/1.5
SS	10–11	2 2 2 2	WET BELOW 8'	24"	50°/1.5/2.5
SS	12–14	1 1 2 2	SOME WHITE & YELLOW GRAINS	23"	45°/0.5/1
SS	15–16	1 1 2 2	* IGNITED WHEN EXPOSED TO AIR SMOKED. NO FLAME (TAILINGS) 16.6 5346.9	24"	45°/0.5/1
SS	17–19	2 3 2 2	FINE TAILINGS SILT (MH/CL-ML) * LIGHT BROWNISH GREY (10YR 6/2) WET (FINE TAILINGS)	24"	45°/0/0.5

HOLE NO. SB-97-4

Barr Engineering Company

DRILLING LOG

SHEET 2 OF 2 SHEETS

PROJECT NAME/NO. SILVER BAY/23146-003 JSL	SIZE AND TYPE OF BIT
LOCATION (Coordinates or Station) SEE FIGURE	DATUM FOR ELEV. SHOWN
DRILLING AGENCY	MANUFACTURERS DESIGNATION OF DRILL
HOLE NO. SB-97-4	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN	DATE HOLE: 11/3/97 Started ____ Completed
DEPTH DRILLED INTO ROCK	ELEV. TOP OF HOLE 5363.5
TOTAL DEPTH OF HOLE	SIGNATURE OF INSPECTOR

SAMPLE	DEPTH	CLASSIFICATION OF MATERIALS (Description)	RECOV-ERY	N	REMARKS
3"SS	21	FINE TAILINGS	18"		SAMPLE TS-5
	22	SAME AS ABOVE	P2.5'		
TW	23		R. 2.5		
	24				
TW	25		P10"		
	26		R10"		
	27	26.6' 5336.9			
	28	FINE TAILING -			
	29	Kv, Kh TEST			
	30	PREFORMED IN			
	31	4-INCH CASING			
	32	SET IN HOLE.			
	33				
	34				
	35				
	36				
	37				
	38				
	39				

HOLE NO. SB-97-5

Barr Engineering Company

DRILLING LOG

SHEET 1 OF 2 SHEETS

PROJECT NAME/NO. SILVER BOW / 2L/46-003 JSL	SIZE AND TYPE OF BIT 6 5/8 ID 10½ OD
LOCATION (Coordinates or Station) SEE FIGURE	DATUM FOR ELEV. SHOWN MSL
DRILLING AGENCY OKEEFE DRILLING	MANUFACTURERS DESIGNATION OF DRILL MOBIL B-G
HOLE NO. SB-97-5	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER DAVE CROWLEY	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN NA	DATE HOLE: 10/ 97 Started 10/ 97 Completed
DEPTH DRILLED INTO ROCK NA	ELEV. TOP OF HOLE 5364.7
TOTAL DEPTH OF HOLE 33.6'	SIGNATURE OF INSPECTOR

SAMPLE	DEPTH		CLASSIFICATION OF MATERIALS (Description)	RECOV-ERY	N	REMARKS
HSA	1		SLAG-COARSE GRAVEL TO COBBLE SIZED. GREY- MOIST			TEMP F°/ PEN / TOR
	2		2.0 5362.7 (SLAG)			42°/0.5/1
SS	3	11 25 21 25	TAILINGS (SM-ML) VERY DARK GREYISH BROWN (10YR 3/2), MOIST	23"		STANDARD PENETRATION TEST SPLIT SPOON SAMPLING WAS CONDUCTED W/ A 140 LB HAMMER DROPPED 30-INCHES. SPLIT SPOON SAMPLERS USED ARE 2-INCH DIAMETER.
	4					
SS	5	8 15 50/5" 50/4"	W/ SOME SLAG LAYERS -	20"		45°/2/3.5
	6					
	7		(TAILINGS)			
SS	8	3 2 2 2	8.0 5356.7	24"		48°/0/0.7
	9		FINE TAILINGS * SILT (ML-MH) VERY DARK GREYISH BROWN (10YR 3/2)			STRONG ODOR BELOW 2-FEET
SS	10	2 2	(FINE TAILINGS) WET 10.5 5354.2	24"		42°/0.5/2.5
	11	1 2	TAILINGS (SM-ML) VERY DARK GREYISH BROWN (10YR 3/2) WET			
	12					
SS	13	2 3 4 3	(TAILINGS) * 14.0 5350.7	2"		NO TESTS
	14					
SS	15	1 1 WH 1	1-10MM LAMINATIONS OF TAILINGS & FINE TAILINGS AS DESCRIBED ABOVE -	24"		48°/0/1.0
	16					
	17					
3" SS	18	2 1 2 2	W/ SOME YELLOW AND WHITE LAMINATIONS - WET			SAMPLE TS-6 NO TEST
	19		* IGNITED WHEN EXPOSED TO AIR SMOKE - NO FLAME -			

HOLE NO. SB-97-5

Barr Engineering Company

DRILLING LOG

SHEET 2 OF 2 SHEETS

PROJECT NAME/NO. SILVER BOW/23146-003 JSL	SIZE AND TYPE OF BIT
LOCATION (Coordinates or Station) SEE FIGURE	DATUM FOR ELEV. SHOWN
DRILLING AGENCY	MANUFACTURERS DESIGNATION OF DRILL
HOLE NO. SB-95-5	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN	DATE HOLE: ____ Started ____ Completed
DEPTH DRILLED INTO ROCK	ELEV. TOP OF HOLE 5364.7
TOTAL DEPTH OF HOLE 33.6	SIGNATURE OF INSPECTOR

SAMPLE	DEPTH		CLASSIFICATION OF MATERIALS (Description)	RECOV-ERY	N	REMARKS
TW	21		SAME AS ABOVE			
	22		22.0' 5342.7			
SS	23	2 1 2 3	FINE TAILINGS (MH / CL-ML) LIGHT BROWNISH-GREY (10YR6/2) WET	24"		50°/0/0.5
	24					
SS	25	2 2 3 3		24"		49°/0/0.5
	26					
	27					VS 27-28'
SS	28	1 2 3 5	VERY SOFT	24"		48°/0/0.5
	29					
SS	30	6 8 10 12		24"		45°/0.5/1
	31		31.0 5333.7			45°/3/6
TW	32		SILTY LEAN CLAY (ML/CL) TO FAT CLAY (CH) OLIVE GREY (5Y 5/2) MOIST (ALLUVIUM)			
	33					
	34		EOB 33.6' 5331.1			
	35		NATIVE SOIL Kv Kh TEST PERFORMED IN 4-INCH CASING SET IN HOLE.			
	36					
	37					
	38					
	39					

HOLE NO. SB-97-6

Barr Engineering Company

DRILLING LOG

SHEET 1 OF 2 SHEETS

PROJECT NAME/NO. SILVER BOW / ZL/46-003 JSL	SIZE AND TYPE OF BIT 4¼ HSA
LOCATION (Coorcinates or Station) SEE FIGURE	DATUM FOR ELEV. SHOWN MSL
DRILLING AGENCY OKEEFE DRILLING	MANUFACTURERS DESIGNATION OF DRILL M013 B61
HOLE NO. SB-97-6	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER DAVE CROWLEY	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN NA	DATE HOLE: 10/4/97 Started 10/4/97 Completed
DEPTH DRILLED INTO ROCK NA	ELEV. TOP OF HOLE 5358.1
TOTAL DEPTH OF HOLE 26.5'	SIGNATURE OF INSPECTOR John Tha

SAMPLE	DEPTH	BLOWS 6"	CLASSIFICATION OF MATERIALS (Description)	RECOV-ERY	N	REMARKS
SS	1	10 10 6 7	SILTY LEAN CLAY (CL / CL-ML) W/ SOME GRAVEL GREENISH GREY (5GY 5/1) MOIST TO FAT CLAY (CH)	14"		STANDARD PENETRATION TEST SPLIT SPOON SAMPLING WAS CONDUCTED W/ A 140 LB HAMMER DROPPED 30-INCHES. SPLIT SPOON SAMPLERS USED ARE 2-INCH DIAMETER.
SS	2 3 4	9 13 16 17		24"		
SS	5 6 7	6 8 11 11	GRAVEL CONTENT REDUCES BELOW 5-FEET	24"		
SS	8 9	6 9 11 14	VERY HARD IN LAYERS BELOW 8-FEET	24"		BAG SAMPLE 0-5'
SS	10 11 12	11 12 14 21	SEVERAL 0.5' LAYERS OF: SILT W/ CLAY (ML-CL) OLIVE YELLOW (5Y 6/6) MOIST BELOW 10-FEET	24"		
SS	13 14 15 16	11 11 12 11 5 6 8 12		23" 24"		
SS	17 18 19	6 8 9 12	COLOR CHANGE TO OLIVE YELLOW (5Y 6/6) BELOW 14-FEET	24"		

HOLE NO. SB-97-6

Barr Engineering Company

DRILLING LOG

SHEET 2 OF 2 SHEETS

PROJECT NAME/NO. SILVER BAY/23146-003 JSL	SIZE AND TYPE OF BIT
LOCATION (Coordinates or Station) SEE FIGURE	DATUM FOR ELEV. SHOWN
DRILLING AGENCY	MANUFACTURERS DESIGNATION OF DRILL
HOLE NO. SB-97-6	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN	DATE HOLE: ____ Started ____ Completed
DEPTH DRILLED INTO ROCK	ELEV. TOP OF HOLE 5358.1
TOTAL DEPTH OF HOLE 26.5	SIGNATURE OF INSPECTOR

SAMPLE	DEPTH		CLASSIFICATION OF MATERIALS (Description)	RECOV-ERY	N	REMARKS
SS	21	6 7 10 11	SAME AS ABOVE	24"		
	22					
	23					
	24		½" Ø CONCRETION @ 20-FEET			
SS	25	9 11 14 14		18"		
	26					
	27		EOB 26.5' 5331.6			
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					
	36					
	37					
	38					
	39					

1997 Well Logs

HOLE NO. MW-97-1

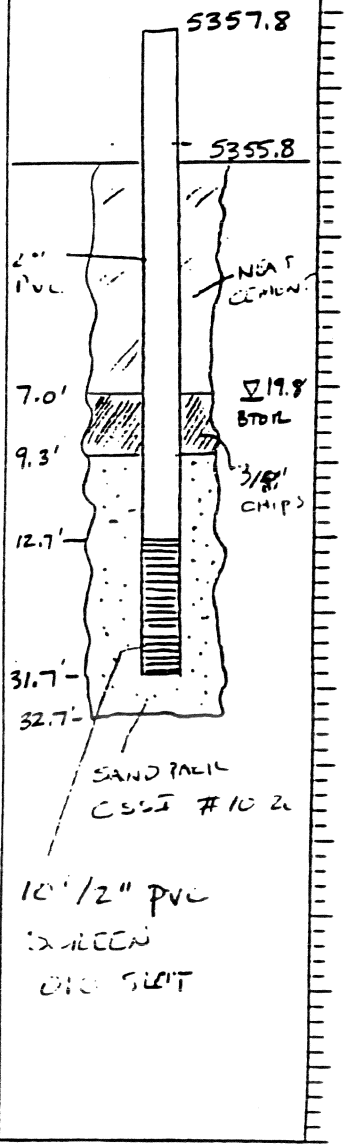
Barr Engineering Company

DRILLING LOG

SHEET 1 OF 2 SHEETS

PROJECT NAME/NO. SILVER BOW 26/46-003	SIZE AND TYPE OF BIT 4¼ HSA
LOCATION (Coordinates or Station) SEE FIGURE	DATUM FOR ELEV. SHOWN MSL
DRILLING AGENCY O'KEEFE DRILLING	MANUFACTURERS DESIGNATION OF DRILL [illegible]
HOLE NO. MW-97-1	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER DAVE CROWLEY	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN NA	DATE HOLE: ____ Started ____ Completed
DEPTH DRILLED INTO ROCK NA	ELEV. TOP OF HOLE 5355.8
TOTAL DEPTH OF HOLE 32.7'	SIGNATURE OF INSPECTOR [signature]

SAMPLE	DEPTH	CLASSIFICATION OF MATERIALS (Description)	RECOV-ERY	N	REMARKS
	1–19	REFER TO LOG OF MW-97-2 FOR PROFILE			BORING ADVANCED W/ 4¼ HSA W/O SAMPLING.



HOLE NO. MW-97-1

Barr Engineering Company

DRILLING LOG

SHEET 2 OF 2 SHEETS

PROJECT NAME/NO. SILVER BOW 26/46-003	SIZE AND TYPE OF BIT
LOCATION (Coordinates or Station) SEE FIGURE	DATUM FOR ELEV. SHOWN
DRILLING AGENCY O'KEEFE DRILLING	MANUFACTURERS DESIGNATION OF DRILL
HOLE NO. MW-97-1	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER DAVE CROWLEY	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN NA	DATE HOLE: ____ Started ____ Completed
DEPTH DRILLED INTO ROCK NA	ELEV. TOP OF HOLE
TOTAL DEPTH OF HOLE	SIGNATURE OF INSPECTOR

SAMPLE	DEPTH	CLASSIFICATION OF MATERIALS (Description)	RECOV-ERY	N	REMARKS
	21	REFER TO			
	22	LOG OF			
	23	MW-97-2			
	24	FOR PROFILE			
	25				
	26				
	27				
	28				
	29				
	30				
	31				
	32	(5323.1)			
	33	EOB 32.7'			
	34				
	35				
	16				
	37				
	38				
	39				

HOLE NO. MW 97 2

Barr Engineering Company

DRILLING LOG

SHEET 1 OF 3 SHEETS

PROJECT NAME/NO. SILVER BOW /26/46-003 SSL	SIZE AND TYPE OF BIT 4 1/4 HSA
LOCATION (Coordinates or Station) SEE FIGURE	DATUM FOR ELEV. SHOWN MSL
DRILLING AGENCY O'KEEFE DRILLING	MANUFACTURERS DESIGNATION OF DRILL MOBILE B-61
HOLE NO. MW-97-2	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER DAVE CROWLEY	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER 5347.9
THICKNESS OF OVERBURDEN NA	DATE HOLE: 10/16/97 Started 10/ /97 Completed
DEPTH DRILLED INTO ROCK NA	ELEV. TOP OF HOLE 5355.7
TOTAL DEPTH OF HOLE 62.3	SIGNATURE OF INSPECTOR

SAMPLE	DEPTH		CLASSIFICATION OF MATERIALS (Description)	RECOV-ERY	N	REMARKS
SS	1	3 9 13 17	Clayey SILT (ML-CL) Brown (10YR 5/3) MOIST (5354.7)	20"		STANDARD PENETRATION TEST SPLIT SPOON SAMPLING WAS CONDUCTED W/ A 140 LB HAMMER DROPPED 30-INCHES. SPLIT SPOON SAMPLERS USED ARE 2-INCH DIAMETER.
	2		1.0			
SS	3	7 7 10 12	Poorly graded SAND W/ SILT (SP-SM) fine to coarse grained W/ gravel pale brown (10YR 6/3) MOIST	12"		
	4		gravel 15%. arkosic			
SS	5	4 6 9 10	3.0 (5352.7) SILT (ML / ML-CL) light grayish brown MOIST	18"		
	6					
SS	7	24 15 10 13	4.2' (5351.5)	24"		
	8					
	9					
SS	10	4 7 11 9	SILTY LEAN CLAY (CL/CL-ML) PALE OLIVE (10YR 6/4) MOIST	26"		(1) SOME CLAY LAYERS ARE HARDENED TO SHALE.
	11					
	12					
SS	13	6 14 28 40	½' LAYER OF GREEN CHERT 8-8.5'	18"		
	14					
	15	22 24 30 40		24"		HARD DRILLING BELOW 12-FEET
SS	16					
	17		(LACUSTRINE) W/ SHALE(1)			
SS	18	7 17 10 11		24"		
	19					

H:\LOGS\STDFORMS\DRILLOG1

HOLE NO. MW-97-2

Barr Engineering Company

DRILLING LOG

SHEET 2 OF 3 SHEETS

PROJECT NAME/NO. SILVER BAY / 23/46-003 JSL	SIZE AND TYPE OF BIT
LOCATION (Coordinates or Station) SEE FIGURE	DATUM FOR ELEV. SHOWN
DRILLING AGENCY	MANUFACTURERS DESIGNATION OF DRILL
HOLE NO. MW-97-2	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN	DATE HOLE: ____ Started ____ Completed
DEPTH DRILLED INTO ROCK	ELEV. TOP OF HOLE 5355.7
TOTAL DEPTH OF HOLE 62.3	SIGNATURE OF INSPECTOR

SAMPLE	DEPTH		CLASSIFICATION OF MATERIALS (Description)	RECOVERY	N	REMARKS
SS	21	32 40 44 42	SILTY LEAN CLAY (CL/CL-ML) PALE OLIVE (10Y6/4) MOIST	20"		
	22					
	23		LAYER OF GREEN CHERT 20.5-21.3'			
	24					▽ @ DRY 21' 10/17/97 8:30AM IN HSA
SS	25	5 11 16 17	WET BELOW 20' IN ZONES	18"		
	26					
	27					HAND DRILLING 20-24 FEET
	28					
	29					
SS	30	7 9 11 18		22"		SHALE PRESENT IN A FEW 0.1-0.2' LAYERS BELOW 31-FEET.
	31					
	32					
	33					
	34					
SS	35	5 7 7 14		22"		
	36					
	37					
	38		(LACUSTRINE) W/ SHALE			
	39					

HOLE NO. MW-97-2

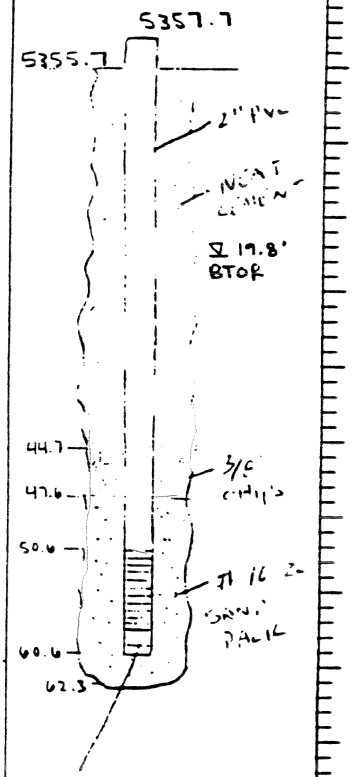
Barr Engineering Company

DRILLING LOG

SHEET 3 OF 3 SHEETS

PROJECT NAME/NO. SILVER BOW/26/96-0071.56	SIZE AND TYPE OF BIT
LOCATION (Coordinates or Station) SEE SKETCH	DATUM FOR ELEV. SHOWN
DRILLING AGENCY	MANUFACTURERS DESIGNATION OF DRILL
HOLE NO. MW-97-2	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN	DATE HOLE: ____ Started ____ Completed
DEPTH DRILLED INTO ROCK	ELEV. TOP OF HOLE 5355.7
TOTAL DEPTH OF HOLE 62.3	SIGNATURE OF INSPECTOR

SAMPLE	DEPTH		CLASSIFICATION OF MATERIALS (Description)	RECOV-ERY	N	REMARKS
SS	41	100 27 8 17	SILTY LEAN CLAY (CL/CL-ML) PALE OLIVE MOIST	20"		
	42					
	43					
	44					
SS	45	9 10 15 13	LAYER OF HARD GREEN CHERT 39½-40'	24"		
	46					
	47					
	48					
	49					
SS	50	5 7 12 16		23"		
	51					
	52					
	53					
	54					
SS	55	12 39 41 46		18"		
	56					
	57					
	58		(LACUSTRINE)			
	59					
SS		*	EOB 61.5' (5294.2)			



59½-61½
BLOWS/6-INCHES
* 16
14
38
34

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HOLE NO. MW-97-3

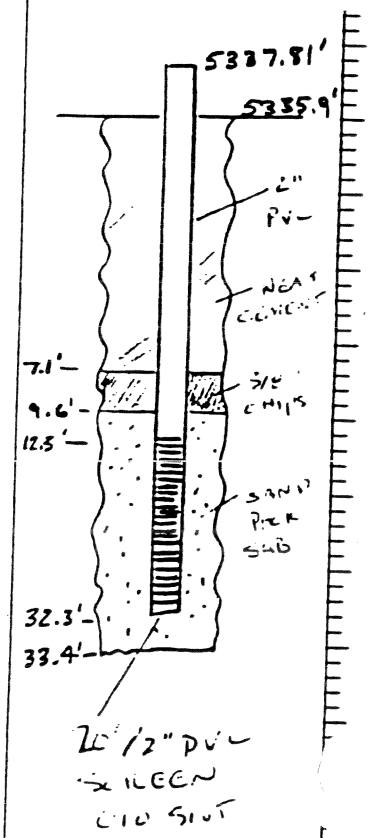
Barr Engineering Company

DRILLING LOG

SHEET 1 OF 3 SHEETS

PROJECT NAME/NO. SILVER BOW / 23/46-003 JSL	SIZE AND TYPE OF BIT 4 1/4 HSA
LOCATION (Coordinates or Station) SEE FIGURE	DATUM FOR ELEV. SHOWN MSL
DRILLING AGENCY	MANUFACTURERS DESIGNATION OF DRILL [illegible]
HOLE NO.	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN	DATE HOLE: 10/ 197 Started 10/ 197 Completed
DEPTH DRILLED INTO ROCK	ELEV. TOP OF HOLE
TOTAL DEPTH OF HOLE	SIGNATURE OF INSPECTOR [signature]

SAMPLE	DEPTH	CLASSIFICATION OF MATERIALS (Description)	RECOVERY	N	REMARKS
	1–19	REFER TO LOG OF MW-97-4 FOR PROFILE			STANDARD PENETRATION TEST SPLIT SPOON sampling was conducted w/ a 140 Lb hammer dropped 30-inches. SPLIT SPOON Samplers used are 2-inch diameter.
		END OF BORING 33.4'			



HOLE NO. MW-97-4

Barr Engineering Company

DRILLING LOG

SHEET 1 OF 3 SHEETS

PROJECT NAME/NO. SILVER BOW / 2L/46-003 JSL	SIZE AND TYPE OF BIT 4 1/4" ID
LOCATION (Coordinates or Station) SEE FIGURE	DATUM FOR ELEV. SHOWN MSL
DRILLING AGENCY O'KEEFE	MANUFACTURERS DESIGNATION OF DRILL Mobile B-61
HOLE NO. MW-97-4	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER DAVE CROWLEY	TOTAL NO. CORE BOXES NA
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER 22' ±
THICKNESS OF OVERBURDEN NA	DATE HOLE: 10/13/97 Started 10/ /97 Completed
DEPTH DRILLED INTO ROCK NA	ELEV. TOP OF HOLE 5336.0
TOTAL DEPTH OF HOLE 61.5'	SIGNATURE OF INSPECTOR

SAMPLE	DEPTH		CLASSIFICATION OF MATERIALS (Description)	RECOV-ERY	N	REMARKS
SS	1	9	CLAYEY SILT (CL-ML)	20"		STANDARD PENETRATION TEST SPLIT SPOON SAMPLING WAS CONDUCTED W/ A 140 Lb HAMMER DROPPED 30-INCHES. SPLIT SPOON SAMPLERS USED ARE 2-INCH DIAMETER.
		13	Dark grey (10YR 3/1)			
		12	MOIST (WETLAND SOIL)			
	2	13	0.2' (5335.8)			
SS	3	10	SILT (ML-SM)	16"		
		9	SAND portion FINE grained			
		6	Light grayish brown (10YR 6/2)			
	4	6	MOIST			
SS	5	8	BELOW 2' grades TO:	18"		
		9	SILTY SAND (SM)			
	6	10	fine grained w/			
		14	Some gravel			
SS	7	11	Light grey (5Y 7/2)	20"		SAND & GRAVEL ARE ARKOSIC, subangular.
		12	MOIST			
	8	16				
		18				
	9		3.8' (5327.2)			
SS	10	10	SANDSTONE: POORLY GRADED SAND W/ SILT (SP-SM/SM) fine grained w/ cemented layers	20"		
		12				
	11	15				
		11				
SS	12	6	Light grey (5Y 7/2)	24"		Cemented layers same composition as MATRIX SOIL, same color and mineralogy as MATRIX SOIL.
	13	8				
		18	MOIST			
		17				
	14					
SS	15	5		23"		
		5				
	16	6				
		6				
	17					
SS	18	5		24"		
		7				
		8				
		8				
	19					
		6	(SILTY SANDSTONE)			

HOLE NO. MW-97-4

Barr Engineering Company

DRILLING LOG

SHEET 2 OF 3 SHEETS

PROJECT NAME/NO. SILVER Bay / 23146-003 JSL	SIZE AND TYPE OF BIT
LOCATION (Coordinates or Station) SEE FIGURE	DATUM FOR ELEV. SHOWN
DRILLING AGENCY	MANUFACTURERS DESIGNATION OF DRILL
HOLE NO. MW-97-4	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN	DATE HOLE: ____ Started ____ Completed
DEPTH DRILLED INTO ROCK	ELEV. TOP OF HOLE 5336.0
TOTAL DEPTH OF HOLE 61.5	SIGNATURE OF INSPECTOR

SAMPLE	DEPTH		CLASSIFICATION OF MATERIALS (Description)	RECOVERY	N	REMARKS
SS	21	3 9 9	SANDSTONE: POORLY GRADED SAND W/ SILT (SP-SM/SM) — SAME AS ABOVE Color change to olive gray (5Y 5/2) below 21-feet	18"		▽ H2O in Hole 22.4' BGS Rose to 22.0 BGS in 15 minutes.
SS	22 23 24	8 7 14 15		23"		
SS	25 26	9 16 14 20	• WET in zones 20-24'. • MOIST 22-30.3'..	20"		
SS	27 28 29	4 5 5 8	• WET BELOW 32'.	12"		
SS	30 31 32	9 10 11 20		23"		
SS	33 34	11 12 18 22		12"		
SS	35 36	9 10 12 17	34.2 (5301.8) SANDY LEAN CLAY (SC) light olive gray (5Y 6/2) WET 35.6 (5300.4)	24"		
SS	37 38 39	8 10 14 17	SANDSTONE: POORLY GRADED SAND W/ SILT (SP-SM/SM) fine grained w/ some cemented layers olive gray (5Y 5/2) WET	20"		

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HOLE NO. MW-97-4

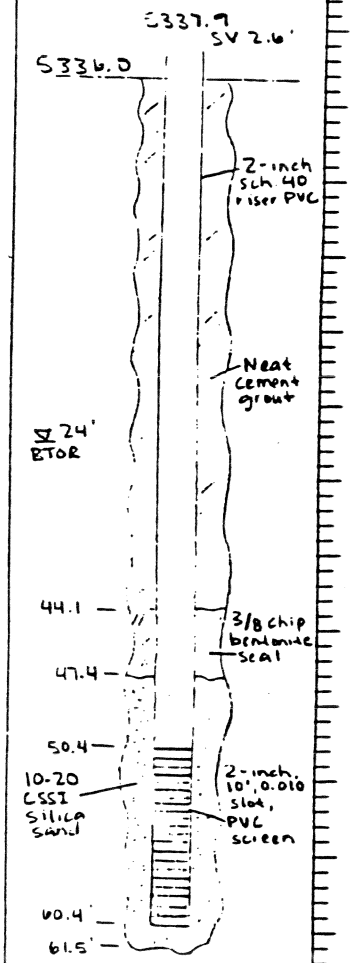
Barr Engineering Company

DRILLING LOG

SHEET 3 OF 3 SHEETS

PROJECT NAME/NO. SILVER BOW/26/96-001ISL	SIZE AND TYPE OF BIT
LOCATION (Coordinates or Station) SEE SKETCH	DATUM FOR ELEV. SHOWN
DRILLING AGENCY	MANUFACTURERS DESIGNATION OF DRILL
HOLE NO. MW-97-4	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN	DATE HOLE: ____ Started ____ Completed
DEPTH DRILLED INTO ROCK	ELEV. TOP OF HOLE 5336.0
TOTAL DEPTH OF HOLE 61.5	SIGNATURE OF INSPECTOR

SAMPLE	DEPTH		CLASSIFICATION OF MATERIALS (Description)	RECOV-ERY	N
SS	41	9 14 19 15	SANDSTONE: POORLY GRADED SAND W/ SILT (SP-SM) FINE GRAINED W/ SOME CEMENTED LAYERS. OLIVE GREY (5Y 5/2) WET	19"	
	42				
SS	43	8 12 20 27		20"	
	44				
SS	45	9 11 17		23"	
	46	21			
	47				
SS	48	10 10 12 20		24"	
	49				
SS	50	9 10 15		23"	
	51	21			
	52				
SS	53	15 24 21		24"	
	54	36			
SS	55	26 37	SOME CHERT LAYERS BELOW 60' (0.1')	19"	
	56	40 44			
	57				
SS	58	19 21 20		24"	
	59	16			
SS		12 12 14	EOB 61.5' (5274.5)	24"	



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HOLE NO. MW-97-5

Barr Engineering Company

DRILLING LOG

SHEET 1 OF 4 SHEETS

PROJECT NAME/NO. SILVER BOW / 26/46-003 JSL	SIZE AND TYPE OF BIT 4¼ HSA
LOCATION (Coordinates or Station) SEE FIGURE	DATUM FOR ELEV. SHOWN MSL
DRILLING AGENCY O'KEEFE DRILLING	MANUFACTURERS DESIGNATION OF DRILL MOBILE B-61
HOLE NO. MW-97-5	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER DAVE CROWLEY	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN NA	DATE HOLE: 10/20/97 Started 10/21/97 Completed
DEPTH DRILLED INTO ROCK NA	ELEV. TOP OF HOLE 5400.1
TOTAL DEPTH OF HOLE 72.6'	SIGNATURE OF INSPECTOR

SAMPLE	DEPTH		CLASSIFICATION OF MATERIALS (Description)	RECOV-ERY	N	REMARKS
SS	1	5 11 18 23	SILTY SAND W/ CLAY (SM-CL) fine to medium grained w/ some gravel Brown (10YR 5/3) MOIST	23"		STANDARD PENETRATION TEST SPLIT SPOON SAMPLING WAS CONDUCTED W/ A 140 LB HAMMER DROPPED 30-INCHES. SPLIT SPOON SAMPLERS USED ARE 2-INCH DIAMETER.
SS	3	50 50/5" 22 16	(5397.1) (FILL) 3.0	23"		
SS	5	18 20 30 50	POORLY GRADED SAND W/ SILT (SP-SM) fine to medium grained w/ some gravel and cobbles Olive gray (5Y 6/2) MOIST	20"		
SS	7	26 50 50/4"	(5396.0) 4.1 SILTY SAND (SM) fine to medium grained w/ some gravel pale brown (10YR 6/3) MOIST	22"		
SS	10	46 50 50/5"	VERY HARD LAYERS BELOW 7-FEET.	14"		
SS	12	31 50 50/3"	(5386.1) 14.0'	12"		
SS	15	34 50/5" 50/5"	SILT W/ SAND (ML-SM) fine grained w/ some gravel Pale yellow (2.5Y 7/3) DRY	16"		MICA FLAKES IN ALL SAMPLES BELOW 14 FEET
SS	17	30 50 50/5"	(5383.6) 16.5 SEE DESCRIPTION ON NEXT PAGE	14"		
	19					

HOLE NO. MW 97 5

Barr Engineering Company

DRILLING LOG

SHEET 2 OF 4 SHEETS

PROJECT NAME/NO. SILVER BAY/23/46-003 JSL	SIZE AND TYPE OF BIT
LOCATION (Coordinates or Station) SEE FIGURE	DATUM FOR ELEV. SHOWN
DRILLING AGENCY	MANUFACTURERS DESIGNATION OF DRILL
HOLE NO. MW-97-5	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN	DATE HOLE: ____ Started ____ Completed
DEPTH DRILLED INTO ROCK	ELEV. TOP OF HOLE 5400.1
TOTAL DEPTH OF HOLE 72.6	SIGNATURE OF INSPECTOR

SAMPLE	DEPTH		CLASSIFICATION OF MATERIALS (Description)	RECOV-ERY	N	REMARKS
SS	21	30 50 50/5"	SILT W/ SAND (ML/ML-SM) fine grained w/ some gravel Pale yellow (10YR 7/3) MOIST Some very hard layers	16"		
	22					
	23					
	24					
SS	25	14 50/5"		18"		
	26	40 50				
	27					
	28					
	29					
SS	30	25 24		20"		
	31	40 50				
	32					
	33					
	34					
SS	35	22 40		23"		
	36	50 50/4"				
	37					
	38					
	39		(5361.1) 39.0 SEE DESCRIPTION ON NEXT PAGE			

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HOLE NO. MW-97-5

Barr Engineering Company

DRILLING LOG

SHEET 3 OF 4 SHEETS

PROJECT NAME/NO. SILVER BOW/26/96-003TSL	SIZE AND TYPE OF BIT
LOCATION (Coordinates or Station) SEE SKETCH	DATUM FOR ELEV. SHOWN
DRILLING AGENCY	MANUFACTURERS DESIGNATION OF DRILL
HOLE NO. MW-97-5	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN	DATE HOLE: ____ Started ____ Completed
DEPTH DRILLED INTO ROCK	ELEV. TOP OF HOLE 5400.1
TOTAL DEPTH OF HOLE 72.6	SIGNATURE OF INSPECTOR

SAMPLE	DEPTH		CLASSIFICATION OF MATERIALS (Description)	RECOVERY	N	REMARKS
SS	41	32 39 44 50	SILTY SAND (SM) fine grained brown (10YR 5/3) moist	23"		
	42					
	43					
	44					
SS	45	25 31 41 50/4"		20"		
	46					
	47					
	48					
	49					
SS	50	29 40 50 50/4"		21"		
	51					
	52					
	53					
	54					
SS	55	32 35 50 50/4"		23"		
	56		(5344.1) 56.0' Poorly graded sand w/ some SILT (SP/SP-SM) medium grained w/ some gravel Dark greyish brown (10YR 6/2) moist			
	57					
	58					
	59					

HOLE NO. MW 97 5

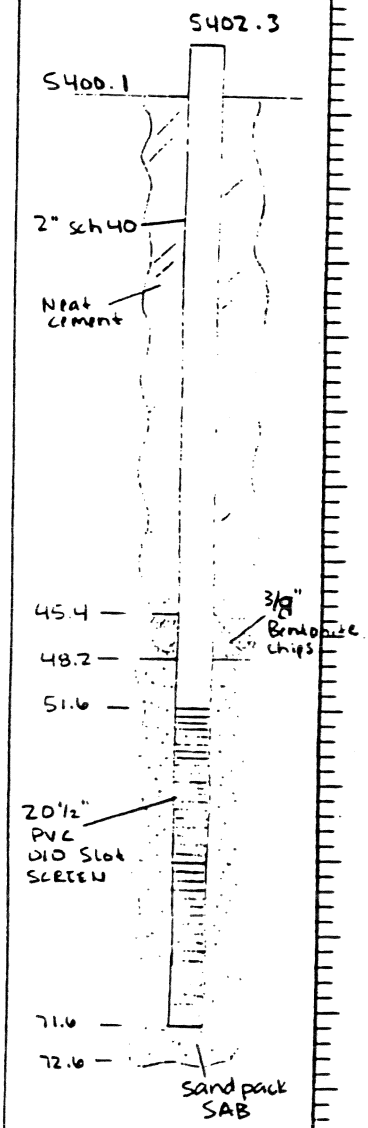
Barr Engineering Company

DRILLING LOG

SHEET 4 OF 4 SHEETS

PROJECT NAME/NO. SILVER BOW/26/96-003TS6	SIZE AND TYPE OF BIT
LOCATION (Coordinates or Station) SEE SKETCH	DATUM FOR ELEV. SHOWN
DRILLING AGENCY	MANUFACTURERS DESIGNATION OF DRILL
HOLE NO. MW-97-5	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN	DATE HOLE: ____ Started ____ Completed
DEPTH DRILLED INTO ROCK	ELEV. TOP OF HOLE 5400.1
TOTAL DEPTH OF HOLE 72.6	SIGNATURE OF INSPECTOR

SAMPLE	DEPTH		CLASSIFICATION OF MATERIALS (Description)	RECOV-ERY	N	REMARKS
SS	61	27 50 50 50/3"	SAME AS ABOVE	24"		
	62					
	63					
	64					
SS	65	14 25 30 40	(5334.1) 66.0	24"		
	66		POORLY GRADED SAND (SP) medium grained w/ some gravel Light grayish brown (10YR 6/2) WET			
	67					
	68					
	69					
SS	70	17 35 50/5" 50/3"		23"		
	71					
	72		(5327.5) EOB 72.6'			
	73					
	74					
	75					
	76					
	77					
	78					
	79					



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HOLE NO. MW 97 6

Barr Engineering Company

DRILLING LOG

SHEET 1 OF 3 SHEETS

PROJECT NAME/NO. SILVER BOW /26/46-003 JSL	SIZE AND TYPE OF BIT 4¼ HSA
LOCATION (Coordinates or Station) SEE FIGURE	DATUM FOR ELEV. SHOWN MSL
DRILLING AGENCY O'KEEFE	MANUFACTURERS DESIGNATION OF DRILL MOBILE B-51
HOLE NO. MW-97-6	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER DAVE CROWLEY	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN NA	DATE HOLE: 10/21/97 Started 10/23/97 Completed
DEPTH DRILLED INTO ROCK NA	ELEV. TOP OF HOLE 5364.6
TOTAL DEPTH OF HOLE 53.1	SIGNATURE OF INSPECTOR

SAMPLE	DEPTH		CLASSIFICATION OF MATERIALS (Description)	RECOV-ERY	N	REMARKS
SS	1	12 13 15 15	SILTY SAND (SM/SM-ML) fine grained w/ some gravel Light Yellowish brown (2.5Y 6/4) MOIST	22"		STANDARD PENETRATION TEST SPLIT SPOON SAMPLING WAS CONDUCTED W/ A 140 Lb hammer dropped 30-inches. SPLIT SPOON SAMPLERS USED ARE 2-INCH DIAMETER.
SS	3	8 9 9 13		20"		
SS	5	10 19 19 29		24"		
SS	8	28 35 41 39		22"		
SS	10	21 32 44 50		22"		
	11.7'	(5352.9)				
SS	13	20 29 40 44	SILTY SAND (SM) fine grained w/ some gravel Light Yellowish brown (2.5Y 6/4) MOIST	23"		MICA FLAKES PRESENT IN ALL SAMPLES BELOW 2-FEET
SS	15	23 24 30 38		23"		
	15.8	(5349.6)				
SS	18	19 36 38 48	SILT W/ SAND (ML/ML-SM) fine grained w/ some gravel Pale brown (10YR 6/3) MOIST	20"		

HOLE NO. MW-97-6

Barr Engineering Company

DRILLING LOG

SHEET 2 OF 3 SHEETS

PROJECT NAME/NO. SILVER BOW / 23146-003 JSL	SIZE AND TYPE OF BIT
LOCATION (Coordinates or Station) SEE FIGURE	DATUM FOR ELEV. SHOWN
DRILLING AGENCY	MANUFACTURERS DESIGNATION OF DRILL
HOLE NO. MW-97-6	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN	DATE HOLE: ____ Started ____ Completed
DEPTH DRILLED INTO ROCK	ELEV. TOP OF HOLE 5364.6
TOTAL DEPTH OF HOLE 53.1	SIGNATURE OF INSPECTOR

SAMPLE	DEPTH		CLASSIFICATION OF MATERIALS (Description)	RECOV-ERY	N	REMARKS
SS	21	24 30 40 50/5"	SILTY SAND (SM / SM-ML) fine grained w/ some gravel Light Yellowish brown (10YR 6/4) MOIST	20"		MICA IN ALL SAMPLES
	22					
	23					
	24					
			(5339.6)			
			25.0'			
SS	25	25 23 17 27	POORLY GRADED SAND W/ SILT (SP-SM) fine to medium grained w/ gravel Olive Yellow (2.5Y 6/6) MOIST	22"		
	26					
	27					
	28					
	29					
			29.0' (5336.6)			
SS	30	15 23 33 47	SILTY SAND (SM / SM-ML) fine grained w/ some gravel Light Yellowish brown (10YR 6/4) MOIST	22"		
	31					
	32					
	33					
	34					
SS	35	25 49 50/6" 50/4"		12"		
	36					
	37					
			37.7 (5326.9)			
	38		SEE DESCRIPTION IN NEXT PAGE			
	39					

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HOLE NO. MW-97-6

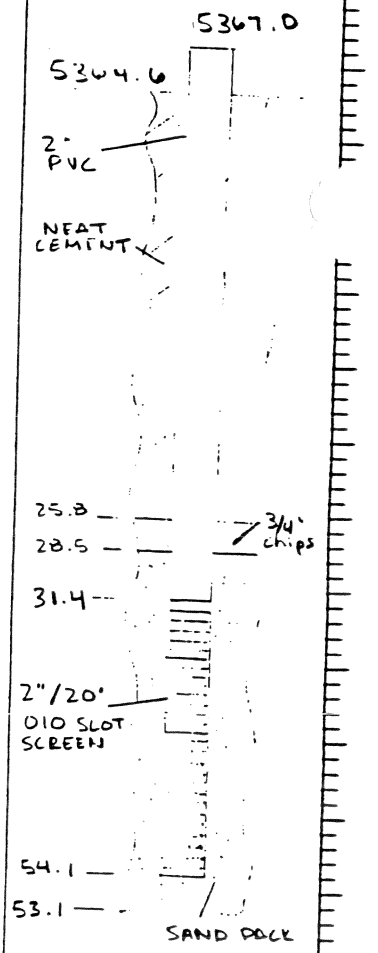
Barr Engineering Company

DRILLING LOG

SHEET 3 OF 3 SHEETS

PROJECT NAME/NO. SILVER BOW/26/96-00JTSL	SIZE AND TYPE OF BIT
LOCATION (Coordinates or Station) SEE SKETCH	DATUM FOR ELEV. SHOWN
DRILLING AGENCY	MANUFACTURERS DESIGNATION OF DRILL
HOLE NO. MW-97-6	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN	DATE HOLE: ____ Started ____ Completed
DEPTH DRILLED INTO ROCK	ELEV. TOP OF HOLE 5364.6
TOTAL DEPTH OF HOLE 53.1	SIGNATURE OF INSPECTOR

SAMPLE	DEPTH		CLASSIFICATION OF MATERIALS (Description)	RECOV-ERY	N	REMARKS
SS	41	3 31 50 50/4"	SILTY SAND (SM/SM-ML) fine grained w/ some grand and a trace of clay Light yellowish brown (10YR 6/4) moist	20"		
	42					
	43					
	44					
SS	45	27 26 43 50/3"	WET BELOW 41'	24"		
	46					
	47		44.5 - 45.0' : 0.5' Layer of poorly graded sand w/ SILT (SP-SM) Medium grained Pale brown (10YR 6/3) wet			
	48					
	49					
SS	50	26 40 50/4" 50/3"		20"		
	51					
	52					
	53		53.1 (5311.5) EOB			
	54					
	55					
	56					
	57					
	58					
	59					



HOLE NO. MW 97-7

Barr Engineering Company

DRILLING LOG

SHEET 1 OF 3 SHEETS

PROJECT NAME/NO. SILVER BOW /26/46-003 JSL	SIZE AND TYPE OF BIT 4½ HSA
LOCATION (Coordinates or Station) SEE FIGURE	DATUM FOR ELEV. SHOWN MSL
DRILLING AGENCY O'KEEFE	MANUFACTURER'S DESIGNATION OF DRILL MODEL B 61
HOLE NO. MW-97-7	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER DAVE CROWLEY	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN NA	DATE HOLE: 10/22/97 Started 10/ /97 Completed
DEPTH DRILLED INTO ROCK NA	ELEV. TOP OF HOLE 5,362.1
TOTAL DEPTH OF HOLE 62.9	SIGNATURE OF INSPECTOR

SAMPLE	DEPTH		CLASSIFICATION OF MATERIALS (Description)	RECOV-ERY	N	REMARKS
SS	1	30 11 11 16	SILTY SAND (SM) W/ gravel fine to medium grained Grey (10YR 5/1) MOIST (FILL)	20"		STANDARD PENETRATION TEST SPLIT SPOON SAMPLING WAS CONDUCTED W/ A 140 LB HAMMER DROPPED 30-INCHES. SPLIT SPOON SAMPLERS USED ARE 2-INCH DIAMETER.
SS	3	11 11 10 17		22"		
	4		1.0 (5361.1)			
SS	5	15 17 15 18	SILTY SAND W/ CLAY (SM-CL) fine grained W/ some gravel Yellowish brown (10YR 5/4) (MOIST)	24"		
SS	8	9 13 16 20		23"		
	9		2.0 (5360.1)			
SS	10	12 14 17 19	SILTY SAND (SM / SM-ML) fine grained W/ some gravel yellowish brown (10YR 5/4) MOIST	18"		MICA FLAKES PRESENT BELOW 2'
SS	13	19 20 37 46	5.0-6.0': 1' LAYER OF: POORLY graded SAND (SP) medium grained W/ gravel pale brown (10YR 6/3) MOIST	21"		
SS	15	20 33 45 50		22"		
	17		7.1 (5,255.0)			
SS	18	15 18 21 30	SILTY SAND W/ CLAY (SM / SM-SC) fine grained W/ gravel Brown (10YR 5/3) MOIST	22"		
	19					

HOLE NO. MW-97-7

Barr Engineering Company

DRILLING LOG

SHEET 2 OF 3 SHEETS

PROJECT NAME/NO. SILVER BAY/23146-003 JSL	SIZE AND TYPE OF BIT
LOCATION (Coordinates or Station) SEE FIGURE	DATUM FOR ELEV. SHOWN
DRILLING AGENCY	MANUFACTURERS DESIGNATION OF DRILL
HOLE NO. MW-97-7	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN	DATE HOLE: ____ Started ____ Completed
DEPTH DRILLED INTO ROCK	ELEV. TOP OF HOLE 5362.1
TOTAL DEPTH OF HOLE 62.9	SIGNATURE OF INSPECTOR

SAMPLE	DEPTH		CLASSIFICATION OF MATERIALS (Description)	RECOV-ERY	N	REMARKS
SS	21	21 26 30 42	19.0 (5343.1) SILTY SAND (SM) fine grained w/ some gravel light yellowish brown (10YR 6/4) MOIST	23"		
	22					
	23					
	24					
SS	25	18 26 30 35		22"		
	26					
	27					
	28					
	29					
SS	30	14 22 32 45		22"		
	31					
	32					
	33		33.0 (5329.1) SILTY SAND W/ CLAY (SM/SM-SC) fine grained w/ gravel brown (10YR 5/3) MOIST			
SS	35	17 29 40 40		24"		
	36					
	37					
	38		38.0 (5324.1) SEE NEXT PAGE			
	39					

HOLE NO. MW-97-7

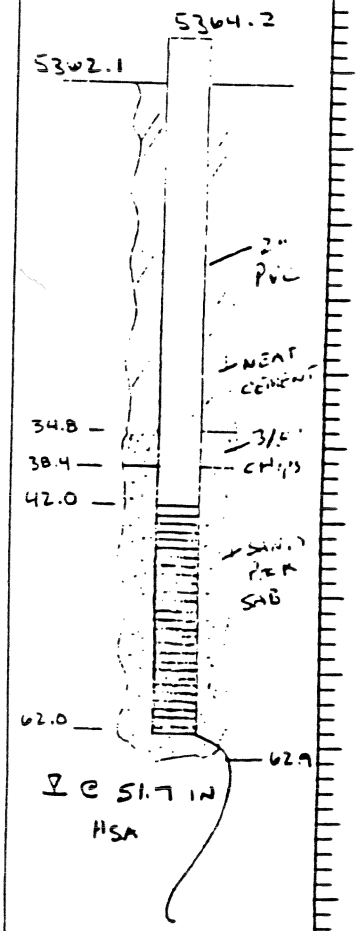
Barr Engineering Company

DRILLING LOG

SHEET 3 OF 3 SHEETS

PROJECT NAME/NO. SILVER BOW/26/96-0023TSL	SIZE AND TYPE OF BIT
LOCATION (Coordinates or Station) SEE SKETCH	DATUM FOR ELEV. SHOWN
DRILLING AGENCY	MANUFACTURERS DESIGNATION OF DRILL
HOLE NO. MW 97 7	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN	DATE HOLE: ____ Started ____ Completed
DEPTH DRILLED INTO ROCK	ELEV. TOP OF HOLE 5362.1
TOTAL DEPTH OF HOLE 62.9	SIGNATURE OF INSPECTOR

SAMPLE	DEPTH	N	CLASSIFICATION OF MATERIALS (Description)	RECOV-ERY	N
SS	41	M 24 22 27	SILTY SAND (SM) fine grained w/ some gravel Brown (10YR5/3) MOIST	24"	
	42				
	43				
	44				
SS	45	16 34 50/4" 50/2"	WET ZONE 41 - 41.2'	24"	
	46				
	47				
	48		48.0 (5314.1)		
	49		SILTY SAND W/CLAY (SM / SM-SC) fine grained w/ gravel Brown (10YR5/3) MOIST		
SS	50	11 12 24 50/5"		24"	
	51				
	52				
	53		WET in zones below 50'		
	54				
SS	55	18 33 50 50/3"		20"	
	56				
	57				
	58				
	59				
SS			EOB 62.9' (5299.2)	20"	



REMARKS

* 59½-61½ BLOWS /6"
24
38
50/4"
50/2"

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HOLE NO. MW 97 8

Barr Engineering Company

DRILLING LOG

SHEET 1 OF 4 SHEETS

PROJECT NAME/NO. SILVER BOW / 26/46-003 JSL	SIZE AND TYPE OF BIT 4 1/4 HSA
LOCATION (Coordinates or Station) SEE FIGURE	DATUM FOR ELEV. SHOWN MSL
DRILLING AGENCY O'KEEFE	MANUFACTURERS DESIGNATION OF DRILL [illegible]
HOLE NO. MW-97-8	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN NA	DATE HOLE: 10/24/97 Started 10/ /97 Completed
DEPTH DRILLED INTO ROCK NA	ELEV. TOP OF HOLE 5377.2
TOTAL DEPTH OF HOLE 72.2	SIGNATURE OF INSPECTOR [signature]

SAMPLE	DEPTH		CLASSIFICATION OF MATERIALS (Description)	RECOV-ERY	N	REMARKS
SS	1	12 18 19 20	SILTY SAND W/ CLAY (SM / SM-SC) fine grained w/ some gravel Brownish yellow (10YR 6/6) MOIST	23"		STANDARD PENETRATION TEST SPLIT SPOON sampling was conducted w/ a 140 Lb hammer dropped 30-inches. SPLIT SPOON Samplers used are 2-inch diameter.
SS	3	15 18 19 21		23"		
SS	5	9 9 11 13	FROST 6"	24"		
SS	8	20 27 36 41		23"		
SS	10	30 44 50/4" 50/3"		20"		MICA FLAKES IN ALL SAMPLES BELOW 15'
SS	13	45 50/3" 60/5" 50/4"	(FILL)	12"		
SS	15	25 29 43 50/4"	15' (5362.2) SILTY SAND (SM/SM-ML) FINE grained w/ some gravel Light greyish brown (10YR 6/2) moist (Fill)	23"		
SS	18	23 46 50 50/4"	19.2'	20"		

HOLE NO. MW 97 - 8

Barr Engineering Company

DRILLING LOG

SHEET 2 OF 4 SHEETS

PROJECT NAME/NO. SILVER BOW / 23146-003 JSL	SIZE AND TYPE OF BIT
LOCATION (Coordinates or Station) SEE FIGURE	DATUM FOR ELEV. SHOWN
DRILLING AGENCY	MANUFACTURERS DESIGNATION OF DRILL
HOLE NO. MW-97-8	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN	DATE HOLE: ____ Started ____ Completed
DEPTH DRILLED INTO ROCK	ELEV. TOP OF HOLE 5377.2
TOTAL DEPTH OF HOLE 72.2	SIGNATURE OF INSPECTOR

SAMPLE	DEPTH		CLASSIFICATION OF MATERIALS (Description)	RECOV-ERY	N	REMARKS
SS	21	24 28 31 30	Poorly grad'd sand w/ SILT (SP-SM) fine to coarse grained w/ gravel Brown (10yr 5/3) (ALLUVIUM) moist 23.0' (5354.2)	22"		GRAINS ARE ARKOSE W/ MICA FLAKES
	22					
	23					
	24					
SS	25	30 30 27 46	SILTY SAND (SM/SM-ML) fine grained w/ some gravel brown (10yr 5/3) moist	23"		
	26					
	27					
	28					
	29					
SS	30	30 37 45 50		24"		
	31					
	32					
	33					
	34					
SS	35	21 25 33 46	(ALLUVIUM)	24"		
	36					
	37					
	38					
	39					

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HOLE NO. MW. 97 - 8

Barr Engineering Company

DRILLING LOG

SHEET 3 OF 4 SHEETS

PROJECT NAME/NO. SILVER BOW/26/44 -003TSL	SIZE AND TYPE OF BIT
LOCATION (Coordinates or Station) SEE SKETCH	DATUM FOR ELEV. SHOWN
DRILLING AGENCY OKEEFE	MANUFACTURERS DESIGNATION OF DRILL
HOLE NO. MW 97-8	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN	DATE HOLE: ____ Started ____ Completed
DEPTH DRILLED INTO ROCK	ELEV. TOP OF HOLE 5377.2
TOTAL DEPTH OF HOLE 72.2	SIGNATURE OF INSPECTOR

SAMPLE	DEPTH		CLASSIFICATION OF MATERIALS (Description)	RECOV-ERY	N	REMARKS
SS	41	42 50/5 50/4 50/4	SAME AS ABOVE	12"		
	42					
	43		40-41' LAYER OF:			GRAINS ARE ARKOSE W/ MICA FLAKES.
	44		Poorly graded sand w/ SILT (SP-SM) fine to coarse grained w/ gravel pale brown (10YR 6/3) MOIST			
SS	45	25 43 50/4" 50/3"		20"		
	46					
	47		43.0 (5334.2)			
	48		POORLY GRADED SAND W/ SILT (SP-SM/SM)			
	49					
SS	50	21 31 50 5/4"	fine grained w/ some gravel brown (10YR 5/3)	23"		
	51					
	52		Partially cemented (SANDSTONE)			
	53		53.0 (5324.2)			
	54		SILTY SAND (SM/SM-ML)			
SS	55	29 50 50 50/3"	FINE GRAINED W/ some gravel brown (10YR 5/3) MOIST	20		
	56					
	57					
	58					
	59					

HOLE NO. MW-97-8

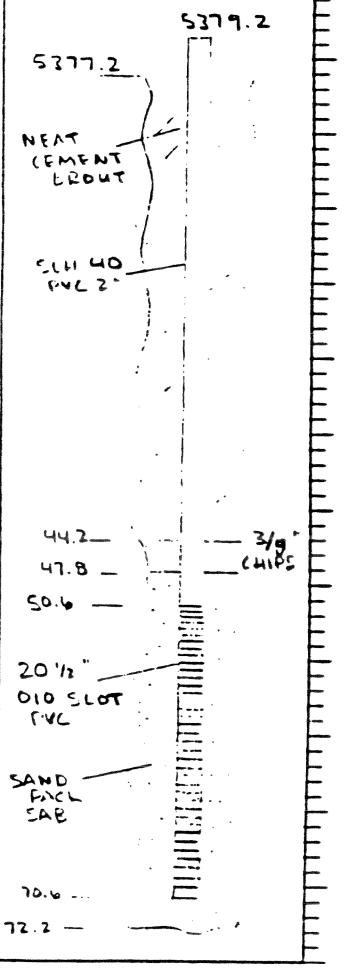
Barr Engineering Company

DRILLING LOG

SHEET 4 OF 4 SHEETS

PROJECT NAME/NO. SILVER Bay / 23/46-003 JSL	SIZE AND TYPE OF BIT
LOCATION (Coordinates or Station) SEE FIGURE	DATUM FOR ELEV. SHOWN
DRILLING AGENCY	MANUFACTURERS DESIGNATION OF DRILL
HOLE NO. MW-97-8	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN	DATE HOLE: ____ Started ____ Completed
DEPTH DRILLED INTO ROCK	ELEV. TOP OF HOLE 5377.2
TOTAL DEPTH OF HOLE 72.2	SIGNATURE OF INSPECTOR

SAMPLE	DEPTH		CLASSIFICATION OF MATERIALS (Description)	RECOV-ERY	N	REMARKS
SS	G1	26 40 50/3" 50/3"	SILTY SAND (SM/SM-ML) FINE GRAINED W/ SOME GRAVEL BROWN (10YR6/3) MOIST	24"		
	G2					
	G3					
	G4					
SS	G5	11 26 40 50/3"		24"		
	G6					
	G7		WET IN ZONES BELOW 63'			
	G8					
	G9		ROSE QUICKLY TO 50' IN HSA			
	70 20					
	71 21					
	72 22		(5305.0)			
	73 23		EOB 72.2			
	74 24					
	75 25					
	76 26					
	77 27					
	78 28					
	79 29					



HOLE NO. MW 97 9

Barr Engineering Company

DRILLING LOG

SHEET 1 OF 4 SHEETS

PROJECT NAME/NO. SILVER BOW /26/46-003 JSL	SIZE AND TYPE OF BIT 4¼ HSA
LOCATION (Coordinates or Station) SEE FIGURE	DATUM FOR ELEV. SHOWN MSL
DRILLING AGENCY O'KEEFE DRILLING	MANUFACTURERS DESIGNATION OF DRILL MOBILE B-61
HOLE NO. MW-97-9	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER DAVE CROWLEY	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN NA	DATE HOLE: 10/27/97 Started 10/ /97 Completed
DEPTH DRILLED INTO ROCK NA	ELEV. TOP OF HOLE 5374.7
TOTAL DEPTH OF HOLE 73.6	SIGNATURE OF INSPECTOR

SAMPLE	DEPTH		CLASSIFICATION OF MATERIALS (Description)	RECOV-ERY	N	REMARKS
SS	1	11 13 14 9	SILT W/ SAND (ML-SM) fine grained with some gravel, trace clay. Light yellowish brown (10YR 6/4) moist (Fill)	24"		STANDARD PENETRATION TEST SPLIT SPOON SAMPLING WAS CONDUCTED W/ a 140 Lb hammer dropped 30-inches. SPLIT SPOON SAMPLERS USED ARE 2-inch diameter.
SS	3	11 5 6 7		23"		
SS	5	10 9 9 15		23"		
SS	8	15 20 25 25	(FILL)	23"		MICA FLAKES PRESENT IN ALL SAMPLES
	10.0 (5364.7)					
SS	11	15 31 50 50/5"	SILT W/ CLAY (SM / SM-SC) fine grained w/ some gravel. Brownish yellow (10YR 6/6) w/ some very hard dry layers.	20"		
SS	13	18 19 50/4" 50		23"		
SS	15	14 26 50 47		24"		
SS	18	17 20 25 30		24"		
	19		(FILL)			

HOLE NO. MW 97 9

Barr Engineering Company

DRILLING LOG

SHEET 2 OF 4 SHEETS

PROJECT NAME/NO. SILVER Bay / 23146-003 JSL	SIZE AND TYPE OF BIT
LOCATION (Coordinates or Station) SEE FIGURE	DATUM FOR ELEV. SHOWN
DRILLING AGENCY	MANUFACTURERS DESIGNATION OF DRILL
HOLE NO. MW 97 9	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN	DATE HOLE: ____ Started ____ Completed
DEPTH DRILLED INTO ROCK	ELEV. TOP OF HOLE 5374.7
TOTAL DEPTH OF HOLE 73.6	SIGNATURE OF INSPECTOR

SAMPLE	DEPTH		CLASSIFICATION OF MATERIALS (Description)	RECOV-ERY	N	REMARKS
SS	21	11 15 22 21	SAME AS ABOVE	23"		
	22		(FILL)			
	23		23.0 (5351.7)			
	24		SILTY SAND (SM) fine grained w/ some gravel Light brownish gray (10YR 6/2) moist			
SS	25	27 32 41 42		22"		
	26					
	27					
	28		30-31': Light grey layer 10YR 7/1			
	29					
SS	30	23 34 38 44		23"		
	31					
	32		(FILL) 32.5 (5342.2)			
	33		SILTY SAND (SM / SM-ML) fine grained w/ some gravel brown (10YR 5/3) moist			Some green shale pieces in soils 33-35.5
	34					
SS	35	10 12 21 38		24"		
	36					
	37		(FILL) 37.5 5337.2			
	38		SEE Descr. on next page			
	39					

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HOLE NO. MW-97-9

Barr Engineering Company

DRILLING LOG

SHEET 3 OF 4 SHEETS

PROJECT NAME/NO. SILVER BOW/26/96-0073.56	SIZE AND TYPE OF BIT
LOCATION (Coordinates or Station) SEE SKETCH	DATUM FOR ELEV. SHOWN
DRILLING AGENCY	MANUFACTURERS DESIGNATION OF DRILL
HOLE NO. MW-97-9	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN	DATE HOLE: ____ Started ____ Completed
DEPTH DRILLED INTO ROCK	ELEV. TOP OF HOLE 5374.7
TOTAL DEPTH OF HOLE 73.6	SIGNATURE OF INSPECTOR

SAMPLE	DEPTH		CLASSIFICATION OF MATERIALS (Description)	RECOV-ERY	N	REMARKS
SS	41	22 7 3 2	Poorly graded sand w/ SILT (SP-SM) medium grained w/ gravel light brownish gray (2.5Y6/2) moist	12"		GRAINS ARKOSE W/ MICA PLATES
SS	42 43	2 2 2 3		23"		
	44					
SS	45 46	3 8 9 21	(FILL or ALLUVIUM) (5328.7) 46.0	24"		
	47 48 49		SILTY SAND w/ CLAY (SM/SM-SC) fine grained w/ some gravel brown (10YR5/3) moist			
SS	50 51	7 17 21 33		20		
	52 53 54					
SS	55 56	7 8 9 5	(ALLUVIUM) 55.6-55.5 6" Layer of SILT (ML) White (10YR8/1) hard chunks when broken	29"		
	57 58 59					

HOLE NO. MW-97-9

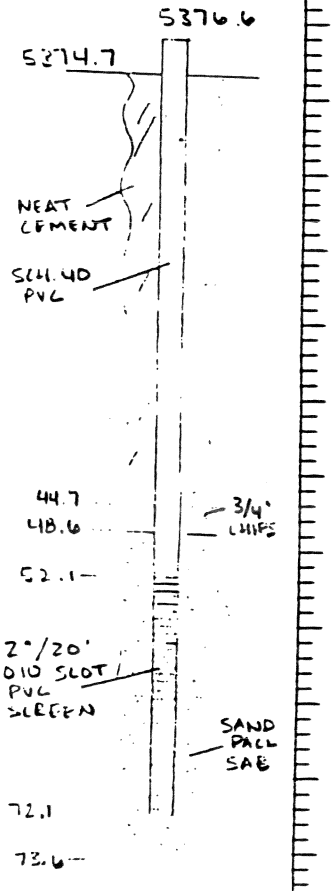
Barr Engineering Co.

DRILLING LOG

SHEET 4 OF 4 SHEETS

PROJECT NAME/NO. SILVER BOW/26/96-00TJSL	SIZE AND TYPE OF BIT
LOCATION (Coordinates or Station) SEE SKETCH	DATUM FOR ELEV. SHOWN
DRILLING AGENCY	MANUFACTURERS DESIGNATION OF DRILL
HOLE NO. MW-97-9	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN	DATE HOLE: ____ Started ____ Completed
DEPTH DRILLED INTO ROCK	ELEV. TOP OF HOLE 5374.7
TOTAL DEPTH OF HOLE 73.6	SIGNATURE OF INSPECTOR

SAMPLE	DEPTH		CLASSIFICATION OF MATERIALS (Description)	RECOV-ERY	N	REMARKS
SS	61	7 6 10 13	SAME AS ABOVE	24"		
	62					WET IN ZONES BELOW 62'
	63		Layer of green chert @ 41½' soil silty clay dark discolored grey 7.5YR6/1 w/ slight purple tint.			
	64					
SS	65	15 23 46 50/4"	65.0' (5309.7)	24"		
	66		INTERBEDDED 0.2' LAYERS OF:			
	67					
	68		SILTY SAND W/ CLAY (SM / SM-CL) SAME AS ABOVE			
	69		AND			
SS	70	15 25 25 25	SILTY SAND (SM/SP-SM) FINE GRAINED BROWN (10YR 5/3) MOIST	23"		
	71					
	72					
	73		68' (5306.7)			
	74		SILTY SAND W/ CLAY (SM / SM-CL) SAME AS ABOVE			
	75					
	76					
	77					
	78		EOB 73.6'			
	79					



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HOLE NO. MW-97-10

Barr Engineering Company

DRILLING LOG

SHEET 1 OF 2 SHEETS

PROJECT NAME/NO. SILVER BOW / 26/46-003 JSL	SIZE AND TYPE OF BIT 4 1/4 HSA
LOCATION (Coordinates or Station) SEE FIGURE	DATUM FOR ELEV. SHOWN MSL
DRILLING AGENCY O'KEEFE	MANUFACTURERS DESIGNATION OF DRILL MOBILE B 61
HOLE NO. MW-97-10	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER DAVE CROWLEY	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN NA	DATE HOLE: 10/15/97 Started 10/15/97 Completed
DEPTH DRILLED INTO ROCK NA	ELEV. TOP OF HOLE 5338.9
TOTAL DEPTH OF HOLE 28.9	SIGNATURE OF INSPECTOR John Fox

SAMPLE	DEPTH		CLASSIFICATION OF MATERIALS (Description)	RECOV-ERY	N	REMARKS
SS	1	20 19 20 21	SILT (ML) slightly organic dark brown (10YR 3/3) MOIST	22"		STANDARD PENETRATION TEST SPLIT SPOON SAMPLING WAS CONDUCTED W/ A 140 LB HAMMER DROPPED 30-INCHES. SPLIT SPOON SAMPLERS USED ARE 2-INCH DIAMETER.
			0.3' 5338.6			
SS	3	14 15 11 10	SILTY SAND (SM/SC-SM) fine to coarse grained w/ gravel Brown (10YR 5/3) MOIST	24"		
SS	5	9 11 12 14		20"		
SS	7	10 13 12 19	(ALLUVIUM) 8.0 5330.9	22"		GRAVEL = ARKOSIC
SS	9	9 12 12 15	SILTY SAND W/ clay (SM-SC) fine grained w/ Gravel Brown (10YR 5/3) MOIST	22"		GRAVEL APPROX 15 %
SS	13	11 19 30 37	(ALLUVIUM) 14.2' 5324.7	23"		
SS	15	8 11 20 31	SILTY SAND (SM) fine grained w/ Gravel Brown (10YR 5/3) MOIST	24"		GRAVEL APPROX. 2 %
SS	18	11 13 14 27		24"		
	19		(ALLUVIUM)			

HOLE NO. MW-97-10

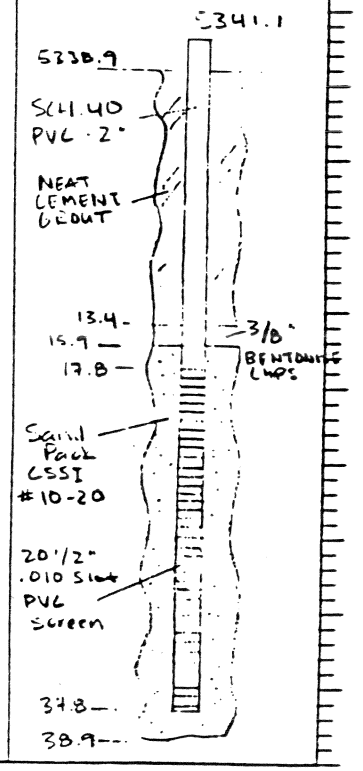
Barr Engineering Company

DRILLING LOG

SHEET 2 OF 2 SHEETS

PROJECT NAME/NO. SILVER BAY/23146-003 JSL	SIZE AND TYPE OF BIT
LOCATION (Coordinates or Station) SEE FIGURE	DATUM FOR ELEV. SHOWN
DRILLING AGENCY	MANUFACTURERS DESIGNATION OF DRILL
HOLE NO. MW-97-10	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN	DATE HOLE: ____ Started ____ Completed
DEPTH DRILLED INTO ROCK	ELEV. TOP OF HOLE 5341.1
TOTAL DEPTH OF HOLE 38.9	SIGNATURE OF INSPECTOR

SAMPLE	DEPTH		CLASSIFICATION OF MATERIALS (Description)	RECOV-ERY	N	REMARKS
SS	21	11 13 30 27	SAME AS ABOVE	23"		
	22					
	23					
	24					
SS	25	13 16 26 34		24"		
	26					
	27		(ALLUVIUM)			
	28		28.0' (5318.9)			
	29		Poorly graded sand w/ SILT (SP-SM/SM) fine grained w/ a trace of gravel Brown (10YR 5/3) MOIST			
SS	30	10 14 24 28		23"		
	31					
	32		WET Below 28'			
	33					
	34					
	35	14 16 29 21		20"		
	36					
	37					
	38		(ALLUVIUM) EOB 38.9 (5300.0)			
	39					



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HOLE NO. MW 97 11

Barr Engineering Co.

DRILLING LOG

SHEET 1 OF 32 SHEETS

PROJECT NAME/NO. SILVER BOW /26/46-003 JSL	SIZE AND TYPE OF BIT 4¼ HSA
LOCATION (Coordinates or Station) SEE FIGURE	DATUM FOR ELEV. SHOWN MSL
DRILLING AGENCY O'KEEFE	MANUFACTURERS DESIGNATION OF DRILL MOBILE B61
HOLE NO. MW-97-11	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER DAVE CROWLEY	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN NA	DATE HOLE: 10/15/97 Started 10/ /97 Completed
DEPTH DRILLED INTO ROCK NA	ELEV. TOP OF HOLE 5345.3
TOTAL DEPTH OF HOLE 329	SIGNATURE OF INSPECTOR

SAMPLE	DEPTH		CLASSIFICATION OF MATERIALS (Description)	RECOV-ERY	N	REMARKS
SS	1	3 6 9 16	SILT W/ SAND (ML-SM) fine grained Dark greyish brown (10YR 4/2) MOIST	20"		STANDARD PENETRATION TEST SPLIT SPOON sampling was conducted w/ a 140 Lb hammer dropped 30-inches. SPLIT SPOON Samplers used are 2-inch diameter.
	2		(ALLUVIUM) 0.5' (5348.3)			
SS	3	12 11 11 9	CLAYEY SAND (SC) fine to medium grained W/ some gravel greyish brown (10YR 5/2) MOIST	18"		
	4					
SS	5	7 7 9 16	(ALLUVIUM) 2.0' (5346.8)	23"		
	6		Poorly graded sand W/ SILT (SP-SM) fine to medium grained W/ gravel Pale brown (10YR 6/3) MOIST			GRAVEL: 20% Angular —
	7					
SS	8	3 4 5 7		18"		
	9		(ALLUVIUM) 3.9' (5344.9)			
SS	10	3 3 6 6	SILT (ML) White (10YR 8/1) MOIST (MARL)	23"		
	11					
	12		(LACUSTRINE) 5.5' (5343.3)			
SS	13	3 5 7 10	SILTY lean clay (CL/CL-ML) Pale olive (5Y 6/4) MOIST	23"		
	14					
SS	15	3 4 7 8		22"		
	16					
	17					
SS	18	3 3 5 6		24"		
	19		(LACUSTRINE)			

HOLE NO. MW-97-11

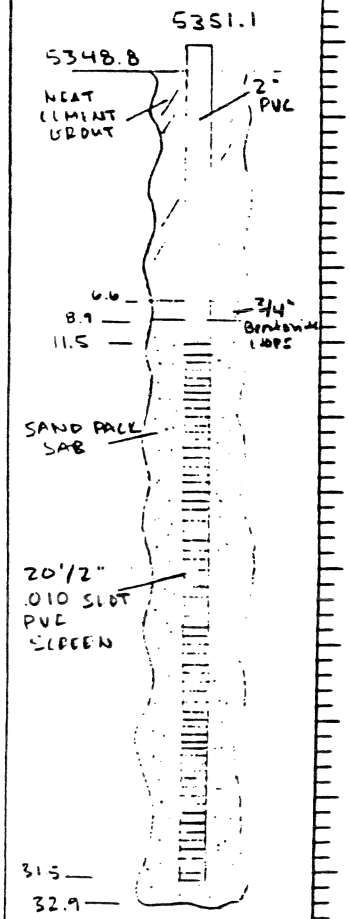
Barr Engineering Company

DRILLING LOG

SHEET 2 OF 2 SHEETS

PROJECT NAME/NO. SILVER BAY/23146-003 JSL	SIZE AND TYPE OF BIT
LOCATION (Coordinates or Station) SEE FIGURE	DATUM FOR ELEV. SHOWN
DRILLING AGENCY	MANUFACTURERS DESIGNATION OF DRILL
HOLE NO. MW-97-11	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN	DATE HOLE: ____ Started ____ Completed
DEPTH DRILLED INTO ROCK	ELEV. TOP OF HOLE 5348.8
TOTAL DEPTH OF HOLE 32.9	SIGNATURE OF INSPECTOR

SAMPLE	DEPTH		CLASSIFICATION OF MATERIALS (Description)	RECOV-ERY	N	REMARKS
TW	21		SILTY LEAN CLAY (CL/CL-ML)	28"		THINWALL 19½-22' PUSH 30" RECOVER 28"
	22		PALE OLIVE (5Y6/4) MOIST			
	23					▽ 20.1 @ 8AM 10/16
	24					
SS	25	4 4 7 9		23"		
	26					
	27		WET IN ZONES BELOW 20'			
	28					
	29					
SS	30	5 7 10 14	(LACUSTRINE)	24"		
	31					
	32		(5315.9) EOB 32.9'			
	33					
	34					
	35		LAB: FAT CLAY (CH)			
	36		LL = 73.1			
	37		PL = 33.6			
	38					
	39					



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HOLE NO. MW-97-12

Barr Engineering Company

DRILLING LOG

SHEET 1 OF 3 SHEETS

PROJECT NAME/NO. SILVER BOW / 23/46-003 JSL	SIZE AND TYPE OF BIT 4¼ HSA
LOCATION (Coordinates or Station) SEE FIGURE	DATUM FOR ELEV. SHOWN MSL
DRILLING AGENCY O'KEEFE DRILLING	MANUFACTURERS DESIGNATION OF DRILL MOBIL B-61
HOLE NO. MW-97-12	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ___ Disturbed ___ Undisturbed
NAME OF DRILLER DAVE CROWLEY	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ___ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN NA	DATE HOLE: 10/28/97 Started 10/28/97 Completed
DEPTH DRILLED INTO ROCK NA	ELEV. TOP OF HOLE 5335.8
TOTAL DEPTH OF HOLE 33.1	SIGNATURE OF INSPECTOR

SAMPLE	DEPTH		CLASSIFICATION OF MATERIALS (Description)	RECOV-ERY	N	REMARKS
SS	1	10 40 42 42	SILT (ML) slightly organic Dark gray (10YR 4/1) moist	22"		STANDARD PENETRATION TEST SPLIT SPOON sampling was conducted w/ a 140 Lb hammer dropped 30-inches. SPLIT SPOON Samplers used are 2-inch diameter.
	2		(WEATHERED SOIL) 0.8' (5335.0)			
SS	3	24 29 33 38	POORLY GRADED SAND W/ SILT (SP-SM) fine to medium grained w/ some gravel & cobbles Arkose Brown (10YR 5/3) moist	24"		
	4					
SS	5	43 50/3" 50/1" 44	(ALLUVIUM) (5329.8) 6.0'	22"		
	6					
SS	7	10 15 12 12	SILTY SAND (SM/SM-ML) fine grained w/ some gravel Yellowish brown (10YR 5/4) moist	24"		MICA FLAKES PRESENT BELOW 6-FEET.
	8					
	9					
SS	10	10 17 22 32	10' - 10.5 FEET Layer of: Poorly graded sand (SP) fine to medium grained w/ gravel Pale Brown (10YR 6/3) moist	23"		
	11					
	12					
SS	13	14 16 16 19	(ALLUVIUM) 13.0' (5322.8)	22"		
	14					
SS	15	14 20 24 31	SILTY SAND W/ CLAY (SM/SM-SC)	20"		
	16					
	17					
SS	18	13 20 26 34	fine grained w/ some gravel brown (10YR 5/3) moist	22"		
	19		(ALLUVIUM)			

HOLE NO. MW-97-12

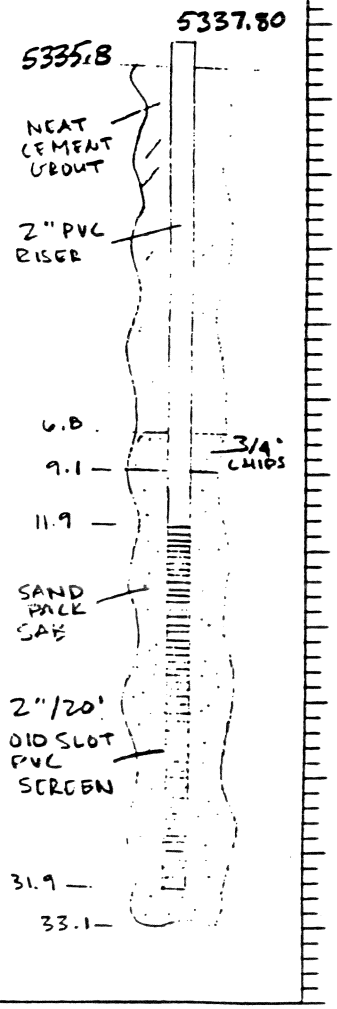
Barr Engineering Company

DRILLING LOG

SHEET 2 OF 3 SHEETS

PROJECT NAME/NO. SILVER BAY / 23/46-003 JSL	SIZE AND TYPE OF BIT
LOCATION (Coordinates or Station) SEE FIGURE	DATUM FOR ELEV. SHOWN
DRILLING AGENCY	MANUFACTURERS DESIGNATION OF DRILL
HOLE NO. MW-97-12	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN	DATE HOLE: ____ Started ____ Completed
DEPTH DRILLED INTO ROCK	ELEV. TOP OF HOLE
TOTAL DEPTH OF HOLE	SIGNATURE OF INSPECTOR

SAMPLE	DEPTH		CLASSIFICATION OF MATERIALS (Description)	RECOV-ERY	N	REMARKS
SS	21	18 26 39 48	SILTY SAND W/ CLAY (SM/SM-SC) FINE GRAINED W/ SOME GRAVEL BROWN (10YR 5/3) MOIST	24"		
	22					
	23					
	24					
SS	25	14 20 40 50/4"		23"		▽ 22.4 IN HSA
	26		WET BELOW 23'			
	27					
	28					
	29					
SS	30	15 24 27 48		24"		
	31					
	32		(ALLUVIUM)			
	33		(5302.7)			
	34		EOB 33.1'			
	35					
	36					
	37					
	38					
	39					



1999 Well and Boring Logs

HOLE NO. SB-99-1

Barr Engineering Company

DRILLING LOG

SHEET 1 OF 2 SHEETS

PROJECT NAME/NO. RHODIA SILVERBOW	SIZE AND TYPE OF BIT 4 5/8" HSA (ID)
LOCATION (Coordinates or Station)	DATUM FOR ELEV. SHOWN
DRILLING AGENCY O'KEEFE	MANUFACTURERS DESIGNATION OF DRILL
HOLE NO. SB-99-1	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER DAVE C.	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN	DATE HOLE: 3/8/99 Started 3/8/99 Completed
DEPTH DRILLED INTO ROCK	ELEV. TOP OF HOLE 5340 ±
TOTAL DEPTH OF HOLE	SIGNATURE OF INSPECTOR

26/46-004 JSL

SAMPLE	DEPTH	CLASSIFICATION OF MATERIALS (Description)	RECOVERY	N	REMARKS
HSA	1–3	CMSS @ SURFACE SILTY FAT CLAY (CH) GREENISH BROWN MOIST WET BELOW 2'			SLIGHTLY ORGANIC 0 – 0.2'
SS	4–5	BLOCKY TEXTURE CLASTS OF SHALE COMPRISE 50% OF SAMPLE – SHALE IS OF SAME MAKE UP AS SOIL. (COLLUVIUM)	18"	3, 2, 3, 5	
		5.5'			
SS	6–7		20"	3, 5, 7, 10	
	8				
SS	9–10	CLAYEY SILT W/ SAND (ML-CH) ALTERED IN ZONES TO SILTSTONE / SHALE HIGHLY FRACTURED W/ STAINING ON FRACTURE PLANES (BLACK) WET IN ZONES BROWN	20"	12, 18, 30, 37	
SS	11–12		22"	15, 27, 31, 32	
	13				
SS	14–15	10.0 LOW GRADE SILTSTONE / SHALE GREYISH BROWN MOST FRACTURES CLOSED MOIST	24"	18, 22, 30, 34	
	16				
SS	17–18		24"	16, 19, 27, 40	
SS	19		10"	29, 50/5"	

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HOLE NO. SB-99-1

Barr Engineering Company

DRILLING LOG

SHEET 2 OF 2 SHEETS

PROJECT NAME/NO. RHODIA SILVERBOW	SIZE AND TYPE OF BIT 4 5/8" ID HSA
LOCATION (Coordinates or Station)	DATUM FOR ELEV. SHOWN MSL
DRILLING AGENCY O'KEEFE	MANUFACTURERS DESIGNATION OF DRILL
HOLE NO. SB-99-1	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER DAVE C.	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN	DATE HOLE: 3/8/99 Started 3/8/99 Completed
DEPTH DRILLED INTO ROCK	ELEV. TOP OF HOLE
TOTAL DEPTH OF HOLE	SIGNATURE OF INSPECTOR

SAMPLE	DEPTH	CLASSIFICATION OF MATERIALS (Description)	RECOV-ERY	N	REMARKS
	21	SAME AS ABOVE			
SS	22	SILTSTONE / SHALE	24"	11, 13, 15, 18	
	23	GREYISH BROWN			
SS	24	MOST FRACTURES	22"	20, 20, 21, 23	
	25	CLOSED			
	26	MOIST			
	27				
	28				
SS	29		24"	18, 19, 22, 21	
	30				
	31	EOB 30.5'			
	32				
	33				
	34				
	35				
	16				
	37				
	38				
	39				

HOLE NO. SB-99-2

Barr Engineering Company

DRILLING LOG

SHEET 1 OF 2 SHEETS

PROJECT NAME/NO. RHODIA SILVER BOW	SIZE AND TYPE OF BIT
LOCATION (Coordinates or Station)	DATUM FOR ELEV. SHOWN
DRILLING AGENCY O'KEEFE	MANUFACTURERS DESIGNATION OF DRILL
HOLE NO. SB-99-2	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER DAVE C.	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN	DATE HOLE: 3/9/99 Started 3/9/99 Completed
DEPTH DRILLED INTO ROCK	ELEV. TOP OF HOLE 5315.5
TOTAL DEPTH OF HOLE	SIGNATURE OF INSPECTOR

26/46-004-JSL

SAMPLE	DEPTH	CLASSIFICATION OF MATERIALS (Description)	RECOV-ERY	N	REMARKS
HSA	2	SLAG ROAD BASE GRAVEL TO COBBLE SIZE			
	4	SILTY SAND (SM) 1.0 FINE TO MEDIUM GRAINED, REDDISH BROWN, MOIST (FILL) 3.0'			
SS	6	SILTY LEAN CLAY (CL) W/ SAND AND GRAVEL, MICA FLAKES, SHALE CLASTS, GREENISH GREY MOIST	12"	3 4 8 6	
	8	(FILL)			
SS	10	10.5	20"	4 4 8 11	WATER LEVEL IN HSA AT END OF DRILLING 20.50' BGS
	12	MIXED SOIL, MOSTLY: SILTY FAT CLAY (CH) W/ SHALE CLASTS GREENISH GREY MOIST			
	14				
SS	16	W/ SOME SILTY LEAN CLAY, AND A COUPLE OF SMALL CLASTS OF ORGANIC SOIL IN THE CLAY.	20"	3 4 8 11	
SS	18		24"	5 7 7	
	20	WET IN ZONES BELOW 13'			
SS	22	(FILL) 22.8	24"	3 4 5 11	
SS	24	SILT (ML) LAMINATED DARK GREY (SLIGHTLY ORGANIC)	22"	3 3 4 4	
SS	26	(FLUVIAL) WET OVERBANK - TYP SOIL 23.2	24"	3 4 8 10	
SS	28	SILTY SAND (SM) FINE GRAINED GREY	23"	4 7 8 9	
	30	(FLUVIAL) WET OVER BANK 24.0			
SS	32	CLAYEY SILT (ML-CH) GREYISH BROWN WET	24"	4 5 6 10	
	34	(FLUVIAL) OVER BANK			
SS	36	SILTY CLAY (CL-ML) 26.0' W/ GRAVEL, BROWN, MOIST	24"	4 5 7 9	
SS	38	37.0	22"	8 13 14 21	
		SEE DESCRIPTION ON PAGE 2 OF 2 39.5			

HOLE NO. SB-99-2

Barr Engineering Company

DRILLING LOG

SHEET 2 OF 2 SHEETS

PROJECT NAME/NO. RHODIA SILVERBOW	SIZE AND TYPE OF BIT
LOCATION (Coordinates or Station)	DATUM FOR ELEV. SHOWN
DRILLING AGENCY O'KEEFE	MANUFACTURERS DESIGNATION OF DRILL
HOLE NO. SB-99-2	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER DAVE C.	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN	DATE HOLE: ____ Started ____ Completed
DEPTH DRILLED INTO ROCK	ELEV. TOP OF HOLE
TOTAL DEPTH OF HOLE	SIGNATURE OF INSPECTOR

SAMPLE	DEPTH	CLASSIFICATION OF MATERIALS (Description)	RECOVERY	N	REMARKS
SS	42	SILT W/ SAND (ML-SM) FINE GRAINED GREYISH BROWN WET	20"	12 15 23 22	
SS	44	(FLUVIAL)	24"	12 18 25 43	
	46	39.5			
	48	SILTY SAND (SM-ML) FINE TO MEDIUM GRAINED W/ GRAVEL, BROWN WET (FLUVIAL) 41.0			
	50	SILTY SAND (SM) FINE GRAINED GREENISH GREY WET (FLUVIAL) 44.7			
	52	SILTY FAT CLAY (CH) 1MM LAMINATED GREENISH GREY WET			ALTERED TO: * LOW GRADE SHALE & SILTSTONE
	54	* (ALLUVIUM/SHALE)			
	56	EOB 45.5'			
	58				
	60				
	62				
	64				
	66				
	68				
	70				
	72				
	74				
	76				
	78				

HOLE NO. SB-99-3

Barr Engineering Company

DRILLING LOG

SHEET 1 OF 2 SHEETS

PROJECT NAME/NO. RHODIA SILVER BOW	SIZE AND TYPE OF BIT
LOCATION (Coordinates or Station)	DATUM FOR ELEV. SHOWN
DRILLING AGENCY O'KEEFE	MANUFACTURERS DESIGNATION OF DRILL
HOLE NO. SB-99-3	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER DAVE C.	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN	DATE HOLE: 3/9/99 Started 3/10/99 Completed
DEPTH DRILLED INTO ROCK	ELEV. TOP OF HOLE 5315.5
TOTAL DEPTH OF HOLE	SIGNATURE OF INSPECTOR

26/46-004 JSL

SAMPLE	DEPTH	CLASSIFICATION OF MATERIALS (Description)	RECOV-ERY	N	REMARKS
	2	SLAG - ROAD BASE SILTY SAND (SM) 1.0 FINE TO MEDIUM GRAINED BROWN, MOIST (FILL)			
SS	4	SILTY LEAN CLAY (CL) 3.0 W/ SAND AND GRAVEL, MICA FLAKES, BROWN MOIST (FILL)	18"		
	6				
	8	7.0 SILTY FAT CLAY (CH) W/ gravel, MICA FLAKES GREENISH GREY TO BROWN MOIST			
SS	10		22"		
	12				
SS	14	(FILL)	22"		
	16				
SS	18		24"		
	20				
SS	22	21.0 INTERBEDDED: ½"-1" LAYERS OF: POORLY GRADED SAND W/ SILT (SP-SM) FINE TO MEDIUM GRAINED, GREY, WET. AND *	20"		* SILT W/ SAND (ML-SM), DARK GREY, W/ ROOTS, SLIGHTLY ORGANIC, (FLUVIAL / TOP SOIL)
SS	24	23.0	6"		
SS	26	POORLY GRADED SAND W/ SILT (SP-SM) FINE TO MEDIUM GRAINED W/ GRAVEL, GREY, WET (FLUVIAL)	20"		
SS	28	25.0 POORLY GRADED SAND W/ SILT (SP-SM/SP) MEDIUM TO COARSE GRAINED W/ GRAVEL, BROWN, WET (FLUVIAL) **	24"		SAND BLOW UP INTO HSA
	30				
	32	31.0 POORLY GRADED SAND (SP) MEDIUM TO COARSE GRAINED W/ GRAVEL, PALE BROWN, WET (FLUVIAL)			** GRADES TO POORLY GRADED SAND BELOW 27'
SS	34		14"		
SS	36	35.2 SILTY SAND (SM) FINE GRAINED GREYISH BROWN WET	20"		
SS	38	(FLUVIAL)	20"		

HOLE NO. SB-99-3

Barr Engineering Company

DRILLING LOG

SHEET 2 OF 2 SHEETS

PROJECT NAME/NO. RHODIA SILVERBOW	SIZE AND TYPE OF BIT
LOCATION (Coordinates or Station)	DATUM FOR ELEV. SHOWN
DRILLING AGENCY O'KEEFE	MANUFACTURERS DESIGNATION OF DRILL
HOLE NO. SB-99-3	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER DAVE C.	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN	DATE HOLE: ____ Started ____ Completed
DEPTH DRILLED INTO ROCK	ELEV. TOP OF HOLE
TOTAL DEPTH OF HOLE	SIGNATURE OF INSPECTOR

SAMPLE	DEPTH	CLASSIFICATION OF MATERIALS (Description)	RECOVERY	N	REMARKS
SS	42	SEE DESCRIPTION ON PAGE 1 of 2.	24"		
		39.5			
SS	44	SILT W/ SAND (ML-SM) FINE GRAINED GREYISH BROWN (ALLUVIUM) WET	18"		
	46	SILT W/ CLAY (ML-CH) ALTERED TO SHALE/SILTSTONE *			* GREENISH BROWN WET IN ZONES
	48	41.5			
SS	50	43.5 SILT W/ SAND (ML-SM) FINE GRAINED GREENISH BROWN WET (ALLUVIUM)	24"		
	52				
	54				
	56	EOB 51.5'			
	58				
	60				
	62				
	64				
	66				
	68				
	70				
	72				
	74				
	76				
	78				

HOLE NO. SB-99-4

Barr Engineering Company

DRILLING LOG

SHEET 1 OF 1 SHEETS

PROJECT NAME/NO. RHODIA SILVER BOW	SIZE AND TYPE OF BIT
LOCATION (Coordinates or Station)	DATUM FOR ELEV. SHOWN
DRILLING AGENCY O'KEEFE	MANUFACTURERS DESIGNATION OF DRILL
HOLE NO. SB-99-4	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER DAVE C.	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN	DATE HOLE: 3/ /99 Started 3/ /99 Completed
DEPTH DRILLED INTO ROCK	ELEV. TOP OF HOLE 5315.5
TOTAL DEPTH OF HOLE	SIGNATURE OF INSPECTOR

26/46-004 JSL

SAMPLE	DEPTH	CLASSIFICATION OF MATERIALS (Description)	RECOVERY	N	REMARKS
HSA 0-19'	2 4 6 8 10 12 14 16 18	REFER TO LOG OF SB-97-1			
SS	20	SILTY FAT CLAY (CH-ML) GREENISH GREY WET (FILL)	20"	3 3 3 3	
SS	22	22.0 SILTY SAND W/ ORGANIC CLAY (SM/SM-OH) DARK GREY, FINE GRAINED, *	2"	3 3 3 4	* W/ ROOTS, WET (ALLUVIUM)
SS	24	SILTY SAND (SM/SP-SM) 23.0 FINE TO MEDIUM GRAINED W/ GRAVEL, GREY, WET (FLUVIAL)	18"	3 4 6 5	
SS	26		18"	5 6 4 4	
SS	28	26.0 CLAYEY SAND (SC) FINE TO MEDIUM GRAINED, GREY, WET **	20"	3 4 4 6	** W/ 1/2" STRINGERS OF POORLY GRADED SAND (SP) FINE TO MEDIUM GRAINED BROWN, WET (ALLUVIUM)
SS	30				
SS	32	29.0 SILTY FAT CLAY (CH-ML) BROWN, WET (ALLUVIUM)	24"	7 11 18 18	
SS	34	31.0 CLAYEY SAND (SC) (ARKOSIC LAG)	20"	5 10 13 16	
SS	36	32.0 SILT (ML) GREENISH GREY	20"	12 19 20 36	*** ALTERED TO SHALE / SILTSTONE 34.2 - 36.2'.
SS	38	*** WET	24"	14 27 27 36	EOB 40½'

HOLE NO. SB-99-5

Barr Engineering Company

DRILLING LOG

SHEET 1 OF 2 SHEETS

PROJECT NAME/NO. RHODIA SILVER BOW	SIZE AND TYPE OF BIT
LOCATION (Coordinates or Station)	DATUM FOR ELEV. SHOWN
DRILLING AGENCY O'KEEFE	MANUFACTURERS DESIGNATION OF DRILL
HOLE NO. SB-99-5	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER DAVE C.	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN	DATE HOLE: 3/10/99 Started 3/10/99 Completed
DEPTH DRILLED INTO ROCK	ELEV. TOP OF HOLE 5315.6
TOTAL DEPTH OF HOLE	SIGNATURE OF INSPECTOR

26/46-004-JSL

SAMPLE	DEPTH	CLASSIFICATION OF MATERIALS (Description)	RECOV-ERY	N	REMARKS
	2	SLAG - ROAD BASE GRAVEL TO COBBLE SIZE			
		SILTY SAND (SM) 2.2' FINE TO MEDIUM GRAINED, REDDISH BROWN *			* MOIST, (FILL)
	4	SILTY LEAN CLAY (CL) 3.0' W/ GRAVEL BROWN MOIST			
SS		(FILL) W/ SOME ORGANIC SOIL INTERCLASTS	18"	5 9 12 14	
	6				
	8	SILTY FAT CLAY (CH) 7.0' W/ GRAVEL GREENISH BROWN MOIST			
SS	10		20"	2 5 9 10	
		WET IN ZONES BELOW 12-FEET			
	12				
	14				▽ IN HSA AM 3/11/99 19.42' BGS (SAT OVER NIGHT)
SS			22"	6 7 8 8	
	16				
		(FILL)			
	18				THIS IS BEST ▽ OF S. DIKE BORINGS.
SS			23"	3 2 3 7	
	20	SILT W/ SAND (ML-SM) 19.5' DARK GREY (SLIGHTLY ORGANIC) W/ ROOTS WET			
SS	22		24"	3 3 5 6	
		SEVERAL 1" LAYERS OF FAT CLAY (CH-OH) DARK GREY, WET (ALLUVIUM) 24.0'			
	24				
SS		POORLY GRADED SAND (SP) MEDIUM GRAINED W/ GRAVEL, BROWN, WET (FLUVIAL)	24"	2 2 3 3	
	26	24.9'			
SS		CLAYEY SILT (ML-CH) GREYISH BROWN WET	23"	2 2 4 6	
	28	GRADES TO SILTY FAT CLAY (CH-ML) BELOW 26' (ALLUVIUM) 30.0'			
SS	30		24"	4 7 14 27	
		CLAYEY SAND (SC) FINE TO COARSE GRAINED W/ GRAVEL, BROWN, WET **			** ARKOSIC ANGULAR (WEATHERED BOULDER OR LAG DEPOSIT)
SS	32		24"	7 28 17 18	
		SILT (ML) 33.1' GREENISH GREY WET (ALLUVIUM)			
	34				
SS		SILT W/ SAND (ML/ML-SM) 34.5' GREENISH GREY (ALLUVIUM) WET	22"	8 11 11 15	
	36				
SS		SILTY FAT CLAY (CH-ML) 36.0' GREENISH GREY W/ SHALE LAYERS (ALLUVIUM/SHALE) WET	24"	5 7 8 10	
	38				

HOLE NO. SB-99-5

Barr Engineering Company

DRILLING LOG

SHEET 2 OF 2 SHEETS

PROJECT NAME/NO. RHODIA SILVERBOW	SIZE AND TYPE OF BIT
LOCATION (Coordinates or Station)	DATUM FOR ELEV. SHOWN
DRILLING AGENCY O'KEEFE	MANUFACTURERS DESIGNATION OF DRILL
HOLE NO. SB-99-5	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER DAVE C.	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN	DATE HOLE: ____ Started ____ Completed
DEPTH DRILLED INTO ROCK	ELEV. TOP OF HOLE
TOTAL DEPTH OF HOLE	SIGNATURE OF INSPECTOR

SAMPLE	DEPTH	CLASSIFICATION OF MATERIALS (Description)	RECOV-ERY	N	REMARKS
SS		SAME AS ABOVE	20"	6 8 11 18	
	42	EOB 41.0'			
	44				
	46				
	48				
	50				
	52				
	54				
	56				
	58				
	60				
	62				
	64				
	66				
	68				
	70				
	72				
	74				
	76				
	78				

HOLE NO. SB-99-6

Barr Engineering Company

DRILLING LOG

SHEET 1 OF 2 SHEETS

PROJECT NAME/NO. RHODIA SILVERBOW	SIZE AND TYPE OF BIT 4 5/8" HSA (ID)
LOCATION (Coordinates or Station)	DATUM FOR ELEV. SHOWN
DRILLING AGENCY O'KEEFE	MANUFACTURERS DESIGNATION OF DRILL
HOLE NO. SB-99-6	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER DAVE C.	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN	DATE HOLE: 3/15/99 Started 3/15/99 Completed
DEPTH DRILLED INTO ROCK	ELEV. TOP OF HOLE 5313.1
TOTAL DEPTH OF HOLE	SIGNATURE OF INSPECTOR

26/46-004-JSL

SAMPLE	DEPTH	CLASSIFICATION OF MATERIALS (Description)	RECOV-ERY	*	REMARKS
HSA	1–3	MIXED FILL: MOSTLY, SILTY SAND (SM) FINE TO MEDIUM GRAINED W/ GRAVEL GREY TO BROWN MOIST			
SS	4–5	W/ SOME CLAYEY SAND (SC) GREY WET PIECE OF WOOD @ 5.5' PIECE OF RED GLASS @ 5.5' (FILL)	18"		
SS	6–7	POORLY GRADED SAND (SP) 5.7' MEDIUM TO COARSE GRAINED W/ GRAVEL PALE BROWN (10YR 6/3) WET (FLUVIAL)	22"		
SS	8–10	CLAYEY SAND (SC) 9.5 FINE TO MEDIUM GRAINED W/ GRAVEL, BROWN * 10.5	24"		* WET (ALLUVIUM)
SS	11–13	SILT W/ SAND (ML-SM) FINE GRAINED W/ GRAVEL – GRAVEL COMPOSED OF SANDSTONE PIECES SIMILAR TO SOIL MATRIX	22"		
SS	14–15	MOTTLED REDDISH BROWN AND GREY 10.5 - 18.0' **	23"		** BROWN (10YR 5/3) BELOW 18'
SS	16–17	WET IN ZONES ABOVE 18-FEET	24"		
SS	18–19	WET BEGN 18-FEET W/ MICA FLAKES	24"		

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HOLE NO. SB-99-6

Barr Engineering Company

DRILLING LOG

SHEET 2 OF SHEETS

PROJECT NAME/NO. RHODIA SILVERBOW	SIZE AND TYPE OF BIT 4 5/8" ID HSA
LOCATION (Coordinates or Station)	DATUM FOR ELEV. SHOWN MSL
DRILLING AGENCY O'KEEFE	MANUFACTURERS DESIGNATION OF DRILL
HOLE NO. SB-99-6	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER DAVE C.	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN	DATE HOLE: 3/15/99 Started 3/15/99 Completed
DEPTH DRILLED INTO ROCK	ELEV. TOP OF HOLE
TOTAL DEPTH OF HOLE	SIGNATURE OF INSPECTOR

SAMPLE	DEPTH	CLASSIFICATION OF MATERIALS (Description)	RECOV-ERY	N	REMARKS
	21	SILT W/ SAND (ML-SM)			
SS	22	SAME AS ABOVE	20"		
	23				
SS	24		23"		
	25				
	26				
SS	27		22"		
	28				
SS	29		6"		
	30				
	31	EOB 30.5'			
	32				
	33				
	34				
	35				
	16				
	37				
	38				
	39				

H:\LOGS\TEQRMS\DRILLOG1

HOLE NO. SB-99-7

Barr Engineering Company

DRILLING LOG

SHEET 1 OF 2 SHEETS

PROJECT NAME/NO. RHODIA SILVERBOW	SIZE AND TYPE OF BIT 4 5/8" HSA (ID)
LOCATION (Coordinates or Station)	DATUM FOR ELEV. SHOWN
DRILLING AGENCY O'KEEFE	MANUFACTURERS DESIGNATION OF DRILL
HOLE NO. SB-99-7	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER DAVE C.	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN	DATE HOLE: 3/15/99 Started 3/15/99 Completed
DEPTH DRILLED INTO ROCK	ELEV. TOP OF HOLE 5315.1
TOTAL DEPTH OF HOLE	SIGNATURE OF INSPECTOR

24/46-004 JSL

SAMPLE	DEPTH	CLASSIFICATION OF MATERIALS (Description)	RECOVERY	N	REMARKS
HSA	1–3	MIXED FILL, MOSTLY: SILTY SAND (SM) FINE GRAINED * GREY TO BROWN MOIST W/ CLAYEY SAND (SC) FINE GRAINED WET (FILL)			* W/ GRAVEL
SS	4–5		18"	10, 36, 18, 11	
SS	6–7		20"	3, 4, 4, 4	** BROWN, WET (FLUVIAL)
	7.0	POORLY GRADED SAND (SP) MEDIUM TO COARSE GRAINED W/ GRAVEL **			
	7.5				
SS	9–10	SILTY LEAN CLAY (CL) DARK GREY (10YR 4/1) W/ SOME SAND AND GRAVEL WET W/MICA FLAKES ***	22"	2, 2, 3, 3	*** MOTTLED REDDISH BROWN 6-8', 5% PLANT PARTS 8.5'-12', GREY BELOW 10'
SS	11–12		23"	1, 1, 2, 2	
	12.0	SILTY SAND (SM-ML) FINE GRAINED W/ GRAVEL - GRAVEL COMPOSED OF SANDSTONE OF SIMILAR TO SOIL MATRIX. DARK GREY (10YR 4/1) MAY BE SLIGHTLY ORGANIC WET (ALLUVIUM)			W/ 5MM (SP) PARTINGS A 1:0.5' (ALLUVIUM)
SS	14–15		24"	4, 6, 12, 18	
SS	16–17		23"	15, 19, 30, 44	
	18				
SS	19		16"	23, 48, 50/4"	
	19.0	SEE DESCRIPTION ON NEXT PAGE.			

HOLE NO. SB-99-7

Barr Engineering Company

DRILLING LOG

SHEET 2 OF 2 SHEETS

PROJECT NAME/NO. RHODIA SILVERBOW	SIZE AND TYPE OF BIT 4 5/8" ID HSA
LOCATION (Coordinates or Station)	DATUM FOR ELEV. SHOWN MSL
DRILLING AGENCY O'KEEFE	MANUFACTURERS DESIGNATION OF DRILL
HOLE NO. SB-99-7	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER DAVE C.	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN	DATE HOLE: 3/15/99 Started 3/15/99 Completed
DEPTH DRILLED INTO ROCK	ELEV. TOP OF HOLE
TOTAL DEPTH OF HOLE	SIGNATURE OF INSPECTOR

SAMPLE	DEPTH	CLASSIFICATION OF MATERIALS (Description)	RECOV-ERY	N	REMARKS
	21	SILTY SAND (SM-ML)			
SS	22	SAME AS ABOVE	24"	6, 11, 16, 26	
	23	W/ CEMENTATION			
	24	TO SANDSTONE		18	
SS	25	BELOW 19-FEET	22"	26, 34, 42	
	26	NOT CLEARLY			
SS	27	WET BELOW	24"	12, 20, 38, 50	
	28	23' - WET IN			
SS	29	ZONES.	15"	21, 32, 50/5"	
	30				
	31	EOB 30.5'			
	32				
	33				
	34				
	35				
	16				
	37				
	38				
	39				

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HOLE NO. SB-99-8

Barr Engineering Company

DRILLING LOG

SHEET 1 OF 2 SHEETS

PROJECT NAME/NO. RHODIA SILVERBOW	SIZE AND TYPE OF BIT 4 5/8" HSA (ID)
LOCATION (Coordinates or Station)	DATUM FOR ELEV. SHOWN
DRILLING AGENCY O'KEEFE	MANUFACTURERS DESIGNATION OF DRILL
HOLE NO. SB-99-8	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER DAVE C.	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN	DATE HOLE: 3/16/99 Started 3/16/99 Completed
DEPTH DRILLED INTO ROCK	ELEV. TOP OF HOLE 5312.6
TOTAL DEPTH OF HOLE	SIGNATURE OF INSPECTOR

26/46-004 JSL

SAMPLE	DEPTH	CLASSIFICATION OF MATERIALS (Description)	RECOV-ERY	N	REMARKS
HSA	1	SILTY SAND (SM) GREY MOIST (FILL) 2.0			
	2	INTERBEDDED 2" LAYERS OF: SILTY SAND (SM) f-M GRAINED W/ GRAVEL AND POORLY GRADED SAND (SP) f-M GRAINED * 4.2'			* PALE BROWN TO GREY (WET) (FLUVIAL)
	3				
SS	4			9	
	5			11	
	6	POORLY GRADED SAND (SP) FINE TO COARSE GRAINED W/ GRAVEL BROWN WET (FLUVIAL)		11	
SS	7			8	
	8			9	
	9			11	
SS	10	10.1		18	
	11	SILTY FAT CLAY (CH) W/ GRAVEL DARK GREY W/ MICA FLAKES WET (ALLUVIUM)		2	
SS	12			4	
	13	12.2		4	
	14	SANDY LEAN CLAY (CL-SC) W/ GRAVEL GREENISH GREY MOIST		8	
SS	15	13.5		5	MICA FLAKES Present Below 12.2'
	16	SILTY LEAN CLAY (CL-ML) W/ SOME SAND DARK GREY WET 15.0		7	
	17			11	
SS	18	SILT (ML) GREY, MOIST 18.0		13	
	19	SILT W/ SAND (ML-SM) HARD, MOIST (ALLUVIUM)		5	
				7	
SS				11	
				13	
				4	
				4	
				5	
				6	
				19	
				24	
				40	
				50	
				11	
				22	
				34	

HOLE NO. SB-99-8

Barr Engineering Company

DRILLING LOG

SHEET 2 OF 2 SHEETS

PROJECT NAME/NO. RHODIA SILVERBOW	SIZE AND TYPE OF BIT 4 5/8" ID HSA
LOCATION (Coordinates or Station)	DATUM FOR ELEV. SHOWN MSL
DRILLING AGENCY O'KEEFE	MANUFACTURERS DESIGNATION OF DRILL
HOLE NO. SB-99-8	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER DAVE C.	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN	DATE HOLE: 3/16/99 Started 3/16/99 Completed
DEPTH DRILLED INTO ROCK	ELEV. TOP OF HOLE
TOTAL DEPTH OF HOLE	SIGNATURE OF INSPECTOR

SAMPLE	DEPTH	CLASSIFICATION OF MATERIALS (Description)	RECOV-ERY	N	REMARKS
	21			37	
	22				
	23				
SS	24			12	
	25			20	
	26			34	
	27			50	
	28				
SS	29			21	
	30			48	
	31	EOB 30.5'		50/4	
	32				
	33				
	34				
	35				
	16				
	37				
	38				
	39				

HOLE NO. SB-99-9

Barr Engineering Company

DRILLING LOG

SHEET 1 OF SHEETS

PROJECT NAME/NO. RHODIA SILVERBOW	SIZE AND TYPE OF BIT 4 5/8" HSA (ID)
LOCATION (Coordinates or Station)	DATUM FOR ELEV. SHOWN
DRILLING AGENCY O'KEEFE	MANUFACTURERS DESIGNATION OF DRILL
HOLE NO. SB-99-9	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER DAVE C.	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN	DATE HOLE: 3/16/99 Started 3/16/99 Completed
DEPTH DRILLED INTO ROCK	ELEV. TOP OF HOLE 5312.6
TOTAL DEPTH OF HOLE	SIGNATURE OF INSPECTOR

24146-004 JSL

SAMPLE	DEPTH	CLASSIFICATION OF MATERIALS (Description)	RECOV-ERY	N	REMARKS
HSA	1–3	SILTY SAND (SM) FINE TO MEDIUM GRAINED BROWN MOIST (FILL)			
		2.2' SILTY LEAN CLAY (CL-ML) BROWNISH GREY TO GREY (BROWN (10YR5/2) BELOW 3-FEET MOIST - WET BELOW 5-FEET (ALLUVIUM)			
SS	4–5		13"	5 7 7 8	
SS	6–7		20"	3 3 4 4	
SS	8–9		22"	2 3 3 4	
		10.0 SANDY LEAN CLAY (CL-SC) WITH GRAVEL GREENISH GREY (ALLUVIUM) MOIST			
SS	11–12		24"	5 6 7 9	* GREENISH GREY, WET (FLUVIAL)
		12.1' POORLY GRADED SAND (SP) MEDIUM TO COARSE GRAINED W/ GRAVEL *			
		13.0 SILT W/ CLAY (ML-CL) GREY TO BROWN WET W/ SHALE LAYERS BELOW 16 FEET W/ MICA FLAKES			
SS	14–15		22"	5 9 11 14	
SS	16–17		23"	7 3 3 7	
		18.2 SEE DESCRIPTION ON PAGE 2 of 2			
SS	19		14"	18 30 50/2"	

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HOLE NO. SB-99-9

Barr Engineering Company

DRILLING LOG

SHEET 2 OF 2 SHEETS

PROJECT NAME/NO. RHODIA SILVERBOW	SIZE AND TYPE OF BIT 4 5/8" ID HSA
LOCATION (Coordinates or Station)	DATUM FOR ELEV. SHOWN MSL
DRILLING AGENCY O'KEEFE	MANUFACTURERS DESIGNATION OF DRILL
HOLE NO. SB-99-9	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER DAVE C.	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN	DATE HOLE: 3/16/99 Started 3/16/99 Completed
DEPTH DRILLED INTO ROCK	ELEV. TOP OF HOLE
TOTAL DEPTH OF HOLE	SIGNATURE OF INSPECTOR

SAMPLE	DEPTH	CLASSIFICATION OF MATERIALS (Description)	RECOV-ERY	N	REMARKS
	21	SILTY SAND (SM-ML)			
SS	22	FINE TO MEDIUM GRAINED	12"	38 50/5"	
	23	GREYISH BROWN MOIST			
	24	CEMENTED TO SILTY SANDSTONE IN LAYERS			
	25				
	26				
SS	27	W/MICA FLAKES	20"	28 34 50/3"	
	28	(ALLUVIUM / SANDSTONE)			
SS	29		22"	28 32 41 50/5"	
	30				
	31	EOB 30.5'			
	32				
	33				
	34				
	35				
	16				
	37				
	38				
	39				

HOLE NO. T-99-1

Barr Engineering Company

DRILLING LOG

SHEET 1 OF 2 SHEETS

PROJECT NAME/NO. RHODIA SILVER BOW	SIZE AND TYPE OF BIT 4 5/8" HSA (ID)
LOCATION (Coordinates or Station) SEE FIGURE	DATUM FOR ELEV. SHOWN MSL
DRILLING AGENCY O'KEEFE	MANUFACTURERS DESIGNATION OF DRILL B-61
HOLE NO. T-99-1	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER DAVE. C.	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN	DATE HOLE: 3/ /99 Started 3/ /99 Completed
DEPTH DRILLED INTO ROCK	ELEV. TOP OF HOLE 5361.5
TOTAL DEPTH OF HOLE	SIGNATURE OF INSPECTOR

SAMPLE	DEPTH	CLASSIFICATION OF MATERIALS (Description)	RECOVERY	N	REMARKS
	2	SLAG GRAVEL TO COBBLE SIZE (DIKE BASE)			
	4	4.0			
SS	6	TAILINGS: ASTM: SILT W/ CLAY (ML) DARK GREY (2.5Y 4/1) WET (SMOKE, ODOR)	0	2 1 2 1	
	8				
SS	10		6"	2 2 3 4	
	12	12.0			
SS	14	FINE TAILINGS: ASTM: SILTY FAT CLAY (CH-ML) OR ELASTIC SILT (MH) GREYISH BROWN (2.5Y 5/2) WET	24"	5 1 1 1	
	16				
	18				
SS	20		20"	1/2 1/2 1/2 1/2	
	22	W/ DARK GREY LAYERS (0.1'/1') BELOW 25'.			
SS	24		24"	1 1 1 1	
SS	26		24"	1 2 2 3	
SS	28				
SS	30		24"	2 2 3 4	
TW	32		P. 2.5' R. 2.5'		
	34	34.3			
SS	36	SEE DESCRIPTION ON NEXT PAGE	24"	3 3 4 4	
SS	38		24"	2 2 3 4	
			~24"	2 2	

HOLE NO. T-99-1

Barr Engineering Company

DRILLING LOG

SHEET 2 OF 2 SHEETS

PROJECT NAME/NO. RHODIA SILVERBOW	SIZE AND TYPE OF BIT 4 5/8" HSA (ID)
LOCATION (Coordinates or Station) SEE FIGURE	DATUM FOR ELEV. SHOWN MSL
DRILLING AGENCY O'KEEFE	MANUFACTURERS DESIGNATION OF DRILL B-61
HOLE NO. T-99-1	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER DAVE C.	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN	DATE HOLE: 3/18/99 Started 3/19/99 Completed
DEPTH DRILLED INTO ROCK	ELEV. TOP OF HOLE
TOTAL DEPTH OF HOLE	SIGNATURE OF INSPECTOR

SAMPLE	DEPTH	CLASSIFICATION OF MATERIALS (Description)	RECOVERY	N	REMARKS
SS	42	FINE TAILINGS ASTM: SILTY FAT CLAY (CH-ML) OR ELASTIC SILT (MH) DARK GREYISH BROWN (2.5Y 4/2) WET	24"	2, 3, 3, 4	
TW	44		P. 2.5' R 2.5'		
SS	46		20"	5, 6, 9, 11	
3" SS	48		18"	13, 15, 15, 10	
SS	50	COLOR CHANGE TO GREYISH BROWN (2.5Y 5/2) BELOW 40-FEET	24"	13, 15, 15, 16	
SS	52		24"	10, 11, 14, 19	
SS	54	45' SILTY FAT CLAY (CH) DARK GREY (5Y 4/1) SLIGHTLY ORGANIC W/ ROOTS & MICA FLAKES MOIST (ALLUVIAL OVERBANK)	22"	8, 14, 19, 20	
SS	56		24"	31, 21, 13, 14	
SS	58				
	60		24"	8, 11, 14, 16	
SS	62	51.0' SILTY FAT CLAY (CH) OLIVE (5Y 4/3) W/ MICA FLAKES MOIST (ALLUVIAL OVERBANK)	16"	12, 14, 15, 18	
3" SS	64		24"	8, 12, 14, 17	
SS	66		24"	9, 15, 20, 23	
SS	68	55.5' CLAYEY SAND (SC) ARKOSIC, MEDIUM GRAINED GREENISH GREY W/ MICA FLAKES MOIST (LAG DEPOSIT)	24"	12, 12, 13, 22	
SS	70		24"	8, 11, 13, 22	* W/ PIECES OF GRAVEL SIZED SANDSTONE CLASTS (ALLUVIUM)
SS	72	57.2' SILT W/ CLAY (ML-CH) OLIVE (5Y 4/3) MOIST *			
	74				
	76	60.0' SILT (ML) LIGHT YELLOW BROWN (2.5Y 6/3) MOIST ** (SILTSTONE)			** CEMENTED TO SILTSTONE BELOW 65' W/ STAINING ON JOINTS; HIGHLY FRACTURED
	78				

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HOLE NO. T-99-2

Barr Engineering Company

DRILLING LOG

SHEET 1 OF 2 SHEETS

PROJECT NAME/NO. RHODIA SILVER BOW	SIZE AND TYPE OF BIT 4 5/8" HSA (ID)
LOCATION (Coordinates or Station) SEE FIGURE	DATUM FOR ELEV. SHOWN MSL
DRILLING AGENCY O'KEEFE	MANUFACTURERS DESIGNATION OF DRILL B-61
HOLE NO. T-99-2	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER DAVE. C.	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN	DATE HOLE: 3/22/99 Started 3/23/99 Completed
DEPTH DRILLED INTO ROCK	ELEV. TOP OF HOLE 5361.6
TOTAL DEPTH OF HOLE	SIGNATURE OF INSPECTOR

SAMPLE	DEPTH	CLASSIFICATION OF MATERIALS (Description)	RECOVERY	N	REMARKS
	2	SLAG GRAVEL TO COBBLE SIZE, (DIKE BASE)			
	4	1.0' TAILINGS: ASTM: SILT W/ CLAY (ML) DARK GREY (2.5Y4/1) WET SMOKE, ODOR			
SS	6		20"	6 8 10 10	
	8				
SS	10		22"	5 1 1 1	
	12				
	14	14.2'			
SS	16	FINE TAILINGS ASTM: SILTY FAT CLAY (CH-ML) OR ELASTIC SILT (MH) GREYISH BROWN (2.5Y 5/2) WET	24"	1 2 1 2	
	18				
SS	20		20"	1 1 1 1	
	22				
	24				
SS	26	0.3' LAYER OF TAILINGS (ML) SAME AS ABOVE 25.0'-25.3'.	20"	2 3 3 4	
SS	28		24"	2 1 1 2	
TW	30		P2.5' R25'		
SS	32		24"	2 2 3 4	
	34				
SS	36		24"	2 2 3 3	
SS	38		24"	2 2 3 3	
TW					

HOLE NO. T-99-2

Barr Engineering Company

DRILLING LOG

SHEET 2 OF 2 SHEETS

PROJECT NAME/NO. RHODIA SILVERBOW	SIZE AND TYPE OF BIT 4 5/8" HSA (ID)
LOCATION (Coordinates or Station) SEE FIGURE	DATUM FOR ELEV. SHOWN MSL
DRILLING AGENCY O'KEEFE	MANUFACTURERS DESIGNATION OF DRILL B-61
HOLE NO. T-99-2	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER DAVE C.	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN	DATE HOLE: 3/22/99 Started 3/23/99 Completed
DEPTH DRILLED INTO ROCK	ELEV. TOP OF HOLE
TOTAL DEPTH OF HOLE	SIGNATURE OF INSPECTOR

SAMPLE	DEPTH	CLASSIFICATION OF MATERIALS (Description)	RECOV-ERY	N	REMARKS
TW		SAME AS ABOVE			
	42				
TW		COLOR CHANGE TO REDDISH BROWN IN TW @ APPROX 42'	P2.5 R2.5		
	44	44			
SS		SILTY FAT CLAY (CH-ML) DARK GREY (5Y 4/1) SLIGHTLY ORGANIC W/ ROOTS, MICA FLAKES MOIST	24"	5 6 8 10	
3"SS	46				
	48	48.2'			
SS		SILT (ML) W/ SOME CLAY / ROOTS OLIVE GREY (5Y 4/2) TO GRECNISH GREY (5G 5/1) MOIST	24"	4 4 5 6	
SS	50		24"	4 7 9 14	
SS	52		24"	10 10 11 14	
SS	54	52.8'	24"	11 15 18 20	
SS	56	POORLY GRADED SAND W/ SILT (SP-SM) MEDIUM TO COARSE GRAINED W/ GRAVEL GREENISH GREY (5G5/1) W/ MUD BALL INTERCLASTS WET	20"	15 18 20 23	
	58				
SS		GRADES TO CLAYEY SAND (SC) BELOW 54'.	24"	10 10 11 12	
SS	60				
	62	56.2'	24"	14 15 18 20	
	64	POORLY GRADED SAND (SP) MEDIUM TO COARSE GRAINED W/ GRAVEL AND COBBLES* GREENISH GREY (5G 5/1) (FLUVIAL) WET			* BASED ON TOOL ACTION
SS	66		20"	16 19 23 31	
SS	68	59.6	24"	8 8 9 10	
SS	70	SILT W/ CLAY (ML-CH) CEMENTED TO SILTSTONE / SHALE OLIVE GREY, MOIST	24"	8 11 12 12	
SS	72	67.5'	22"	17 25 32 37	
	74	SILT (ML) LIGHT YELLOWISH BROWN (2.5Y 6/3) MOIST CEMENTED TO SILTSTONE**			** IN ZONES HIGHLY FRACTURED STAINED (BLACK) ON FRACTURE PLANES WET BELOW 70'
	76	EOB 76.5'			
	78				

HOLE NO. T-99-3

Barr Engineering Company

DRILLING LOG

SHEET 1 OF 2 SHEETS

PROJECT NAME/NO. RHODIA SILVER BOW	SIZE AND TYPE OF BIT 4 5/8" HSA (ID)
LOCATION (Coordinates or Station) SEE FIGURE	DATUM FOR ELEV. SHOWN MSL
DRILLING AGENCY O'KEEFE	MANUFACTURERS DESIGNATION OF DRILL B-61
HOLE NO. T-99-3	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER DAVE, C.	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN	DATE HOLE: 3/24/99 Started 3/25/99 Completed
DEPTH DRILLED INTO ROCK	ELEV. TOP OF HOLE 5361.3
TOTAL DEPTH OF HOLE	SIGNATURE OF INSPECTOR

SAMPLE	DEPTH	CLASSIFICATION OF MATERIALS (Description)	RECOVERY	N	REMARKS
	2	SLAG GRAVEL TO COBBLE SIZED (DIKE BASE)			
	4	1.0' TAILINGS ASTM: SILT W/ CLAY (ML) DARK GREY (2.5Y 4/1) WET (SMOKE, ODOR)			
SS	6		18"	3 2 2 4	
	8				
SS	10		20"	1 ½ ½ 1	
	12				
	14	14.8' FINE TAILINGS ASTM: SILTY FAT CLAY (CH-ML) OR ELASTIC SILT (MH) GREYISH BROWN (2.5Y5/2) WET			
SS	16		24"	1 1 1 1	
	18				
SS	20		24"	1 1 1 1	
	22	W/ SOME DARK GREY LAYERS (0.1' THICK)			
SS	24		23"	1 1 1 2	
SS	26		24"	1 2 1 2	
SS	28		24"	2 2 3 2	
TW	30		P 2.5' R 2.5'		
SS	32		24"	3 3 3 4	
SS	34		24"	3 4 4 5	
TW	36				
	38				

HOLE NO. T-99-3

Barr Engineering Company

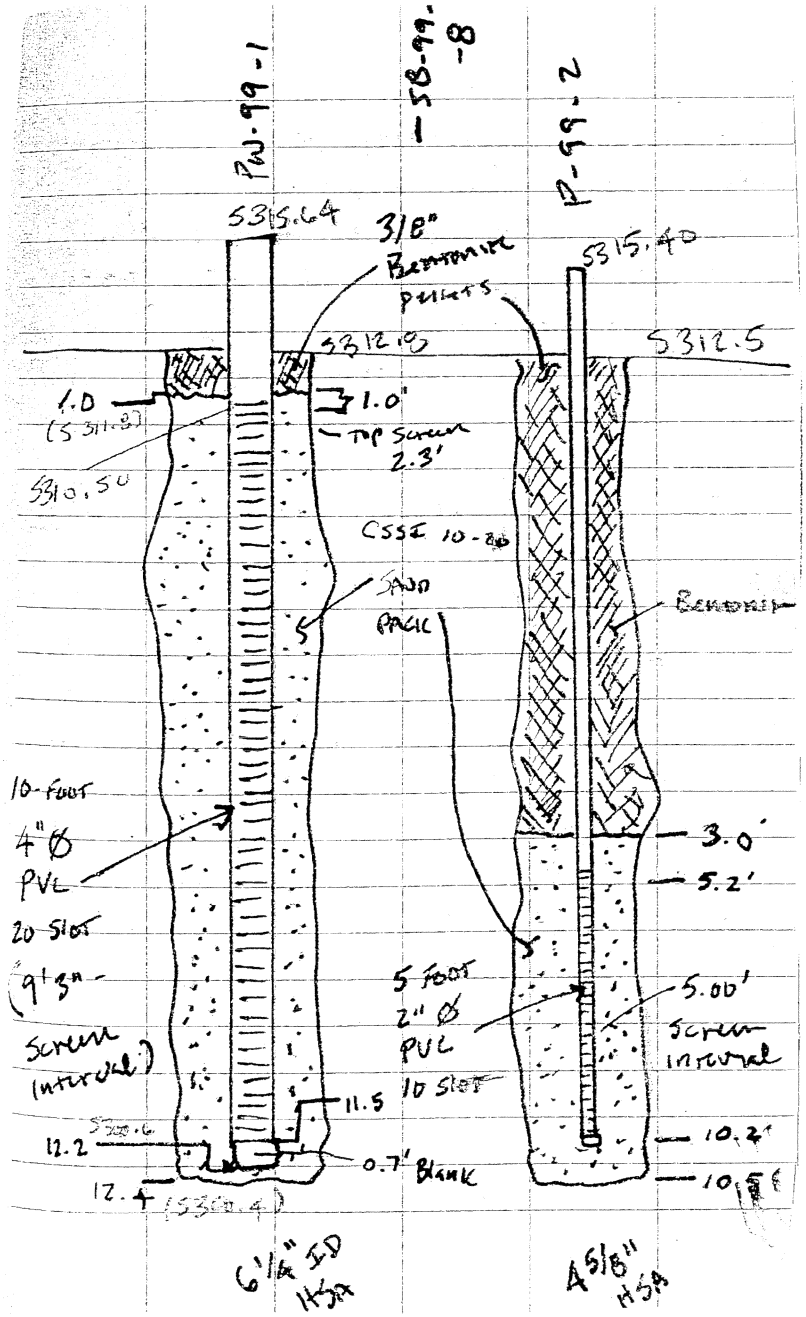
DRILLING LOG

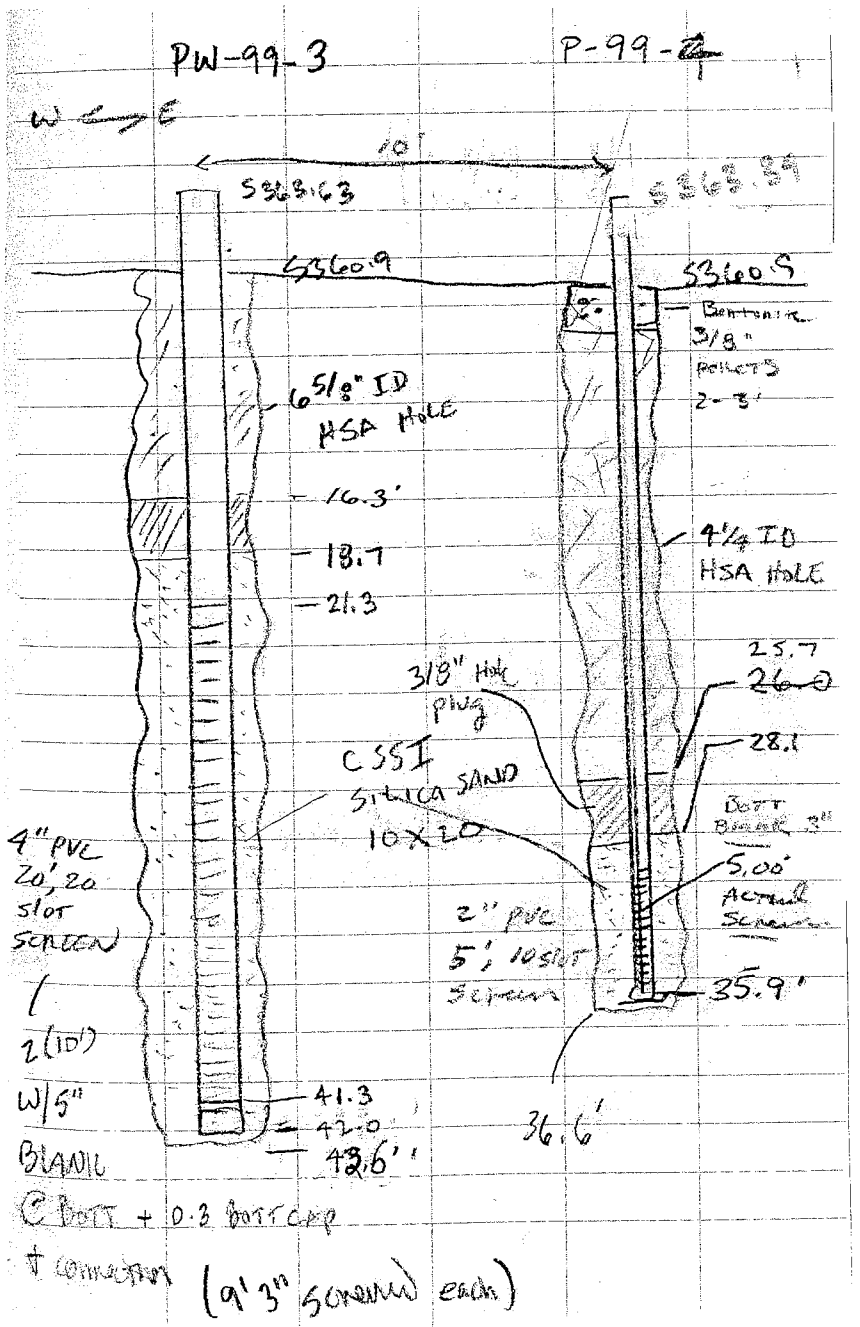
SHEET 2 OF 2 SHEETS

PROJECT NAME/NO. RHODIA SILVERBOW	SIZE AND TYPE OF BIT 4 5/8" HSA (ID)
LOCATION (Coordinates or Station) SEE FIGURE	DATUM FOR ELEV. SHOWN MSL
DRILLING AGENCY O'KEEFE	MANUFACTURERS DESIGNATION OF DRILL B-61
HOLE NO. T-99-3	TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN ____ Disturbed ____ Undisturbed
NAME OF DRILLER DAVE C.	TOTAL NO. CORE BOXES
DIRECTION OF HOLE ☒ Vertical ☐ Inclined ____ Deg. from Vert.	ELEV. GROUNDWATER
THICKNESS OF OVERBURDEN	DATE HOLE: 3/24/99 Started 3/25/99 Completed
DEPTH DRILLED INTO ROCK	ELEV. TOP OF HOLE 5361.3
TOTAL DEPTH OF HOLE	SIGNATURE OF INSPECTOR

SAMPLE	DEPTH	CLASSIFICATION OF MATERIALS (Description)	RECOVERY	N	REMARKS
TW	42	SAME AS ABOVE COLOR CHANGE TO REDDISH BROWN BELOW 42'	P2.5 R2.5		
SS	44		20"	6 7 9 11	
SS	46	45.0' SILT W/ CLAY (ML-CH) DARK GREY (2.5Y 4/1) MOIST *	20"	10 10 14 15	* BLACK W/ ROOTS 45.0 - 45.3'
SS	48	=	24"	5 5 6 6	
SS	50	48.0' FAT CLAY (CH) BROWNISH GREY WET	24"	10 14 19 21	
SS	52	(ALLUVIUM)	24"	9 11 14 16	
SS	54	53.6 SILT (ML) LIGHT YELLOW BROWN (2.5Y 6/3) MOIST	24"	8 9 13 13	
SS	56	=	20"	8 9 13 15	
	58	ALTERED TO SILTSTONE IN ZONES			
SS	60				
	62				
SS	64	SILTSTONE ALTERATION INCREASES W/ DEPTH	18"	11 14 18 20	
TW	66	W/ SOME SHALE (ML-CH)	P2.5		THIN WALL CRUSHED
	68		R0.0		
	70				
SS	72		24	20 24 27 31	
SS	74		24	15 17 18 21	
	76		24	15 11 19 32	
	78	EOB 76.5			

Four-inch diameter wells (PW-99-1, and PW-99-3) were installed upstream and downstream of the tailings basin for use as the pumping well in two aquifer tests. Two-inch observation wells (P-99-2, and P-99-4) were placed approximately 10 feet from each pumping well. The pumping wells were constructed of 4-inch-diameter PVC risers equipped with 10 and 20-foot-long (PW-99-1 was installed with a 10-foot long screen), 0.020-slot, PVC screens. The observation wells were constructed of 2-inch-diameter PVC risers equipped with 5-foot-long, 0.010-slot, PVC screens. Sand pack was installed in each of the wells before the borehole annuli were sealed with bentonite slurry and neat cement grout. All of the wells were developed, primarily by surging and bailing, until return water was clear and sediment free.


MW-99-1
MW-99-2
5315.64
5315.40
3/8" Bentonite pellets
5312.5
5312.19
1.0
(5311.8)
5310.50
1.0'
Top Screen 2.3'
CSSI 10-20
Sand Pack
Bentonite
10-Foot 4" Ø PVC 20 Slot (9+3" Screen Interval)
5 Foot 2" Ø PVC 10 Slot
5.00' Screen Interval
3.0'
5.2'
11.5
12.2
5300.6
0.7' Blank
12.4 (5300.4)
10.2'
10.5'
6 1/4" ID HSA
4 5/8" HSA


PW-99-3
P-99-
W ↔ E
10'
5363.63
5363.59
5360.9
5360.9
Bentonite
3/8" PELLETS
2-3'
6 5/8" ID
HSA HOLE
16.3'
18.7
21.3
4 1/4 ID
HSA HOLE
25.7
26.0
28.1
3/8" Hole plug
CSSI
SILICA SAND
10x20
Bott Blank 3'
5.00' Actual Screen
4" PVC
20, 20
slot
SCREEN
(
2(10')
W/5"
BLANK
2" PVC
5', 10 SLOT
SCREEN
35.9'
36.6'
41.3
42.0
42.6'
@ Bott + 0.3 Bott cap
+ connection
(9' 3" screens each)

PW-99-1

Project KHONE POLENC

Engineer BARR ENG./JOHN FOX Installed By O'KEEFE/DAVE CROWLEY Date 3/17/99

Location SILVER BOW MT Twp 3 (N)/S Range 9 E/(W) SW 1/4 NW 1/4 Section 26

Method of Installation HOLLOW STEM AUGER

DA 141787

LOG OF BORING AND WELL

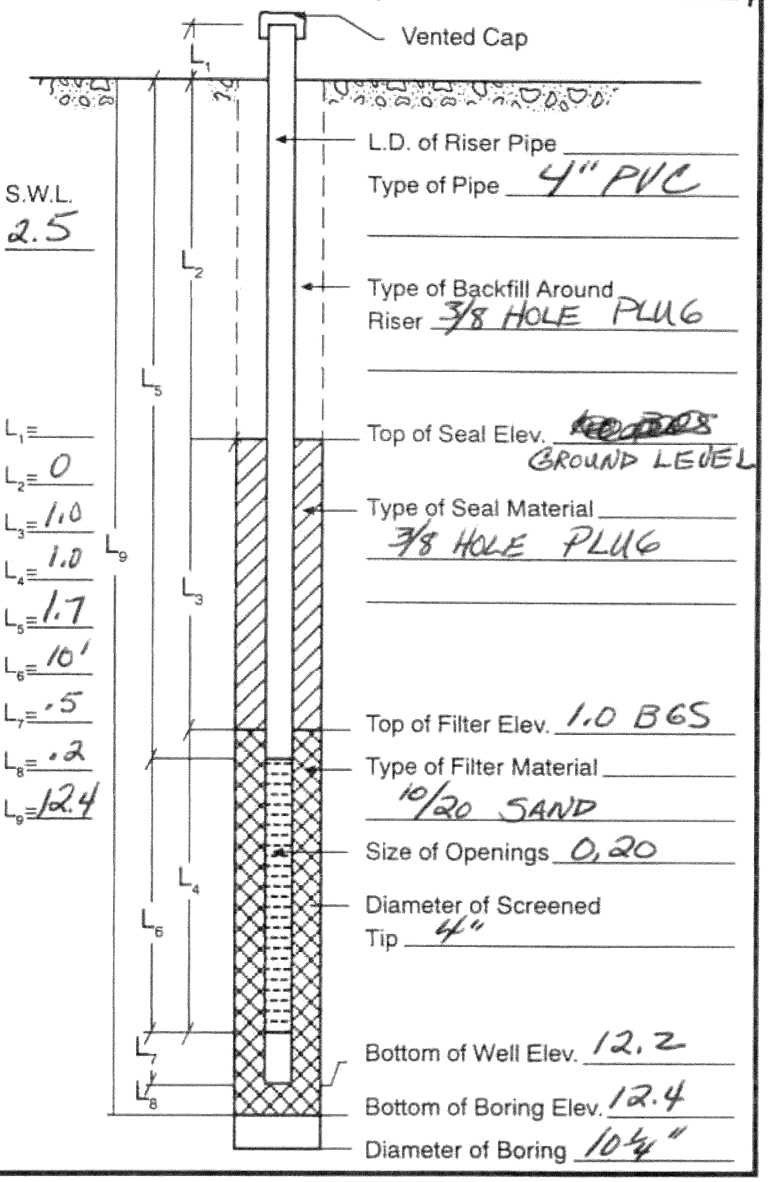
BORING

Depth In ft.	Description	H. Nu Reading

OBSERVATION WELL INFORMATION

Type of WELL Pumping WELL

Ground Elev. _____ Top of Riser Elev. 26 stick up



L.D. of Riser Pipe _____

Type of Pipe 4" PVC

S.W.L. 2.5

Type of Backfill Around Riser 3/8 HOLE PLUG

L_1 = _____

L_2 = 0

L_3 = 1.0

L_4 = 1.0

L_5 = 1.7

L_6 = 10'

L_7 = .5

L_8 = .2

L_9 = 12.4

Top of Seal Elev. ~~4608~~ GROUND LEVEL

Type of Seal Material 3/8 HOLE PLUG

Top of Filter Elev. 1.0 BGS

Type of Filter Material 10/20 SAND

Size of Openings 0.20

Diameter of Screened Tip 4"

Bottom of Well Elev. 12.2

Bottom of Boring Elev. 12.4

Diameter of Boring 10¼"

Remarks NO Protective Casing

O'KEEFE DRILLING COMPANY
P.O. Box 3810
2000 Four Mile Road
~~Butte, MT 59702~~

L-1 Flush MT/Well Protector
L-2 Surface to Bentonite Seal
L-3 Bentonite Seal
L-4 Filter Pack
L-5 Surface to Top of Screen
L-6 Screen
L-7 Sump
L8 Rat Hole
L-9 Total Depth

Prepared by _____ 181444 #269

P-99-2

Project RHONE POLENC

Engineer BARR ENG./JOHN FOX Installed By O'KEEFE/DAVE CROWLEY Date 3/17/99

Location SILVER BOW MT Twp 3 (N)S Range 9 E(W) SW 1/4 NW 1/4 Section 26

Method of Installation HOLLOW STEM AUGER

PA

141788

LOG OF BORING AND WELL

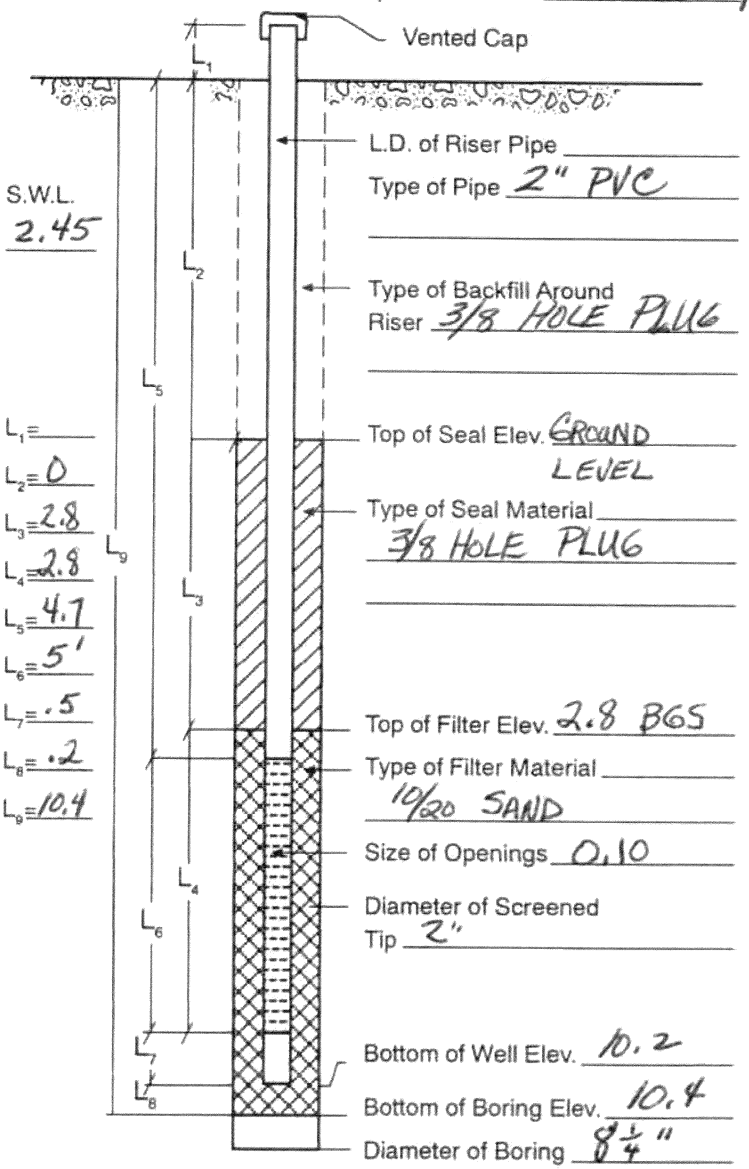
BORING

Depth In ft.	Description	H. Nu Reading

OBSERVATION WELL INFORMATION

Type of WELL MONITORING WELL

Ground Elev. _____ Top of Riser Elev. 2.6 stick up



S.W.L. 2.45

L_1 = _____
L_2 = 0
L_3 = 2.8
L_4 = 2.8
L_5 = 4.7
L_6 = 5'
L_7 = .5
L_8 = .2
L_9 = 10.4

L.D. of Riser Pipe _____

Type of Pipe 2" PVC

Type of Backfill Around Riser 3/8 HOLE PLUG

Top of Seal Elev. GROUND LEVEL

Type of Seal Material 3/8 HOLE PLUG

Top of Filter Elev. 2.8 BGS

Type of Filter Material 10/20 SAND

Size of Openings 0.10

Diameter of Screened Tip 2"

Bottom of Well Elev. 10.2

Bottom of Boring Elev. 10.4

Diameter of Boring 8¼"

Remarks NO PROTECTIVE CASING

O'KEEFE DRILLING COMPANY
P.O. Box 3810
2000 Four Mile Road
Butte, MT 59702

L-1 Flush MT/Well Box L-4 Filter Pack L-7 Sump
L-2 Surface to Bentonite Seal L-5 Surface to Top of Screen L8 Rat Hole
L-3 Bentonite Seal L-6 Screen L-9 Total Depth

Prepared by Dave Crowley #269 181445

Project RHONE POLENCI

Engineer BARR ENG / JOHN FOX Installed By O'KEEFE / DAVE CROWLEY Date 3/12/99

Location SILVER BOW MT Twp 3 (N)/S Range 9 E(W) NE 1/4 SW 1/4 Section 26

Method of Installation HOLLOW STEM AUGER

PA

141789

LOG OF BORING AND WELL

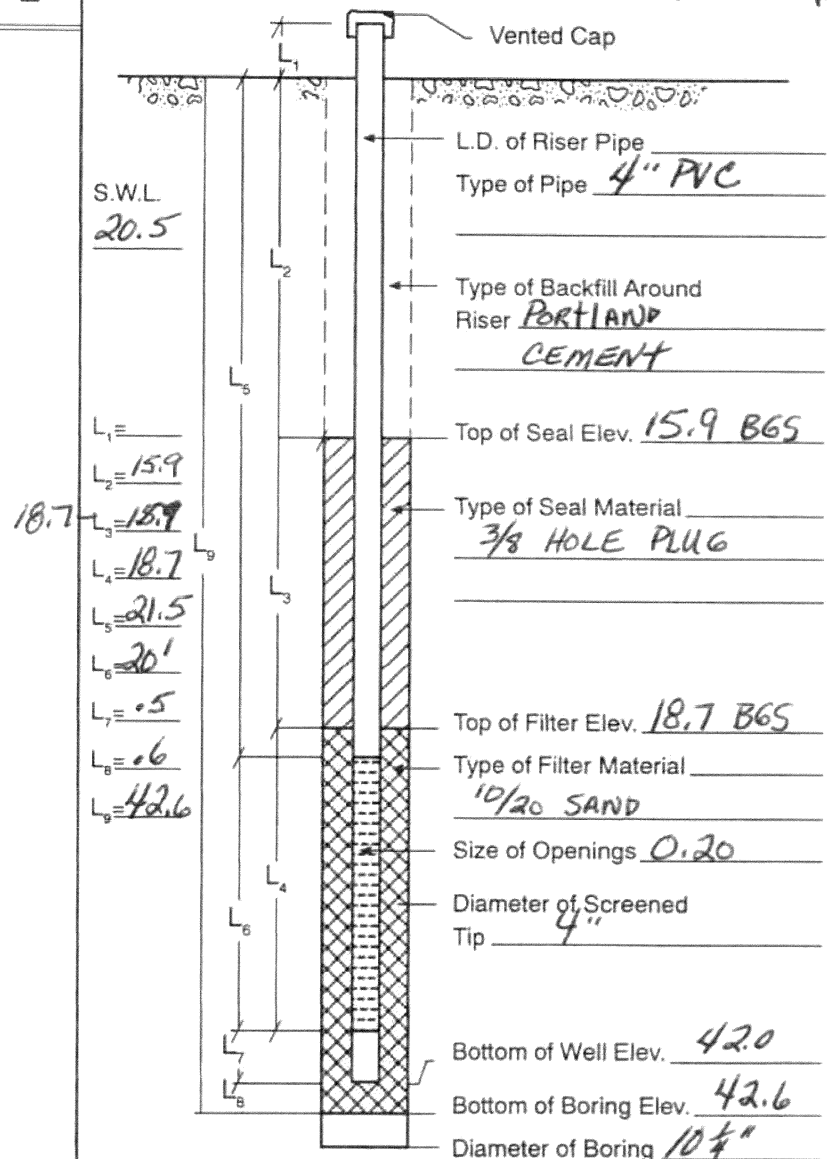
BORING

Depth In ft.	Description	H. Nu Reading

OBSERVATION WELL INFORMATION

Type of WELL Pumping WELL

Ground Elev. _____ Top of Riser Elev. 2.9 stick up



L1 = _____
L2 = 15.9
18.7 → L3 = 18.7
L4 = 18.7
L5 = 21.5
L6 = 20'
L7 = .5
L8 = .6
L9 = 42.6

Remarks PORTLAND CEMENT 15.9 TO 1.2 BGS
TOP OF HOLE 1.2 BGS TO SURFACE 3/8 PLUG
NO PROTECTIVE CASING

O'KEEFE DRILLING COMPANY
P.O. Box 3810
2000 Four Mile Road
Butte, MT 59702

L-1 Flush MT/Well Protector
L-2 Surface to Bentonite Seal
L-3 Bentonite Seal
L-4 Filter Pack
L-5 Surface to Top of Screen
L-6 Screen
L-7 Sump
L8 Rat Hole
L-9 Total Depth

Prepared by Dave Crowley #269 18144/6

U3N09W23 CA Well No. 1 11-1 P-99-4

Project RHONE POLENC

Engineer BARR/JOHN FOX Installed By O'KEEFE/DAVE CROWLEY Date 3/12/99

O/L Location SILVER BOW MONT. Twp 3 (N)/S Range 9 E/(W) NE 1/4 SW 1/4 Section 23

thod of Installation HOLLOW STEM AUGER

PA 141786

LOG OF BORING AND WELL

BORING

Depth In ft.	Description	H. Nu Reading

OBSERVATION WELL INFORMATION

Type of WELL Monitoring Well

Ground Elev. _____ Top of Riser Elev. 2.8 STICK up

Vented Cap

L1

L.D. of Riser Pipe _____

Type of Pipe 2" PVC

S.W.L. 20.50

L2

Type of Backfill Around Riser PORTLAND CEMENT

L5

L1 = PORTLAND 0

Top of Seal Elev. 25.7 BGS

L2 = 25.7

L3 = 28.1

L4 = 28.1

L9

28.1

Type of Seal Material 3/8 HOLE PLUG

L5 = 30.4

L6 = 5'

L7 = .5

L8 = .7

L9 = 36.6

L3

Top of Filter Elev. 28.1 BGS

Type of Filter Material 10/20 SAND

Size of Openings 0.10

L4

Diameter of Screened Tip 2"

L6

L7

L8

Bottom of Well Elev. 35.9

Bottom of Boring Elev. 36.6

Diameter of Boring 8¼"

Remarks PORTLAND CEMENT 25.7 TO ~~SURFACE~~ 1.1 BGS TOP OF HOLE 1.1 TO 0 3/8 PLUG
NO PROTECTIVE CASING

O'KEEFE DRILLING COMPANY
P.O. Box 3810
2000 Four Mile Road
Butte, MT 59702

L-1 Flush MT/Well Protector
L-2 Surface to Bentonite Seal
L-3 Bentonite Seal
L-4 Filter Pack
L-5 Surface to Top of Screen
L-6 Screen
L-7 Sump
L8 Rat Hole
L-9 Total Depth

Prepared by Dave Crowley 269 181443

[redacted]

2001 Well and Boring Logs

Barr Engineering Company | Ref. Boring # n/a | Well # MW-01-1

Project: Pre-Closure Groundwater Monitoring Program

Project Number:	26/25/001-JSL-021	Total Drilled Depth (ft):	50.3
Boring Location:	Rhodia Silver Bow Plant - Butte, Montana	Ground Surface Elevation (ft):	5370.7
Drilling Contractor:	O'Keefe Drilling	Depth to Groundwater (ft):	42.41
Drilling Method:	Hollow Stemmed Auger	Riser Elevation (ft):	5372.79
Driller:	Steve Malkovich	Date Started:	9/17/01
Geologist:	Sheryl Filby	Date Completed:	9/19/01

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Depth (ft. bgs)	Split spoon Recovery (ft)	Blow Count	Moisture/W.L.	ASTM	Lithologic Unit	Material Descriptions and Remarks	Well Construction/ Comments	Elevation
2								5372
0						: Split-spoon sampling began at 19.2'.		5370
2								5368
4								5366
6							2" PVC Well Pipe	5364
8								5362
10								5360
12								5358
14								5356
16							Neat Cement Grout	5354
18								5352
20	1.5	16/18/18/19	none	SM	Sand	SAND: Poorly sorted medium to coarse grained sand. 4/6/7.5YR (dark brown) color. Increased fines including silt and clay sized particles to 21'.		5350
22	1.8	11/14/17/21	none	SM-CL	Silty sand with clay	SILTY SAND WITH CLAY: Silty sand with some clay. 5/6/7.5YR. At 28', increased mica flakes. At 30', some subangular pebbles and mica. Color has graded in 4/6/7.5YR. At 32', increased fines (silt and clay) content. Very tight and stiff (holds shape of spoon). At 38', increased water		5348
24	1.8	14/33/37/50+	none	SM-CL		content which steadily increases until water		5346

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Barr Engineering Company

Ref. Boring # n/a

Well # MW-01-1

Depth (ft. bgs)	Sample Type/ Recovery (ft.)	Blow Count	Moisture\W.L.	ASTM	Lithologic Unit	Material Descriptions and Remarks	Well Construction/ Comments	Elevation
26	1.5	33/34/43/50+	none	SM-CL		saturated below water table and sediment is same as above.		5344
28	1.8	27/38/42/43	none	SM-CL				5342
30	1.0	28/33/44/50+	none	SM-CL				5340
32	1.7	20/30/32/39	slight	SM-CL				5338
34	1.7	19/31/41/50+	slight	SM-CL			Hole Plug	5336
36	1.7	15/19/37/40	slight	SM-CL			100-mesh Sand	5334
38	1.0	21/37/50+	slight-moist	SM-CL				5
40	1.8	19/44/48/50+	slight-moist	SM-CL				5330
42	1.0	44/50/50+	moist-sat.	SM-CL				5328
44	1.2	23/29/50+	sat.	SM-CL			#6-slot 2" PVC Screen	5326
46	1.9	17/17/39/50+	sat.	SM-CL			Specified Sand Pack	5324
48	1.0	35/50+	sat.	SM-CL				5322
50								

Barr Engineering Company | Ref. Boring # n/a | Well # MW-01-2

Project: Pre-Closure Groundwater Monitoring Program

Project Number:	26/25/001-JSL-021	Total Drilled Depth (ft):	43.4
Boring Location:	Rhodia Silver Bow Plant - Butte, Montana	Ground Surface Elevation (ft):	5361.3
Drilling Contractor:	O'Keefe Drilling	Depth to Groundwater (ft):	36.59
Drilling Method:	Hollow Stemmed Auger	Riser Elevation (ft):	5363.47
Driller:	Steve Malkovich	Date Started:	9/18/01
Geologist:	Sheryl Filby	Date Completed:	9/18/01

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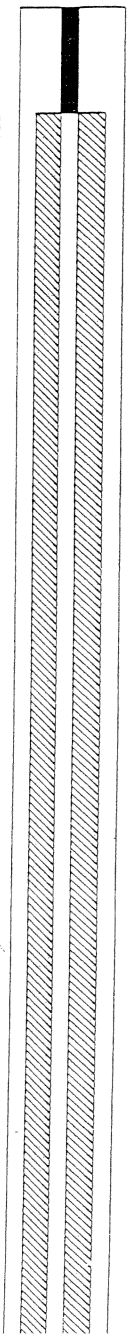
Depth (ft. bgs)	Split spoon Recovery (ft)	Blow Count	Moisture/W.L.	ASTM	Lithologic Unit	Material Descriptions and Remarks	Well Construction/ Comments	Elevation
						: Split-spoon sampling began at 9.4'.		
10	0.8	3/4/3/6	Moist	SM	Sand	SAND: Yellowish-orange (5/6/7.5YR) sand (fill) with some slag.		
12	1.5	3/3/2/2	Moist	SM				
14	1.9	5/12/16/28	Moist	SM-CL	Silty Sand with clay	SILTY SAND WITH CLAY: Homogeneous silty sand (4/6/7.5YR) with visible mica flakes. Estimated sand/silt/clay fraction is 70/20/10. Very stiff, holds the shape of the spoon. Increased sand content from 17.4-18.4. From 18.4-19.4 grades into a fine sand with increased silt (finer than the 15.4-17.4 increment).		
16	1.7	8/12/23/24	Moist	SM-CL				
18		7/10/18/27	Moist	SM-CL				
20	1.8	8/14/25/40	Moist	SM	Sand	SAND: Small layer (1.5") of coarse sand at 20.8'. 20.8' - 21.4' fine-medium grained sand with mica flakes. At 21.4' - 23.2', coarse sand with angular granite pebbles. Sand is mostly quartz with some visible mica. Very poorly sorted. 23.2- 23.6 fine sand and silt. 23.6 - 27.4 coarse sand and gravel with some silt (same as 21.4 - 23.2) with two thin layers of fine sand.		
22	1.5	23/30/45/50+	Moist	SM-GM				
24	1.7	24/27/25/26	Moist	SM-GM				



5362
5360
5358
5356
5354
5352
5350
5348
5346
5344
5342
5340
5338

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Barr Engineering Company

Ref. Boring # n/a

Well # MW-01-2

Depth (ft. bgs)	Sample Type/ Recovery (ft.)	Blow Count	Moisture\W.L.	ASTM	Lithologic Unit	Material Descriptions and Remarks	Well Construction/ Comments	Elevation
26	1.5	15/18/18/21	Moist	SM/GM/CL				
28	1.7	12/18/33/48	Moist	SM		SILTY SAND WITH CLAY: Homogeneous silty sand. Fine grained with mica (4.6/7.5YR). Slight increase fines at 33.7. At 35.0', 1.5" layer of coarse sand. Increased clay content at 37.4 that maintains until depth.	Hole Plug	5334
30	1.8	12/18/28/34	Moist	SM			100-mesh Sand	5332
32	1.7	8/10/18/28	Moist	SM				5330
34	1.6	8/16/25/22	Moist	SM				5328
36	2.0	7/14/26/47	Moist/Sat.	SM			#6-slot 2" PVC Screen	5326
38	1.2	8/30/50+	Sat.	SM-ML	Silty Sand with clay		Specified Sand Pack	5324
40	1.2	17/50+	Sat.	SM-ML				5322
42	2.0	15/15/33/50+	Sat.	SM-ML				5320
								5318

Barr Engineering Company

Ref. Boring # n/a

Well # MW-01-3

Project: Pre-Closure Groundwater Monitoring Program

Project Number:	26/25/001-JSL-021
Boring Location:	Rhodia Silver Bow Plant - Butte, Montana
Drilling Contractor:	O'Keefe Drilling
Drilling Method:	Hollow Stemmed Auger
Driller:	Steve Malkovich
Geologist:	Sheryl Filby

Total Drilled Depth (ft):	40.3
Ground Surface Elevation (ft):	5357.0
Depth to Groundwater (ft):	32.74
Riser Elevation (ft):	5358.99
Date Started:	9/19/01
Date Completed:	9/21/01

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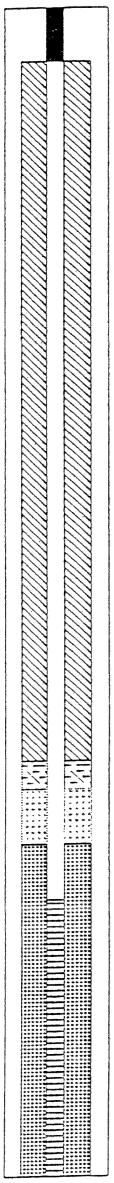
Depth (ft. bgs)	Split spoon Recovery (ft)	Blow Count	Moisture/W.L.	ASTM	Lithologic Unit	Material Descriptions and Remarks
28	1.5	31/19/29/30	moist	SM-GM	Silty sand with clay	SILTY SAND WITH CLAY: 26.3-27.3 Clayey fine sand. 27.3-28.3 Coarse grained sand with mica. Sample smoking. Phosphorus odor. At 28.3', silty sand with some clay. From 28.3 - 28.5 saturated. 29.8-30.3 increased fines- moist but not saturated. 30.3- 38.3 homogenous siltysand with clay with mica. 38.3-40.3 coarse grained sand and gravel with subangular pebbles. Samples smoking throughout. Phosphorus odor throughout.
30	2.0	20/22/28/50+	moist-sat.	SM-SC		
32	1.8	14/44/50+	moist	SM-		
34	2.0	13/28/38/50	sat.	SM/CL		
36	2.0	15/16/18/40	sat.	SM/CL SC/CL		
38	1.8	12/28/23/50+	sat.	SM/CL		
40	1.2	15/20/50+	sat.	SM/CL		

: Split-spoon sampling began at 26.3'.



2" PVC Well Pipe

Neat Cement Grout

Hole Plug

100-mesh Sand

Specified Sand Pack

#6-slot 2" PVC Screen

Elevation
5360
5358
5356
5354
5352
5350
5348
5346
5344
5342
5340
5338
5336
5334
5332
5330
5328
5326
5324
5322
5320

Barr Engineering Company

Ref. Boring # n/a

Well # MW-01-4

Project: Pre-Closure Groundwater Monitoring Program

Project Number:	26/25/001-JSL-021	Total Drilled Depth (ft):	48.4
Boring Location:	Rhodia Silver Bow Plant - Butte, Montana	Ground Surface Elevation (ft):	5366.4
Drilling Contractor:	O'Keefe Drilling	Depth to Groundwater (ft):	39.11
Drilling Method:	Hollow Stemmed Auger	Riser Elevation (ft):	5368.05
Driller:	Steve Malkovich	Date Started:	9/19/01
Geologist:	Sheryl Filby	Date Completed:	9/20/01

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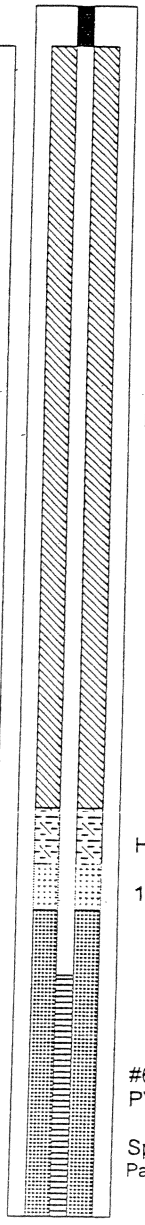
Depth (ft. bgs)	Split spoon Recovery (ft)	Blow Count	Moisture/W.L.	ASTM	Lithologic Unit	Material Descriptions and Remarks
30	1.7	14/26/30/40	none	SM-ML	Silty sand	: Split-spoon sampling began at 29.4'. SILTY SAND: Fine sand with silt. 4/4/7.5YR. Homogeneous throughout with mica flakes. At 31.4 increased silt content in sand which continues to 39.4.
32	1.9	11/17/27/30	moist	SM-ML		
34	1.8	13/19/25/25	moist	SM-ML		
36	1.7	12/21/43/50+	moist	SM-ML		
38	1.0	19/50+	moist	SM-ML		
40	1.7	17/21/34/43	moist	SM-CL	Silty sand with clay	SILTY SAND WITH CLAY: Increased silt and clay from 29.4-39.4'. 4/6/7.5YR.
42	2.0	10/15/20/28	sat.	SM-CL		
44	1.7	35/50+	sat.	SM-CL		
46	1.1	36/50+	sat.	SM-CL		
48						



Elevation
5368
5366
5364
5362
5360
5358
535
5354
5352
5350
5348
5346
5344
5342
5340
5338
5336
5334
5332
5330
5328
5326
5324
5322
5320
5318

Barr Engineering Company

Ref. Boring # n/a

Well # MW-01-5

Project: Pre-Closure Groundwater Monitoring Program

Project Number:	26/25/001-JSL-021	Total Drilled Depth (ft):	46.3
Boring Location:	Rhodia Silver Bow Plant - Butte, Montana	Ground Surface Elevation (ft):	5366.2
Drilling Contractor:	O'Keefe Drilling	Depth to Groundwater (ft):	39.36
Drilling Method:	Hollow Stemmed Auger	Riser Elevation (ft):	5368.33
Driller:	Steve Malkovich	Date Started:	9/20/01
Geologist:	Sheryl Filby	Date Completed:	9/20/01

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Depth (ft. bgs)	Split spoon Recovery (ft)	Blow Count	Moisture/W.L.	ASTM	Lithologic Unit	Material Descriptions and Remarks	Well Construction/ Comments	Elevation
2						: Split-spoon sampling began at 36.3'.		5368
0								5366
2								5364
4								5362
6							2" PVC Well Pipe	5360
8								5358
10								5356
12								5354
14								5352
16							Neat Cement Grout	5350
18								5348
20								5346
22								5344
24								5342
26								5340
28								5338
30								5336
32							Hole Plug 100-mesh Sand	5334
34								5332
36								5330
38	1.8	17/21/26/32	moist	SM-SC		SILTY SAND WITH CLAY: Fine sand with some clay and silt. Mica flakes present. 4/6/7.5YR. 36.7-37.0 - increased fines (40/30/30). 37.0-37.2 - increased sand (50/25/25). 37.2-37.6 - increased fines (40/30/30) 37.6-38.3 - increased sand (60/20/20). All same color throughout grain size variations. 38.3 - 44.3 - Silty sand with clay (40/30/30). 44.3-44.6 - sand and gravel layer 44-6 - 46.3 - Silty sand with clay (40/30/30)		5328
40	1.9	14/14/29/50+	sat.	SM-SC	Silty sand with clay			5326
42	1.2	19/37/50+	sat.	SM-SC			#6-slot 2" PVC Screen	5324
44	1.8	15/21/24/34	sat.	SM-SC			Specified Sand Pack	5322
		12/27/50+	sat.	SM-SC				5320

Barr Engineering Company

Ref. Boring # n/a

Well # MW-01-6

Project: Pre-Closure Groundwater Monitoring Program

Project Number:	26/25/001-JSL-021	**Total Drilled Depth (ft):**	40.3
Boring Location:	Rhodia Silver Bow Plant - Butte, Montana	**Ground Surface Elevation (ft):**	5356.0
Drilling Contractor:	O'Keefe Drilling	**Depth to Groundwater (ft):**	31.56
Drilling Method:	Hollow Stemmed Auger	**Riser Elevation (ft):**	5357.75
Driller:	Steve Malkovich	**Date Started:**	9/21/01
Geologist:	Sheryl Filby	**Date Completed:**	9/21/01

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Depth (ft. bgs)	Split spoon Recovery (ft)	Blow Count	Moisture/W.L.	ASTM	Lithologic Unit	Material Descriptions and Remarks	Well Construction/ Comments	Elevation
0								5356
2								5354
4								5352
6							2" PVC Well Pipe	5350
8								5348
10								5346
12								5344
14								5342
16							Neat Cement Grout	5340
18								5338
20								5336
22								5334
24						: Split-spoon sampling began at 29.0'.	Hole Plug	5332

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Barr Engineering Company

Ref. Boring # n/a

Well # MW-01-6

Page 2 of 2

Depth (ft. ugs)	Sample Type/ Recovery (ft.)	Blow Count	Moisture\W.L.	ASTM	Lithologic Unit	Material Descriptions and Remarks	Well Construction/ Comments	Elevation
28							100-mesh Sand	5328
30	1.8	11/18/32/50+	moist	SM/CL/ML	Silty sand with clay.	SILTY SAND WITH CLAY: Fine sand with silt and clay. Very tight. Some weathered quartz granite pebbles. Mica Flakes. 4/6/7.5YR. Some coarse grained saturated sand in lenses.	Specified Sand Pack	5326
32	1.8	12/19/32/42	moist	SM/CL/ML				5324
34	2.0	13/18/32/50+	sat.	SM/CL/ML			#6-slot 2" PVC Screen	5322
36	2.0	14/25/35/45	sat.	SM/CL/ML				5320
38	1.8	17/27/31/50+	sat.	SM/CL/ML	Coarse sand.	SAND AND GRAVEL: Coarse sand and gravel.		5318
40					Medium sand.	SAND: Dark brown medium grained sand with mica.		5316

2002 Well and Boring Logs

Barr Engineering Company | Ref. Boring # n/a | Well # MW-02-1

Project: Pre-Closure Groundwater Monitoring Program

Project Number:	26/25/001-JSL-031	**Total Drilled Depth (ft):**	42.0
Boring Location:	Rhodia Silver Bow Plant - Butte, Montana	**Ground Surface Elevation (ft):**	5356.54
Drilling Contractor:	O'Keefe Drilling	**Depth to Groundwater (ft):**	32.8
Drilling Method:	Hollow Stemmed Auger	**Riser Elevation (ft):**	5358.70
Driller:	Steve Malkovich	**Date Started:**	1/14/02
Geologist:	Sheryl Filby	**Date Completed:**	1/15/02

Depth (ft. bgs)	Split spoon Recovery (ft)	Blow Count	Moisture/W.L.	ASTM	Odor/PH3 Reading	Lithologic Unit	Material Descriptions and Remarks	Well Construction/ Comments	Elevation
2									
0									
2	2.0	frozen	none	SM	N/0.0		SAND: 0-0.3', sand and gravel. 0.3-0.4', slag. 0.4-0.6' brown (2.5/3 7.5YR) organic-rich soil. 0.6-4'light brown (7/4 10YR) silty sand with some small angular pebbles. At 6', color grades into 6/6 10yr. 8-12', increased fines. 12-14.5, fine grained sand with some medium grained sand, sand/silt/clay 70/30/0. 14.5-14.7', pocket of medium grained sand. 14.7-16', silty sand with mica. 16-16.5', as 14.7-16' with some medium sand.		5358
4	1.5	10/10/12/14	none	SM	N/0.0	Sand			5356
6	1.7	23/30/33/46	none	SM	N/0.0			2" PVC Well Pipe	5354
8	1.7	23/44/57/58	none	SM	N/0.0				5352
10	1.6	21/38/64/71	none	SM	N/0.0				5350
12	1.6	31/51/73/90	none	SM	N/0.0				5348
14	1.6	26/37/64/78	none	SM	N/0.0				5346
16	1.6	30/46/53/57	none	SM-ML	N/0.0				5344
18	1.7	22/31/50/61	none	SM-ML	N/0.0		SILTY SAND WITH CLAY: 16.5-17.8, fine grained sand and silt with some clay. Mica and small sub-angular pebbles present. Color 5/6/7.5YR. 17.8-18.4', increased silt (55/40/5). 18.4-19.3, thin layer of medium-coarse sand. 19.3-19.5, clean fine sand with some silt (8/1 10YR). 19.5-42', silty fine grained sand with clay (65/30/5). Includes mica and small sub-angular pebbles. Reddish color (5/6/7.5 YR).		5342
20	1.7	16/19/30/46	none	SM-ML	N/0.0				5340
22	1.7	22/34/54/71	none	SM-ML	N/0.0				5338
24	1.6	32/56/87/116	moist	SM-ML	N/0.0	Silty sand with clay			5336
26	1.7	30/36/62/75	moist	SM-ML	N/0.0				5334
28	1.7	28/57/83/105	moist	SM-ML	N/0.0			Hole Plug	5332
30	1.8	30/44/68/74	moist	SM-ML	N/0.0				5330
32	1.8	23/50/55/73	moist	SM-ML	N/0.0				5328
34	1.8	22/36/48/63	moist	SM-ML	N/0.0				5326
36	1.8	12/32/50/67	moist-wet	SM-ML	N/0.0			Specified Sand Pack	5324
38	1.8	?12/22/41/52?	moist-wet	SM-ML	N/0.0				5322
40	1.8	17/63/74/101	moist-wet	SM-ML	N/0.0		37.6-37.7', thin layer of black stained soil. No noticeable odor. Sheen observed on drill bit.	#6-slot 2" PVC Screen	5320
42	2.0	31/49/73/112	moist-wet	SM-ML	SL/0.0		41.6-41.7', thin layer of black stained soil. Slight petroleum odor.		5318
									5316

Barr Engineering Company | **Ref. Boring # n/a** | **Well # MW-02-2**

Project: 2002 Requested Services

Project Number: 26/25/001-JSL-035
Boring Location: Rhodia Silver Bow Plant - Butte, Montana
Drilling Contractor: O'Keefe Drilling
Drilling Method: Hollow Stem Auger
Driller: Steve Malkovich
Geologist: Karma Geiger

Total Drilled Depth (ft): 38.0 (bgs)
Ground Surface Elevation (ft): 5357.10
Depth to Groundwater (ft): 34.94 (bgs)
Riser Elevation (ft): 5358.81
Date Started: 8/19/02
Date Completed: 8/20/02

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Depth (ft. bgs)	Split spoon Recovery (ft)	Blow Count	Moisture/W.L.	ASTM	Odor/PH3 Reading	Lithologic Unit	Material Descriptions and Remarks	Well Construction/ Comments	Elevation
0						Fill	FILL: Concrete and fill.		
2	1.6	156	dry	SM	No/0.00	Silty Sand	SILTY SAND: Yellowish-brown (7.5YR5/4), homogenous, very dense, silty sand. Sand is mostly fine grained but includes medium to coarse sand as well as trace fine gravel. Sand is predominantly golden-colored mica and subrounded to subangular quartz. Silt fraction is 30%.	2" PVC Well Pipe	
4	1.6	18/26/30/31	dry	SM	No/0.00				
6	1.9	15/24/34/38	dry	SM	No/0.00				
8	1.6	12/24/32/41	dry	SM	No/0.00				
10	1.6	16/27/41/49	dry	SM	No/0.00				
12	1.6	21/32/34/36	dry	SP	No/0.00	Sand	SAND: Light gray (10YR7/2), loose fine to coarse sand with trace silt.	Neat Cement Grout	
14	1.6	13/20/33/40	dry	SM	No/0.00	Silty Sand with Gravel	SILTY SAND: Homogenous, dark yellowish brown (10YR4/4), very dense silty fine sand with trace gravel. Sand includes 20% medium to coarse grained sand with fine gravel. Silt fraction is approximately 40%. Sand is golden-colored mica (possible iron pyrite), quartz and igneous.		
16	1.7	11/15/22/29	moist	SM	No/0.00				
18	1.9	10/19/30/50	moist	SM	No/0.00				
20	1.8	10/21/33/54	dry	SM	No/0.00				
22	1.8	11/17/36/48	dry	SM	No/0.00			Hole Plug	
24	1.8	8/22/37/38	dry	SM-ML	No/0.00	Silty Sand to Silt	SILTY SAND TO SILT: Dark yellowish brown silty very fine sand.	100 Sieve Sand	
26	1.8	8/21/38/45	moist	SM	No/0.00	Silty Sand with Clay	SILTY SAND: Homogenous, dark yellowish brown, homogenous silty sand. Sand is mostly very fine to fine grained but includes up to approximately 15% medium to coarse sand and trace fine gravel. Sand is quartz, mica and igneous-rich. Silt fraction is 35 to 40%.		
28	1.7	8/20/28/48	moist	SM	No/0.00				
30	1.8	13/42/68/91	moist	SM	No/0.00			70/30 Sand Pack	
32	1.8	12/24/30/52	dry moist	SM	No/0.00				
34	1.8	10/24/43/74	saturated	SM	No/0.00			#6-slot 2" PVC Screen	
36	1.9	11/24/42/63	saturated	SM	No/0.00				
38									
40									

Barr Engineering Company | **Ref. Boring # n/a** | **Well # MW-02-3**

Project: 2002 Requested Services

Project Number: 26/25/001-JSL-035
Boring Location: Rhodia Silver Bow Plant - Butte, Montana
Drilling Contractor: O'Keefe Drilling
Drilling Method: Hollow Stem Auger
Driller: Steve Malkovich
Geologist: Karma Geiger

Total Drilled Depth (ft): 89.0 (bgs)
Ground Surface Elevation (ft): 5370.16
Depth to Groundwater (ft): 76.01 (bgs)
Riser Elevation (ft): 5371.53
Date Started: 8/21/02
Date Completed: 8/26/02

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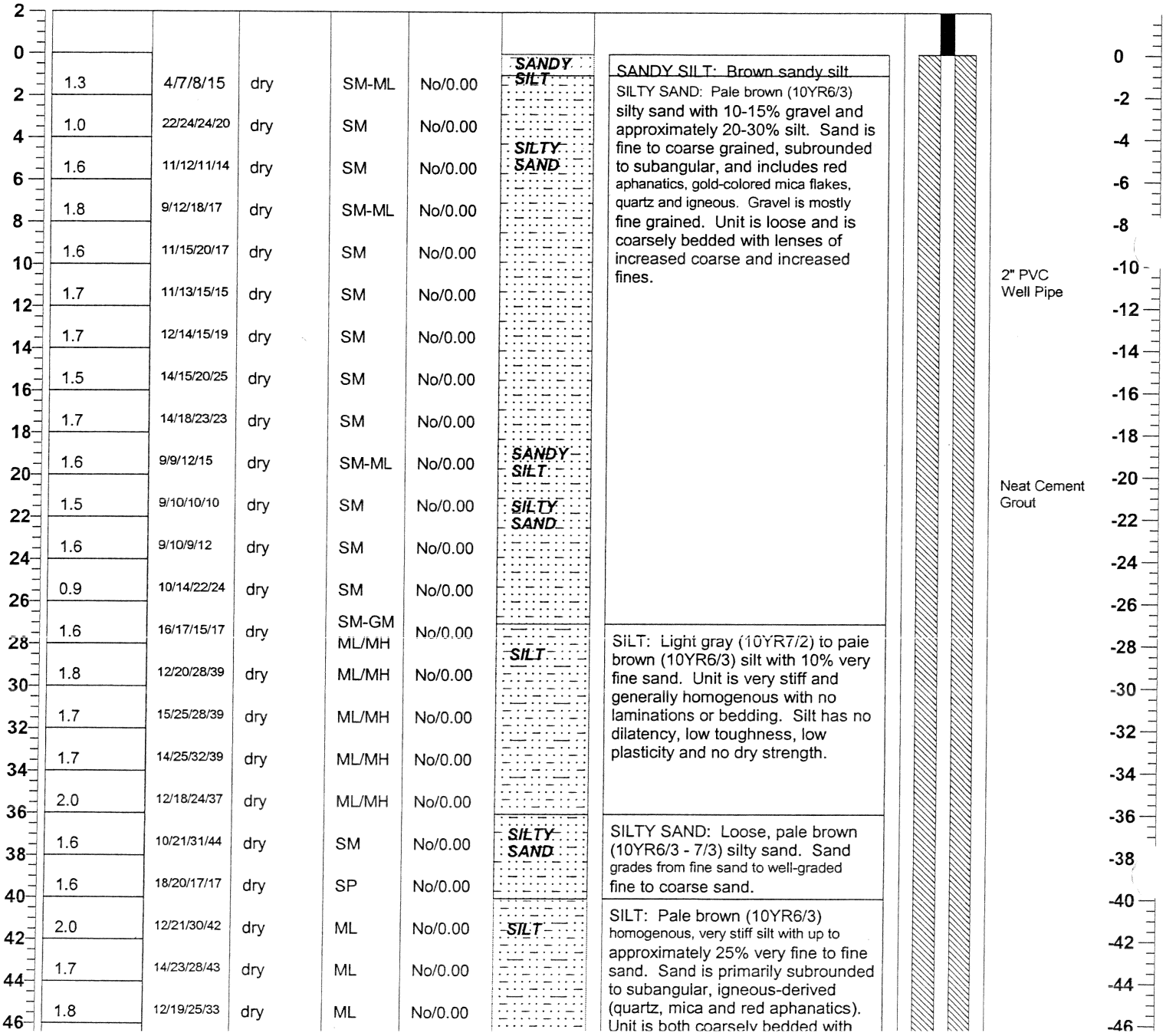
Depth (ft. bgs)	Split spoon Recovery (ft)	Blow Count	Moisture/W.L.	ASTM	Odor/PH3 Reading	Lithologic Unit	Material Descriptions and Remarks	Well Construction/ Comments	Elevation
2									
0									
2	1.3	4/7/8/15	dry	SM-ML	No/0.00	SANDY SILT	SANDY SILT: Brown sandy silt		
4	1.0	22/24/24/20	dry	SM	No/0.00		SILTY SAND: Pale brown (10YR6/3) silty sand with 10-15% gravel and approximately 20-30% silt. Sand is fine to coarse grained, subrounded to subangular, and includes red aphanatics, gold-colored mica flakes, quartz and igneous. Gravel is mostly fine grained. Unit is loose and is coarsely bedded with lenses of increased coarse and increased fines.		
6	1.6	11/12/11/14	dry	SM	No/0.00	SILTY SAND			
8	1.8	9/12/18/17	dry	SM-ML	No/0.00				
10	1.6	11/15/20/17	dry	SM	No/0.00				
12	1.7	11/13/15/15	dry	SM	No/0.00			2" PVC Well Pipe	
14	1.7	12/14/15/19	dry	SM	No/0.00				
16	1.5	14/15/20/25	dry	SM	No/0.00				
18	1.7	14/18/23/23	dry	SM	No/0.00				
20	1.6	9/9/12/15	dry	SM-ML	No/0.00	SANDY SILT			
22	1.5	9/10/10/10	dry	SM	No/0.00	SILTY SAND		Neat Cement Grout	
24	1.6	9/10/9/12	dry	SM	No/0.00				
26	0.9	10/14/22/24	dry	SM	No/0.00				
28	1.6	16/17/15/17	dry	SM-GM ML/MH	No/0.00	SILT	SILT: Light gray (10YR7/2) to pale brown (10YR6/3) silt with 10% very fine sand. Unit is very stiff and generally homogenous with no laminations or bedding. Silt has no dilatency, low toughness, low plasticity and no dry strength.		
30	1.8	12/20/28/39	dry	ML/MH	No/0.00				
32	1.7	15/25/28/39	dry	ML/MH	No/0.00				
34	1.7	14/25/32/39	dry	ML/MH	No/0.00				
36	2.0	12/18/24/37	dry	ML/MH	No/0.00				
38	1.6	10/21/31/44	dry	SM	No/0.00	SILTY SAND	SILTY SAND: Loose, pale brown (10YR6/3 - 7/3) silty sand. Sand grades from fine sand to well-graded fine to coarse sand.		
40	1.6	18/20/17/17	dry	SP	No/0.00				
42	2.0	12/21/30/42	dry	ML	No/0.00	SILT	SILT: Pale brown (10YR6/3) homogenous, very stiff silt with up to approximately 25% very fine to fine sand. Sand is primarily subrounded to subangular, igneous-derived (quartz, mica and red aphanatics). Unit is both coarsely bedded with		
44	1.7	14/23/28/43	dry	ML	No/0.00				
46	1.8	12/19/25/33	dry	ML	No/0.00				



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Barr Engineering Company

Ref. Boring # n/a

Well # MW-02-3

Depth (ft. bgs)	Sample Type/ Recovery (ft.)	Blow Count	Moisture\W.L.	ASTM	Odor/PH3 Reading	Lithologic Unit	Material Descriptions and Remarks	Well Construction/ Comments	Elevation
48	1.9	10/22/35/49	dry	ML	No/0.00		increasing and decreasing fines and is finely laminated in areas with clay and silt lenses.		-48
50	1.7	10/11/20/37	dry	ML	No/0.00				-50
52	1.9	11/24/33/49	dry	ML	No/0.00				-52
54	1.8	14/29/37/60	dry	SM	No/0.00				-54
56	1.8	23/41/62/81	dry	ML	No/0.00				-56
58	1.9	23/39/63/103	dry	ML	No/0.00				-58
60	1.8	22/42/64/95	dry	ML	No/0.00				-60
62	1.9	20/32/47/58	dry	ML SP-SM	No/0.00	SILTY SAND			-62
64	1.9	17/26/34/52	dry	ML	No/0.00	SILT		Hole Plug	-64
	1.9	14/28/39/54	dry	ML	No/0.00			100 Sieve Sand	-66
68	1.8	12/18/29/43	dry	ML	No/0.00				-68
70	1.7	14/21/35/48	moist	ML	No/0.00				-70
72	1.9	12/22/30/37	moist	ML	No/0.00			#10-slot 2" PVC Screen	-72
74	1.6	10/17/24/25	moist	ML-SM	No/0.00				-74
76	1.8	9/16/27/32	moist	CL/CH	No/0.00	CLAY	CLAY: Pale brown (2.5Y6/3), homogenous clay with sand and silt.		-76
78	1.9	10/15/18/30	dry	CL/CH	No/0.00	SAND	SAND		-78
80	1.9	9/10/21/50	sat. dry	SP CL/CH	No/0.00	CLAY	CLAY: Light yellow brown (2.5Y6/3) silty clay with 20% fine sand. Unit is faintly laminated, stiff to very stiff, with slow dilatency and medium plasticity.	20-40 Sand Pack	-80
82	1.6	10/10/26/38	dry	CL/CH	No/0.00				-82
84	1.5	7/14/36/62	moist	CL/CH	No/0.00				-84
86	1.7	24/37/51/73	sat.	SM-SC	No/0.00	SAND-SILT	SILTY SAND TO SANDY SILT: Brown (10YR5/3) silty sand to sandy		-86
88	1.8	19/38/60/79	sat.	SC	No/0.00	CLAYEY SAND	CLAYEY SAND: Homogenous, clayey sand to sandy clay.		-88
	1.3	22/38	sat.	SC	No/0.00				
90									-90
92									-92

Barr Engineering Company | **Ref. Boring # n/a** | **Well # MW-02-4**

Project: 2002 Requested Services

Project Number:	26/25/001-JSL-035	**Total Drilled Depth (ft):**	79.0 (bgs)
Boring Location:	Rhodia Silver Bow Plant - Butte, Montana	**Ground Surface Elevation (ft):**	5322.15
Drilling Contractor:	O'Keefe Drilling	**Depth to Groundwater (ft):**	27.7 (bgs)
Drilling Method:	Hollow Stem Auger	**Riser Elevation (ft):**	5324.66
Driller:	Steve Malkovich	**Date Started:**	9/24/02
Geologist:	Sheryl Filby	**Date Completed:**	9/26/02

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Depth (ft. bgs)	Split spoon Recovery (ft)	Blow Count	Moisture/W.L.	ASTM	Odor	Lithologic Unit	Material Descriptions and Remarks	Well Construction/ Comments	Elevation
0							TOPSOIL: Medium grained brown (7.5YR 4/3-4/4) sand.		5324
	1.0	8/14/21/21	dry	SM	No		SILTY SAND: Silty fine grained sand. Sand is well sorted and homogeneous. No visible bedding.		5322
2	1.3	14/17/16/19	dry	SM	No		FINE TO MEDIUM SAND: Brownish yellow (7.5TY4/4 - 10YR6/6) sand with silt. Sand is fine to medium grained and subangular to		5320
4	1.0	13/16/19/27	dry	SM	No	SAND	subrounded. Some (1%) weathered orthoclase-rich granite pebbles.		5318
6	1.3	11/14/18/24	dry	SM	No		increased silt content from 5-6. 6-10, reddish "iron" staining in secondary porosity (fractures).		5316
8	1.5	8/15/21/24	dry	SM	No		SAND TO SILTY SAND: Homogeneous, very stiff fine to medium grained sand with silt. Sub		5314
10	1.3	10/14/20/27	moist	SM-SC	No	SAND	rounded to subangular grains with visible mica, feldspars, and mafics. Some pockets of reddish iron staining. Color varies from yellowish	2" PVC Well Pipe	5312

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Barr Engineering Company

Ref. Boring # n/a

Well # MW-02-4

Depth (ft. bgs)	Sample Type/ Recovery (ft.)	Blow Count	Moisture\W.L.	ASTM	Odor	Lithologic Unit	Material Descriptions and Remarks	Well Construction/ Comments	Elevation
12							brown (10YR5/4) to dark yellowish brown (10YR4/4).		5310
	1.0	8/14/16/17	moist	SM-SC	No	SAND	FINE TO MEDIUM SAND: Homogeneous fine to medium grained sand. Mostly quartz with some mafics and feldspars. Loose and subangular to subrounded grains.		
14									5308
	1.7	7/16/20/15	moist	SM-GM	No	SAND WITH GRAVEL	SAND WITH GRAVEL: Fine to medium grained sand with gravel and pebbles. Gravel/Sand/Fines (G/S/F) is about 30/65/5. Pebbles are subrounded to subangular and inclue quartz, granite, feldspars, range in size from 2mm to 40mm. Color from 14.5-16.2 and 16.6-17.8 is dark yellowish brown (10YR4/4). From 16.2-16.4, weathered orthoclase. From 16.4-16.6, fine grained pale brown (10YR6/3) sand with about 10% silt. 16.6-16.9 reddish iron staining. 17.8-18.2 light brownish gray (10YR6/2) with some iron staining.		
16									5306
	2.0	8/10/15/14	moist	SM-GM	No				
18									5304
	2.0	3/5/12/11	moist	SM-CL	No	SILTY SAND	SILTY SAND WITH CLAY: Dark yellowish brown (10YR4/4-10YR3/4) silty sand with clay. Some subrounded pebbles.	Neat Cement Grout	
20									5302
	1.8	7/7/12/17	moist	SM-CL	No		SAND WITH SILT: Fine to medium sand with silt and clay matrix. Small (<5mm) subangular to subrounded pebbles (including some weathered granite, mafics, and feldspars). Very stiff and homogeneous.		
22									5300
	1.7	10/9/16/19	moist	SM-GM	No	SAND WITH GRAVEL	SAND AND GRAVEL: Yellowish brown to brown (10YR5/4-10YR5/3) fine to coarse sand and gravel with pebbles. Loose, poorly sorted, subangular grains.		
24									5298
	1.8	17/14/6/6	sat.	SM-GM	No		SAND WITH GRAVEL AND FINES: Fine to medium grained sand with some gravel and pebbles. Silty matrix present from 24-24.2 and 25.3-26. Color ranges from brown to dark yellowish brown (10YR4/3 to 10YR4/6).		
26									5296
	2.0	5/6/12/23	sat.	SM	No	SAND	SILTY FINE SAND: Dark yellowish brown (10YR4/6) fine sand with silt. Homogeneous and stiff to very stiff with no pebbles.		
28									5294
	2.0	14/26/34/37	sat.	SM	No		FINE SAND: Very pale brown (10YR7/4) homogeneous well-sorted		

Barr Engineering Company | Ref. Boring # n/a | Well # MW-02-4 | Page 3 of 5

Depth (ft. bgs)	Sample Type/ Recovery (ft.)	Blow Count	Moisture\W.L.	ASTM	Odor	Lithologic Unit	Material Descriptions and Remarks	Well Construction/ Comments	Elevation
							fine clean sand.		
30						SILTY	SILTY FINE SAND: same as 26-27 but stained reddish/orange.		5292
	0.8	12/12/16/18	sat.	SM	No	SAND	FINE TO MEDIUM SAND: Fine to medium sand with some subrounded pebbles about 5mm.		
32							SILTY SAND WITH CLAY: Yellowish brown (10YR5/4- 10YR5/6) fine grained silty sand with 2mm laminations of cemented compact silt/clay. Approximately 5mm of silty sand between layers. Layers of reddish/orange staining (1-2mm) in silty sand. Silty sand with coarse sand from 34-34.5.		5290
	1.6	10/42/65/97	sat.	SM-SC	No				
34									5288
	1.2	12/50/50+	sat.	SM-SC	No		SILTY SAND WITH CLAY: Fine to medium dark grayish brown (10YR4/2) grained sand with reddish/orange staining. Some cementation.		
36									52
	1.1	18/35/50+	sat.	SM-SC	No	SILTY SAND	SILTY SAND WITH CLAY: Fine		
38									5284
	1.1	30/50+	sat.	SM-SC	No				
40							grained dark brown to dark yellowish		5282
	2.0	10/12/26/50+	sat.	SM-SC	No				
42									5280
	2.0	8/10/32/50+	sat.	SM-SC	No		brown (10YR3/3-10YR3/4) silty sand		
44									5278
	0.5	14/32/50+	sat.	SM-SC	No				
46							with some cementation. Sandstone		5276

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Barr Engineering Company

Ref. Boring # n/a

Well # MW-02-4

Depth (ft. bgs)	Sample Type/ Recovery (ft.)	Blow Count	Moisture\W.L.	ASTM	Odor	Lithologic Unit	Material Descriptions and Remarks	Well Construction/ Comments	Elevation
48	1.7	15/34/50+	sat.	SM-SC	No				5274
	1.8	13/33/50+	sat.	SM-SC	No		pebbles of cemented sand same as		
50									5272
	1.8	8/39/50+	sat.	SM-SC	No				
52									5270
	1.0	50+	sat.	SM-SC	No		matrix.	Hole Plug	
54									5268
	1.3	29/50+	sat.	SM-SC	No			100 Sieve	
56							SILTY SAND WITH CLAY: Fine	Sand	5266
	1.0	100+	sat.	SM-SC	No				
58						***SILTY***	grained dark brown to dark yellowish		5264
	0.8	50/50+	sat.	SM-SC	No	***SAND***			
60							brown (10YR3/3-10YR3/4) silty sand	#10-slot 2" PVC Screen	5262
	0.8	25/50+	sat.	SM-SC	No				
							with some cementation. Sandstone		5260
	0.8	42/50+	sat.	SM-SC	No				
64							pebbles of cemented sand same as		5258

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Barr Engineering Company

Ref. Boring # n/a

Well # MW-02-4

Depth (ft. bgs)	Sample Type/ Recovery (ft.)	Blow Count	Moisture\W.L.	ASTM	Odor	Lithologic Unit	Material Descriptions and Remarks	Well Construction/ Comments	Elevation
	1.5	33/50+	sat.	SM-SC	No		matrix, vary in size from about 5mm		
66									5256
	1.2	47/50/50+	sat.	SM-SC	No		to the size of spoon (2").		
68								20-40 Sand	5254
	2.0	50/50+	sat.	SM-SC	No		Cementation appears to increase	Pack	
70									5252
	1.0	50/50+	sat.	SM-SC	No		with depth.		
72									5250
	1.8	45/50+	sat.	SM-SC	No		SILTY SAND WITH CLAY: Yellowish		
74									5248
	2.0	50/50+	sat.	SM-SC	No	***SILTY***			
76						***SAND***	brown (10YR5/4) silty sand with		5246
	2.0	39/50+	sat.	SM-SC	No				
78							clay. Sandstone pebbles.		5244
	2.0	50+	sat.	SM-SC	No				
80									

2006 Well and Boring Logs

LOG OF Boring MW-06-01

Client Rhodia
Project Name Rhodia RFI Groundwater
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor O'Keefe
Drill Method HSA
Drilling Started 9/28/06 Ended 9/28/06
Logged By KAM

Elevation 5307.2
Total Depth 28.5

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		1	2-4-6-12	None None None	Dry	SM		SILTY SAND: Grayish brown, fine to medium-grained silty sand with 20% coarse-grained sand and 5% lower fine gravel. Sample has approximately 15 to 20% fines, angular to sub-round grains/clasts, and small roots present.	6" Steel Protop with Vented Cap 2' ags-8' bgs: 2" Sch 40 PVC Riser 0-3': Neat Cement Grout	
		2	10-9-9-11	None None None	Dry	SP		POORLY GRADED SAND: Brown, fine to medium-grained sand with 20% coarse-grained sand and 3 to 5% lower fine gravel. Sample has approximately 5% fines, angular to sub-round grains/clasts, and abundant mica.		5305
5		3	9-13-12-14	None None None	Moist			A 1.2 cm lense of dark brown clayey sand (SC) observed at 5.1' bgs.	3-6': Bentonite Well Seal	
		4	7-5-9-8	None None None	Moist	SC		CLAYEY SAND: Very dark brown clayey sand with approximately 60% fine to coarse-grained sand and 5% fine gravel. Sample has approximately 35% fines, angular to sub-round grains/clasts, and is soft.	6-28.5': Sand Pack, 20/40 Sand	5300
		5	16-11-14-16	None None None	Moist	SP SC SM		POORLY GRADED SAND: Brown, fine to medium-grained sand with 20% coarse-grained sand and trace fine gravel. Sample has approximately 5% fines, angular to sub-round grains/clasts, and abundant mica.		
10		6	12-6-8-9	None None None	Moist			CLAYEY SAND: Very dark brown, clayey sand with approximately 40% fine to coarse-grained sand and trace fine gravel. Sample has approximately 40% fines that decrease with depth, angular to sub-round grains/clasts, and mica present.		
		7	4-5-5-7	None None None	Moist	ML		SILTY SAND: Dark grayish brown, fine to coarse-grained sand with trace fine gravel. Sample has approximately 20% fines, angular to sub-round grains/clasts, and mica present.		5295
15		8	4-5-10-10	None None None	Moist Moist to Wet			SILT with SAND: Light yellowish brown silt with approximately 15% fine to coarse-grained sand and trace lower fine gravel. Sample has angular to sub-round grains/clasts, no to very low cohesiveness, and is firm. Gravel increases to 3% at depth.		
		9	8-9-11-19	None None None	Wet	ML		CLAYEY SILT with SAND: Light gray to light grayish brown clayey silt with approximately 15% fine to coarse-grained sand and 3 to 5 % lower fine gravel. Sample has angular to sub-round grains/clasts, low cohesiveness, low dry strength, abundant mica, and is firm. Clay increases with depth.		5290
		10	5-11-18-21	None None None	Wet				8-28': 2"X20' Sch 40 PVC 0.010 Slot Screen	

(continued)

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450 S. Wagner Road
Ann Arbor, MI 48103
Telephone: 1-800-270-5017
Fax: 734-327-1212

Remarks: Static water after one hour measured 15.1' bgs. Samples were collected using a 3 inch split spoon from 0 to 10' bgs and a 2 inch split spoon from 10 to 28' bgs.

Additional data may have been collected in the field which is not included on this log.

ENVIRO LOG 5 (5/27/04) 2646006.GPJ BARRLOG.GDT 6/4/07

LOG OF Boring MW-06-01

Client Rhodia
Project Name Rhodia RFI Groundwater
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor O'Keefe
Drill Method HSA
Drilling Started 9/28/06 Ended 9/28/06
Logged By KAM

Elevation 5307.2
Total Depth 28.5

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
						ML				
		11	12-13-26-50/0.4	None None None	Wet	CL/ML		SILTY CLAY with SAND and GRAVEL: Light yellowish brown silty clay with approximately 15% fine to coarse-grained sand and 15% fine gravel. Sample has angular to sub-round grains/clasts, moderate plasticity and toughness, and is soft to firm. Percentage of clay decreases with depth and percentage of sand increases with depth to approximately 30% by 25' bgs (CL - sandy clay with silt and gravel).		5285
25		12	46-26-41-50/0.4	None None None	Wet	CL		SANDY CLAY with SILT and GRAVEL: Light yellowish brown sandy clay with approximately 30% fine to coarse-grained sand and 15% fine gravel. Sample has angular to sub-round grains/clasts, moderate plasticity and toughness, and is soft to firm.		5280
								End of Boring - 28.5 feet		
30										5275
35										5270

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Remarks: Static water after one hour measured 15.1' bgs. Samples were collected using a 3 inch split spoon from 0 to 10' bgs and a 2 inch split spoon from 10 to 28' bgs.

Additional data may have been collected in the field which is not included on this log.

ENVIRO LOG b (5/27/04) 2646006.GPJ BARRLOG.GDT 6/4/07

LOG OF BORING MW-06-02

SHEET 1 OF 4

Client Rhodia
Project Name Rhodia RFI Groundwater
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor O'Keefe
Drill Method HSA
Drilling Started 9/13/06 Ended 9/14/06
Logged By JAM2

Elevation 5355.3
Total Depth 71.9

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		1	18-26-26-30	None None None	Dry	ML		SILT: Light brown silt with fine to medium-grained sand and fine gravel. Sample is homogeneous.	6" Steel Protop with Vented Cap	5355
		2	32-48-50-50	None None None	Dry	SM		SILTY SAND: Light reddish brown silty sand with gravel. Sand is fine to coarse-grained and angular to sub-rounded. Gravel is fine and angular to subangular. Unit is poorly sorted and homogeneous.	3' ags-51.8' bgs: 2" Sch 40 PVC Riser	
5		3	30-28-22-14	None None None	Dry					
		4	11-14-13-14	None None None	Dry	SM		SILTY SAND: Light brown, very fine to fine-grained silty sand. Sample is loose to medium dense, well sorted, homogeneous and mica-rich.		5350
		5	20-14-17-18	None None None	Dry	ML		SILT: Light to dark brown silt with sand, gravel, and a trace of clay. Sample has low to no dry strength, rapid dilatancy, and low toughness.		
10		6	20-12-10-11	None None None	Dry	SW		SAND: Light brown sand with gravel and silt. Unit is poorly sorted and homogeneous.		5345
		7	7-7-10-19	None None None	Dry	ML		SILT: Predominantly silt with varying percentages of sand and clay. Color varies from light brown to grayish brown. Unit is homogeneous and mica-rich. Sample has low to no dry strength, rapid dilatancy, low toughness, and low plasticity.		
15		8	10-9-9-12	None None None	Dry			Cobbles of grayish black crystalline rock present from 13.8 to 15.8' bgs.		5340
		9	12-15-21-30	None None None	Dry			A few portions of the sample are very well cemented from 15.8 to 17.8' bgs.		
		10	13-14-16-23	None None None	Dry			Slightly increased gravel content (approximately 5%) observed from 17.8 to 19.8' bgs.		
								(continued)		

Barr Engineering Co.
450 S. Wagner Road
Ann Arbor, MI 48103
Telephone: 1-800-270-5017
Fax: 734-327-1212

Remarks:

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ENVIRO LOG 5 (5/27/04) 2646006.GPJ BARRLOG.GDT 6/4/07

LOG OF BORING MW-06-02

Client Rhodia | Drill Contractor O'Keefe | Elevation 5355.3

Project Name Rhodia RFI Groundwater | Drill Method HSA

Number 26/46-006 | Drilling Started 9/13/06 Ended 9/14/06

Location Silver Bow, Montana | Logged By JAM2 | Total Depth 71.9

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		11	19-31-30->50	None None None	Dry			Iron staining and white precipitate observed from 19 to 21.8' bgs. SILT: Predominantly silt with varying percentages of sand and clay. Color varies from light brown to grayish brown. Unit is homogeneous and mica-rich. Sample has low to no dry strength, rapid dilatancy, low toughness, and low plasticity. *(continued)*	0-45.3': Neat Cement Grout	5335
25		12	17-20-50->50	None None None	Dry					5330
30		13	23-31-38-47	None None None	Dry	ML		Approximately 10% very well cemented fine gravel size pieces observed from 28.8 to 30.8' bgs.		5325
35		14	22-28-44->50	None None None	Dry					5320
		15	28->50->50-	None None	Slightly			*(continued)*		

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450 S. Wagner Road
Ann Arbor, MI 48103
Telephone: 1-800-270-5017
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Remarks:

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LOG OF BORING MW-06-02

Client Rhodia | Drill Contractor O'Keefe

Project Name Rhodia RFI Groundwater | Drill Method HSA

Number 26/46-006 | Drilling Started 9/13/06 Ended 9/14/06 | Elevation 5355.3

Location Silver Bow, Montana | Logged By JAM2 | Total Depth 71.9

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
			>50	None	Moist			SILT: Predominantly silt with varying percentages of sand and clay. Color varies from light brown to grayish brown. Unit is homogeneous and mica-rich. Sample has low to no dry strength, rapid dilatancy, low toughness, and low plasticity.*(continued)*		5315
45		16	21-24-46->50	None None None	Slightly Moist					5310
						ML			45.3-48.7': Bentonite Well Seal	
50		17	20-25-40-47	None None None	Slightly Moist			Increased sand content (approximately 40%) observed from 49 to 50.8' bgs. Unit has a few lenses, less than 1" thick, with approximately 60% fine to coarse-grained sand. Sand is well-rounded to subangular.	48.7-71.9': Sand Pack, 20/40 Sand	5305
55		18	21-26-33-48	None None None	Slightly Moist					5300
						SM		SILTY SAND: Reddish brown silty sand with gravel. Sand is fine to coarse-grained and sub-rounded to subangular. Gravel is fine to sub-rounded. Unit is poorly sorted and homogeneous.		
		19	18-23->50-	None None	Moist	ML		SILT: Reddish brown silt with fine-grained sand. Unit is homogeneous and has iron staining throughout. *(continued)*		

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450 S. Wagner Road
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ENVIRO LOG 5 (5/27/04) 2646006.GPJ BARRLOG.GDT 6/4/07

LOG OF BORING MW-06-02

Client Rhodia | Drill Contractor O'Keefe

Project Name Rhodia RFI Groundwater | Drill Method HSA

Number 26/46-006 | Drilling Started 9/13/06 Ended 9/14/06 | Elevation 5355.3

Location Silver Bow, Montana | Logged By JAM2 | Total Depth 71.9

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
			>50	None	Saturated	ML		SILT: Reddish brown silt with fine-grained sand. Unit is homogeneous and has iron staining throughout.*(continued)*	51.8-71.8': 2"X20' Sch 40 PVC 0.010 Slot Screen	5295
65		20	38->50->50->50	None None None	Saturated	SW		SAND: Reddish brown gravel and sand with silt. Gravel is fine to coarse-grained and sand is fine to medium-grained. Unit is poorly sorted.		
						ML		SILT: Silt with gravel that is fine to coarse-grained and angular. Unit is homogeneous.		5290
70		21	18-22-39-47	None None None	Moist to Saturated	ML		Dark reddish brown silt with gravel and sand observed from 68.8 to 70.8' bgs. Unit is mica-rich and homogeneous.		5285
								End of Boring - 71.9 feet		
75										5280

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450 S. Wagner Road
Ann Arbor, MI 48103
Telephone: 1-800-270-5017
Fax: 734-327-1212

Remarks:

Additional data may have been collected in the field which is not included on this log.

LOG OF BORING MW-06-03

SHEET 1 OF 6

Client Rhodia | Drill Contractor O'Keefe

Project Name Rhodia RFI Groundwater | Drill Method HSA

Number 26/46-006 | Drilling Started 9/11/06 Ended 9/12/06 | Elevation 5374.8

Location Silver Bow, Montana | Logged By JAM2 | Total Depth 100.6

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		1	50-36-28-28	None None None	Dry			SILT: Brown silt with fine-grained sand and a trace of gravel. Unit is homogeneous and dense to very dense.	6" Steel Protop with Vented Cap	
		2	42-50-38-36	None None None	Dry			Silt, as above, with increased sand content from 3 to 4' bgs. Sand is medium to coarse-grained and subangular to sub-rounded. Entire unit is homogeneous and dense to very dense.		
5		3	29-37-33-31	None None None	Dry to Slightly Moist	ML		Brown silt and sand with fine gravel from 4 to 5.6' bgs. Sand is fine to coarse-grained. Sand and gravel are subangular to sub-rounded. Unit is homogeneous and dense to very dense.		5370
		4	12-15-17-18	None None None	Slightly Moist			Brown silt with a trace of clay and fine to medium-grained sand from 6.1 to 8.1' bgs. Clay has moderate plasticity.		
		5	12-16-14-12	None None None	Dry			Silt and sand, as above, but no clay.		
10		6	12-14-30-36	None None None	Dry	SP		SAND: Grayish brown, very fine to fine-grained sand with silt and a trace of angular, coarse gravel. Unit is homogeneous.	3' ags-78' bgs: 2" Sch 40 PVC Riser	5365
		7	26-33->50->50	None None None	Dry			SILT: Whitish pink silt and very fine-grained sand. Unit is homogeneous. Interval grades to grayish white and has slightly increased sand content from 14.5 to 15.6' bgs.		
15		8	26-48->50->50	None None None	Dry	ML		Grayish brown silt with very fine to fine-grained sand and gravel from 16.1 to 25' bgs. Gravel is coarse-grained and angular to subangular. Unit is medium dense to very dense.		5360
		9	18-26-40-50	None None None	Dry to Slightly Moist			Iron staining present from 18.5 to 20.5' bgs.		5355
								(continued)		

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Ann Arbor, MI 48103
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Fax: 734-327-1212

Remarks:

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LOG OF BORING MW-06-03

Client Rhodia | Drill Contractor O'Keefe

Project Name Rhodia RFI Groundwater | Drill Method HSA

Number 26/46-006 | Drilling Started 9/11/06 Ended 9/12/06 | Elevation 5374.8

Location Silver Bow, Montana | Logged By JAM2 | Total Depth 100.6

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		10	27-22-42->50	None None None	Dry to Slightly Moist	ML		SILT: Whitish pink silt and very fine-grained sand. Unit is homogeneous. Interval grades to grayish white and has slightly increased sand content from 14.5 to 15.6' bgs.*(continued)*		
25		11	36-40-44-48	None None None	Slightly Moist					5350
						CL/ML		SILTY CLAY: Brownish gray clay with gravel and fine to medium-grained sand. Gravel is fine to medium-grained and angular. Unit is homogeneous, very stiff, and has moderate to high plasticity.		
30		12	18-29-43->50	None None None	Slightly Moist			SILT: Grayish brown silt with a trace of clay and gravel. Gravel is fine to medium-grained and angular. Unit is homogeneous, dense to very dense and mica-rich. Sample has no to low dry strength, rapid dilatancy, low toughness and low plasticity.		5345
35		13	34-38-44-50	None None None	Slightly Moist	ML			0-73.3': Neat Cement Grout	5340
		14	25-38->50->50	None None None	Dry			*(continued)*		5335

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450 S. Wagner Road
Ann Arbor, MI 48103
Telephone: 1-800-270-5017
Fax: 734-327-1212

Remarks:

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LOG OF BORING MW-06-03

Client Rhodia | Drill Contractor O'Keefe

Project Name Rhodia RFI Groundwater | Drill Method HSA

Number 26/46-006 | Drilling Started 9/11/06 Ended 9/12/06 | Elevation 5374.8

Location Silver Bow, Montana | Logged By JAM2 | Total Depth 100.6

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
								SILT: Grayish brown silt with a trace of clay and gravel. Gravel is fine to medium-grained and angular. Unit is homogeneous, dense to very dense and mica-rich. Sample has no to low dry strength, rapid dilatancy, low toughness and low plasticity.*(continued)*		
								Increased fine-grained sand content observed from 43 to 50' bgs.		
45		15	27-44-45->50	None None None	Dry					5330
50		16	26-33-50->50	None None None	Dry	ML				5325
55		17	30-33->50->50	None None None	Dry					5320
		18	25-28-48->50	None None None	Dry					5315

(continued)

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450 S. Wagner Road
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Remarks:

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LOG OF BORING MW-06-03

Client Rhodia
Project Name Rhodia RFI Groundwater
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor O'Keefe
Drill Method HSA
Drilling Started 9/11/06 Ended 9/12/06
Logged By JAM2

Elevation 5374.8
Total Depth 100.6

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
								SILT: Grayish brown silt with a trace of clay and gravel. Gravel is fine to medium-grained and angular. Unit is homogeneous, dense to very dense and mica-rich. Sample has no to low dry strength, rapid dilatancy, low toughness and low plasticity.*(continued)*		
65		19	36-44-38-43	None None None	Dry			Slightly increased fine to medium-grained sand content observed from 63.6 to 64.6' bgs.		5310
70		20	28-36->50->50	None None None	Dry	ML				5305
75		21	31-43->50->50	None None None	Dry				73.3-75.8': Bentonite Well Seal 75.8-100.6': Sand Pack, 20/40 Sand	5300
		22	>50->50->50-	None None None	Dry to Slightly Moist			*(continued)*		5295

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Remarks:

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LOG OF BORING MW-06-03

Client Rhodia | Drill Contractor O'Keefe

Project Name Rhodia RFI Groundwater | Drill Method HSA

Number 26/46-006 | Drilling Started 9/11/06 Ended 9/12/06 | Elevation 5374.8

Location Silver Bow, Montana | Logged By JAM2 | Total Depth 100.6

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
			>50					SILT: Grayish brown silt with a trace of clay and gravel. Gravel is fine to medium-grained and angular. Unit is homogeneous, dense to very dense and mica-rich. Sample has no to low dry strength, rapid dilatancy, low toughness and low plasticity.*(continued)*		
85		23	28-37->50->50	None None None	Slightly Moist	ML				5290
		24	45-40-33-42	None None None	Slightly Moist	SP		SILTY SAND: Dark brown fine to medium-grained silty sand with gravel. Unit is homogeneous and well sorted.	78.6-98.6': 2"X20' Sch 40 PVC 0.010 Slot Screen	
90					Saturated			SILT: Dark brown silt as above interval from 28.5 to 89' bgs.		5285
						ML				
		25	39-50->50->50	None None None	Saturated	SP		SILTY SAND: Dark brown, fine to coarse-grained silty sand with gravel. Gravel is fine to medium-grained and angular. Unit is homogeneous and poorly sorted.		
95										5280
		26	28-20-50->50	None None None	Saturated	ML		SILT: Light brown silt with gravel and sand. *(continued)*		5275

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Remarks:

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LOG OF BORING MW-06-03

Client Rhodia
Project Name Rhodia RFI Groundwater
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor O'Keefe
Drill Method HSA
Drilling Started 9/11/06 Ended 9/12/06
Logged By JAM2

Elevation 5374.8
Total Depth 100.6

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
					Very Moist	OL		ORGANIC SILT: Black organic-rich silt with trace sand.		
								End of Boring - 100.6 feet		
105										5270
110										5265
115										5260
										5255

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Fax: 734-327-1212

Remarks:

Additional data may have been collected in the field which is not included on this log.

LOG OF BORING MW-06-04

SHEET 1 OF 5

Client Rhodia
Project Name Rhodia RFI Groundwater
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor O'Keefe
Drill Method HSA
Drilling Started 9/11/06 Ended 9/12/06
Logged By KAM

Elevation 5388.2
Total Depth 95.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		1	7-13-12-9	None None None	Dry			CLAYEY SILT to CLAYEY SILT with SAND: Grayish brown clayey silt with trace sand. Sample is hard and has a few roots present at the surface. Trace sand increases to 20% at depth.	6" Steel Protop with Vented Cap	
		2	7-9-17-16	None None None	Moist	ML			2.5' ags-73' bgs: 2" Sch 40 PVC Riser 0-6: Concrete Grout	5385
5		3	13-15-17-15	None None None	Moist					
		4	16-17-27-33	None None None	Moist	SP		POORLY GRADED SAND: Pale brown, fine to medium-grained sand with 40% coarse-grained sand and 30% fine gravel. Sample has approximately 5% fines and angular to sub-round grains/clasts.		
						ML		CLAYEY SILT with SAND: Grayish brown clayey silt with approximately 20% sand. Sample is firm to hard.		
		5	14-30-71-83	None None None	Moist	SM		SILTY SAND: Pale brown, fine-grained silty sand with approximately 20 to 30% fines.		5380
10		6	16-34-52-64	None None None	Moist	ML		SANDY SILT: Grayish brown sandy silt with approximately 30% fine-grained and trace medium to coarse-grained sand. Sample is slightly cohesive when wetted.		
		7	12-26-31-54	None None None	Moist	SP		POORLY GRADED SAND: Pale brown to light grayish brown, fine to medium-grained sand with 30% coarse-grained sand and approximately 15% fine quartz gravel. Sample has approximately 5% fines and abundant mica flakes.		5375
15		8	15-32-57-77	None None None	Moist	ML		SILT with SAND to SANDY SILT: Pale brown silt with approximately 25% fine-grained sand. Trace medium to coarse-grained sand increases to 30% fine to coarse-grained sand with trace lower fine (pea size) mudstone/sandstone gravel at depth. Gravel pieces break apart in hand to a blocky texture.		
		9	15-29-48-59	None None None	Moist					5370
		10	17-26-39-53	None None None	Moist					

(continued)

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Remarks: Samples were collected using a 3 inch split spoon from 0 to 12' bgs and a 2 inch split spoon from 12 to 96' bgs.

Additional data may have been collected in the field which is not included on this log.

ENVIRO LOG 5 (5/27/04) 2646006.GPJ BARRLOG.GDT 6/4/07

LOG OF BORING MW-06-04

Client Rhodia | Drill Contractor O'Keefe

Project Name Rhodia RFI Groundwater | Drill Method HSA

Number 26/46-006 | Drilling Started 9/11/06 Ended 9/12/06 | Elevation 5388.2

Location Silver Bow, Montana | Logged By KAM | Total Depth 95.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
						ML		SILT with SAND to SANDY SILT: Pale brown silt with approximately 25% fine-grained sand. Trace medium to coarse-grained sand increases to 30% fine to coarse-grained sand with trace lower fine (pea size) mudstone/sandstone gravel at depth. Gravel pieces break apart in hand to a blocky texture.*(continued)*		5365
25		11	22-31-21-41	None None None	Moist	SM		SILTY SAND: Brown to light yellowish brown, very fine-grained silty sand with approximately 30% fines that increase to 40% with depth. A few 3 to 10 mm laminations resembling lime scale observed from 24 to 26' bgs.		5360
30		12	17-37-52-66	None None None	Moist			A few cemented angular mudstone and sandstone fragments observed below 29' bgs. Soil is hard with blocky texture. A 30 mm lens resembling lime scale observed at 30.8' bgs.		5355
35		13	49-31-42-44	None None None	Moist	SP		POORLY GRADED SAND: Light grayish brown, fine-grained sand with 15% medium-grained, 3% coarse-grained sand, and trace lower (pea size) fine gravel. Sample has approximately 3 to 5% fines, angular to sub-round grains/clasts, and abundant mica.	6-67.8': Neat Cement Grout	5350
			13-26-	None		ML		*(continued)*		

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Remarks: Samples were collected using a 3 inch split spoon from 0 to 12' bgs and a 2 inch split spoon from 12 to 96' bgs.

Additional data may have been collected in the field which is not included on this log.

LOG OF BORING MW-06-04

Client Rhodia | Drill Contractor O'Keefe | Elevation 5388.2

Project Name Rhodia RFI Groundwater | Drill Method HSA

Number 26/46-006 | Drilling Started 9/11/06 Ended 9/12/06

Location Silver Bow, Montana | Logged By KAM | Total Depth 95.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		14	34-52	None None	Moist	ML		SANDY SILT: Light grayish sandy silt with approximately 30% very fine to fine-grained sand, trace coarse-grained sand, and lower fine (pea size) gravel. Gravel size material is hard and blocky. A few cemented 3 to 5 mm laminations observed.*(continued)* Lens of silty sand with approximately 20% fines observed between 40.2 to 40.5' bgs.		5345
45		15	32-37-46-48	None None None	Moist	SP ML SP		POORLY GRADED SAND: Light grayish brown, medium to coarse-grained sand with approximately 5% fines and angular to sub-round grains. SANDY SILT: Grayish brown sandy silt with approximately 30% fine-grained sand, trace coarse-grained sand and lower fine (pea size) gravel. Sample has a few cemented lenses/laminations that are hard and break into blocky pieces.		
						ML		POORLY GRADED SAND: Light grayish brown, medium to coarse-grained sand with approximately 5% fines and angular to sub-rounded grains.		5340
50		16	16-27-48-58	None None None	Moist			SANDY SILT: Grayish brown sandy silt with approximately 30% fine-grained sand, trace coarse-grained sand and lower fine gravel. Sample has a few cemented lenses/laminations that are hard and break into blocky pieces.		
						ML-SM		SANDY SILT to SILTY SAND: Grayish brown very fine-grained sand. Approximately 50% fines, 3 to 5% of fines fraction is clay. Sample is hard with no cementation observed.		5335
55		17	16-21-36-54	None None None	Moist	ML		SANDY SILT: Grayish brown sandy slit with approximately 30% fine-grained sand and trace to 5% mafic coarse-grained sand. Sample has a few laminations/lenses of horizontally oriented mudstone.		
						SP		POORLY GRADED SAND: Pale olive, very fine to fine-grained sand with 10% medium-grained, 3% coarse-grained sand, and approximately 3% fines. Two 2 mm varves of yellowish brown observed.		
						ML		SANDY SILT: Grayish brown sandy silt with approximately 30% fine-grained sand and trace coarse-grained sand with a few cemented claystone/mudstone lenses. Silty sand (SM) lenses observed between 59.8 to 60' bgs and 60.2 to 60.5 bgs. Sample is cohesive when wetted.		5330
			17-23-	None				*(continued)*		

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Remarks: Samples were collected using a 3 inch split spoon from 0 to 12' bgs and a 2 inch split spoon from 12 to 96' bgs.

Additional data may have been collected in the field which is not included on this log.

LOG OF BORING MW-06-04

Client Rhodia | Drill Contractor O'Keefe

Project Name Rhodia RFI Groundwater | Drill Method HSA

Number 26/46-006 | Drilling Started 9/11/06 Ended 9/12/06 | Elevation 5388.2

Location Silver Bow, Montana | Logged By KAM | Total Depth 95.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		18	34-51	None None	Moist			SANDY SILT: Grayish brown sandy silt with approximately 30% fine-grained sand and trace coarse-grained sand with a few cemented claystone/mudstone lenses. Silty sand (SM) lenses observed between 59.8 to 60' bgs and 60.2 to 60.5 bgs. Sample is cohesive when wetted. *(continued)*		5325
65		19	16-24-46-48	None None None	Moist	ML				
										5320
70		20	9-17-34-50/0.3	None None None	Moist			Sample is grayish brown to olive gray at base. Mudstone/claystone becomes more prevalent below 69' bgs.	67.8-70.5': Bentonite Well Seal	
						SM		SILTY SAND: Olive gray, very fine-grained silty sand with approximately 30% fines. Sample is very dense.	70.5-93': Sand Pack, 20/40 Sand	
								MUDSTONE/CLAYSTONE: Light yellowish brown to olive brown mudstone/claystone that is hard, brittle, and friable in hand with considerable pressure. Sample prefers to fracture on a near horizontal plane. Drilling became hard at approximately 73' bgs.		5315
75		21	10-21-33-45	None None None	Moist					
										5310
			18-27-	None	Moist			*(continued)*		

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LOG OF BORING MW-06-04

Client Rhodia | Drill Contractor O'Keefe

Project Name Rhodia RFI Groundwater | Drill Method HSA

Number 26/46-006 | Drilling Started 9/11/06 Ended 9/12/06 | Elevation 5388.2

Location Silver Bow, Montana | Logged By KAM | Total Depth 95.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		22	35-50/0.4	None None	to Wet			MUDSTONE/CLAYSTONE: Light yellowish brown to olive brown mudstone/claystone that is hard, brittle, and friable in hand with considerable pressure. Sample prefers to fracture on a near horizontal plane.*(continued)* Moist to wet at approximately 80' bgs and appears brown due to moisture. Some thin (>5 mm) pieces cannot be broken with hand pressure and sample prefers to fracture on a horizontal plane.	73-93': 2"X20' Sch 40 PVC 0.010 Slot Screen	5305
		23	16-37-34-35	None None None	Wet					
85										
										5300
90		24	100/0.6-–	None None None	Moist to Wet					
										5295
		25	27-28-50/0.3-	None None None	Wet					
95								End of Boring - 95 feet		
										5290

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Remarks: Samples were collected using a 3 inch split spoon from 0 to 12' bgs and a 2 inch split spoon from 12 to 96' bgs.

Additional data may have been collected in the field which is not included on this log.

ENVIRO LOG 5 (5/27/04) 2646006.GPJ BARRLOG.GDT 6/4/07

LOG OF BORING MW-06-05

SHEET 1 OF 2

Client Rhodia | Drill Contractor O'Keefe

Project Name Rhodia RFI Groundwater | Drill Method HSA

Number 26/46-006 | Drilling Started 9/14/06 Ended 9/14/06 | Elevation 5348.2

Location Silver Bow, Montana | Logged By KAM | Total Depth 23.5

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
								GRASS	6" Steel Protop with Vented Cap	
			11-11-12-12	None None None	Dry	SP		POORLY GRADED SAND: Light grayish brown, fine to medium-grained sand with 30% coarse-grained sand, 10% fine gravel and approximately 3 to 5% fines.	0-3': Concrete Grout	
			11-12-17-9	None None None	Dry				2.5' ags-3.5' bgs: 2" Sch 40 PVC Riser 2-3': Bentonite Well Seal	5345
5			6-6-4-6	None None None	Moist	SP/GP		POORLY GRADED SAND to POORLY GRADED GRAVEL: Brown sand and gravel with approximately 45% sand, 45% gravel, and 5% fines. Sample is mostly coarse-grained sand and lower fine gravel with 3% upper fine and lower coarse gravel. Sample has angular to sub-round grains/clasts.		
			4-4-4-9	None None None	Wet	CL/CH		CLAY with SAND: Brown, soft clay with approximately 15 to 20% sand and a few thin (3 to 5 mm) sand stringers observed.	3-23.5': Sand Pack, 20/40 Sand	
			6-11-17-10	None None None	Wet	SP		POORLY GRADED SAND with GRAVEL: Brown, coarse-grained sand with 20% lower fine gravel of granitic origin. Sample has approximately 5% fines and angular to sub-round grains/clasts.		5340
10			5-5-13-12	None None None	Wet	CL/CH		CLAY with SAND: Olive clay with approximately 15% fine to medium-grained sand. Sample is soft and becomes firm with depth.		
			5-7-7-7	None None None	Wet	GP/GC		POORLY GRADED GRAVEL with CLAY and SAND: Yellowish brown, approximately 60% fine and trace coarse gravel, 20% fine to coarse-grained sand, and 20% clay. Sample has angular to sub-round grains/clasts and abundant mica.		5335
15			5-6-8-7	None None None	Wet	GC		CLAYEY GRAVEL: Light brownish gray, coarse gravel and pulverized cobbles that are angular and platey. Clayey gravel has approximately 10 to 15% fine to coarse-grained, sand size grains and approximately 40% fines. Sample is cohesive. Clay fraction of fines decreases with depth and grades to silty gravel.	3.5-23.5': 2"X20' Sch 40 PVC 0.010 Slot Screen	
			9-11-14-13	None None None	Wet	GM		SILTY GRAVEL: Light brownish gray silty gravel and pulverized cobbles that are angular and platey. Silty gravel has approximately 10-15% fine to coarse-grained, sand size grains and approximately 40% fines. Sample has very low cohesiveness. Light brownish gray color grades to light olive brown with depth.		5330
			12-13-15-17	None None None	Wet					

(continued)

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Remarks: Static water at 6.0' bgs. Samples were collected using a 3 inch split spoon from 0 to 6' bgs and a 2 inch split spoon from 6 to 23' bgs.

Additional data may have been collected in the field which is not included on this log.

ENVIRO LOG 5 (5/27/04) 2646006.GPJ BARRLOG.GDT 6/4/07

LOG OF BORING MW-06-05

Client Rhodia | Drill Contractor O'Keefe

Project Name Rhodia RFI Groundwater | Drill Method HSA

Number 26/46-006 | Drilling Started 9/14/06 Ended 9/14/06 | Elevation 5348.2

Location Silver Bow, Montana | Logged By KAM | Total Depth 23.5

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
			9-15-16-50	None None None	Wet	GM		SILTY GRAVEL: Light brownish gray silty gravel and pulverized cobbles that are angular and platey. Silty gravel has approximately 10-15% fine to coarse-grained, sand size grains and approximately 40% fines. Sample has very low cohesiveness. Light brownish gray color grades to light olive brown with depth. *(continued)*		
					Moist	ML		SILT with GRAVEL: Light olive brown silt with approximately 15% fine, angular gravel pieces. Sample is hard, laminated and fractured in split spoon sampler. Sample is soft and friable in hand, and breaks up to silt.		5325
25								End of Boring - 23.5 feet		5320
30										5315
35										5310

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Remarks: Static water at 6.0' bgs. Samples were collected using a 3 inch split spoon from 0 to 6' bgs and a 2 inch split spoon from 6 to 23' bgs.

Additional data may have been collected in the field which is not included on this log.

ENVIRO LOG 5 (5/27/04) 2646006.GPJ BARRLOG.GDT 6/4/07

LOG OF BORING MW-06-06

Client Rhodia | Drill Contractor O'Keefe

Project Name Rhodia RFI Groundwater | Drill Method HSA

Number 26/46-006 | Drilling Started 9/14/06 Ended 9/20/06 | Elevation 5348.3

Location Silver Bow, Montana | Logged By KAM | Total Depth 176.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
								GRASS	6" Steel Protop with Vented Cap	
						SP		POORLY GRADED SAND: Light grayish brown, fine to medium-grained sand with 30% coarse-grained sand, 10% fine gravel and approximately 3 to 5% fines.	0-3: Concrete Grout	
										5345
5						SP/GP		POORLY GRADED SAND to POORLY GRADED GRAVEL: Brown sand and gravel with approximately 45% sand, 45% gravel, and 5% fines. Sample is mostly coarse-grained sand and lower fine gravel with 3% upper fine and lower coarse gravel. Sample has angular to sub-round grains/clasts.	2.5' ags-154' bgs: 2" Sch 40 PVC Riser	
						CL/CH		CLAY with SAND: Brown, soft clay with approximately 15 to 20% sand and a few thin (3 to 5 mm) sand stringers observed.		5340
						SP		POORLY GRADED SAND with GRAVEL: Brown, coarse-grained sand with 20% lower fine gravel of granitic origin. Sample has approximately 5% fines and angular to sub-round grains/clasts.		
10						CL/CH		CLAY with SAND: Olive clay with approximately 15% fine to medium-grained sand. Sample is soft and becomes firm with depth.		
						GP/GC		POORLY GRADED GRAVEL with CLAY and SAND: Yellowish brown, approximately 60% fine and trace coarse gravel, 20% fine to coarse-grained sand, and 20% clay. Sample has angular to sub-round grains/clasts and abundant mica.		5335
						GC		CLAYEY GRAVEL: Light brownish gray, coarse gravel and pulverized cobbles that are angular and platey. Clayey gravel has approximately 10 to 15% fine to coarse-grained, sand size grains and approximately 40% fines. Sample is cohesive. Clay fraction of fines decreases with depth and grades to silty gravel.		
15						GM		SILTY GRAVEL: Light brownish gray silty gravel and pulverized cobbles that are angular and platey. Silty gravel has approximately 10-15% fine to coarse-grained, sand size grains and approximately 40% fines. Sample has very low cohesiveness. Light brownish gray color grades to light olive brown with depth.		5330

(continued)

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Ann Arbor, MI 48103
Telephone: 1-800-270-5017
Fax: 734-327-1212

Remarks: Static water at 6.0' bgs. Samples were collected with a 2 inch split spoon from 24 to 176' bgs. Lithological data from 0 to 23' bgs taken from adjacent nested well MW-06-05.

Additional data may have been collected in the field which is not included on this log.

ENVIRO LOG 5 (5/27/04) 2646006.GPJ BARRLOG.GDT 6/4/07

LOG OF BORING MW-06-06

Client Rhodia
Project Name Rhodia RFI Groundwater
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor O'Keefe
Drill Method HSA
Drilling Started 9/14/06 Ended 9/20/06
Logged By KAM

Elevation 5348.3
Total Depth 176.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
						GM		SILTY GRAVEL: Light brownish gray silty gravel and pulverized cobbles that are angular and platey. Silty gravel has approximately 10-15% fine to coarse-grained, sand size grains and approximately 40% fines. Sample has very low cohesiveness. Light brownish gray color grades to light olive brown with depth. *(continued)*		
						ML		SILT with GRAVEL: Light olive brown silt with approximately 10% fine to coarse-grained sand, 15% angular fine gravel, and a few cemented layers of mudstone. Sample is hard, laminated, and fractured in split spoon sampler. Sample is soft to firm and friable in hand.		5325
25		1	9-12-12-23	None None None	Moist					
										5320
30		2	33-31-69-50/0.4	None None None	Moist			Grayish brown, fine to medium-grained sand lens (SP) between 30.4 to 30.7' bgs. Sand observed in lens is angular to sub-round with a few pieces of grass. Soil becomes clayey sand (SC) below 30.5' bgs.		
										5315
35		3	10-14-31-50	None None None	Moist to Wet	CL/CH		CLAY with GRAVEL: Olive brown, soft clay with approximately 15% fine, angular gravel. A few small roots observed below 35.5' bgs. Driller reported softer formation at 37' bgs.		
										5310
			50-67-	None		GC ML		CLAYEY GRAVEL: Olive brown fine gravel with 3% coarse gravel. Sample has approximately 30% fines. Gravel is angular and appears to be *(continued)*		

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Remarks: Static water at 6.0' bgs. Samples were collected with a 2 inch split spoon from 24 to 176' bgs. Lithological data from 0 to 23' bgs taken from adjacent nested well MW-06-05.

Additional data may have been collected in the field which is not included on this log.

LOG OF BORING MW-06-06

Client Rhodia | Drill Contractor O'Keefe | Elevation 5348.3

Project Name Rhodia RFI Groundwater | Drill Method HSA

Number 26/46-006 | Drilling Started 9/14/06 Ended 9/20/06

Location Silver Bow, Montana | Logged By KAM | Total Depth 176.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		4	100-NA	None None	Wet			claystone clasts.		
						ML		SILT with SAND: Olive brown silt with approximately 15% fine-grained sand and a few 5 to 10 mm cemented mudstone laminations. Sample is firm to hard in sampler, and firm and friable in hand (prefers near horizontal fracture). Fine gravel size pieces of mudstone increase with depth to 15% (silt with sand and gravel).*(continued)* Difficult drilling from 40 to 45' due to slough in the augers caused by heaving.		5305
45		5	16-25-24-50/0.4	None None None	Wet Moist					
						CL/ML		SILTY CLAY: Light yellowish brown to olive yellow silty clay with trace sand. Sample is hard, homogeneous and massive.		5300
50		6	20-26-54-71	None None None	Moist					
										5295
55		7	14-22-28-38	None None None	Moist					
										5290
			23-20-	None				*(continued)*		

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Remarks: Static water at 6.0' bgs. Samples were collected with a 2 inch split spoon from 24 to 176' bgs. Lithological data from 0 to 23' bgs taken from adjacent nested well MW-06-05.

Additional data may have been collected in the field which is not included on this log.

ENVIRO LOG 5 (5/27/04) 2646006.GPJ BARRLOG.GDT 6/4/07

LOG OF BORING MW-06-06

Client Rhodia | Drill Contractor O'Keefe

Project Name Rhodia RFI Groundwater | Drill Method HSA

Number 26/46-006 | Drilling Started 9/14/06 Ended 9/20/06 | Elevation 5348.3

Location Silver Bow, Montana | Logged By KAM | Total Depth 176.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		8	26-66	None None	Moist			SILTY CLAY: Light yellowish brown to olive yellow silty clay with trace sand. Sample is hard, homogeneous and massive.*(continued)* A few pieces of fine sub-round gravel and buff pulverized chert cobble observed at approximately 60' bgs. Dark green, pulverized chert cobble observed in sampler cutting shoe.		5285
65		9	27-38-42-77	None None None	Moist	CL/ML		Olive color observed below 64' bgs.		
										5280
70		10	67-100/0.2-NA-NA	None None None	Moist			CHERT: Dark green chert that is highly broken in sampler and fractures randomly into shards.	3-139': Neat Cement Grout	
										5275
75		11	31-106-54-56	None None None	Moist	GC		CLAYEY GRAVEL: Light yellowish brown clayey gravel with approximately 60 to 70% gravel and angular broken pieces of dark green chert. Sample is hard in sampler and friable in hand.		
						CL/CH		CLAY: Pale yellow to light yellowish brown clay with trace sand and pebble size fine gravel. Sample is homogeneous, hard, breaks blocky, and has medium plasticity/toughness.		5270
			23-23-	None	Moist	CL/ML		*(continued)*		

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Remarks: Static water at 6.0' bgs. Samples were collected with a 2 inch split spoon from 24 to 176' bgs. Lithological data from 0 to 23' bgs taken from adjacent nested well MW-06-05.

Additional data may have been collected in the field which is not included on this log.

LOG OF BORING MW-06-06

Client Rhodia | Drill Contractor O'Keefe

Project Name Rhodia RFI Groundwater | Drill Method HSA

Number 26/46-006 | Drilling Started 9/14/06 Ended 9/20/06 | Elevation 5348.3

Location Silver Bow, Montana | Logged By KAM | Total Depth 176.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		12	27-47	None None	to Dry			SILTY CLAY: Pale yellow to light yellowish brown silty clay with trace fine-grained sand. Sample is homogeneous, hard, breaks blocky, and has medium plasticity and high toughness. Sample appears to have a higher silt content than above interval and no preferred fracture/cleavage planes. *(continued)* Augers did not produce cuttings below approximately 80' bgs and was presumably caused by plugged auger flights. Lack of cuttings brought to the surface results in slough being forced into the HSA.		
										5265
85		13	22-36-47-87	None None None	Moist to Dry					
										5260
					Moist to Dry					
90		14	70-82-200/0.25-NA	None None None	Moist Moist to Dry	CL/ML		Moist lens of clayey gravel (GC) between 89.2 and 89.3' bgs. Lens is possibly a pulverized mudstone lens. Angular gravel pieces display a black dendritic pattern of secondary mineralization on clast faces. Difficult drilling conditions (hard formation) encountered from 90 to 91' bgs. Mudstone in sampler cutting shoe from 91' bgs.		
										5255
95		15	17-41-38-61	None None None	Moist			Mottled pale yellow and light yellowish brown below 94' bgs.		
										5250
			16-23-	None				*(continued)*		

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ENVIRO LOG 5 (5/27/04) 2646006.GPJ BARRLOG.GDT 6/4/07

LOG OF BORING MW-06-06

Client Rhodia | Drill Contractor O'Keefe

Project Name Rhodia RFI Groundwater | Drill Method HSA

Number 26/46-006 | Drilling Started 9/14/06 Ended 9/20/06 | Elevation 5348.3

Location Silver Bow, Montana | Logged By KAM | Total Depth 176.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		16	32-58	None None	Moist			SILTY CLAY: Pale yellow to light yellowish brown silty clay with trace fine-grained sand. Sample is homogeneous, hard, breaks blocky, and has medium plasticity and high toughness. Sample appears to have a higher silt content than above interval and no preferred fracture/cleavage planes. *(continued)*		5245
105		17/18	61-200/0.1-6-140/0	None None None	Moist			Sample sucked out of first sample attempt and recovered with second split spoon.		5240
110		19	22-36-43-50/0.4	None None None	Dry to Moist	CL/ML		Claystone observed in sampler cutting shoe.		5235
115		20	17-21-29-38	None None None	Dry to Moist					5230
			29-46-	None	Dry to Moist Moist			Lens of moist gravely clay observed from 119.5 *(continued)*		

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LOG OF BORING MW-06-06

Client Rhodia | Drill Contractor O'Keefe

Project Name Rhodia RFI Groundwater | Drill Method HSA

Number 26/46-006 | Drilling Started 9/14/06 Ended 9/20/06 | Elevation 5348.3

Location Silver Bow, Montana | Logged By KAM | Total Depth 176.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		21	48-50/0.4	None None	Dry to Moist			to 119.7' bgs. Gravel is fine to coarse, angular mudstone. Moisture observed along the faces of some gravel pieces, but not waterbearing. SILTY CLAY: Pale yellow to light yellowish brown silty clay with trace fine-grained sand. Sample is homogeneous, hard, breaks blocky, and has medium plasticity and high toughness. Sample appears to have a higher silt content than above interval and no preferred fracture/cleavage planes. *(continued)*		5225
125		22	24-49-69-50/0.4	None None None	Dry to Moist			Light yellowish brown color observed at 124.5' bgs.		
						CL/ML				5220
130		23	19-31-42-50/0.3	None None None	Dry to Moist			A few near vertical fractures displaying black secondary mineralization observed at 131' bgs.		5215
135		24	161-200-NA-NA	None None None	Moist			MUDSTONE: Light yellowish brown mudstone. Sample is fractured with clay present in the fracture interstitial spaces. CLAYEY SILT: Light yellowish brown clayey silt. Sample is friable in hand, massive, hard, breaks blocky, cohesive when wetted, and tends to prefer near horizontal fractures.		
						ML				5210
			32-33-	None		CL/ML		*(continued)*		

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ENVIRO LOG 5 (5/27/04) 2646006.GPJ BARRLOG.GDT 6/4/07

LOG OF BORING MW-06-06

Client Rhodia | Drill Contractor O'Keefe

Project Name Rhodia RFI Groundwater | Drill Method HSA

Number 26/46-006 | Drilling Started 9/14/06 | Ended 9/20/06 | Elevation 5348.3

Location Silver Bow, Montana | Logged By KAM | Total Depth 176.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		25	48-50/0.4	None None	Moist			SILTY CLAY: Pale olive silty clay with trace fine-grained sand. Sample is homogeneous, massive, hard, and breaks into blocky pieces with no preferred fracture/cleavage planes. *(continued)*		
										5205
145		26	29-77-200/0.1-NA	None None None	Moist	CL/ML			139-149': Bentonite Well Seal	
										5200
150		27	91-200/0.1-NA-NA	None None None	Moist			SILTY CLAY to CLAYEY SILT: Light grayish brown silty clay to clayey silt. Sample is hard, breaks blocky to platey, and prefers to fracture on a near horizontal plane. A few small (less than 3 mm) clay nodules observed. Black secondary mineralization present in the bottom portion of sample.	149-174': Sand Pack, 20/40 Sand	
										5195
155		28	79-200/0.3-NA-NA	None None None	Dry to Moist	CL/ML		A few mudstone/claystone fragments observed from 154 to 156' bgs. Bottom three inches of sample has an olive tint and is very hard, bordering on mudstone.		
										5190
			49-56-	None	Dry			A half inch mudstone lense observed at *(continued)*		

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LOG OF BORING MW-06-06

Client Rhodia | Drill Contractor O'Keefe

Project Name Rhodia RFI Groundwater | Drill Method HSA

Number 26/46-006 | Drilling Started 9/14/06 Ended 9/20/06 | Elevation 5348.3

Location Silver Bow, Montana | Logged By KAM | Total Depth 176.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		29	200/0.1-NA	None None	to Moist	CL/ML		approximately 159.5 bgs. Black secondary mineralization present in the bottom of the sample as medium-grained sand size specs. Auger penetration rate significantly increased between 160 and 170' bgs. Slurry in augers appeared more watery than that observed above 160' bgs and indicates possible penetration of a thin waterbearing unit.		5185
165		30	79-129-200/0.3-NA	None None None	Moist			CLAY with SILT: Brown to light yellowish brown clay with trace fine to coarse-grained sand and a few pieces of fine mudstone gravel. Sample is homogeneous, hard, and has no preferred fracture/cleavage planes.	154-174': 2"X20' Sch 40 PVC 0.010 Slot Screen	5180
170		31	29-38-48-100/0.4	None None None	Moist	CL/CH		Light yellowish brown color with a few pale olive mottles observed at 169' bgs.		5175
175		32	30-113-131-100/0.3	None None None	Moist			SHALE: Grayish green shale with trace fine-grained sand and few pebble size claystone fragments. Sample is homogeneous and hard.		5170
								End of Boring - 176 feet		

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ENVIRO LOG 5 (5/27/04) 2646006.GPJ BARRLOG.GDT 6/4/07

LOG OF Boring MW-06-07

Client Rhodia | Drill Contractor O'Keefe

Project Name Rhodia RFI Groundwater | Drill Method HSA

Number 26/46-006 | Drilling Started 10/13/06 Ended 10/14/06 | Elevation 5364.5

Location Silver Bow, Montana | Logged By MMB | Total Depth 46.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		1	18-11-16-13	None Slight None	Dry to Slightly Moist			SLAG: Bluish gray to white slag. Grain size is 40% fine to coarse-grained sand and 60% fine to coarse-grained gravel. Sample has a faint sulfur odor.	6" Steel Protop with Vented Cap	
									3' ags-22' bgs: 2" Sch 40 PVC Riser	5360
5		2	26-28->50->50		Dry to Slightly Moist			TAILINGS: Very dark grayish brown silt and/or clay size particles with up to 10% fine-grained sand. Sample is homogeneous, non-plastic or has very low plasticity, and has low toughness.		
									0-17.5': Neat Cement Grout	
					Moist					5355
10		3	3-2-3-2	None Strong None	Wet			Tailings below 10' are black and saturated. A pungent odor observed at 10' bgs. Sample from 10 to 20' bgs is smoking in air.		
								Sample has up to 15% fine-grained sand from 14 to 15' bgs.		5350
15		4	1-1-1-1	None Slight None	Wet			Sample has medium plasticity and no sand from 15 to 16' bgs.		
									17.5-19.8': Bentonite Well Seal	
				None				Tailings, same as above, with 1 to 2 inch beds from 19 to 20' bgs.		5345
								(continued)		

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LOG OF Boring MW-06-07

Client Rhodia
Project Name Rhodia RFI Groundwater
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor O'Keefe
Drill Method HSA
Drilling Started 10/13/06 Ended 10/14/06
Logged By MMB

Elevation 5364.5
Total Depth 46.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		5	1-1-1-1	None None	Wet			TAILINGS: Laminated black to yellowish brown tailings with high plasticity. Sample is smoking in air.	19.8-29.1': Sand Pack, 20/40 Sand	
25		6	1-2-2-3	None None None	Wet				22-27': 2"X5' Sch 40 PVC 0.010 Slot Screen	5340
30		7	2-2-2-2	None None None	Very Moist					5335
35		8	2-3-3-3	None None None	Very Moist to Wet					5330
								TAILINGS: Black tailings with low to medium plasticity. Sample is homogeneous.	29.1-44': Bentonite Chips	
				None	Very Moist			TAILINGS: Laminated black to yellowish brown tailings with high plasticity. Sample is smoking in air.		5325

(continued)

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ENVIRO LOG 5 (5/27/04) 2646006.GPJ BARRLOG.GDT 6/4/07

LOG OF Boring MW-06-07

Client Rhodia
Project Name Rhodia RFI Groundwater
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor O'Keefe
Drill Method HSA
Drilling Started 10/13/06 Ended 10/14/06
Logged By MMB

Elevation 5364.5
Total Depth 46.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		9	3-3-4-5	None None	to Wet			TAILINGS: Laminated black to yellowish brown tailings with high plasticity. Sample is smoking in air.*(continued)*		
45		10	3-5-5-6	None None None	Dry to Slightly Moist	CL/OL		SANDY CLAY: Very dark gray sandy organic clay with rootlets. Sample is homogeneous, micaceous, and has medium to high plasticity.		5320
								End of Boring - 46 feet		
50										5315
										5310
55										
										5305

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LOG OF Boring MW-06-08

Client Rhodia | Drill Contractor O'Keefe

Project Name Rhodia RFI Groundwater | Drill Method HSA

Number 26/46-006 | Drilling Started 10/27/06 Ended 10/27/06 | Elevation 5364.6

Location Silver Bow, Montana | Logged By KAM | Total Depth 62.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
								SLAG: Bluish gray to white slag with a faint sulfur odor. Grain size is 40% fine to coarse-grained sand and 60% fine to coarse-grained gravel.	6" Steel Protop with Vented Cap	
5								TAILINGS: Very dark grayish brown silt and/or clay size particles with up to 10% fine-grained sand. Sample is homogeneous, non-plastic or has very low plasticity, and has low toughness.	2.5' ags-54' bgs: 2" Sch 40 PVC Riser	5360
10								Tailings below 10' are black and saturated. Soil cuttings from approximately 10 to 15' bgs were observed to slightly smoke. Trace to light elemental phosphorous odors were occasionally noted.		5355
15								Sample has up to 15% fine-grained sand from 14 to 15' bgs. Sample has medium plasticity and no sand from 15 to 16' bgs.		5350
								TAILINGS: Dark grayish brown tailings with clayey and silty layers. Sample is soft and wet.		5345

(continued)

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Remarks: Samples were collected using a 2 inch split spoon from 46 to 60' bgs (boring was blind-drilled to 46' bgs). Lithology shown from 0 to 46' bgs is from MW-06-07 (to 18' bgs) and MW-06-09 (from 18 to 46' bgs).

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ENVIRO LOG 5 (5/27/04) 2646006.GPJ BARRLOG.GDT 6/4/07

LOG OF Boring MW-06-08

Client Rhodia
Project Name Rhodia RFI Groundwater
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor O'Keefe
Drill Method HSA
Drilling Started 10/27/06 Ended 10/27/06
Logged By KAM

Elevation 5364.6
Total Depth 62.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
25								TAILINGS: Dark grayish brown tailings with clayey and silty layers. Sample is soft and wet.*(continued)*	0-49.5': Neat Cement Grout	5340
30								Color becomes very dark gray below 28' bgs.		5335
35								*(continued)*		5330
										5325

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LOG OF Boring MW-06-08

Client Rhodia | Drill Contractor O'Keefe

Project Name Rhodia RFI Groundwater | Drill Method HSA

Number 26/46-006 | Drilling Started 10/27/06 Ended 10/27/06 | Elevation 5364.6

Location Silver Bow, Montana | Logged By KAM | Total Depth 62.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
								TAILINGS: Dark grayish brown tailings with clayey and silty layers. Sample is soft and wet.*(continued)* Tailings are mostly of clay consistency below 40' bgs. Varves of yellowish brown and dark grayish brown observed from 42 to 44' bgs.		
45						OL/OH		ORGANIC SOIL: Very dark brown to black organic soil with approximately 15% fine to coarse-grained sand. Soil is clayey with abundant small roots and mica flakes.		5320
		1	5-12-15-17	None None None None Earthy Odor None	Moist	OL/CL		ORGANIC SOIL: Dark gray, soft to firm, organic clayey soil to clayey sand with approximately 15% fine to coarse-grained sand and mica. Sample has angular to sub-round grains and small roots/plant material that decrease with depth. Sand stringers (2 to 3 mm) observed at 47.1' and 47.5' bgs. Color becomes gray, mottled with black, peat-like flecks (1 to 3 mm) below 49.5' bgs. Soil has a sulfur (rotten egg) odor.		
		2	6-8-11-11	None Earthy Odor None None Sulfur Odor	Moist					
50				None None Trace Sulfur Odor	Moist					5315
		3	7-15-10-13	None None None None	Wet Moist	ML		SILT: Light gray, homogenous, firm silt with approximately 3% fine-grained sand and organics. Sample has low dilatancy and trace sulfur odor.	49.5-51.7': Bentonite Well Seal	
		4	3-4-10-11	None None None	Moist	CL		CLAY: Dark gray to olive gray clay with approximately 10 to 15% fine-grained sand, organics, and mica. Sample has moderate plasticity and toughness. At 52' bgs, clay has 10 to 15% fine to coarse-grained sand with trace fine gravel, angular to sub-round grains/clasts, low plasticity and moderate toughness. Silt lens at 52.3' bgs. Color grades to greenish gray at 53.5' bgs and has trace vertical roots with sand.	51.7-62': Sand Pack, 20/40 Sand	
55		5	7-12-11-15	None None None	Wet	SC SP				5310
		6	10-11-13-18	None None None	Wet	SC		CLAYEY SAND: Greenish gray, soft clayey sand. POORLY GRADED SAND: Greenish gray, fine to coarse-grained, granitic sand with 20% fine gravel, and approximately 7 to 10% fines. Clay lense from 55 to 55.2'.	54-59': 2"X5' Sch 40 PVC 0.010 Slot Screen	
		7	7-9-18-30	None None None	Wet Moist to Wet	ML		CLAYEY SAND with GRAVEL: Greenish gray, soft clayey sand. SILT: Greenish gray silt with trace fine-grained sand and a few angular to round, weakly cemented, green silt pieces.		5305
								(continued)		

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LOG OF Boring MW-06-08

Client Rhodia
Project Name Rhodia RFI Groundwater
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor O'Keefe
Drill Method HSA
Drilling Started 10/27/06 Ended 10/27/06
Logged By KAM

Elevation 5364.6
Total Depth 62.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
						ML		SILT: Greenish gray silt with trace fine-grained sand and a few angular to round, weakly cemented, green silt pieces.*(continued)*		
								End of Boring - 62 feet		
65										5300
70										5295
75										5290
										5285

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ENVIRO LOG 5 (5/27/04) 2646006.GPJ BARRLOG.GDT 6/4/07

LOG OF BORING MW-06-09

Client Rhodia | Drill Contractor O'Keefe

Project Name Rhodia RFI Groundwater | Drill Method HSA

Number 26/46-006 | Drilling Started 10/23/06 Ended 10/24/06 | Elevation 5364.5

Location Silver Bow, Montana | Logged By KAM | Total Depth 91.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
								SLAG: Bluish gray to white slag with a faint sulfur odor. Grain size is 40% fine to coarse-grained sand and 60% fine to coarse-grained gravel.	6" Steel Protop with Vented Cap	
5								TAILINGS: Very dark grayish brown silt and/or clay size particles with up to 10% fine-grained sand. Sample is homogeneous, non-plastic or has very low plasticity, and has low toughness.	2.8' ags-72' bgs: 2" Sch 40 PVC Riser	5360
10								Tailings below 10' are black and saturated. Soil cuttings from approximately 10 to 15' bgs were observed to slightly smoke. Trace to light elemental phosphorous odors were occasionally noted.		5355
15								Sample has up to 15% fine-grained sand from 14 to 15' bgs. Sample has medium plasticity and no sand from 15 to 16' bgs.		5350
		1	2-2-1-2	None None None	Wet			TAILINGS: Dark grayish brown tailings with clayey and silty layers. Sample is soft and wet.		5345

(continued)

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Remarks: Static water at 6.0' bgs. Samples were collected using a 2 inch split spoon from 18 to 30' bgs, a 3 inch split spoon from 34 to 48' bgs, and a 2" split spoon from 48 to 91' bgs. Lithological data from 0 to 18' taken from adjacent nested well MW-06-07.

Additional data may have been collected in the field which is not included on this log.

ENVIRO LOG 5 (5/27/04) 2646006.GPJ BARRLOG.GDT 6/4/07

LOG OF BORING MW-06-09

Client Rhodia
Project Name Rhodia RFI Groundwater
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor O'Keefe
Drill Method HSA
Drilling Started 10/23/06 Ended 10/24/06
Logged By KAM

Elevation 5364.5
Total Depth 91.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
								TAILINGS: Dark grayish brown tailings with clayey and silty layers. Sample is soft and wet.*(continued)*		
25		2	1-2-2-4	None None None	Wet					5340
								Color becomes very dark gray below 28' bgs.		
30		3	2-1-1-2	None None None	Wet					5335
									0-66.2': Neat Cement Grout	
35		4	1-2-3-5	None None None	Wet					5330
		5	1-2-3-4	None None None	Wet					
		6	2-3-4-6	None None None	Wet					5325
								(continued)		

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Remarks: Static water at 6.0' bgs. Samples were collected using a 2 inch split spoon from 18 to 30' bgs, a 3 inch split spoon from 34 to 48' bgs, and a 2" split spoon from 48 to 91' bgs. Lithological data from 0 to 18' taken from adjacent nested well MW-06-07.

Additional data may have been collected in the field which is not included on this log.

ENVIRO LOG 5 (5/27/04) 2646006.GPJ BARRLOG.GDT 6/4/07

LOG OF BORING MW-06-09

Client Rhodia | Drill Contractor O'Keefe

Project Name Rhodia RFI Groundwater | Drill Method HSA

Number 26/46-006 | Drilling Started 10/23/06 Ended 10/24/06 | Elevation 5364.5

Location Silver Bow, Montana | Logged By KAM | Total Depth 91.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		7	3-4-5-7	None None None	Wet			TAILINGS: Dark grayish brown tailings with clayey and silty layers. Sample is soft and wet.*(continued)* Tailings are mostly of clay consistency below 40' bgs. Varves of yellowish brown and dark grayish brown observed from 42 to 44' bgs.		
		8	2-3-4-5	None None None	Wet					
45		9	7-9-12-15	None Earthy Odor None	Moist	OL/OH		ORGANIC SOIL: Very dark brown to black organic soil with approximately 15% fine to coarse-grained sand. Soil is clayey with abundant small roots and mica flakes.		5320
		10	7-10-18-19	None Earthy Odor None	Moist	OL-CL		CLAYEY ORGANIC SOIL to CLAY with SAND: Dark gray clayey organic soil with approximately 15% fine to coarse-grained sand and trace fine gravel. Sample has angular to sub-round grains/clasts, low plasticity, moderate toughness, and is firm. Wet sand stringers (<5 mm) observed below 47.4' bgs. Sample becomes mottled with light gray and non-cohesive.		
		11	4-6-8-8	None Earthy Odor None	Moist					5315
50				Trace Sulfur Odor	Wet	ML		SILT: Light gray, homogeneous, non-cohesive silt with moderate dilatancy.		
		12	8-9-8-10	None None None	Moist	CL		CLAY: Mottled gray and olive gray clay with approximately 10 to 15% fine to coarse-grained sand and trace fine gravel. Sample has angular to sub-round grains/clasts, low plasticity, moderate toughness, and is firm. Some plant material/roots and mica are present in sample.		
		13	7-8-8-9	None None None	Moist					
						SP		POORLY GRADED SAND: Greenish gray, fine to medium-grained sand with 20% coarse-grained sand, trace fine gravel, and 7 to 10% fines that increase with depth.		5310
55		14	8-10-9-13	None None None	Wet	SC		CLAYEY SAND: Greenish gray, fine to medium-grained sand with 20% coarse-grained sand and trace fine gravel.		
		15	7-9-8-9	None None None	Wet					
		16	4-4-7-14	None None None	Wet	ML		SILT: Olive gray to greenish gray silt with moderate dilatancy. Sample is soft and non-cohesive; becomes slightly cohesive with depth. A few coarse-grained, sand to fine gravel size pieces of weakly cemented silt observed below 58' bgs. *(continued)*		5305

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Remarks: Static water at 6.0' bgs. Samples were collected using a 2 inch split spoon from 18 to 30' bgs, a 3 inch split spoon from 34 to 48' bgs, and a 2" split spoon from 48 to 91' bgs. Lithological data from 0 to 18' taken from adjacent nested well MW-06-07.

Additional data may have been collected in the field which is not included on this log.

ENVIRO LOG 5 (5/27/04) 2646006.GPJ BARRLOG.GDT 6/4/07

LOG OF BORING MW-06-09

Client Rhodia | Drill Contractor O'Keefe | Elevation 5364.5

Project Name Rhodia RFI Groundwater | Drill Method HSA

Number 26/46-006 | Drilling Started 10/23/06 Ended 10/24/06

Location Silver Bow, Montana | Logged By KAM | Total Depth 91.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		17	7-10-14-16	None None None	Moist			Light gray silt with trace fine-grained sand at 60' bgs. Sample has low cohesiveness when wetted. Sample is homogeneous and soft to firm. A few olive colored halos observed around the sand grains.		
		18	8-11-12-10	None None None	Moist Wet					
65		19	7-12-14-19	None None None	Wet Moist	ML		Gray to dark gray in color with a few gravel size pieces of weakly cemented silt at 64' bgs. Color grades back to light gray by 66' bgs. Percentage of clay increases with depth.	66.2-69': Bentonite Well Seal	5300
70		20	14-22-28-41	None None None	Moist			CLAYEY SILT: Greenish gray to gray clayey silt and trace fine to medium-grained sand with moderate plasticity. Sample is homogeneous, soft to firm, and blocky.	69-84.3': Sand Pack, 20/40 Sand	5295
75		21	21-36-50-50+	None None None	Moist to Wet	ML			72-82': 2"X10' Sch 40 PVC 0.010 Slot Screen	5290
			13-14-	None		CL		*(continued)*		5285

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Remarks: Static water at 6.0' bgs. Samples were collected using a 2 inch split spoon from 18 to 30' bgs, a 3 inch split spoon from 34 to 48' bgs, and a 2" split spoon from 48 to 91' bgs. Lithological data from 0 to 18' taken from adjacent nested well MW-06-07.

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ENVIRO LOG 5 (5/27/04) 2646006.GPJ BARRLOG.GDT 6/4/07

LOG OF BORING MW-06-09

Client Rhodia
Project Name Rhodia RFI Groundwater
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor O'Keefe
Drill Method HSA
Drilling Started 10/23/06 Ended 10/24/06
Logged By KAM

Elevation 5364.5
Total Depth 91.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		22	16-18	None None	Very Moist			SILTY CLAY: Light gray silty clay with trace fine to medium-grained sand and a few very weakly cemented, gravel size silty clay pieces that appear shiny with moisture along the exposed faces. Sample is homogeneous and firm. Sample has moderate to high plasticity and moderate toughness. a few gray-green clay nodules present throughout.*(continued)*		
85		23	15-21-30-42	None None None	Moist	CL		Pale yellow color mottled with very pale brown and gray observed from 84 to 86' bgs.	84.3-89: Bentonite Chips	5280
90		24	18-17-25-33	None None None	Moist			Light gray color with a few pale olives mottles at 89' bgs. Some black, dendritic secondary mineralization observed at approximately 89.6' bgs. White material, resembling limescale, observed at approximately 90.8' bgs. End of Boring - 91 feet		5275
95										5270
										5265

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ENVIRO LOG 5 (5/27/04) 2646006.GPJ BARRLOG.GDT 6/4/07

LOG OF BORING MW-06-10

SHEET 1 OF 2

Client Rhodia | Drill Contractor O'Keefe

Project Name Rhodia RFI Groundwater | Drill Method HSA

Number 26/46-006 | Drilling Started 9/28/06 Ended 9/28/06 | Elevation 5327.2

Location Silver Bow, Montana | Logged By JAM2 | Total Depth 41.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		1	14-26-16-14	None None None	Dry	ML		TOPSOIL: Brownish black, organic-rich silty topsoil with angular, fine to coarse-grained gravel.	6" Steel Protop with Vented Cap	
						SP-SM		SILTY SAND: Dark brown, poorly sorted silty sand with gravel. Unit is homogeneous and mica-rich. Grains are angular to sub-rounded.		5325
		2	16-17-18-16	None None None	Dry	SM				
5		3	12-16-29-36	None None None	Dry	SP-SM			3' ags-17 'bgs: 2" Sch 40 PVC Riser	
									0-12.1': Neat Cement Grout	
		4	17-24-42-25	None None None	Moist	ML SM		SILT: Dark brown silt with fine gravel and sand. Sample has low dry strength, rapid dilatancy, low toughness and elasticity.		5320
				None None None	Moist	ML SM		SILTY SAND: Dark brown, poorly sorted silty sand with gravel. From 8 to 10' bgs, sample is a very heterogeneous mixture of silt with a trace of clay, fine to coarse-grained sand and angular, fine gravel. Unit becomes more silt rich with depth.		
10		6	6-6-8-12	None None None	Moist	ML		SILT: Dark brown silt with iron staining throughout.		
						SP-SM		SAND with SILT: Predominantly dark brown, poorly sorted, fine to coarse-grained sand with fine gravel and varying percentages of silt.		5315
		7	9-11-13-18	None None None	Slightly Moist	ML SM			12.1-14.9': Bentonite Well Seal	
15		8	11-11-13-10	None None None	Slightly Moist	SM		Interbedded lenses of increased silt (g/s/f=10/10/80) less than one inch thick throughout from 14 to 20' bgs.		
		9	10-12-14-14	None None None	Slightly Moist	SP			14.9-41': Sand Pack, 20/40 Sand	5310
		10	10-13-14-16	None None None	Dry					
20		11	6-7-9-21	None None None	Moist	CL		CLAY: Light brownish gray, lean clay with fine-grained sand. Unit has moderate dry strength, rapid dilatancy, medium toughness, and low to medium plasticity.		
						SM				5305
			8-13-	None		ML		SILT: Dark brown clayey silt with fine gravel. Unit is homogeneous and mica-rich.		
								(continued)		

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Ann Arbor, MI 48103
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Remarks:

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ENVIRO LOG 5 (5/27/04) 2646006.GPJ BARRLOG.GDT 6/4/07

LOG OF BORING MW-06-10

Client Rhodia
Project Name Rhodia RFI Groundwater
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor O'Keefe
Drill Method HSA
Drilling Started 9/28/06 Ended 9/28/06
Logged By JAM2

Elevation 5327.2
Total Depth 41.0

DEPTH FEET	SAMP. NUMBER	SAMP. LENGTH & RECOVERY	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
	12		21-40	None None	Moist			SILT: Dark brown clayey silt with fine gravel. Unit is homogeneous and mica-rich.*(continued)*	17-37': 2"X10' Sch 40 PVC 0.010 Slot Screen	5300
30	13		11-15-26-42	None None None	Very Moist to Saturated					
						ML				5295
35	14		16-11-19-32	None None None	Very Moist					
										5290
40	15		14-18-32-46	None None None	Very Moist			Sand-rich slough at top of sample from 39 to 41' bgs.		
								End of Boring - 41 feet		5285
45										
										5280

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Remarks:

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LOG OF BORING MW-06-11

SHEET 1 OF 2

Client Rhodia | Drill Contractor O'Keefe

Project Name Rhodia RFI Groundwater | Drill Method HSA

Number 26/46-006 | Drilling Started 10/1/06 Ended 10/1/06 | Elevation 5328.3

Location Silver Bow, Montana | Logged By JAM2 | Total Depth 31.4

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		1	19-22-22-15	None None None	Dry	ML		SILT with SAND and GRAVEL: Dark grayish brown silt with fine-grained sand and fine-grained, angular gravel. Sample has low to no dry strength, rapid dilatancy, low toughness and low plasticity. Unit is moderately well cemented.	6" Steel Protop with Vented Cap	
		2	18-22-24-27	None None None	Dry			SILT: Grayish brown to whitish brown silt with a trace of clay. Unit is homogeneous. Unit from 3 to 6' bgs is moderately well cemented.	0-5': Neat Cement Grout	5325
5		3	18-26-36-33	None None None	Dry			Iron staining observed from 5.5 to 6' bgs and 8 to 10' bgs.	3' ags-9.5' bgs: 2" Sch 40 PVC Riser	
		4	16-33-50->50	None None None	Dry			Sample has abundant white precipitate throughout from 6 to 10' bgs.	5-6.7': Bentonite Well Seal	
		5	12-12-12-14	None None None	Moist	ML		Sample has iron staining from 8 to 10' bgs.		5320
10		6	3-4-6-7	None None None	Moist			Clay content increases slightly to approximately 10%. Unit is somewhat cohesive and clay has low plasticity.		
		7	5-6-6-13	None None None	Moist			Increased fine-grained sand content observed from 13.5 to 14' bgs.		5315
15		8	7-9-7-7	None None None	Very Moist	SM		SILTY SAND: Dark brown, fine to coarse-grained silty sand. Gravel is fine-grained and angular to sub-round. Sand is angular to sub-round. Unit is homogeneous and poorly sorted.	6.7-31.4': Sand Pack, 20/40 Sand	
		9	15-16-8-11	None None None	Very Moist Saturated Very Moist	ML SM ML		SILT: Dark greenish brown silt; homogeneous and mica-rich. SILTY SAND: Poorly sorted, fine to coarse-grained silty sand with fine-grained, angular gravel.		5310
		10	8-5-6-9	None None None	Saturated Very Moist	SM ML		SILT: Silt with fine-grained sand and gravel. Unit is homogeneous and mica-rich. SILTY SAND: Dark reddish brown, poorly sorted, fine to coarse-grained silty sand with fine to *(continued)*	9.5-29.5': 2"X20' Sch 40 PVC 0.010 Slot	

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Remarks:

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LOG OF BORING MW-06-11

Client Rhodia
Project Name Rhodia RFI Groundwater
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor O'Keefe
Drill Method HSA
Drilling Started 10/1/06 Ended 10/1/06
Logged By JAM2

Elevation 5328.3
Total Depth 31.4

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
								coarse-grained, angular gravel.	Screen	
		11	6-6-8-10	None None None	Moist	ML		SILT: Dark brown silt with fine-grained sand and trace gravel. Unit is homogeneous.*(continued)* Dark grayish brown silt with fine-grained sand and angular gravel from 20 to 22' bgs. Unit is homogeneous with gravel size pieces of well cemented silt throughout sample.		5305
					Saturated	SM		SILTY SAND: Fine to coarse-grained silty sand and fine-grained, angular gravel. Unit is homogeneous and poorly sorted.		
25		12	9-14-23-24	None None None	Moist	ML		SILT: Homogeneous silt, as above, from 24.5 to 26' bgs.		
						SM		SILTY SAND: Fine to coarse-grained silty sand with gravel. Gravel is angular to sub-round. Unit is homogeneous, poorly sorted and mica-rich.		5300
30		13	10-11-19-31	None None None	Saturated					
								End of Boring - 31.4 feet		5295
35										5290

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Remarks:

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LOG OF BORING MW-06-12

Client Rhodia | Drill Contractor O'Keefe

Project Name Rhodia RFI Groundwater | Drill Method HSA

Number 26/46-006 | Drilling Started 10/1/06 Ended 10/13/06 | Elevation 5335.4

Location Silver Bow, Montana | Logged By KAM/MMB | Total Depth 191.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
								GRASS	6" Steel Protop with Vented Cap	5335
		1	11-21-15-19	None None None	Dry	SM		SILTY SAND: Dark brown, fine to coarse-grained sand and trace lower fine gravel. Sample has approximately 40% fines and angular to sub-round grains/clasts.		
		2	11-8-7-7	None None None	Dry	ML		SILT with SAND: Pale yellow to light yellowish brown silt with approximately 20% fine to coarse-grained sand and 3% lower fine gravel. Sample has angular to sub-round grains. Percentage of sand and gravel decreases with depth.	2.5' ags-167' bgs: 2" Sch 40 PVC Riser	
5		3	8-8-12-12	None None None	Dry			SILT: Gray to light grayish brown silt with trace fine-grained sand. Sample is homogeneous, non-cohesive and soft.		5330
		4	9-9-12-15	None None None	Dry Moist	ML		A few fine to coarse, angular rhyolite gravel pieces observed between 6 to 8' bgs.		
		5	11-18-24-21	None None None	Moist			Percentage of sand increases below 8' bgs.		
10		6	12-13-17-21	None None None	Moist	ML		SANDY SILT: Gray to light brownish gray, soft sandy silt. Sample has approximately 25% fine-grained sand with trace medium to coarse-grained sand and lower fine mudstone gravel. A few near horizontal, weakly cemented laminations observed.		5325
		7	8-8-9-9	None None None	Moist			SILT: Gray to light grayish brown silt with trace fine-grained sand and a few mudstone gravel pieces. Sample is firm and friable. A few weakly cemented lenses observed throughout.		
15		8	6-5-4-8	None None None	Moist					5320
		9	10-8-9-8	None None None	Moist	ML		Color grades to gray then olive gray by 16' bgs.		
		10	2-3-3-3	None None None	Moist Very Moist			Color grades to light gray by 18' bgs and becomes weakly cemented. Sample preferentially fractures on a near horizontal plane. A few oxidation halos observed around fine-grained sand.		

(continued)

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450 S. Wagner Road
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Remarks: Samples were collected using a 3 inch split spoon from 0 to 14' bgs and a 2 inch split spoon from 14 to 191' bgs.

Additional data may have been collected in the field which is not included on this log.

LOG OF BORING MW-06-12

Client Rhodia | Drill Contractor O'Keefe

Project Name Rhodia RFI Groundwater | Drill Method HSA

Number 26/46-006 | Drilling Started 10/1/06 Ended 10/13/06 | Elevation 5335.4

Location Silver Bow, Montana | Logged By KAM/MMB | Total Depth 191.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
								SILT: Gray to light grayish brown silt with trace fine-grained sand and a few mudstone gravel pieces. Sample is firm and friable. A few weakly cemented lenses observed throughout.*(continued)*		5315
25		11	7-16-17-23	None None None	Wet			Olive gray silt with trace fine to coarse-grained sand and trace lower fine gravel. Sample is homogeneous, non-cohesive and firm to hard.		5310
30		12	14-19-24-37	None None None	Wet	ML		Color becomes gray to olive gray.		5305
35		13	19-14-12-20	None None None	Wet			A few pulverized, weak to moderately cemented zones in sample. Trace clay observed in the interstitial spaces. Sample preferentially fractures on a near horizontal plane.		5300
			11-12-	None				Clay fraction increases, very low cohesiveness observed. *(continued)*		

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Remarks: Samples were collected using a 3 inch split spoon from 0 to 14' bgs and a 2 inch split spoon from 14 to 191' bgs.

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LOG OF BORING MW-06-12

Client Rhodia | Drill Contractor O'Keefe

Project Name Rhodia RFI Groundwater | Drill Method HSA

Number 26/46-006 | Drilling Started 10/1/06 Ended 10/13/06 | Elevation 5335.4

Location Silver Bow, Montana | Logged By KAM/MMB | Total Depth 191.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		14	14-16	None None	Wet			SILT: Gray to light grayish brown silt with trace fine-grained sand and a few mudstone gravel pieces. Sample is firm and friable. A few weakly cemented lenses observed throughout.*(continued)*		5295
45		15	7-11-16-21	None None None	Wet	ML		A few weakly cemented, fine, gravel size pieces of silt observed.		5290
50		16	14-9-10-19	None None None	Wet	CL/ML		SILTY CLAY: Brown to grayish brown silty clay with approximately 10% fine to coarse-grained sand and lower fine, angular mudstone gravel pieces. Sample is cohesive, soft, and has low toughness. Sample has a few moderately cemented mudstone lenses.		5285
55		17	11-9-11-16	None None None	Wet	GC		CLAYEY GRAVEL: Brown, soft clayey gravel with approximately 45 to 50% fine to coarse-grained gravel and 5 to 10% fine to coarse-grained sand. Sample has angular to sub-round clasts.		5280
		18	9-8-9-21	None None None	Wet			A few silty gravel lenses observed throughout. *(continued)*		

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Remarks: Samples were collected using a 3 inch split spoon from 0 to 14' bgs and a 2 inch split spoon from 14 to 191' bgs.

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LOG OF BORING MW-06-12

Client Rhodia | Drill Contractor O'Keefe

Project Name Rhodia RFI Groundwater | Drill Method HSA

Number 26/46-006 | Drilling Started 10/1/06 Ended 10/13/06 | Elevation 5335.4

Location Silver Bow, Montana | Logged By KAM/MMB | Total Depth 191.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
								CLAYEY GRAVEL: Brown, soft clayey gravel with approximately 45 to 50% fine to coarse-grained gravel and 5 to 10% fine to coarse-grained sand. Sample has angular to sub-round clasts.*(continued)*		5275
65		19	14-19-28-50/0.4	None None None	Wet	GC				5270
70		20	36-41-39-50/0.4	None None None	Wet Moist					5265
75		21	17-22-32-36	None None None	Moist to Wet	CL/ML		SILTY CLAY or CLAYEY SILT: Brown to light olive brown, firm, silty clay to clayey silt with approximately 10 to 15% fine to coarse-grained, sand size pieces and 3 to 5% lower fine, gravel size pieces of claystone/mudstone. Sample has low to moderate plasticity and low to moderate toughness. Some weak to moderately cemented layers appear wet with some black secondary mineralization observed on the faces of the gravel size pieces. Percentage of clay fraction of fines increase with depth.	0-155': Neat Cement Grout	5260
			16-23-	None		CL/ML		*(continued)*		

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450 S. Wagner Road
Ann Arbor, MI 48103
Telephone: 1-800-270-5017
Fax: 734-327-1212

Remarks: Samples were collected using a 3 inch split spoon from 0 to 14' bgs and a 2 inch split spoon from 14 to 191' bgs.

Additional data may have been collected in the field which is not included on this log.

ENVIRO LOG 5 (5/27/04) 2646006.GPJ BARRLOG.GDT 6/4/07

LOG OF BORING MW-06-12

Client Rhodia | Drill Contractor O'Keefe

Project Name Rhodia RFI Groundwater | Drill Method HSA

Number 26/46-006 | Drilling Started 10/1/06 Ended 10/13/06 | Elevation 5335.4

Location Silver Bow, Montana | Logged By KAM/MMB | Total Depth 191.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		22	32-50	None None	Moist			SILTY CLAY: Brown, firm silty clay with approximately 15% fine to coarse-grained, sand size and 3% lower fine, gravel size pieces of claystone/mudstone. Sample has moderate plasticity and low to moderate toughness.*(continued)*		5255
85		23	37-66-58-76	None None None	Moist			Soil becomes yellowish brown in color and grades to grayish brown by 85.7' bgs.		5250
90		24	28-39-59-133	None None None	Moist	CL/ML		Soil is brown to yellowish brown in color.		5245
95		25	17-36-57-65	None None None	Moist			Light yellowish brown to yellowish brown in color with approximately 10% fine to coarse-grained, sand size and trace fine, gravel size pieces of claystone/mudstone.		5240
			26-55-	None				Percentage of fine to coarse-grained sand increases to approximately 15%. *(continued)*		

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LOG OF BORING MW-06-12

Client Rhodia | Drill Contractor O'Keefe

Project Name Rhodia RFI Groundwater | Drill Method HSA

Number 26/46-006 | Drilling Started 10/1/06 Ended 10/13/06 | Elevation 5335.4

Location Silver Bow, Montana | Logged By KAM/MMB | Total Depth 191.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		26	105-150/0.3	None None	Moist			SILTY CLAY: Brown, firm silty clay with approximately 15% fine to coarse-grained, sand size and 3% lower fine, gravel size pieces of claystone/mudstone. Sample has moderate plasticity and low to moderate toughness.*(continued)* A 2 mm lamination of black, coarse-grained sand, oriented 10 degrees from horizontal, observed at 100.6' bgs. Silty clay is oxidized and strong brown for 2 to 3 mm above and below the sand lamination.		5235
105		27	20-37-52-59	None None None	Very Moist Moist			Some gravel is very moist along exposed faces when the sample is broken open by hand. Sample is soft to firm and has a few pieces of pale green mudstone/claystone.		5230
110		28	11-45-60-71	None None None	Very Moist	CL/ML				5225
115		29	25-32-59-68	None None None	Very Moist					5220
			15-27-	None				Color becomes light yellowish brown to yellowish brown. *(continued)*		

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LOG OF BORING MW-06-12

Client Rhodia | Drill Contractor O'Keefe

Project Name Rhodia RFI Groundwater | Drill Method HSA

Number 26/46-006 | Drilling Started 10/1/06 Ended 10/13/06 | Elevation 5335.4

Location Silver Bow, Montana | Logged By KAM/MMB | Total Depth 191.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		30	40-59	None None	Moist			SILTY CLAY: Brown, firm silty clay with approximately 15% fine to coarse-grained, sand size and 3% lower fine, gravel size pieces of claystone/mudstone. Sample has moderate plasticity and low to moderate toughness.*(continued)*		5215
125		31	54-66-82-158	None None None	Moist	CL/ML		Approximately 3% fine to coarse-grained, sand size clay nodules.		5210
130		32	18-31-56-82	None None None	Moist	CL/ML		SILTY CLAY with SAND or CLAYEY SILT with SAND: Light grayish brown, approximately 30% fine to coarse-grained, sand size and trace fine, gravel size, weakly cemented, angular clay fragments. A few moderate to well cemented horizontal layers of mudstone displaying black secondary mineralization along fractures observed at 129.6' bgs. Hard, round clay balls, up to 5 mm in diameter, observed below 130.3' bgs. Sample is cohesive with very low plasticity and toughness only when wetted.		5205
135		33	18-32-54-81	None None None	Moist	CL/ML		SILTY CLAY with SAND: Yellowish brown, firm silty clay with approximately 15% fine to coarse-grained sand and trace to 5% fine gravel. Sand and gravel are mostly weak to well cemented mudstone/claystone, some of which appear mottled with pale green. Sample has angular to sub-round grains/clasts.		5200
			11-12-	None				*(continued)*		

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LOG OF BORING MW-06-12

Client Rhodia | Drill Contractor O'Keefe

Project Name Rhodia RFI Groundwater | Drill Method HSA

Number 26/46-006 | Drilling Started 10/1/06 Ended 10/13/06 | Elevation 5335.4

Location Silver Bow, Montana | Logged By KAM/MMB | Total Depth 191.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		34	22-109	None None	Moist	CL/ML		SILTY CLAY with SAND: Yellowish brown, firm silty clay with approximately 15% fine to coarse-grained sand and trace to 5% fine gravel. Sand and gravel are mostly weak to well cemented mudstone/claystone, some of which appear mottled with pale green. Sample has angular to sub-round grains/clasts.*(continued)*		5195
145		35	20-18-29-37	None None None	Moist	CL		CLAY or CLAYEY SILT: Yellowish brown, low plasticity clay or clayey silt with approximately 15% fine sand. Sample is homogeneous and moderately well cemented. Core contains approximately 20% very well cemented zones, 1 to 2" thick.		5190
150		36	29-51-62-79	None None None	Moist Wet Moist	CL		SANDY LEAN CLAY: Sandy lean clay with approximately 5% fine-grained gravel and 25% fine to coarse-grained sand from 149 to 149.6' bgs. From 149.6 to 151', interval has approximately 1% fine-grained gravel and 15% fine to medium-grained sand observed with trace pale green to gray mottles, 0.1 to 1 cm in diameter.		5185
155		37	22-44-91-200/4	None None None	Moist			Brown sandy lean clay with 15 to 20% fine-grained sand and approximately 2% pebble size hardened silt nodules. An irregular sand bleb (approximately 3 cm in diameter) observed with a pale gray rind (approximately 2 mm).		5180
			34-40-	None				As above, but yellowish brown and moderately cemented. A 1 to 2" thick medium to coarse-grained sand *(continued)*		

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LOG OF BORING MW-06-12

Client Rhodia | Drill Contractor O'Keefe

Project Name Rhodia RFI Groundwater | Drill Method HSA

Number 26/46-006 | Drilling Started 10/1/06 Ended 10/13/06 | Elevation 5335.4

Location Silver Bow, Montana | Logged By KAM/MMB | Total Depth 191.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		38	83-193	None None	Moist			seam overlying a 2 to 3" thick well cemented, clayey silt seam observed from 159.2 to 159.5' bgs.	155-165': Bentonite Well Seal	5175
						CL				
165		39	22-43-74-130	None None None	Moist Wet Moist			Brown sandy lean clay with up to 15% gravel content from 164.0 to 164.4' bgs. Moderate to well cemented sandy lean clay observed with trace silt nodules.		5170
									165-189': Sand Pack, 20/40 Sand	
								LEAN CLAY with SAND: Brown lean clay with 15% fine to medium-grained sand and less than 1% fine-grained gravel or well cemented nodules. Sample is homogeneous.		
170		40	25-57-111-150/3	None None None	Dry to Moist	CL				5165
175		41	36-85-123-150/3	None None None	Moist to Very Moist	SP		POORLY GRADED SAND with SILT: Light gray fine-grained sand with approximately 10% silt. Sample has trace mottled oxidation staining and low cementation.		5160
									167-187': 2"X20' Sch 40 PVC 0.010 Slot Screen	
						ML		SILT: Light yellowish brown silt with approximately 20% fine-grained sand. Sample is homogeneous and non-plastic.		
			23-37-	None	Moist to			*(continued)*		

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ENVIRO LOG 5 (5/27/04) 2646006.GPJ BARRLOG.GDT 6/4/07

LOG OF BORING MW-06-12

Client Rhodia | Drill Contractor O'Keefe

Project Name Rhodia RFI Groundwater | Drill Method HSA

Number 26/46-006 | Drilling Started 10/1/06 Ended 10/13/06 | Elevation 5335.4

Location Silver Bow, Montana | Logged By KAM/MMB | Total Depth 191.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		42	86-150/3	None None	Very Moist	ML		SILT: Light yellowish brown silt with approximately 20% fine-grained sand. Sample is homogeneous and non-plastic.*(continued)*		5155
185		43	27-53-153-150/3	None None None	Moist	CL		LEAN CLAY with SAND: Light yellowish brown lean clay with sand. Sample has trace (less than 1%) coarse-grained sand pieces of various colors - reddish, white, and yellow. Sample is homogeneous and has moderate cementation. Material appears to have thin (less than 1 mm) horizontal and vertical angular fractures from 184.5 to 185.5' bgs. These faces are shiny with moisture.		5150
190		44	26-36-63-150/4	None None None	Moist			End of Boring - 191 feet		5145
195										5140

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LOG OF BORING MW-06-13

Client Rhodia | Drill Contractor O'Keefe

Project Name Rhodia RFI Groundwater | Drill Method HSA

Number 26/46-006 | Drilling Started 10/2/06 Ended 10/2/06 | Elevation 5327.5

Location Silver Bow, Montana | Logged By JAM2 | Total Depth 29.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		1	42-44-25-31	None None None	Dry			SILT with GRAVEL and SAND: Silt with angular gravel and cobbles, and fine-grained sand. Color grades from black at 0' to dark brown at 2' bgs. Unit is homogeneous and well cemented. Roots/organic matter observed from 0 to 1' bgs.	6" Steel Protop with Vented Cap	
		2	33-50->50->50	None None None	Dry			Light grayish brown silt with angular gravel and cobbles, and fine-grained sand from 2 to 4' bgs. Unit is homogeneous with portions very well cemented. Sample has low to no dry strength, rapid dilatancy, low toughness and low plasticity. Streaks of white precipitate observed throughout sample.	3' ags-8' bgs: 2" Sch 40 PVC Riser 0-5.6': Neat Cement Grout	5325
5		3	29-44-38-42	None None None	Dry			Silt, as above, with reduced gravel and sand content from 4 to 10' bgs. Unit has abundant white precipitate.		
		4	24-36-45-42	None None None	Dry	ML		Color changes to dark brown from 6 to 10' bgs.	5.6-6.3': Bentonite Well Seal 6.3-29': Sand Pack, 20/40 Sand	5320
		5	23-28-32-36	None None None	Dry					
10		6	6-6-6-7	None None None	Moist			Clay content increases from 10 to 13.9' bgs. Unit has rapid dilatancy, moderate plasticity and moderate toughness.		
		7	6-7-34->50	None None None	Moist			Whitish gray, angular gravel and cobbles with fine to coarse-grained sand observed from 13.9 to 14' bgs. Unit is poorly sorted and may be broken cobble due to the high blow count.		5315
15		8	>50->50->50-22	None None None	Moist to Wet	SP-SM		GRAVEL and SAND with SILT: Poorly sorted, angular, fine to coarse-grained gravel and fine to coarse-grained sand with silt. Sample has a mottled appearance with color ranging from black to dark reddish brown. Upper portion of sample (approximately 1 inch) is grayish black crystalline rock broken into angular gravel and cobble size pieces.		
		9	13-12-13-11	None None None	Wet Moist	SP-SM ML		GRAVEL and SAND with SILT: Fine to coarse-grained, angular gravel and fine to coarse-grained sand. Sand is predominately quartz with angular to sub-round grains. Unit is poorly sorted and mica-rich.	8-28': 2"X20' Sch 40 PVC 0.010 Slot Screen	5310
		10	11-13-18-20	None None None	Moist			SILT: Light reddish brown silt with a trace of gravel and fine-grained sand. Unit is homogeneous. Silt becomes mica-rich at 18' bgs.		

(continued)

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450 S. Wagner Road
Ann Arbor, MI 48103
Telephone: 1-800-270-5017
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Remarks:

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ENVIRO LOG 5 (5/27/04) 2646006.GPJ BARRLOG.GDT 6/4/07

LOG OF BORING MW-06-13

Client Rhodia | Drill Contractor O'Keefe

Project Name Rhodia RFI Groundwater | Drill Method HSA

Number 26/46-006 | Drilling Started 10/2/06 Ended 10/2/06 | Elevation 5327.5

Location Silver Bow, Montana | Logged By JAM2 | Total Depth 29.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		11	12-18-24-33	None None None	Moist	ML		SILT: Light reddish brown silt with a trace of gravel and fine-grained sand. Unit is homogeneous.*(continued)* Sample has some (less than one inch) intervals that are wet from 20 to 22' bgs.		5305
25		12	12-18-22-28	None None None	Moist					
		13	14-20-21-34	None None None	Moist					5300
30								End of Boring - 29 feet		5295
35										5290

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450 S. Wagner Road
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Telephone: 1-800-270-5017
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Remarks:

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LOG OF BORING MW-06-14

Client Rhodia
Project Name Rhodia RFI Groundwater
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor O'Keefe
Drill Method HSA
Drilling Started 9/30/06 Ended 9/30/06
Logged By KAM

Elevation 5334.2
Total Depth 27.0

DEPTH FEET	SAMP. NUMBER	SAMP. LENGTH & RECOVERY	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
								GRASS	6" Steel Protop with Vented Cap	
	1		14-35-58-56	None None None	Dry	SM		SILTY SAND: Brown, fine-grained silty sand with 20% medium to coarse-grained sand, and trace lower fine gravel. Sample has approximately 20 to 25% fines and angular to sub-round grains/clasts.	0-2.5': Neat Cement Grout	
	2		25-37-43-49	None None None	Dry Moist	SM		SILTY SAND with GRAVEL: Pale brown to brown, fine to medium-grained silty sand with 20% coarse-grained sand and 15% fine gravel. Sample has approximately 15% fines and angular to sub-round grains/clasts. Gravel decreases with depth and fines increase with depth. Grades to clayey silt with sand (as described below) at approximately 3.5' bgs.	2.5' ags-7' bgs: 2" Sch 40 PVC Riser 2.5-5': Bentonite Well Seal	
5	3		26-44-56-59	None None None	Moist	ML		CLAYEY SILT with SAND: Light yellowish brown clayey silt with approximately 25% fine to coarse-grained sand and trace to 3% fine gravel. Angular to sub-round grains/clasts. Sample has very low cohesiveness and some mica present. Poor recovery of sample from 4 to 6' due to granitic cobble lodged in cutting shoe.		5330
	4		19-26-36-69	None None None	Moist				5-27': Sand Pack, 20/40 Sand	
	5		15-26-36-39	None None None	Moist			SILT with SAND: Yellowish brown silt with approximately 15% fine to coarse-grained sand and trace lower fine gravel. Sample is firm, non-cohesive, has angular to sub-round grains/clasts, and abundant mica.		5325
10	6		17-24-36-39	None None None	Moist			Higher clay fraction from 10 to 12' bgs with very low cohesiveness when wetted.		
	7		11-14-34-36	None None None	Moist Very Moist	ML				
								Low dilatancy and appears to be brown below the water table at 14' bgs.		5320
15	8		10-13-21-27	None None None	Wet					
	9		7-15-19-27	None None None	Wet				7-27: 2"X20' Sch 40 PVC 0.010 Slot Screen	
	10		9-15-22-27	None None None	Wet					5315

(continued)

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450 S. Wagner Road
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Remarks: Water table at approximately 14' bgs while drilling. Samples were collected using a 3 inch split spoon from 0 to 12' bgs and a 2 inch split spoon from 12 to 25' bgs.

Additional data may have been collected in the field which is not included on this log.

ENVIRO LOG 5 (5/27/04) 2646006.GPJ BARRLOG.GDT 6/4/07

LOG OF BORING MW-06-14

Client Rhodia
Project Name Rhodia RFI Groundwater
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor O'Keefe
Drill Method HSA
Drilling Started 9/30/06 Ended 9/30/06
Logged By KAM

Elevation 5334.2
Total Depth 27.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
25		11	7-7-15-24	None None None	Wet	ML		SILT with SAND: Yellowish brown silt with approximately 15% fine to coarse-grained sand and trace lower fine gravel. Sample is firm, non-cohesive, has angular to sub-round grains/clasts, and abundant mica.*(continued)*		5310
								End of Boring - 27 feet		
30										5305
										5300
35										5295

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Remarks: Water table at approximately 14' bgs while drilling. Samples were collected using a 3 inch split spoon from 0 to 12' bgs and a 2 inch split spoon from 12 to 25' bgs.

Additional data may have been collected in the field which is not included on this log.

ENVIRO LOG 5 (5/27/04) 2646006.GPJ BARRLOG.GDT 6/4/07

LOG OF BORING MW-06-15

SHEET 1 OF 3

Client Rhodia
Project Name Rhodia RFI Groundwater
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor O'Keefe
Drill Method HSA
Drilling Started 9/29/06 Ended 9/29/06
Logged By JAM2

Elevation 5349.6
Total Depth 46.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		1	33-29-13-16	None None None	Dry	ML		TOPSOIL: Dark black silty topsoil with angular cobbles and coarse-grained gravel. Cobbles and gravel are predominately slag material.	6" Steel Protop with Vented Cap	
						ML		SILT: Dark brown, homogeneous silt with gravel size pieces of slag material.		
		2	15-9-10-8	None None None	Moist			SILT: Primarily dark brown homogeneous silt with a trace of clay and variable fine gravel content (5 to 20%).	3' ags-22' bgs: 2" Sch 40 PVC Riser	
5		3	9-12-11-12	None None None	Slightly Moist					5345
		4	6-4-7-6	None None None	Moist	ML				
		5	5-4-6-6	None None None	Moist				0-17.6': Neat Cement Grout	
10		6	6-9-12-15	None None None	Saturated			Increased gravel content (approximately 20%) observed from 10 to 12' bgs.		5340
					Saturated					
		7	16-30-36-38	None None None	Moist			SILTY SAND: Dark brown, fine to medium-grained silty sand with fine to coarse-grained gravel and cobbles. Gravel is angular and easily broken with fingers. Unit is poorly sorted.		
15		8	38-46-38-31	None None None	Dry	SM				5335
		9	48-45-48-18	None None None	Dry			Majority of sample is broken pieces of granite and black crystalline rock from 16 to 18' bgs.		
		10	10-12-14-16	None None None	Slightly Moist	ML		SILT: Dark yellowish brown silt with fine-grained sand and fine-grained, angular gravel. Unit is homogeneous, mica-rich and has low dry strength, rapid dilatancy, low toughness and plasticity.	17.6-19.9': Bentonite Well Seal	5330
								(continued)		

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Remarks:

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LOG OF BORING MW-06-15

Client Rhodia | Drill Contractor O'Keefe

Project Name Rhodia RFI Groundwater | Drill Method HSA

Number 26/46-006 | Drilling Started 9/29/06 Ended 9/29/06 | Elevation 5349.6

Location Silver Bow, Montana | Logged By JAM2 | Total Depth 46.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		11	11-14-17-17	None None None	Dry	ML SM		SILTY SAND: Dark reddish brown, fine to coarse-grained silty sand with fine-grained gravel. Unit is poorly sorted and appears oxidized.	19.9-46': Sand Pack, 20/40 Sand	
25		12	14-17-20-24	None None None	Moist			SILT: Dark reddish brown silt with fine-grained sand. Unit is homogeneous and has low dry strength, rapid dilatancy, low toughness and plasticity.		5325
30		13	10-15-20-28	None None None	Very Moist Saturated Very Moist	ML			22.5-42.5': 2"X20' Sch 40 PVC 0.010 Slot Screen	5320
35		14	10-18-26-33	None None None	Very Moist					5315
			17-26-	None		ML		*(continued)*		5310

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Remarks:

Additional data may have been collected in the field which is not included on this log.

LOG OF BORING MW-06-15

Client Rhodia | Drill Contractor O'Keefe

Project Name Rhodia RFI Groundwater | Drill Method HSA

Number 26/46-006 | Drilling Started 9/29/06 Ended 9/29/06 | Elevation 5349.6

Location Silver Bow, Montana | Logged By JAM2 | Total Depth 46.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		15	50-50	None None	Saturated	ML		SILT: Dark brown silt with fine-grained, angular gravel and fine-grained sand. Unit is homogeneous and mica-rich. Unit has increased gravel content (approximately 25%) from 39 to 39.2' and 40.8 to 41' bgs. A sand-rich slough observed at the top of 39 to 41' and 44 to 46' samples.*(continued)*		
45		16	11-20-36-48	None None None	Saturated			End of Boring - 46 feet		5305
50										5300
55										5295
										5290

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Remarks:

Additional data may have been collected in the field which is not included on this log.

LOG OF BORING MW-06-16

Client Rhodia | Drill Contractor O'Keefe

Project Name Rhodia RFI Groundwater | Drill Method HSA

Number 26/46-006 | Drilling Started 9/30/06 Ended 10/1/06 | Elevation 5343.7

Location Silver Bow, Montana | Logged By KAM | Total Depth 37.5

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
								GRASS	6" Steel Protop with Vented Cap	
		1	15-27-43-69	None None None	Dry	SM		SILTY SAND: Brown, fine-grained silty sand with 20% medium to coarse-grained sand and 3% fine gravel. Sample has approximately 25% fines and angular to sub-round grains/clasts.		
		2	30-31-31-36	None None None	Dry	SC		CLAYEY SAND: Light yellowish brown, hard, fine to medium-grained sand with 15% coarse-grained sand and 3% lower fine gravel. Sample has approximately 40% fines, angular to sub-round grains/clasts, and low cohesiveness when wetted.	2.5' ags-17.5' bgs: 2" Sch 40 PVC Riser	5340
5		3	30-26-21-21	None None None	Dry	SM		SILTY SAND: Light yellowish brown to pale brown, fine to medium-grained sand with 20% coarse-grained sand and 10% fine gravel. Sample has approximately 15% fines, angular to sub-round grains/clasts, and some mica present.		
		4	7-16-19-26	None None None	Moist			SILT: Yellowish brown silt with approximately 5% fine to medium-grained sand, trace coarse-grained sand, and lower fine gravel. Sample has angular to sub-round grains/clasts. Sample is firm to hard and homogeneous.	0-12.5': Neat Cement Grout	
		5	14-26-22-25	None None None	Moist	ML				5335
10		6	9-14-14-21	None None None	Moist					
		7	12-16-17-21	None None None	Moist			SILT with SAND: Yellowish brown silt with approximately 15% fine to coarse-grained sand and trace lower fine gravel. Sample is firm and homogeneous. Sample has abundant mica and very low cohesiveness when wetted.	12.5-14.5': Bentonite Well Seal	5330
15		8	9-12-22-28	None None None	Moist	ML			14.5-37.5': Sand Pack, 20/40 Sand	
		9	16-16-12-20	None None None	Moist	SP		POORLY GRADED SAND: Light yellowish brown, fine to coarse-grained, 3 to 5% lower fine gravel, and 3 to 5% fines.		
						CL/CH		SILTY CLAY: Light yellowish brown silty clay with approximately 5 to 10% fine to coarse-grained sand, and approximately 5% fine, gravel size pieces of clay nodules and mudstone.		5325
		10	12-16-32-30	None None None	Moist	SM				

(continued)

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Remarks: Samples were collected using a 3 inch split spoon from 0 to 10' bgs and a 2 inch split spoon from 10 to 35' bgs.

Additional data may have been collected in the field which is not included on this log.

ENVIRO LOG 5 (5/27/04) 2646006.GPJ BARRLOG.GDT 6/4/07

LOG OF BORING MW-06-16

Client Rhodia
Project Name Rhodia RFI Groundwater
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor O'Keefe
Drill Method HSA
Drilling Started 9/30/06 Ended 10/1/06
Logged By KAM

Elevation 5343.7
Total Depth 37.5

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
						SM		SILTY SAND: Yellowish brown, very fine to fine-grained sand with trace medium to coarse-grained sand and 30% fines. Sample coarsens with depth to 20% medium to coarse-grained and 5% lower fine gravel. Fines decrease with depth.*(continued)*		
		11	10-19-20-19	None None None	Moist to Very Moist	SP		POORLY GRADED SAND: Yellowish brown, fine to medium-grained sand with 20% coarse-grained sand, trace lower fine gravel, 5 to 7% fines, and angular to sub-round grains/clasts.		5320
25								SILT with SAND: Yellowish brown silt with approximately 15% fine to coarse-grained sand and trace lower fine gravel. Sample is non-cohesive and firm. Sample has angular to sub-round grains/clasts and abundant mica.	17.5-37.5': 2"x20' Sch 40 PVC 0.010 Slot Screen	
		12	9-10-19-36	None None None	Wet			Soil is soft to firm.		5315
30						ML				
		13	9-17-26-35	None None None	Wet			Sample is dark yellowish brown in color, and has very low cohesiveness and low dilatancy. A fine to coarse-grained sand lens with 3% lower fine gravel observed from 34.6 to 34.9' bgs.		5310
35								End of Boring - 37.5 feet		5305

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Remarks: Samples were collected using a 3 inch split spoon from 0 to 10' bgs and a 2 inch split spoon from 10 to 35' bgs.

Additional data may have been collected in the field which is not included on this log.

ENVIRO LOG 5 (5/27/04) 2646006.GPJ BARRLOG.GDT 6/4/07

LOG OF BORING MW-06-17

SHEET 1 OF 3

Client Rhodia
Project Name Rhodia RFI Groundwater
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor O'Keefe
Drill Method HSA
Drilling Started 9/30/06 Ended 9/30/06
Logged By JAM2

Elevation 5345.9
Total Depth 41.1

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		1	32-25-22-24	None None None	Dry			SLAG: Light whitish gray silt with abundant angular and coarse gravel size pieces of slag material. Slag material is very porous.	6" Steel Protop with Vented Cap	5345
		2	28->50->50->50	None None None	Dry	ML		SILT: Dark brown silt with fine-grained sand and fine to coarse-grained angular gravel. Unit is homogeneous. Poor recovery (likely cobble) from 2 to 4' bgs.	3' ags-19.8' bgs: 2" Sch 40 PVC Riser	
5		3	8-11-11-15	None None None	Dry	SM		SILTY SAND: Dark brown, well sorted, fine-grained silty sand with fine-grained gravel. Unit is homogeneous.		
		4	20-48-46-37	None None None	Dry	ML		SILT: Dark brown silt with fine to coarse-grained sand and fine to coarse-grained gravel. Unit is homogeneous.		5340
		5	18-17-18-26	None None None	Dry	SW-SM		SAND with SILT: Grayish brown, fine to coarse-grained sand with fine to coarse-grained, angular gravel and cobbles. Unit is poorly sorted. Gravel and cobbles consist mostly of granite.	0-14.4': Neat Cement Grout	
10		6	16-19-27-33	None None None	Dry	ML		SILT: Dark brown silt with gravel and fine-grained sand. Unit is homogeneous and mica-rich. Sample has low dry strength, rapid dilatancy, low toughness and plasticity. Thin (less than 1/2") white laminations throughout sample from 10 to 12' bgs.		5335
		7	11-18-22-26	None None None	Moist					
15		8	16-20-30-26	None None None	Slightly Moist			SILTY SAND: Light grayish brown to light brown, poorly sorted, fine to coarse-grained silty sand with fine-grained and angular gravel. Unit is generally mica-rich and homogeneous.	14.4-16.4': Bentonite Well Seal	5330
		9	18-18-26-19	None None None	Dry	SM			16.4-41.1': Sand Pack, 20/40 Sand	
		10	30-34-28-30	None None None	Dry			Increased coarse-grained sand content from 18 to 20' bgs.		

(continued)

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Ann Arbor, MI 48103
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Remarks:

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ENVIRO LOG 5 (5/27/04) 2646006.GPJ BARRLOG.GDT 6/4/07

LOG OF BORING MW-06-17

Client Rhodia | Drill Contractor O'Keefe

Project Name Rhodia RFI Groundwater | Drill Method HSA

Number 26/46-006 | Drilling Started 9/30/06 Ended 9/30/06 | Elevation 5345.9

Location Silver Bow, Montana | Logged By JAM2 | Total Depth 41.1

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		11	29-36-43->50	None None None	Slightly Moist			SILTY SAND: Light grayish brown to light brown, poorly sorted, fine to coarse-grained silty sand with fine-grained and angular gravel. Unit is generally mica-rich and homogeneous.*(continued)* Decreased coarse-grained sand content and increased silt content from 20 to 22' bgs. Sample is well cemented from 21 to 22' bgs.		5325
25		12	28-36-42-46	None None None	Moist	SM		One inch lens of silt (g/s/f=5/10/85) observed at 25.8' bgs.		5320
30		13	8-11-15->50	None None None	Sat.				← 19.8-39.8': 2"x20' Sch 40 PVC 0.010 Slot Screen	5315
35		14	22-24-27-50	None None None	Moist	ML		SILT: Dark brown to dark reddish brown silt with fine-grained sand and fine-grained gravel. Unit is homogeneous and mica-rich. Sample has low dry strength, low toughness, low plasticity, and rapid dilatancy.		5310
			11-24-	None				*(continued)*		

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Ann Arbor, MI 48103
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Remarks:

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LOG OF BORING MW-06-17

Client Rhodia
Project Name Rhodia RFI Groundwater
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor O'Keefe
Drill Method HSA
Drilling Started 9/30/06 Ended 9/30/06
Logged By JAM2

Elevation 5345.9
Total Depth 41.1

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		15	42-46	None None	Moist	ML				5305
								End of Boring - 41.1 feet		
45										5300
50										5295
55										5290

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Ann Arbor, MI 48103
Telephone: 1-800-270-5017
Fax: 734-327-1212

Remarks:

Additional data may have been collected in the field which is not included on this log.

LOG OF BORING MW-06-18

Client Rhodia
Project Name Rhodia RFI Groundwater
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor O'Keefe
Drill Method HSA
Drilling Started 9/29/06 Ended 9/29/06
Logged By KAM

Elevation 5353.3
Total Depth 45.5

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		1	81-98-34-16	None None None	Dry	SM		SILTY SAND: Dark brown, fine-grained silty sand with 20% medium to coarse-grained sand and trace gravel. Sample has approximately 20% fines.	6" Steel Protop with Vented Cap	
						SM		SLAG: Appears as light gray silty sand and gravel.		
		2	7-8-10-21	None None None	Dry to Moist	CL		SILTY SAND: Very dark brown, very fine-grained silty sand with approximately 20% fines. SILTY CLAY with SAND: Brown, firm silty clay with approximately 20 to 30% fine to coarse-grained sand and 5% fine gravel. Percentage of sand increases with depth. Sample has angular to sub-round grains/clasts, low cohesiveness when wetted, and abundant mica.		5350
5		3	21-25-25-23	None None None	Moist	SC		CLAYEY SAND: Light yellowish brown clayey sand with approximately 50% fine to coarse-grained sand and 5% fine gravel. Sample has angular to sub-round grains/clasts, low cohesiveness, and is firm.	2.5' ags-25' bgs: 2" Sch 40 PVC Riser	
		4	19-20-23-24	None None None	Moist			SILT with SAND: Light yellowish brown silt with approximately 20% fine to coarse-grained sand and trace fine gravel. Clay fraction of fines increases with depth. Sample has angular to sub-round grains/clasts, very low to no cohesiveness, mica present, and is firm.		5345
		5	14-17-24-29	None None None	Moist					
10		6	21-29-39-50	None None None	Moist	ML		Color grades to yellowish brown below 10' bgs.	0-21': Neat Cement Grout	
		7	14-19-26-33	None None None	Moist					5340
15		8	14-19-26-33	None None None	Moist			Low cohesiveness below 14' bgs.		
		9	22-29-30-30	None None None	Moist	SP		POORLY GRADED SAND: Yellowish brown, fine to medium-grained sand with approximately 15 to 20% coarse-grained sand and 3% lower fine gravel. Sample has approximately 5 to 7% fines and angular to sub-round grains/clasts.		5335
		10	16-15-15-28	None None None	Moist	ML				

(continued)

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Fax: 734-327-1212

Remarks: Samples were collected using a 3 inch split spoon from 0 to 12' bgs and a 2 inch split spoon from 12 to 45' bgs.

Additional data may have been collected in the field which is not included on this log.

ENVIRO LOG 5 (5/27/04) 2646006.GPJ BARRLOG.GDT 6/4/07

LOG OF BORING MW-06-18

Client Rhodia | Drill Contractor O'Keefe

Project Name Rhodia RFI Groundwater | Drill Method HSA

Number 26/46-006 | Drilling Started 9/29/06 Ended 9/29/06 | Elevation 5353.3

Location Silver Bow, Montana | Logged By KAM | Total Depth 45.5

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
						ML		CLAYEY SILT: Brown to yellowish brown clayey silt with trace sand and lower fine gravel. Sample is homogeneous and firm to hard. Sample has low to moderate plasticity and toughness when wetted. *(continued)*	21-23': Bentonite Well Seal	
25		11	14-19-40-50	None None None	Moist	ML		SILT with SAND: Yellowish brown silt with approximately 20% fine-grained sand, trace medium to coarse-grained sand, and lower fine gravel. Sample has angular to sub-round grains/clast and abundant mica. Sample is friable in hand, firm to hard and becomes mottled with brown at depth.	23-45.5': Sand Pack, 20/40 Sand	5330
30		12	11-17-23-33	None None None	Very Moist	ML		CLAYEY SILT with SAND: Dark yellowish brown clayey sand with approximately 20% fine to coarse-grained sand and trace lower fine gravel. Sample has angular to sub-round grains/clasts, abundant mica, and is soft to firm. Sample has low plasticity and toughness		5325
		13	14-19-33-41	None None None	Moist					
35		14	11-19-30-50	None None None	Moist Very Moist to Wet	ML		SILT with SAND: Dark yellowish brown silt with approximately 15% fine to medium-grained sand, trace coarse-grained sand, and lower fine gravel. Sample has angular to sub-round clasts, very low to no cohesiveness, and is firm. Soil becomes soft to firm below approximately 35' bgs.	25-45': 2"x20' Sch 40 PVC 0.010 Slot Screen	5320
			12-23-	None				*(continued)*		5315

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Ann Arbor, MI 48103
Telephone: 1-800-270-5017
Fax: 734-327-1212

Remarks: Samples were collected using a 3 inch split spoon from 0 to 12' bgs and a 2 inch split spoon from 12 to 45' bgs.

Additional data may have been collected in the field which is not included on this log.

LOG OF BORING MW-06-18

Client Rhodia
Project Name Rhodia RFI Groundwater
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor O'Keefe
Drill Method HSA
Drilling Started 9/29/06 Ended 9/29/06
Logged By KAM

Elevation 5353.3
Total Depth 45.5

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		15	28-50/0.4	None None	Wet			SILT with SAND: Dark yellowish brown silt with approximately 15% fine to medium-grained sand, trace coarse-grained sand, and lower fine gravel. Sample has angular to sub-round clasts, very low to no cohesiveness, and is firm.*(continued)* Soil is soft from 40.1 to 40.8' bgs.		
						ML				5310
		16	16-23-38-50/0.4	None None None	Wet			Silt with approximately 30% fine to coarse-grained sand observed from 43 to 43.3' bgs.		
45										
								End of Boring - 45.5 feet		5305
50										5300
55										5295

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Fax: 734-327-1212

Remarks: Samples were collected using a 3 inch split spoon from 0 to 12' bgs and a 2 inch split spoon from 12 to 45' bgs.

Additional data may have been collected in the field which is not included on this log.

LOG OF BORING MW-06-19

SHEET 1 OF 3

Client Rhodia
Project Name Rhodia RFI Groundwater
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor O'Keefe
Drill Method HSA
Drilling Started 9/27/06 Ended 9/27/06
Logged By JAM2

Elevation 5353.3
Total Depth 46.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		1	42->50->50-40	None None None	Dry			SILT with GRAVEL and SAND: Dark grayish brown silt with gravel and fine-grained sand. The top six inches of the sample contains roots/organic material. Unit has few very well cemented sections. Unit is likely ore material.	6" Steel Protop with Vented Cap	
		2	23-40->50->50	None None None				SLAG: Grayish black, angular gravel and cobbles with fine to medium-grained sand and silt. Unit is heterogeneous and poorly sorted. Gravel and cobbles are very porous.		5350
5		3	27-44-50-42	None None None	Moist			FILL: Dark brown, heterogeneous mixture of fine-grained angular, gravel, medium to coarse-grained sand, silt and trace clay.	3' ags-22.2' bgs: 2" Sch 40 PVC Riser	
		4	27-36-24-28	None None None				SILT: Predominantly dark brown silt with varying percentages of gravel, sand and clay. Unit is homogeneous and mica-rich. Sample has low to no dry strength, low toughness, low to no plasticity, and rapid dilatancy.		
		5	24-36-39-36	None None None				Slightly increased sand (20%) and gravel (20%) content from 8 to 10' bgs. Interval has horizontal streaks of white precipitate throughout.		5345
10		6	25-34-46->50	None None None	Dry			Unit fines with depth and becomes harder from 10 to 12' bgs. Sample has white precipitate throughout.	0-18.2': Neat Cement Grout	
		7	28-42->50->50	None None None	Dry	ML		Increased clay content (5 to 10%) observed from 12 to 14'bgs.		5340
15		8	35-44->50->50	None None None	Dry					
		9	11-12-17-19	None None None	Dry					5335
		10	22-40-44-50	None None None	Dry				18.2-20.4': Bentonite Well Seal	

(continued)

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Remarks:

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ENVIRO LOG 5 (5/27/04) 2646006.GPJ BARRLOG.GDT 6/4/07

LOG OF BORING MW-06-19

Client Rhodia
Project Name Rhodia RFI Groundwater
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor O'Keefe
Drill Method HSA
Drilling Started 9/27/06 Ended 9/27/06
Logged By JAM2

Elevation 5353.3
Total Depth 46.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		11	26-30-36-40	None None None	Dry			SILT: Predominantly dark brown silt with varying percentages of gravel, sand and clay. Unit is homogeneous and mica-rich. Sample has low to no dry strength, low toughness, low to no plasticity, and rapid dilatancy.*(continued)* Increased clay content observed from 20 to 22' bgs.	20.4-46': Sand Pack, 20/40 Sand	5330
25		12	24-30-34-44	None None None	Moist Wet Moist					
										5325
30		13	16-21-40->50	None None None	Moist Dry	ML		Sample is soft from 29 to 30' bgs.	22.2-42.2': 2"x20' Sch 40 PVC 0.010 Slot Screen	
										5320
35		14	22-30-50->50	None None None	Moist Wet Moist			Entire run drilled soft from 34 to 36' bgs. Approximately two inches of sand-rich slough observed at the top of sample. Sand is poorly sorted, fine to coarse-grained, and angular to sub-rounded. Isolated lenses, 1 to 2 inches thick, are saturated from 36 to 38' bgs. Upper foot of sample is soft with two inches of sand-rich slough at the top.		
										5315
			16-21-	None	Moist			*(continued)*		

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Remarks:

Additional data may have been collected in the field which is not included on this log.

LOG OF BORING MW-06-19

Client Rhodia
Project Name Rhodia RFI Groundwater
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor O'Keefe
Drill Method HSA
Drilling Started 9/27/06 Ended 9/27/06
Logged By JAM2

Elevation 5353.3
Total Depth 46.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		15	38->50	None None	to Wet	ML		SILT: Predominantly dark brown silt with varying percentages of gravel, sand and clay. Unit is homogeneous and mica-rich. Sample has low to no dry strength, low toughness, low to no plasticity, and rapid dilatancy.*(continued)*		5310
45		16	23-38->50->50	None None None	Moist			End of Boring - 46 feet		5305
50										5300
55										5295

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450 S. Wagner Road
Ann Arbor, MI 48103
Telephone: 1-800-270-5017
Fax: 734-327-1212

Remarks:

Additional data may have been collected in the field which is not included on this log.

LOG OF BORING MW-06-20

SHEET 1 OF 3

Client Rhodia
Project Name Rhodia RFI Groundwater
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor O'Keefe
Drill Method HSA
Drilling Started 10/3/06 Ended 10/3/06
Logged By JAM2

Elevation 5355.9
Total Depth 46.2

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		1	36-750-750-750	None None None	Dry			FILL: Black silty topsoil with angular, coarse-grained gravel and debris throughout (insulation, metal, wire). Gravelly material does not appear to be slag. A piece of tin (approximately 2"x 2") was recovered in the cutting shoe. Some gravel size slag observed from 2 to 3' bgs.	6" Steel Protop with Vented Cap	5355
		2	38-50-35-23	None None None	Dry	ML		SILT with SAND: Dark yellowish brown silt with fine-grained sand and fine-grained, angular gravel. Unit is homogeneous and mica-rich.		
5		3	18-14-14-33	None None None	Dry			SANDY SILT: Dark yellowish brown, fine-grained sandy silt with fine-grained gravel. Unit is homogenous and mica-rich.	2.8' ags-26' bgs: 2" Sch 40 PVC Riser	
		4	14-20-41->50	None None None	Dry			Sandy silt, as above, with low to no dry strength, rapid dilatancy, low toughness and low plasticity from 5.8 to 7.8' bgs. A two inch cobble of dark black crystalline rock observed at the top of sample.		5350
		5	28-48->50->50	None None None	Dry			Sample has reduced sand and gravel content from 7.8 to 9.8' bgs. Gravel size pieces of well cemented silt observed throughout the sample.		
10		6	34-40->50->50	None None None	Dry			Sample is very hard and well cemented from 9.8 to 11.8' bgs.	0-21.5': Neat Cement Grout	5345
		7	44->50->50->50	None None None	Dry	ML				
		8	28-33-40-48	None None None	Dry			Silt with fine-grained gravel and sand, as above.		
15		9	30-37-42-50	None None None	Dry			Slightly darker color than above (dark reddish brown).		5340
		10	24-33-42->50	None None None	Dry			Sample from 17.8 to 19.8' interval is broken along horizontal planes and well cemented. Iron staining observed throughout from 17.8 to 25.8' bgs.		
								(continued)		

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450 S. Wagner Road
Ann Arbor, MI 48103
Telephone: 1-800-270-5017
Fax: 734-327-1212

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LOG OF BORING MW-06-20

Client Rhodia
Project Name Rhodia RFI Groundwater
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor O'Keefe
Drill Method HSA
Drilling Started 10/3/06 Ended 10/3/06
Logged By JAM2

Elevation 5355.9
Total Depth 46.2

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		11	18-21-38-44	None None None	Slightly Moist			SANDY SILT: Dark yellowish brown, fine-grained sandy silt with fine-grained gravel. Unit is homogenous and mica-rich. *(continued)*		5335
									21.5-23.8': Bentonite Well Seal	
25		12	26-38-32-31	None None None	Slightly Moist	ML			23.8-46.2': Sand Pack, 20/40 Sand	5330
30		13	14-13-25-31	None None None	Slightly Moist			SILTY SAND: Dark brown, fine to coarse-grained silty sand with gravel. Gravel is fine-grained and angular to sub-round. Sand is angular to sub-round. Unit is poorly sorted and mica-rich.		5325
					Saturated	SM				
35		14	22-24-29-40	None None None	Moist			SANDY SILT: Dark brown sandy silt with fine-grained, angular gravel. Unit is homogeneous and mica-rich. Sample has low to no dry strength, rapid dilatancy, low toughness and low plasticity.	26-46': 2"x20' Sch 40 PVC 0.010 Slot Screen	5320
						ML				
		15	23-27-	None None	Moist			Dark brown silt with fine-grained gravel and fine-grained sand from 38.8 to 40.8' bgs. unit is homogeneous and mica-rich. *(continued)*		

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LOG OF BORING MW-06-20

Client Rhodia
Project Name Rhodia RFI Groundwater
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor O'Keefe
Drill Method HSA
Drilling Started 10/3/06 Ended 10/3/06
Logged By JAM2

Elevation 5355.9
Total Depth 46.2

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
			31-40	None				SANDY SILT: Dark brown sandy silt with fine-grained, angular gravel. Unit is homogeneous and mica-rich. Sample has low to no dry strength, rapid dilatancy, low toughness and low plasticity.*(continued)*		5315
						ML				
45		16	21-36-30-37	None None None	Moist			Dark brown sandy silt with fine-grained gravel and medium to coarse-grained sand from 43.5 to 45.8' bgs. Sand is subangular to sub-rounded. Unit is homogeneous. One inch lens of increased sand content (approximately 60%) observed at 45.4' bgs.		5310
								End of Boring - 46.2 feet		
50										5305
55										5300

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450 S. Wagner Road
Ann Arbor, MI 48103
Telephone: 1-800-270-5017
Fax: 734-327-1212

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LOG OF Boring MW-06-21

SHEET 1 OF 4

Client Rhodia | Drill Contractor O'Keefe

Project Name Rhodia RFI Groundwater | Drill Method HSA

Number 26/46-006 | Drilling Started 10/11/06 Ended 10/12/06 | Elevation 5374.0

Location Silver Bow, Montana | Logged By MMB | Total Depth 72.4

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		1	44->50->50-46	None None None	Dry			TAILINGS and GRANULATED SLAG: Very dark gray, silt to fine-grained sand size tailings mixed and/or layered with light gray slag and up to 10% gravel. Slag is glassy, fine to coarse-grained and sand size.	6" Steel Protop with Vented Cap	
		2	27-30-33-28	None Strong Odor None	Dry to Slightly Moist			TAILINGS: Very dark gray clay with up to 30% silt and approximately 1% fine (less than 1 mm) white flecks. Sample has low plasticity and a pungent odor. Soil is smoking in air. Granulated slag and tailings from 4 to 4.5' bgs.	2.8' ags-51.5' bgs: 2" Sch 40 PVC Riser	5370
5		3	11-9-20-21	None Strong Odor None	Dry to Slightly Moist					
		4	20-23-20-17	None Strong Odor None	Dry to Slightly Moist			Dark green rind present from 6.8 to7' in approximately 1 cm irregular clumps appearing on less than 5% of the total matrix.		
		5	13-20-22-19	None Strong Odor None	Dry to Slightly Moist			TAILINGS: Very dark gray sandy silt that is non-plastic.		5365
10										
										5360
		6	7-10-9-5	None Strong Odor None None None None	Moist			TAILINGS: Lean clay, as above, with a pungent odor. Soil is smoking in air.		
15					Dry			TAILINGS: Sandy silt, not smoking.		
								Lean clay, smoking from 16 to 16.4' bgs.		
		7	9-12-6-4	None Strong Odor None	Dry					
								TAILINGS: Very dark gray clay with medium plasticity. Soil is smoking in air.		
		8	11-7-4-6	None Strong Odor None	Moist to Wet			SLAG: Light gray slag with glassy cobbles.		5355
								TAILINGS: Very dark gray sandy silt that is homogeneous. Soil is smoking in air.		
								(continued)		

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450 S. Wagner Road
Ann Arbor, MI 48103
Telephone: 1-800-270-5017
Fax: 734-327-1212

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LOG OF Boring MW-06-21

Client Rhodia | Drill Contractor O'Keefe

Project Name Rhodia RFI Groundwater | Drill Method HSA

Number 26/46-006 | Drilling Started 10/11/06 Ended 10/12/06 | Elevation 5374.0

Location Silver Bow, Montana | Logged By MMB | Total Depth 72.4

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		9	4-23-14-10	None Strong Odor None	Moist to Wet			TAILINGS: Very dark gray sandy silt that is homogeneous. Soil is smoking in air.*(continued)*		
								SLAG: Light gray to yellowish green, medium to coarse-grained, gravel size pieces of slag.		
		10	4-2-3-3	None None None	Moist to Wet			TAILINGS: Olive brown and dark gray clay with medium to high plasticity. Clay has laminae less than 2 mm thick, not smoking.	0-45.9': Neat Cement Grout	
25		11	2-2-2-3	None None None	Moist to Wet					5350
		12	2-1-2-2	None None None	Moist to Wet					
		13	2-3-4-3	None None None	Moist to Wet					5345
30		14	2-3-4-5	None None None	Moist to Wet					
		15	9-13-22-21	None None None	Moist	CL/OL		LEAN CLAY: Lean organic clay with 15 to 20% sand. Clay has rootlets and organic material to 33' bgs. Color grades from very dark gray/black to light yellowish brown from 31.7 to 34' bgs. Sample is micaceous, massive and has medium plasticity. Analytical sample collected at 31.7 to 32.7' bgs.		5340
35										
		16	11-20-33-45	None None None	Slightly Moist	CL/ML		SILTY CLAY with SAND: Silty clay with approximately 20% fine to coarse-grained sand. Sample is micaceous. Interval from 38 to 39' has four seams of fine partings (less than 1 mm thick) filled with white mineral.		5335
								(continued)		

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450 S. Wagner Road
Ann Arbor, MI 48103
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LOG OF Boring MW-06-21

Client Rhodia
Project Name Rhodia RFI Groundwater
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor O'Keefe
Drill Method HSA
Drilling Started 10/11/06 Ended 10/12/06
Logged By MMB

Elevation 5374.0
Total Depth 72.4

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		17	31-32-43->50	None None None	Dry	CL/ML		SILTY CLAY with SAND: Silty clay with approximately 20% fine to coarse-grained sand. Sample is micaceous. Analytical sample collected at 40 to 42' bgs. Pinkish white clay from 40.8 to 41.1' bgs. Clay has medium plasticity, approximately 2% mica flakes.		
						ML		SILTY SAND with CLAY: Brownish yellow silty sand with approximately 5% clay. Sample is very micaceous and has low plasticity.		5330
45		18	50-42-40-20	None None None	Dry					
								CLAY: Brownish yellow clay with medium plasticity and approximately 15% iron oxide staining.	45.9-49.2': Bentonite Well Seal	5325
50		19	7-8-10-14	None None None	Dry to Slightly Moist	CL		Pale yellow clay with conchoidally fracturing chert-like material from 49.4 to 50.1' bgs. Sample is very well cemented and very hard.	49.2-72.4': Sand Pack, 20/40 Sand	5320
55		20	11-22-48->50	None None None	Slightly Moist	SP		POORLY GRADED SAND: Light olive brown to pale yellow, fine to coarse-grained sand with approximately 10% fine-grained gravel pieces (silica-chert), and less than 2% clay at 56' bgs. Sand contains quartz, biotite, and amphibole.		
			19-21-	None	Wet			Sand is saturated from 59 to 60' bgs.		5315
								(continued)		

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450 S. Wagner Road
Ann Arbor, MI 48103
Telephone: 1-800-270-5017
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LOG OF Boring MW-06-21

Client Rhodia | Drill Contractor O'Keefe

Project Name Rhodia RFI Groundwater | Drill Method HSA

Number 26/46-006 | Drilling Started 10/11/06 Ended 10/12/06 | Elevation 5374.0

Location Silver Bow, Montana | Logged By MMB | Total Depth 72.4

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		21	20-27	None None	Moist	CL/ML		SILTY CLAY: Light yellowish brown silty clay with low plasticity and low toughness.	51.5-71.5': 2"x20' Sch 40 PVC 0.010 Slot Screen	
						SP		POORLY GRADED SAND: Light olive brown, fine to coarse-grained sand that is micaceous.		5310
65		22	19-22-23-31	None None None	Wet					
						CL/ML		SILTY CLAY: Pale yellow silty clay with low to medium plasticity. Sample is homogeneous.		5305
70		23	11-15-19-20	None None None	Moist			Bedded silty clay (0.2 to 0.5' thick beds) of varying colors (white, gray, pale yellow, and grayish brown) with two 1 mm thick reddish oxidized beds from 69 to 70.5' bgs. Grayish brown clay with approximately 20% sand from 70 to 71' bgs.		
								End of Boring - 72.4 feet		5300
75										5295

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450 S. Wagner Road
Ann Arbor, MI 48103
Telephone: 1-800-270-5017
Fax: 734-327-1212

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LOG OF BORING MW-06-22

SHEET 1 OF 3

Client Rhodia | Drill Contractor O'Keefe

Project Name Rhodia RFI Groundwater | Drill Method HSA

Number 26/46-006 | Drilling Started 10/4/06 Ended 10/4/06 | Elevation 5361.6

Location Silver Bow, Montana | Logged By JAM2 | Total Depth 53.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		1	18-25-28-24	None None None	Dry			TOPSOIL: Dark brownish black, organic-rich silty topsoil with roots and angular, fine to coarse-grained gravel.	6" Steel Protop with Vented Cap	
								SLAG: Light whitish gray slag material ranging in size from cobbles to silt. Unit is poorly sorted.		5360
		2	>50->50-48-42	None None None	Dry			SLAG and TOPSOIL: Heterogeneous mixture of silt to gravel size slag and topsoil as in 0 to 1.5' interval.		
									2.5' ags-29.2' bgs: 2" Sch 40 PVC Riser	
5		3	9-9-10-11	None None None	Dry			SLAG: Dark gray silty material with fine to coarse-grained, angular, gravel size slag; likely washout material from the kiln.		
								SILT with GRAVEL and SAND: Dark reddish brown silt with angular, fine-grained gravel and fine-grained sand. Unit is homogeneous and mica-rich. Sample breaks along horizontal planes at approximately one inch intervals. Unit has low to no dry strength, rapid dilatancy, low toughness and low plasticity.		5355
		4	10-9-10-9	None None None	Dry					
		5	12-21-35->50	None None None	Dry	ML		Color grades to dark reddish brown with well cemented gravel size pieces throughout.		
10		6	14-24-44-50	None None None	Dry			Clay content slightly increases and sample becomes mica-rich at 10' bgs.		5350
									0-24.2': Neat Cement Grout	
		7	18-26-48->50	None None None	Dry	ML/SM		SILT and SILTY SAND: Brown, homogeneous, mica-rich silt with angular to sub-round grains. Unit has two lenses of poorly sorted, fine to coarse-grained silty sand. Unit is finely laminated (1 to 2 mm layers).		
15		8	24-32->50->50	None None None	Slightly Moist			Fine to coarse-grained silty sand lens from 14.5 to 14.6' bgs.		
						SM		SILTY SAND: Grayish brown, fine to coarse-grained silty sand with sub-round to subangular grains. Unit is poorly sorted, finely laminated, and has iron staining throughout. Dark brown, mica-rich silt lens from 16 to 16.3' bgs. Color grades to light tan at 16.3' bgs.		5345
		9	18-20-28-39	None None None	Slightly Moist to Dry					
						ML		SILT: Dark reddish brown silt that is homogeneous and mica-rich. Sample has angular, gravel size, well cemented pieces throughout from 18 to 20' bgs.		
		10	16-21-29-42	None None None	Dry					

(continued)

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450 S. Wagner Road
Ann Arbor, MI 48103
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Fax: 734-327-1212

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ENVIRO LOG 5 (5/27/04) 2646006.GPJ BARRLOG.GDT 6/4/07

LOG OF BORING MW-06-22

Client Rhodia | Drill Contractor O'Keefe

Project Name Rhodia RFI Groundwater | Drill Method HSA

Number 26/46-006 | Drilling Started 10/4/06 Ended 10/4/06 | Elevation 5361.6

Location Silver Bow, Montana | Logged By JAM2 | Total Depth 53.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		11	22-28-34-40	None None None	Slightly Moist to Dry	ML		SILT: Dark reddish brown silt that is homogeneous and mica-rich.*(continued)* Sample is slightly cohesive and has slightly increased clay content from 20 to 22' bgs.		5340
25		12	24-39-50->50	None None None	Dry	SM		SILTY SAND: Light grayish brown, fine to coarse-grained silty sand. Grains are sub-round to subangular. Unit is homogeneous and poorly sorted. A one inch lense of silt observed at 25.5' bgs.	24.2-26.6': Bentonite Well Seal	5335
									26.6-53': Sand Pack, 20/40 Sand	
30		13	21-26-25-36	None None None	Slightly Moist			Heterogeneous mixture of silt and sand.		5330
						ML		SILT: Dark reddish brown silt that is homogeneous and mica-rich.		
35		14	14-20-40->50	None None None	Moist			Fine-grained, mica-rich silty sand lens from 35 to 35.1.		5325
			18-23-	None	Moist Saturated			Dark reddish brown, homogeneous, silty sand lens with fine-grained gravel, and sub-round to subangular grains from 39.8 to 40' bgs. *(continued)*	29.2-49.2': 2"x20' Sch 40 PVC 0.010 Slot Screen	

Barr Engineering Co.
450 S. Wagner Road
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LOG OF BORING MW-06-22

Client Rhodia
Project Name Rhodia RFI Groundwater
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor O'Keefe
Drill Method HSA
Drilling Started 10/4/06 Ended 10/4/06
Logged By JAM2

Elevation 5361.6
Total Depth 53.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		15	29-32	None None	Moist			SANDY SILT: Dark reddish brown sandy silt with sand content increasing with depth. Sample has a lens of well sorted, fine-grained sand from 40.8 to 40.9 bgs.		5320
45		16	16-24-34-40	None None None	Moist to Wet	ML		A few lenses of increased sand content (g/s/f=<5/50/50) observed throughout 44 to 46' interval.		5315
50		17	12-13-26-44	None None None	Moist to Wet			Increased sand content (fine sand) observed from 49 to 49.5' (g/s/f=<5/40/60).		5310
								End of Boring - 53 feet		
55										5305

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LOG OF BORING MW-06-23

Client Rhodia | Drill Contractor O'Keefe

Project Name Rhodia RFI Groundwater | Drill Method HSA

Number 26/46-006 | Drilling Started 9/15/06 Ended 9/18/06 | Elevation 5426.3

Location Silver Bow, Montana | Logged By JAM2 | Total Depth 97.4

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		1	40-44-28-17	None None None	Dry			SILT: Light brown silt with sand, gravel and a few cobbles. Sand and gravel are fine-grained. Unit is poorly sorted, homogeneous, and mica-rich.	6" Steel Protop with Vented Cap	5425
		2	12-9-12-9	None None None	Dry	ML				
									3' ags-76.8' bgs: 2" Sch 40 PVC Riser	
5		3	12-15-28-30	None None None	Dry	SM		SILTY SAND: Light greenish brown, fine to coarse-grained sand with gravel and silt. Unit is poorly sorted.		
		4	31-50->50->50	None None None	Dry	ML		SILT: Light greenish brown silt with well sorted, very fine to fine-grained sand and a few very well cemented intervals (less than 1" thick) throughout unit.		5420
		5	21-48->50->50	None None None	Dry					
10		6	28->50->50->50	None None None	Dry	GM		SILTY GRAVEL: Dark reddish brown, coarse-grained gravel and cobbles with fine to medium-grained sand and silt. Unit is poorly sorted.		5415
						SM		SILTY SAND: Light greenish brown, poorly sorted, fine to coarse-grained sand with fine to coarse-grained gravel and cobbles. Gravel and cobbles are angular and mostly granitic.		
		7	21-38-40-50	None None None	Dry	ML		SILT: Light whitish brown silt with trace gravel and sand. Unit is homogeneous. Chert cobble observed at 12' bgs.		
15		8	18-24-36-81	None None None	Dry					
		9	26-30-36-39	None None None	Dry			Slightly increased percentage of very fine to fine-grained sand from 16 to 18' bgs.		5410
		10	26-32->50->50	None None None	Dry					
						SM		SILTY SAND: Fine to coarse-grained, poorly		

(continued)

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450 S. Wagner Road
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LOG OF BORING MW-06-23

Client Rhodia | Drill Contractor O'Keefe

Project Name Rhodia RFI Groundwater | Drill Method HSA

Number 26/46-006 | Drilling Started 9/15/06 Ended 9/18/06 | Elevation 5426.3

Location Silver Bow, Montana | Logged By JAM2 | Total Depth 97.4

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
								sorted sand with angular gravel and silt.		
		11	31-44-48-40	None None None	Dry			SILT: Light greenish brown silt with gravel, sand and cobbles. Gravel and cobbles are angular. Unit is homogeneous and poorly sorted with a few well cemented intervals (less than 1" thick) throughout.		5405
25		12	50-44-45->50	None None None	Dry	ML				5400
30		13	34-33->50->50	None None None	Dry	SM		SILTY SAND: Light greenish brown silty sand with gravel. Sand is fine to coarse-grained and subangular to sub-rounded. Gravel is fine and angular to sub-rounded.		5395
35		14	28-35-46-50	None None None	Dry			Color changes to light yellowish brown at 34' bgs.		
						GM		SILTY GRAVEL: Same as above unit, but increased gravel content to approximately 40%.	0-71.9': Neat Cement Grout	5390
			22-35-	None		SM		*(continued)*		

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450 S. Wagner Road
Ann Arbor, MI 48103
Telephone: 1-800-270-5017
Fax: 734-327-1212

Remarks:

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LOG OF BORING MW-06-23

Client Rhodia
Project Name Rhodia RFI Groundwater
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor O'Keefe
Drill Method HSA
Drilling Started 9/15/06 Ended 9/18/06
Logged By JAM2

Elevation 5426.3
Total Depth 97.4

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		15	>50->50	None None	Dry	SM		SILTY SAND: Fine to medium-grained sand with angular, fine to medium-grained gravel and silt. Unit is poorly sorted. Yellow precipitate present at 39', 40.5' and 40.75' bgs.*(continued)*		5385
45		16	>50->50->50->50	None None None	Dry	GM		SILTY GRAVEL: Sample consists of mostly angular gravel and cobbles of various lithologies (granite, gabbro and possible sandstone). Unit is very poorly sorted and heterogeneous.		5380
50		17	>50->50->50->50	None None None	Dry			SILT: Predominately silt with varying percentages of gravel, sand and clay. Color varies from light brown to dark grayish brown. Unit is homogeneous with no dry strength, rapid dilatancy, low toughness and low plasticity.		5375
55		18	38-50->50->50	None None None	Dry	ML		Interval is very hard from 54 to 56' bgs.		5370
			>50->50-	None				Gravel consists of angular pieces of mafic rock and is mica-rich from 59 to 60' bgs. *(continued)*		

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LOG OF BORING MW-06-23

Client Rhodia
Project Name Rhodia RFI Groundwater
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor O'Keefe
Drill Method HSA
Drilling Started 9/15/06 Ended 9/18/06
Logged By JAM2

Elevation 5426.3
Total Depth 97.4

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		19	>50- >50	None None	Dry			SILT: Predominately silt with varying percentages of gravel, sand and clay. Color varies from light brown to dark grayish brown. Unit is homogeneous with no dry strength, rapid dilatancy, low toughness and low plasticity.*(continued)*		5365
65		20	>50- >50- >50- >50	None None None	Dry					5360
70		21	>50- >50- >50- >50	None None None	Dry	ML		Sample is very hard from 69 to 70' bgs.	71.9-74.2': Bentonite Well Seal	5355
75		22	>50- >50- >50- >50	None None None	Dry			Very well cemented, white precipitate throughout sample from 74 to 76' bgs.	74.2-97.4': Sand Pack, 20/40 Sand	5350
			>50- >50-	None				*(continued)*		

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LOG OF BORING MW-06-23

Client Rhodia
Project Name Rhodia RFI Groundwater
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor O'Keefe
Drill Method HSA
Drilling Started 9/15/06 Ended 9/18/06
Logged By JAM2

Elevation 5426.3
Total Depth 97.4

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		23	>50->50	None None	Dry			SILT: Predominately silt with varying percentages of gravel, sand and clay. Color varies from light brown to dark grayish brown. Unit is homogeneous with no dry strength, rapid dilatancy, low toughness and low plasticity.*(continued)*		5345
85		24	>50->50->50->50	None None None	Dry	ML				5340
									76.8-96.8': 2"x20' Sch 40 PVC 0.010 Slot Screen	
90		25	34-37-45->50	None None None	Sat. Moist	SM ML		SILTY SAND: Dark grayish brown, medium to coarse-grained silty sand with gravel, sand, and sub-rounded gravel. Unit is well sorted and homogeneous. SILT: Dark brown silt with very fine to fine-grained sand and gravel. Unit is homogeneous and mica-rich.		5335
95		26	33->50->50->50	None None None	Sat. Moist	SP ML				5330
								End of Boring - 97.4 feet		

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LOG OF BORING MW-06-24

Client Rhodia
Project Name Rhodia RFI Groundwater
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor O'Keefe
Drill Method HSA
Drilling Started 9/19/06 Ended 9/26/06
Logged By JAM2

Elevation 5426.1
Total Depth 158.6

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
						ML		SILT: Light brown silt with sand, gravel and a few cobbles. Sand and gravel are fine-grained. Unit is poorly sorted, homogeneous, and mica-rich.	6" Steel Protop with Vented Cap	5425
5						SM		SILTY SAND: Light greenish brown, fine to coarse-grained sand with gravel and silt. Unit is poorly sorted.	3' ags-146.6' bgs: 2" Sch 40 PVC Riser	
						ML		SILT: Light greenish brown silt with well sorted, very fine to fine-grained sand and a few very well cemented intervals (less than 1" thick) throughout unit.		5420
10						GM		SILTY GRAVEL: Dark reddish brown, coarse-grained gravel and cobbles with fine to medium-grained sand and silt. Unit is poorly sorted.		
						SM		SILTY SAND: Light greenish brown, poorly sorted, fine to coarse-grained sand with fine to coarse-grained gravel and cobbles. Gravel and cobbles are angular and mostly granitic.		5415
						ML		SILT: Light whitish brown silt with trace gravel and sand. Unit is homogeneous. Chert cobble observed at 12' bgs.		
15								Slightly increased percentage of very fine to fine-grained sand from 16 to 18' bgs.		5410
						SM		SILTY SAND: Fine to coarse-grained, poorly		

(continued)

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Remarks: Boring was blind-drilled to 99' bgs. Lithology shown from 0 to 97.4' bgs is from MW-06-23.

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ENVIRO LOG 5 (5/27/04) 2646006.GPJ BARRLOG.GDT 6/4/07

LOG OF BORING MW-06-24

Client Rhodia
Project Name Rhodia RFI Groundwater
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor O'Keefe
Drill Method HSA
Drilling Started 9/19/06 Ended 9/26/06
Logged By JAM2

Elevation 5426.1
Total Depth 158.6

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
								sorted sand with angular gravel and silt.		
								SILT: Light greenish brown silt with gravel, sand and cobbles. Gravel and cobbles are angular. Unit is homogeneous and poorly sorted with a few well cemented intervals (less than 1" thick) throughout.		5405
25						ML				5400
30						SM		SILTY SAND: Light greenish brown silty sand with gravel. Sand is fine to coarse-grained and subangular to sub-rounded. Gravel is fine and angular to sub-rounded.		5395
35								Color changes to light yellowish brown at 34' bgs.		
						GM		SILTY GRAVEL: Same as above unit, but increased gravel content to approximately 40%.		5390
						SM		*(continued)*		

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LOG OF BORING MW-06-24

Client Rhodia
Project Name Rhodia RFI Groundwater
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor O'Keefe
Drill Method HSA
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Logged By JAM2

Elevation 5426.1
Total Depth 158.6

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
						SM		SILTY SAND: Fine to medium-grained sand with angular, fine to medium-grained gravel and silt. Unit is poorly sorted. Yellow precipitate present at 39', 40.5' and 40.75' bgs. *(continued)*		5385
45						GM		SILTY GRAVEL: Sample consists of mostly angular gravel and cobbles of various lithologies (granite, gabbro and possible sandstone). Unit is very poorly sorted and heterogeneous.		5380
50								SILT: Predominately silt with varying percentages of gravel, sand and clay. Color varies from light brown to dark grayish brown. Unit is homogeneous with no dry strength, rapid dilatancy, low toughness and low plasticity.		5375
55						ML		Interval is very hard from 54 to 56' bgs.		5370
								Gravel consists of angular pieces of mafic rock and is mica-rich from 59 to 60' bgs. *(continued)*		

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LOG OF BORING MW-06-24

Client Rhodia
Project Name Rhodia RFI Groundwater
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor O'Keefe
Drill Method HSA
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DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
								SILT: Predominately silt with varying percentages of gravel, sand and clay. Color varies from light brown to dark grayish brown. Unit is homogeneous with no dry strength, rapid dilatancy, low toughness and low plasticity.*(continued)*	0-124': Neat Cement Grout	5365
65										5360
								Sample is very hard from 69 to 70' bgs.		
70						ML				5355
								Very well cemented, white precipitate throughout sample from 74 to 76' bgs.		
75										5350
								(continued)		

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LOG OF BORING MW-06-24

Client Rhodia | Drill Contractor O'Keefe

Project Name Rhodia RFI Groundwater | Drill Method HSA

Number 26/46-006 | Drilling Started 9/19/06 Ended 9/26/06 | Elevation 5426.1

Location Silver Bow, Montana | Logged By JAM2 | Total Depth 158.6

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
								SILT: Predominately silt with varying percentages of gravel, sand and clay. Color varies from light brown to dark grayish brown. Unit is homogeneous with no dry strength, rapid dilatancy, low toughness and low plasticity.*(continued)*		5345
85						ML				5340
90						SM		SILTY SAND: Dark grayish brown, medium to coarse-grained silty sand with gravel, sand, and sub-rounded gravel. Unit is well sorted and homogeneous.		
						ML		SILT: Dark brown silt with very fine to fine-grained sand and gravel. Unit is homogeneous and mica-rich.		5335
95						SP				
						ML				5330
		1	44->50->50->50	None	Moist	ML		Dark reddish brown, homogeneous, mica-rich silt from 99 to 110.5' bgs. Sample has low toughness, no plasticity, and rapid dilatancy. *(continued)*		

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LOG OF BORING MW-06-24

Client Rhodia
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Number 26/46-006
Location Silver Bow, Montana

Drill Contractor O'Keefe
Drill Method HSA
Drilling Started 9/19/06 Ended 9/26/06
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Elevation 5426.1
Total Depth 158.6

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
				None None	Saturated	SM		SILTY SAND: Dark brown to black, medium to coarse-grained silty sand. Unit is homogenous, well sorted and mica-rich.		5325
105		2	33-34- 33-45	None None None	Moist Saturated	ML/SP		SILT: Predominately silt, as 99 to 100.5' interval, with lenses of dark brown to black sand at 105.5 to 105.6' and 105.8 to 105.9' bgs. Sand is fine to coarse-grained, homogeneous and poorly sorted.		5320
110		3	18-36- 40->50	None None None	Saturated	SP-SM		SAND with SILT: Dark reddish brown silt with fine to coarse-grained sand, coarse, angular gravel and cobbles. Unit is very heterogeneous. Silt occurs in lenses, less than 1 inch thick. Entire sample has mottled appearance and is mica-rich.		5315
115		4	33->50- >50- >50	None None None	Moist			SILT: Dark brown to dark reddish brown silt with some lean clay. Unit is homogeneous and mica-rich. Sample has low rapid dilatancy, low toughness, low plasticity, and low dry strength.		5310
			48->50-	None				*(continued)*		

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LOG OF BORING MW-06-24

Client Rhodia
Project Name Rhodia RFI Groundwater
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor O'Keefe
Drill Method HSA
Drilling Started 9/19/06 Ended 9/26/06
Logged By JAM2

Elevation 5426.1
Total Depth 158.6

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		5	>50->50	None None	Dry			SILT: Dark brown to dark reddish brown silt with some lean clay. Unit is homogeneous and mica-rich. Sample has low rapid dilatancy, low toughness, low plasticity, and low dry strength.*(continued)*		5305
125		6	>50->50->50->50	None None None	Dry to Slightly Moist					5300
130		7	>50->50->50->50	None None None	Slightly Moist to Dry	ML		Decreased sand content (<5%) and increased gravel content (5%) observed from 129 to 131' bgs. Gravel is fine, angular and of granitic composition.		5295
135		8	>50->50->50->50	None None None	Moist to Wet			A few thin, less than 1 inch, zones throughout sample are wet.	124-144.2': Bentonite Well Seal	5290
			32->50-	None	Moist			*(continued)*		

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LOG OF BORING MW-06-24

Client Rhodia
Project Name Rhodia RFI Groundwater
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor O'Keefe
Drill Method HSA
Drilling Started 9/19/06 Ended 9/26/06
Logged By JAM2

Elevation 5426.1
Total Depth 158.6

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		9	>50->50	None None	to Wet			SILT: Dark brown to dark reddish brown silt with some lean clay. Unit is homogeneous and mica-rich. Sample has low rapid dilatancy, low toughness, low plasticity, and low dry strength.*(continued)*		5285
145		10	43-50->50->50	None None None	Moist				144.2-158.6': Sand Pack, 20/40 Sand	5280
150		11	48->50->50->50	None None None	Saturated	SP-SM		SILTY SAND: Dark brown silty sand with gravel. Sand is fine to coarse-grained and subangular to rounded. Gravel is fine-grained and well rounded. Unit is poorly sorted and fines with depth.		5275
					Very Moist			SILT: Dark brown silt with fine sand and trace gravel. Unit is homogeneous and mica-rich.	146.6-156.6': 2"x10' Sch 40 PVC 0.010 Slot Screen	
155		12	38-42->50->50	None None None	Slightly Moist to Dry	ML		Lenses of white precipitate throughout sample from 154 to 156' bgs.		5270
								End of Boring - 158.6 feet		

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ENVIRO LOG 5 (5/27/04) 2646006.GPJ BARRLOG.GDT 6/4/07

LOG OF Boring MW-06-25

Client Rhodia
Project Name Rhodia RFI Groundwater
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor O'Keefe
Drill Method HSA
Drilling Started 10/15/06 Ended 10/16/06
Logged By MMB

Elevation 5362.5
Total Depth 51.2

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		1	>50->50--	None None None	Dry			SLAG with TAILINGS and SOIL: Very dark grayish brown to light gray, silt to boulder size particles of granulated slag, tailings and soil. Note: Slag and cobble stuck in split spoon.	6" Steel Protop with Vented Cap	
		2	18-19-22-29	None None None	Dry			SILTY CLAY: Yellowish brown silty clay with low to medium plasticity. Clay is micaceous. Analytical sample collected at 2.6 to 3.6' bgs.		5360
5		3	21-21-25-38	None None None	Dry				3' ags-30.1' bgs: 2" Sch 40 PVC Riser	
		4	17-26-40->50	None None None	Dry			Grayish brown silt (possible siltstone) that is very well cemented from 6.6 to 7' bgs.		5355
		5	17-27-32-44	None None None	Dry	CL/ML				
10		6	21-30-32-40	None None None	Dry			Analytical sample collected at 10 to 12' bgs.		
		7	11-14-30-39	None None None	Dry			Soil has up to approximately 1% gravel and pebble size pieces of chert or quartz.	0-25.3': Neat Cement Grout	5350
15		8	21-28-41-15	None None None	Dry					
		9	22-25-23-22	None None None	Dry	SP		POORLY GRADED SAND: Light olive brown, medium to coarse-grained sand with approximately 40% gravel. Sample contains mica, quartz and amphibole.		5345
						ML		SILT: Yellowish brown silt with approximately 15% fine-grained sand. Sample is very micaceous and has low plasticity.		
		10	13-22-44-48	None None None	Dry	CL		CLAY: Clay with medium plasticity.		

(continued)

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Remarks:

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LOG OF Boring MW-06-25

Client Rhodia
Project Name Rhodia RFI Groundwater
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor O'Keefe
Drill Method HSA
Drilling Started 10/15/06 Ended 10/16/06
Logged By MMB

Elevation 5362.5
Total Depth 51.2

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		11	15-28-35-46	None None None	Slightly Moist			CLAY: Clay with medium plasticity.*(continued)*		5340
25		12	23-30-42->50	None None None	Moist	CL		Clay has medium to high plasticity and is more micaceous from 24 to 26' bgs. Sample has up to 2% fine to medium-grained gravel, and pieces of chert or quartzite.	25.3-27.9': Bentonite Well Seal	5335
30		13	21-37-42->50	None None None	Moist	ML/CL		CLAYEY SILT: Clayey silt with approximately 1% mica and low to medium plasticity.	27.9-51.2': Sand Pack, 20/40 Sand	5330
35		14	12-21-26->50	None None None	Moist to Very Moist	SP		SILTY SAND: Grayish brown silty sand with up to approximately 10% mica flakes and interbeds of clayey silt.		
						CL		CLAY: Yellowish brown clay with medium plasticity and minor bedded (approximately 0.5" horizons) fine to medium-grained sand.		5325
			21-26-	None		SP		*(continued)*		

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LOG OF Boring MW-06-25

Client Rhodia
Project Name Rhodia RFI Groundwater
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor O'Keefe
Drill Method HSA
Drilling Started 10/15/06 Ended 10/16/06
Logged By MMB

Elevation 5362.5
Total Depth 51.2

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		15	26-28	None None	Wet	SP		SAND: Light olive brown to yellowish brown, fine to coarse-grained sand with up to 1% fine-grained gravel. Biotite, quartz, amphibole and k-feldspar present in sand.*(continued)*	30.1-50.1': 2"x20' Sch 40 PVC 0.010 Slot Screen	5320
45		16	14-16-16-22	None None None	Very Moist	CL/SP		CLAY and SAND: Yellowish brown stratified clay and light olive brown sand with up to 20% pebble gravel. Clay beds are 0.5 to 3" thick and sand seams are thinner. Clay has medium plasticity. Sand is fine to coarse-grained with mica, quartz and amphibole present.		5315
					Wet					
50		17	16-33-44->50	None None None	Very Moist			End of Boring - 51.2 feet		5310
55										5305

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Remarks:

Additional data may have been collected in the field which is not included on this log.

LOG OF Boring SB-06-8A

Client Rhodia
Project Name Rhodia RFI Groundwater
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor O'Keefe
Drill Method HSA
Drilling Started 10/26/06 Ended 10/26/06
Logged By KAM

Elevation --
Total Depth 60.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
								SLAG: Bluish gray to white slag with a faint sulfur odor. Grain size is 40% fine to coarse-grained sand and 60% fine to coarse-grained gravel.	
5								TAILINGS: Very dark grayish brown silt and/or clay size particles with up to 10% fine-grained sand. Sample is homogeneous, non-plastic or has very low plasticity, and has low toughness.	5
10								Tailings below 10' are black and saturated. Soil cuttings from approximately 10 to 15' bgs were observed to slightly smoke. Trace to light elemental phosphorous odors were occasionally noted.	10
								Sample has up to 15% fine-grained sand from 14 to 15' bgs.	
15								Sample has medium plasticity and no sand from 15 to 16' bgs.	15
								TAILINGS: Dark grayish brown tailings with clayey and silty layers. Sample is soft and wet.	
								(continued)	

Barr Engineering Co.
450 S. Wagner Road
Ann Arbor, MI 48103
Telephone: 1-800-270-5017
Fax: 734-327-1212

Remarks: Samples were collected using a 2 inch split spoon from 40 to 60' bgs (boring was blind-drilled to 40' bgs). Lithology shown from 0 to 40' bgs is from MW-06-07 (to 18' bgs) and MW-06-09 (from 18 to 40' bgs).

Additional data may have been collected in the field which is not included on this log.

ENVIRO LOG 5 (5/27/04) 2646006.GPJ BARRLOG.GDT 6/4/07

LOG OF Boring SB-06-8A

Client Rhodia
Project Name Rhodia RFI Groundwater
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor O'Keefe
Drill Method HSA
Drilling Started 10/26/06 Ended 10/26/06
Logged By KAM

Elevation --
Total Depth 60.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
								TAILINGS: Dark grayish brown tailings with clayey and silty layers. Sample is soft and wet. *(continued)*	
25									25
								Color becomes very dark gray below 28' bgs.	
30									30
35									35
								(continued)	

Barr Engineering Co.
450 S. Wagner Road
Ann Arbor, MI 48103
Telephone: 1-800-270-5017
Fax: 734-327-1212

Remarks: Samples were collected using a 2 inch split spoon from 40 to 60' bgs (boring was blind-drilled to 40' bgs). Lithology shown from 0 to 40' bgs is from MW-06-07 (to 18' bgs) and MW-06-09 (from 18 to 40' bgs).

Additional data may have been collected in the field which is not included on this log.

ENVIRO LOG 5 (5/27/04) 2646006.GPJ BARRLOG.GDT 6/4/07

LOG OF Boring SB-06-8A

Client Rhodia | Drill Contractor O'Keefe

Project Name Rhodia RFI Groundwater | Drill Method HSA

Number 26/46-006 | Drilling Started 10/26/06 Ended 10/26/06 | Elevation --

Location Silver Bow, Montana | Logged By KAM | Total Depth 60.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor-Sheen	Moisture	ASTM	LITHOLOGY	DESCRIPTION	DEPTH FEET
		1	2-5-8-11	None None None	Moist to Wet			TAILINGS: Light brownish gray tailings with yellowish brown and dark grayish brown varves. Sample is soft with a silty clay to clay consistency, and moist to wet.	
		2	6-14-20-26	None None None None Earthy Odor None	Moist to Wet Moist	OL/OH		ORGANIC SOIL: Very dark gray to very dark brown, soft to firm, clayey organic soil with abundant small roots/plant material and small mica flakes. Sample has very low plasticity and toughness when wetted. Soil becomes black and has a peaty odor at 44' bgs.	
45		3	10-14-19-26	None Earthy Odor None	Moist	CL		SILTY CLAY with SAND: Dark gray to olive gray silty clay with approximately 10 to 15% fine to medium-grained sand, trace roots/plant material and some mica. Sample has moderate plasticity/toughness and is firm. Soil becomes siltier with depth.	45
		4	5-8-12-14	None None None None Earthy Odor None None Earthy Odor	Moist	CL/ML		SILTY CLAY to CLAYEY SILT: Dark gray to olive gray, silty clay to clayey silt with approximately 10% fine-grained sand, trace plant material/roots and abundant mica. Sample is homogeneous and soft to firm. Soil becomes mottled with black peaty flecks at approximately 47.4' bgs. At 48' bgs, sample has approximately 5 to 10% fine-grained sand and abundant mica that decreases with depth.	
		5	4-5-9-15	None None Sulfur Odor	Moist				
50				None None Sulfur Odor		ML		SILT: Gray silt with trace fine-grained sand and a moderate sulfur odor. Sample is mottled with black flecks, soft to firm, and non-cohesive. Soil is moist to wet from 49.6 to 49.8' bgs.	50
		6	5-7-11-16	None None Earthy Odor None	Moist Moist	CL/ML CL		CLAYEY SILT to SILTY CLAY: Dark gray to olive gray clayey silt to silty clay with approximately 5 to 10% fine-grained sand, abundant mica and trace organic plant material/roots. Sand and mica abundance decreases with depth. Soil is homogeneous, soft to firm, and mottled with black peat looking flecks.	
		7	4-10-15-16	None None None	Wet Moist			CLAY with SAND: Greenish gray, firm clay with approximately 15 to 20% fine to coarse-grained sand, trace lower fine gravel, and some mica. Sample has angular to sub-round grains/clasts and a 5 mm clayey sand lens (SC) at approximately 51.3' bgs. Sand decreases with depth.	
					Moist to Wet	CL		Sand and gravel lens from 52 to 52.2' bgs.	
55		8	9-9-12-15	None None None	Moist	SC		Soil becomes soft and grades to fine to coarse-grained clayey sand with approximately 30% fines by 52.8' bgs. CLAY: Greenish gray, firm clay with trace sand. CLAYEY SAND: Greenish gray, soft, fine to coarse-grained clayey sand with approximately 40% fines. At 54' bgs, sample becomes moist and has approximately 5% fine gravel, angular to sub-round grains/clasts, and some mica. Random mottling observed at approximately 55' bgs.	55
		9	4-6-10-18	None None None	Moist	ML		CLAYEY SILT: Olive gray to greenish gray clayey silt with approximately 15% coarse-grained sand to fine gravel size pieces of weakly cemented silt. Sample is soft and homogeneous. Soil becomes wet at 58' bgs.	
		10	7-24-30-33	None None None	Wet	ML		SILT: Olive gray silt with a few angular, fine gravel size pieces of weakly cemented silt. Sample is homogeneous, soft to firm, and appears wet.	
								End of Boring - 60 feet	

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Remarks: Samples were collected using a 2 inch split spoon from 40 to 60' bgs (boring was blind-drilled to 40' bgs). Lithology shown from 0 to 40' bgs is from MW-06-07 (to 18' bgs) and MW-06-09 (from 18 to 40' bgs).

Additional data may have been collected in the field which is not included on this log.

ENVIRO LOG 5 (5/27/04) 2646006.GPJ BARRLOG.GDT 6/4/07

2008 Well and Boring Logs

LOG OF Boring SB-08-1

DRAFT

SHEET 1 OF 1

Client Rhodia
Project Name Rhodia RFI Groundwater
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor O'Keefe
Drill Method HSA
Drilling Started 12/11/08 Ended 12/11/08
Logged By MMB

Elevation 5362.7
Total Depth 22.0

DEPTH FEET	SAMP. NUMBER	SAMP. LENGTH & RECOVERY	Blows/6 in.	Discoloration-Odor	Moisture	ASTM	LITHOLOGY	DESCRIPTION	ELEV. FEET
	1		50-3"–					SLAG: Fused light gray slag. Hole advanced with auger. Cuttings are silty gravel slag.	
	2		21-20-11-9	None None	Dry			SLAG: Gray silty sand with gravel.	5360
5	3		7-7-6-7	None None	Moist				
	4		10-3-3-2	None None				TAILINGS: Very dark gray to black silt with up to 20% sand.	5355
	5		5-2-4-17	None None	Wet				
10								Sand with silt, twigs, and grass from 9.5 to 10'.	
	6		6-9-10-12	None None	Dry			SILT: Light olive brown (2.5Y 5/3) to pale yellow (2.5Y 7/3) silt, non-plastic, low toughness.	
					Moist			Contains 15% sand, mica flakes, and grass in matrix from 11 to 12'.	
	7		10-14-14-25	None None				Laminated with low to no plasticity, moderate toughness from 12 to 18'.	5350
						ML			
15	8		16-18-20-20	None None					
	9		14-12-28-36	None None					5345
	10		12-24-40-54	None None				SILT: Light olive brown silt with fine-grained sand.	
20					Moist	ML		One 3" very pale yellow horizon.	
	11		12-24-40-54	None None					
								End of Boring - 22 feet	5340
25									5335

Barr Engineering Co.
4700 W. 77th St. Suite 200
Edina, MN 55435
BARR
Telephone: 952-832-2600
Fax: 952-832-2601

Remarks: Analytical samples: SB-08-1 8-11', SB-08-1 11-12' and SB-08-1 19-21'

Additional data may have been collected in the field which is not included on this log.

ENVIRO LOG 5 (5/27/04) 2646006.GPJ BARR JAN06.GDT 1/19/09

LOG OF Boring SB-08-2

DRAFT

SHEET 1 OF 1

Client Rhodia | Drill Contractor O'Keefe

Project Name Rhodia RFI Groundwater | Drill Method HSA

Number 26/46-006 | Drilling Started 12/11/08 Ended 12/11/08 | Elevation 5364.0

Location Silver Bow, Montana | Logged By MMB | Total Depth 28.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor	Moisture	ASTM	LITHOLOGY	DESCRIPTION	ELEV. FEET
		1	39-42-19-17	None None	Dry			SLAG: Gray slag, 40% gravel, 50-55% sand.	
		2	14-18-11-7	None None					5360
5		3	7-6-5-6	None None					
		4	5-3-3-3	None None	Moist				
		5	4-4-5-1	None None					5355
10		6	1-1-2-4	None None	Wet			TAILINGS: Very dark gray (2.5Y 3/1), fine-grained tailings, silt with some sand, both bedded and homogenous, occassionally whitish, irregular shaped blebs that have a jelly-like texture.	
		7	1-2-1-2	None None					5350
15		8	1-2-5-8	None None				Light yellowish brown (2.5Y 6/3) silty sand with rootlets from 15.5 to 16'.	
		9	2-2-6-7	None None	Moist			Light yellowish brown soil from 17.5 to 18'.	
		10	4-6-12-13	None None	Moist -Wet			Light yellowish brown soil from 19 to 19.5'.	5345
20		11	4-9-17-15	None None		CL		CLAY: Light yellowish brown clay with some fine-grained sand, occasional white precipitate in irregular lenses.	
		12	4-6-7-9	None None	Moist				
25		13	3-4-10-14	None None	Moist	SM		SILTY SAND: Light yellowish brown, homogenous, low plasticity, some clay possible.	5340
		14	9-16-18-29	None None	Moist -Wet	SC/SP		SAND with CLAY: Light yellowish brown, bedded sandy clay and silty sand. Beds are 1 to 3" thick.	
								End of Boring - 28 feet	5335

Barr Engineering Co.
4700 W. 77th St. Suite 200
Edina, MN 55435
BARR
Telephone: 952-832-2600
Fax: 952-832-2601

Remarks: Analytical samples: SB-08-2 26-28', SB-08-2 17.5-18.5' and SB-08-2 10-14'

Additional data may have been collected in the field which is not included on this log.

ENVIRO LOG 5 (5/27/04) 2646006.GPJ BARR JAN06.GDT 1/19/09

LOG OF Boring SB-08-3

DRAFT

Client Rhodia
Project Name Rhodia RFI Groundwater
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor O'Keefe
Drill Method HSA
Drilling Started 12/11/08 Ended 12/13/08
Logged By MMB

Elevation 5363.6
Total Depth 52.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor	Moisture	ASTM	LITHOLOGY	DESCRIPTION	ELEV. FEET
		1	28-49-78-40	None None	Dry			SLAG: Gray slag, 40% gravel, 50% sand.	
		2	18-17-17-14	None None				TAILINGS: Black (2.5Y 2.5/1), homogenous silty tailings, less than 1% white flecks.	5360
5		3	9-9-50 for 3"-	None None	Moist				
		4	32-50 for 2"--	None None	Dry			SLAG: Gray slag, 70% gravel, 20% sand.	
		5	6-4-2-4	None Pungent	Moist -Wet			TAILINGS: Black to very dark gray (2.5Y 2.5/1), homogenous, silty tailings with 10 to 20% sand, fine-grained, some white flecks, smoking, garlic or onion odor.	5355
10		6	6-9-10-12	None Pungent					
		7	6-5-5-6	None Pungent					5350
15		8	5-2-2-6	None Pungent					
		9	1-1-2-2	None Pungent					
		10	2-2-2-1	None Pungent	Moist			TAILINGS: Grayish brown (2.5Y 5/2), clayey, laminated tailings, lightly smoking.	5345
20		11	2-2-2-1	None Pungent	Moist -Wet			TAILINGS: Very dark gray, homogenous silty tailings, not smoking.	
		12	2-2-4-3	None Faint	Moist			TAILINGS: Very dark gray and light brown (7.5YR 6/4) laminated, clayey tailings, not smoking.	5340
25		13	2-3-2-7	None Faint					
		14	2-4-4-6	None None	Moist -Wet				
		15	4-4-5-2	None None					5335

(continued)

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4700 W. 77th St. Suite 200
Edina, MN 55435
Telephone: 952-832-2600
Fax: 952-832-2601

Remarks: Analytical samples: SB-08-3 2-6', SB-08-3 13-20', SB-08-3 28-32', SB-08-3 36-40', SB-08-3 42-43' and SB-08-3 50-52'

Additional data may have been collected in the field which is not included on this log.

ENVIRO LOG 5 (5/27/04) 2646006.GPJ BARR JAN06.GDT 1/19/09

Client Rhodia | Drill Contractor O'Keefe

Project Name Rhodia RFI Groundwater | Drill Method HSA

Number 26/46-006 | Drilling Started 12/11/08 Ended 12/13/08

Location Silver Bow, Montana | Logged By MMB

LOG OF Boring SB-08-3

DRAFT

Elevation 5363.6

Total Depth 52.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor	Moisture	ASTM	LITHOLOGY	DESCRIPTION	ELEV. FEET
		16	4-4-12-19	None None	Moist -Wet			TAILINGS: Very dark gray and light brown (7.5YR 6/4) laminated, clayey tailings, not smoking.*(continued)*	
		17	4-4-7-6	None None	Moist				5330
35		18	3-3-6-9	None None					
		19	4-6-10-16	None None					
		20	3-8-10-17	None None					5325
40		21	4-6-9-14	None None					
		22	9-14-24-32	None Earthy Odor		SM		SILTY SAND: Greenish gray (Gley1 6/GY) silty sand with rootlets, fine-grained, moderate toughness, low plasticity.	5320
45		23	4-7-26-34	None None		ML		SANDY SILT: Greenish gray and light brownish gray silt with fine-grained sand, low plasticity, high toughness. Abundant red mottles from 46 to 48'. Thinly bedded (beds 2 to 6" thick) from 48 to 50'.	
		24	14-24-26-40	None None					
		25	17-23-22-31	None None					5315
50		26	14-21-26-44	None None	Moist -Wet	ML/CL		CLAYEY SILT: Light olive gray (5Y 6/2) clayey silt, dense, low plasticity, moderate toughness, abundant green, yellow and red, irregular shaped mottles.	
								End of Boring - 52 feet	5310
55									
									5305

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4700 W. 77th St. Suite 200
Edina, MN 55435
Telephone: 952-832-2600
Fax: 952-832-2601

Remarks: Analytical samples: SB-08-3 2-6', SB-08-3 13-20', SB-08-3 28-32', SB-08-3 36-40', SB-08-3 42-43' and SB-08-3 50-52'

Additional data may have been collected in the field which is not included on this log.

ENVIRO LOG 5 (5/27/04) 2646006.GPJ BARR JAN06.GDT 1/19/09

LOG OF Boring SB-08-4

DRAFT

Client Rhodia
Project Name Rhodia RFI Groundwater
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor O'Keefe
Drill Method HSA
Drilling Started 12/17/08 Ended 12/18/08
Logged By MMB

Elevation 5360.7
Total Depth 52.0

DEPTH FEET	SAMP. NUMBER	SAMP. LENGTH & RECOVERY	Blows/6 in.	Discoloration-Odor	Moisture	ASTM	LITHOLOGY	DESCRIPTION	ELEV. FEET
	1		46-25-18-9	None None	Dry			SLAG: Blueish gray slag, 90% gravel, 10% sand.	5360
	2		8-5-4-4	None None	Moist			TAILINGS: Very dark gray to light gray silty (10YR 3/1), homogenous tailings. Abundant white flecks and precipitate from 2 to 6' and 8 to 10'.	
5	3		6-6-12-22	None None					5355
	4		4-5-4-3	None None					
	5		9-6-7-5	None None					
10	6		1-1-1-1	None None	Wet			TAILINGS: Very dark gray and brown (10YR 5/3) clayey tailings, very soft. Tailings soft and homogeneous from 10 to 16'.	5350
	7		1-1 for 24"--	None None					
15	8		1-1-2-2	None Faint				Possible faint smoke (or steam in cold air) from 14 to 16'.	5345
	9		2-2-3-4	None None				Tailings laminated from 16 to 40'. Laminae 0.1 to 1.0" thick.	
	10		2-2-3-4	None None					
20	11		4-4-6-7	None None					5340
	12		2-3-3-6	None None					
25	13		2-2-2-5	None None					5335
	14		2-2-5-6	None None					
	15		2-2-2-3	None None	Wet				

(continued)

Barr Engineering Co.
4700 W. 77th St. Suite 200
Edina, MN 55435
BARR
Telephone: 952-832-2600
Fax: 952-832-2601

Remarks: Analytical samples: SB-08-4 6-12', SB-08-4 18-24', SB-08-4 32-38', SB-08-4 40.5-41.5' and SB-08-4 50-52'

Additional data may have been collected in the field which is not included on this log.

ENVIRO LOG 5 (5/27/04) 2646006.GPJ BARR JAN06.GDT 1/19/09

Client Rhodia | Drill Contractor O'Keefe

Project Name Rhodia RFI Groundwater | Drill Method HSA

Number 26/46-006 | Drilling Started 12/17/08 Ended 12/18/08 | Elevation 5360.7

Location Silver Bow, Montana | Logged By MMB | Total Depth 52.0

LOG OF Boring SB-08-4

DRAFT

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor	Moisture	ASTM	LITHOLOGY	DESCRIPTION	ELEV. FEET
					Wet			TAILINGS: Very dark gray and brown (10YR 5/3) clayey tailings, very soft.*(continued)*	5330
		16	2-2-2-2	None None				Tailing is very sticky, tough, and dense below 32'.	
		17	2-2-3-3	None None					
35		18	2-1-2-4	None None					5325
		19	2-2-2-4	None None					
		20	2-2-2-4	None None					
40		21	2-9-11-17	None None	Wet	SM		SILTY SAND: Light yellowish brown (2.5Y 6/3) to olive gray (5Y 5/2), fine to medium-grained silty sand, moderately dense. Several fine to coarse-grained sand seams.	5320
		22	9-14-19-29	None None	Moist				
45		23	8-10-14-22	None None					
		24	9-9-11-12	None None	Dry -Moist	SP		SAND: Light yellowish brown (10YR 6/4), fine to coarse-grained sand, sand is angular and poorly sorted.	5315
		25	5-7-10-9	None None	Moist -Wet	ML		SILT: Pale brown (10YR 6/3), homogenous silt, some cemented silt, non-plastic, low to moderate toughness, dense.	
50		26	8-11-14-20	None None	Wet				5310
								End of Boring - 52 feet	
55									5305

Barr Engineering Co.
4700 W. 77th St. Suite 200
Edina, MN 55435
Telephone: 952-832-2600
Fax: 952-832-2601

Remarks: Analytical samples: SB-08-4 6-12', SB-08-4 18-24', SB-08-4 32-38', SB-08-4 40.5-41.5' and SB-08-4 50-52'

Additional data may have been collected in the field which is not included on this log.

ENVIRO LOG 5 (5/27/04) 2646006.GPJ BARR JAN06.GDT 1/19/09

LOG OF Boring SB-08-5

DRAFT

Client Rhodia
Project Name Rhodia RFI Groundwater
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor O'Keefe
Drill Method HSA
Drilling Started 12/16/08 Ended 12/17/08
Logged By MMB

Elevation 5371.9
Total Depth 56.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor	Moisture	ASTM	LITHOLOGY	DESCRIPTION	ELEV. FEET
			50 for 2"---		Dry			SLAG: Gray slag, 40% gravel, 55% sand.	5370
		1	7-4-5-5	None None	Moist			TAILINGS: Very dark gray (2.5Y 3/1), fine-grained tailings with white flecks, silty, smoking. Silty tailings from 3 to 11'.	
5		2	10-11-9-14	None None					
		3	21-21-23-?	None Pungent					5365
		4	7-14-14-14	None Pungent					
10		5	6-6-5-5	None Pungent				TAILINGS: Very dark gray and light brownish gray, laminated, clayey, smoking.	
		6	3-2-2-4	None Pungent					5360
15		7	5-50 for 3"--	None None		CL		Silty tailings from 14 to 20', somewhat granular, very dark gray with white flecks, smoking.	
		8	20-20-22-23	None Faint	Dry -Moist				5355
		9	8-4-3-4	None Faint	Moist - Wet				
20					Wet			TAILINGS: Clayey, laminated, very dark gray and grayish brown, faintly smoking (or steam in cold air).	
		10	2-1-3-4	None None					5350
		11	2-2-3-3	None None					
25		12	2-2-2-4	None None		CL			
		13	2-2-2-4	None None					5345
		14		None Faint					

(continued)

Barr Engineering Co.
4700 W. 77th St. Suite 200
Edina, MN 55435
Telephone: 952-832-2600
Fax: 952-832-2601

Remarks: Analytical samples: SB-08-5 4-10', SB-08-5 16-22', SB-08-5 28-36', SB-08-5 42-44', SB-08-5 46-47' and SB-08-05 54-56'; Water in augers at 40.9' bgs after 12 hours.

Additional data may have been collected in the field which is not included on this log.

ENVIRO LOG 5 (5/27/04) 2646006.GPJ BARR JAN06.GDT 1/19/09

Client Rhodia | Drill Contractor O'Keefe

Project Name Rhodia RFI Groundwater | Drill Method HSA

Number 26/46-006 | Drilling Started 12/16/08 Ended 12/17/08 | Elevation 5371.9

Location Silver Bow, Montana | Logged By MMB | Total Depth 56.0

LOG OF Boring SB-08-5

DRAFT

DEPTH FEET	SAMP. NUMBER	SAMP. LENGTH & RECOVERY	Blows/6 in.	Discoloration-Odor	Moisture	ASTM	LITHOLOGY	DESCRIPTION	ELEV. FEET
	15		12-11-12-18	None None	Wet	CL		TAILINGS: Clayey, laminated, very dark gray and grayish brown, faintly smoking (or steam in cold air).*(continued)* Silty tailings, homogenous, faint smoking from 30 to 32'.	
	16		4-4-5-9	None Faint				TAILINGS: Laminated, clayey, very dark gray and brownish gray, faintly smoking (or steam in cold air).	5340
35	17		6-6-10-12	None Faint	Moist -Wet				
	18		6-9-12-21	None None					5335
	19		6-8-6-10	None None		CL			
40	20		4-4-4-5	None None					
	21		4-4-5-7	None None					5330
	22		5-5-6-12	None None					
45	23		17-20-27-31	None None	Dry			CLAYEY SILT: Light yellowish brown (10YR 6/4), low plasticity, moderate toughness, 20% fine-grained sand.	5325
	24		8-9-17-21	None None	Moist -Dry	ML/CL			
50	25		12-13-22-39	None None				white precipitate in thin soil partings.	
	26		21-22-20-19		Moist	SM		SILTY SAND: Light yellowish brown, fine-grained silty sand.	5320
55	27		14-11-24-46	None None		ML		SILT with SAND: Light olive brown (2.5Y 5/3), homogenous, dense, mica flakes, non-plastic, low toughness.	
								End of Boring - 56 feet	5315

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Fax: 952-832-2601

Remarks: Analytical samples: SB-08-5 4-10', SB-08-5 16-22', SB-08-5 28-36', SB-08-5 42-44', SB-08-5 46-47' and SB-08-05 54-56'; Water in augers at 40.9' bgs after 12 hours.

Additional data may have been collected in the field which is not included on this log.

ENVIRO LOG 5 (5/27/04) 2646006.GPJ BARR JAN06.GDT 1/19/09

LOG OF Boring SB-08-6

DRAFT

SHEET 1 OF 1

Client Rhodia
Project Name Rhodia RFI Groundwater
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor O'Keefe
Drill Method HSA
Drilling Started 12/13/08 Ended 12/13/08
Logged By MMB

Elevation 5363.5
Total Depth 22.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Blows/6 in.	Discoloration-Odor	Moisture	ASTM	LITHOLOGY	DESCRIPTION	ELEV. FEET
		1	50 for 3"---	None None	Dry			SLAG: Gray, dense, compacted slag, 65% gravel, 25% sand. Contains some very dark grayish brown sand and silt.	
		2	41-50 for 4"--	None None					5360
5		3	41-37-30-26	None None				FILL: Sand with silt and gravel, clasts are fine-grained to coarse-grained. Reddish yellow (7.5YR 7/6) from 5 to 6'. (SILICA) Very dark gray (2.5Y 3/1) from 6 to 8'.	
		4	50 for 3"---	None None	Moist				
		5	47-23-11-4	None None	Dry Moist			Light blueish gray and light greenish gray from 8 to 9'.	5355
10		6	8-6-2-2	None Faint				TAILINGS: Very dark gray, fine-grained tailings with white flecks, not smoking. TAILINGS: Very dark to medium grayish brown, clayey, laminated, not smoking.	
		7	8-14-16-16	None None	Moist	SP-SM		SILTY SAND: Brown (10YR 4/3), fine to medium-grained, mica flakes.	5350
15		8	12-14-12-8	None None		ML/SM		BEDDED SILT and SILTY SAND: Yellowish brown (10YR 5/6), non-plastic, low toughness. Beds 2 to 6" thick.	
		9	17-27-30-39	None None					
		10	18-22-26-29	None None	Moist	ML		SILT: Light yellowish brown (10YR 6/4), low plasticity, moderate toughness, with possible clay.	5345
20		11	14-20-36-37	None None					
								End of Boring - 22 feet	5340
25									5335

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Telephone: 952-832-2600
Fax: 952-832-2601

Remarks: Analytical samples: SB-08-6 9-12', SB-08-6 12-13' and SB-08-6 20-22'; Thin fiberglass in sampler at 5'.

Additional data may have been collected in the field which is not included on this log.

ENVIRO LOG 5 (5/27/04) 2646006.GPJ BARR JAN06.GDT 1/19/09

2012 Well Logs

LOG OF BORING MW-12-1

Client Rhodia | Drill Contractor Major Drilling | SHEET 1 OF 9

Project Name Rhodia RFI 2012 | Drill Method Rotasonic

Number 26460006.24 | Drilling Started 10/15/12 Ended 10/17/12 | Surface Elevation 5327.6 ft

Location Silver Bow, Montana | Logged By KAM | Total Depth 205.0 ft

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Moisture	Discoloration-Odor-Sheen	Color	ASTM	LITHOLOGY	DESCRIPTION
			Dry	None	10YR 3/1	ML		0-0.5': SILTY TOPSOIL with GRAVEL, very dark gray, organic rich, angular to subangular fine to coarse gravel, abundant roots.
		1		None				0.5-6': SILTY SAND, generally brown, fine to coarse-grained sand with 10% fine gravel, approximately 20% silty fines, angular grains/clasts (primarily granite), abundant mica.
			Dry	None	10YR 5/3	SM		
5								
			Moist		10YR 4/2	ML		6-6.6': SILT with SAND and GRAVEL, dark grayish brown, fine to coarse-grained sand, angular, abundant mica, some clay present, moist.
								6.6-16': SILTY SAND, brown, fine to medium-grained with approximately 20% coarse-grained sand and 10% fine gravel, approximately 20% fines, angular grains/clasts, abundant mica.
		2		None				Few sandy clay lenses present between 10-15' bgs.
10				None				
			Moist	None	10YR 5/3	SM		
15								
			Moist		10YR 5/4	SP-SM		16-16.8': POORLY GRADED SAND with SILT, yellowish brown, fine to coarse-grained with approximately 10% fine gravel, sub-angular to angular grains/clasts.
					10YR 5/2	CL		16.8-17.8': LEAN CLAY with SAND, generally grayish brown, approximately 20% fine to medium-grained sand, medium plasticity and toughness, no dilatancy.
								17.8-25': CLAYEY SILT with SAND and GRAVEL, generally brown, fine to coarse-grained sand (approximately 15%) and fine sub-angular to sub-rounded gravel (approximately 20%)(siltstone/mudstone), slightly cohesive, homogenous except for sand lens (SM) from 20-20.2' bgs.
20		3		None				
			Moist	None	10YR 4/3	ML		
				None				
			Wet					
								(continued)

WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
PRO. CASING Diameter: **6"** Type: **Protop-Sch. 40 Steel** Interval:	5325
RISER CASING Diameter: **2 inch** Type: **Sch. 40 PVC** Interval: **2.5' ags-195' bgs**	
GROUT Type: **Concrete, Neat Cement Grout** Interval: **0-5' bgs, 5-188' bgs**	5320
SEAL Type: **Bentonite Chips** Interval: **188-191' bgs**	
SANDPACK Type: **NSF Certified Silica Sand** Interval: **191-205' bgs**	5315
SCREEN Diameter: **2 inch** Type: **Sch. 40, .010 Slot, PVC** Interval: **195-205' bgs**	
	5310
	5305

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Telephone: 952-832-2600
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Remarks:

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ENVIRO LOG 5 (5/27/04) 26460006.24_RHODIA.GPJ BARR LIBR JAN06.GLB 12/20/12

LOG OF BORING MW-12-1

Client Rhodia | Drill Contractor Major Drilling | SHEET 2 OF 9

Project Name Rhodia RFI 2012 | Drill Method Rotasonic

Number 26460006.24 | Drilling Started 10/15/12 Ended 10/17/12 | Surface Elevation 5327.6 ft

Location Silver Bow, Montana | Logged By KAM | Total Depth 205.0 ft

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Moisture	Discoloration-Odor-Sheen	Color	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
								25-46': CLAYEY SILT with GRAVEL, brown, approximately 10-15% fine to coarse-grained sand particles, fine sub-angular to angular siltstone/mudstone gravel, slightly cohesive, low plasticity and toughness, homogeneous, abundant mica.	PRO. CASING Diameter: **6"** Type: **Protop-Sch. 40 Steel** Interval:	5300
30		4		None None None					RISER CASING Diameter: **2 inch** Type: **Sch. 40 PVC** Interval: **2.5' ags-195' bgs** GROUT Type: **Concrete, Neat Cement Grout** Interval: **0-5' bgs, 5-188' bgs** SEAL Type: **Bentonite Chips** Interval: **188-191' bgs** SANDPACK Type: **NSF Certified Silica Sand** Interval: **191-205' bgs** SCREEN Diameter: **2 inch** Type: **Sch. 40, .010 Slot, PVC** Interval: **195-205' bgs**	5295
35			Wet		10YR 4/3	ML		35': Clay content appears to increase with depth.		5290
40		5		None None None						5285
45			Wet		10YR 5/4	SM		46-48': SILTY SAND with GRAVEL, generally brown, fine-grained sand with approximately 20% fine sub-angular to sub-round gravel, approximately 30% silty fines.		5280
				None		ML		*(continued)*		

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ENVIRO LOG 5 (5/27/04) 26460006.24_RHODIA.GPJ BARR LIBR JAN06.GLB 12/20/12

LOG OF BORING MW-12-1

Client Rhodia | Drill Contractor Major Drilling | SHEET 3 OF 9

Project Name Rhodia RFI 2012 | Drill Method Rotasonic

Number 26460006.24 | Drilling Started 10/15/12 Ended 10/17/12 | Surface Elevation 5327.6 ft

Location Silver Bow, Montana | Logged By KAM | Total Depth 205.0 ft

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Moisture	Discoloration-Odor-Sheen	Color	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		6		None None				48-61': CLAYEY SILT with GRAVEL, brown, approximately 10-15% fine to coarse-grained sand particles, fine sub-angular to angular siltstone/mudstone gravel, slightly cohesive, low plasticity and toughness, homogeneous, abundant mica.*(continued)*	PRO. CASING Diameter: **6"** Type: **Protop-Sch. 40 Steel** Interval: RISER CASING Diameter: **2 inch** Type: **Sch. 40 PVC** Interval: **2.5' ags-195' bgs** GROUT Type: **Concrete, Neat Cement Grout** Interval: **0-5' bgs, 5-188' bgs** SEAL Type: **Bentonite Chips** Interval: **188-191' bgs** SANDPACK Type: **NSF Certified Silica Sand** Interval: **191-205' bgs** SCREEN Diameter: **2 inch** Type: **Sch. 40, .010 Slot, PVC** Interval: **195-205' bgs**	5275
55			Wet		10YR 5/4 10YR 4/3	ML		55': Clay content appears to increase with depth, brown.		5270
60		7		None None None				61-64.5': SANDY LEAN CLAY with SILT, brown, approximately 30-40% fine to coarse-grained sand and 10% silt, low to medium plasticity and toughness, no dilatancy, sand particles are sub-angular to angular, firm to hard, abundant mica.		5265
			Wet		10YR 5/3	CL				
65					2.5Y 6/3	SM		64.5-65': SILTY SAND, light yellowish brown, fine to coarse-grained with approximately 30% silty fines, trace fine sub-angular to angular gravel, abundant mica.		
					10YR 4/3	ML		65-71': CLAYEY SILT with GRAVEL, brown, approximately 20-30% fine sub-angular to angular mudstone/siltstone gravel, approximately 10% fine to coarse-grained sand size particles, cohesive, low plasticity, low to no toughness, homogeneous, abundant mica.		5260
70		8		None None None						
					10YR 5/4	ML		71-75': SANDY SILT, generally yellowish brown, approximately 40% fine to coarse-grained sand, sub-angular to sub-round grains, approximately 60% silty fines, no plasticity or toughness, firm, abundant mica.		5255
								(continued)		

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Telephone: 952-832-2600
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ENVIRO LOG 5 (5/27/04) 26460006.24_RHODIA.GPJ BARR LIBR JAN06.GLB 12/20/12

LOG OF BORING MW-12-1

Client Rhodia | Drill Contractor Major Drilling | SHEET 4 OF 9

Project Name Rhodia RFI 2012 | Drill Method Rotasonic

Number 26460006.24 | Drilling Started 10/15/12 Ended 10/17/12 | Surface Elevation 5327.6 ft

Location Silver Bow, Montana | Logged By KAM | Total Depth 205.0 ft

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Moisture	Discoloration-Odor-Sheen	Color	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
								75-86': LEAN CLAY with GRAVEL/SILT/SAND, generally brown, approximately 30% sub-angular to angular siltstone/mudstone fine gravel, soft to firm, low to medium plasticity and toughness, some mica (less than units located above).	PRO. CASING Diameter: **6"** Type: **Protop-Sch. 40 Steel** Interval: RISER CASING Diameter: **2 inch** Type: **Sch. 40 PVC** Interval: **2.5' ags-195' bgs** GROUT Type: **Concrete, Neat Cement Grout** Interval: **0-5' bgs, 5-188' bgs** SEAL Type: **Bentonite Chips** Interval: **188-191' bgs** SANDPACK Type: **NSF Certified Silica Sand** Interval: **191-205' bgs** SCREEN Diameter: **2 inch** Type: **Sch. 40, .010 Slot, PVC** Interval: **195-205' bgs**	5250
80		9	Wet		10YR 4/3	CL				
85		10	Wet		10YR 5/4	ML		86-89.5': CLAYEY SILT with SAND and GRAVEL, generally yellowish brown, approximately 25% fine to coarse-grained sand, 20% fine gravel, sub-angular to angular grains/clasts, cohesive, low to no plasticity and toughness, firm, abundant mica. Silty sand lens (SM) observed from approximately 87.5-87.8' bgs.		5245 5240
90		11	Wet		10YR 5/3 10YR 5/4 10YR 5/3 10YR 6/3	SM		89.5-95': SILTY SAND, brown, fine to coarse-grained sand with approximately 5% fine gravel, sub-angular to angular grains/clasts, firm but very easily broken in core, approximately 40% silty fines, abundant mica. Silt (SM) lens from approximately 93-94' bgs, mottled yellowish brown, brown, and pale brown.		5235
95					10YR 5/4 10YR 5/3 10YR 6/3	ML		95-96.5': SILT, mottled yellowish brown, brown, and pale brown, abundant mica.		
			Moist to Wet		10YR 4/3	CL		96.5-101': LEAN CLAY with GRAVEL/SILT/SAND, generally brown, approximately 20% fine gravel, sub-round to angular grains/clasts, soft to firm, low to medium plasticity and toughness, some mica, moist to wet. *(continued)*		5230

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Telephone: 952-832-2600
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ENVIRO LOG 5 (5/27/04) 26460006.24_RHODIA.GPJ BARR LIBR JAN06.GLB 12/20/12

LOG OF BORING MW-12-1

Client Rhodia | Drill Contractor Major Drilling | SHEET 5 OF 9

Project Name Rhodia RFI 2012 | Drill Method Rotasonic

Number 26460006.24 | Drilling Started 10/15/12 Ended 10/17/12 | Surface Elevation 5327.6 ft

Location Silver Bow, Montana | Logged By KAM | Total Depth 205.0 ft

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Moisture	Discoloration-Odor-Sheen	Color	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		12				CL			PRO. CASING Diameter: 6" Type: Protop-Sch. 40 Steel Interval:	
			Moist to Wet	None None None	10YR 5/3	ML		101-107': CLAYEY SILT with SAND and GRAVEL, generally brown, approximately 25% fine to coarse-grained sand, 15-20% fine gravel, sub-angular to angular grains/clasts, low to no plasticity and toughness, firm.	RISER CASING Diameter: 2 inch Type: Sch. 40 PVC Interval: 2.5' ags-195' bgs	5225
105									GROUT Type: Concrete, Neat Cement Grout Interval: 0-5' bgs, 5-188' bgs	
			Moist to Wet		2.5Y 5/3	SP-SM		107-112': POORLY GRADED SAND with SILT, light olive brown, fine to coarse-grained sand with approximately 10% silty fines, trace fine gravel, sub-angular to sub-round grains/clasts, loose, abundant mica.	SEAL Type: Bentonite Chips Interval: 188-191' bgs	5220
110		13							SANDPACK Type: NSF Certified Silica Sand Interval: 191-205' bgs	
								112-124': CLAYEY SILT with GRAVEL, brown, 5-10% fine to coarse-grained sand, approximately 40% fine gravel, cohesive, low plasticity, low to no toughness, sub-round to angular grains/clasts, abundant mica.		5215
115									SCREEN Diameter: 2 inch Type: Sch. 40, .010 Slot, PVC Interval: 195-205' bgs	
			Moist	None None None	10YR 5/3	ML				5210
120		14								
										5205
			Moist		2.5Y 5/3	SP-SM		124-125': POORLY GRADED SAND with SILT, generally light olive brown, fine to		
								(continued)		

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ENVIRO LOG 5 (5/27/04) 26460006.24_RHODIA.GPJ BARR LIBR JAN06.GLB 12/20/12

LOG OF BORING MW-12-1

Client Rhodia | Drill Contractor Major Drilling | SHEET 6 OF 9

Project Name Rhodia RFI 2012 | Drill Method Rotasonic

Number 26460006.24 | Drilling Started 10/15/12 Ended 10/17/12 | Surface Elevation 5327.6 ft

Location Silver Bow, Montana | Logged By KAM | Total Depth 205.0 ft

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Moisture	Discoloration-Odor-Sheen	Color	ASTM	LITHOLOGY	DESCRIPTION
					10YR 5/4 10YR 5/3	ML		medium-grained with approximately 20% coarse-grained sand, trace fine gravel, approximately 10% silty fines, loose in core, sub-angular to sub-round grains/clasts, abundant mica.
			Moist to Wet		2.5Y 5/3	SP-SM		125-127': SILT, mottled yellowish brown and brown, trace fine-grained sand, abundant mica.
			Moist		10YR 5/3	ML		127-127.5': Lens of POORLY GRADED SAND with SILT, generally light olive brown, fine to medium-grained with approximately 20% coarse-grained sand, trace fine gravel, approximately 10% silty fines, loose in core, sub-angular to sub-round grains/clasts, abundant mica.
130		15		None None None				
			Appears Wet		10YR 6/3 10YR 5/3 10YR 5/4	SM		127.5-129': CLAYEY SILT with GRAVEL, brown, 5-10% fine to coarse-grained sand, approximately 40% fine gravel, cohesive, low plasticity, low to no toughness, sub-round to angular grains/clasts, abundant mica. 129-137': SILTY SAND, generally pale brown with some mottles of brown and yellowish brown, fine to coarse-grained sand with trace fine gravel, approximately 40-45% silty fines with some clay, slightly cohesive when wetted, angular to sub-round grains/clasts, firm to hard in core. 135': Fines increase with depth.
135								
			Moist to Wet		10YR 5/4	ML		137-141': CLAYEY SILT with GRAVEL and SAND, yellowish brown, approximately 20% fine gravel, 10% fine to coarse-grained sand, cohesive, low plasticity, low to no toughness, firm in core, sub-angular to angular grains/clasts, abundant mica.
140		16		None None None				
								141-150': SILT with CLAY and SAND, generally yellowish brown, mottled with yellowish brown and pale brown, approximately 10% fine to coarse-grained sand, 5-10% fine gravel (mudstone/siltstone), firm to hard in core but easily broken, abundant mica grains are generally smaller than above.
145			Appears Wet Appears Wet		10YR 5/4 10YR 5/6 10YR 6/3 2.5Y 5/2	ML		145': Becomes more clayey with depth, grades to clayey silt with gravel (same as 137-141' bgs).
				None				*(continued)*

WELL OR PIEZOMETER CONSTRUCTION DETAIL

PRO. CASING
Diameter: **6"**
Type: **Protop-Sch. 40 Steel**
Interval:

RISER CASING
Diameter: **2 inch**
Type: **Sch. 40 PVC**
Interval: **2.5' ags-195' bgs**

GROUT
Type: **Concrete, Neat Cement Grout**
Interval: **0-5' bgs, 5-188' bgs**

SEAL
Type: **Bentonite Chips**
Interval: **188-191' bgs**

SANDPACK
Type: **NSF Certified Silica Sand**
Interval: **191-205' bgs**

SCREEN
Diameter: **2 inch**
Type: **Sch. 40, .010 Slot, PVC**
Interval: **195-205' bgs**

ELEV. FEET: 5200, 5195, 5190, 5185, 5180

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Minneapolis, MN 55435-4803
Telephone: 952-832-2600
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LOG OF BORING MW-12-1

Client Rhodia | Drill Contractor Major Drilling | SHEET 7 OF 9

Project Name Rhodia RFI 2012 | Drill Method Rotasonic

Number 26460006.24 | Drilling Started 10/15/12 Ended 10/17/12 | Surface Elevation 5327.6 ft

Location Silver Bow, Montana | Logged By KAM | Total Depth 205.0 ft

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Moisture	Discoloration-Odor-Sheen	Color	ASTM	LITHOLOGY	DESCRIPTION	ELEV. FEET
		17		None None				150-163': CLAYEY to SILTY SAND, generally olive brown, approximately 30% clayey to silty fines, 70% fine to coarse-grained sand, sub-angular to sub-round grains/clasts, trace fine gravel, slightly cohesive when wetted, very compact/hard in the core, abundant mica - more than observed above - large flakes.	5175
155			Moist		10YR 5/3	SC-SM		Lens of silt (ML) with clay laminations observed from 156.5-157' bgs, generally pale brown and brown.	
		18		None None None					5170
160									
		19		None None None					5165
					2.5Y 6/3	CL		163-164.5': LEAN CLAY with SAND and GRAVEL, generally light yellowish brown, approximately 15% fine to coarse-grained sand, 15% fine gravel, sub-angular to angular grains/clasts, few sub-rounded, medium plasticity and toughness, firm in core, abundant mica - large flakes.	
165					10YR 5/3	SC-SM		164.5-167': CLAYEY to SILTY SAND, generally olive brown, approximately 30% clayey to silty fines, 70% fine to coarse-grained sand, trace fine gravel, sub-angular to sub-round grains/clasts, slightly cohesive when wetted, very compacted/hard in the core, abundant mica - more than observed above.	
			Moist		10YR 5.5/3	CL		167-172': LEAN CLAY with SAND, generally pale brown to brown, approximately 20% fine to coarse-grained sand, 5% fine gravel, sub-angular to sub-round grains/clasts, firm in core, abundant mica - large flakes.	5160
170		20		None None None					
			Moist		2.5Y 6/3	SM		172-174': SILTY SAND with CLAY, light yellowish brown, fine to coarse-grained sand, trace fine gravel, approximately 30% silty fines, sub-angular to sub-round grains/clasts, firm, abundant mica.	5155
						ML			

(continued)

WELL OR PIEZOMETER CONSTRUCTION DETAIL

PRO. CASING
Diameter: **6"**
Type: **Protop-Sch. 40 Steel**
Interval:

RISER CASING
Diameter: **2 inch**
Type: **Sch. 40 PVC**
Interval: **2.5' ags-195' bgs**

GROUT
Type: **Concrete, Neat Cement Grout**
Interval: **0-5' bgs, 5-188' bgs**

SEAL
Type: **Bentonite Chips**
Interval: **188-191' bgs**

SANDPACK
Type: **NSF Certified Silica Sand**
Interval: **191-205' bgs**

SCREEN
Diameter: **2 inch**
Type: **Sch. 40, .010 Slot, PVC**
Interval: **195-205' bgs**

Barr Engineering Co.
4700 West 77th Street
Minneapolis, MN 55435-4803
Telephone: 952-832-2600
Fax:

Remarks:

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ENVIRO LOG 5 (5/27/04) 26460006.24_RHODIA.GPJ BARR LIBR JAN06.GLB 12/20/12

LOG OF BORING MW-12-1

Client Rhodia | Drill Contractor Major Drilling | SHEET 8 OF 9

Project Name Rhodia RFI 2012 | Drill Method Rotasonic

Number 26460006.24 | Drilling Started 10/15/12 Ended 10/17/12 | Surface Elevation 5327.6 ft

Location Silver Bow, Montana | Logged By KAM | Total Depth 205.0 ft

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Moisture	Discoloration-Odor-Sheen	Color	ASTM	LITHOLOGY	DESCRIPTION
			Moist		10YR 5/3	ML		174-177': CLAYEY SILT with GRAVEL, brown, approximately 10% fine to coarse-grained sand, approximately 30% fine gravel, firm in core.*(continued)*
						CL		177-182': LEAN CLAY with SAND, generally brown, approximately 20% fine to coarse-grained sand, trace fine gravel, sub-angular to sub-round grains/clasts, firm in core, abundant mica.
180		21	Moist	None None None	10YR 5/3			
						SC		182-185': CLAYEY SAND, generally brown to pale brown, fine to coarse-grained sand with trace to 5% fine gravel, approximately 30-40% clayey fines (material is cohesive when wetted), sub-round to angular grains/clasts, hard in core, fines increase with depth, abundant mica.
			Moist		10YR 5.5/3			
185						CL-SC		185-189': SANDY LEAN CLAY to CLAYEY SAND, generally brown, approximately 50% fine to coarse-grained sand with trace fine gravel, approximately 50% clayey to silty fines, fines decrease with depth, some mica. Grades to clayey sand (SC) below approximately 187' bgs.
			Moist		10YR 5/3			
			Moist	None None None	10YR 5/2	SM		189-190': SILTY SAND, generally grayish brown, fine to coarse-grained with trace fine gravel, approximately 20% silty fines likely with some clay (cohesive when wetted), abundant small mica flakes.
190		22						
			Moist		10YR 5/3 10YR 6/3	ML		190-195': SILT with CLAY and SAND, generally brown to pale brown, laminated silt with abundant mica, firm to hard in core, very bottom of core appears as very hard claystone.
195			Moist to Wet		2.5Y 5/3	SP		195-195.8': POORLY GRADED SAND, light olive brown, fine to medium-grained with approximately 20% coarse-grained sand, no gravel, approximately trace to 5% fines, sub-angular to sub-round grains, abundant large flakes of mica.
			Moist to Wet		2.5Y 6/3	CL		
			Appears Wet		2.5Y 5/2	SP/SP-SM		195.8-196.5': LEAN CLAY with SAND to SANDY LEAN CLAY, generally light yellowish brown, approximately 20-30% fine to coarse-grained sand, trace fine gravel, sub-angular grains/clasts, firm, low to medium
				None				*(continued)*

WELL OR PIEZOMETER CONSTRUCTION DETAIL

PRO. CASING
Diameter: **6"**
Type: **Protop-Sch. 40 Steel**
Interval:

RISER CASING
Diameter: **2 inch**
Type: **Sch. 40 PVC**
Interval: **2.5' ags-195' bgs**

GROUT
Type: **Concrete, Neat Cement Grout**
Interval: **0-5' bgs, 5-188' bgs**

SEAL
Type: **Bentonite Chips**
Interval: **188-191' bgs**

SANDPACK
Type: **NSF Certified Silica Sand**
Interval: **191-205' bgs**

SCREEN
Diameter: **2 inch**
Type: **Sch. 40, .010 Slot, PVC**
Interval: **195-205' bgs**

ELEV. FEET: 5150, 5145, 5140, 5135, 5130

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Remarks:

BGS = "below ground surface"
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ENVIRO LOG 5 (5/27/04) 26460006.24_RHODIA.GPJ BARR LIBR JAN06.GLB 12/20/12

LOG OF BORING MW-12-1

Client Rhodia
Project Name Rhodia RFI 2012
Number 26460006.24
Location Silver Bow, Montana

Drill Contractor Major Drilling
Drill Method Rotasonic
Drilling Started 10/15/12 Ended 10/17/12
Logged By KAM

Surface Elevation 5327.6 ft
Total Depth 205.0 ft

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Moisture	Discoloration-Odor-Sheen	Color	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		23		None None		SP/SP-SM		plasticity and toughness,abundant mica. Approximate 3" silt (ML) lens from approximately 199.5-199.6' bgs.	PRO. CASING Diameter: **6"** Type: **Protop-Sch. 40 Steel** Interval: RISER CASING Diameter: **2 inch** Type: **Sch. 40 PVC** Interval: **2.5' ags-195' bgs** GROUT Type: **Concrete, Neat Cement Grout** Interval: **0-5' bgs, 5-188' bgs** SEAL Type: **Bentonite Chips** Interval: **188-191' bgs** SANDPACK Type: **NSF Certified Silica Sand** Interval: **191-205' bgs** SCREEN Diameter: **2 inch** Type: **Sch. 40, .010 Slot, PVC** Interval: **195-205' bgs**	5125
			Moist		2.5Y 6/2	ML				
			Moist to Wet		2.5Y 5/3	SM		196.5-201': POORLY GRADED SAND to POORLY GRADED SAND with SILT, generally grayish brown, fine to medium-grained sand with coarse-grained sand ranging from 10-20% in zone of unit, trace fine gravel, approximately 5-10% fines, abundant mica. *(continued)*		
			Wet		2.5Y 5/2	SP/SP-SM		201-201.5': SILT with laminations of clay with claystone gravel, generally light grayish brown, hard, some mica.		
205								201.5-202.5': SILTY SAND, generally light olive brown, very fine to fine-grained sand, approximately 20% silty fines, abundant mica - small flakes.		5120
								202.5-205': POORLY GRADED SAND to POORLY GRADED SAND with SILT, generally grayish brown, fine to medium-grained with approximately 20% coarse-grained, approximately 5-10% fines, trace to 5% fine gravel, sub-angular to sub-round grains/clasts, abundant mica.		
210								End of Boring - 205 feet		5115
215										5110
220										5105

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ENVIRO LOG 5 (5/27/04) 26460006.24_RHODIA.GPJ BARR LIBR JAN06.GLB 12/20/12

LOG OF BORING MW-12-2

Client Rhodia
Project Name Rhodia RFI 2012
Number 26460006.24
Location Silver Bow, Montana

Drill Contractor Major Drilling
Drill Method Rotasonic
Drilling Started 10/1/12 Ended 10/1/12
Logged By AKJ

Surface Elevation 5321.3 ft
Total Depth 35.0 ft

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Moisture	Discoloration-Odor-Sheen	Color	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
			Dry			OL/ML		0-1': SILTY TOPSOIL with roots (~1'), mica-rich subsoil chunks, crumble with moderate finger pressure.	PRO. CASING Diameter: **6"** Type: **Protop-Sch. 40 Steel** Interval:	5320
		1	Moist		10YR 5/3	CL		1-5': SANDY LEAN CLAY, brown, approximately 30% fine to medium-grained sand.	RISER CASING Diameter: **2 inch** Type: **Sch. 40 PVC** Interval: **3' ags-15' bgs**	
5									GROUT Type: **Concrete, Neat Cement Grout** Interval: **0-5' bgs, 5-11' bgs**	5315
		2	Moist		2.5YR 6/2 2.5YR 6/8	CL		5-12': LEAN CLAY, mottled light brownish gray to olive yellow, approximately 10% sand, hard, decreasing sand and mica with depth.	SEAL Type: **Bentonite Chips** Interval: **11-13' bgs**	
10									SANDPACK Type: **NSF Certified Silica Sand** Interval: **13-35' bgs**	5310
			Moist		10YR 5/3	SP-SM		12-15': POORLY GRADED SAND with SILT, brown, approximately 10% sand, mica, sub-angular, sub-rounded.	SCREEN Diameter: **2 inch** Type: **Sch. 40, .010 Slot, PVC** Interval: **15-35' bgs**	
15			Moist		10YR 5/3	CL		15-16': SANDY LEAN CLAY, brown, approximately 30% fine to medium-grained sand.		
								16-20': SILTY SAND, olive gray to olive yellow, approximately 40% sand and 60% fines.		5305
		3	Moist		5Y 6/2 2.5Y 6/8	SM				
20			Moist		10YR 6/4	SC		20-22': CLAYEY SAND, light yellowish brown, approximately 30% fines.		5300
		4				CL		22-35': SANDY LEAN CLAY, light yellowish brown, approximately 20% sand, saturated.		

(continued)

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Remarks: No discoloration, odor, or sheen noted.

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ENVIRO LOG 5 (5/27/04) 26460006.24_RHODIA.GPJ BARR LIBR JAN06.GLB 12/20/12

LOG OF BORING MW-12-2

Client Rhodia
Project Name Rhodia RFI 2012
Number 26460006.24
Location Silver Bow, Montana

Drill Contractor Major Drilling
Drill Method Rotasonic
Drilling Started 10/1/12 Ended 10/1/12
Logged By AKJ

Surface Elevation 5321.3 ft
Total Depth 35.0 ft

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Moisture	Discoloration-Odor-Sheen	Color	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
								22-35': SANDY LEAN CLAY, light yellowish brown, approximately 20% sand, saturated.*(continued)* Few silt lenses from 25-35' bgs.	PRO. CASING Diameter: **6"** Type: **Protop-Sch. 40 Steel** Interval: RISER CASING Diameter: **2 inch** Type: **Sch. 40 PVC** Interval: **3' ags-15' bgs** GROUT Type: **Concrete, Neat Cement Grout** Interval: **0-5' bgs, 5-11' bgs** SEAL Type: **Bentonite Chips** Interval: **11-13' bgs** SANDPACK Type: **NSF Certified Silica Sand** Interval: **13-35' bgs** SCREEN Diameter: **2 inch** Type: **Sch. 40, .010 Slot, PVC** Interval: **15-35' bgs**	5295
30		5	Wet		10YR 6/4 10YR 7/3 10YR 6/8	CL		Generally light yellowish brown but with lenses of very pale brown with brownish yellow mottling.		5290
35								End of Boring - 35 feet		5285
40										5280
45										5275

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ENVIRO LOG 5 (5/27/04) 26460006.24_RHODIA.GPJ BARR LIBR JAN06.GLB 12/20/12

LOG OF BORING MW-12-3

Client Rhodia
Project Name Rhodia RFI 2012
Number 26460006.24
Location Silver Bow, Montana

Drill Contractor Major Drilling
Drill Method Rotasonic
Drilling Started 10/1/12 Ended 10/2/12
Logged By AKJ

Surface Elevation 5370.1 ft
Total Depth 190.0 ft

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Moisture	Discoloration-Odor-Sheen	Color	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
			Dry			OL/ML		0-1': ORGANIC TOPSOIL with roots, approximately 30% sand and 70% fines.	PRO. CASING Diameter: **6"** Type: **Protop-Sch. 40 Steel** Interval:	
		1						1-15': POORLY GRADED SAND with SILT, brown, medium to fine-grained, approximately 10% fines, sub-rounded, sub-angular.	RISER CASING Diameter: **2 inch** Type: **Sch. 40 PVC** Interval: **3' ags-170' bgs**	
5										5365
			Moist		10YR 5/4	SP-SM			GROUT Type: **Concrete, Neat Cement Grout** Interval: **0-5' bgs, 5-166.5' bgs**	
									SEAL Type: **Bentonite Chips** Interval: **166.5-168.5' bgs**	
10		2								5360
									SANDPACK Type: **NSF Certified Silica Sand** Interval: **168.5-182' bgs**	
									SCREEN Diameter: **2 inch** Type: **Sch. 40, .010 Slot, PVC** Interval: **171-181' bgs**	
15								15-20': SILTY SAND, powdery very pale brown, fine-grained, approximately 50% fines.	Screen fell slightly due to vibration packing of sand. Bentonite backfill from 182.5-190' bgs.	5355
			Moist		10YR 7/3	SM				
20		3						20-25': POORLY GRADED SAND with SILT, brown, medium to fine-grained, approximately 10% fines, sub-rounded, sub-angular.		5350
			Moist		10YR 5/4	SP-SM				
								(continued)		

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ENVIRO LOG 5 (5/27/04) 26460006.24_RHODIA.GPJ BARR LIBR JAN06.GLB 12/20/12

LOG OF BORING MW-12-3

Client Rhodia | Drill Contractor Major Drilling | SHEET 2 OF 8

Project Name Rhodia RFI 2012 | Drill Method Rotasonic

Number 26460006.24 | Drilling Started 10/1/12 Ended 10/2/12 | Surface Elevation 5370.1 ft

Location Silver Bow, Montana | Logged By AKJ | Total Depth 190.0 ft

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Moisture	Discoloration-Odor-Sheen	Color	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
			Moist		10YR 6/3 10YR 6/8	SC		25-27': CLAYEY SAND, pale brown to brownish yellow, fine-grained, approximately 40% fines, mottled, clumps broken with moderate pressure, mica.	PRO. CASING Diameter: **6"** Type: **Protop-Sch. 40 Steel** Interval: RISER CASING Diameter: **2 inch** Type: **Sch. 40 PVC** Interval: **3' ags-170' bgs** GROUT Type: **Concrete, Neat Cement Grout** Interval: **0-5' bgs, 5-166.5' bgs** SEAL Type: **Bentonite Chips** Interval: **166.5-168.5' bgs** SANDPACK Type: **NSF Certified Silica Sand** Interval: **168.5-182' bgs** SCREEN Diameter: **2 inch** Type: **Sch. 40, .010 Slot, PVC** Interval: **171-181' bgs** Screen fell slightly due to vibration packing of sand. Bentonite backfill from 182.5-190' bgs.	
		4						27-38.5': CLAYEY SAND, gray/pale brown, fine-grained, approximately 30% fines, smaller clumps than 25-27' bgs.		
30			Moist		10YR 6/3	SC				5340
		5	Moist		10YR 7/3			Larger flat, sub-angular clumps, mica from 33.5-34.5' bgs, approximately 50% fines. Color grades to very pale brown from 34.5-38.5' bgs, approximately 40% fines.		
35										5335
		6						38.5-45': SANDY LEAN CLAY, light yellowish brown, approximately 30% sand, small mica flakes.		
40			Moist		10YR 6/4	CL				5330
45										5325
			Moist		10YR 6/3 10YR 8/2	CL		45-50': SANDY LEAN CLAY, light brownish gray, approximately 10% sand.		
		7						*(continued)*		

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ENVIRO LOG 5 (5/27/04) 26460006.24_RHODIA.GPJ BARR LIBR JAN06.GLB 12/20/12

LOG OF BORING MW-12-3

Client Rhodia
Project Name Rhodia RFI 2012
Number 26460006.24
Location Silver Bow, Montana

Drill Contractor Major Drilling
Drill Method Rotasonic
Drilling Started 10/1/12 Ended 10/2/12
Logged By AKJ

Surface Elevation 5370.1 ft
Total Depth 190.0 ft

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Moisture	Discoloration-Odor-Sheen	Color	ASTM	LITHOLOGY	DESCRIPTION	ELEV. FEET
			Moist		2.5YR 6/2	SM		50-52': SILTY SAND, pale red, approximately 30% fines, low plasticity.	
		8	Moist		10YR 6/3	CL		52-55': SANDY LEAN CLAY, pale brown, approximately 30% sand, micaceous.	
55			Moist		10YR 6/4	CL		55-57': SANDY LEAN CLAY with GRAVEL, light yellowish brown, fine gravel, approximately 25% sand and 5% fine, sub-angular, elongated, gravel.	5315
		9	Moist		10YR 6/4 10YR 8/1	SC		57-60': CLAYEY SAND, light yellowish brown, fine-grained, approximately 35% fines, micaceous.	
60		10	Moist		10YR 6/4	CL		60-64': SANDY LEAN CLAY with GRAVEL, light yellowish brown, approximately 25% sand and 5% fine, sub-angular, elongated, gravel.	5310
			Moist		10YR 6/3	SM		64-65': SILTY SAND, pale brown, fine to medium-grained, approximately 20% fines, loose.	
65			Moist		10YR 6/4	CL		65-69': SANDY LEAN CLAY with GRAVEL, light yellowish brown, fine gravel, approximately 25% sand and 5% fine, sub-angular, elongated gravel, stiff.	5305
70		11	Dry to Moist		10YR 8/1	SM		69-70': SILTY SAND, gray, fine to medium-grained, approximately 20% fines, loose.	5300
			Moist		10YR 6/3	CL		70-73': SANDY LEAN CLAY, pale brown, approximately 10% sand, micaceous, stiff.	
			Moist		10YR 6/2	SC		73-74': CLAYEY SAND, light brownish gray, fine to medium-grained sand, approximately 40% fines, medium dense.	
			Moist		10YR 6/4	CL		74-75': SANDY LEAN CLAY with GRAVEL, light	

(continued)

WELL OR PIEZOMETER CONSTRUCTION DETAIL

PRO. CASING
Diameter: **6"**
Type: **Protop-Sch. 40 Steel**
Interval:

RISER CASING
Diameter: **2 inch**
Type: **Sch. 40 PVC**
Interval: **3' ags-170' bgs**

GROUT
Type: **Concrete, Neat Cement Grout**
Interval: **0-5' bgs, 5-166.5' bgs**

SEAL
Type: **Bentonite Chips**
Interval: **166.5-168.5' bgs**

SANDPACK
Type: **NSF Certified Silica Sand**
Interval: **168.5-182' bgs**

SCREEN
Diameter: **2 inch**
Type: **Sch. 40, .010 Slot, PVC**
Interval: **171-181' bgs**

Screen fell slightly due to vibration packing of sand. Bentonite backfill from 182.5-190' bgs.

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Remarks: No discoloration, odor, or sheen noted.

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ENVIRO LOG 5 (5/27/04) 26460006.24_RHODIA.GPJ BARR LIBR JAN06.GLB 12/20/12

LOG OF BORING MW-12-3

Client Rhodia | Drill Contractor Major Drilling | SHEET 4 OF 8

Project Name Rhodia RFI 2012 | Drill Method Rotasonic

Number 26460006.24 | Drilling Started 10/1/12 Ended 10/2/12 | Surface Elevation 5370.1 ft

Location Silver Bow, Montana | Logged By AKJ | Total Depth 190.0 ft

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Moisture	Discoloration-Odor-Sheen	Color	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
								yellowish brown, sub-angular, elongated fine gravel, approximately 25% sand and 5% fine gravel.	PRO. CASING Diameter: 6" Type: Protop-Sch. 40 Steel Interval:	
								75-85': SANDY LEAN CLAY, light brownish gray, approximately 30% fine-grained sand, medium dense, trace gravel and sand lenses present.	RISER CASING Diameter: 2 inch	
80		12	Moist to Wet		2.5Y 6/2	CL			Type: Sch. 40 PVC Interval: 3' ags-170' bgs	5290
									GROUT Type: Concrete, Neat Cement Grout Interval: 0-5' bgs, 5-166.5' bgs	
85								85-91': SANDY LEAN CLAY, light yellowish brown, approximately 30% fine to coarse-grained sand, approximately 10% fine gravel.	SEAL Type: Bentonite Chips Interval: 166.5-168.5' bgs	5285
									SANDPACK Type: NSF Certified Silica Sand Interval: 168.5-182' bgs	
			Moist to Wet		2.5Y 6/3	CL			SCREEN Diameter: 2 inch	
		13							Type: Sch. 40, .010 Slot, PVC	
90									Interval: 171-181' bgs	5280
									Screen fell slightly due to vibration packing of sand. Bentonite backfill from 182.5-190' bgs.	
			Moist to Wet		2.5Y 5/3	SC		91-93': CLAYEY SAND, light olive brown, approximately 30% fines, medium dense.		
			Wet		10YR 5/2	SP-SC		93-94': POORLY GRADED SAND with CLAY, grayish brown, medium-grained sand, approximately 10% fines, medium dense.		
		14	Moist		2.5Y 6/3	CL		94-95': LEAN CLAY with GRAVEL, light yellowish brown, approximately 5% sand and 10% gravel.		
95										5275
			Wet		2.5Y 5/2	CL		95-97': SANDY LEAN CLAY, grayish brown, approximately 25% sand, micaceous, stiff.		
			Wet		2.5Y 8/2 5Y 6/3	SP		97-98': POORLY GRADED SAND, gray, medium to fine-grained, approximately 5% fines, trace clay.		
			Wet		2.5Y 5/2	CL		98-99': SANDY LEAN CLAY, grayish brown, approximately 25% sand, micaceous, stiff.		
			Moist		2.5Y 5/2 5Y 6/3	GP		99-100': POORLY GRADED GRAVEL with		
								(continued)		

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Remarks: No discoloration, odor, or sheen noted.

BGS = "below ground surface"
Additional data may have been collected in the field which is not included on this log.

ENVIRO LOG 5 (5/27/04) 26460006.24_RHODIA.GPJ BARR LIBR JAN06.GLB 12/20/12

LOG OF BORING MW-12-3

Client Rhodia | Drill Contractor Major Drilling | SHEET 5 OF 8

Project Name Rhodia RFI 2012 | Drill Method Rotasonic

Number 26460006.24 | Drilling Started 10/1/12 Ended 10/2/12 | Surface Elevation 5370.1 ft

Location Silver Bow, Montana | Logged By AKJ | Total Depth 190.0 ft

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Moisture	Discoloration-Odor-Sheen	Color	ASTM	LITHOLOGY	DESCRIPTION	ELEV. FEET
		15	Moist to Wet		5YR 5/1	CL		SAND, gray gravel, yellowish brown sand, fine to medium angular, elongated gravel, approximately 35% sand and 5% fines. 100-105': LEAN CLAY, gray, approximately 5% sand, micaceous, very stiff, cleaves on horizontal plane.	
105									5265
			Moist to Wet		5YR 4/1	CL		105-112': LEAN CLAY, dark gray, approximately 5% sand, massive, stiff to very stiff.	
110		16							5260
			Moist to Wet		10YR 5/2	CL		112-115': SANDY LEAN CLAY, grayish brown, fine-grained sand, approximately 30% fine-grained sand, fine mica. Chert vein at 113' bgs.	
115									5255
			Wet		2.5Y 5/2	CL		115-118': SANDY LEAN CLAY, grayish brown, fine-grained sand, approximately 30% fine-grained sand, fine mica.	
								118-125': SANDY LEAN CLAY, grayish brown, trace gravel, approximately 40% sand. Difficult to determine contact at 125' bgs.	
120									5250
			Wet		2.5Y 5/2	CL			
								(continued)	

WELL OR PIEZOMETER CONSTRUCTION DETAIL

PRO. CASING
Diameter: **6"**
Type: **Protop-Sch. 40 Steel**
Interval:

RISER CASING
Diameter: **2 inch**
Type: **Sch. 40 PVC**
Interval: **3' ags-170' bgs**

GROUT
Type: **Concrete, Neat Cement Grout**
Interval: **0-5' bgs, 5-166.5' bgs**

SEAL
Type: **Bentonite Chips**
Interval: **166.5-168.5' bgs**

SANDPACK
Type: **NSF Certified Silica Sand**
Interval: **168.5-182' bgs**

SCREEN
Diameter: **2 inch**
Type: **Sch. 40, .010 Slot, PVC**
Interval: **171-181' bgs**

Screen fell slightly due to vibration packing of sand. Bentonite backfill from 182.5-190' bgs.

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Remarks: No discoloration, odor, or sheen noted.

BGS = "below ground surface"
Additional data may have been collected in the field which is not included on this log.

ENVIRO LOG 5 (5/27/04) 26460006.24_RHODIA.GPJ BARR LIBR JAN06.GLB 12/20/12

LOG OF BORING MW-12-3

Client Rhodia
Project Name Rhodia RFI 2012
Number 26460006.24
Location Silver Bow, Montana

Drill Contractor Major Drilling
Drill Method Rotasonic
Drilling Started 10/1/12 Ended 10/2/12
Logged By AKJ

Surface Elevation 5370.1 ft
Total Depth 190.0 ft

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Moisture	Discoloration-Odor-Sheen	Color	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		17	Wet		2.5Y 5/1	CL		125-126': SANDY LEAN CLAY, gray, approximately 20% sand, much more plastic than above (118-125' bgs).	PRO. CASING Diameter: **6"** Type: **Protop-Sch. 40 Steel** Interval:	
			Wet		2.5Y 5/2	CL		126-130': SANDY LEAN CLAY, grayish brown, approximately 40% sand.	RISER CASING Diameter: **2 inch** Type: **Sch. 40 PVC**	
130			Wet		2.5Y 5/1	CL		130-131': SANDY LEAN CLAY, gray, approximately 20% sand.	Interval: **3' ags-170' bgs** GROUT Type: **Concrete, Neat Cement Grout**	5240
			Dry to Moist		5Y 7/1	CL		131-132': MUDSTONE/CLAYSTONE, light gray, approximately 5% sand, blocky, hard to very hard.	Interval: **0-5' bgs, 5-166.5' bgs** SEAL Type: **Bentonite Chips**	
			Dry to Moist		5Y 7/2 5Y 4/1	CL		132-134': CLAY, mostly light gray, loose gravel size pieces (possibly broken claystone). Lens of dark gray silt at approximately 133' bgs.	Interval: **166.5-168.5' bgs** SANDPACK Type: **NSF Certified Silica Sand**	
135								134-149': LEAN CLAY, gray, approximately 5% sand, massive, very stiff.	Interval: **168.5-182' bgs** SCREEN Diameter: **2 inch** Type: **Sch. 40, .010 Slot, PVC**	5235
		18							Interval: **171-181' bgs** Screen fell slightly due to vibration packing of sand. Bentonite backfill from 182.5-190' bgs.	
140			Moist to Wet		2.5Y 5/1	CL				5230
145			Moist/Wet							5225
						CL		*(continued)*		

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Remarks: No discoloration, odor, or sheen noted.

BGS = "below ground surface"
Additional data may have been collected in the field which is not included on this log.

ENVIRO LOG 5 (5/27/04) 26460006.24_RHODIA.GPJ BARR LIBR JAN06.GLB 12/20/12

LOG OF BORING MW-12-3

Client Rhodia
Project Name Rhodia RFI 2012
Number 26460006.24
Location Silver Bow, Montana

Drill Contractor Major Drilling
Drill Method Rotasonic
Drilling Started 10/1/12 Ended 10/2/12
Logged By AKJ

Surface Elevation 5370.1 ft
Total Depth 190.0 ft

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Moisture	Discoloration-Odor-Sheen	Color	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		19	Moist to Wet		5Y 5/1 5Y 6/1	CL		149-151': LEAN CLAY, gray with gray mottling, medium stiffness, medium dense, medium to high plasticity.*(continued)*	PRO. CASING Diameter: **6"** Type: **Protop-Sch. 40 Steel** Interval:	
			Dry to Moist		5Y 6/2	CL		151-155': CLAY, light olive gray, yellow/olive mottling in places, very hard, almost claystone, cemented into blocks or plates, acid negative, dry in some places.	RISER CASING Diameter: **2 inch** Type: **Sch. 40 PVC** Interval: **3' ags-170' bgs**	
155								155-163': LEAN CLAY, olive gray, massive, stiff, micaceous.	GROUT Type: **Concrete, Neat Cement Grout** Interval: **0-5' bgs, 5-166.5' bgs** SEAL Type: **Bentonite Chips**	5215
			Moist		5Y 5/2	CL			Interval: **166.5-168.5' bgs**	
160									SANDPACK Type: **NSF Certified Silica Sand** Interval: **168.5-182' bgs**	5210
								163-167': LEAN CLAY, olive gray, yellow mottling, very hard, blocky, cleaves into sheets.	SCREEN Diameter: **2 inch** Type: **Sch. 40, .010 Slot, PVC** Interval: **171-181' bgs** Screen fell slightly due to vibration packing of sand. Bentonite backfill from 182.5-190' bgs.	
165		20	Dry to Moist		5Y 5/2 5Y 7/8	CL				5205
								167-180': LEAN CLAY, olive gray, massive, stiff, micaceous.		
170			Moist		5Y 5/2	CL				5200
								(continued)		

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Remarks: No discoloration, odor, or sheen noted.

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Additional data may have been collected in the field which is not included on this log.

ENVIRO LOG 5 (5/27/04) 26460006.24_RHODIA.GPJ BARR LIBR JAN06.GLB 12/20/12

LOG OF BORING MW-12-3

Client Rhodia
Project Name Rhodia RFI 2012
Number 26460006.24
Location Silver Bow, Montana

Drill Contractor Major Drilling
Drill Method Rotasonic
Drilling Started 10/1/12 Ended 10/2/12
Logged By AKJ

Surface Elevation 5370.1 ft
Total Depth 190.0 ft

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Moisture	Discoloration-Odor-Sheen	Color	ASTM	LITHOLOGY	DESCRIPTION	ELEV. FEET
			Moist/Wet			CL		167-180': LEAN CLAY, olive gray, massive, stiff, micaceous. *(continued)*	
180		21	Moist		5Y 6/4 7.5YR 5/8	CL		180-182': CLAY, pale olive and greenish, strong brown mottling, approximately 10% sand, very hard, some darker sand mixed in.	5190
			Dry to Moist		5Y 6/1 5Y 2.5/1	CL		182-185': CLAY, gray to black, color darkens with depth, very hard, broken into angular fragments, pieces of shale similar to 132-134' bgs, chert pieces present. Silt lens at 183' bgs.	
185								185-190': CLAY, dark gray, hard, shale pieces at bottom, may be all pulverized shale.	5185
		22	Dry to Moist		5B 4/1				
190								End of Boring - 190 feet	5180
195									5175

WELL OR PIEZOMETER CONSTRUCTION DETAIL

PRO. CASING
Diameter: **6"**
Type: **Protop-Sch. 40 Steel**
Interval:

RISER CASING
Diameter: **2 inch**
Type: **Sch. 40 PVC**
Interval: **3' ags-170' bgs**

GROUT
Type: **Concrete, Neat Cement Grout**
Interval: **0-5' bgs, 5-166.5' bgs**

SEAL
Type: **Bentonite Chips**
Interval: **166.5-168.5' bgs**

SANDPACK
Type: **NSF Certified Silica Sand**
Interval: **168.5-182' bgs**

SCREEN
Diameter: **2 inch**
Type: **Sch. 40, .010 Slot, PVC**
Interval: **171-181' bgs**

Screen fell slightly due to vibration packing of sand. Bentonite backfill from 182.5-190' bgs.

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Remarks: No discoloration, odor, or sheen noted.

BGS = "below ground surface"
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ENVIRO LOG 5 (5/27/04) 26460006.24_RHODIA.GPJ BARR LIBR JAN06.GLB 12/20/12

LOG OF BORING MW-12-4

Client Rhodia
Project Name Rhodia RFI 2012
Number 26460006.24
Location Silver Bow, Montana

Drill Contractor Major Drilling
Drill Method Rotasonic
Drilling Started 10/6/12 Ended 10/7/12
Logged By AKJ

SHEET 1 OF 2
Surface Elevation 5315.1 ft
Total Depth 40.5 ft

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Moisture	Discoloration-Odor-Sheen	Color	ASTM	LITHOLOGY	DESCRIPTION	ELEV. FEET
			Dry		10YR 5/3	SP		0-2': POORLY GRADED SAND, brown, fine to medium-grained, approximately 5% fines, sub-angular. Blueish gray cement debris near surface.	
		1	Dry		10YR 5/2	CL		2-5': SANDY LEAN CLAY, grayish brown, fine to medium-grained sand, approximately 30% sand, sub-angular to sub-round, some mica, clay is laminated.	
5			Dry		10YR 5/3	SM		5-6': SILTY SAND, brown, fine-grained, approximately 20% fines, sub-angular to sub-round.	5310
			Dry to Moist		10YR 6/3 10YR 7/2	SC		6-9': CLAYEY SAND, pale brown to light brown, approximately 30% fines and 10% gravel, some gravel, a few large cobbles.	
10		2	Moist		10YR 6/3	CL		9-15': LEAN CLAY, pale brown, approximately 10% sand, some mica.	5305
15			Dry to Moist		2.5Y 6/3 10YR 5/3	SP-SM		15-18': SILTY SAND, light yellowish brown, silt near top is brown, fine to medium-grained, approximately 10% fines.	5300
20		3	Moist		5Y 7/2 2.5Y 5/2	CL		18-25': LEAN CLAY, light gray, grayish brown near the top, approximately 5% sand, stiff, more plastic towards bottom.	5295

(continued)

WELL OR PIEZOMETER CONSTRUCTION DETAIL

PRO. CASING
Diameter: **6"**
Type: **Protop-Sch. 40 Steel**
Interval:

RISER CASING
Diameter: **2 inch**
Type: **Sch. 40 PVC**
Interval: **3' ags-19.5' bgs**

GROUT
Type: **Concrete, Neat Cement Grout**
Interval: **0-5' bgs, 5-14.5' bgs**

SEAL
Type: **Bentonite Chips**
Interval: **14.5-16.8' bgs**

SANDPACK
Type: **NSF Certified Silica Sand**
Interval: **16.8-40.5' bgs**

SCREEN
Diameter: **2 inch**
Type: **Sch. 40, .010 Slot, PVC**
Interval: **19.5-39.5' bgs**

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Remarks: *Geologic information obtained from MW-12-6 boring log*

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ENVIRO LOG 5 (5/27/04) 26460006.24_RHODIA.GPJ BARR LIBR JAN06.GLB 12/20/12

LOG OF BORING MW-12-4

Client Rhodia
Project Name Rhodia RFI 2012
Number 26460006.24
Location Silver Bow, Montana

Drill Contractor Major Drilling
Drill Method Rotasonic
Drilling Started 10/6/12 Ended 10/7/12
Logged By AKJ

Surface Elevation 5315.1 ft
Total Depth 40.5 ft

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Moisture	Discoloration-Odor-Sheen	Color	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
								Sand lens at 25' bgs.		
								25-32': LEAN CLAY, olive gray, spots of strong brown, approximately 5% sand, hard, massive.	PRO. CASING Diameter: **6"** Type: **Protop-Sch. 40 Steel** Interval: RISER CASING Diameter: **2 inch** Type: **Sch. 40 PVC** Interval: **3' ags-19.5' bgs** GROUT Type: **Concrete, Neat Cement Grout** Interval: **0-5' bgs, 5-14.5' bgs** SEAL Type: **Bentonite Chips** Interval: **14.5-16.8' bgs** SANDPACK Type: **NSF Certified Silica Sand** Interval: **16.8-40.5' bgs** SCREEN Diameter: **2 inch** Type: **Sch. 40, .010 Slot, PVC** Interval: **19.5-39.5' bgs**	
30		4	Moist		5Y 5/2 7.5YR 5/8	CL				5285
		5						32-40.5': SILTY SAND with CLAY, gray, low to medium plasticity, approximately 40% fines. Some very hard laminated disks from 32-35' bgs.		
35						SM				5280
			Moist		5Y 6/1					
40		6								5275
								End of Boring - 40.5 feet		
45										5270

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Telephone: 952-832-2600
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Remarks: *Geologic information obtained from MW-12-6 boring log*

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ENVIRO LOG 5 (5/27/04) 26460006.24_RHODIA.GPJ BARR LIBR JAN06.GLB 12/20/12

LOG OF BORING MW-12-5

Client Rhodia
Project Name Rhodia RFI 2012
Number 26460006.24
Location Silver Bow, Montana

Drill Contractor Major Drilling
Drill Method Rotasonic
Drilling Started 10/6/12 Ended 10/6/12
Logged By AKJ

SHEET 1 OF 4
Surface Elevation 5315.1 ft
Total Depth 95.0 ft

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Moisture	Discoloration-Odor-Sheen	Color	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
			Dry		10YR 5/3	SP		0-2': POORLY GRADED SAND, brown, fine to medium-grained, approximately 5% fines, sub-angular. Blueish gray cement debris near surface.	PRO. CASING Diameter: 6" Type: Protop-Sch. 40 Steel Interval:	
		1	Dry		10YR 5/2	CL		2-5': SANDY LEAN CLAY, grayish brown, fine to medium-grained sand, approximately 30% sand, sub-angular to sub-round, some mica, clay is laminated.	RISER CASING Diameter: 2 inch Type: Sch. 40 PVC Interval: 3' ags-83.5' bgs	
5			Dry		10YR 5/3	SM		5-6': SILTY SAND, brown, fine-grained, approximately 20% fines, sub-angular to sub-round.		5310
			Dry to Moist		10YR 6/3 10YR 7/2	SC		6-9': CLAYEY SAND, pale brown to light brown, approximately 30% fines and 10% gravel, some gravel, a few large cobbles.	GROUT Type: Concrete, Neat Cement Grout Interval: 0-5' bgs, 5-79.8' bgs SEAL Type: Bentonite Chips Interval: 79.8-81.8' bgs	
10		2	Moist		10YR 6/3	CL		9-15': LEAN CLAY, pale brown, approximately 10% sand, some mica.	SANDPACK Type: NSF Certified Silica Sand Interval: 81.8-95' bgs SCREEN Diameter: 2 inch Type: Sch. 40, .010 Slot, PVC Interval: 83.5-93.5' bgs	5305
15			Dry to Moist		2.5Y 6/3 10YR 5/3	SP-SM		15-18': SILTY SAND, light yellowish brown, silt near top is brown, fine to medium-grained, approximately 10% fines.		5300
20		3	Moist		5Y 7/2 2.5Y 5/2	CL		18-25': LEAN CLAY, light gray, grayish brown near the top, approximately 5% sand, stiff, more plastic towards bottom.		5295

(continued)

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Remarks: *Geologic information obtained from MW-12-6 boring log*

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ENVIRO LOG 5 (5/27/04) 26460006.24_RHODIA.GPJ BARR LIBR JAN06.GLB 12/20/12

LOG OF BORING MW-12-5

Client Rhodia | Drill Contractor Major Drilling | SHEET 2 OF 4

Project Name Rhodia RFI 2012 | Drill Method Rotasonic

Number 26460006.24 | Drilling Started 10/6/12 Ended 10/6/12 | Surface Elevation 5315.1 ft

Location Silver Bow, Montana | Logged By AKJ | Total Depth 95.0 ft

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Moisture	Discoloration-Odor-Sheen	Color	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
								Sand lens at 25' bgs.		
								25-32': LEAN CLAY, olive gray, spots of strong brown, approximately 5% sand, hard, massive.	PRO. CASING Diameter: **6"** Type: **Protop-Sch. 40 Steel** Interval:	
		4	Moist		5Y 5/2 7.5YR 5/8	CL			RISER CASING Diameter: **2 inch** Type: **Sch. 40 PVC**	
30									Interval: **3' ags-83.5' bgs** GROUT Type: **Concrete, Neat Cement Grout**	5285
								32-45': SILTY SAND with CLAY, gray, low to medium plasticity, approximately 40% fines. Some very hard laminated disks from 32-35' bgs.	Interval: **0-5' bgs, 5-79.8' bgs** SEAL Type: **Bentonite Chips**	
		5							Interval: **79.8-81.8' bgs**	
35										5280
									SANDPACK Type: **NSF Certified Silica Sand**	
			Moist		5Y 6/1	SM			Interval: **81.8-95' bgs** SCREEN Diameter: **2 inch**	
									Type: **Sch. 40, .010 Slot, PVC**	
40		6							Interval: **83.5-93.5' bgs**	5275
45										5270
			Dry to Moist		2.5Y 7/1 5Y 7/8 5Y 5/1	CL		45-48': LEAN CLAY, light gray with yellow mottling, gray from 46-47' bgs.		
			Dry to Moist		5Y 5/1	CL		48-50': LEAN CLAY, gray, approximately 10% sand, medium plasticity, breaks apart easily, some mica.		
								(continued)		

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ENVIRO LOG 5 (5/27/04) 26460006.24_RHODIA.GPJ BARR LIBR JAN06.GLB 12/20/12

LOG OF BORING MW-12-5

Client Rhodia | Drill Contractor Major Drilling | SHEET 3 OF 4

Project Name Rhodia RFI 2012 | Drill Method Rotasonic

Number 26460006.24 | Drilling Started 10/6/12 Ended 10/6/12 | Surface Elevation 5315.1 ft

Location Silver Bow, Montana | Logged By AKJ | Total Depth 95.0 ft

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Moisture	Discoloration-Odor-Sheen	Color	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
								50-58': LEAN CLAY, light gray with yellow mottling.	PRO. CASING Diameter: 6" Type: Protop-Sch. 40 Steel Interval: RISER CASING Diameter: 2 inch	
			Dry to Moist		2.5Y 7/1 5Y 7/8	CL			Type: Sch. 40 PVC Interval: 3' ags-83.5' bgs	
55										5260
									GROUT Type: Concrete, Neat Cement Grout Interval: 0-5' bgs, 5-79.8' bgs	
								58-65': SANDY LEAN CLAY, yellow mottling decreases and color grades to light olive gray, approximately 35% sand.	SEAL Type: Bentonite Chips Interval: 79.8-81.8' bgs	
60		8								5255
			Moist		5Y 7/8 5Y 6/2	CL			SANDPACK Type: NSF Certified Silica Sand Interval: 81.8-95' bgs	
									SCREEN Diameter: 2 inch Type: Sch. 40, .010 Slot, PVC Interval: 83.5-93.5' bgs	
65			Moist to Wet		5Y 6/3	CL		65-66': GRAVELLY LEAN CLAY, pale olive, approximately 20% gravel and 10% sand, relatively soft.		5250
			Dry to Moist		5Y 7/3	CL		66-69': LEAN CLAY, pale yellow, piece of blue/gray shale at contact with 69-71' bgs, approximately 5% sand and 5% gravel, gravel may be chert.		
		9								
70			Moist		5Y 5/1 5Y 4/1	GC		69-71': CLAYEY GRAVEL, gray clay, dark gray gravel, approximately 35% fines and 5% sand, hard, angular, sub-round to elongated, gravel may be chert.		5245
			Dry to Moist		5Y 4/1 7.5YR 5/8	CL		71-73': LEAN CLAY with SAND, light olive gray, approximately 15% sand, very hard, some strong brown mottling.		
		10	Moist		5Y 8/2 7.5YR 7/8	CHERT		73-76': PULVERIZED CHERT, pale yellow with strong brown mottling, looks like sand and gravel but macroscopic pieces are all same material, conchoidal fracturing.		

(continued)

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Remarks: *Geologic information obtained from MW-12-6 boring log*

BGS = "below ground surface"
Additional data may have been collected in the field which is not included on this log.

ENVIRO LOG 5 (5/27/04) 26460006.24_RHODIA.GPJ BARR LIBR JAN06.GLB 12/20/12

LOG OF BORING MW-12-5

Client Rhodia
Project Name Rhodia RFI 2012
Number 26460006.24
Location Silver Bow, Montana

Drill Contractor Major Drilling
Drill Method Rotasonic
Drilling Started 10/6/12 Ended 10/6/12
Logged By AKJ

Surface Elevation 5315.1 ft
Total Depth 95.0 ft

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Moisture	Discoloration-Odor-Sheen	Color	ASTM	LITHOLOGY	DESCRIPTION	ELEV. FEET
						CHERT			
			Moist		2.5Y 7/6 10YR 6/8 2.5Y 8/1	CL/CHERT CHERT		76-78': LEAN CLAY with CHERT, yellow clay, brownish yellow and white chert.	
80		11	Moist		5Y 5/2 7.5YR 5/8 2.5Y 6/2	CL		78-83': LEAN CLAY, light olive gray with strong brown mottling, approximately 10% sand, noticeable thin layers. Chert lens at 81' bgs. Color grades to light brownish gray and material becomes medium stiff to stiff from 81-83' bgs.	5235
			Moist		2.5Y 5/2	SM		83-85': SILTY SAND. grayish brown, fine-grained, approximately 40% fines, low to medium plasticity.	
85								85-95': SILTY SAND, grayish brown, approximately 40% fines. More plastic than 83-85' bgs.	5230
90			Moist		2.5Y 5/2	SM			5225
95								End of Boring - 95 feet	5220

WELL OR PIEZOMETER CONSTRUCTION DETAIL

PRO. CASING
Diameter: **6"**
Type: **Protop-Sch. 40 Steel**
Interval:

RISER CASING
Diameter: **2 inch**
Type: **Sch. 40 PVC**
Interval: **3' ags-83.5' bgs**

GROUT
Type: **Concrete, Neat Cement Grout**
Interval: **0-5' bgs, 5-79.8' bgs**

SEAL
Type: **Bentonite Chips**
Interval: **79.8-81.8' bgs**

SANDPACK
Type: **NSF Certified Silica Sand**
Interval: **81.8-95' bgs**

SCREEN
Diameter: **2 inch**
Type: **Sch. 40, .010 Slot, PVC**
Interval: **83.5-93.5' bgs**

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Remarks: *Geologic information obtained from MW-12-6 boring log*

BGS = "below ground surface"
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ENVIRO LOG 5 (5/27/04) 26460006.24_RHODIA.GPJ BARR LIBR JAN06.GLB 12/20/12

LOG OF BORING MW-12-6

Client Rhodia
Project Name Rhodia RFI 2012
Number 26460006.24
Location Silver Bow, Montana

Drill Contractor Major Drilling
Drill Method Rotasonic
Drilling Started 10/3/12 Ended 10/4/12
Logged By AKJ

Surface Elevation 5315.0 ft
Total Depth 205.0 ft

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Moisture	Discoloration-Odor-Sheen	Color	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
			Dry		10YR 5/3	SP		0-2': POORLY GRADED SAND, brown, fine to medium-grained, approximately 5% fines, sub-angular. Blueish gray cement debris near surface.	PRO. CASING Diameter: **6"** Type: **Protop-Sch. 40 Steel** Interval:	
		1	Dry		10YR 5/2	CL		2-5': SANDY LEAN CLAY, grayish brown, fine to medium-grained sand, approximately 30% sand, sub-angular to sub-round, some mica, clay is laminated.	RISER CASING Diameter: **2 inch** Type: **Sch. 40 PVC** Interval: **3' ags-189.5' bgs**	
5			Dry		10YR 5/3	SM		5-6': SILTY SAND, brown, fine-grained, approximately 20% fines, sub-angular to sub-round.		5310
			Dry to Moist		10YR 6/3 10YR 7/2	SC		6-9': CLAYEY SAND, pale brown to light brown, approximately 30% fines and 10% gravel, a few cobbles.	GROUT Type: **Concrete, Neat Cement Grout** Interval: **0-5' bgs, 5-184.2' bgs** SEAL Type: **Bentonite Chips**	
10		2	Moist		10YR 6/3	CL		9-15': LEAN CLAY, pale brown, approximately 10% sand, some mica.	Interval: **184.2-187' bgs** SANDPACK Type: **NSF Certified Silica Sand** Interval: **187-205' bgs**	5305
15			Dry to Moist		2.5Y 6/3 10YR 5/3	SP-SM		15-18': SILTY SAND, light yellowish brown, silt near top is brown, fine to medium-grained, approximately 10% fines.	SCREEN Diameter: **2 inch** Type: **Sch. 40, .010 Slot, PVC** Interval: **189.5-199.5' bgs**	5300
20		3	Moist		5Y 7/2 2.5Y 5/2	CL		18-25': LEAN CLAY, light gray, grayish brown near the top, approximately 5% sand, stiff, more plastic towards bottom.		5295

(continued)

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Remarks: No discoloration, odor, or sheen noted.

BGS = "below ground surface"
Additional data may have been collected in the field which is not included on this log.

ENVIRO LOG 5 (5/27/04) 26460006.24_RHODIA.GPJ BARR LIBR JAN06.GLB 12/20/12

LOG OF BORING MW-12-6

Client Rhodia
Project Name Rhodia RFI 2012
Number 26460006.24
Location Silver Bow, Montana

Drill Contractor Major Drilling
Drill Method Rotasonic
Drilling Started 10/3/12 Ended 10/4/12
Logged By AKJ

Surface Elevation 5315.0 ft
Total Depth 205.0 ft

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Moisture	Discoloration-Odor-Sheen	Color	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
								Sand lens at 25' bgs.		
								25-32': LEAN CLAY, olive gray, spots of strong brown, approximately 5% sand, hard, massive.	PRO. CASING Diameter: **6"** Type: **Protop-Sch. 40 Steel** Interval:	
		4	Moist		5Y 5/2 7.5YR 5/8	CL			RISER CASING Diameter: **2 inch**	
30									Type: **Sch. 40 PVC**	5285
									Interval: **3' ags-189.5' bgs** GROUT Type: **Concrete, Neat Cement Grout**	
								32-45': SILTY SAND with CLAY, gray, low to medium plasticity, approximately 40% fines. Some very hard laminated disks from 32-35' bgs.	Interval: **0-5' bgs, 5-184.2' bgs** SEAL Type: **Bentonite Chips**	
		5							Interval: **184.2-187' bgs**	
35										5280
									SANDPACK Type: **NSF Certified Silica Sand**	
									Interval: **187-205' bgs** SCREEN Diameter: **2 inch**	
			Moist		5Y 6/1	SM			Type: **Sch. 40, .010 Slot, PVC**	
40		6							Interval: **189.5-199.5' bgs**	5275
45										5270
			Dry to Moist		2.5Y 7/1 5Y 7/8 5Y 5/1	CL		45-48': LEAN CLAY, light gray with yellow mottling, gray from 46-47' bgs.		
			Dry to Moist		5Y 5/1	CL		48-50': LEAN CLAY, gray, approximately 10% sand, medium plasticity, breaks apart easily, some mica.		
								(continued)		

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ENVIRO LOG 5 (5/27/04) 26460006.24_RHODIA.GPJ BARR LIBR JAN06.GLB 12/20/12

LOG OF BORING MW-12-6

Client Rhodia
Project Name Rhodia RFI 2012
Number 26460006.24
Location Silver Bow, Montana

Drill Contractor Major Drilling
Drill Method Rotasonic
Drilling Started 10/3/12 Ended 10/4/12
Logged By AKJ

Surface Elevation 5315.0 ft
Total Depth 205.0 ft

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Moisture	Discoloration-Odor-Sheen	Color	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
								50-58': LEAN CLAY, light gray with yellow mottling.	PRO. CASING Diameter: **6"** Type: **Protop-Sch. 40 Steel** Interval: RISER CASING Diameter: **2 inch** Type: **Sch. 40 PVC** Interval: **3' ags-189.5' bgs** GROUT Type: **Concrete, Neat Cement Grout** Interval: **0-5' bgs, 5-184.2' bgs** SEAL Type: **Bentonite Chips** Interval: **184.2-187' bgs** SANDPACK Type: **NSF Certified Silica Sand** Interval: **187-205' bgs** SCREEN Diameter: **2 inch** Type: **Sch. 40, .010 Slot, PVC** Interval: **189.5-199.5' bgs**	
			Dry to Moist		2.5Y 7/1 5Y 7/8	CL				
55										5260
								58-65': SANDY LEAN CLAY, yellow mottling decreases and color grades to light olive gray, approximately 35% sand.		
60		8								5255
			Moist		5Y 7/8 5Y 6/2	CL				
65			Moist to Wet		5Y 6/3	CL		65-66': GRAVELLY LEAN CLAY, pale olive, approximately 20% gravel and 10% sand, relatively soft.		5250
			Dry to Moist		5Y 7/3	CL		66-69': LEAN CLAY, pale yellow, piece of blue/gray shale at contact with 69-71' bgs, approximately 5% sand and 5% gravel, gravel may be chert.		
		9								
70			Moist		5Y 5/1 5Y 4/1	GC		69-71': CLAYEY GRAVEL, gray clay, dark gray gravel, approximately 35% fines and 5% sand, hard, angular, sub-round to elongated, gravel may be chert.		5245
			Dry to Moist		5Y 4/1 7.5YR 5/8	CL		71-73': LEAN CLAY with SAND, light olive gray, approximately 15% sand, very hard, some strong brown mottling.		
		10	Moist		5Y 8/2 7.5YR 7/8	CHERT		73-76': PULVERIZED CHERT, pale yellow with strong brown mottling, looks like sand and gravel but macroscopic pieces are all same material, conchoidal fracturing.		

(continued)

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Remarks: No discoloration, odor, or sheen noted.

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ENVIRO LOG 5 (5/27/04) 26460006.24_RHODIA.GPJ BARR LIBR JAN06.GLB 12/20/12

LOG OF BORING MW-12-6

Client Rhodia | Drill Contractor Major Drilling | SHEET 4 OF 9

Project Name Rhodia RFI 2012 | Drill Method Rotasonic

Number 26460006.24 | Drilling Started 10/3/12 Ended 10/4/12 | Surface Elevation 5315.0 ft

Location Silver Bow, Montana | Logged By AKJ | Total Depth 205.0 ft

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Moisture	Discoloration-Odor-Sheen	Color	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
						CHERT			PRO. CASING Diameter: **6"** Type: **Protop-Sch. 40 Steel** Interval:	
			Moist		2.5Y 7/6 10YR 6/8 2.5Y 8/1	CL CHERT		76-78': LEAN CLAY with CHERT, yellow clay, brownish yellow and white chert.		
80		11	Moist		5Y 5/2 7.5YR 5/8 2.5Y 6/2	CL		78-83': LEAN CLAY, light olive gray with strong brown mottling, approximately 10% sand, noticeable thin layers. Chert lens at 81' bgs. Color grades to light brownish gray and material becomes medium stiff to stiff from 81-83' bgs.	RISER CASING Diameter: **2 inch** Type: **Sch. 40 PVC** Interval: **3' ags-189.5' bgs** GROUT Type: **Concrete, Neat Cement Grout** Interval: **0-5' bgs, 5-184.2' bgs** SEAL Type: **Bentonite Chips** Interval: **184.2-187' bgs**	5235
85			Moist		2.5Y 5/2	SM		83-85': SILTY SAND. grayish brown, fine-grained, approximately 40% fines, low to medium plasticity.		5230
								85-95': SILTY SAND, grayish brown, approximately 40% fines. More plastic than 83-85' bgs.	SANDPACK Type: **NSF Certified Silica Sand** Interval: **187-205' bgs** SCREEN Diameter: **2 inch** Type: **Sch. 40, .010 Slot, PVC** Interval: **189.5-199.5' bgs**	
90		12	Moist		2.5Y 5/2	SM				5225
95			Moist		2.5Y 5/2	CL		95-98': SANDY LEAN CLAY, grayish brown, approximately 30% sand. Similar to 85-95' bgs but with more clay.		5220
						CL		98-104': LEAN CLAY, light brownish gray, approximately 10% fine-grained sand.		

(continued)

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ENVIRO LOG 5 (5/27/04) 26460006.24_RHODIA.GPJ BARR LIBR JAN06.GLB 12/20/12

LOG OF BORING MW-12-6

Client Rhodia | Drill Contractor Major Drilling | SHEET 5 OF 9

Project Name Rhodia RFI 2012 | Drill Method Rotasonic

Number 26460006.24 | Drilling Started 10/3/12 Ended 10/4/12 | Surface Elevation 5315.0 ft

Location Silver Bow, Montana | Logged By AKJ | Total Depth 205.0 ft

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Moisture	Discoloration-Odor-Sheen	Color	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		13	Moist		2.5Y 6/2	CL		98-104': LEAN CLAY, light brownish gray, approximately 10% fine-grained sand.*(continued)*	PRO. CASING Diameter: **6"** Type: **Protop-Sch. 40 Steel** Interval: RISER CASING Diameter: **2 inch** Type: **Sch. 40 PVC** Interval: **3' ags-189.5' bgs** GROUT Type: **Concrete, Neat Cement Grout** Interval: **0-5' bgs, 5-184.2' bgs** SEAL Type: **Bentonite Chips** Interval: **184.2-187' bgs** SANDPACK Type: **NSF Certified Silica Sand** Interval: **187-205' bgs** SCREEN Diameter: **2 inch** Type: **Sch. 40, .010 Slot, PVC** Interval: **189.5-199.5' bgs**	
105			Moist to Wet		2.5Y 5/2	SM		104-106': SILTY SAND. grayish brown, fine-grained, approximately 30% fines, low to medium plasticity.		5210
			Moist		2.5Y 6/2	CL		106-111': LEAN CLAY, light brownish gray, approximately 10% fine-grained sand. Manganese flecks at 108' bgs.		
110		14								5205
			Moist		2.5Y 5/2	SM		111-113': SILTY SAND. grayish brown, fine-grained, approximately 30% fines, low to medium plasticity.		
			Moist		2.5Y 6/2	CL		113-115': LEAN CLAY, light brownish gray, approximately 10% fine-grained sand.		
115										5200
			Moist to Wet		2.5Y 5/2	SM		115-120': SILTY SAND. grayish brown, fine-grained, approximately 30% fines, low to medium plasticity. Medium to coarse-grained sand from 118-120' bgs.		
120		15								5195
			Moist		2.5Y 7/2	CL		120-123': LEAN CLAY, light gray, hard.		
			Moist to Wet		2.5Y 5/2	SM		123-125': SILTY SAND. grayish brown, fine-grained, approximately 30% fines, low to medium plasticity. Medium to coarse-grained sand from 124-125'		
								(continued)		

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ENVIRO LOG 5 (5/27/04) 26460006.24_RHODIA.GPJ BARR LIBR JAN06.GLB 12/20/12

LOG OF BORING MW-12-6

Client Rhodia | Drill Contractor Major Drilling | SHEET 6 OF 9

Project Name Rhodia RFI 2012 | Drill Method Rotasonic

Number 26460006.24 | Drilling Started 10/3/12 Ended 10/4/12 | Surface Elevation 5315.0 ft

Location Silver Bow, Montana | Logged By AKJ | Total Depth 205.0 ft

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Moisture	Discoloration-Odor-Sheen	Color	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
								bgs.		
								125-135': LEAN CLAY with SAND, brown, approximately 20% fine to medium-grained sand.	PRO. CASING Diameter: **6"** Type: **Protop-Sch. 40 Steel** Interval: RISER CASING Diameter: **2 inch**	
130		16	Moist to Wet		10YR 5/3 10YR 7/4	CL		Color grades to pale brown at 130' bgs.	Type: **Sch. 40 PVC** Interval: **3' ags-189.5' bgs** GROUT Type: **Concrete, Neat Cement Grout** Interval: **0-5' bgs, 5-184.2' bgs** SEAL Type: **Bentonite Chips**	5185
135								135-145': LEAN CLAY, brown with some strong brown mottling, approximately 10% sand, clay cemented into angular blocky pieces about the size of small gravel, similar to 125-135' bgs but less sand.	Interval: **184.2-187' bgs** SANDPACK Type: **NSF Certified Silica Sand** Interval: **187-205' bgs** SCREEN Diameter: **2 inch** Type: **Sch. 40, .010 Slot, PVC** Interval: **189.5-199.5' bgs**	5180
140		17	Moist to Wet		10YR 5/3 7.5YR 5/8	CL				5175
145			Moist to Wet		7.5YR 5/4 10YR 6/2	CL		145-149': SANDY LEAN CLAY, brown sand and gravel, light brownish gray clay, approximately 30% sand and 5% gravel, medium soft.		5170
						CL		*(continued)*		

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ENVIRO LOG 5 (5/27/04) 26460006.24_RHODIA.GPJ BARR LIBR JAN06.GLB 12/20/12

LOG OF BORING MW-12-6

Client Rhodia | Drill Contractor Major Drilling | SHEET 7 OF 9

Project Name Rhodia RFI 2012 | Drill Method Rotasonic

Number 26460006.24 | Drilling Started 10/3/12 Ended 10/4/12 | Surface Elevation 5315.0 ft

Location Silver Bow, Montana | Logged By AKJ | Total Depth 205.0 ft

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Moisture	Discoloration-Odor-Sheen	Color	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
		18	Moist to Wet		2.5Y 7/1	CL		149-152': LEAN CLAY, light gray, approximately 10% medium to fine-grained sand, medium to low plasticity, could be silty clay (CL-ML).*(continued)*	PRO. CASING Diameter: **6"** Type: **Protop-Sch. 40 Steel** Interval: RISER CASING Diameter: **2 inch** Type: **Sch. 40 PVC** Interval: **3' ags-189.5' bgs** GROUT Type: **Concrete, Neat Cement Grout** Interval: **0-5' bgs, 5-184.2' bgs** SEAL Type: **Bentonite Chips** Interval: **184.2-187' bgs** SANDPACK Type: **NSF Certified Silica Sand** Interval: **187-205' bgs** SCREEN Diameter: **2 inch** Type: **Sch. 40, .010 Slot, PVC** Interval: **189.5-199.5' bgs**	
155			Moist to Wet					152-185': LEAN CLAY with SAND, brown, approximately 10% sand, medium to low plasticity.		5160
160		19								5155
			Moist		7.5YR 5/4	CL				
165			Moist to Wet							5150
170		20								5145
								(continued)		

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ENVIRO LOG 5 (5/27/04) 26460006.24_RHODIA.GPJ BARR LIBR JAN06.GLB 12/20/12

LOG OF BORING MW-12-6

Client Rhodia
Project Name Rhodia RFI 2012
Number 26460006.24
Location Silver Bow, Montana

Drill Contractor Major Drilling
Drill Method Rotasonic
Drilling Started 10/3/12 Ended 10/4/12
Logged By AKJ

Surface Elevation 5315.0 ft
Total Depth 205.0 ft

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Moisture	Discoloration-Odor-Sheen	Color	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
			Moist					152-185': LEAN CLAY with SAND, brown, approximately 10% sand, medium to low plasticity.*(continued)*	PRO. CASING Diameter: **6"** Type: **Protop-Sch. 40 Steel** Interval: RISER CASING Diameter: **2 inch**	
180		21				CL			Type: **Sch. 40 PVC** Interval: **3' ags-189.5' bgs** GROUT Type: **Concrete, Neat Cement Grout** Interval: **0-5' bgs, 5-184.2' bgs** SEAL Type: **Bentonite Chips**	5135
185								185-200': CLAYEY SAND, brown, medium to coarse-grained sand, sand content increases with depth, approximately 30% fines and 10% gravel, some granite gravel.	Interval: **184.2-187' bgs** SANDPACK Type: **NSF Certified Silica Sand** Interval: **187-205' bgs** SCREEN Diameter: **2 inch** Type: **Sch. 40, .010 Slot, PVC** Interval: **189.5-199.5' bgs**	5130
190		22								5125
			Moist to Wet		7.5YR 5/4	SC				
195			Moist/Wet							5120
		23						Some light red coloring near 200' bgs.		
								(continued)		

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ENVIRO LOG 5 (5/27/04) 26460006.24_RHODIA.GPJ BARR LIBR JAN06.GLB 12/20/12

LOG OF BORING MW-12-6

Client Rhodia
Project Name Rhodia RFI 2012
Number 26460006.24
Location Silver Bow, Montana

Drill Contractor Major Drilling
Drill Method Rotasonic
Drilling Started 10/3/12 Ended 10/4/12
Logged By AKJ

Surface Elevation 5315.0 ft
Total Depth 205.0 ft

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Moisture	Discoloration-Odor-Sheen	Color	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
					10R 6/8			200-205': LEAN CLAY, yellowish brown, approximately 5% sand.	PRO. CASING Diameter: **6"** Type: **Protop-Sch. 40 Steel** Interval: RISER CASING Diameter: **2 inch** Type: **Sch. 40 PVC** Interval: **3' ags-189.5' bgs** GROUT Type: **Concrete, Neat Cement Grout** Interval: **0-5' bgs, 5-184.2' bgs** SEAL Type: **Bentonite Chips** Interval: **184.2-187' bgs** SANDPACK Type: **NSF Certified Silica Sand** Interval: **187-205' bgs** SCREEN Diameter: **2 inch** Type: **Sch. 40, .010 Slot, PVC** Interval: **189.5-199.5' bgs**	
		24	Moist		10YR 5/4	CL				
205								End of Boring - 205 feet		5110
210										5105
215										5100
220										5095

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ENVIRO LOG 5 (5/27/04) 26460006.24_RHODIA.GPJ BARR LIBR JAN06.GLB 12/20/12

LOG OF BORING MW-12-7

Client Rhodia
Project Name Rhodia RFI 2012
Number 26460006.24
Location Silver Bow, Montana

Drill Contractor Major Drilling
Drill Method Rotasonic
Drilling Started 10/8/12 Ended 10/8/12
Logged By AKJ

Surface Elevation 5344.4 ft
Total Depth 69.0 ft

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Moisture	Discoloration-Odor-Sheen	Color	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
			Dry		10YR 5/3	ML/OL		0-1': SILTY TOPSOIL, brown, approximately 40% sand and 60% fines, roots.	PRO. CASING Diameter: 6" Type: Protop-Sch. 40 Steel Interval:	
		1	Dry to Moist		10YR 5/3	CL		1-8': SANDY LEAN CLAY, brown, approximately 35% sand, medium plasticity, some mica.	RISER CASING Diameter: 2 inch Type: Sch. 40 PVC Interval: 3' ags-49' bgs	5340
5									GROUT Type: Concrete, Neat Cement Grout Interval: 0-5' bgs, 5-44.4' bgs	
		2	Moist		10YR 5/4	SP		8-12': POORLY GRADED SAND with GRAVEL, yellowish brown, fine to medium-grained sand, approximately 30% gravel and 5% fines, fines are silt, some cobbles.	SEAL Type: Bentonite Chips Interval: 44.4-46.5' bgs	5335
10									SANDPACK Type: NSF Certified Silica Sand Interval: 46.5-69' bgs	
			Moist		2.5Y 5/2 10YR 6/8	CL		12-15': LEAN CLAY, grayish brown with brownish yellow mottling, approximately 5% sand, hard claystone pieces, abundant mica.	SCREEN Diameter: 2 inch Type: Sch. 40, .010 Slot, PVC Interval: 49-69' bgs	5330
15								15-25': CLAYEY SAND, brown, fine gravel near top, approximately 30% fines and 10% gravel, a few very hard clumps.		
		3	Moist		10YR 5/3	SC				5325
20					2.5Y 7/2 10YR 5/6			Lens of light gray with yellowish brown mottling from 21-22' bgs.		
										5320
								(continued)		

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Minneapolis, MN 55435-4803
Telephone: 952-832-2600
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Remarks: *Geologic information obtained from MW-12-8 boring log*

BGS = "below ground surface"
Additional data may have been collected in the field which is not included on this log.

ENVIRO LOG 5 (5/27/04) 26460006.24_RHODIA.GPJ BARR LIBR JAN06.GLB 12/20/12

LOG OF BORING MW-12-7

Client Rhodia
Project Name Rhodia RFI 2012
Number 26460006.24
Location Silver Bow, Montana

Drill Contractor Major Drilling
Drill Method Rotasonic
Drilling Started 10/8/12 Ended 10/8/12
Logged By AKJ

Surface Elevation 5344.4 ft
Total Depth 69.0 ft

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Moisture	Discoloration-Odor-Sheen	Color	ASTM	LITHOLOGY	DESCRIPTION	ELEV. FEET
			Moist		10YR 5/3	CL		25-26': LEAN CLAY, brown, approximately 5% sand, a few cobbles, high dry strength.	
			Moist		10YR 6/2	ML		26-27': SILT, light brownish gray, approximately 5% sand.	
		4	Moist		10YR 5/4	ML		27-31': SANDY SILT, yellowish brown, approximately 20% sand and 5% gravel, gravel is granite.	5315
30									
		5						31-55': SILT, yellowish brown, approximately 10% sand, low plasticity.	5310
35									
								Clay content increases from 38-45' bgs.	5305
40		6	Moist		10YR 5/4	ML			
								Approximately 30% sand at 45' bgs.	5300
45									
									5295

(continued)

WELL OR PIEZOMETER CONSTRUCTION DETAIL

PRO. CASING
Diameter: **6"**
Type: **Protop-Sch. 40 Steel**
Interval:

RISER CASING
Diameter: **2 inch**
Type: **Sch. 40 PVC**
Interval: **3' ags-49' bgs**

GROUT
Type: **Concrete, Neat Cement Grout**
Interval: **0-5' bgs, 5-44.4' bgs**

SEAL
Type: **Bentonite Chips**
Interval: **44.4-46.5' bgs**

SANDPACK
Type: **NSF Certified Silica Sand**
Interval: **46.5-69' bgs**

SCREEN
Diameter: **2 inch**
Type: **Sch. 40, .010 Slot, PVC**
Interval: **49-69' bgs**

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ENVIRO LOG 5 (5/27/04) 26460006.24_RHODIA.GPJ BARR LIBR JAN06.GLB 12/20/12

LOG OF BORING MW-12-7

Client Rhodia
Project Name Rhodia RFI 2012
Number 26460006.24
Location Silver Bow, Montana

Drill Contractor Major Drilling
Drill Method Rotasonic
Drilling Started 10/8/12 Ended 10/8/12
Logged By AKJ

Surface Elevation 5344.4 ft
Total Depth 69.0 ft

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Moisture	Discoloration-Odor-Sheen	Color	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
						ML		31-55': SILT, yellowish brown, approximately 10% sand, low plasticity.*(continued)* Sand content increases from 45-55' bgs, sand is granitic, grain size increases with depth.	PRO. CASING Diameter: **6"** Type: **Protop-Sch. 40 Steel** Interval: RISER CASING Diameter: **2 inch** Type: **Sch. 40 PVC** Interval: **3' ags-49' bgs** GROUT Type: **Concrete, Neat Cement Grout** Interval: **0-5' bgs, 5-44.4' bgs** SEAL Type: **Bentonite Chips** Interval: **44.4-46.5' bgs** SANDPACK Type: **NSF Certified Silica Sand** Interval: **46.5-69' bgs** SCREEN Diameter: **2 inch** Type: **Sch. 40, .010 Slot, PVC** Interval: **49-69' bgs**	5290
55								55-61': SANDY SILT, brown, approximately 35% very fine-grained sand, low plasticity, appears to be water bearing.		
			Wet		10YR 4/3	ML				5285
60		8						61-65': SANDY SILT with CLAY, reddish gray, approximately 15% medium to coarse-grained sand, sub-angular. Appears to be layered with light olive gray with strong brown mottling. Color grades to gray from 62-65' bgs. Hard, difficult to break up.		
			Moist		2.5YR 5/1 5Y 6/2 7.5YR 4/6 2.5Y 6/1	ML				5280
65								65-69': SANDY SILT, color varies from grayish brown with strong brown streaks to brown, approximately 20% fine-grained sand, some clay, becomes drier with depth, low plasticity, rapid dilatancy.		
						ML				
								End of Boring - 69 feet		5275
70										
										5270

Barr Engineering Co.
4700 West 77th Street
Minneapolis, MN 55435-4803
Telephone: 952-832-2600
Fax:

Remarks: *Geologic information obtained from MW-12-8 boring log*

BGS = "below ground surface"
Additional data may have been collected in the field which is not included on this log.

ENVIRO LOG 5 (5/27/04) 26460006.24_RHODIA.GPJ BARR LIBR JAN06.GLB 12/20/12

LOG OF BORING MW-12-8

Client Rhodia
Project Name Rhodia RFI 2012
Number 26460006.24
Location Silver Bow, Montana

Drill Contractor Major Drilling
Drill Method Rotasonic
Drilling Started 10/7/12 Ended 10/7/12
Logged By AKJ

SHEET 1 OF 4
Surface Elevation 5344.2 ft
Total Depth 100.0 ft

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Moisture	Discoloration-Odor-Sheen	Color	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
			Dry		10YR 5/3	ML/OL		0-1': SILTY TOPSOIL, brown, approximately 40% sand and 60% fines, roots.	PRO. CASING Diameter: **6"** Type: **Protop-Sch. 40 Steel** Interval:	
		1	Dry to Moist		10YR 5/3	CL		1-8': SANDY LEAN CLAY, brown, approximately 35% sand, medium plasticity, some mica.	RISER CASING Diameter: **2 inch** Type: **Sch. 40 PVC** Interval: **3' ags-85' bgs** GROUT Type: **Concrete, Neat Cement Grout** Interval: **0-5' bgs, 5-80' bgs** SEAL Type: **Bentonite Chips** Interval: **80-82.5' bgs** SANDPACK Type: **NSF Certified Silica Sand** Interval: **82.5-96' bgs** SCREEN Diameter: **2 inch** Type: **Sch. 40, .010 Slot, PVC** Interval: **85-95' bgs**	5340
5										
		2	Moist		10YR 5/4	SP		8-12': POORLY GRADED SAND with GRAVEL, yellowish brown, fine to medium-grained sand, approximately 30% gravel and 5% fines, fines are silt, some cobbles.		5335
10										
			Moist		2.5Y 5/2 10YR 6/8	CL		12-15': LEAN CLAY, grayish brown with brownish yellow mottling, approximately 5% sand, hard claystone pieces, abundant mica.		5330
15										
		3	Moist		10YR 5/3 2.5Y 7/2 10YR 5/6	SC		15-25': CLAYEY SAND, brown, fine gravel near top, approximately 30% fines and 10% gravel, a few very hard clumps. Lens of light gray with yellowish brown mottling from 21-22' bgs.	Bentonite backfill from 96-100' bgs.	5325
20										5320
								(continued)		

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Telephone: 952-832-2600
Fax:

Remarks: No discoloration, odor, or sheen noted.

BGS = "below ground surface"
Additional data may have been collected in the field which is not included on this log.

ENVIRO LOG 5 (5/27/04) 26460006.24_RHODIA.GPJ BARR LIBR JAN06.GLB 12/20/12

LOG OF BORING MW-12-8

Client Rhodia
Project Name Rhodia RFI 2012
Number 26460006.24
Location Silver Bow, Montana

Drill Contractor Major Drilling
Drill Method Rotasonic
Drilling Started 10/7/12 Ended 10/7/12
Logged By AKJ

Surface Elevation 5344.2 ft
Total Depth 100.0 ft

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Moisture	Discoloration-Odor-Sheen	Color	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
			Moist		10YR 5/3	CL		25-26': LEAN CLAY, brown, approximately 5% sand, a few cobbles, high dry strength.	PRO. CASING Diameter: 6" Type: Protop-Sch. 40 Steel Interval:	
			Moist		10YR 6/2	ML		26-27': SILT, light brownish gray, approximately 5% sand.		
		4	Moist		10YR 5/4	ML		27-31': SANDY SILT, yellowish brown, approximately 20% sand and 5% gravel, gravel is granite.	RISER CASING Diameter: 2 inch Type: Sch. 40 PVC Interval: 3' ags-85' bgs	5315
30									GROUT Type: Concrete, Neat Cement Grout Interval: 0-5' bgs, 5-80' bgs	
		5						31-55': SILT, yellowish brown, approximately 10% sand, low plasticity.	SEAL Type: Bentonite Chips Interval: 80-82.5' bgs	5310
35									SANDPACK Type: NSF Certified Silica Sand Interval: 82.5-96' bgs	
								Clay content increases from 38-45' bgs.	SCREEN Diameter: 2 inch Type: Sch. 40, .010 Slot, PVC Interval: 85-95' bgs	5305
40		6	Moist		10YR 5/4	ML			Bentonite backfill from 96-100' bgs.	
										5300
45								Approximately 30% sand at 45' bgs.		
										5295

(continued)

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Fax:

Remarks: No discoloration, odor, or sheen noted.

BGS = "below ground surface"
Additional data may have been collected in the field which is not included on this log.

ENVIRO LOG 5 (5/27/04) 26460006.24_RHODIA.GPJ BARR LIBR JAN06.GLB 12/20/12

LOG OF BORING MW-12-8

Client Rhodia | Drill Contractor Major Drilling | SHEET 3 OF 4

Project Name Rhodia RFI 2012 | Drill Method Rotasonic

Number 26460006.24 | Drilling Started 10/7/12 Ended 10/7/12 | Surface Elevation 5344.2 ft

Location Silver Bow, Montana | Logged By AKJ | Total Depth 100.0 ft

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Moisture	Discoloration-Odor-Sheen	Color	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
						ML		31-55': SILT, yellowish brown, approximately 10% sand, low plasticity.*(continued)* Sand content increases from 45-55' bgs, sand is granitic, grain size increases with depth.	PRO. CASING Diameter: **6"** Type: **Protop-Sch. 40 Steel** Interval: RISER CASING Diameter: **2 inch** Type: **Sch. 40 PVC** Interval: **3' ags-85' bgs** GROUT Type: **Concrete, Neat Cement Grout** Interval: **0-5' bgs, 5-80' bgs** SEAL Type: **Bentonite Chips** Interval: **80-82.5' bgs** SANDPACK Type: **NSF Certified Silica Sand** Interval: **82.5-96' bgs** SCREEN Diameter: **2 inch** Type: **Sch. 40, .010 Slot, PVC** Interval: **85-95' bgs** Bentonite backfill from 96-100' bgs.	5290
55								55-61': SANDY SILT, brown, approximately 35% very fine-grained sand, low plasticity, appears to be water bearing.		
			Wet		10YR 4/3	ML				
60		8								5285
								61-65': SANDY SILT with CLAY, reddish gray, approximately 15% medium to coarse-grained sand, sub-angular. Appears to be layered with light olive gray with strong brown mottling. Color grades to gray from 62-65' bgs. Hard, difficult to break up.		
			Moist		2.5YR 5/1 5Y 6/2 7.5YR 4/6 2.5Y 6/1	ML				5280
65								65-85': SANDY SILT, color varies from grayish brown with strong brown streaks to brown, approximately 20% fine-grained sand, some clay, becomes drier with depth, low plasticity, rapid dilatancy.		
70		9	Moist to Wet		2.5Y 5/2	ML				5275
										5270
								(continued)		

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Remarks: No discoloration, odor, or sheen noted.

BGS = "below ground surface"
Additional data may have been collected in the field which is not included on this log.

ENVIRO LOG 5 (5/27/04) 26460006.24_RHODIA.GPJ BARR LIBR JAN06.GLB 12/20/12

LOG OF BORING MW-12-8

Client Rhodia | Drill Contractor Major Drilling | SHEET 4 OF 4

Project Name Rhodia RFI 2012 | Drill Method Rotasonic

Number 26460006.24 | Drilling Started 10/7/12 Ended 10/7/12 | Surface Elevation 5344.2 ft

Location Silver Bow, Montana | Logged By AKJ | Total Depth 100.0 ft

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Moisture	Discoloration-Odor-Sheen	Color	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
					7.5YR 4/6 10YR 5/3			65-85': SANDY SILT, color varies from grayish brown with strong brown streaks to brown, approximately 20% fine-grained sand, some clay, becomes drier with depth, low plasticity, rapid dilatancy.*(continued)* Less sand from 75-80' bgs.	PRO. CASING Diameter: **6"** Type: **Protop-Sch. 40 Steel** Interval: RISER CASING Diameter: **2 inch** Type: **Sch. 40 PVC** Interval: **3' ags-85' bgs** GROUT Type: **Concrete, Neat Cement Grout** Interval: **0-5' bgs, 5-80' bgs** SEAL Type: **Bentonite Chips** Interval: **80-82.5' bgs** SANDPACK Type: **NSF Certified Silica Sand** Interval: **82.5-96' bgs** SCREEN Diameter: **2 inch** Type: **Sch. 40, .010 Slot, PVC** Interval: **85-95' bgs** Bentonite backfill from 96-100' bgs.	
80		10	Wet			ML				5265
		11								
85					5Y 4/1			85-92': SILT, gray with reddish yellow mottling/streaks, approximately 10% fine-grained sand and 5% gravel, low plasticity. Dark gray at 86' bgs.		
			Wet		5Y 5/1 7.5YR 6/8	ML				
90		12						Wet from 90-91' bgs, gravel seam.		5255
			Wet		10YR 6/4 10YR 6/6			92-95': MUDSTONE, light yellowish brown with brownish yellow mottling, pieces of mudstone weakly cemented, resembles clayey gravel in core.		5250
95			Moist		2.5Y 6/2	CL		95-98': LEAN CLAY with some SAND, light brownish gray, approximately 15% fine-grained sand.		
		13	Moist		2.5Y 5/1	ML		98-100': SILT, gray, low plasticity.		5245
								End of Boring - 100 feet		

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Fax:

Remarks: No discoloration, odor, or sheen noted.

BGS = "below ground surface"
Additional data may have been collected in the field which is not included on this log.

ENVIRO LOG 5 (5/27/04) 26460006.24_RHODIA.GPJ BARR LIBR JAN06.GLB 12/20/12

ASMI / REC Well Logs

Barr Engineering Company
4700 West 77th Street • Minneapolis, MN 55435-4803
Phone: 612-832-2600 • Fax: 612-832-2601

Minneapolis, MN • Hibbing, MN • Duluth, MN • Ann Arbor, MI • Jefferson City, MO

Facsimile Cover Page

Attention: John Fox / Dave Dahlstrom

From: Jim Langseth

Regarding: Silver Bow Groundwater

Date: March 22, 1999 **Time:** 7:04 pm **Total number of pages:** 4

Fax number: 406 782 4498

Project number: 26/46-004 JSL 110

__X__ Fax only _____ Original to follow

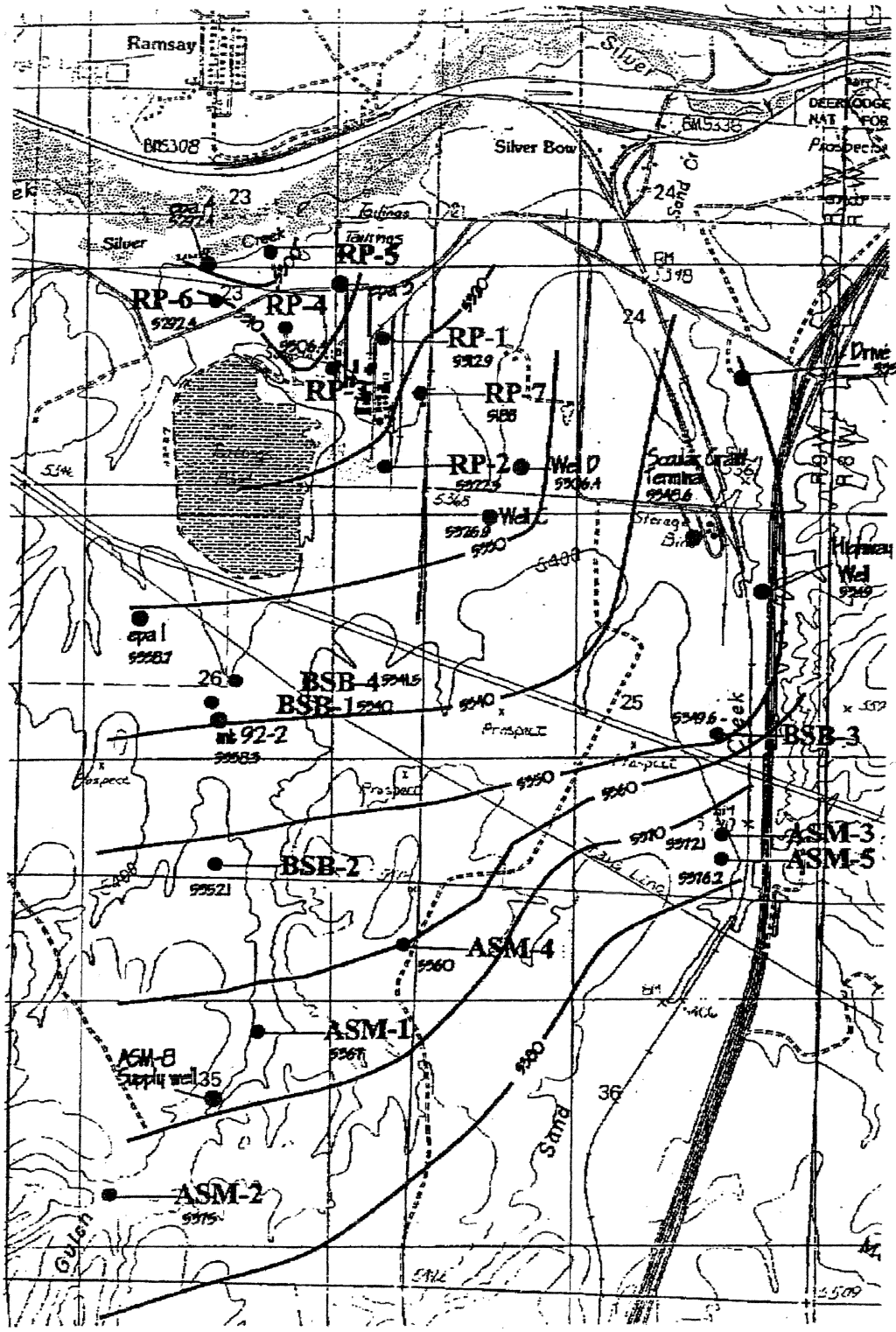
The information contained in this fax is intended for the use of the individual named above. If this fax is received in error, or if the transmission is incomplete, please call **612/832-2600** immediately and ask for

.

Additional comments: Here are 3 items re ASiMI wells south of plant site:

1) map of water levels & well locations
2) BSB-1 log
3) BSB-4 log

I did not find the mt 92-2 log.



Scale Approx. 1" = 2000'

ASIMI AREA GROUND WATER

July 1996 Water Levels

Leonard Rice Consulting Water Engineers, Inc.
2401 Fifteenth Street, Suite 300
Denver, Colorado 80202-1143
(303)455-9589 • FAX (303)455-9715

DWN: H.L.B.	CHK: K.P.	REV:
DATE: 06/5/97	PROJECT NO. 96ASIM04	DRAWING 3

Attn: Tina Flint

O'KEEFE DRILLING CO., INC.

P.O. Box 3810
4 Mile Road

Butte, Montana 59701
(406) 494-3310

WELL LOCATION Hole # 1 DATE 1-26-96 19__

NAME Butte Silver Bow

ADDRESS Silver Bow Mt.

				$
DEPTH OF WELL	218'			
CASED 40' of 6"	FROM 0	TO 40'		
DRIVE SHOE				
PLASTICLINER 2" PVC	FROM 0	TO 220'		
PERFORATED	FROM 217	TO 207		
GALLONS PER MINUTE	65+			
STATIC WATER LEVEL	12'			
		TOTAL		$

DEPTH	FORMATION
0 to 40'	top soil
40' to 208'	clay
208' to 218'	hard rock, 65+ GPM
	2" reconstruct well.

WATER USE Test hole
DEVELOPED BY Air
REMARKS

1-dogg sub base
220' of 2" PVC Pipe
40' of 6" steel casing
1-6" locking well cap.
1-5¼" tricone bit.

DRILLER Fred LaMere HELPER Ken Walsh

Ashton Printing
Butte, Montana

3SB - 1 03N09W26DBBBB
01/23-26/96
Driller: O'Keefe - reverse rotary
Logged By: PMN, OB

FROM	TO	
0	5	Tan to brown silty fine-medium sand with clay.
5	18	Yellowish brown sticky moist clay. Water at 18'.
18	20	Gravel (1/8" - 1/2") with sand, silt & clay. Tan
20	30	Tan to brown clay, moist, sticky.
30	40	Tan to brown clay, moist, sticky with fine gravel (5%) and fine to very coarse sand. Water, set 20' surf csg.
40	50	Tan to brown gravel (1/8" to 3/8"), 70%. Clay, 30%.
50	60	Tan to brown silty clay with about 10% fine gravel. Tan to brown mudstone layer at 50 to 52'. Water at 55 to 60'
60	70	As above, 5-10 gpm. pH=7.5, SC=641.
70	80	Sandy gravel & mudstone, about 15 gpm at 80'.
80	90	Sandstone, mudstone & siltstone.
90	95	Brown silty, heavy clay.
95	100	Brown claystone. 25-30 gpm.
100	110	Alternating brown claystone and hard shale layers.
110	120	Alternating tan clay and brown claystone. pH=7.1, SC=360
120	125	Alternating tan clay and brown claystone. Gravel layer, 125 - 126'.
125	130	Brown claystone alternating with sand & gravel. Occasional quartz fracture or joint filling.
130	140	Hard claystone with sand & gravel (quartz cement ?). 30 gpm.
140	160	Tan to pink clay alternating with claystone, sand & gravel. pH=7.2, SC=385.
160	190	Alternating white, tan or pink sticky, plastic clay and dark green claystone. pH=7.4, SC=390.
190	200	Blue-green plastic clay. Blowing about 60 gpm from open hole. pH=7.1, SC=410. Set 20' surface casing.
200	208	Blue-green, tan and pink stiff clay.
208	218	Sand & gravel - quartz fragments, finely crystalline volcanics and hard tan to brown claystone or shale. 60 gpm, pH=6.84, SC=382, T=9C. Blow for 70 min at about 60 gpm and take sample. pH=6.98, SC=399, T=6C.

6" steel from 2' ALS to 18'
2" plastic to 217'. Bell end, glued, 2-6" saw slots per foot.
3 joints slotted.

BSB - 4 LOCATION T R S tract (75 ft E of BSB-1
2/20- 3/7/1996
Driller: O'Keefe ~ reverse rotary
Logged By: DV

FROM	TO	
0	20	"Tan silt and mud, water @ ~10'"
20	60	"Drill and drive, no recovery"
60	80	"Fine sand and mud, pebble layer @ 65', silicified mudston @73'-75'"
80	90	Interbedded silt and silicified mudstone
90	100	"Interbedded silt and brown silicified mudstone, moist clay @ 98-100"
100	110	Interbedded silicified brown mudstone and moist tan clay
110	120	Silicified brown mudstone with moist tan clay interbeds; very hard drilling
120	150	Interbedded brown silicified mudstone and moist tan clay
150	160	Moist tan/green clay with brown silicified mudstone interbeds. Making 25-30gpm
160	170	Interbedded brown silicified mudstone and moist tan clay
170	180	Interbedded brown silicified mudstone and moist tan clay; "Tair=6, Twater=9, pH=7.6, SC=383"
180	190	Moist tan/green clay with brown silicified mudstone interbeds
190	197	Moist tan/green clay with brown silicified mudstone interbeds
197	300	Dark grey volcanic rock (tonalite/tonalite porphyry);fractures @ 245' " @220' Tair=8, Twater=10, pH=8.05, SC=488 (possible probl w/ pH meter)"

"6"" steel from 0 to 118'"
"5"" steel from 0 to 235.7' (minus stickup of 5"" casing)"
"30-slot 5"" steel from 205.6 to 225.6' (minus stickup of 5"" casing). "
"Open bottom, welded joints, K-packer seal from 21.8' to 22.5' (minus 5"" casing stickup) "

BSB-2 5410 − 180 = 5230 (5" casing)
BSB-3 5427 −360 = 5067
BSB-21 536 −320 = 5160

120 7 months, Set @ 60'
80 gpm → after hour 46'

MONTANA WELL LOG REPORT

This well log reports the activities of a licensed Montana well driller, serves as the official record of work done within the borehole and casing, and describes the amount of water encountered. This report is complied electronically from the contents of the Ground-Water Information Center (GWIC) database for this site. Acquiring water rights is the well owner's responsibility and is NOT accomplished by the filing of this report.

Other Options

Plot this site on a topographic map

Site Name: BUTTE-SILVERBOW BSB-04
GWIC Id: 153820

Section 1: Well Owner

Owner Name
N/A

Section 2: Location

Township	Range	Section	Quarter Sections
03N	09W	26	NW¼ NW¼ NW¼ SE¼

County SILVER BOW **Geocode**

Latitude	Longitude	Geomethod	Datum
45.982385	112.68421	TRS-SEC	NAD83

Altitude	Method	Datum	Date
5365			

Addition **Block** **Lot**

Section 3: Proposed Use of Water
MONITORING (1)

Section 4: Type of Work
Drilling Method: REVERSE ROTARY

Section 5: Well Completion Date
Date well completed: Thursday, March 07, 1996

Section 6: Well Construction Details
There are no borehole dimensions assigned to this well.

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
0	118	6				STEEL
0	236	5				STEEL

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
206	226	5			30 SLOT STEEL

Annular Space (Seal/Grout/Packer)

There are no annular space records assigned to this well.

Section 7: Well Test Data

Total Depth: 300
Static Water Level: 11.15
Water Temperature:

Pump Test *

Depth pump set for test _ feet.
40 gpm pump rate with _ feet of drawdown after 1.8 hours of pumping.
Time of recovery _ hours.
Recovery water level _ feet.
Pumping water level 27 feet.

* *During the well test the discharge rate shall be as uniform as possible. This rate may or may not be the sustainable yield of the well. Sustainable yield does not include the reservoir of the well casing.*

Section 8: Remarks

Section 9: Well Log

Geologic Source
Unassigned

From	To	Description
0	20	TAN SILT & MUD WATER AT 10
20	60	DRILL & DRIVE NO RECOVERY
60	80	FINE SAND & MUD PEBBLE LAYER AT 65 SILICIFIED MUDSTONE 73-75
80	90	INTERMBEDDED SILT & SILICIFIED MUDSTONE
90	100	INTERBEDDED SILT & BROWN SILICIFIED MUDSTONE MOIST CLAY 98-100
100	110	INTERBEDDED SILICIFIED BROWN MUDSTONE & MOIST TAN CLAY
110	120	SILICIFIED BROWN MUDSTONE W/ MOIST TAN CLAY INTERBEDS VERY HARD DRILLING
120	150	INTERBEDDED BROWN SILICIFIED MUDSTONE & MOIST TAN CLAY
150	160	MOIST TAN/GREEN CLAY W/ BROWN SILICIFIED MUDSTONE INTERBEDS MAKING 25-30 GPM
160	170	INTERBEDDED BROWN SILICIFIED MUDSTONE & MOIST TAN CLAY
170	180	SAME AS ABOVE TAIR=6 TWATER=9 PH=7.6 SC=383
180	197	MOIST TAN/GREEN CLAY W/ BROWN SILICIFIED MUDSTONE INTERBEDS
197	300	DARK GREY VOLCANIC ROCK (TONALITE/TONALITE PORPHYRY) FRACTURES @ 245; AT 220 TAIR=8 TWATER=10 PH=8.05 SC=488 POSSIBLE PROBLEMS W/ PH METER

Driller Certification

All work performed and reported in this well log is in compliance with the Montana well construction standards. This report is true to the best of my knowledge.

Name:

Company: OKEEFE DRILLING CO
License No: -
Date Completed: 3/7/1996

State of Montana
Department of Health
and Environmental Sciences

Route to: Solid Waste ☐

MONITORING WELL CONSTRUCTION

Facility/Project Name: ASiMT	Local Grid Location of Well: 736343 ft ☐N ☐S 1189365 ft ☐E ☐W	Well Name: GW-2
Facility License:	Grid Origin Location: Lat. ___ Long. ___ or St. Plane ___ ft N ___ ft S	MT Unique Well Number: DHES Well Name:
Type of Well: Water Table Observation Well ☒ 11; Piezometer ☐ 12	Section Location of Waste/Source: ☐E ☐W	Date Well Installed: 02/23/98 (mm dd yy)
Distance Well is From Waste/Source Boundary: ft	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient; d ☒ Downgradient n ☐ Not Known	Well Installed By: (Person's Name and Firm) Dan Duran - Okerele Drill
Is Well a Point of Standards Application? ☐ Yes ☐ No		Monitoring Well Constructor License Number:

A. Protective pipe, top elevation 5320.3 ft. MSL
B. Well casing, top elevation 5319.8 ft. MSL
C. Land Surface elevation 5317.___ ft. MSL
D. Surface seal, bottom ____ ft. MSL or 13.5 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ GW ☐ SP ☐
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

14. Drilling method used: Rotary ☒; Hollow Stem Auger ☐; Other ☐ ____

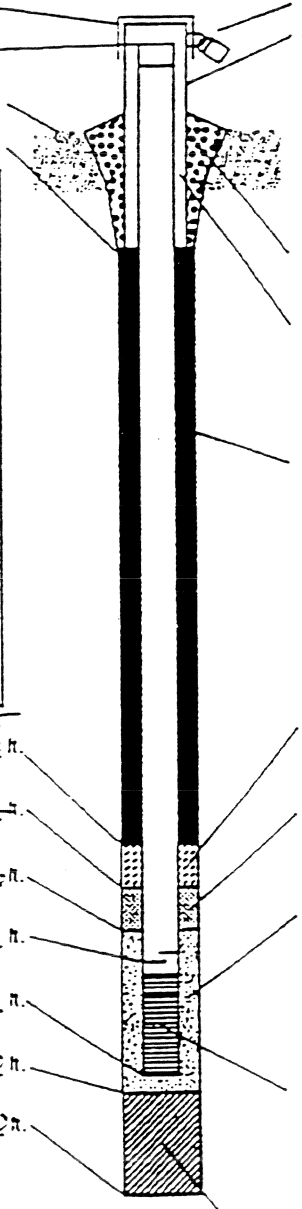
15. Drilling fluid used: Water ☐ Air ☒; Drilling Mud ☐ None ☐

16. Drilling additives used? ☐ Yes ☒ No
Describe ____

17. Source of water: None

E. Bentonite seal, top ____ ft. MSL or 17.5 ft.
F. Fine sand, top ____ ft. MSL or ____ ft.
G. Filter pack, top ____ ft. MSL or 34.6 ft.
H. Screen joint, top ____ ft. MSL or 37.1 ft.
I. Well bottom ____ ft. MSL or 47.1 ft.
J. Filter pack, bottom ____ ft. MSL or 51.0 ft.
K. Borehole bottom ____ ft. MSL or 75.0 ft.
L. Borehole, diameter 8.0 in.
M. O.D. well casing 4.5 in.
N. I.D. well casing 4.0 in.

1. Cap and lock? ☐ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 8.0 in.
b. Length: 20.0 ft.
c. Material: Steel ☒; Other ☐ ____
d. Additional protection? ☐ Yes ☐
If yes, describe: ____
3. Surface seal: Bentonite ☐; Concrete ☐; Other ☐ ____
4. Material between well casing and protective pipe: Bentonite ☒; Annular space seal ☐; Other ☐ ____
5. Annular space seal: a. Granular bentonite ☒
b. ____ Lbs/gal mud weight ... Bentonite-sand slurry ☐
c. ____ Lbs/gal mud weight ... Bentonite slurry ☐
d. ____ % bentonite ..... Bentonite cement grout ☐
e. 10 Ft³ volume added for any of the above
f. How installed: Tremie ☐; Tremie pumped ☐; Gravity ☒
6. Bentonite seal: a. Bentonite granules ☐
b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2. Bentonite pellets ☒
c. ____ Other ☐
7. Fine sand material: Manufacturer, product name & mesh size
a. 10-20 Mesh Colo
b. Volume added ____ ft³
8. Filter pack material: Manufacturer, product name & mesh size
a. 10-20 mesh Colo. Silica Sand
b. Volume added 6 ft³
9. Well casing: Flush threaded PVC schedule 40 ☒; Flush threaded PVC schedule 80 ☐; Other ☐ ____
10. Screen material: Flush thread PVC sch 40
a. Screen type: Factory cut ☒; Continuous slot ☐; Other ☐ ____
b. Manufacturer: ____
c. Slot size: 0.020 in
d. Slotted length: 10.0 ft
11. Backfill material: Grout 53-63; Bentonite 51-Slurry 67-75; Bentonite 63-67 None ☐



I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: [signature] Firm: Pioneer Technical Services, Inc.

State of Montana - Department of Health and Environmental Sciences

SOIL BORING LOG INFORMATION

Project Name: ASiNI — Boring No.: GW-2

Project No: _____ — Logger's Name: D. Tessier, PTS — Date: 3-28-78

___ 1/4 of ___ 1/4 of Section ___ T ___ N, R ___ E or W ___ — Grid Location (if applicable): ___ feet W or S ___ feet E or W

Well diameter _____ Surface elevation: _____ MT unique well number: _____

Method of Advance: Auger to _____ Wash to _____

Free Water Encountered: Yes [X] No [ ] at _____

DEPTH	SAMPLE	SYMBOL	HNU PPM	TIME IN MIN.	BLOWS PER FOOT
10					
20					
30					
40					
50					
60					
70					
80					

0-20' Brown silt, fine sand, gravel
Damp at 16'

20-22' Damp clayey silt seam (perched?)

22-40' Lt. brown clayey silt with little to no gravel, Damp at 40'

40-52' Tan clayey silt. Damp.
Dry at 47'

52-74' Pinkish brown silt, Dry + Hard

74-75' Crystalline bedrock, dry, very hard

BLOW PER FOOT	DESCRIPTIVE TERM
0 - 4	Very Loose
5 - 10	Loose
11 - 30	Firm
31 - 50	Dense
OVER 50	Very Dense

POCKET PEN.	DESCRIPTIVE TERM
Less than 0.25	Very Soft
0.25 to 0.50	Soft
0.50 to 1.00	Medium
1.00 to 2.00	Stiff
2.00 to 4.00	Very Stiff
4.00 and higher	Hard

Time	Depth to Water	Time	Depth to Water
1430	61		
1450	60		
0900	40.5		

State of Montana
Department of Health
and Environmental Sciences

Route to: Solid Waste ☐

MONITORING WELL CONSTRUCTION

Facility/Project Name: AS, MT	Local Grid Location of Well: 7357.22 ft N/S, 1190.64 ft E/W	Well Name: C-W-3A
Facility License:	Grid Origin Location: Lat. ___ Long. ___ or	MT Unique Well Number: DHES Well Name:
Type of Well: Water Table Observation Well ☑ 11; Piezometer ☐ 12	St. Plane ___ ft N ___ ft S	Date Well Installed: 8/21/1998 (mm/dd/yy)
Distance Well is From Waste/Source Boundary: ft	Section Location of Waste/Source: E/W	Well Installed By: (Person's Name and Firm): Dan Doran - Cascade Drilling
Is Well a Point of Standards Application? ☐ Yes ☐ No	Location of Well Relative to Waste/Source: u ☐ Upgradient; s ☐ Sidegradient; d ☒ Downgradient; n ☐ Not Known	Monitoring Well Constructor License Number:

A. Protective pipe, top elevation 5356.__ ft. MSL
B. Well casing, top elevation 5355.4 ft. MSL
C. Land Surface elevation 5353.__ ft. MSL
D. Surface seal, bottom ____.__ ft. MSL or 2.3 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ GW ☐ SP ☐
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

14. Drilling method used: Rotary ☒; Hollow Stem Auger ☐; Other ☐ ____

15. Drilling fluid used: Water ☐; Air ☒; Drilling Mud ☐; None ☐

16. Drilling additives used? ☐ Yes ☒ No
Describe ____

17. Source of water: None

E. Bentonite seal, top ____.__ ft. MSL or 4.3 ft.
F. Fine sand, top ____.__ ft. MSL or ____ ft.
G. Filter pack, top ____.__ ft. MSL or 7.5 ft.
H. Screen joint, top ____.__ ft. MSL or 9.9 ft.
I. Well bottom ____.__ ft. MSL or 19.9 ft.
J. Filter pack, bottom ____.__ ft. MSL or 20.4 ft.
K. Borehole bottom ____.__ ft. MSL or 20.4 ft.
L. Borehole, diameter 8.0 in.
M. O.D. well casing 4.5 in.
N. I.D. well casing 4.0 in.

1. Cap and lock? ☐ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 8.0 in.
b. Length: 3.1 ft.
c. Material: Steel ☒; Other ☐ ____
d. Additional protection? ☐ Yes ☐
If yes, describe: ____
3. Surface seal: Bentonite ☒; Concrete ☐; Other ☐ ____
4. Material between well casing and protective pipe: Bentonite ☒; Annular space seal ☐; Other ☐ ____
5. Annular space seal: a. Granular bentonite ☒; b. ____ Lbs/gal mud weight ... Bentonite-sand slurry ☐; c. ____ Lbs/gal mud weight ... Bentonite slurry ☐; d. ____ % bentonite ..... Bentonite cement grout ☐; e. 3 Ft³ volume added for any of the above
f. How installed: Tremie ☐; Tremie pumped ☐; Gravity ☒
6. Bentonite seal: a. Bentonite granules ☐; b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2. Bentonite pellets ☒; c. ____ Other ☐
7. Fine sand material: Manufacturer, product name & mesh size
a. ____
b. Volume added ____ ft³
8. Filter pack material: Manufacturer, product name & mesh size
a. Colo. Silica Sand 10-20 Mesh C
b. Volume added 6 ft³
9. Well casing: Flush threaded PVC schedule 40 ☒; Flush threaded PVC schedule 80 ☐; Other ☐ ____
10. Screen material: PVC
a. Screen type: Factory cut ☒; Continuous slot ☐; Other ☐ ____
b. Manufacturer: ____
c. Slot size: 0.020 in
d. Slotted length: 10.2 ft
11. Backfill material: ____ None ☒

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: [signature] Firm: Hydro-Technical Services, Inc.

State of Montana - Department of Health and Environmental Sciences

SOIL BORING LOG INFORMATION

Project Name: S. Hill — Boring No.: GW-3A

Project No: _____ — Logger's Name: DTisdale/TS — Date: 2/24/95

___ 1/4 of ___ 1/4 of Section ___ T ___ N. R ___ E or W ___ — Grid Location (if applicable): ___ feet W or S ___ feet E or W

Well diameter _____ Surface elevation: _____ MT unique well number: _____

Method of Advance: Auger to _____ Wash to _____

Free Water Encountered: Yes [X] No [ ] at 18'

DEPTH	SAMPLE	SYMBOL	HNU PPM	TIME IN MIN.	BLOWS PER FOOT	
5						0-5 DK Brn silty sand, some gravel
						5-15 Lt Brn to Gold clayey silt - damp @ 12'
10						
15						15-20 Same as above Very damp, water @ 18'
20						TD = 20.4'

BLOW PER FOOT	DESCRIPTIVE TERM
0 - 4	Very Loose
5 - 10	Loose
11 - 30	Firm
31 - 50	Dense
OVER 50	Very Dense

POCKET PEN.	DESCRIPTIVE TERM
Less than 0.25	Very Soft
0.25 to 0.50	Soft
0.50 to 1.00	Medium
1.00 to 2.00	Stiff
2.00 to 4.00	Very Stiff
4.00 and higher	Hard

Time	Depth to Water	Time	Depth to Water
1345	15.2		
1350	15.1'		
1400	15.1'		

SSTOU Well and Boring Logs

Client Rhodia
Project Name SSTOU
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor
Drill Method
Drilling Started Ended
Logged By Driller

LOG OF Boring C10

DRAFT

SHEET 1 OF 1

Elevation 5301.2
Total Depth 58.6

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
			SP		0-0.2-: Very fine sand, medium brown 4-6': Same as above with rust colored stringers and mica flakes, high plasticity 9-11': Coarse sand and fine gravel, poorly sorted, containing quartz and feldspar with mica flakes	0-5.6': Steel	5300
10							5290
20			ML		14-16': Same as above, silt, medium brown with indurated chunks 19-21': Same as above 24-26': Same as above	0-58': PVC	5280
30			SM		29-31': Fine, coarse silty sand with mica flakes, silt, medium brown with indurated chunks		5270
40			SP		34-36': Very fine sand with some clayey lenses mottled with black and containing stan siltstone 39-41': Same as above with reddish/black zones and mica flakes 44-46': Very fine sand, medium brown	46-49': Bentonite	5260
50					49-51': Same as above with some indurated chunks	53-58': 0.020 Slotted PVC Screen	5250
					End of Boring - 58.6 feet		

SSTOU.GPJ BARRLOG.GDT 2/1/07

BARR
Barr Engineering Co
4700 West 77th Street
Minneapolis, MN 55435
Telephone: 1-800-632-2277
Fax: 952-832-2601

ENVIRO LOG 5 (L

Remarks: The well was drilled and installed in 1999. No other information is known.

Additional data may have been collected in the field which is not included on this log.

Client Rhodia | Drill Contractor | **LOG OF Boring C11**

Project Name SSTOU | Drill Method | **DRAFT** | SHEET 1 OF 1

Number 26/46-006 | Drilling Started | Ended | Elevation 5301.3

Location Silver Bow, Montana | Logged By Driller | Total Depth 31.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
			SP & CL/ML		0-2': Very fine sand medium brown, silty clay dark brown, moderate to high plasticity with roots		5300
5			CL/ML		4-6': Same as above with rust colored stringers and mica flakes		5295
10			SP		9-11': Coarse sand and fine gravel, poorly sorted, containing quartz and feldspar with mica flakes	0-29': PVC	5290
15			ML		14-16': Same as above silt, medium brown with indurated chunks		5285
20					19-21': Same as above	17-20': Bentonite	5280
25					24-26': Same as above		5275
30			SM		29-31': Fine, coarse silty sand with mica flakes, silt, medium brown with indurated chunks		5270
					End of Boring - 31 feet		

SSTOU.GPJ BARRLOG.GDT 2/1/07

ENVIRO LOG 5 (

Barr Engineering Co
4700 West 77th Street
Minneapolis, MN 55435
Telephone: 1-800-632-2277
Fax: 952-832-2601

Remarks: The well was drilled and installed in 1999. No other information is known.

Additional data may have been collected in the field which is not included on this log.

LOG OF Boring C12

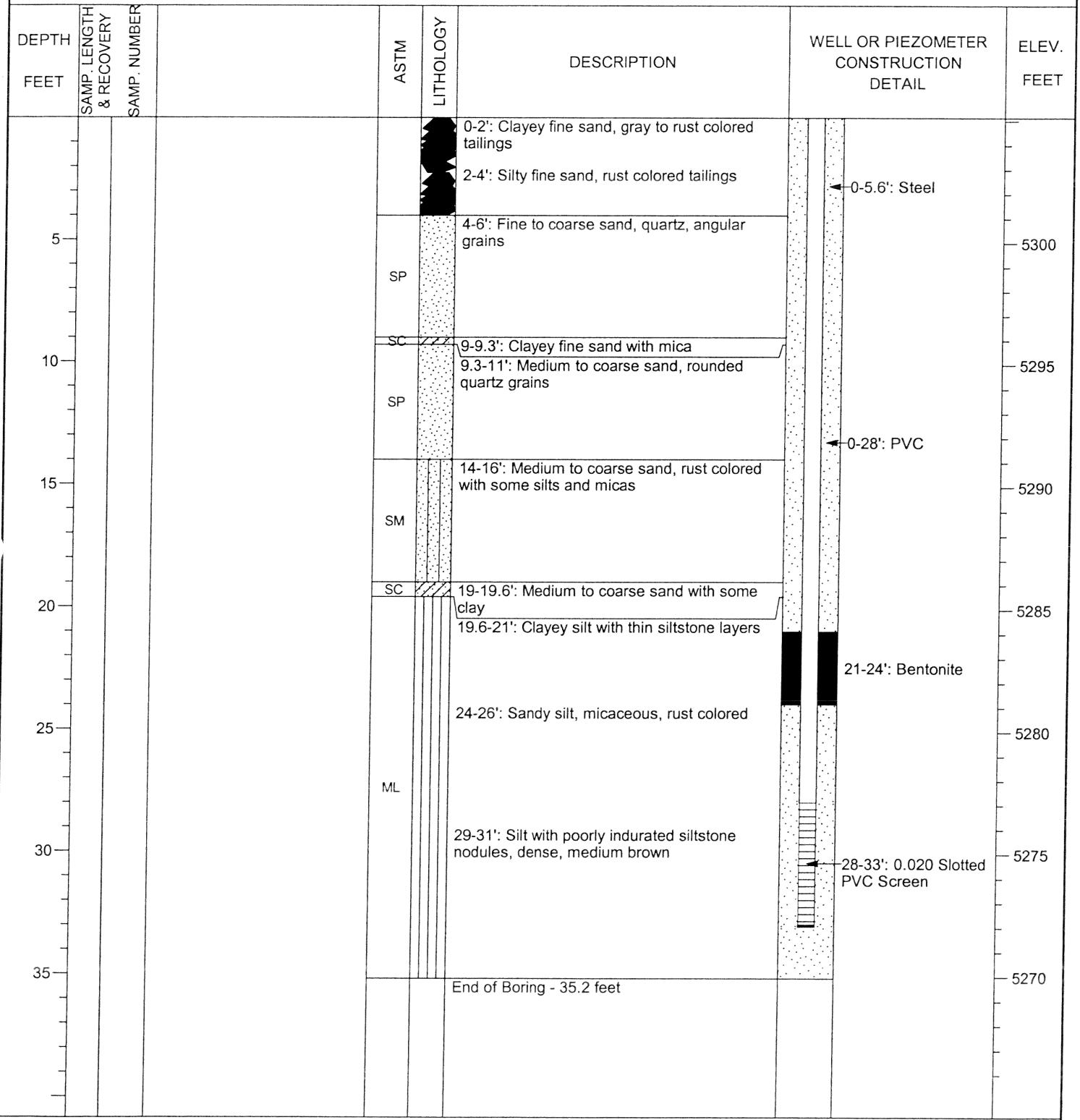
SHEET 1 OF 1

DRAFT

Client Rhodia
Project Name SSTOU
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor
Drill Method
Drilling Started Ended
Logged By Driller

Elevation 5305.1
Total Depth 35.2



Barr Engineering Co
4700 West 77th Street
Minneapolis, MN 55435
Telephone: 1-800-632-2277
Fax: 952-832-2601

Remarks: The well was drilled and installed in 1999. No other information is known.

Additional data may have been collected in the field which is not included on this log.

SSTOU.GPJ BARRLOG.GDT 2/1/07
ENVIRO LOG 5 (5.

Client Rhodia
Project Name SSTOU
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor
Drill Method
Drilling Started Ended
Logged By Driller

LOG OF Boring C13

SHEET 1 OF 1

DRAFT

Elevation 5304.6
Total Depth 31.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
			SP & CL/ML		0-2': Coarse sand rust colored, silty clay gray/brown, soft, plastic with rust	0-5.6': Steel	
5			CL/ML		4-6': Same as above, dark brown with roots		5300
10					9-11': Fine sandy silt, medium brown with semi-indurated chunks	0-28': PVC	5295
15					14-16': Fine sandy silt, medium brown	16-19': Bentonite	5290
20			ML		19-21': Silt, low plasticity with some indurated chunks		5285
25					24-26': Same as above with softly indurated siltstone chunks, some mica	23-28': 0.020 Slotted PVC Screen	5280
30					29-31': Same as above		5275
					End of Boring - 31 feet		5270

SSTOU.GPJ BARRLOG.GDT 2/1/07

Barr Engineering Co
4700 West 77th Street
Minneapolis, MN 55435
Telephone: 1-800-632-2277
Fax: 952-832-2601

ENVIRO LOG 5 (5.

Remarks: The well was drilled and installed in 1999. No other information is known.

Additional data may have been collected in the field which is not included on this log.

Client Rhodia | Drill Contractor | **LOG OF Boring C13 S**

Project Name SSTOU | Drill Method | **DRAFT** SHEET 1 OF 1

Number 26/46-006 | Drilling Started | Ended | Elevation 5304.6

Location Silver Bow, Montana | Logged By Driller | Total Depth 31.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
			SP & CL/ML		0-2': Coarse sand rust colored, silty clay gray/brown, soft, plastic, with rust		
			CL/ML		2-4': Same as above, dark brown with roots	0-5.6': Steel	
5			SC/GC		4-6': Clayey coarse sand and gravel, drilled through rock		5300
						0-17': PVC	
10					9-11': Fine sandy silt, medium brown with semi-indurated chunks	9-11': Bentonite	5295
15					14-16': Fine sandy silt, medium brown	15-17': 0.020 Slotted PVC Screen	5290
20			ML		19-21': Silt, low plasticity with some indurated chunks		5285
25					24-26': Same as above with softly indurated siltstone chunks, some mica		5280
30					29-31': Same as above		5275
					End of Boring - 31 feet		5270

SSTOU.GPJ BARRLOG.GDT 2/1/07

ENVIRO LOG 5 (5

Barr Engineering Co
4700 West 77th Street
Minneapolis, MN 55435
Telephone: 1-800-632-2277
Fax: 952-832-2601

Remarks: The well was drilled and installed in 1999. No other information is known.

Additional data may have been collected in the field which is not included on this log.

Client Rhodia
Project Name SSTOU
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor
Drill Method
Drilling Started Ended
Logged By Driller

LOG OF Boring C14

DRAFT

SHEET 1 OF 1

Elevation 5307.9
Total Depth 21.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
			OL/OH		0-5': One inch organics with roots, then carbonate zone	2 ags-6 bgs': Steel	
					0.5-2': Light brown, silty fine sand with roots and rock fragments		
			SM		2-5': Light brown, silty fine sand, slightly cohesive with weathered quartz monzonite pebbles	2 ags-24 bgs': PVC	5305
						0-7.5': Cement	
5					5-6': Medium to coarse sand with pebbles, subangular quartz, feldspar, hornblende		
			SP		6-7': Very fine sand, light tan to white, large gravel inclusions		
					7-9': Same as above with larger rock fragments, including much quartz monzonite		5300
						7.5-10': Bentonite	
10			SM		9-11': Dark brown, medium to coarse sand, subangular with fines and gravel		
			SP		11-14': Medium brown, very fine sand, no rock fragments or gravel	10-12': 100 Mesh Silica Sand	5295
15					14-19': Medium brown, fine sandy silt, little clay content, dense	13-18': 0.020 Slotted PVC Screen	
			ML				5290
20					19-21': Medium brown, silt, dense with fine sand and gravel inclusions		
					End of Boring - 21 feet	12-24': 10/20 Silica Sand	5285

SSTOU.GPJ BARRLOG.GDT 2/1/07

Barr Engineering Co
4700 West 77th Street
Minneapolis, MN 55435
Telephone: 1-800-632-2277
Fax: 952-832-2601

Remarks: The well was drilled and installed in 1999. No other information is known.

Additional data may have been collected in the field which is not included on this log.

ENVIRO LOG 5 (5.

Client Rhodia
Project Name SSTOU
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor
Drill Method
Drilling Started Ended
Logged By Driller

LOG OF Boring C19

DRAFT

SHEET 1 OF 1

Elevation 5303.3
Total Depth 15.8

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
					0-2.5': Light brown to orange to gray, soft, loose, silty fine sand, tailings, fine sand stringers, multi-layered, dry	2' ags-15' bgs: PVC-SCHED40	
			SP		2.5-3.6': Light brown, loose, fine sand with trace silt, dry 3.6-7.8': Light brown, very loose, medium to coarse sand, dry	0-7': Cement/ Bentonite	5300
5							
			SM		7.8-8.5': Light brown, very loose, medium to coarse sand, dry 8.5-10.3': Light brown, loose, fine to coarse sand with some silt, moist	7-9': 3/8 Bentonite	5295
10						9-15.8': 16-30 Environ Media	
			SP		10.3-15.8': Black, loose, fine to coarse-grained sand with trace gravel and trace silt, wet	10-15': Screen	5290
15							
					End of Boring - 15.8 feet		5285

SSTOU.GPJ BARRLOG.GDT 2/1/07

BARR
Barr Engineering Co
4700 West 77th Street
Minneapolis, MN 55435
Telephone: 1-800-632-2277
Fax: 952-832-2601

ENVIRO LOG 5 (E

Remarks: The well was drilled and installed in 1999. No other information is known.

Additional data may have been collected in the field which is not included on this log.

Client Rhodia | Drill Contractor | **LOG OF Boring C20**

Project Name SSTOU | Drill Method | **DRAFT** | SHEET 1 OF 1

Number 26/46-006 | Drilling Started | Ended | Elevation 5303.5

Location Silver Bow, Montana | Logged By Driller | Total Depth 19.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
					0-3': Light brown with gray and orange stringers; soft, loose, silty fine sand with strings of poorly graded fine sand; multi layered tailings	2 ags-15 bgs': PVC-SCHED40	
					3-4.9': Light brown, loose, fine sand with trace silt, dry	0-7': Cement/ Bentonite	5300
5			SP		4.9-7.8': Light brown, loose, fine to coarse sand with trace gravel, dry		
			ML		7.8-9.2': Dark gray, soft, fine sandy silt with two 0.1' stringers of orange coarse sand, moist	7-9': 3/8 Bentonite	5295
			SP		9.2-9.7': Light brown, loose, fine to coarse sand, moist	9-19': 16-30 Environ Media	
10			SM		9.7-10.3': Dark gray, soft, silty fine sand, wet		
			SP		10.3-19': Light brown, loose, fine to coarse sand, wet	10-15': Screen	5290
15							5285
					End of Boring - 19 feet		

SSTOU.GPJ BARRLOG.GDT 2/1/07

Barr Engineering Co
4700 West 77th Street
Minneapolis, MN 55435
Telephone: 1-800-632-2277
Fax: 952-832-2601

ENVIRO LOG 5 (E

Remarks: The well was drilled and installed in 1999. No other information is known.

Additional data may have been collected in the field which is not included on this log.

LOG OF Boring P073

SHEET 1 OF 1

DRAFT

Client Rhodia
Project Name SSTOU
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor
Drill Method
Drilling Started Ended
Logged By Driller

Elevation 5308.8
Total Depth 14.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
0			SM		0-0.9': Brown silt to fine sand with intervals of fine to coarse rust colored sand		5308
					0.9-1.1': Buff colored fine sand (tailings)		
2			ML		1.1-1.4': Orange brown silt 1.4-2.5': Brown silt with bottom becoming more clayey		
			CL/ML		2.5-4': Brown, silty, micaceous clay with organic matter on top at 2.5'		5306
4			CL/ML w/SP		4-6.2': Reddish brown silty clay matrix intermixed with coarse sand and fragments		5304
6			SP		6.2-6.5': Wet coarse sand		
			SP-SC		6.5-8': Orange brown, micaceous, medium sand with clay and silt 8-9.9': Orange brown, micaceous, medium sand with clay and silt		5302
8							5300
10			SP		9.9-10.7': Orange brown, micaceous, medium to coarse sand		
			SM		10.7-11.5': Micaceous, fine silty sand with interspersed gravel	9.8-12.3': Screen	5298
12			SP		11.5-12': Medium to coarse sand with gravel		
			SM & ML		12-13.6': Light brown, fine sand and silt		5296
14			ML		13.6-14': Light brown, fine silt		
					End of Boring - 14 feet		5294

3STOU.GPJ BARRLOG.GDT 2/1/07

ENVIRO LOG 5 (5/.

BARR
Barr Engineering Co
4700 West 77th Street
Minneapolis, MN 55435
Telephone: 1-800-632-2277
Fax: 952-832-2601

Remarks: The well was drilled and installed in 1999. No other information is known.

Additional data may have been collected in the field which is not included on this log.

LOG OF Boring P074

DRAFT

SHEET 1 OF 1

Client Rhodia
Project Name SSTOU
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor
Drill Method
Drilling Started Ended
Logged By Driller

Elevation 5308.8
Total Depth 12.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
0			ML		0-1.8': Gray silt		5308
2			SP		1.8-4': Light brown to gray, coarse sand with intermittent rock fragments up to 1.0" in diameter		5306
4					4-8': Brown, wet, coarse sand with intermittent rock fragments up to 1.5" in diameter		5304
6							5302
8			GP		8-9': Very coarse gravel		5300
10			SP		9.9-10.8': Brown, medium to coarse sand with intermittent 0.25" to 0.5" rock fragments	←8.9-11.4': Screen	5298
12			OL/OH		10.8-12': Black, organic material and micaceous silty fine sand		5296
					End of Boring - 12 feet		
14							5294

Barr Engineering Co
4700 West 77th Street
Minneapolis, MN 55435
Telephone: 1-800-632-2277
Fax: 952-832-2601

Remarks: The well was drilled and installed in 1999. No other information is known.

Additional data may have been collected in the field which is not included on this log.

SSTOU.GPJ BARRLOG.GDT 2/1/07
ENVIRO LOG 5 (5/

Client Rhodia
Project Name SSTOU
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor
Drill Method
Drilling Started Ended
Logged By Driller

LOG OF Boring P075

DRAFT

SHEET 1 OF 1

Elevation 5311.6
Total Depth 8.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
			SM		0-3': Light brown, fine silty sand		5310
2							
					3-4': Brown, medium to coarse sand with 0.25" gravel		5308
4					4-5.5': Brown coarse sand		
			SP		5.5-6.2': Dark brown medium sand		5306
6					6.2-8': Brown, fine, micaceous sand	5-7.5': Screen	
							5304
8					End of Boring - 8 feet		
							5302

Barr Engineering Co
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Minneapolis, MN 55435
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Fax: 952-832-2601

Remarks: The well was drilled and installed in 1999. No other information is known.

Additional data may have been collected in the field which is not included on this log.

SSTOU.GPJ BARRLOG.GDT 2/1/07
ENVIRO LOG 5 (5/...

Client Rhodia | Drill Contractor | **LOG OF Boring P081**

Project Name SSTOU | Drill Method | **DRAFT** | SHEET 1 OF 1

Number 26/46-006 | Drilling Started | Ended | Elevation 5306.3

Location Silver Bow, Montana | Logged By Driller | Total Depth 12.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
			SM		0-2.3': Light brown to gray, fine sand in clayey silt		5306
2					2.3-4': Orange to light brown silt with mica		5304
4					4-8': Orange brown, micaceous silt with small amounts of coarse sand and pebbles up to 0.25"		5302
6					Wet at 6.0'		5300
			ML				
8					8-12': Wet, orange brown, micaceous silt with small amounts of coarse sand and pebbles up to 0.25"		5298
10						9.2-11.7': Screen	5296
12					End of Boring - 12 feet		5294
14							5292

SSTOU.GPJ BARRLOG.GDT 2/1/07

ENVIRO LOG 5 (5.

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Remarks: The well was drilled and installed in 1999. No other information is known.

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Client Rhodia
Project Name SSTOU
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor
Drill Method
Drilling Started Ended
Logged By Driller

LOG OF Boring P083

DRAFT

SHEET 1 OF 1

Elevation 5304.6
Total Depth 12.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
			OL/OH		0-1.8': Brown soil, roots, organic material with silty fine sand		5304
2			SM		1.8-2': Rust brown, silty sand with rounded rock fragment to 1.0" at 1.9' to 2.0'		
			SP		2-2.8': Fine to medium, clean sand with some rounded rock fragments		5302
			SP-GP		2.8-4': Clean, fine to gravel size (0.25") sediments with larger rock fragments to 1.5"		
4					4-5.3': Clean, fine to gravel size (0.25") sediments with larger rock fragments to 1.5"		5300
			SP		5.3-6.8': Rust, coarse sand with 1" rock fragments at 6.0' to 6.1'		
6					Wet at 6.0'		5298
			ML		6.8-8': Orange brown silt		
8					8-12': Orange brown silt		5296
						7.8-10.3': Screen	
10							5294
12					End of Boring - 12 feet		5292
14							5290

SSTOU.GPJ BARRLOG.GDT 2/1/07

ENVIRO LOG 5 (L

BARR
Barr Engineering Co
4700 West 77th Street
Minneapolis, MN 55435
Telephone: 1-800-632-2277
Fax: 952-832-2601

Remarks: The well was drilled and installed in 1999. No other information is known.

Additional data may have been collected in the field which is not included on this log.

Client Rhodia
Project Name SSTOU
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor
Drill Method
Drilling Started Ended
Logged By Driller

LOG OF Boring P085

DRAFT

SHEET 1 OF 1

Elevation 5301.0
Total Depth 7.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
			SM		0-1': Brown, silty, fine sand		5300
			CL		1-2': Tan to brown clay		
2			SM		2-2.5': Tan, medium to coarse sand with approximately 30% silt 2.5-3': Tan, medium to coarse sand with approximately 20% silt		5298
			SM/SC		3-6.5': Tan, medium to coarse sand with approximately 50% clay and silt	2.5-5': Screens	
4							5296
6			SP		6.5-7': Tan to reddish brown, coarse to very coarse sand		5294
					End of Boring - 7 feet		
8							5292

SSTOU.GPJ BARRLOG.GDT 2/1/07

ENVIRO LOG 5 (5/.

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Minneapolis, MN 55435
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Fax: 952-832-2601

Remarks: The well was drilled and installed in 1999. No other information is known.

Additional data may have been collected in the field which is not included on this log.

Client Rhodia
Project Name SSTOU
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor
Drill Method
Drilling Started Ended
Logged By Driller

LOG OF Boring P086

DRAFT

SHEET 1 OF 1

Elevation 5293.5
Total Depth 8.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
					0-0.5': Tan, fine to coarse sand		
					0.5-2': Tan to reddish brown, fine to very coarse sand		5292
2							
							5290
4			SP		4-8': Tan, medium to very coarse sand with fine gravel		
							5288
6						5.5-8': Screen	
							5286
8					End of Boring - 8 feet		
							5284

SSTOU.GPJ BARRLOG.GDT 2/1/07

ENVIRO LOG 5 (5

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Minneapolis, MN 55435
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Remarks: The well was drilled and installed in 1999. No other information is known.

Additional data may have been collected in the field which is not included on this log.

Client Rhodia
Project Name SSTOU
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor
Drill Method
Drilling Started Ended
Logged By Driller

LOG OF Boring P087

DRAFT

SHEET 1 OF 1

Elevation 5297.1
Total Depth 11.2

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
0			CL & ML		0-4': Tan to brown alternating clay and silt layers		5296
2							5294
4			SP		4-8': Tan to gray, fine to coarse sand		5292
6							5290
8			SM		8-8.5': Silty, very fine sand		
			SP		8.5-11.2': Tan, medium to very coarse sand with bottom 1.5" turning gray	8.7-11.2': Screen	5288
10							5286
					End of Boring - 11.2 feet		
12							5284
14							

SSTOU.GPJ BARRLOG.GDT 2/1/07

ENVIRO LOG 5 (5

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4700 West 77th Street
Minneapolis, MN 55435
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Fax: 952-832-2601

Remarks: The well was drilled and installed in 1999. No other information is known.

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LOG OF Boring P088

SHEET 1 OF 1

DRAFT

Client Rhodia
Project Name SSTOU
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor
Drill Method
Drilling Started Ended
Logged By Driller

Elevation 5298.7
Total Depth 11.5

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
			SP		0-1': Tan to red, very fine to very coarse sand		5298
2			CL/ML & ML		1-4': Black silty clay and silt		5296
4			SC-SM		4-5.5': Brown to black, silty clay to silty fine and medium sand		5294
6			SP		5.5-8': Tan to reddish brown, coarse to very coarse sand		5292
8					8-8.7': Tan to reddish brown, coarse to very coarse sand		5290
			ML		8.7-9.4': Black silt		
10			SM/GM		9.4-11.5': Gray to black with reddish stain, coarse sand to fine gravel with silt and medium sand	← 8.3-10.8': Screen	5288
12					End of Boring - 11.5 feet		5286
14							5284

ENVIRO LOG 5 (5/2.. :STOU.GPJ BARRLOG.GDT 2/1/07

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4700 West 77th Street
Minneapolis, MN 55435
Telephone: 1-800-632-2277
Fax: 952-832-2601

Remarks: The well was drilled and installed in 1999. No other information is known.

Additional data may have been collected in the field which is not included on this log.

LOG OF Boring P091

DRAFT

SHEET 1 OF 1

Client Rhodia
Project Name SSTOU
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor
Drill Method
Drilling Started Ended
Logged By Driller

Elevation 5296.6
Total Depth 8.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
			SM		0-0.5': Tan, silty medium sand 0.5-1.0': Yellow sand and tan silt		5296
2			SM/ML		1-3.3': Brown, silty, fine sand and sandy silt		5294
			SP		3.3-4': Tan, medium sand		
4			ML/CL		4-5.5': Gray to brown clayey silt	3-5.5': Screen	5292
			OL/OH		5.5-6.2': Black soil horizon		
6			SM		6.2-7.4': Dark gray, silty, medium sand		5290
			SP		7.4-8': Gray, medium to very coarse sand		
8					End of Boring - 8 feet		5288

SSTOU.GPJ BARRLOG.GDT 2/1/07

ENVIRO LOG 5 (5/...

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4700 West 77th Street
Minneapolis, MN 55435
Telephone: 1-800-632-2277
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Remarks: The well was drilled and installed in 1999. No other information is known.

Additional data may have been collected in the field which is not included on this log.

Client Rhodia
Project Name SSTOU
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor
Drill Method
Drilling Started Ended
Logged By Driller

LOG OF Boring P092

DRAFT

SHEET 1 OF 1

Elevation 5303.9
Total Depth 8.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
			ML		0-1.3': Tan, sandy silt		
2			CL		1.3-2': Tan to brown clay 2-2.7': Gray clay		5302
4			SM		2.7-5.5': Gray to brown cobbles, gravel, and silty sand		5300
			SP-GP		5.5-6': Reddish brown, wet, fine sand to fine gravel		5298
6			ML		6-8': Tan to orange silt and very fine sand	5.5-8': Screen	
8					End of Boring - 8 feet		5296
							5294

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Minneapolis, MN 55435
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Remarks: The well was drilled and installed in 1999. No other information is known.

Additional data may have been collected in the field which is not included on this log.

3STOU.GPJ BARRLOG.GDT 2/1/07
ENVIRO LOG 5 (5/2

LOG OF Boring P093

SHEET 1 OF 1

DRAFT

Client Rhodia
Project Name SSTOU
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor
Drill Method
Drilling Started Ended
Logged By Driller

Elevation 5303.0
Total Depth 12.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
			SP		0-0.6': Tan, fine to medium sand 0.6-1': Brown, fine to medium sand		5302
			SM		1-1.6': Dark brown, silty, very fine to fine sand		
2			CL/ML		1.6-2.2': Brown silty clay		
			SP-GP		2.2-4': Yellow to tan, fine sand to gravel with pebbles at 4.0'		5300
4					4-7.8': Tan to yellow, medium sand to coarse gravel		5298
6						5.5-8': Screen	5296
8			SP		7.8-8': Black, fine sand		
			SP-GP		8-10.2': Brown and gray, coarse sand to coarse gravel		5294
10					10.2-12': Yellow red to brown, very coarse sand to coarse gravel and pebbles		5292
12					End of Boring - 12 feet		5290
14							

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Additional data may have been collected in the field which is not included on this log.

SSTOU.GPJ BARRLOG.GDT 2/1/07
ENVIRO LOG 5 (5.

Client Rhodia
Project Name SSTOU
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor
Drill Method
Drilling Started Ended
Logged By Driller

LOG OF Boring P094

DRAFT

SHEET 1 OF 1

Elevation 5309.1
Total Depth 16.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
0			SP		0-0.4': Tan, very fine to medium sand 0.4-1.3': Pink turning yellow, very fine to medium sand		5308
			CL		1.3-1.6': Tan clay		
2			ML		1.6-2.3': Brown sandy silt		
			SP		2.3-3': Tan to brown, medium sand with pebbles (subangular to subround) 3-4': Gray, medium sand, grading to very coarse sand with subround pebbles and cobbles		5306
4					4-4.5': Gray, medium sand, grading to very coarse sand with subround pebbles and cobbles		
			SM		4.5-4.7': Tan, fine to medium sand with 10% fine green gravel 4.7-5.5': Tan to reddish brown, silty, fine to coarse sand 5.5-7': Tan to orange, silty, very fine sand		5304
6							
			ML		7-8': Tan to orange, very fine, wet, sandy silt		5302
8					8-12': Tan to orange, very fine, wet, sandy silt		
							5300
10							
							5298
12					12-16': Tan to orange, very fine, wet, sandy silt	11.1-13.6': Screen	
							5296
14							
							5294
16					End of Boring - 16 feet		

SSTOU.GPJ BARRLOG.GDT 2/1/07

ENVIRO LOG 5 (5/...

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4700 West 77th Street
Minneapolis, MN 55435
Telephone: 1-800-632-2277
Fax: 952-832-2601

Remarks: The well was drilled and installed in 1999. No other information is known.

Additional data may have been collected in the field which is not included on this log.

LOG OF Boring P095

DRAFT

SHEET 1 OF 1

Client Rhodia
Project Name SSTOU
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor
Drill Method
Drilling Started Ended
Logged By Driller

Elevation 5309.2
Total Depth 12.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	ASTM	LITHOLOGY	DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	ELEV. FEET
			SP		0-0.5': Tan, fine to medium sand 0.5-1.4': Tan to red, medium to very coarse sand		5308
2			SP/GP		1.4-3': Tan to yellow, coarse sand to fine gravel 3-3.9': Gray, coarse sand to medium gravel		5306
4			OL/OH		3.9-4': Soil layer		
			SP		4-4.7': Tan, medium to very coarse sand		
			SP/GP		4.7-5.9': Maroon, medium sand to fine gravel		5304
6			SP		5.9-7.5': Tan, medium to very coarse sand with subround to subangular pebbles		5302
8			SP/GP		8-8.6': Reddish brown, coarse sand to fine gravel	7-9.5': Screen	
			SM		8.6-12': Tan, silty, very fine sand		5300
10							5298
12					End of Boring - 12 feet		

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Remarks: The well was drilled and installed in 1999. No other information is known.

Additional data may have been collected in the field which is not included on this log.

ENVIRO LOG 5 (5/... SSTOU.GPJ BARRLOG.GDT 2/1/07

Client Rhodia
Project Name SSTOU
Number 26/46-006
Location Silver Bow, Montana

Drill Contractor
Drill Method
Drilling Started Ended
Logged By Driller

LOG OF Boring U01

DRAFT

SHEET 1 OF 1

Elevation 5298.2
Total Depth 6.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	ASTM	LITHOLOGY	DESCRIPTION	ELEV. FEET
					No lithology records in GWIC (Ground-Water Information Center, Montana Bureau of Mines and Geology).	5298
2						5296
4						5294
6					End of Boring - 6 feet	5292
8						5290

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Minneapolis, MN 55435
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Remarks: The well was drilled and installed in 1999. No other information is known.

Additional data may have been collected in the field which is not included on this log.

ENVIRO LOG 5 (5/... SSTOU.GPJ BARRLOG.GDT 2/1/07

EPA Logs

EPA - 1

DRILL LOG

PROJECT Stauffer Chemical Co JOB NO. For-Spill-ID DATE 05/05/88

WELL/BORING SCC- MW-1 LOCATION Silver Bow LOGGER K Eddy

DRILL METHOD Hollow Stem Auger Montana PAGE 1 OF 2

WATER LEVEL FIRST ENCOUNTERED 26.5' FINAL ELEV.

DEPTH IN FEET	LITH COL	SAMPLE TYPE IDENT.	MOISTURE CONTENT WATER LEVEL	LITHOLOGIC DESCRIPTION	NOTES
				CL, w/ organic materials dry pale yell brn (10YR 6/2) 0.0-2.0'	Continuous coring w/ 4.5" 5 foot barrel
				same as above pale yell org. (10YR 5/6)	2.0-3.5'
5.0				SP, dry poorly sorted sub-ang - sub rounded grains 55% qtz w/ hornblende	3.5 - 5.5'
				same as above better sorting angular grains	5.5 - 7.5
				same as above 11" clayey silt (CL) med yell brn (10YR 5/4)	7.5 - 8.5
10.0				ML, dusky yell (5Y 6/4)	8.5 - 10.5
				same as above w/ fibrous imbedded (vegetation)	10.5 - 12.5
				same as above w/ some pebble imbedded (5Y 7/6) med yell brn	12.5 - 13.5
15.0				same w/ chert nodules and bands	13.5 - 15.5
				same as above but with more clay CH.	15.5 - 17.5
				CH moist	17.5 - 19.5
20.0				same as above	19.5 - 21.5
				same as above	21.5 - 23.5
				same as above	23.5 - 25.5

EPA-1

DRILL LOG

PROJECT STAUFFER CHEMICAL CO JOB NO. FC8-8804-10 DATE 08/05/88
WELL/BORING SCC-MW-1 LOCATION SILVER BOW LOGGER R EDDY
DRILL METHOD HOLLOW STEM AUGER MONTANA PAGE 2 OF 2
WATER LEVEL FIRST ENCOUNTERED 26.5 FINAL ELEV.

DEPTH IN FEET	LITH COL	SAMPLE TYPE IDENT.	MOISTURE CONTENT WATER LEVEL	LITHOLOGIC DESCRIPTION	NOTES
			▽	same as above Water table at 26.5	24.5 - 26.5
				no change, same as above	26.5 - 28.5
30.0				same lithology clr change med ol bn (5Y 4/4)	28.5 - 30.5
				semi-consolidated silty/clay very fissile	30.5 - 32.5
				stiff clay, same clr	32.5 - 34.5
35.0				same as above medium cohesion	34.5 - 36.5
				clay w/ pebble to cobble size fragments weathered	36.5 - 38.5
				Same as above	38.5 - 40.5
40.0				Same as above	40.5 - 42.5
				Same as above	42.5 - 44.5
45.0				Same as above	44.5 - 45.2

EPA-3

DRILL LOG

PROJECT Stauffer Chemical Co JOB NO. FOS-8804-10 DATE 08/06/85

WELL/BORING SCC-MW-3 LOCATION Silver Bow LOGGER K. Eddy

DRILL METHOD Hollow Stem Auger Montana PAGE 1 OF 2

WATER LEVEL FIRST ENCOUNTERED 19.0 FINAL ELEV.

DEPTH IN FEET	LITH COL	SAMPLE TYPE IDENT.	MOISTURE CONTENT WATER LEVEL	LITHOLOGIC DESCRIPTION	NOTES
				SLAG	0.0 - 1.5
				1.4 recovered, 0.8' fine - med gravel w/ slag pebbles pale to mod brn (5YR 5/2 - 5YR 4/4) poorly sorted sands w/ some silt ang. to sub ang. grains	1.5 - 3.5
5.0				SM, mod brn to mod yell brn (5YR 4/4 - 10YR 5/4) angular grains	3.5 - 5.5
				SM, med yell brn (10YR 5/4) Subrounded qtz and feldspar	5.5 - 7.5
10.0				~~SM~~ to SM subrounded grains SM (1.4')	7.5 - 9.5
				CL, mod yell brn (10YR 5/4)	9.5 - 11.5
				CL, pale yell brn (10YR 6/2)	11.5 - 13.5
				CL, med orange pink (5YR 8/4)	13.5 - 15.5
15.0				SM Same as above (5YR 7/2) w/ some mica flakes	15.5 - 17.5
				SP dk yell brn (10YR 6/6) well rounded to rounded qtz grains WATER AT 19.0	17.5 - 19.5
20.0				same as above	19.5 - 21.5
				SC, med yell brn (10YR 5/4)	21.5 - 23.5
				SM, med yell brn (10YR 5/4) w/ mica chips	23.5 - 25.5

EPA-3

DRILL LOG

PROJECT STAUFFER CHEMICAL CO JOB NO. FOS-8804-10 DATE 08/06/88

WELL/BORING SCC-MW-3 LOCATION SILVER BOW LOGGER R. EDDY

DRILL METHOD HOLLOW STEM AUGER MONTANA PAGE 2 OF 2

WATER LEVEL FIRST ENCOUNTERED _____ FINAL _____ ELEV. _____

DEPTH IN FEET	LITH COL	SAMPLE TYPE IDENT.	MOISTURE CONTENT WATER LEVEL	LITHOLOGIC DESCRIPTION	NOTES
				SW same color w/ streaks of dusky (5R 3/4)	25.5 - 27.5
				SW same as above	27.5 - 29.5
				same as above	29.5 - 31.5

EPA-4

DRILL LOG

PROJECT STAUFFER CHEMICAL CO JOB NO. FOR-8804-10 DATE 08/05/88

WELL/BORING SCC-MW-4 LOCATION SILVER BOW LOGGER R. EDDY

DRILL METHOD HOLLOW STEM AUGER MONTANA PAGE 1 OF 2

WATER LEVEL FIRST ENCOUNTERED 35.4 FINAL ELEV.

DEPTH IN FEET	LITH COL	SAMPLE TYPE IDENT.	MOISTURE CONTENT WATER LEVEL	LITHOLOGIC DESCRIPTION	NOTES
				SW, qtz grains sub angular to subrounded, poorly graded. (5YR 6/4)	2.0 - 4.0'
				Same as above	4.0 - 6.0
5.0				Same as above, pale brn (5YR 5/2) angular to subrounded qtz some feldspar	6.0 - 8.0
				SW med yell (5Y 7/6)	8.0 - 10
10.0				Same as above	10.0 - 12.0
				SW yell gray (5Y 7/2) some subangular pebbles	12.0 - 14.0
				SM med yell brn (10YR 5/4)	14.0 - 16.0
15.0				SM Same as above	16.0 - 18.0
				Same as above	18.0 - 20.0
20.0				Same as above	20.0 - 22.0
				Same as above	22.0 - 24.0

EPA-4

DRILL LOG

PROJECT STAUFFER CHEMICAL CO JOB NO. FCS-8804-10 DATE 08/06/88

WELL/BORING SCC-MW-4 LOCATION SILVER BOW LOGGER K. EDDY

DRILL METHOD HOLLOW STEM AUGER MONTANA PAGE 2 OF 2

WATER LEVEL FIRST ENCOUNTERED 35.7 FINAL ELEV.

DEPTH IN FEET	LITH COL	SAMPLE TYPE IDENT.	MOISTURE CONTENT WATER LEVEL	LITHOLOGIC DESCRIPTION	NOTES
				same as above	24.0 - 26.0
				same as above	26.0 - 28.0
				clr change to grayish red (5 R 4/2)	28.0 - 29.0
30.0				SP clr. change to med yell brn (10YR 5/4)	29.0 - 31.0
				same as above	31.0 - 33.0
				same as above	33.0 - 35.0
35.0				same as above	35.0 - 37.0
			▽	same as above water table at 37.5'	37.0 - 39.0
				same as above	39.0 - 41.0
40.0				same as above	41.0 - 43.0
				same as above	43.0 - 45.0
45.0				same as above	45.0 - 47.0
				same as above	47.0 - 49.0
ET.D					

WELL/PIEZOMETER COMPLETION DIAGRAM

EPA-1

Project STAUFFER CHEMICAL CO.

TDD No. F08-8804-10

Location SILVER BOW MONTANA

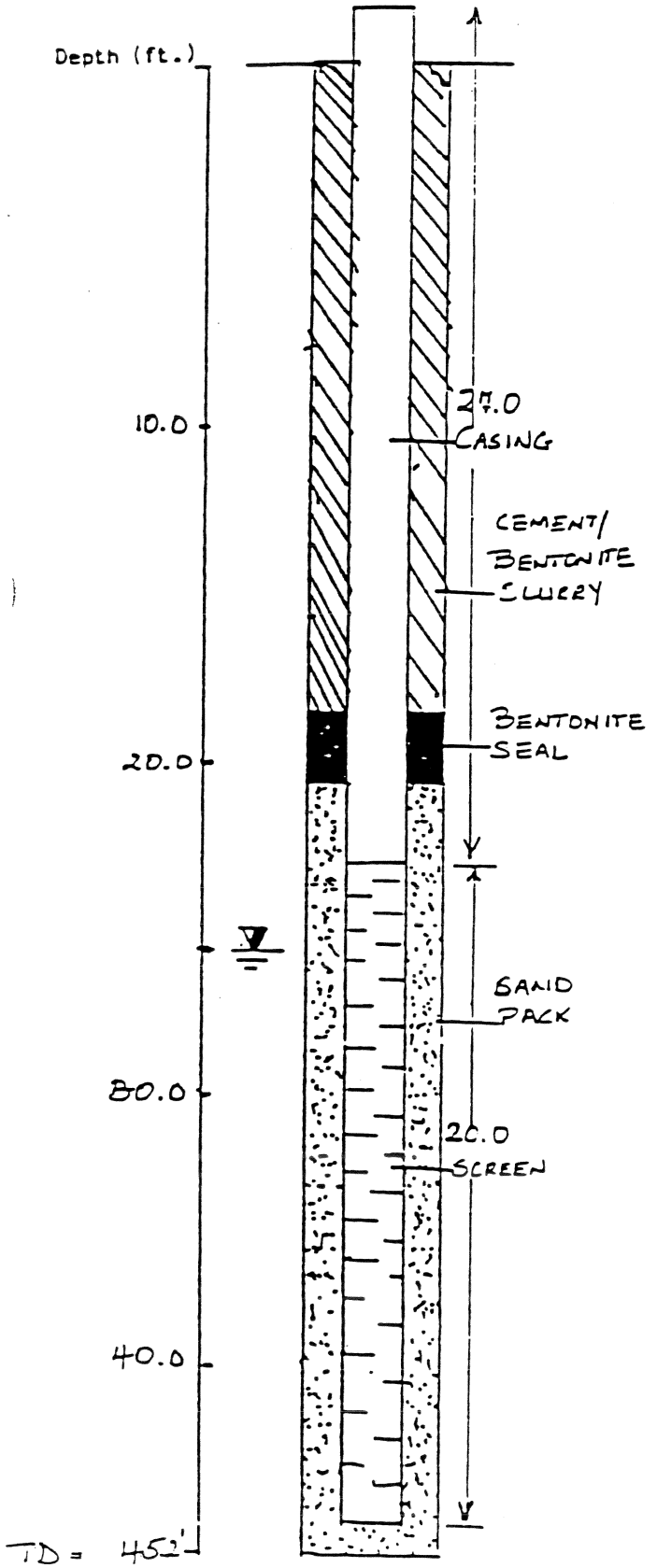
Well Number SCC-MW-1

Geologist ROBERT EDDY

Date(s) of Installation 08-05-88

Depth to Water 26.6 feet (G.L.)

Elevation from Measuring Point



DRILLING SUMMARY:

Driller BOYLES BROS DRILLING C

Rig Type MOBILE B-57

Drilling Method HOLLOW STEM AUGER

Bit(s)

Drilling Fluid NONE

Surface Casing STEEL 6" I.D

Hollow Stem/Drive Casing I.D. (in.) 4.25"

Total Depth of Boring (ft.)

Borehole Diameter (in.)

WELL DESIGN:

Completion Basis: Above Grade / Below Grade

Geological Log YES Geophysical Log NO Type

Total Depth of Well (ft.) 45.0

Casing String(s): C=casing S=screen

45.2 - 25.2 S

25.0 - 0.0 C

Casing: 2" I.D EAGLE PVC 1120 SCH 80 ASTM 1785 400 PSI @ 73°F

Screen: SLOT 0.010 2" ID EAGLE PVC 1120 SCH 80 ASTM 1785 400 PSI @ 73°F

Centralizers NONE

Gravel/Sand Pack 45.2 to 23.5

Bentonite Seal(s) 23.5 to 21.5

to

Bentonite (type) 1/4" VOLCLAY PELLETS

Backfill (cuttings) to

Cement Seal(s) to

to

Cement Composition 10:1 CEMENT TO BENTONITE (POWDERED)

Protective Casing 3.0 to -2.0

Protective Casing Type 1/4 STEEL 6" I.D W/ LOCKING CAP

Other

WELL DEVELOPMENT:

Method STAINLESS STEEL BAILER

Duration 2.5 hrs Estimated production

Water Appearance brownish w/ fines

Remarks: .50 gals bailed.

WELL/PIEZOMETER COMPLETION DIAGRAM

EPA-3

Project STAUFFER CHEMICAL CO

Location SILVER BOW MONTANA

Geologist ROBERT EDDY

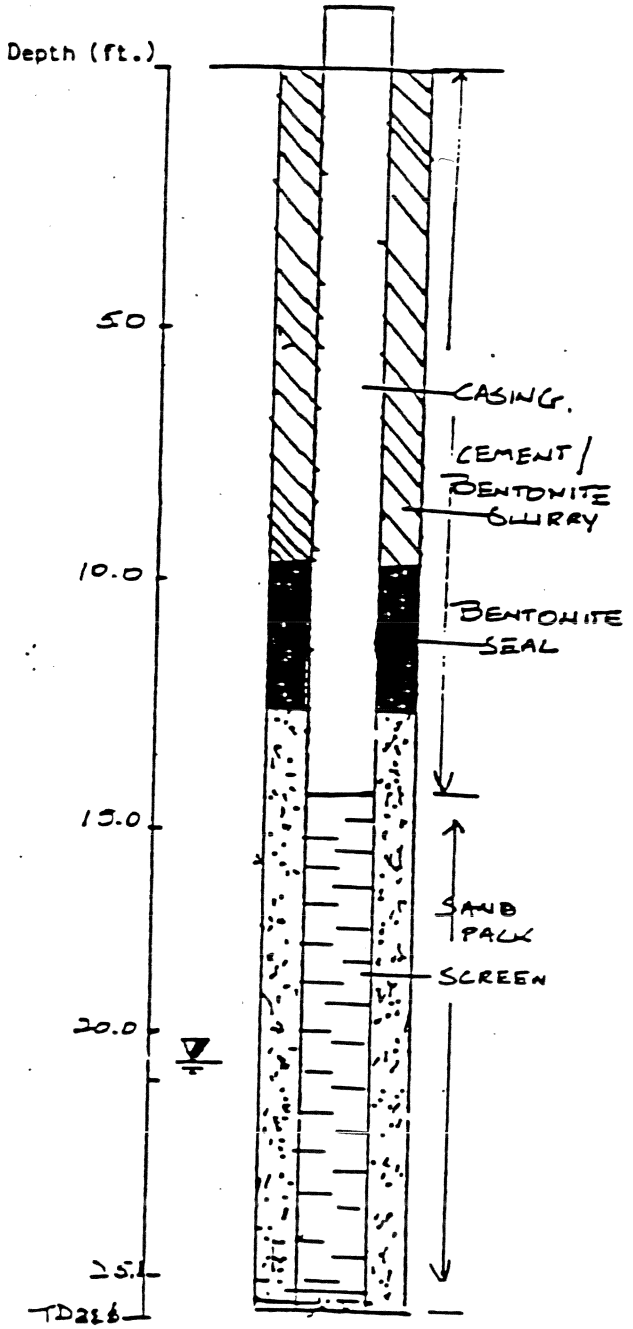
Depth to Water 21.02 feet (G.L.)

TDD No. F08 - 8804 -10

Well Number SCC- MW - 3

Date(s) of Installation 08 - 05 - 8

Elevation from Measuring Point



DRILLING SUMMARY:

Driller BOYLES BROS DRILLING

Rig Type MOBILE B-57

Drilling Method HOLLOW STEM AUGER

Bit(s)

Drilling Fluid NONE

Surface Casing STEEL 6" I.D

Hollow Stem/Drive Casing I.D. (in.) 4.25"

Total Depth of Boring (ft.)

Borehole Diameter (in.)

WELL DESIGN:

Completion Basis: Above Grade / Below Grade

Geological Log YES Geophysical Log Type

Total Depth of Well (ft.) 31.5'

Casing String(s): C=casing S=screen

31.5 - 21.5 S

21.5 - -2.0 C

Casing: 2" I.D EAGLE PVC 1120 SCH 80 ASTM 1785 400 PSI @ 73°F

Screen: SLOT 0.010 2" ID EAGLE PVC SCH80 ASTM 1785 400 PSI @ 73°F

Centralizers NONE

Gravel/Sand Pack 28.6 to 16.0

Bentonite Seal(s) 16.0 to 13.4

Bentonite (type) 1/4" VOLCLAY PELLETS

Backfill (cuttings) to

Cement Seal(s) to

to

Cement Composition 10:1 CEMENT TO BENTONITE (POWDERED)

Protective Casing to

Protective Casing Type 1/2" STEEL 6" ID W/ LOCKING CAP

Other

WELL DEVELOPMENT:

Method STAINLESS STEEL BAIL 6.5

Duration 2.0 hrs Estimated production

Water Appearance BROWN W/ FINES

Remarks: 60 GALS REMOVED.

Offsite Logs

Michael W. Borduin
1015 N. Henry Street
Butte, Montana. 59701
(406) 723-3307
mborduin@hotmail.com

May 27, 1999

TO: Dave Dalstrom of Barr Engineering Company.

Enclosed is the information you requested and a summary of charges we agreed upon.

Thank you,

Michael W Borduin

Michael Wirkler Borduin

Summary of Charges:

1) 3.5 hours @ $20/hour assembly, copy, and shipping time.....$70.

2) 15 copies at 5 cents each.....$0.75.

3) Shipping Costs.....$1.05.

4) One diskette.....$0.79.

TOTAL: **$72.59**

DILLON

Form No. 603 R9/82

JUL 27 1983

MONT. DEPT. OF NATURAL RESOURCES & CONSERVATION

File No. _____

WELL LOG REPORT

State law requires that this form be filed by the water well driller within 60 days after completio

026457

1. WELL OWNER
Name Harry Hartz

2. CURRENT MAILING ADDRESS ~~1830 Elm Butte, Montana 59701~~ 116082 Buxton Rd Silver Bow

3. WELL LOCATION
County Butte-Silver Bow
Township 2 North N/S Range 9 West E/W
CADC N½ ¼ NE ¼ SW ¼ Section 11
Lot _____ Block _____
Subdivision BUXTON

4. PROPOSED USE Domestic ☒ Stock ☒ Irrigation ☐
Other ☐ specify _____

5. DRILLING METHOD X cable, _____ bored, _____ forward rotary, _____ reverse rotary, _____ jetted, _____ other (specify) _____

6. WELL CONSTRUCTION AND COMPLETION

Size of drilled hole	Size and weight of casing	From (feet)	To (feet)	Perforations _____ and/or Screen _____ Kind Size	From (feet)	To (feet)
6"	6 5/8" od x .250	+2'	38'	Torch	28'	38'

Was casing left open end? X Yes ___ No
Was a packer or seal used? ___ Yes X No
If so, what material _____
Was the well gravel packed? ___ Yes X No
Was the well grouted? ___ Yes X No
To what depth? _____
Material used in grouting _____
Well head completion: Pitless adapter ___ Yes ___ No
Top of casing 12 in. or greater above grade X Yes ___ No

7. WHAT IS THE TEMPERATURE OF THE WATER?
_____ Degrees Fahrenheit
☐ Measured ☐ Estimated

8. WATER LEVEL
Static water level 20 feet below land surface
If flowing; closed-in pressure _____ psi
_____ gpm
Controlled by: _____ valve, _____ reducers, _____ other, (specify) _____

9. WELL TEST DATA _____ pump X bailer _____ other, (specify) _____
Pumping level below land surface:
_____ ft. after _____ hrs. pumping 45 gpm
_____ ft. after _____ hrs. pumping _____ gpm

10. WAS WELL PLUGGED OR ABANDONED? ___ Yes X No
If yes, how? _____

11. DATE COMPLETED June 17, 1983

12. WELL LOG

Depth (ft.) From	To	Formation
0'	1'	Top soil
1'	20'	Clay and sand
20'	38'	Brown shale
		Water PA

LOCATION FROM MBMG INVENTORY 2-9-92

WFK/RB

(use separate sheet if necessary)

13. DRILLER'S CERTIFICATION
This well was drilled under my jurisdiction and this report is true to the best of my knowledge.

6/28/83
Date

O'Keefe Drilling Company 4 Mile Road
Firm Name

P.O. Box 3810, Butte, Montana 59702
Address

Ed O'Keefe 287
Signature Ed O'Keefe License No.

MONTANA DEPARTMENT OF NATURAL RESOURCES & CONSERVATION **DNRC**

32 SOUTH EWING HELENA, MONTANA 59620 449-3962

DEPARTMENT — BUREAU COPY

M:49687

Hartz for Part 2

M: 49687

MONTANA BUREAU OF MINES AND GEOLOGY
WELL DATA SHEET

TOWNSHIP 2 N ☒ S ☐ RANGE 9 E ☐ W ☒ SECTION 4 TRACT CADC SEQUENCE NO. __

COUNTY Butte - Silver Bow CODE ___

Original owner: Harris, Clara Harris Address: _____

Owner (____ yr.): 116232 Duncan Rd Resident (if not owner): Silver Bow, MT 59750

Addition (if in subdivision): _____ Block: ____ Lot: ____ Other: _____

USGS 7.5' map: Duncan Lat. __ ° __ ' __ " N; Lon __ ° __ ' __ " W

Altitude of Land Surface(L.S.) @ well: 5530 Ft.

REPORTED DATA

Total depth of well below L.S.: 01/7/83 28 Ft.

Pumping water level below L.S.: ____ Ft.

Static water level below* L.S.: 20 Ft.

Yield in gallons per minute: 45 gpm

How tested: bailer hours: ___

If flowing, shut-in pressure in PSI: ___

CASING

From (Ft.)	To (Ft.)	Dia.(in.)	Type
+2	38	6 5/8	steel

PERFS

From (Ft.)	To (Ft.)	Description
28	38	Torch

Pump type: _____ Size (HP): ___

Well seal type: _____

Well seal depth: from ____ Ft. to ____ Ft.

Water use: _____

Date well completed: __ day __ mo. ____ year

How drilled: _____

By whom: _____ Licence no.: ____

SOURCE

Well appropriation: ☐ MBMG: ☒

Driller: ☐ Owner: ☐ USGS: ☐

SCS: ☐ Other (specify): _____

FIELD DATA

Has well location been field verified?: ☒ yes ☐ no

By whom: L. Rivenart Agency: MBMG

Date verified: 2 day 9 mo. 1992 year

Location of measuring point: West edge at casing

Measuring point** L.S.: +1.80 Ft.

Total depth of well below L.S.: ____ Ft.

Pumping water level below L.S.: 31.31 Ft.

Static water level below* L.S.: ~~21.31~~ Ft.

pH: __.__

Water temperature: ___.__ °C

Specific conductivity @ 25°C: _____.__

Yield in gallons per minute: ____.__

How measured: _____ hours: ___

DATE MEASURED	DAY	MO.	YEAR
	2	9	1992
	2	9	1992

22.1
1.80
31.31

FILE DATA

MBMG water well no.(key): __ Q ____

MBMG water quality no.(key): _____

MBMG aquifer test: ☐ yes ☐ no Project no.: _____

MBMG static water level file: ☐ yes ☐ no

DNRC WR number(key): _____ Geophysics logs: ☐ yes ☐ no

USGS groundwater station ID no.: _____

REMARKS

Pump Running . Well located 30' East of Home under environmental well house

Pump Runs almost continuously according to Owner

* If well is flowing, place a (+) here. If the discharge height above land surface is known, place that value here and precede it by a (+).

** Above (+) below (-) L.S.

LITHOLOGIC LOG

(Ft.) From	(Ft.) To	Lithologic Descriptions
0	1	Top Soil
1	20	Clay w Sand
20	38	Brown Shale

NO Lat & Lon needed

120SDMS

ALT MAP = 5531.80

NO USGS Data

Aquifer: _____ Code: _____

SKETCH MAP

Green house
Garage
House
Domestic Well (monitored)
Irrigation Well not monitored

Date this form completed: 2 DAY 9 MO. 1992 YEAR

By

note: copy at previous loc

093 02N 09W 12 AA Silver Bow

Form No. 603 R2/81

DILLON

File No.

RECEIVED
WELL LOG REPORT

SEP - 7 1982

State law requires that this form be filed by the water well driller within 60 days after completion

MONT. DEPT. OF NATURAL RESOURCES & CONSERVATION

026458

1. WELL OWNER
Name Dan Riley

2. CURRENT MAILING ADDRESS
1153 West Gold
Butte, Montana 59701

3. WELL LOCATION
County Butte-Silver Bow
Township 2- North N/S Range 9- West E/W
NE ¼ NE ¼ ¼ Section 12
Lot Block
Subdivision Buxton

4. PROPOSED USE Domestic ☒ Stock ☐ Irrigation ☐
Other ☐ specify

5. DRILLING METHOD X cable, bored,
forward rotary, reverse rotary, jetted,
other (specify)

6. WELL CONSTRUCTION AND COMPLETION

Size of drilled hole	Size and weight of casing	From (feet)	To (feet)	Perforations / Screen Kind Size	From (feet)	To (feet)
6"	6 5/8" od x .250	+2'	86'	Torch 1/8"	76'	86'

Was casing left open end? X Yes No
Was a packer or seal used? Yes X No
If so, what material
Was the well gravel packed? Yes X No
Was the well grouted? Yes X No
To what depth?
Material used in grouting
Well head completion: Pitless adapter
Yes No
Top of casing 12 in. or greater above grade
X Yes No

7. WHAT IS THE TEMPERATURE OF THE WATER?
Degrees Fahrenheit
☐ Measured ☐ Estimated

8. WATER LEVEL
Static water level 60 feet below land surface
If flowing; closed-in pressure psi
gpm
Controlled by: valve, reducers,
other, (specify)

9. WELL TEST DATA pump X bailer
other, (specify)
Pumping level below land surface:
ft. after hrs. pumping 25 gpm
ft. after hrs. pumping gpm

10. WAS WELL PLUGGED OR ABANDONED? Yes X No
If yes, how?

11. DATE COMPLETED August 10, 1982

12. WELL LOG

Depth (ft.) From	To	Formation		
0'	8'	Fill	12	5573.0
8'	14'	Sand and clay	7	5565.3
14'	23'	Sand	2	5559.3
23'	70'	Sand and clay	7	5550.3
70'	75'	Sand and gravel with clay seams	6	5503.3
75'	86'	Sand and gravel	6	5498.3
		Water		5487.3

WFK (use separate sheet if necessary)

13. DRILLER'S CERTIFICATION
This well was drilled under my jurisdiction and this report is true to the best of my knowledge.

8/17/82
Date

O'Keefe Drilling Company
Firm Name

P.O. Box 3810, Butte, Montana 59702
Address

Ed O'Keefe 287
Signature Ed O'Keefe License No.

MONTANA DEPARTMENT OF NATURAL RESOURCES & CONSERVATION DNRC

32 SOUTH EWING HELENA, MONTANA 59620 449-3962

artcraft printers of missoula

DEPARTMENT COPY

W:49690

Riley or Riley 2

093 02N 09W 12 BCA SILVER BOW

(1)

2N 9W 12

County Silver Bow BC

3 GW 2 Revised 1969
STATE PUBLISHING COMPANY

STATE OF MONTANA
ADMINISTRATOR OF GROUNDWATER CODE
MONTANA WATER RESOURCES BOARD

NOTICE OF COMPLETION OF GROUNDWATER APPROPRIATION BY MEANS OF WELL

Developed after January 1, 1962

(Under Chapter 237 ~~Montana Session Laws~~, 1961, as amended)

This form to be prepared by driller, and three copies to be filed by the **owner** with the County Clerk and Recorder in the county in which the well is located, last copy to be retained by driller.

Please answer all questions. If not applicable, so state, otherwise the form may be returned.

Owner Ray Fitzwilliams

Address P. O. Box 3594

Butte, Montana

Date well started April 4, 1972

completed April 5, 1972

For Administrator's Use
File
GW 1

Type of well Drilled (Dug, driven, bored or drilled)

Equipment used Churn Drill (Churn drill, rotary or other)

Water Use: Domestic ☒ Municipal ☐ Stock ☐ Irrigation ☐

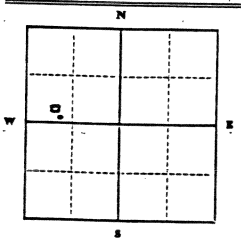
Industrial ☐ Drainage ☐ Other ☐* Garden/Lawn ☒

*Describe

USE: If used for irrigation, industrial, drainage or other. Explain, state number of acres and location or other data (i.e. Lot, Block and Addition).

ESTIMATED ANNUAL WITHDRAWAL

Size of Drilled Hole	Size and Weight of Casing	From (Feet)	To (Feet)	PERFORATIONS Kind Size	From (Feet)	To (Feet)
6"	6 5/8" od x .250	0'	95'	cutting torch	90'	95'



SW ¼ NW ¼ Sec. 12

T. 2 (N) S R. 9 E (W)

Static water level 55 ft.*
Pumping water level 75 ft.*
at 30 gallons per minute,
measured minutes after pumping
began.
*Measured from ground level.
Well developed by bailing
for two hours.
Power Pump HP
Remarks: (Gravel packing, cementing, packers, type of shutoff)

INDICATE LOCATION OF WELL AND PLACE OF USE, IF POSSIBLE. EACH SMALL SQUARE REPRESENTS 40 ACRES.

Driller's Signature O'Keefe Contracting Company
Joe Booth

Driller's Address 2804 Harvard Ave.
Butte, Montana LICENSE NO.

DRILLER'S

Indicate the character and hardness of strata such as soil, clay, sand, gravel, shale, sandstone, etc. Show depth at which water is found and height to which water rises in well.

Top of Ground (Elev. above sea level) 55'

From (Feet)	To (Feet)		
0'	1'	top soil	5574.82
1'	30'	clay	5535.82
30'	70'	sandy clay	5519.82
			5464.82
70'	85'	cemented sand & gravel	5454.82
85'	95'	sand gravel & water	
			5464.82

GEO: 110 ALVM

95' Show exact depth of bottom

M: 49692

Fitzwilliams

Form No. 603 (R 6-87)

3N-9W-24 BBDC
File No. _____

SITE 08896

WELL LOG REPORT

State law requires that this form be filed by the water well driller within 60 days after completion of the well.

1. WELL OWNER
Name Port of Montana

CURRENT MAILING ADDRESS
Silverbow, Hill
Silverbow, Mt.

3. WELL LOCATION
County Silverbow
Township 3 N S Range 9 E W
NW ¼ NW ¼ Section 24
Lot _____ Block _____
Subdivision _____
Tract Number _____

4. PROPOSED USE Domestic X Stock ☐ Irrigation ☐
Other ☐ specify Public use

5. DRILLING METHOD X cable, _____ air rotary, _____ forward rotary, _____ reverse rotary, _____ jetted, _____ other (specify) _____

6. WELL LOG

Depth (ft.) From	To	Formation
0	14	Decomposed Granite
14	22	Sand & Some Gravel
22	60	Decomposed Granite
60	98	"
98	119	Sand & Gravel

PA

LOCATION VERIFIED
MBMG 9-8-92

ATTACH ADDITIONAL SHEETS IF NECESSARY

7. WELL CONSTRUCTION AND COMPLETION

Size of drilled hole	Size and PSI Rating of casing	From (feet)	To (feet)	Perforations X and/or Screen	From (feet)	To (feet)
8"	85	119'	+ 1½'	Kind Size ½" K 3" Tom L	119'	101'

Was casing left open end? X Yes _____ No
Was a packer or seal used? _____ Yes X No
If so, what material _____
Was the well gravel packed? _____ Yes X No
To what depth was the well grouted? 20' ft
Material used in grouting Concrete
Well head completion: Pitless adapter X Yes _____ No
Top casing 18 in. or greater above grade X Yes _____ No

8. WELL TEST DATA
The pump test information request in this section is required for all wells. All depth measurements shall be from the top of the well casing unless otherwise specified.
All wells under 100 gpm must be tested for a minimum of one hour and provide the following information:
a) Air _____ Pump 5-H.P. Bailer X
b) Static water level immediately before testing 14 ft. If flowing; closed-in pressure _____ psi 92 gpm
Controlled by: _____ valve, _____ reducers, _____ other, (specify) _____
c) Depth at which pump is set for test 84'
d) The pumping rate and means of discharge (i.e., bailing, airlift, pumping) 92 gpm
e) Maximum drawdown during the test To 41' ft
f) Duration of test: Pumping time 8 hrs
Recovery time _____ hrs
g) Recovery water level _____ ft
Amount of time after pumping recovery level water data was taken _____ hrs
Wells intended to yield 100 gpm or more shall be tested for a period of 8 hours or more. The test shall follow the development of the well, and shall be conducted continuously at a constant discharge at least as great as the intended appropriation. In addition to the above information, water level data shall be collected and recorded on the Department's "Aquifer Test Data" form included in each packet of well logs.
NOTE: All wells shall be equipped with an access port ½ inch minimum or a pressure gauge that will indicate the shut-in pressure of a flowing well. Removable caps are acceptable as access ports.

9. WAS WELL PLUGGED OR ABANDONED? _____ Yes X No
If yes, how? _____

10. DATE COMPLETED July 30th 88

11. DRILLER/CONTRACTOR'S CERTIFICATION
This well was drilled under my jurisdiction and this report is true to the best of my knowledge.

Date _____
Tri-Valley Drilling
Firm Name
Sheridan Mt. 59749
Address
Robert L. Gudson 331
Signature License No.

MONTANA DEPARTMENT OF NATURAL RESOURCES & CONSERVATION
1620 EAST SIXTH AVENUE HELENA, MONTANA 59620-2301 444-6610

DNRC

DRILLER: Please give this copy to the well owner.
OWNER: Complete reverse side and send to DNRC when the well has been tested.

M. 129085

093 3 N 09W 24 CBAC Silver Bow

MONTANA BUREAU OF MINES AND GEOLOGY — WELL LOG — GROUND WATER DIVISIO

County SilverBow Location: T. 3N R. 9W Sec. 24 Tract CBAC Hole name or number Well F

Hole location

Recorded by HRM Date hole started 6/10/83 Date hole completed 6/10/83 Driller FAS Drilling company MBMG

Total well depth (ft.) 43 Well diameter(s) 6" Casing diameter(s) and length(s) 4" PVC

Type of casing(s): A. Steel (black) B. Steel (gal.) C. Plastic D. Open hole E. Wood cribbing F. Other (specify)

Weight or gage of casing

Method—perforated or screened:

Interval—perforated or screened: 23 - 43'

A. No casing in hole
B. Open bottom only
C. Slotted with Mill's knife
D. Slotted with a torch
E. Screened by pulling ca
F. Other (specify)

Saw Slotted

Has or will well be test pumped? Yes No Were material samples taken? (Yes) No Was a water sample(s) taken? Yes No

Remarks

Note:—This log is designed to supplement the well inventory sheet (ABC cards). A well inventory sheet must be filled out to have a complete record for the we
Test pumping data should be recorded on an aquifer form.

From	To	DRILLING LOG Geological, drilling, and water conditions; remarks and sampling	Estimated composition, % Gravel: c	f	Sand: vc	c	m	f	vf	silt	c
0	4	Top soil, silty									
4	4.5	Sand, brown									
4.5	8	Sand, brown w/coarse gravels									
8	13	Sand, brown, quartz, hornblend, feldspar w/fine gravels									
3	14	Sand, brown									
14	18	Sand, brown w/thin layers of fine pebbles									
18	20	Silt w/coarse sand and gravel (saturated)									
20	21	Silt w/very coarse gravel (saturated)									
21	23	Silt w/coarse sand and gravel (saturated)									
23	28	Silt w/coarse sand and very coarse gravels (saturated)									
28	33	Silt w/coarse sand and fine gravels (saturated)									
33	38	Silt w/coarse sand and fine gravels (saturated)									
38	43	Silty clay w/coarse sand and fine gravels scattered throughout (saturated)									
	TD	43'									
		packer @ 15'									

MW 5087

093 3N09W24CBCB SILVER BOW

MONTANA BUREAU OF MINES AND GEOLOGY
WELL LOG
GROUND WATER DIVISION

County Silver Bow Location: T. 3N ~~24N~~ R. 9W Sec. 24 Tract CBCB Hole name or number Well G 085870

Hole location

Recorded by HRM Date hole started 6/10/83 Date hole completed 6/10/83 Driller FAS Drilling company MBMG

Total well depth (ft.) 53' Well diameter(s) 6" Casing diameter(s) and length(s) 4" PVC

Type of casing(s): A. Steel (black) B. Steel (gal.) (C) Plastic D. Open hole E. Wood cribbing F. Other (specify)

Weight or ~~gage~~ of casing Sch40 Method—perforated or screened: A. No casing in hole B. Open bottom only C. Slotted with Mill's knif D. Slotted with a torch E. Screened by pulling ca (F.) Other (specify)

Interval—perforated or screened: Saw Slotted

Has or will well be test pumped? Yes No Were material samples taken? (Yes) No Was a water sample(s) taken? Yes No

Remarks

Note:—This log is designed to supplement the well inventory sheet (ABC cards). A well inventory sheet must be filled out to have a complete record for the wel Test pumping data should be recorded on an aquifer form.

From	To	DRILLING LOG Geological, drilling, and water conditions; remarks and sampling	Estimated composition, % Gravel c	f	Sand vc	c	m	f	vf	silt	c
0	3	Top soil, reddish brown, silty									
3	5	Silt, clayey									
5	7	Sand, light brown									
7	10	Silt, reddish brown w/medium gravels, granite									
10	13	Sand, coarse, reddish brown, silty w/very fine gravel									
13	17.5	Sand, coarse, reddish brown, silty w/very fine gravel									
17.5	20	Gravel, very coarse w/silty sand, reddish brown									
20	23	Gravel, very coarse									
23	27	Gravel, w/thin layers of sand moist									
		24' very hard drilling									
27	33	Sand, medium, reddish brown, silty w/medium gravel									
33	38	Clay, dark brown, silty w/coarse sand very moist									
38	43	Clay, dark brown, silty w/coarse sand very moist									
43	48	Clay, dark brown, silty w/coarse sand very moist									
48	53	Sand, w/silty oxidized zone (Fe) Rust red at 49'-50'									
	TD	53'									

TABLE 6

M: 505 38

093 TABLE 3 3N09W24CBCC S.B.

MONTANA BUREAU OF MINES AND GEOLOGY **WELL LOG** GROUND WATER DIVISION

County Silver Bow Location: T. 3N R. 9W Sec. 24 Tract CBCC Hole name or number Well A 065671

Hole location Sludge Site #4 - Well A

Recorded by TED Date hole started 9/9/82 Date hole completed 9/9/82 Driller FAS Drilling company MBMG

Total well depth (ft.) 43' Well diameter(s) 6" Casing diameter(s) and length(s) 4" PVC

Type of casing(s): A. Steel (black) (C) Plastic E. Wood cribbing B. Steel (gal.) D. Open hole F. Other (specify)

Weight or gage of casing SCH 40 Method–perforated or screened: A. No casing in hole B. Open bottom only C. Slotted with Mill's knife D. Slotted with a torch E. Screened by pulling casir (F) Other (specify) Saw Slotted

Interval–perforated or screened: 30-43

Has or will well be test pumped? (Yes) No Were material samples taken? (Yes) No Was a water sample(s) taken? (Yes) No

Remarks QW - 9/20/82 - and QW taken during pump test 9/22/82

Note: –This log is designed to supplement the well inventory sheet (ABC cards). A well inventory sheet must be filled out to have a complete record for the well. Test pumping data should be recorded on an aquifer form.

From	To	DRILLING LOG Geological, drilling, and water conditions; remarks and sampling	Estimated composition, % Gravel c	f	Sand vc	c	m	f	vf	silt	clr
0	3	Top Soil									
3	8	Brown sand with gravels and boulders									
8	12.5	Dark reddish-brown sand with cobble gravels									
12.5	13	Black slag									
13	23	Dark brown coarse sand with gravels									
23	28	Moist brown sand with some clay									
28	33	Silt with clay and gravels, water @ ≈ 31'									
33	38	Brown silty clay - saturated									
38	40	Silty sand with clay and siltstone balls									
40	43	Dry reddish-brown clay									
	43'	TD									
		SWL - 29.36' GS-CT 3.5'									
		Packer set 5' above water (25')									

M: 65671

must be MBMG Sect

093 3N09W24 CCAA

MONTANA BUREAU OF MINES AND GEOLOGY — WELL LOG — GROUND WATER DIVISION SILVER BOW

County Silver Bow Location: T. 3N R. 9W Sec. 24 Tract CCAA Hole name or number Well D

Hole location Sludge Site #1 - Well D

Recorded by TED Date hole started 9/8/82 Date hole completed 9/3/82 Driller FAS Drilling company MBMG

Total well depth (ft.) 53' Well diameter(s) 6" Casing diameter(s) and length(s) 4" PVC

Type of casing(s): A. Steel (black) B. Steel (gal.) (C. Plastic) D. Open hole E. Wood cribbing F. Other (specify) Weight or gage of casing SCH 40 Method—perforated or screened: Saw Slotted

A. No casing in hole
B. Open bottom only
C. Slotted with Mill's knife
D. Slotted with a torch
E. Screened by pulling casin
(F.) Other (specify)

Interval—perforated or screened: 38-53

Has or will well be test pumped? (Yes) No Were material samples taken? (Yes) No Was a water sample(s) taken? (Yes) No

Remarks OW taken during pump test

Note:—This log is designed to supplement the well inventory sheet (ABC cards). A well inventory sheet must be filled out to have a complete record for the well. Test pumping data should be recorded on an aquifer form.

From	To	DRILLING LOG Geological, drilling, and water conditions; remarks and sampling	Estimated composition, % Gravel c	f	Sand w	c	m	f	vf	silt	cla
0	1	Top soil									
1	2.5	Top soil and gravels									
2.5	7	Sand and gravel									
7	18	Sandy with some small to large gravels									
18	23	Sand with gravel-size quartz and siltstone balls									
23	28	Moist sand with siltstone balls									
28	33	Sand - more moisture									
33	35	Sand with clay									
35	38	Sand and clay with large granitic gravels									
38	43	Clay with stilstone balls and some gravels									
		water @ ≈ 41' - saturated									
43	48	Moist clay and sand with siltstone balls									
48	53	Clay with sand and silt - moist									
53	'TD										
		SWL = 44.6'									
		Cased to 53' with packer 35', cemented and									
		sealed with bentonite									

M: 5097

well D
(no date)

Form No. 603 (Rev. 3/75) 093 03N 09W 24DCA SILVER BOW File No.

STATE OF MONTANA
Department of Natural Resources and Conservation
MAP: DIVIDE 1 NW
WELL LOG REPORT

Whi 058236
Pin
Yellow
Gold-Driller

(3) VISITED 11/16/79 10078 976

State law requires that this form be filed by the water well driller within 60 days after completion of the well, and Form 602, Notice of Completion of Groundwater Development, be filed by the well owner within 60 days after the water has been put to beneficial use.

1. WELL OWNER
Name Mark Hansen
Current address 2745 St. Ann, Butte, Montana 5970

2. WELL LOCATION Lot ____, Block ____, Subdivision ____
County Silver Bow, or E 1/2 ____ ¼ (SE) ¼ Sec. 24, T. 3-N XX-S, R. 9-W E-W

3. PROPOSED USE ____ domestic (includes lawn and garden); ____ stock; ____ municipal; ____ industrial; ____ irrigation; X other (specify) Drive-In Theater
BUTTE ~~NORTH~~ SOUTH 15

4. METHOD DRILLED X cable, ____ bored, ____ forward rotary, ____ reverse rotary, ____ jetted, ____ other (specify) ____

5. WELL CONSTRUCTION
Diameter of hole 6 in.; depth 47 ft.
Casing: X steel, ____ plastic, ____ concrete, ____ threaded, X welded, ____ other (specify) ____
Pipe weight: ____ lb/ft Dia. 6 5/8 in. From ~~46~~ ft. To 47 ft.
____ lb/ft ____ in. ____ ft. ____ ft.
Was casing left open end? X Yes ____ No
Was a well screen installed? ____ Yes X No
Material ____, dia. ____ in.
(stainless steel, bronze, etc.)
Was perforated pipe used? X Yes ____ No
Perforation type: X slots ____ holes
Size 1/8" set from 40 ft. to 45 ft.
Size ____ set from ____ ft. to ____ ft.
Was a packer or seal used? ____ Yes X No
If so, what material ____
Well type: ____ Straight screen ____ Graveled
Was the well grouted: ____ Yes X No
To what depth: ____ ft.
Material used in grouting ____
Well head completion: Pitless adapter ____
12 in. above grade ____, other ____
(if other, specify) ____
Was well disinfected? X Yes ____ No

6. WATER LEVEL
Static water level 10 ft. below land surface
If flowing: closed-in pressure ____ psi
____ gpm flow ____ through ____ inch pipe
Controlled by: ____ valve ____ reducers
____ other (specify) ____

7. WELL TEST DATA ____ Pump X Bailer ____ Other
(if other, specify) ____
Pumping level below land surface:
____ ft. after ____ hrs. pumping 30 gpm
____ ft. after ____ hrs. pumping ____ gpm

8. WELL LOG
No elev

Depth (ft) From	To	Formation
0'	2'	Top soil
2'	12'	Sand & clay
12'	30'	Tight sand & rocky ledges
30'	40'	Silty sand - water
40'	47'	Brown shale - water
		120 SOMS

(use separate sheet if necessary)

9. DATE STARTED 5/24/76
DATE COMPLETED 5/26/76

10. WAS WELL PLUGGED OR ABANDONED? ____ Yes X No
If so, how? ____

11. DRILLER'S CERTIFICATION
This well was drilled under my jurisdiction and this report is true to the best of my knowledge.

O'Keefe Drilling Company 237
Driller's or firm name License No.

P.O. Box 3810, Butte, Montana 59701
Address

W. J. Keefe 5/27/76
Signed by date

MISDES

NOT IN MBMG FILES

Form No. 603 R8/83 — File No. 111956

Billed to: Walsh Plumbing & Heating

WELL LOG REPORT

State law requires that this form be filed by the water well driller within 60 days after completion of the well.

1. WELL OWNER Name: ~~PORT OF MONTANA~~ Seaway Grain No 1

2. CURRENT MAILING ADDRESS
P. O. Box 3641
Butte, Montana 59702

3. WELL LOCATION
County: Silver Bow
Township: 3 (N/S) Range: 8 (E/W)
¼ ¼ ¼ Section: 25
Lot: Block:
Subdivision:

4. PROPOSED USE Domestic ☐ Stock ☐ Irrigation ☐ Other ☐ Specify: Industrial

5. DRILLING METHOD X cable, ___ bored, ___ forward rotary, ___ reverse rotary, ___ jetted, ___ other (specify)

6. WELL CONSTRUCTION AND COMPLETION

Size of drilled hole	Size and weight of casing	From (feet)	To (feet)	Perforations or Screen (Kind/Size)	From (feet)	To (feet)
6"	6 5/8" x .250	0'	78'	cutting torch 1/8"	71'	76'

Was casing left open end? X Yes ___ No
Was a packer or seal used? ___ Yes X No
If so, what material:
Was the well gravel packed? ___ Yes X No
Was the well grouted? ___ Yes X No
To what depth?
Material used in grouting:
Well head completion: Pitless adapter ___ Yes X No
Top of casing 12 in. or greater above grade X Yes ___ No

7. WHAT IS THE TEMPERATURE OF THE WATER?
___ Degrees Fahrenheit ☐ Measured ☐ Estimated

8. WATER LEVEL
Static water level: 32 feet below land surface
If flowing; closed-in pressure: ___ psi
___ gpm
Controlled by: ___ valve, ___ reducers, other, (specify)

9. WELL TEST DATA ___ pump X bailer other, (specify)
Pumping water level below land surface:
___ ft. after ___ hrs. pumping 15 gpm
___ ft. after ___ hrs. pumping ___ gpm

10. WAS WELL PLUGGED OR ABANDONED? ___ Yes X No
If yes, how?

11. DATE COMPLETED 10/9/84

12. WELL LOG

Depth (ft.) From	To	Formation	
0'	12'	decomposed sand	2
12'	32'	sand & clay	7
32'	60'	clay	3
60'	68'	silty clay	18
68'	78'	shale & clay bearing water	9
		Visited 7/20/85 Patton/Richert	

(use separate sheet if necessary)

13. DRILLER'S CERTIFICATION
This well was drilled under my jurisdiction and this report is true to the best of my knowledge.

October 11, 1984
Date

O'Keefe Drilling Company
Firm Name

P. O. Box 3810, Butte, Mt. 59702
Address

Edward O'Keefe 287
Signature License No.

MONTANA DEPARTMENT OF NATURAL RESOURCES & CONSERVATION
32 SOUTH EWING HELENA, MONTANA 59620 449-3962 DNRC

WELL DRILLER COPY

Mc 149765

SGT

3N 09W 25 BBAC

Silver Bow

MONTANA BUREAU OF MINES AND GEOLOGY
WELL DATA SHEET

092890

TOWNSHIP 3 N ☒ S ☐ RANGE 9 E ☐ W ☒ SECTION 25 TRACT BBAC SEQUENCE NO.

COUNTY Silver Bow CODE

Original owner: Butte - Silver Bow

Owner (yr.): Well Drilled Jerry Hydro Address: Metro Sewer Sludge Injection Site

Addition (if in subdivision): filled course Block: Lot: Other:

USGS 7.5' map: Buxton Lat. ° ′ ″ N; Lon ° ′ ″ W

Altitude of Land Surface (L.S.) @ well: 5391 Ft.

REPORTED DATA

Total depth of well below L.S.: Ft.

Pumping water level below L.S.: Ft.

Static water level below* L.S.: Ft.

Yield in gallons per minute:

How tested: hours:

If flowing, shut-in pressure in PSI:

CASING

From (Ft.)	To (Ft.)	Dia.(in.)	Type

PERFS

From (Ft.)	To (Ft.)	Description

Pump type: Size (HP):

Well seal type:

Well seal depth: from Ft. to Ft.

Water use:

Data well completed: day mo. year

How drilled:

By whom: Licence no.:

SOURCE

Well appropriation: ☐ MBMG: ☒

Driller: ☐ Owner: ☐ USGS: ☐

SCS: ☐ Other (specify):

FIELD DATA

Has well location been field verified? ☒ yes ☐ no

By whom: L. Rinehart Agency: MBMG

Date verified: 2 day 9 mo. 1992 year

Location of measuring point: N. edge of casing

Measuring point** L.S.: +1.96 Ft.

	DATE MEASURED DAY	MO.	YEAR
Total depth of well below L.S.: Ft.			
Pumping water level below L.S.: Ft.			
Static water level below* L.S.: 68.68 Ft.	2	9	1992
pH:			
Water temperature: °C			
Specific conductivity @ 25°C:			
Yield in gallons per minute:			
How measured: hours:			

FILE DATA

MBMG water well no.(key): 0

MBMG water quality no.(key):

MBMG aquifer test: ☐ yes ☐ no Project no.:

MBMG static water level file: ☐ yes ☐ no

DNRC WR number(key): Geophysics logs: ☐ yes ☐ no

USGS groundwater station ID no.:

REMARKS

8" Steel casing ~~w/out~~ w/ cover

Call Potts Drilling or Brian Hankson for Drill log.

* If well is flowing, place a (+) here. If the discharge height above land surface is known, place that value here and precede it by a (+).

** Above (+) below (−) L.S.

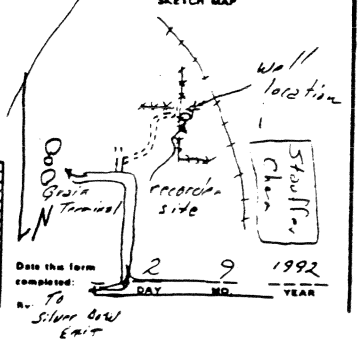
Mo 131579

LITHOLOGIC LOG

(Ft.) From	(Ft.) To	Lithologic Descriptions
0	20	Medium - Coarse sand (olive)
20	30	Coarse sand + pebbles (brown-gray)
30	60	Pebbles to med. sand (grading down)
60	62	sandy silt
62	62.5	Gravel
62.5	74	sandy silt
74	82	Gravel w/ coarse sand + silt
82	112	sandy silt w/ clay
112	114	sandy gravel
114	119	sandy silt
119	120	coarse sands + Gravels
120	161	light brown coarse sandy silt w/pebbles + mi
161	162	sandy gravel
162	165	light brown coarse sandy silt w/ pebbles
165	195	light brown fine sandy silt
195	345	light brown coarse sandy silt w/subrounded pebbles
345	395	light brown silty coarse subrounded sand
395	410	light to med brown coarse subrounded sand, silt
410	443	Tan to brown coarse subrounded sand silt w/ some subrounded pebbles @ top grading down to no pebbles near bottom.
		Long: 112° 40′ 10″
		Lat: 45° 39′ 18″
		PA

Aquifer: Code:

SKETCH MAP



Date this form completed: 2 9 1992 DAY MO. YEAR

By: To Silver Bow EMIT

60.64 − 1.96 = 68.68

30.00 + 79.75 − .25

093 / 3N 8W 19 CAD

Form No. 603: New 7-73

STATE OF MONTANA
Department of Natural Resources and Conservation

File No. 055605

WHITE —
PINK —
CANARY — WELL OWNER
GOLDENROD — DRILLER

WELL LOG REPORT

do not code 6039451-7dd

State law requires that this form be filed by the water well driller on any water well completed by him on and after July 1, 1973 within sixty (60) days after completion of the well.

1. WELL OWNER: Name John Gordan Address 659½ S. Main - Butte, Montana

2. WELL LOCATION: County Silver Bow ; NW¼ NE¼ SW¼, Sec. 19, Twp. 3 (N)-S, Rg. 8 E(W)

3. PROPOSED USE: x Domestic ___ Stock ___ Municipal ___ Industrial ___ Lawn and Garden ___ Irrigation ___ Other (*if other, specify*)

4. METHOD DRILLED: ___ Cable ___ Bored ___ Forward Rotary x Reverse Rotary ___ Jetted ___ Other (*if other, specify*)

5. WELL CONSTRUCTION:
Diameter of hole 6 inches. Depth 135 ft.
Casing: x Steel ___ Plastic ___ Concrete
___ Threaded ___ Welded ___ Other (*if other, specify*)

Pipe Weight:	Dia.:	From:	To:
136 lb/ft.	6 5/8 inches	0 feet	136 feet
___ lb/ft.	___ inches	___ feet	___ feet
___ lb/ft.	___ inches	___ feet	___ feet

Was perforated pipe used? x Yes ___ No
Mgth of pipe perforated 5' feet
Was casing left open end? x Yes ___ No
Was a well screen installed? x Yes ___ No
Material ___ Dia. ___ inches
(*stainless steel, bronze, etc.*)
Perforation type: ___ x slots ___ holes
Size ___ set from 128 feet to 133 feet
Size ___ set from ___ feet to ___ feet
Size ___ set from ___ feet to ___ feet
Was a packer or seal used? ___ Yes x No
If so, what material
Well type: x Straight screen ___ Gravel
Was the well grouted? ___ Yes x No
To what depth? feet
Material used in grouting
Well head completion: Pitless adapter ___
12" above grade. Other ___
(*If other, specify*)
Was the well disinfected? x Yes ___ No

6. WATER LEVEL:
Static water level 98 ft. below land surface
If flowing: closed-in pressure ___ psi
___ GPM flow ___ through ___ inch pipe
Controlled by: ___ Valve ___ Reducers
___ Other, *specify*

7. WELL TEST DATA: ___ Pump x Bailer ___ Other (*if other, specify*)
Pumping level below land surface:
___ ft. after ___ hrs. pumping 13 gpm
___ ft. after ___ hrs. pumping ___ gpm

8. WELL LOG:

Depth (ft.) From	To	Formation
0'	2'	Top Soil
2'	7'	Clay
7'	10'	Gravel & Clay
10'	40'	Brown decomposed rock
40'	60'	Black rock
60'	107'	Decomposed Rock w/ clay
107'	130'	Shale & sand (water)
130'	135'	Sand & gravel (water)

(*Use separate sheet if necessary*)

9. DATE STARTED: 3/25/74

10. DATE COMPLETED: 3/26/74

11. WAS WELL PLUGGED OR ABANDONED? ___ Yes ___ No
If so, how

12. DRILLER'S CERTIFICATION:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge.

Gilbert Contracting Co. 098
Driller's or Firm Name *License No.*

P. O. Box 3410, Butte, Montana 59701
Address

Signed by W. Smithfield 4/8/74
M. 50384 *Date*

M 50384?

90 min +

DILLON

Form No. 603 (R 6-84)

093

2N 9W 10 ACB

RECEIVED

OCT 29 1985

MONTANA DEPT. OF NATURAL RESOURCES & CONSERVATION

File No. Silver Bow 026456

WELL LOG REPORT

State law requires that this form be filed by the water well driller within 60 days after completio

1. WELL OWNER
Name Doug Torpey 782-1881

2. CURRENT MAILING ADDRESS
116103 S. Buxton Road
Silver Bow ~~Butte,~~ Montana ~~59701~~ 59750

3. WELL LOCATION Buxton
County Butte-Silver Bow County
Township 3-N N/S Range 9-W E/W
NW ¼ SW ¼ NE ¼ Section 10
Lot ____ Block ____
Subdivision ____

4. PROPOSED USE Domestic ☒ Stock ☐ Irrigation ☐
Other ☐ specify ____

5. DRILLING METHOD X cable, ____ bored,
____ forward rotary, ____ reverse rotary, ____ jetted,
____ other (specify) ____

6. WELL CONSTRUCTION AND COMPLETION

Size of drilled hole	Size and weight of casing	From (feet)	To (feet)	Perforations / Screen Kind Size	From (feet)	To (feet)
6"	5 5/8" od x .250 4" PVC 200#	+2'	83'			
		30'	225'	Skill Saw	165'	225'

Was casing left open end? X Yes ____ No
Was a packer or seal used? ____ Yes X No
If so, what material ____
Was the well gravel packed? ____ Yes X No
Was the well grouted? ____ Yes X No
To what depth? ____
Material used in grouting ____
Well head completion: Pitless adapter ____ Yes ____ No
Top of casing 12 in. or greater above grade X Yes ____ No

7. WHAT IS THE TEMPERATURE OF THE WATER?
____ Degrees Fahrenheit
☐ Measured ☐ Estimated

8. WATER LEVEL
Static water level 8 feet below land surf
If flowing; closed-in pressure ____ gpm
Controlled by: ____ vaive, ____ reducers, ____ other, (specify) ____

9. WELL TEST DATA ____ pump X bailer ____ other, (specify) ____
Pumping water level below land surface:
____ ft. after ____ hrs. pumping 8 gpm
____ ft. after ____ hrs. pumping ____ gpm

10. WAS WELL PLUGGED OR ABANDONED? ____ Yes X No
If yes, how? ____

11. DATE COMPLETED September 11, 1985

12. WELL LOG

Depth (ft.) From	To	Formation	
0'	1'	Top soil	12
1'	30'	Clay	3
30'	50'	Decomposed sna and clay	3
50'	80'	Red clay	3
80'	85'	Clay and rock	21
85'	150'	Rock	11
150'	155'	Green porus rock	21
		Water 1/2 gpm	
155'	195'	Hard rock	11
195'	220'	Green broken rock	21
220'	225'	Hard rock	11
		Water	

(use separate sheet if necessary)

13. DRILLER'S CERTIFICATION
This well was drilled under my jurisdiction and this report is true to the best of my knowledge.
9/20/85 Date
O'Keefe Drilling Company 4 Mile Road Firm Name
P.O. Box 3810, Butte, Montana 59702 Address
W. F. Kentfield 459
Signature W. F. Kentfield License No.

MONTANA DEPARTMENT OF NATURAL RESOURCES & CONSERVATION
32 SOUTH EWING HELENA, MONTANA 59620 444-6610 DNRC

DEPARTMENT — BUREAU COPY

M: 49681

toppey

Dillon 093 2N 09W 10 AB Silver Bow

070094

WELL LOG REPORT

1. WELL OWNER
Name Alex Christie

2. CURRENT MAILING ADDRESS
Buxton Road
Butte MT 59701

3. WELL LOCATION Same
County Silverbow
Township 2 N~~S~~ Range 9 ~~E~~W
NW 1/4 NE 1/4 SECTION 10
Lot _____ Block _____
Subdivision _____
Tract Number _____

4. PROPOSED USE Domestic X
Irrigation _____ Stock _____
Other: _____

5. DRILLING METHOD _____ Cable
Rotary: X Air _____ FWD _____ Reverse
_____ Jetted _____ Other: _____

6. WELL LOG

From	To	Formation
0	130	Clay
130	200	Brown Soft Shale Tuff?
200	365	Granite? or Rhyolite?

5454.32 Clay
5524.32 Shale
5454.32 Rhyolite
5284.32

Drainage = PA

7. WELL CONSTRUCTION

Hole Size	Casing Size	From Feet	To Feet
6"	Steel 6 5/8" X .250	1 1/2"	104
4"	PVC	10	365

COMPLETIONS
perforations _____ screen _____

Kind	From feet	To feet
Skill Saw	325	365

Was casing left open? YES
Was a packer/seal used? NO
Well gravel packed? NO
To What depth Well grouted? 18 FT
Grouting Material: Bentonite
Well head completion :
Pitless adapter NO
Top of casing 18" or greater above grade YES

8. WELL TEST DATA
All wells under 100 GPM must be tested for a minimum of one hour and provide:

A. Air X Pump ___ Bailer ___
B. Static Water Level before: _____ FT
If flowing closed in pressure _____ PSI _____ GPM
Controlled by:
C. Depth of Pump for Test FT
D. Pumping Rate & Discharge 4 GPM
E. Maximum Drawdown for test FT
F. Duration of test:
Pumping time: HRS.
Recovery Time: HRS.
G. Recovery Water Level FT
Time after pumping recovery water data was taken HRS.

9. WELL PLUGGED OR ABANDONED? NO
If yes, how? _____

10. DATE COMPLETED August 9 1990

11. DRILLER/CONTRACTOR'S CERTIFICATION
This well was drilled under my jurisdiction and this report is true to the best of my knowledge.

Date: August 25 1990

O'Keefe Drilling Company
P.O. Box 3810 - 2000 Four Mile Road
Butte, MT. 59702

Signature Daniel E. O'Keefe License No. 462 WWC

MONTANA DEPARTMENT OF NATURAL RESOURCES
1520 East 6th Ave Helena, MT 59620-2301 406-444-6610

M;120310

christie

Site Production Wells

F 1

T 3N R 9W

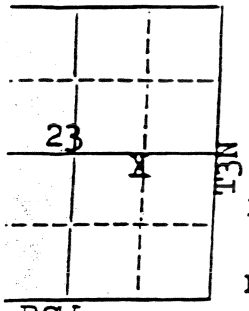
RP-W-1

County Silver Bow

MONTANA BUREAU OF MINES AND GEOLOGY

Butte, Montana

WATER WELL LOG



Owner Victor Chemical Works Address Silver Bow, Montana

Driller Walter Riddock & Sons Address Helena, Montana

Date Started January 7, 1954 Date Completed February 4, 195

Location: Sec. 23 T. 3N R. 9W ¼ sec. South East

f well Drilled Equipment used Rotary
(Dug, driven, bored, or drilled) (Churn drill, rotary, other)

use: Domestic ☐ Municipal ☐ Stock ☐ Irrigation ☐

Industrial ☒ Drainage ☐ Other:

0 ft. to 225 ft. Type Welded Size 10"

ft. to ft. Type Size

ft. to ft. Type Size

ted ~~or Screened~~: Ft. 20 to ft. 222 Ft. to ft.

screen or perforations 4 ea. 1/4" slits per foot

Water level, for non-flowing well: 40 feet.

pressure, for flowing well: lb./sq. in. on:
(date)

g water level 55 feet at 350 - 400 gal. per min.

ed: Layne-Minnesota deep well pump was installed.

f test 8 hours

: (Gravel packing, cementing, packers, type of shut-off, depth of shut-off)

(over)

RP-W-1

Log of Well

Depth, feet		Description of Material Drilled
	To	
		No written log is available. Refer to log of #3 well which is about 1060 feet southwest of this well.

093 03N09W23 SA C.02 S. Iver Bow

Form No. 603 (R 6-67) **RECEIVED** FEB 12 1990 RP-W-1A **RECEIVED** FEB 12 1990 File No. 069371 Well 1A

WELL LOG REPORT

State law requires that this form be filed by the water well driller within 20 days after completion of the well.

MONT. DEPT. of NATURAL RESOURCES & CONSERVATION — MONTANA DNRC HELENA FIELD OFFICE — W049913-00

1. WELL OWNER Name Rhodia Inc Phone-Foote Mineral Chemical Co.

2. CURRENT MAILING ADDRESS P.O. Box 3146 Butte, Mt. 59702-3146

3. WELL LOCATION
County Silver Bow
Township 3 N/S Range 9 E/W
SW NE ¼ SE ¼ Section 23
Lot Block
Subdivision
Tract Number

4. PROPOSED USE Domestic ☐ Stock ☐ Irrigation ☐
Other ☒ specify Chemical Plant

5. DRILLING METHOD X cable, X air rotary, forward rotary, reverse rotary, jetted, other (specify)

6. WELL LOG

Depth (ft.) From	To	Formation
0	5	Topsoil & fill
5	75	Clay & Sand
75	120	Clay with sand seams
120	136	Hard Clay or volcanic contact
136	225	Clay & hard Lenses of volcanic (H20)
225	275	Volcanic Tuff (H20) (soft Rock)

Well 1-A 20 East of Well #1

June 3, 1992 from Owner

PA

ATTACH ADDITIONAL SHEETS IF NECESSARY

7. WELL CONSTRUCTION AND COMPLETION

Size of drilled hole	PSI Rating of casing	From (feet)	To (feet)	Perforations / Screen	Kind Size	From (feet)	To (feet)
20"	20"	+1	125				
20"	12 3/4 steel pipe	+2	275		12 3/4 stainless steel	136	206
	d screen →				110 ft	225	265

Was casing left open end? X Yes ___ No
Was a packer or seal used? ___ Yes X No
If so, what material
Was the well gravel packed? X Yes ___ No
To what depth was the well grouted? 20 ft
Material used in grouting Bentonite Clay
Well head completion: Pitless adapter ___ Yes ___ No
Top casing 18 in. or greater above grade X Yes ___ No

8. WELL TEST DATA

The pump test information request in this section is required for all wells. All depth measurements shall be from the top of the well casing unless otherwise specified.

All wells under 100 gpm must be tested for a minimum of one hour and provide the following information:

a) Air ___ Pump ✓ Bailer ___
b) Static water level immediately before testing 39 ft. If flowing; closed-in pressure ___ psi ___ gpm
Controlled by: ___ valve, ___ reducers, ___ other, (specify)
c) Depth at which pump is set for test 262
d) The pumping rate and means of discharge (i.e., bailing, airlift, pumping) 600 gpm
e) Maximum drawdown during the test 260 ft
f) Duration of test: Pumping time 32 hrs
Recovery time 24 hrs
g) Recovery water level 39 ft
Amount of time after pumping recovery level water data was taken 24 hrs

Wells intended to yield 100 gpm or more shall be tested for a period of 8 hours or more. The test shall follow the development of the well, and shall be conducted continuously at a constant discharge at least as great as the intended appropriation. In addition to the above information, water level data shall be collected and recorded on the Department's "Aquifer Test Data" form included in each packet of well logs.

NOTE: All wells shall be equipped with an access port ½ inch minimum or a pressure gauge that will indicate the shut-in pressure of a flowing well. Removable caps are acceptable as access ports.

9. WAS WELL PLUGGED OR ABANDONED? ___ Yes X No
If yes, how?

10. DATE COMPLETED 1-16-90

11. DRILLER/CONTRACTOR'S CERTIFICATION

This well was drilled under my jurisdiction and this report is true to the best of my knowledge.

1-16-90
Date

Lindsay & Son Drilling Co.
Firm Name

P.O. Box 26 Clancy, Mt.
Address

Tony Lindsay 253
Signature License No.

M: 50527

No. 2 Well

T 3N R 9W

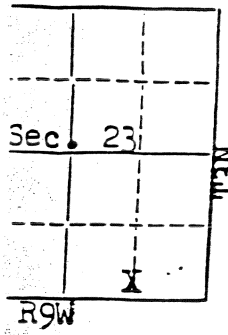
RP-W-2

County Silver Bow

MONTANA BUREAU OF MINES AND GEOLOGY

Butte, Montana

WATER WELL LOG



Owner Victor Chemical Works Address Silver Bow, Montana

Driller Price & Lindsey Address Clancy, Montana

Date Started January 1951 Date Completed January 1951

Location: Sec. 23 T 3N R 9W ¼ sec. South East

f well Drilled Equipment used Rotary
(Dug, driven, bored, or drilled) (Churn drill, rotary, other)

use: Domestic ☐ Municipal ☐ Stock ☐ Irrigation ☐

Industrial ☒ Drainage ☐ Other:

0 ft. to 226 ft. Type Welded Size 10"

ft. to ft. Type Size

ft. to ft. Type Size

ted ~~or Screened~~: Ft. ? to ft. ? Ft. to ft.

screen or perforations 4 ea. 1/4" slits per foot

ater level, for non-flowing well: 33' feet.

pressure, for flowing well: lb./sq. in. on:
(date)

water level 47' feet at 500 gal. per min.

ed:

f test ?

(Gravel packing, cementing, packers, type of shut-off, depth of shut-off)

(over)

RP-W-2

Log of Well

Depth, feet		Description of Material Drilled
0	50	Clay
50	55	Sandy clay - some shallow strata fine sand
55	60	Clay (very dense and slimy)
60	70	Some very fine gravel - considerable fine sand and clay in shallow stratas
70	78	Silty clay
78	87	Alternate stratas of very fine sand and clay
87	95	Silty clay
95	118	Alternate stratas of very fine sand and clay
118	123	Sandy clay
123	150	Shallow stratas of sand and clay
150	155	Clay
155	170	Clay, some gravel embedded in the clay
170	185	Sandy clay, some very fine sand
185	198	Sandy clay
198	201	Coarse sand and some fine gravel
201	226	Coarse gravel and some fine gravel
55		Possible 30 - 40 g.p.m. - bailer test
70		Possible 20 - 30 g.p.m. - bailer test
87		Possible 30 - 40 g.p.m. - bailer test
118) 150)		Possible 50 - 60 g.p.m. - bailer test
170		Very little water - bailer test
185		No water - bailer test
226		500 g.p.m. after perforating

Well #2A RP-W-2A County Silver Bow

STATE OF MONTANA
ADMINISTRATOR OF GROUNDWATER CODE
MONTANA WATER RESOURCES BOARD

NOTICE OF COMPLETION OF GROUNDWATER APPROPRIATION BY MEANS OF WELL

Developed after January 1, 1962

(Under Chapter 237 Montana Session Laws, 1961, as amended)

This form to be prepared by driller, and three copies to be filed by the owner with the County Clerk and Recorder in the county in which the well is located, last copy to be retained by driller.

Please answer all questions. If not applicable, so state, otherwise the form may be returned.

Owner Stauffer Chemical

Address 150 S. 6th E.
Salt Lake City, Utah

Date well started August 16, 1971

completed August 30, 1971

For Administrator's Use
File
GW

Type of well Drilled (Dug, driven, bored or drilled)

Equipment used Churn Drill (Churn drill, rotary or other)

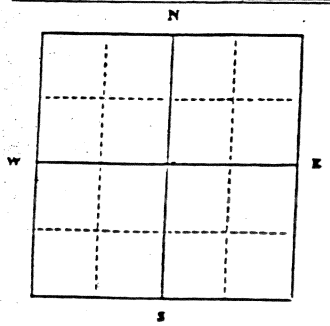
Water Use: Domestic ☐ Municipal ☐ Stock ☐ Irrigation ☐
Industrial ☑ Drainage ☐ Other ☐* Garden/Lawn ☐

*Describe

*E: If used for irrigation, industrial, drainage or other. Explain, state number of acres and location or other data (i.e. Lot, Block and Addition).

ESTIMATED ANNUAL WITHDRAWAL

Size of Drilled Hole	Size and Weight of Casing	From (Feet)	To (Feet)	PERFORATIONS Kind Size	From (Feet)	To (Feet)
10"	10 5/8" od x .365	0'	209'			
	8 5/8" od x .250	200'	257'	cutting torch	200'	257'



Static water level 44 ft.*
Pumping water level 126 ft.*
at 500+ gallons per minute,
measured minutes after pumping began.
*Measured from ground level.
Well developed by test pump
for 21 hours.
Power Pump HP
Remarks: (Gravel packing, cementing, packers, type of shutoff)
Pump is set @ 175'

¼ ¼ Sec.
T. N/S R. E/W

ATE LOCATION OF WELL AND PLACE OF USE, IF POSSIBLE.
SMALL SQUARE REPRESENTS 40 ACRES.

Driller's Signature O'Keefe Contracting Company
W. F. Neufield
Driller's Address 2804 Harvard Ave.
Butte, Montana 59701 LICENSE NO. 8

DRILLER'S LOG

Indicate the character, color, thickness of strata such as soil, clay, sand, gravel, shale, sandstone, etc. Show depth at which water is found and height to which water rises in well.

Top of Ground (Elev. above sea level)

From (Feet)	To (Feet)	
0'	2'	Clay
2'	6'	Hard pan
6'	70'	Sand & clay making some clay
70'	85'	Fine to Medium sand
85'	101'	Dirty fine sand w/clay embedded
101'	231'	Clay w/sand & gravel Water
231'	232'	Good sand & gravel
232'	257'	Sandy clay
	257'	Fine sand

257' Show exact depth of bottom

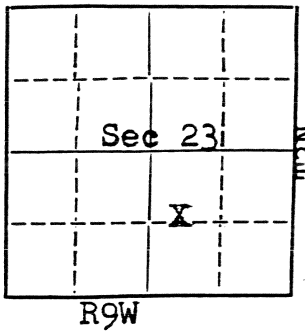
T 3N R 9W

RP-W-3

County Silver Bow,

MONTANA BUREAU OF MINES AND GEOLOGY
Butte, Montana

WATER WELL LOG



Owner Victor Chemical Works Address Silver Bow, Montana

Driller Price & Lindsey Address Clancy, Montana

Date Started ..... Date Completed March 1951

Location: Sec. 23 T. 3N R. 9W ¼ sec. South East

Type of well Drilled (Dug, driven, bored, or drilled) Equipment used Rotary (Churn drill, rotary, other)

Water use: Domestic ☐ Municipal ☐ Stock ☐ Irrigation ☐

Industrial ☒ Drainage ☐ Other: .....

Casing: 0 ft. to 250 ft. Type Welded Size 10"

Casing: ..... ft. to ..... ft. Type ..... Size .....

Casing: ..... ft. to ..... ft. Type ..... Size .....

Perforated ~~or Screened~~: Ft. See log on back to ft. ..... Ft. ..... to ft. .....

Type of screen or perforations 4-1/4" slits per foot

Static Water level, for non-flowing well: 52' 6" feet.

Shut-in pressure, for flowing well: ..... lb./sq. in. on: ..... (date)

Pumping water level 71 feet at 550 gal. per min.

How tested: Pump

Length of test .....

Remarks: (Gravel packing, cementing, packers, type of shut-off, depth of shut-off)

.....

.....

.....

.....

.....

(over)

RP-W-3

Log of Well

Depth, feet From	Depth, feet To	Description of Material Drilled
0	5	Clay and some surface gravel
5	83	Silty clay
83	90	Fine sand and some fine gravel, some water
90	105	Very silty clay
105	108	Medium coarse sand, some water
108	123	Silty clay
123	128	Fine silty sand, some water, perforated
128	132	Silty clay and some fine sand
132	135	Fine silty sand, some water, perforated
135	180	Silty clay
180	227	Sandy clay
227	230	Coarse sand and some fine washed gravel, water, perforated
230	232	Very fine sand
232	238	Sandy clay
238	242	Fine sand and some small gravel, water, perforated
242	246	Hard sandy clay
246	250	Medium coarse sand, water, perforated
		Most water being made from 227' strata down.

GW 4

No. 3 Well

T 3N R 9W

RP-W-3

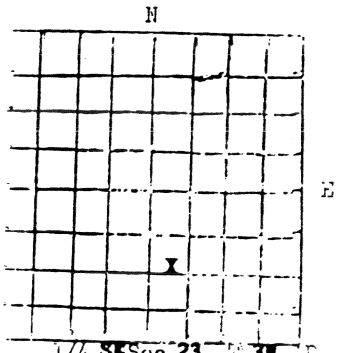
County Silver Bow

STATE OF MONTANA
ADMINISTRATOR OF GROUNDWATER CODE
OFFICE OF STATE ENGINEER

- - - - -

DECLARATION OF VESTED GROUNDWATER RIGHTS
(Under Chapter 237, Montana Session Laws, 1961)

1. Stauffer Chemical Company
Victor Chemical Division, of Silver Bow, Montana
(Name of Appropriator) (Address) (Town)
County of Silver Bow, State of Montana, have appropriated groundwater according to the Montana laws in effect prior to January 1, 1962, as follows:



1/4 SE Sec 23 T 3N R 9W
Indicate point of appropriation and place of use, if possible. Each small square represents 10 acres.

2. The beneficial use on which the claim is based
Industrial.

3. Date or approximate date of earliest beneficial use; and how continuous the use has been
September 1951, continuous.

4. The amount of groundwater claimed (in miner's inches or gallons per minute)
450 Gal./Min.

5. If used for irrigation, give the acreage and description of the lands to which water has been applied and name of the owner thereof

6. The means of withdrawing such water from the ground and the location of each well or other means of withdrawal
Multi-stage deep well turbine pump.

7. The date of commencement and completion of the construction of the well, wells, or other works for withdrawal of groundwater
Completed March 1951.

8. The depth of water table 68 Feet below surface.

9. So far as it may be available, the type, size and depth of each well or the general specifications of any other works for the withdrawal of groundwater
See attached sheets.

10. The estimated amount of groundwater withdrawn each year 220,000,000 Gal.

11. The log of formations encountered in the drilling of each well if available
See attached sheets.

12. Such other information of a similar nature as may be useful in carrying out the policy of this act, including reference to book and page of any county record
See attached sheets.

Signature of Owner

Title

- - - - -

STATE OF MONTANA)
COUNTY OF SILVER BOW) ss

_____, being first duly sworn, deposes and says that he is _____ of lawful age and _____ the appropriator and claimant of the ground water right mentioned in the foregoing declaration of vested groundwater rights and the person whose name is subscribed thereto, as the appropriator and claimant, that he knows the contents of said foregoing notice and that the matters and things therein stated are true.

Subscribed and sworn to before me, this _____ day of _____, 19__

Notary Public for the State of Montana, residing at _____

RP-W-4 #4

T 3N R 9W

County Silver Bow

MONTANA BUREAU OF MINES AND GEOLOGY
Butte, Montana

WATER WELL LOG

ec 23			
	X		

Owner Victor Chemical Works Address Silver Bow, Montana

Driller Price & Lindsey Address Clancy, Montana

Date Started ____ Date Completed August 1954

Location: Sec 23 T 3N R 9W ¼ sec South East

vell Drilled Equipment used Rotary
(Dug, driven, bored, or drilled) (Churn drill, rotary, other)

e: Domestic ☐ Municipal ☐ Stock ☐ Irrigation ☐

Industrial ☒ Drainage ☐ Other: ____

0 ft. to 300 ft. Type Welded Size 10"

____ ft. to ____ ft. Type ____ Size ____

____ ft. to ____ ft. Type ____ Size ____

d ~~or Screened~~: Ft 42 to ft 295 Ft ____ to ft ____

~~reen or~~ perforations 4 1/4" slits per foot

ter level, for non-flowing well: 35 ft. feet.

ressure, for flowing well: ____ lb./sq. in. on: ____ (date)

water level 40.5 feet at 350 gal. per min.

l: Pump

est ____

(Gravel packing, cementing, packers, type of shut-off, depth of shut-off)

RP-W-4

Log of Well

Depth, feet To	Description of Material Drilled
16	Top soil and sand
46	Clay and some gravel
50	Brown clay and some shallow stratas of sand, some water, 15 perforations
60	Brown clay and some fine gravel, some water, 35 perforation:
75	Brown fine sandy clay
80	Brown coarse sandy clay
134	Light sandy silt with some clay and some sand
137	Fine silty sand
200	Clay containing fine silty sand
204	Firm fine silty sand
205	Running fine silty sand
222	Very tight fine silty sand
225	Fairly clean fine sand, some water, 35 perforations
255	Fine silty sand and some clay
260	Medium coarse sand and some silt, some water, 40 perforatior
265	Very fine tight silty sand
275	Very fine tight silty sand with ribs of chert-like rock
290	Tight chert with some sand
295	Tight clean chert, some water, 35 perforations
310	Tight clean chert
333	Shallow stratas of chert and dark sticky clay, some water
360	Very dense sticky brown clay
400	Alternate stratas of very soft and firm clay

No. 5 Well

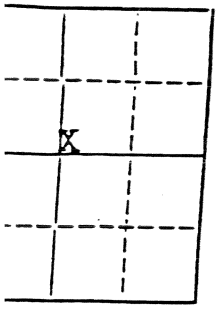
RP-W-5

T 3N R 9W

County Silver Bow

MONTANA BUREAU OF MINES AND GEOLOGY
Butte, Montana

WATER WELL LOG



Owner Victor Chemical Works Address Silver Bow, Montana

Driller Price & Lindsey Address Clancy, Montana

Date Started Date Completed August 1954

Location: Sec. 23 T. 3N R. 9W ¼ sec. North East

well Drilled Equipment used Rotary
(Dug, driven, bored, or drilled) (Churn drill, rotary, other)

se: Domestic ☐ Municipal ☐ Stock ☐ Irrigation ☐

Industrial ☒ Drainage ☐ Other:

ft. to 303 ft. Type Welded Size 10"

ft. to ft. Type Size

ft. to ft. Type Size

d ~~or Screened~~: Ft. 80 to ft. 290 Ft. to ft.

reen or perforations 4-1/4" slits per foot

er level, for non-flowing well: 16 feet.

essure, for flowing well: lb./sq. in. on: (date)

vater level 62 feet at 350 gal. per min.

: Pump

est

(Gravel packing, cementing, packers, type of shut-off, depth of shut-off)

RP-W-5

Log of Well

Depth, feet	To	Description of Material Drilled
0	8	Top soil, sand, some clay
8	20	Sticky gray clay
0	35	Shallow stratas of sticky and sandy brown clay
5	85	Sandy brown clay
5	100	Sticky clay
0	130	Alternate stratas of sticky and sandy clay
0	150	Very sticky clay
0	160	Sandy clay
0	175	Alternate shallow stratas of sticky and sandy clay
	180	Sticky clay
	225	Sandy clay
	230	Very sticky clay
	241	Tight sandy clay
	245	Very sticky fat clay
	293	Alternate shallow stratas of firm sandy clay and sticky cla
	302	Fine sandy silt
	335	Sandy clay
	345	Very sticky clay
	350	Tight sandy clay
		No definite water courses, the more sandy clay exposed
		the more water was made.

6

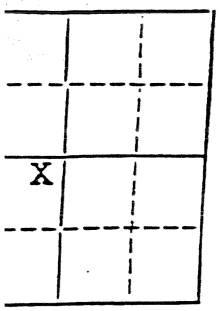
T 3N R 9W

RP-W-6

County Silver Bow

MONTANA BUREAU OF MINES AND GEOLOGY
Butte, Montana

WATER WELL LOG



Owner Victor Chemical Works Address Silver Bow, Montana

Driller Price & Lindsey Address Clancy, Montana

Date Started _____ Date Completed September 1954

Location: Sec. 23 T. 3N R. 9W, ¼ sec. South West

well Drilled Equipment used Rotary
(Dug, driven, bored, or drilled) (Churn drill, rotary, other)

se: Domestic ☐ Municipal ☐ Stock ☐ Irrigation ☐

Industrial ☒ Drainage ☐ Other: _____

0 ft. to 225 ft. Type Welded Size 10"

_____ ft. to _____ ft. Type _____ Size _____

_____ ft. to _____ ft. Type _____ Size _____

ed ~~or Screened~~: Ft. 90 to ft. 200 Ft. _____ to ft. _____

creen or perforations 4-1/4" slits per foot

ater level, for non-flowing well: 19.5 feet.

ressure, for flowing well: _____ lb./sq. in. on: _____ (date)

water level 20.5 feet at 350 gal. per min.

d: Pump

test _____

(Gravel packing, cementing, packers, type of shut-off, depth of shut-off)

RP-W-6

Log of Well

Depth, feet		Description of Material Drilled
	To	
[illegible]	2	Soil and sand
2	10	Clay, some sand
[illegible]0	50	Very sandy clay, some silt
[illegible]0	90	Sandy clay
[illegible]0	120	Chert-like material with sand, some clay
[illegible]0	130	Sandy clay
[illegible]0	135	Very silty sand with some clay
	165	Tight fine sand, very clean
	180	Alternate stratas of tight and loose medium sand
	185	Chert-like material, some sand
	190	Brown clay with some chert, some sand
	215	Alternate stratas of firm and tight chert, some coarse sand
	225	Brown sticky clay
	230	Brown firm sandy clay
		Definite water course from 185' - 200', bailer test at 60 g.p.m. no drawdown.

GW 2 Revised 1969

WELL #7 RP-W-7

County Silver Bow

STATE OF MONTANA
ADMINISTRATOR OF GROUNDWATER CODE
MONTANA WATER RESOURCES BOARD

NOTICE OF COMPLETION OF GROUNDWATER APPROPRIATION BY MEANS OF WELL

Developed after January 1, 1962

(Under Chapter 237 Montana Session Laws, 1961, as amended)

This form to be prepared by driller, and three copies to be filed by the owner with the County Clerk and Recorder in the county in which the well is located, last copy to be retained by driller.

Please answer all questions. If not applicable, so state, otherwise the form may be returned.

Owner Stauffer Chemical Co.

Address 150 Sixth East

Salt Lake City, Utah

Date well started 6-30-71

completed 7-15-71

For Administrator's Use
File
GW 1

Type of well Drilled (Dug, driven, bored or drilled)

Equipment used Churn Drill (Cable drill, rotary or other)

Water Use: Domestic ☐ Municipal ☐ Stock ☐ Irrigation ☐

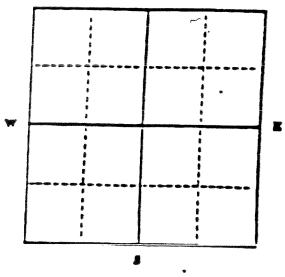
Industrial ☒ Drainage ☐ Other ☐* Garden/Lawn ☐

*Describe

USE: If used for irrigation, industrial, drainage or other. Explain, state number of acres and location or other data (i.e. Lot, Block and Addition).

ESTIMATED ANNUAL WITHDRAWAL

Size of Drilled Hole	Size and Weight of Casing	From (Feet)	To (Feet)	PERFORATIONS Kind Size	From (Feet)	To (Feet)
10"	10 5/8" od	0'	207'			
	8 5/8" od	200	280'	cutting torch	200'	280'



Static water level 44' ft.*
Pumping water level 126-128 ft.*
at 500 gallons per minute,
measured minutes after pumping began.
*Measured from ground level.
Well developed by test pumping for 15 hours.
Power Pump HP
Remarks: (Gravel packing, cementing, packers, type of shutoff) Water @ 187-190' coming from very fine sand. SS screen was installed in an attempt to develope this water.

¼ ¼ Sec
T. N/S R. E/W

INDICATE LOCATION OF WELL AND PLACE OF USE, IF POSSIBLE. EACH SMALL SQUARE REPRESENTS 40 ACRES.

Driller's Signature O'Keefe Contracting Company
W. F. Kenfield

Driller's Address 2804 Harvard Ave.

Butte, Montana 59701 LICENSE NO. 8

DRILLER'S LOG

Indicate the character, color, thickness of strata such as soil, clay, sand, gravel, shale, sandstone, etc. Show depth at which water is found and height to which water rises in well.

Top of Ground (Elev. above sea level)

From (Feet)	To (Feet)	
0'	3'	cinders
3'	7'	fill
7'	29'	sand & clay
29'	62'	sand w/clay-seepage
62'	78'	tight dand w/clay silt & a large amount of mica
78'	79'	good medium sand (approx. 60 gpm)
79'	87'	tight sand, some clay 90 gpm w/4' draw down
87'	88'	good sand
88'	187'	brown clay w/ sand (90+ w/4' draw down)
187'	190'	fine sand
190'	205	Sand & clay
205'	278'	Sand & clay making some water
278'	280'	Medium sand

280' Show exact depth of bottom

Appendix 3.1-B

Preliminary Geophysics at Rhodia (Draft)

GEOLEX LLC

Geology ***Geophysical Engineering*** ***Water Resources***

302 N. Last Chance Gulch STE 311
PO Box 1226
Helena, MT 59624
406.449.8432

Draft Report of Seismic, Gravity, and Magnetic Geophysical Surveys at the Rhodia Inc. plant area near Rocker, Montana

Abstract

Three geophysical surveys (seismic reflection, magnetic, and gravity) were conducted to establish the effectiveness of mapping the subsurface topography at the decommissioned Rhodia, Inc. phosphorous plant near Rocker, Montana. The seismic reflection survey proved ineffective due to the lack of a sufficient seismic source able to reflect back from deep basement bedrock. Both the magnetic and gravity survey provided usable data; however, the gravity survey was more appropriate considering that magnetic properties of geology at depth can be distorted greatly by near-surface geology and anomalies. Results from the gravity and magnetic survey were similar to the results of a magnetic survey conducted in 1998 by the Montana Tech geophysical field camp. The 1998 survey found a horst-graben formation in the region trending southwest to northeast through the Rhodia plant. A density contrast model produced from the gravity survey confirmed a subsurface bedrock ridge located near the west-central area of the Rhodia plant close to the surface. This bedrock ridge can also be associated with the ridge found during the 1998 survey and can be assumed to follow the volcanic lineation trending southwest to northeast along the horst-graben formation.

Introduction

The Rhodia plant is located eight miles west of Butte and within the Sand Creek drainage basin at Rocker, Montana (Figure 1). The basin is located at the southern part of the Boulder Batholith, and is comprised of Butte-Quartz Monzonite (BQM), Quaternary Alluvium, Tertiary, and Lowland Creek Volcanics (LCV).

Figure 1. Rhodia phosphorous plant eight miles west of Butte, Montana.

Bedrock under the basin is primarily Butte Quartz Monzonite (BQM) with some aplite intrusions. The area of study has LCV overlying the BQM and a sedimentary basin filled with Tertiary sediments and Quaternary alluvium. The USGS geologic map of the area modified by M.W. Borduin in 1999 illustrates the distribution of BQM, LCV, Tertiary and Quaternary sediments (Figure 2).

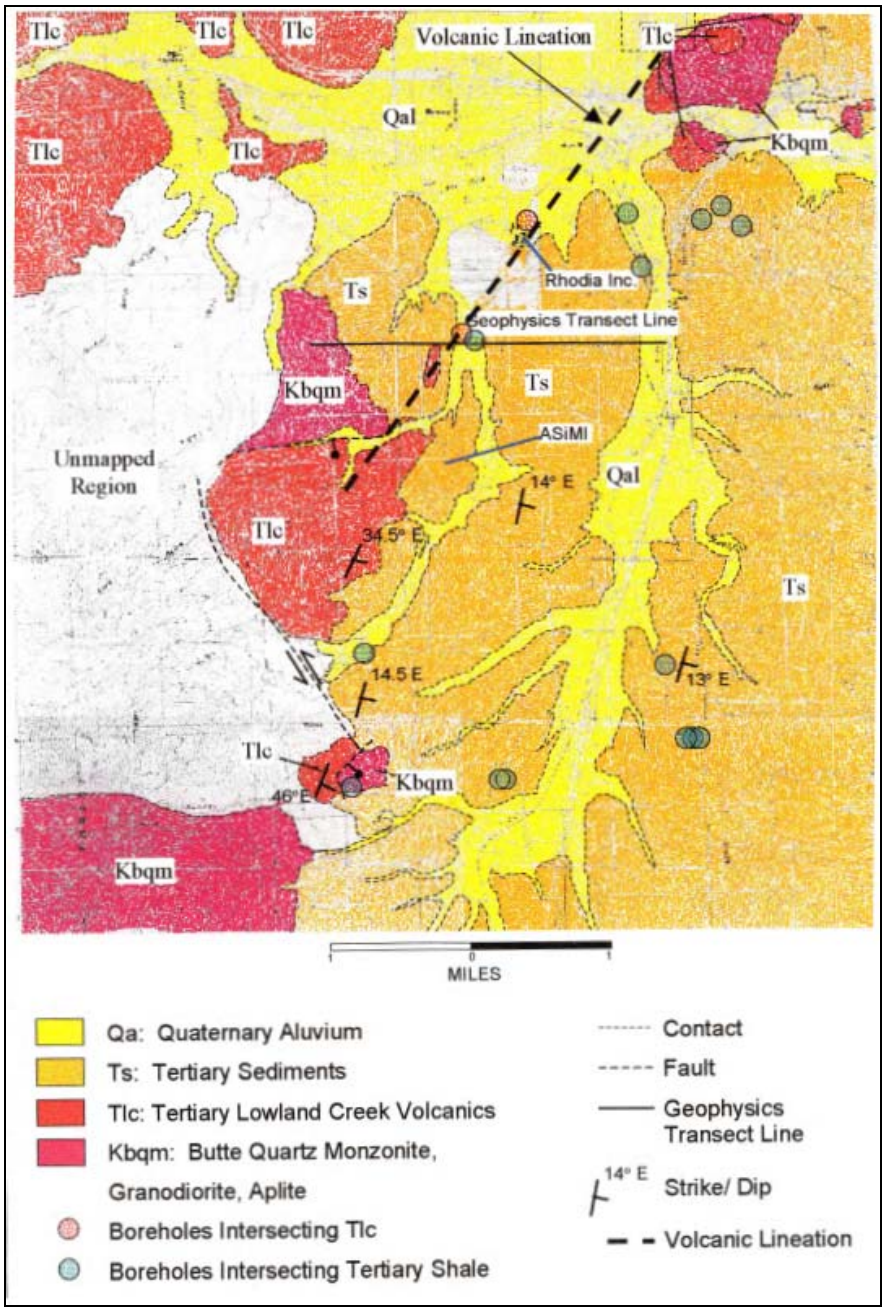


Figure 2. Geologic Map of Lower Sand Creek Drainage Basin and Silver Bow Creek area near Rocker.

A geophysical survey was performed by the 1998 Montana Tech geophysical field camp and indicated that additional faulting may exist in the central region of the valley floor (Borduin, 1999). A magnetic survey located the depth to the granite bedrock on a transect line running east-west just south of the Rhodia plant, shown in Figure 2.

From the 1998 data, the field camp produced a graben model with a downthrown BQM block that has been displaced more than 2000 feet. The idealized extent of the Quaternary, Tertiary, and LCV have been added to the bedrock profile using well logs and field observations. An idealized east-west cross-section of the Quaternary, Tertiary, and bedrock faulting in the valley floor is shown in Figure 3 (location of transect shown in Figure 2).

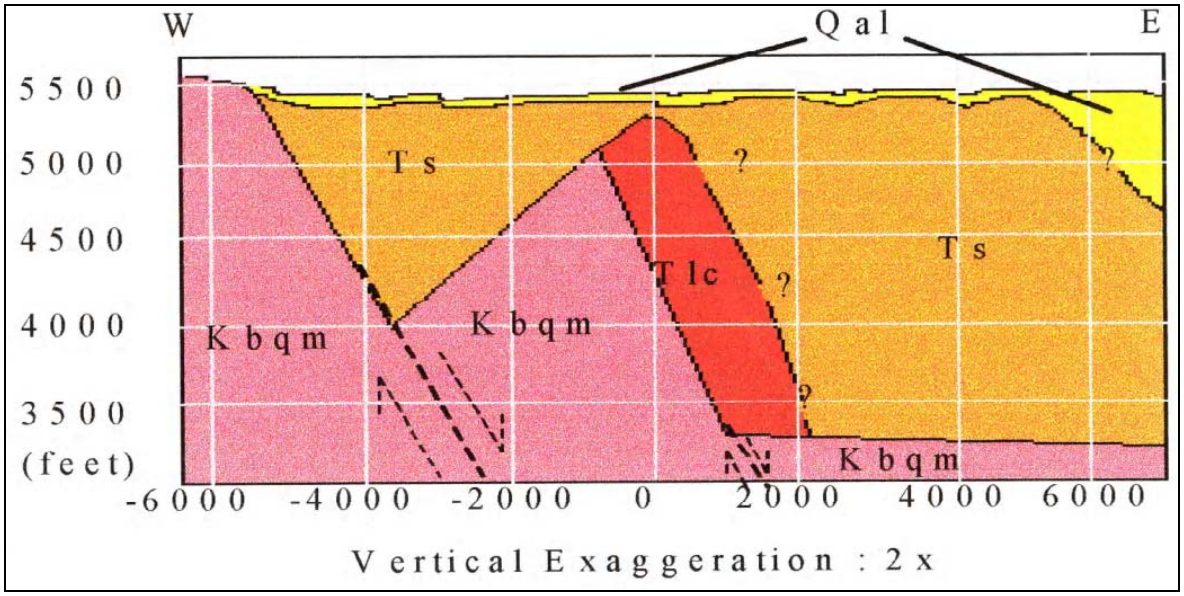


Figure 3. East-west cross-section of valley in vicinity of Rhodia plant (1998 Geophysics camp). Kbqm – Butte Quartz Monzonite, Ts – Tertiary Sediments, Qal – Quaternary Alluvium, Tlc – Tertiary Lowland Creek Volcanics.

Seismic Survey

In the spring of 2008, Montana Tech geophysical engineering students attempted to run a seismic line to further delineate bedrock surface characteristics. The seismic line consisted of 96 gimbaled geophones spaced 1 meter apart. The first geophone was placed 3 meters from the seismic source. At each shot location, a field stack of 8 was performed. The four seismic soundings were taken along 1.5 km of county road west of the plant (Figure 4). The soundings were spaced evenly along the line.

Figure 4. The Rhodia plant (purple line along road indicates seismic line location).

Survey geometry was assigned and data were filtered in a flowchart with a time variant bandpass filter designed to remove 60 Hz noise. Seismic data were imported to the SPW processing program for interpretation.

Several seismic soundings were done along German Gulch road near the Rhodia plant to determine if depth to bedrock could be found. These soundings tested the

effectiveness a sledge-hammer as opposed to a weight drop in producing a seismic source. Neither source was strong enough to reach the depth of the bedrock.

There are two reflections in the data, one at 120 milliseconds (ms) and the other occurring at 160 ms; both of these reflections are quickly terminated by surface waves (Figure 5). Reflection events have an estimated velocity around 1000 meters per second. This velocity is too slow to be the reflection of bedrock and is closer to a velocity expected from the overlying alluvium (Appendix A). Depth to the reflection was calculated at about 7.5 meters. According to the well logs in the area, this depth is too shallow to be the bedrock of interest.

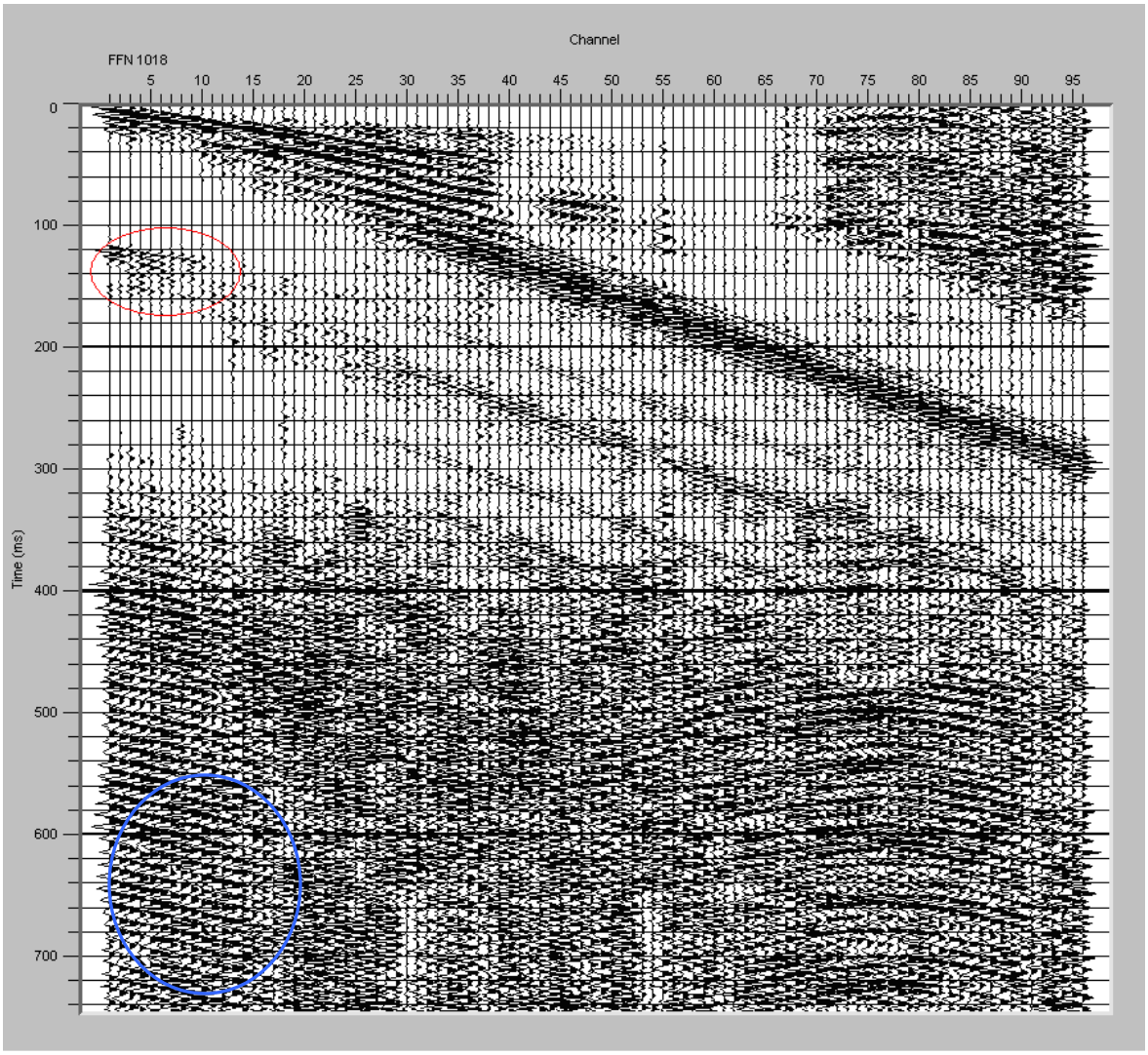


Figure 5. A filtered shot record taken along German Gulch Road. The red circle indicates reflections likely from an alluvium layer. The blue circle indicates 120Hz noise from power lines nearby.

Magnetic Survey

The Tech students also conducted a magnetic survey along a 5.6 km line extending southwest to northeast across the Rhodia plant and connecting two Butte Quartz-Monzonite outcrops (Figure 6). There are 51 observation stations at an interval of 100 meters along the line. No observation stations were placed over a 400 meter section on the northeastern side of the line due to the presence of a residential area. Stations along the survey line were located using a handheld GPS unit.

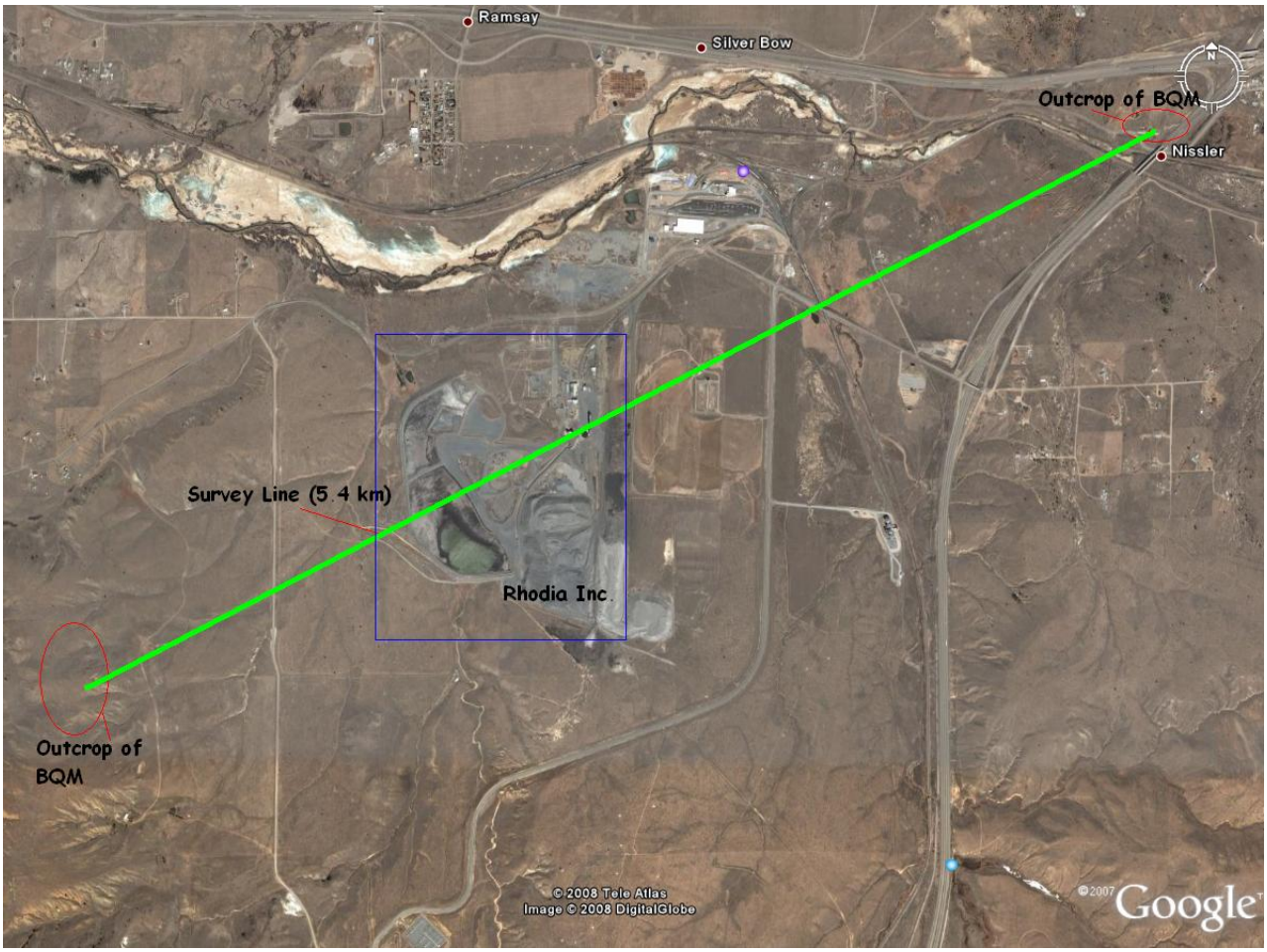


Figure 6. Gravity and magnetic survey line location.

Magnetic data were collected with a Geometrics G-856 proton precession magnetometer. The device records the strength of the total magnetic field and is accurate to 0.5 nano-Tesla (nT). The data were downloaded from the magnetometer with Geometrics' MagMap2000 program. This program allows the operator to set up the

survey line geometry and place the magnetic readings to the corresponding stations. Data were then imported into a spread sheet, plotted and inspected for outliers in magnetic susceptibility due to nearby metallic objects, such as buildings and fences. Data from stations at 2400, 2500, and 3700 meters were removed due to metallic objects. The magnetic data presented are not drift-corrected for diurnal variations in the magnetic field (Figure 7).

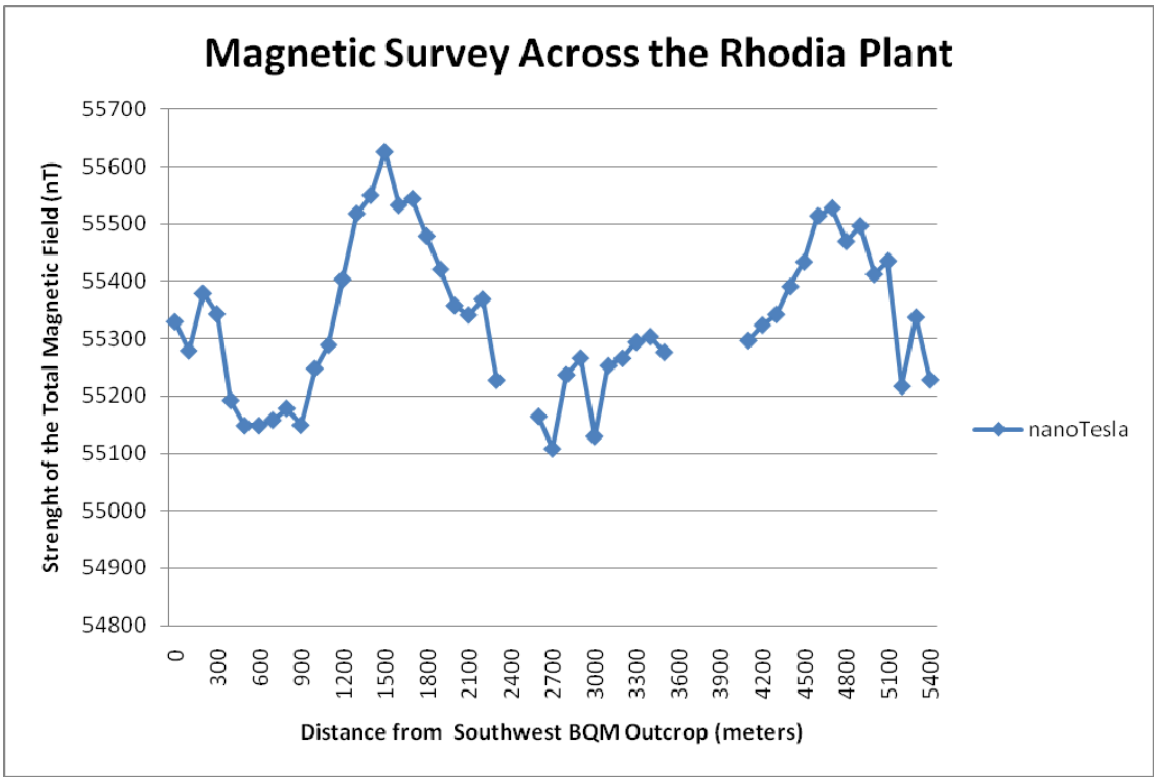


Figure 7. Magnetic data across survey line (gaps in chart due to residential areas not surveyed).

Assuming the findings from the 1998 field camp and subsequent magnetic survey were accurate, the supplementary magnetic survey proved somewhat helpful in validating general geology types below the Rhodia plant. Although magnetic susceptibility is greatly affected by what is present near the surface, a useful correlation between geology and the observed data can be made. Areas with shallow depth-to-bedrock (assumed to be BQM or LCV) will have high magnetic susceptibility because the bedrock has high magnetic susceptibility. Areas with large depth-to-bedrock will have low susceptibility because the overlying sediments have low magnetic susceptibility. As can be seen in

Figure 7, there are two areas that can be associated with deep bedrock and an area around the 1500 meter mark that can be associated with shallow bedrock.

Gravity Survey

The Tech students also performed a gravity survey along the same line used for the magnetic survey (the 5.6 km line connecting the two Butte Quartz-Monzonite outcrops, Figure 6). In addition, the same 51 observation stations at an interval of 100 meters were used for the gravity survey. No observation stations were placed over a 400 meter section on the northeastern side of the line due to the residential area. A D-66 gravimeter was used to measure variations in acceleration due to gravity, which are caused by density variations in the subsurface (Figure 8).

Figure 8. A picture of the L&R D-66 gravimeter.

A number of corrections needed to be applied to the observed gravity data before further processing and interpretation could be performed. The initial corrections removed instrument drift and tidal gravity variations. An instrument drift of 0.04 mGal/hr was estimated by occupying a local base station every 60-75 minutes. To remove the effect of the gravity variation due to latitude, the gravity data were reduced using the 1984 International Gravity Formula. Free-air and Bouguer gravity corrections were made

using sea level as a datum and 2.67 g/cc as the Bouguer reduction density. After reviewing the net effect of terrain corrections on the gravity measurements it was determined that they were too small to affect the results and thus were not applied.

An inversion program was written in MATLAB to derive a model to describe the subsurface from the observed data. A Conjugate Gradient (CG) iterative method (with adaptive regularization and model weights) was used to minimize misfit that the observed data had with the theoretical data produced by the model. Conjugate direction, step length, and model parameters were updated after each iteration to minimize data misfit. A background model was also added to the gravity anomaly to hold the sediment layer in place over the bedrock. After 63 iterations, calculated data from the model had a relatively low data misfit compared to the observed data and the model was determined to be geologically sound (Appendix B).

Results of the inversion present an image of a 2D density contrast model (Figure 9) that was consistent with what was expected for the density values of geology in the area (Table 1).

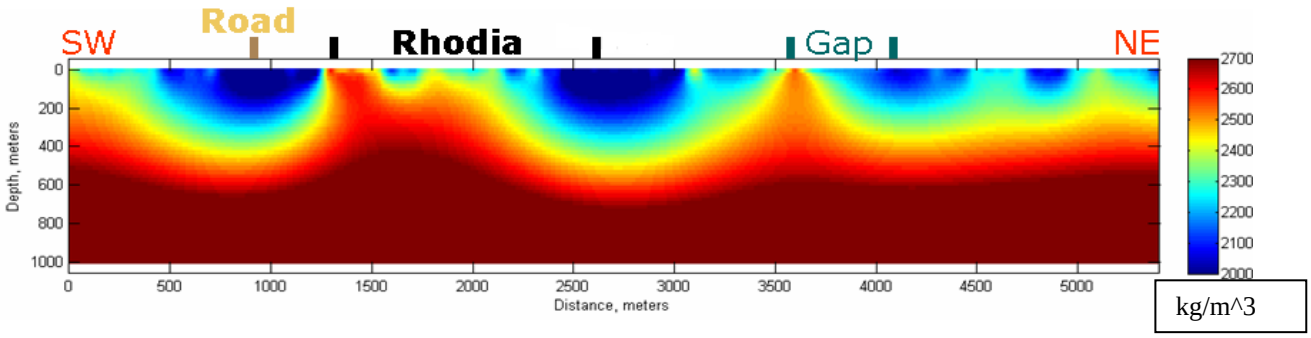


Figure 9. Inverted 2-D density contrast model.

Table 1. Density values of the bedrock, sediments and volcanic rocks.

Rock type	Average density, kg/m^3	Density contrast with BQM
Butte Quartz Monzonite	2670	0
Aplite dikes (LCV)	2520	-0.15
Tertiary sediments	2120 - 2200	-0.55 to -0.47

The density contrast model indicates a bedrock ridge starting at ~1200 meters, and extending to ~2200 meters from the southwest outcrop. This bedrock ridge is near the surface and is flanked on both sides by sediment/alluvial basins. Because the aplite

dikes (LCV) have similar density to the BQM, it is not possible to distinguish the two types of bedrock from each other.

Data Comparisons and Conclusion

Although a magnetic survey alone is not ideal due to near-surface effects, when combined with a gravity survey, each one can help validate the other and indicate possible problem areas. Gravity and magnetic data collected along the survey line both showed the same general trends and validate each other well (Figure 10).

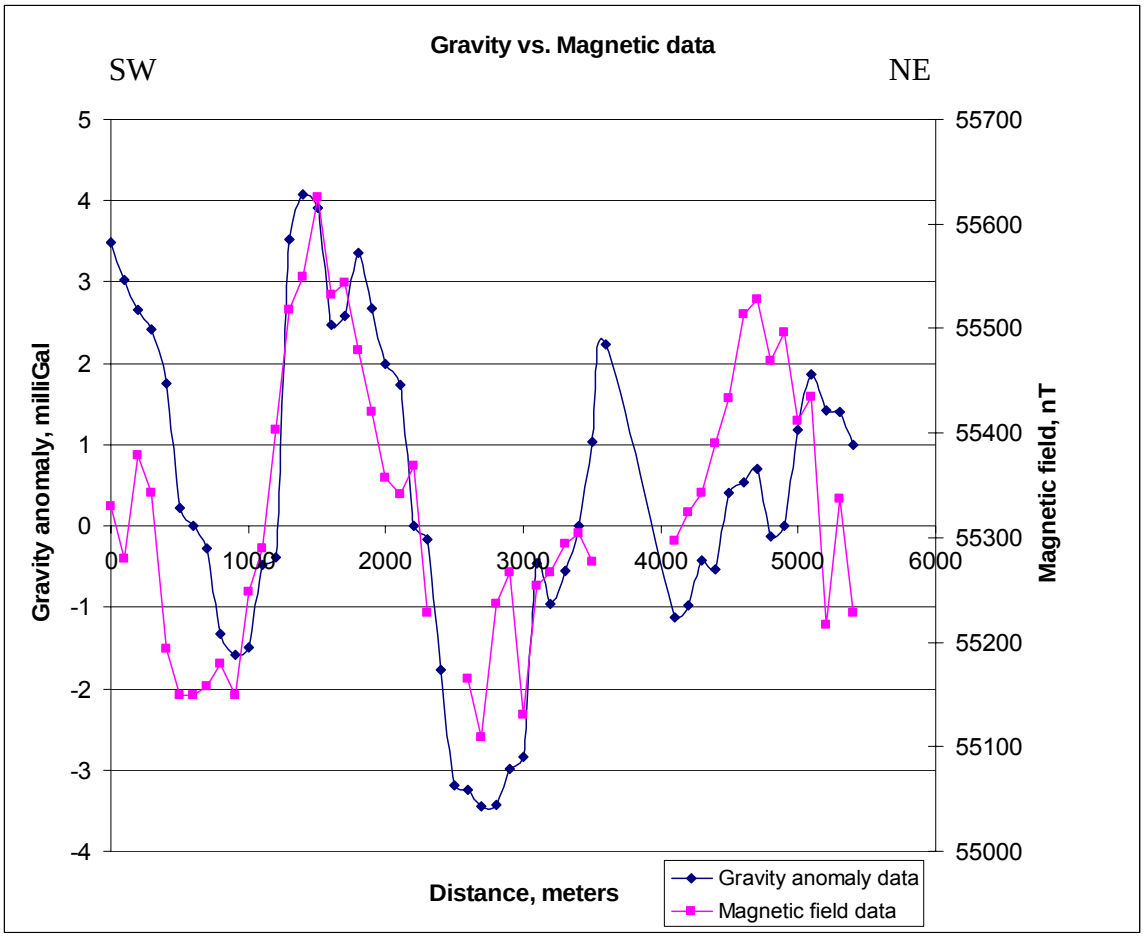


Figure 10. Magnetic and gravity survey comparison.

Figure 11 shows location of the 1998 field camp survey line and proposed volcanic rock trend that was determined from two bore holes that intersected the LCV,

the two volcanic outcrops, and the 1998 magnetic survey (Borduin, 1999). The ridge found in the recent magnetic survey (Figure 7) and gravity survey (Figure 9) occurred near the proposed volcanic lineation confirming the continuation of the ridge found during the 1998 magnetic survey. This is also consistent with the horst-graben model of the downthrown BQM block associated with the trend of volcanic rocks.

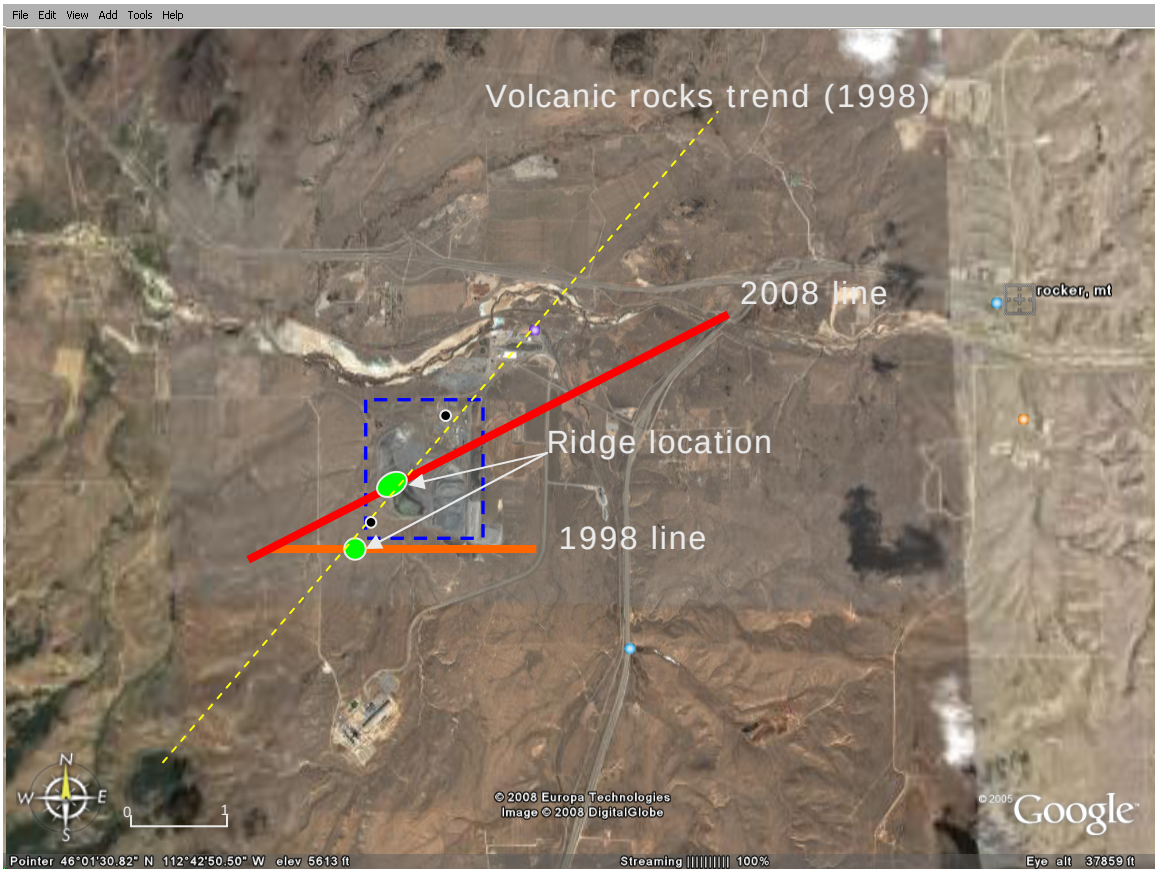


Figure 11. Location of the 1998 and 2008 survey lines. Black circles are well/borehole locations.

There are indications of additional bedrock topography characteristics within the ridge. Both the density contrast model (Figure 9) and the raw gravity and magnetic plots (Figure 10) suggest the ridge has two crests or peaks. Bedrock is likely to be near the surface at station 16 (Lat 45.988, Long. 112.687) and slightly deeper at station 19 (Lat. 45.989, Long 112.684) with a small basin in between those points. To provide more detail of the subsurface in future surveys, tighter station spacing for the gravity survey and a grid pattern rather than a line pattern would be necessary. Given the speed at which a magnetic survey can be executed it would be beneficial to compliment the gravity survey with magnetic data for comparison and troubleshooting purposes.

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Appendix A. Rock Velocities

TABLE 2.2 REPRESENTATIVE P-WAVE VELOCITIES

Unconsolidated Materials		Consolidated Materials		Other	
Weathered layer	300–900	Granite	5000–6000	Water	1400–1600
Soil	250–600	Basalt	5400–6400	Air	331.5
Alluvium	500–2000	Metamorphic rocks	3500–7000		
Clay	1100–2500	Sandstone and shale	2000–4500		
Sand		Limestone	2000–6000		
Unsaturated	200–1000				
Saturated	800–2200				
Sand and gravel					
Unsaturated	400–500				
Saturated	500–1500				
Glacial till					
Unsaturated	400–1000				
Saturated	1700				
Compacted	1200–2100				

Velocities in m/s.

Velocity ranges compiled from Press (1966, 195–218).

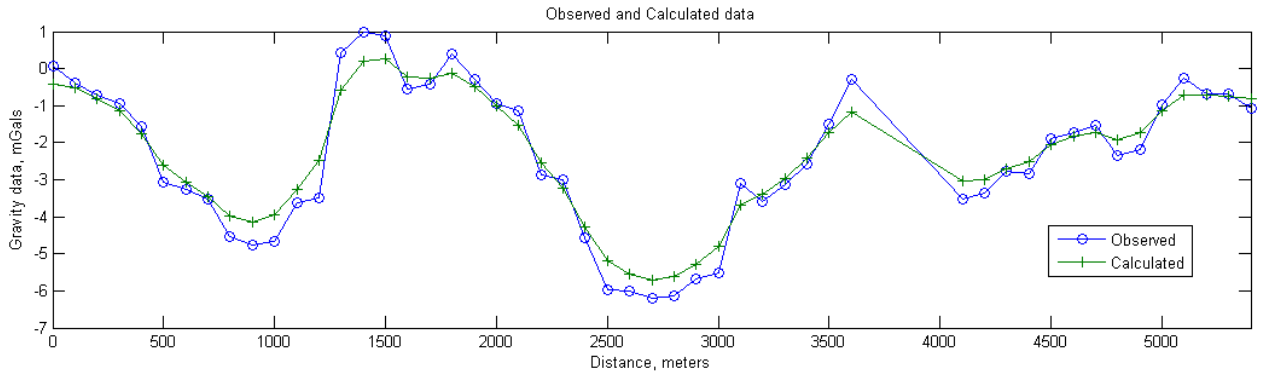
(Burger, Robert H., 2006, Table 2.2)

Appendix B. Gravity Data and Corrections

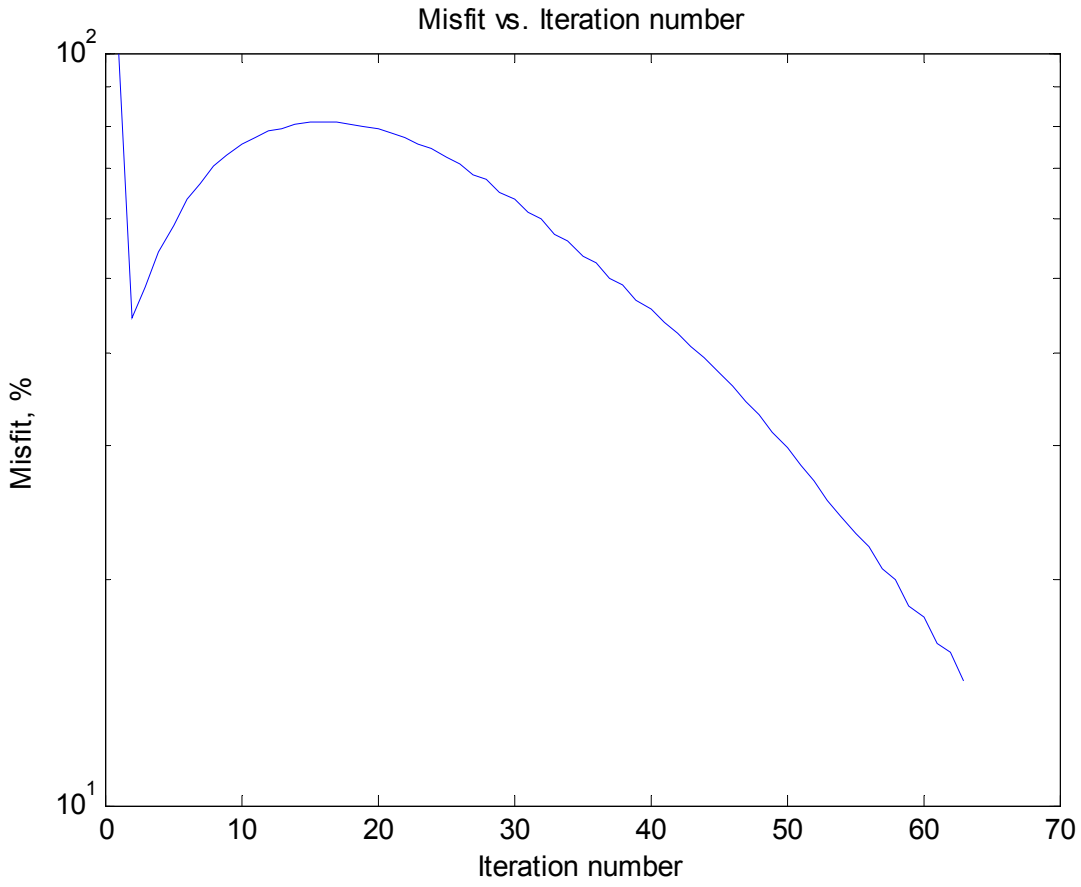
Station	Dial Number	mGals	Δt	Lat	Long	Elevation	drift	free air	bouger	gn(GRS 84)	Corrected (base)	(m)
Master	**116.563**	143.780	**…**									…….
base 1	116.288	143.441	0	45.984	-112.698	1646.449	…			980708.98		…….
L(1) 1	114.12	140.767	24	45.981	-112.705	1676.623	0.010	-9.312	3.376	-0.24	3.495	0
L(1) 2	115.415	142.364	33	45.982	-112.703	1666.26	0.014	-6.114	2.217	-0.22	3.023	100
L(1) 3	116.273	143.423	40	45.982	-112.702	1659.25	0.017	-3.950	1.432	-0.17	2.654	200
L(1) 4	116.939	144.244	49	45.983	112.701	1654.069	0.021	-2.352	0.853	-0.13	2.407	300
L(1) 5	116.662	143.903	55	45.983	-112.700	1652.545	0.024	-1.881	0.682	-0.13	1.763	400
L(1) 6	116.305	143.462	63	45.984	-112.699	1647.364	0.027	-0.282	0.102	-0.05	0.219	500
base 1	116.312	143.471	68	45.984	-112.698	1646.449	…….	0.000	0.000	0.00	0.000	600
L(1) 7	116.421	143.605	73	45.985	-112.697	1644.621	0.027	0.564	-0.205	0.05	-0.268	700
L(1) 8	116.459	143.652	78	45.985	-112.696	1639.134	0.025	2.257	-0.819	0.07	-1.325	800
L(1) 9	116.52	143.727	84	45.985	-112.694	1637.61	0.022	2.728	-0.989	0.11	-1.583	900
L(1) 10	117.354	144.756	91	45.986	-112.693	1633.039	0.019	4.138	-1.501	0.15	-1.495	1000
L(1) 11	118.251	145.863	96	45.986	-112.692	1632.734	0.016	4.232	-1.535	0.19	-0.483	1100
L(1) 12	118.174	145.768	103	45.987	-112.691	1633.953	0.013	3.856	-1.398	0.24	-0.380	1200
base 1	116.291	143.445	122	45.984	-112.698	1646.449	…	0.000	0.000	0.00	…	
Master	**116.589**	143.813	**…**				**0.032**	**…**	**…**	…	…	**……**
base2	116.81	144.085	0	46.001	-112.647	1636.391	…	0.000	0.000	980710.51		……
L(2) 1	116.905	144.202	12	46.003	-112.642	1642.182	0.036	-1.787	0.648	0.22	1.004	5400
L(2) 2	119.081	146.886	30	46.003	-112.643	1630.296	0.041	1.881	-0.682	0.16	1.399	5300
L(2) 3	119.559	147.476	44	46.002	-112.644	1627.248	0.045	2.822	-1.023	0.12	1.430	5200
L(2) 4	119.32	147.181	51	46.002	-112.645	1630.905	0.047	1.693	-0.614	0.10	1.871	5100
L(2) 5	118.577	146.265	63	46.002	-112.646	1631.82	0.050	1.411	-0.511	0.05	1.185	5000
base2	116.826	144.105	68	46.001	-112.647	1636.391	…	0.000	0.000	0.00	…	4900
L(2) 6	115.704	142.721	75	46.001	-112.649	1642.792	0.055	-1.975	0.716	-0.04	-0.124	4800
L(2) 7	116.541	143.753	80	46.000	-112.650	1641.573	0.057	-1.599	0.580	-0.07	0.703	4700
L(2) 8	117.2	144.566	85	46.000	-112.651	1636.391	0.059	0.000	0.000	-0.12	0.540	4600
L(2) 9	117.155	144.511	88	45.999	-112.652	1635.782	0.060	0.188	-0.068	-0.15	0.399	4500
L(2) 10	116.909	144.207	93	45.999	-112.653	1632.429	0.062	1.223	-0.443	-0.19	-0.530	4400
L(2) 11	116.575	143.795	101	45.999	-112.654	1634.867	0.066	0.470	-0.171	-0.23	-0.429	4300
L(2) 12	115.128	142.010	108	45.998	-112.656	1640.963	0.069	-1.411	0.512	-0.26	-0.982	4200

L(2) 13	115.066	141.934	113	45.998	-112.657	1640.354	0.071	-1.223	0.443	-0.31	-1.135	4100
base2	116.846	144.130	126	46.001	-112.647	1636.391	…	0.000	0.000	0.00		
Master	**116.555**	143.771	**…**				**-0.010**	**…**	**…**	…	…	**…….**
base3	115.33	142.260	0	45.990	-112.679	1639.744	…	0.000	0.000	980709.53		…….
L(3) 1	118.471	146.134	24	45.987	-112.690	1636.391	-0.027	1.035	-0.375	-0.29	3.531	1300
L(3) 2	118.829	146.576	35	45.987	-112.689	1637.001	-0.034	0.846	-0.307	-0.26	4.073	1400
L(3) 3	117.308	144.699	46	45.988	-112.687	1645.84	-0.042	-1.881	0.682	-0.24	3.925	1500
base3	115.299	142.221	55	45.990	-112.679	1639.744	…	…	…	0.00	…	
L(3) 4	119.03	146.824	77	45.988	-112.686	1627.857	-0.050	3.668	-1.330	-0.21	2.484	1600
L(3) 5	118.955	146.731	83	45.988	-112.685	1629.077	-0.050	3.292	-1.194	-0.17	2.595	1700
L(3) 6	118.474	146.138	94	45.989	-112.684	1636.087	-0.051	1.129	-0.409	-0.14	3.354	1800
L(3) 7	117.821	145.332	103	45.989	-112.683	1637.001	-0.052	0.846	-0.307	-0.09	2.675	1900
L(3) 8	117.429	144.849	110	45.989	-112.681	1636.087	-0.052	1.129	-0.409	-0.07	1.994	2000
L(3) 9	116.531	143.741	115	45.990	-112.680	1640.658	-0.052	-0.282	0.102	-0.03	1.741	2100
base 3	115.295	142.216	124	45.990	-112.679	1639.744	…	…	…	0.00	0.000	2200
L(3) 10	114.751	141.545	131	45.991	-112.678	1642.487	-0.045	-0.846	0.307	0.05	-0.175	2300
L(3) 11	114.182	140.843	139	45.991	-112.677	1638.22	-0.036	0.470	-0.171	0.08	-1.761	2400
L(3) 12	113.873	140.462	147	45.991	-112.676	1633.039	-0.028	2.069	-0.750	0.11	-3.197	2500
L(3) 13	113.867	140.455	153	45.992	-112.674	1633.039	-0.021	2.069	-0.750	0.14	-3.247	2600
base 3	115.339	142.271	173	45.990	-112.679	1639.744	…	…	…	0.00	…	
Master	**116.523**	143.731	**…**				**-0.049**	**…**	**…**	…	…	**……**
base 4	116.204	143.338	0	45.995	-112.665	1638.22	…	0.000	0.000	980709.95		……
L(4)1	115.692	142.706	11	45.995	-112.666	1638.22	-0.051	0.000	0.000	-0.03	-0.554	3300
L(4)2	115.146	142.033	18	45.994	-112.667	1639.439	-0.052	-0.376	0.136	-0.05	-0.959	3200
L(4)3	115.024	141.882	24	45.994	-112.669	1642.487	-0.053	-1.317	0.477	-0.10	-0.464	3100
L(4)4	114.914	141.746	31	45.993	-112.670	1630.905	-0.053	2.257	-0.819	-0.14	-2.841	3000
L(4)5	114.429	141.148	37	45.993	-112.671	1633.039	-0.054	1.599	-0.580	-0.16	-2.991	2900
L(4)6	114	140.619	62	45.993	-112.672	1633.343	-0.058	1.505	-0.546	-0.20	-3.421	2800
L(4)7	113.694	140.242	72	45.992	-112.673	1634.867	-0.059	1.035	-0.375	-0.24	-3.452	2700
base4	116.194	143.325	93	45.995	-112.665	1638.22	…	0.000	0.000	0.00	…	3400
L(4)8	116.983	144.299	105	45.995	-112.664	1638.525	-0.067	-0.094	0.034	0.05	1.042	3500
L(4)9	117.879	145.404	110	45.996	-112.663	1639.134	-0.069	-0.282	0.102	0.08	2.233	3600
base5	116.186	143.315	116	45.995	-112.665	1638.22	…	0.000	0.000	0.00		

Appendix C. MATLAB Inversion Code



(data that was produced by our model compared to out observed data.)



(the number of iterations and misfit.)

(MATLAB Code)

```
function [F]=Fd(x,z)
F=z.*atan(x./z)+(x./2).*log(z.^2+x.^2);

function a=run_ave(input,width)
%width=21
win=gausswin(width);
fil=win./sum(win);
%input=hout1;
a=conv(fil,input);
%below takes care of edge effects
for ind=1:width-1
    mod=sum(fil(1:ind));
a(ind)=a(ind)./mod;
a(end+1-ind)=a(end+1-ind)./mod;
end
a=a((ceil(width/2)):(end-ceil(width/2))+1);

%[mi err p]=conj_grad_stab(G,d)
%or
%[mi err p]=conj_grad_stab(G,d,errlev,Wm,Wd,ni,ascale,q)
%inputs:
%just G and d--> no weighting, defaults: ni=100, ascale=1, q=.7
%or input all variables
%if Wd=0, no data weighting, else, input Wd as an array length(d)
%if Wm=0, no model weighting, else, input Wm as an array length(m)
%if Wm=1, default modeling weighting (Wm=diag(S)^(1/4))
%set 0<q<=1
function [mi err p]=conj_grad_stab(varargin)
G=varargin{1};
do=varargin{2};
if length(varargin)==2;
    errlev=1e-3;
    Wm=eye(size(G,2),size(G,2));
    Wd=eye(size(G,1),size(G,1));
    ascale=1;
    q=.7;
    ni=100;
else
    errlev=varargin{3};
    Wm=varargin{4};
    Wd=varargin{5};
    ni=varargin{6};
    ascale=varargin{7};
    q=varargin{8};
    if Wm==0;
        Wm=eye(size(G,2),size(G,2));
    elseif Wm==1;
     %   S=diag(diag(G'*G).^.5);
     S=(sum(G.*G).^.5)';
        Wm=(S.^.5);

    else
```

```
        Wm=diag(Wm);
    end
    if Wd==0;
        Wd=eye(size(G,1),size(G,1));
    else
        Wd=diag(Wd);
    end
    x=varargin{9};
    z=varargin{10};
end
mi=zeros(size(G,2),1);
mt=varargin{11};
ma=varargin{12};
%Wm2=diag(diag(Wm).^2);
Wm2=S;
%Wd2=diag(diag(Wd).^2);
Wd2=diag(Wd).^2;
alpha=0;
Wd=diag(Wd);
Wm=(Wm);
mi=ma;
ma=mi.*0;
Nd=length(do);
for indi=1:ni
    r=(G*mi-do);
    err(indi)=norm(Wd.*r)./norm(Wd.*do)*100; %percent

%    err(indi)=sum((r./errlev).^2)/length(do);
    disp(['%misfit=' num2str(err(indi))])

    %percent misfit cutoff
    if err(indi)<errlev
        break
    end

   %chi^2 cutoff
%     chi2=sum((r./errlev).^2)./Nd;
%     if chi2<1
%         break
%     end

    if indi==2;

        alpha=(norm(Wd.*r)./norm(Wm.*(mi-ma)))^2*ascale;
       % mi=mi*0;
       %lt=0;
       % lto=0;
    else
        alpha=alpha*q;
    end
    l=G'*(Wd2.*r)+alpha*(Wm2.*(mi-ma));
    if indi>1
        beta=(l'*l)/(lo'*lo);
        lt=l+beta*lto;
    else
        lt=l;
```

```
    end
    lt=l;
    g=norm(Wd.*(G*lt))^2+alpha.*norm(Wm.*lt)^2;
    k=(lt'*l)./g;
    mi=mi-k*lt;
    lto=lt;
    lo=l;
% a=find(mi<-200);
% mi(a)=-200;
% a=find(mi>1500);
% mi(a)=1500;

dp=G*mi;
if 0
figure(2)
subplot(2,1,2)
imagesc(x,z,reshape(mi+mt,length(x),length(z))');
set(gca,'clim',[2000 2700])
axis equal
axis tight
colorbar
subplot(2,1,1)
xp=1:length(do);
plot(xp,dp,xp,do);
%imagesc(x,z,reshape(mt,length(x),length(z))');
%colorbar

pause(.1)
end
end



close all
clear all
format short g

%inv3_dat
lamda=6.67e-11
%load Gozsvd.dat;
%load xssvd.dat;
%do=Gozsvd*1e-5;
%xp=xssvd';
%load hw5.mat
%xp=-500:25:1500;
%xp=xp+rand(size(xp))*20;

x=linspace(0,5400,500);
z=linspace(2,1000,50);

[Z X]=meshgrid(z,x);
zm=Z(:);
xm=X(:);
dx=x(2)-x(1);
dz=z(2)-z(1);
load rhodia
```

```
F=ones(length(xp),length(zm));

if 1 %intergral
    for i=1:length(xp)
            F(i,:)=Fd((xm-dx/2)-xp(i),zm)-...
                Fd((xm-dx/2)-xp(i),zm+dz)+...
                Fd((xm+dx/2)-xp(i),zm+dz)-...
                Fd((xm+dx/2)-xp(i),zm);
    end
end

if 0 %midpoint rule
    dz=z(2)-z(1);
    dx=x(2)-x(1);
    for i=1:length(xp)
        for k=1:a*b
            l=ceil(k./a);
            F(i,k)=Z(k)./((X(k)-xp(i)).^2+Z(k).^2).*dx.*dz;
            %    Fa(i,k)=Z(k)./((X(k)+dx/2-xp(i)).^2+Z(k).^2).*dx.*dz;
        end
    end
end

%model building
mt=zeros(length(xm),1);
k=2*pi/300;
zdb=20*sin(k*x)+100;
zdb=repmat(zdb,length(z),1);
zdb=zdb';
if 1
for indc=1:length(xm);
if Z(indc)>0
    mt(indc)=2200;
end
if  Z(indc)>0
     mt(indc)=(Z(indc))*(470)/(500)+2200;
 end
if Z(indc)>500
    %mt(indc)=2670;
end
if X(indc)<-50
    %mt(indc)=2670;
end
end
end
ma=mt.*0;
for indc=1:length(xm);

if X(indc)<0&&Z(indc)<800
    ma(indc)=2400-mt(indc);
end
if X(indc)>5400&&Z(indc)<800
    ma(indc)=2400-mt(indc);
end
end
ma=ma.*0;
```

```
G=F*2*lamda;
do=dlin;
do=do-max(do)+1;
do=do/1e5
%do=run_ave(do,5);
[mi err]=conj_grad_stab(G,do,15,1,0,1000,100,.9,x,z,mt,ma);

% tic
% alpha=2e-8;
%  S=diag(diag(G'*G).^.5);
%       Wm=(S.^.5);
%        Wm2=diag(diag(Wm).^2);
% mii=inv(G'*G+alpha*Wm2)*(G'*do);
% toc
dp=G*mi;
figure
subplot(2,1,2)
imagesc(x,z,reshape(mi+mt,length(x),length(z))');
set(gca,'clim',[2000 2700])
colorbar
subplot(2,1,1)
%imagesc(x,z,reshape(mt,length(x),length(z))');
plot(xp,do*1e5,'o-',xp,dp*1e5,'+-');
set(gca,'xlim',[min(x) max(x)])
colorbar
%subplot(2,1,3)
figure
 imagesc(x,z,reshape(mt,length(x),length(z))');
 colorbar
%figure
%imagesc(x,z,reshape(mii,length(x),length(z))');
%colorbar
%figure

%plot(xp,do*1e5,'o-',xp,dp*1e5,'+-');
er_d=norm(dp-do)./norm(do)*100
figure
semilogy(err)
```

Appendix 3.1-C

Gravity Characterization of the Rhodia Inc. Phosphorus Plant Site

Gravity Characterization of the Rhodia Inc. Phosphorous Plant Site, Ramsey, Montana

Thomas Petrovich
Montana Tech
Department of Geophysical Engineering

GEOP 4750
Geophysical Engineering Design

Instructor: Dr. Marvin Speece

May 1, 2009

Edited by Dr. Curtis Link
April 30, 2010

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Executive Summary

For a senior design class project, a geophysical survey was conducted at the Rhodia Phosphorous plant near Butte, Montana using the gravity method. The investigation was intended to help address concerns that a plume of contaminated ground water might be flowing into residential wells in the surrounding area. The goal of the gravity investigation was to gain more information about the topography of the bedrock that might be affecting possible contaminant flow along the bedrock-alluvium interface.

Gravity data was collected on a 1.6 km x 2.0 km grid at 200 m station spacings. Modeling results showed evidence for two sets of faults and a general trend of higher elevation bedrock topography to the west of the Rhodia site. The east portion of the Rhodia site is located over a sediment trough that extends to a depth of about 500 m. A volcanic ridge that cuts through the middle of the site, trending northeast/southwest, rises to depth of about 50 m from the surface. If a contaminant plume travels along the bedrock/tertiary sedimentary boundary, it could be confined by the trough known as the Buried Sheep Gulch Channel and run north, exiting into Silver Bow Creek. If the contamination plume travels in the water table at shallower depths, the high ridge or west slope of the Buried Sheep Gulch Channel would not allow ground water flow to the west. Based on the current analysis and past study results, it is reasonable to conclude that the residential wells to the west of the Rhodia phosphorous plant would not likely be affected by a contaminant plume.

Introduction

The Rhodia Inc. plant is located near Ramsey, MT, eight miles west of Butte, MT (Figure 1). The Rhodia plant produced elemental phosphorous beginning operation in 1986 and continued production through 1996. The elemental phosphorous produced at the site was used for the production of fertilizer, pesticides, and phosphoric acid.

The plant ceased production in 1996 after the phosphorous waste was classified hazardous by the Resource Conservation and Recovery Act (United States Department of Justice, 2004). Rhodia was fined for storage of a hazardous waste without a permit. Ignitable crude phosphorous was found in the clarifier, and ignitable precipitator dust contaminated with elemental phosphorus, and ignitable carbon brick contaminated with elemental phosphorus, were also found (United States Environmental Protection Agency, 2004).

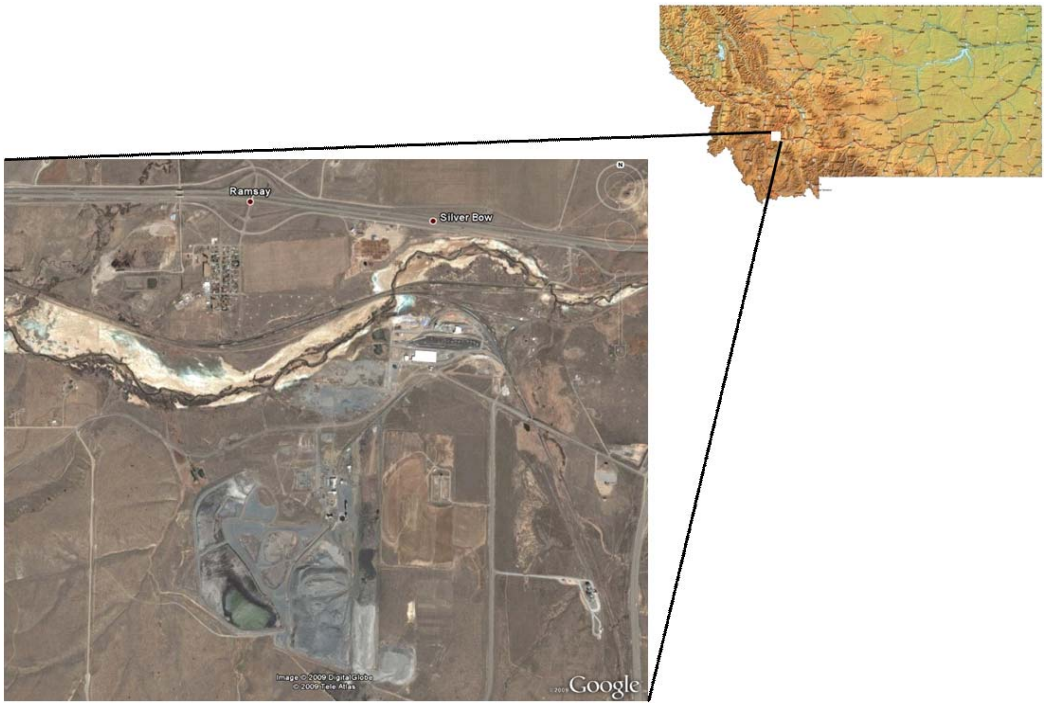


Figure 1. Location of Rhodia Plant site near Butte, MT (Google Earth, 2009).

Contaminants associated with phosphorous waste were found to have leached into the ground and produced high levels of phosphorous, arsenic, and cadmium at monitoring wells near the site. The hazardous phosphorous waste was discharged into Silver Bow Creek through a buried pipe. The discharge pipe had been plugged, but contaminants continued to leach into the ground. In 1999, wells that were monitored to the west were found to have no contaminants (Tillman, 1999). However, ten years after the last monitoring took place; new channels diverting the flow to new directions with increased flow rates may have formed.

In 1998, the Montana Tech Geophysical Engineering Field Methods class performed an east-west gravity and magnetics survey and concluded that faults cut through the bedrock starting at a depth under the site of less than 100 m and increasing to a depth of 2000 m ending in tertiary sediment troughs produced by the faulted bedrock. Additionally, Montana Tech's 2008 Geophysical Engineering Senior Design class designed and performed a gravity and magnetic survey near the Rhodia plant site. Their results showed bedrock depths varying from 200 m to 600 m below the surface, and their interpretation also identified a subsurface ridge trending northeast/southwest.

In order to better understand possible preferred ground water movement paths, a new gravity survey was conducted during the spring semester 2009. The gravity data was collected on 2-D grid, and three-dimensional (3-D) modeling was used to produce a map of the bedrock topography to better define possible flow paths along the bedrock/sediment boundary. Gravity readings were taken on a grid that encompasses the entire Rhodia site and extends west to the first home with a well. Surface material on the

survey site is Quaternary alluvium and Tertiary sediments. Underlying the alluvium and sediments is Butte Quartz Monzonite that outcrops further west (Borduin, 1999).

Gravity Survey Instruments

2009 geophysical survey was conducted using two different gravimeters: the LaCoste & Romberg model D-66 and LaCoste & Romberg model G-198 (Figure 2). Both models of gravimeters used in the survey operate in a similar fashion, varying only by conversion of the division readout on the gravimeter to mGal. Readings are taken by leveling the instrument and turning the nulling dial until the cross hair approaches the reading line (Zhou, 2006). The reading line is found by looking through an eye piece. Both of these gravimeters record relative gravity and not absolute gravity.

Figure 2. Photograph of LaCoste & Romberg model G-198 gravimeter.

The locations of each station were marked and recorded using a Leica ATX 1230 GG base/rover GPS system (Figure 3). The Leica ATX 1230 GG GPS uses a base station and a rover to acquire differential positions of the rover with respect to the base. Once

the base station data is sent to OPUS for corrections, the absolute location of the points taken with the rover can be determined to centimeter accuracy.

Figure 3. Photograph showing Leica ATX 1230 GG dual frequency GPS system.

Data Acquisition

Gravity data were collected on a 2-D grid over the Rhodia site (Figure 4 yellow lines). The boundaries of the grid lay outside of the plant site to the north and to the west. The grid is approximately 1.6 km x 2.0 km with survey lines inside the grid running parallel with the survey taken in 1998. The 1998 survey line (Figure 4 red line) defines the southern boundary of the grid while Silver Bow Creek defines the northern boundary. Gravity readings were taken at a station spacing of 200 m in the east-west direction; the survey line spacing is 400 m. The east-west station spacing is smaller than the survey line spacing to help resolve bedrock topography and to track the location of the volcanic ridge trending north-east. The total number of survey points was 50,

comprising 10 stations on each survey line. Before collecting any gravity readings, a base station was established first and readings were taken every two hours to correct for instrument drift. After data at all stations were collected, a single base station was used to tie all the stations to a single reference point.

Figure 4. Location of 1998 field camp survey line in red and 2009 gravity survey lines in yellow (Google Earth, 2008).

To determine densities for gravity modeling, measurements were made on hand samples. Bedrock density was estimated by measuring the mass and displacement of a sample of Butte Quartz Monzonite resulting in a density of 2.64 g/cc. Density of the Tertiary sediment was estimated by collecting a soil sample at the Rhodia site. A hole was dug to an approximate depth of 24 inches to minimize the effect of vegetation in the sample. The sample was then saturated with water to approximate the soil underneath the water table and then weighed. The saturated sample was found to have a mass of 58.9 grams. The soil sample was then emptied into a beaker of water. The water level was

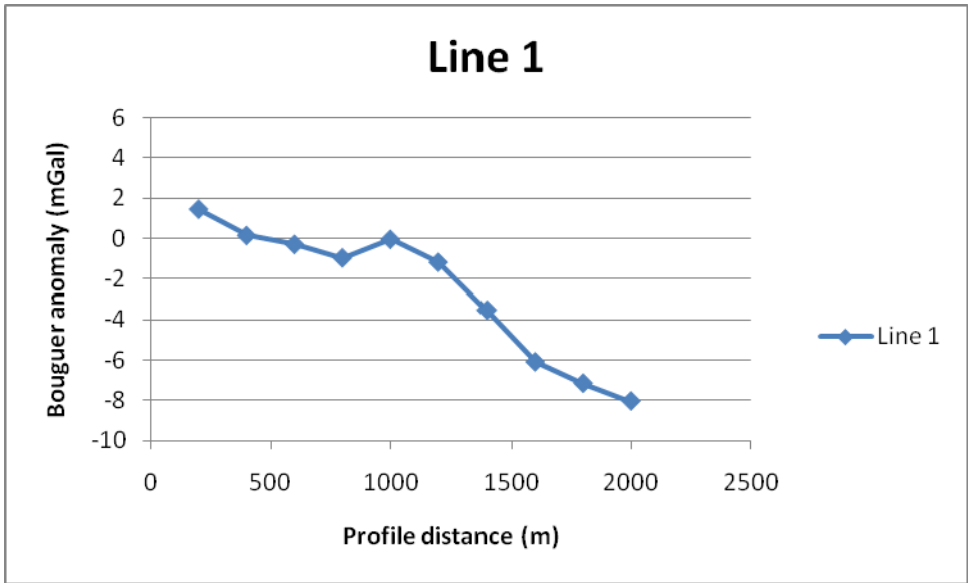
recorded before and after with a total displacement of 33.5 ml. The resulting mass density estimate for the tertiary sediment is 1.76 g/cc.

Data Analysis

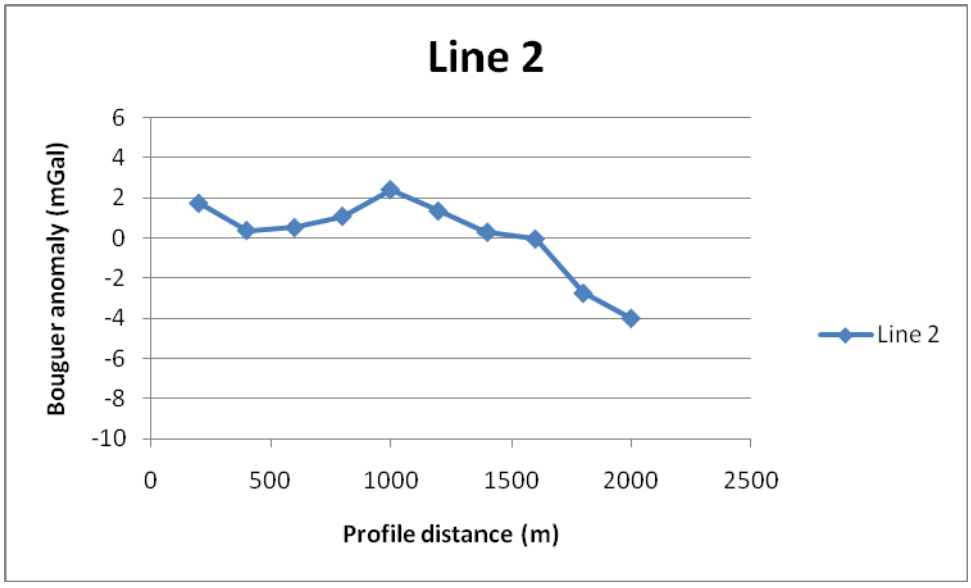
After the gravity measurements were made, corrections to account for variations in gravity not caused by subsurface density variations were performed. Three corrections were performed: drift, free-air, and Bouguer.

Two other possible corrections were investigated and found to have negligible effects on the data. The GSR 1984 correction that accounts for variations in latitude was performed on some of the readings and was determined to have negligible difference. Terrain correction calculations were also negligible for the area.

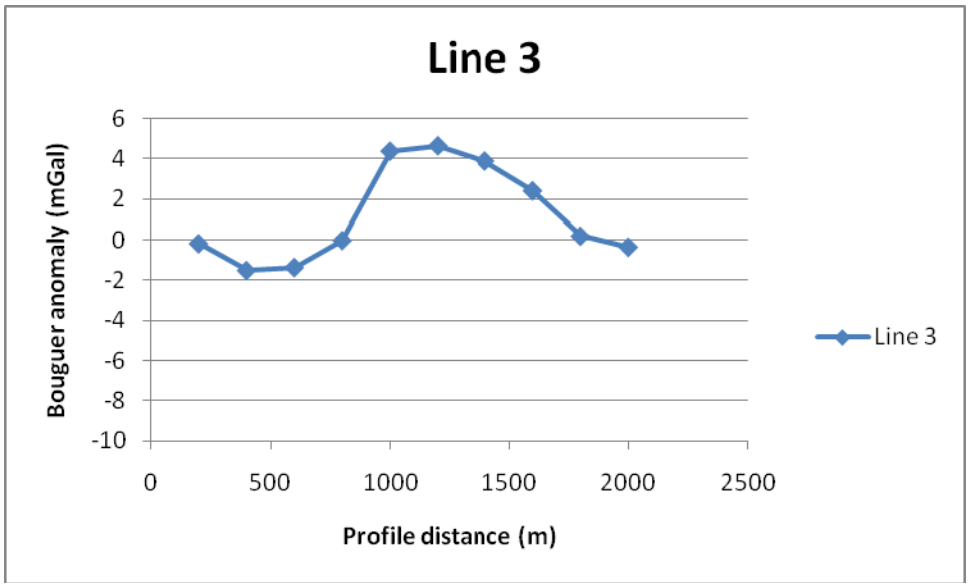
Figure 5 shows the corrected gravity profiles for all lines. Line orientation is west on the left to east on the right. Comparing the plots for each line, the bedrock seems to have a definite trend. Lines 3 and 4 show profile characteristics of a reverse fault. Line 5 shows the same characteristic, but with another ridge farther west. Lines 1 and 2 show similar trends with deeper bedrock to the east (Figure 5).


Line 1
Bouguer anomaly (mGal)
6
4
2
0
-2
-4
-6
-8
-10
0
500
1000
1500
2000
2500
Profile distance (m)
Line 1

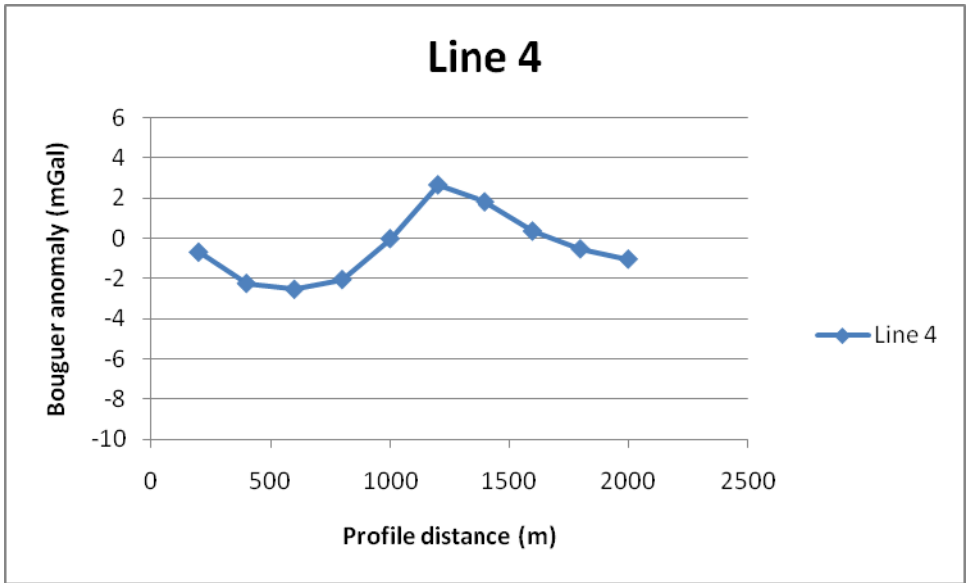
(a)


Line 2
Bouguer anomaly (mGal)
6
4
2
0
-2
-4
-6
-8
-10
0
500
1000
1500
2000
2500
Profile distance (m)
Line 2

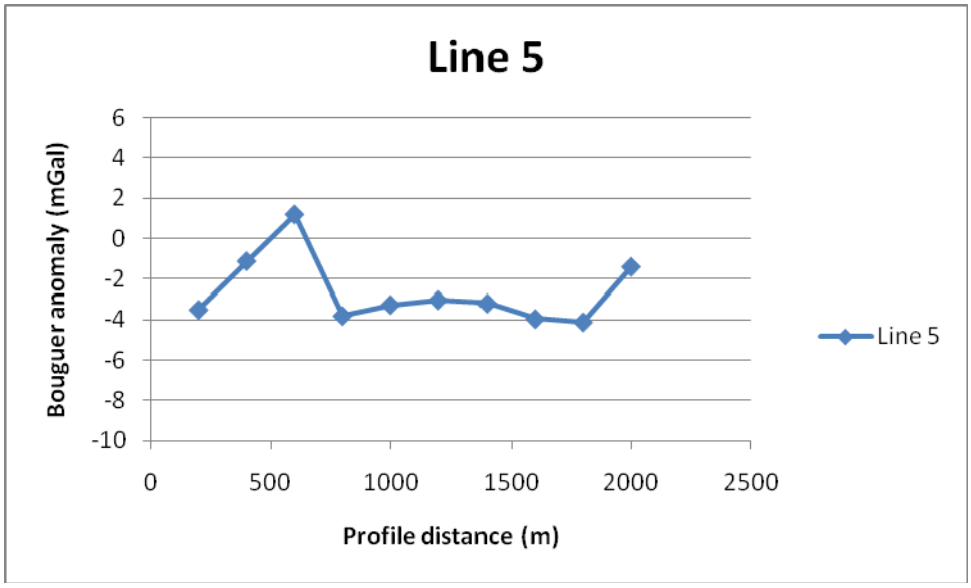
(b)


Line 3
Bouguer anomaly (mGal)
6
4
2
0
-2
-4
-6
-8
-10
0
500
1000
1500
2000
2500
Profile distance (m)
Line 3

(c)


Line 4
Bouguer anomaly (mGal)
6
4
2
0
-2
-4
-6
-8
-10
0
500
1000
1500
2000
2500
Profile distance (m)
Line 4

(d)



(e)

Figure 5. Gravity profiles for lines 1 to 5 (a to e). Line orientation is west (left) to east (right). All plots are at same scale.

Figure 6 is a plot showing an overlay of the five gravity profiles. Of significant note are the consistent lows at approximately 500 m and the highs at approximately 1200 m on all lines except line 5. The gravity lows correlate with greater depth to bedrock and the gravity highs to shallower bedrock.

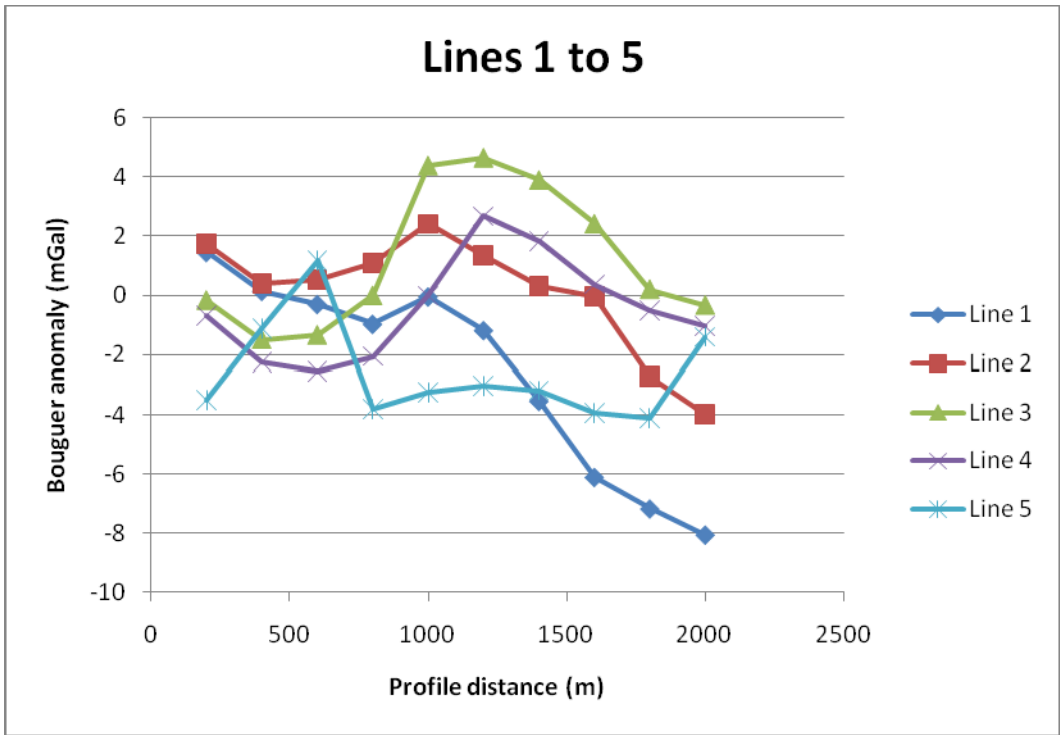
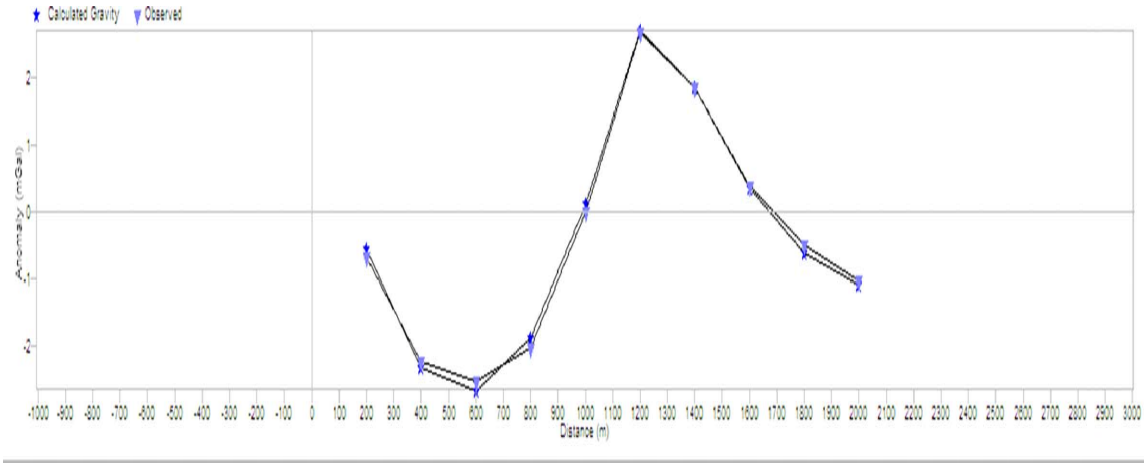


Figure 6. Overlay of all gravity profiles. Line orientation is west (left) to east (right).

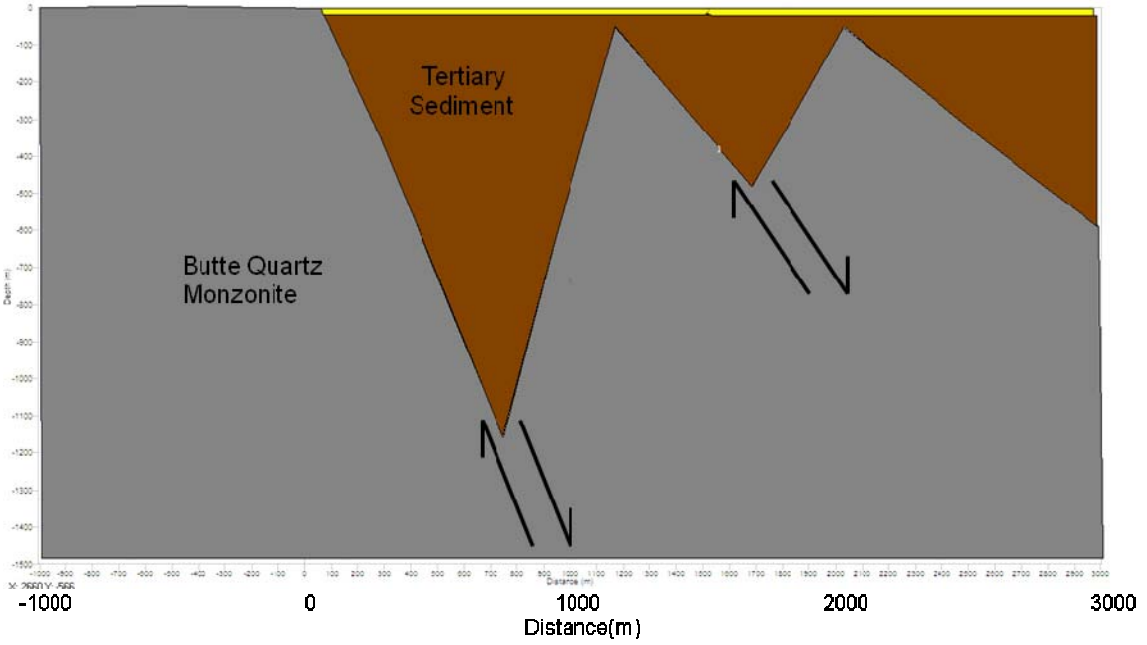
Results

Two-dimensional results

Using the forward modeling program *GravMag*, subsurface models were produced for each of the survey lines. For each survey line, two reverse faults were found to model the observed data well with line 4 showing the best fit with an RMS misfit of 0.099917 (Figure 7). These models agree with the model that was produced by the 1998 field camp (Figure 8). Because all survey lines were taken from east to west, they all produced similar forward model results indicating the faults all trend north to east.



(a)



(b)

Figure 7. (a) Plot showing line 4 observed vs. predicted gravity data for subsurface model shown in (b). Horizontal axis for plot shown in (a) is -1000 m on left to 3000 m on right. Vertical axis for plot shown in (a) is 2 mGal to -2 mGal. Vertical axis for depth model in (b) is 0 m to -1500 m.

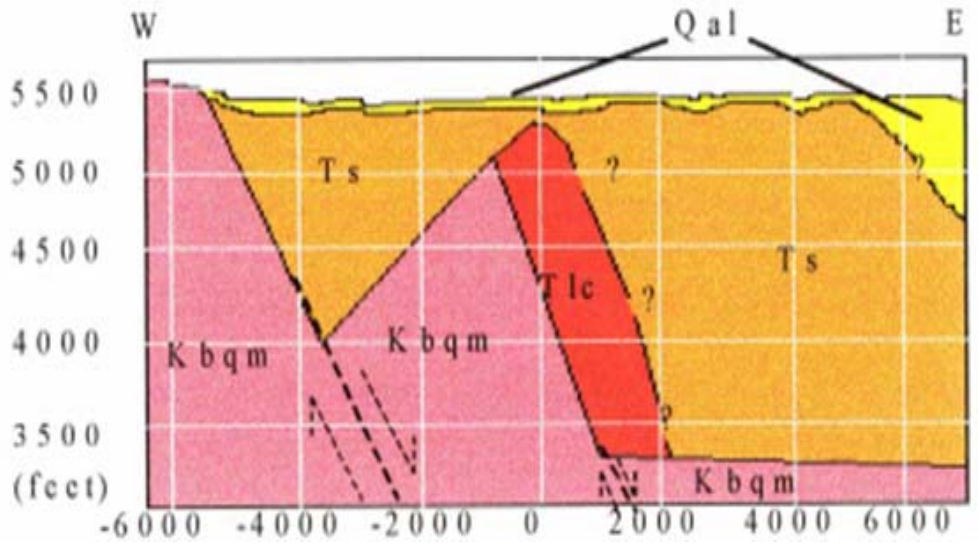
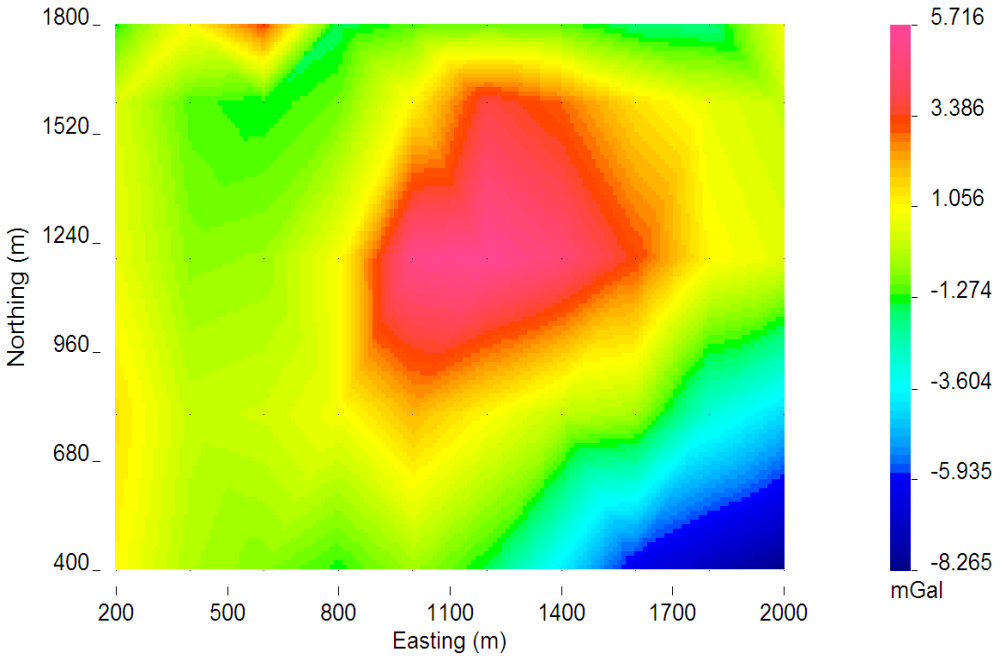


Figure 8. Subsurface model produced by 1998 field camp class (red line in Figure 4). Note that distance units (horizontal) and elevation units (vertical) are in feet.

Three-dimensional results

The corrected gravity data were also plotted after interpolation using *Grav3D* (Figure 9a) and in perspective view using *Surfer* (Figure 9b). A 3-D subsurface model (Figure 10a) was created using a contrast of 0.88 g/cc between the sediment and the bedrock. This model creates predicted data close to the observed data reasonably well (Figure 10b).



(a)

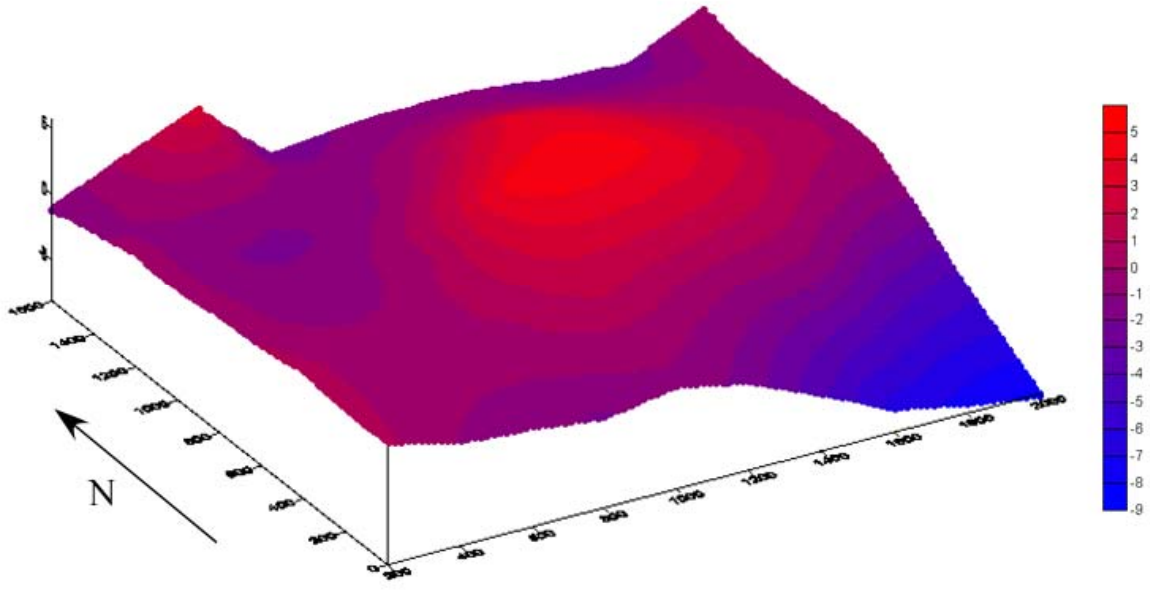
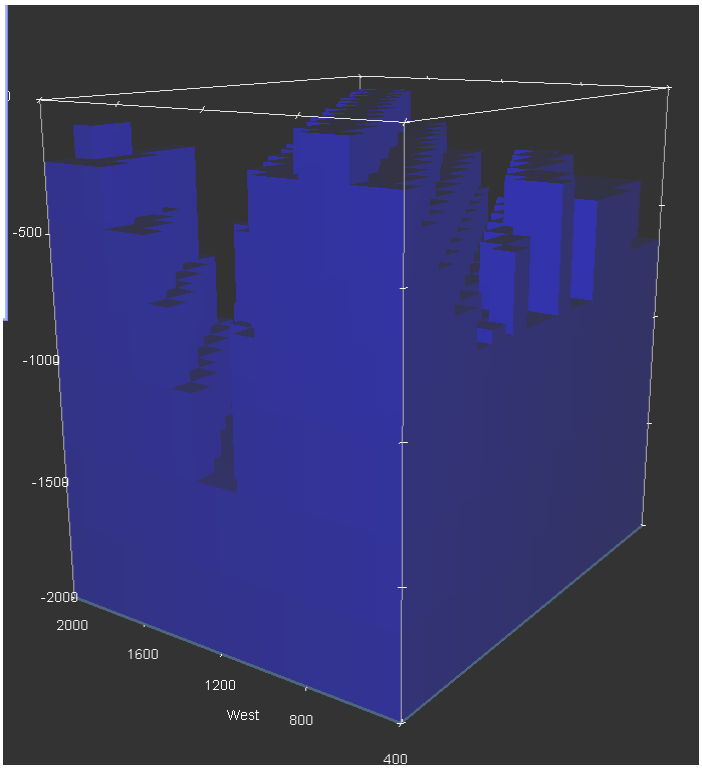
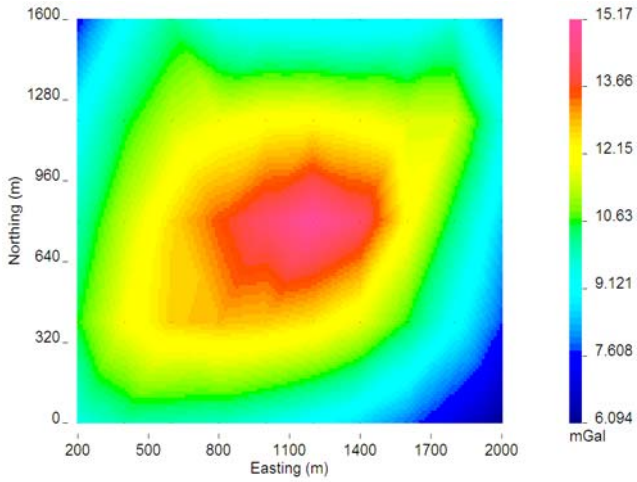


Figure 9. (a) Interpolated, corrected gravity data using *Grav3D*. (b) Interpolated, corrected gravity data using *Surfer*.



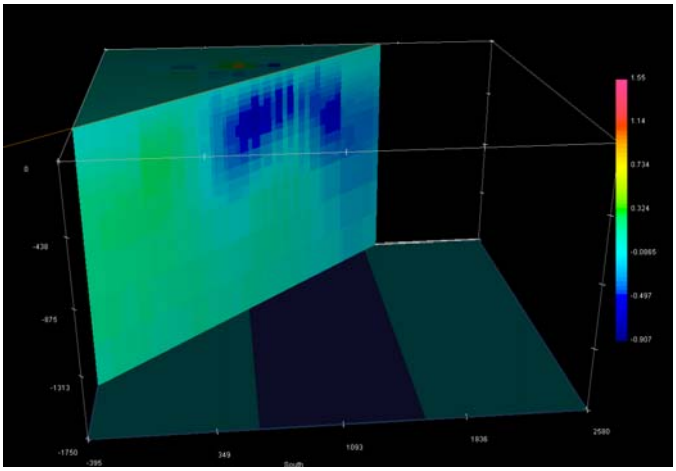
(a)



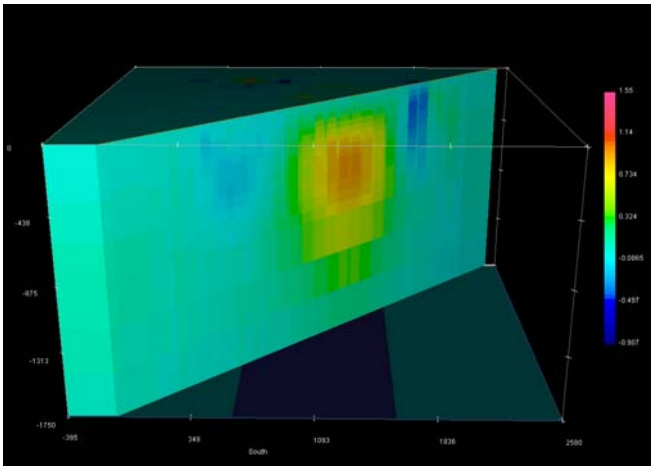
(b)

Figure 10. (a) 3-D forward model using density contrast of 0.88 g/cc and (b) predicted data produced by model in (a).

Grav3D was also used to run a 3-D inversion. Slicing the inverted model at different locations shows a strong correlation to the forward models that were produced herein as well as the 1998 field camp (Figure 11). The middle ridge can also be seen to increase in height and apparently outcrop as it is projected north. The high ridges are easily seen and are the result of the dip/slip faulting through the Butte Quartz Monzonite (Figure 12).



(a)



(b)

Figure 11. (a) and (b) are 3-D inversion results at different slice locations.

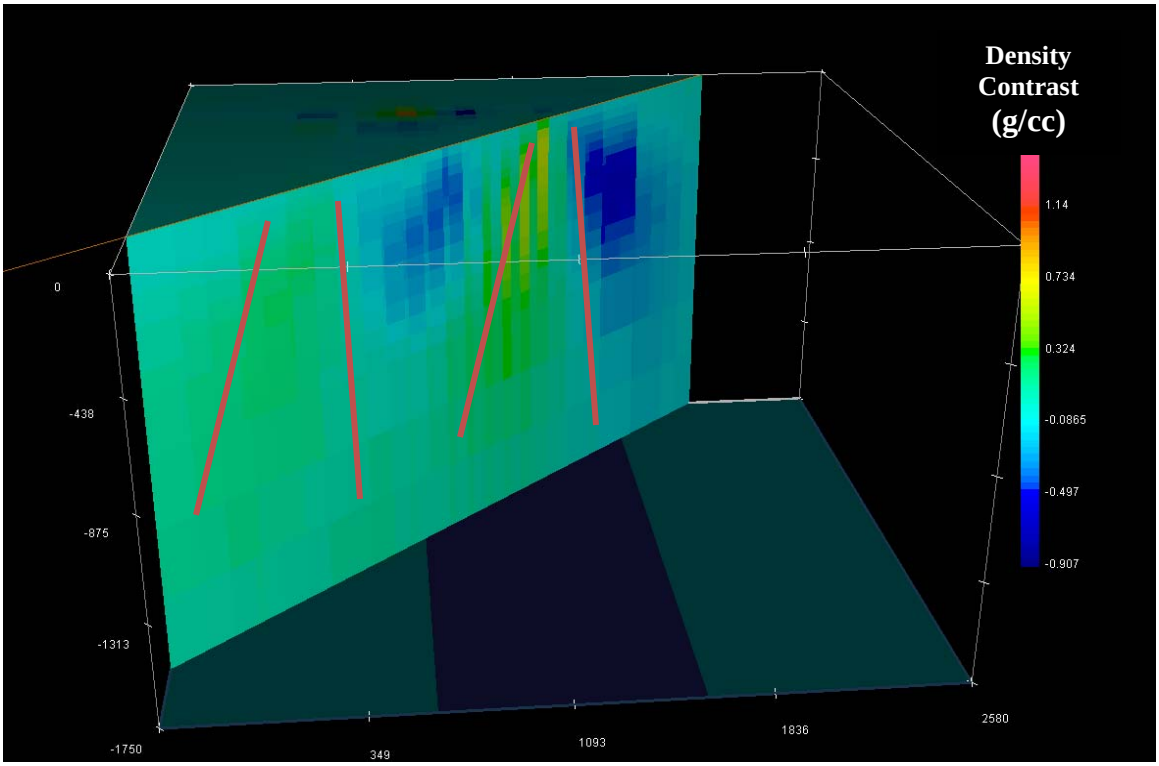


Figure 12. Slice through 3-D inversion result showing interpreted faults in red.

Conclusions

After collecting gravity data in the field and reviewing past examinations of the area, it appears that residential wells to the west of Rhodia facility are not likely to be affected by the contaminant plume. The plume can have two modes of transport within the ground water: contaminated ground water can either travel along the bedrock/sediment interface, or it can flow in the shallower water table at a depth of about 80 m. If the contaminant plume flows within the water table, it will be confined by the bedrock ridge and travel north, exiting into Silver Bow Creek (Figure 13). If the ground water takes the path along the bedrock/sediment boundary, the contaminant plume will be

confined into the trough defined by the bedrock ridge and will also flow north, eventually exiting into Silver Bow Creek (Figure 13). In either case, contamination transport should be blocked by the bedrock ridge on the west side of the study area unless transport occurs within shallower sediments above the bedrock ridge. However, this gravity study does not address contaminant transport within these shallow sediments.

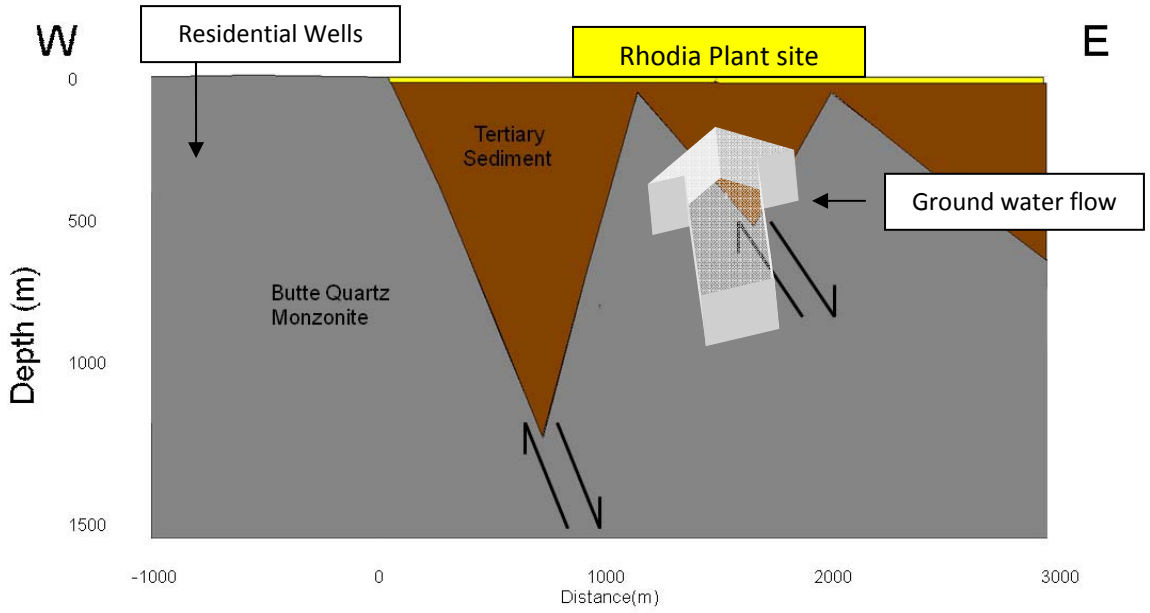


Figure 13. Model derived from gravity data analysis showing plant location and expected flow of ground water.

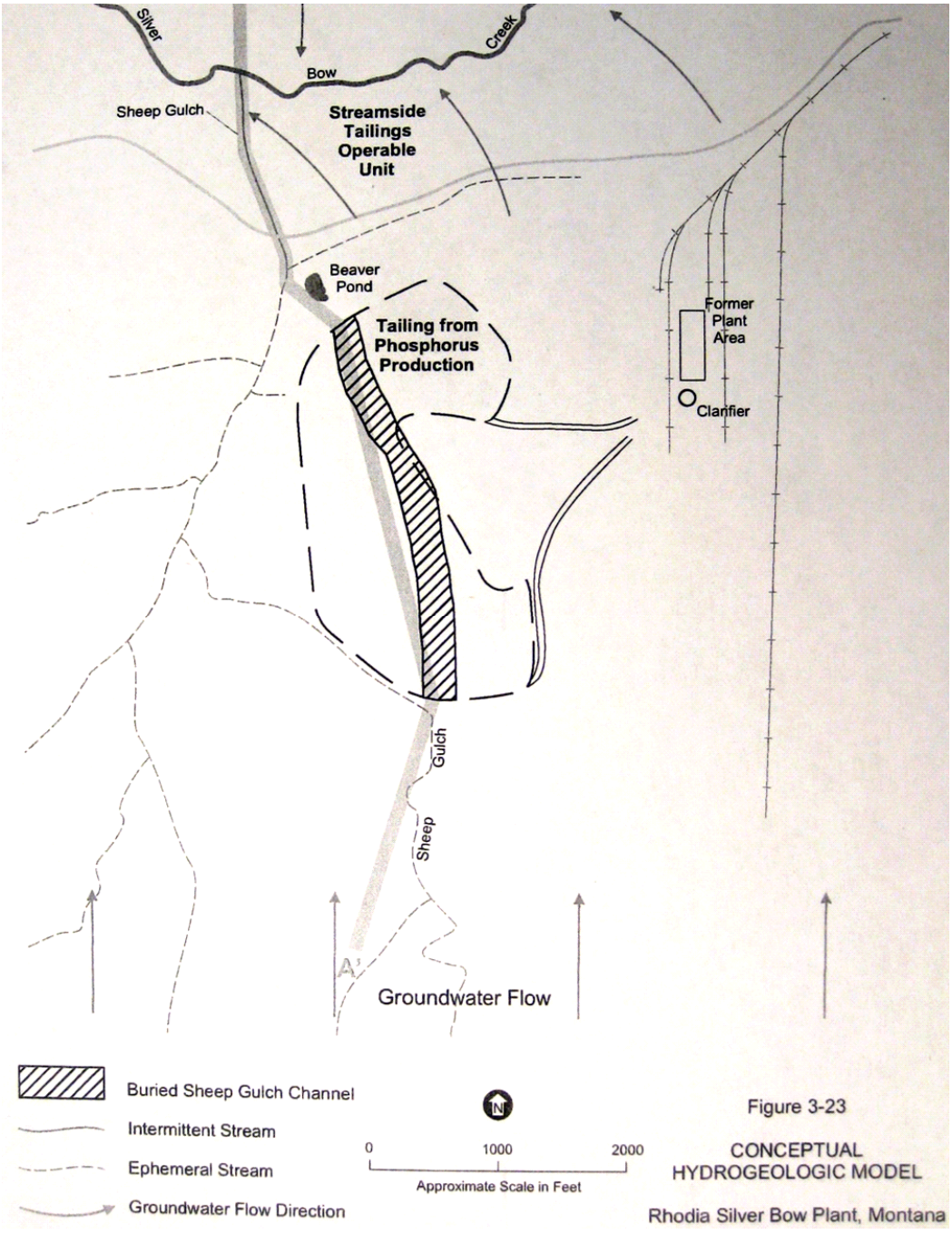


Figure 14. Conceptual model of location and direction of ground water flow (Tilman, 1999).

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Appendix A

Corrected gravity data for Lines 1 to 5

Line 1			
Station	Elev (m)	Distance (m)	Anomaly (mGal)-Base
1	1640.0696	200	1.460312832
2	1632.0008	400	0.150665709
3	1631.9101	600	-0.294202171
4	1630.0656	800	-0.964081651
5	1628.6974	1000	-0.041428715
6	1628.6991	1200	-1.176975225
7	1620.1883	1400	-3.526956075
8	1636.5894	1600	-6.095299822
9	1638.8763	1800	-7.15974723
10	1638.0919	2000	-8.042560987

Line 2			
Station	Elev (m)	Distance (m)	Anomaly (mGal)-Base
1	1632.6803	200	1.738493365
2	1628.2865	400	0.387447322
3	1619.287	600	0.528703865
4	1621.096	800	1.088022769
5	1623.1264	1000	2.411866064
6	1621.8042	1200	1.349702449
7	1616.9293	1400	0.299139632
8	1640.0381	1600	-0.039815901
9	1651.6785	1800	-2.736723645
10	1631.3456	2000	-3.985428838

Line 3

Station	Elev (m)	Distance (m)	Anomaly (mGal)-Base
1	1628.4072	200	-0.171222914
2	1620.0201	400	-1.496009295
3	1620.9687	600	-1.350671483
4	1617.7149	800	-0.014899104
5	1619.2233	1000	4.391249797
6	1618.9572	1200	4.655639412
7	1624.4405	1400	3.898616841
8	1623.3305	1600	2.418684686
9	1628.3995	1800	0.199309695
10	1626.495	2000	-0.341746933

Line 4

Station	Elev (m)	Distance (m)	Anomaly (mGal)-Base
1	1614.605	200	-0.685116465
2	1630.8911	400	-2.247758199
3	1626.859	600	-2.542760377
4	1621.7249	800	-2.054613514
5	1610.6782	1000	-0.009978387
6	1621.0739	1200	2.676640432
7	1624.8781	1400	1.826483619
8	1627.0711	1600	0.367066477
9	1621.4075	1800	-0.52372445
10	1621.0682	2000	-1.033681631

Line 5

Station	Elev (m)	Distance (m)	Anomaly (mGal)-Base
1	1611.6702	200	-3.497212967
2	1607.2675	400	-1.12541494
3	1613.5165	600	1.174593975
4	1612.5374	800	-3.795556262
5	1611.9303	1000	-3.253409158
6	1614.7524	1200	-3.023421698
7	1617.165	1400	-3.187178326
8	1610.8801	1600	-3.9453008
9	1624.8327	1800	-4.103353602
10	1619.4294	2000	-1.404861514