GOLDCORP

Wharf Resources (USA), Inc.

October 3, 2011

Mr. Matt P. Hicks
Ground Water Quality Program
SD DENR
Joe Foss Building
523 East Capitol
Pierre, South Dakota 57501

RE: American Eagle Ground Water Discharge Permit Application

Dear Matt,

In response to your technical review comments included in your August 29, 2011 letter I offer the following:

1. When we initially developed the plan for the American Eagle Ground Water Discharge Permit application we did not have the mine expansion plan complete. As we developed the mine plan for the expansion project we refined the plan for waste rock disposal to include more waste rock disposal in the American Eagle, Deep Portland and Trojan Pit. Additional waste rock will not be placed in the Trojan Rock Facility. This should clarify the additional waste rock placed in each location. Based on this revised information Environmental Resource Management (ERM) Consultants up-dated the model for nitrate and arsenic loading which includes the effects of barren rock placement. Bottle roll analysis was completed on samples of waste rock taken in order to get an up-dated value for the nitrate contribution from barren rock to be placed in the future. The results for the bottle rolls are included in Table X-1. The model was run using a nitrate concentration of 35.6 mg/L for barren rock placed through 2011 and a nitrate concentration of 18.42 for barren rock placed after 2011. The arsenic model was run using the most recent water mobility testing done for barren rock included in the Wharf Mine Expansion permit application. I have included a Figure 1 (Revised Summary of Spent Ore and Barren Rock Disposal Used in Geochemical Models), Figure X-1 (Revised Nitrate Concentration Solution – Year 2020), Figure X-2 (Revised Nitrate Concentration Solution – Year 2040), and Figure X-3 (Revised Nitrate Concentration Solution – Year 2060). The additional waste rock placement did not have any significant change in the arsenic loading as shown in figures X-4, X-5 and X-6.
2. For the geochemical mixing cell models, the initial moisture content of the spent ore after offload in the proposed disposal areas was estimated to be 6%. After placement in the disposal areas some of the water will drain from the spent ore, reducing the moisture content. The moisture content of the spent ore after placement and drain down in the proposed disposal areas was estimated to be 4% in the geochemical mixing cell models.
3. The arsenic concentration in the pore water of the spent ore was estimated to be 1.6 mg/L based on analyses of process solutions and spent ore on the leach

10928 Wharf Road • Lead, South Dakota 57754-9710
Telephone (605) 584-1441 • Fax (605) 584-4188

pads after neutralization and drain down. The average arsenic concentration of the pore water in the barren rock based on recent meteoric water mobility tests is 0.06 mg/L (Table X-2).

4. An additional 61,373,490 tons of waste rock will be placed in the area included in the American Eagle POP zone. I have revised the sections in the American Eagle Ground Water Discharge Permit application and attached the modified pages.
5. The nitrate loading that would occur within the POP zone from the proposed spent ore disposal and barren rock has been recalculated and is included in Table X-3 attached.

I have also sent a revised cover page for the monitoring plan indicating that it is both the current and post-closure monitoring plan, and a replacement page 1 in that plan that includes a reference to the Ross Valley (GWD 1-88) in the third paragraph.

If you have any questions or comments, please don't hesitate to give me a call at (605) 584-4155.

Sincerely,

Ron Waterland
Environmental Manager

Encl.

Cc: Mike Cepak, DENR MMP
Bill Shand, WR
Ken Nelson, WR

10928 Wharf Road • Lead, South Dakota 57754-9710
Telephone (605) 584-1441 • Fax (605) 584-4188

☐ Other (i.e. agricultural, silvicultural, gravel washing, rock crushing Activities, etc.)
Specify_____

Description of operation.

The American Eagle Pit, Trojan Pit and the Portland pit will cover approximately 93 acres and extend approximately 360 feet deep. Wharf Resources (USA), Inc. (Wharf) estimates that an estimated 129,295,000 tons of ore and barren rock will be mined from the Wharf Mine. With approval of this discharge permit, the mined pit will be backfilled barren rock and with spent ore that will be processed and neutralized on site in the Process Area.

4. Name, location (1/4, 1/4, 1/4, Section, Township, and Range), and description of all wells (existing, abandoned, or proposed), water bodies, drainages, natural or man-made structures, and water usage (past, present, or future) within a one-mile radius of the discharge site. *Refer to ARSD 74:54:02:06 (4).*

Wells - existing, abandoned, proposed, *refer to ARSD 74:54:02:06 (12)*

Name	Location	Description	Status	Usage
Monitoring wells and private water supply wells within and arround an approximate one-mile radius arround the American Eagle Pit are shown on Figure 8-1 (ERM, 2011) and listed in Exhibit 1, attached.				

Water Bodies and Drainages

Name	Location	Description	Status	Usage
Water bodies and drainages within and arround an approximate one-mile radius arround the American Eagle Pit are shown on Figure 8-1 (ERM, 2011) and listed In Exhibit 2, attached.				

Structures

Name	Location	Description	Status	Usage
Structures within and arround an approximate one-mile radius arround the American Eagle Pit are shown figure 8-1 ERM, 2011) and listed in Exhibit 3, attached.				

The above information MUST be included on a plat map and attached to the application.

Ground Water Discharge Plan Application
American Eagle Pit, Wharf Mine
Lead, South Dakota
Wharf Resources

#1. Name of discharger or person legally responsible for discharge (owner/ operator), refer to ARSD 74:54:02:06 (1):
Wharf Resources (USA), Inc.
c/o Ron Waterland, Environmental Manager

Address:
10928 Wharf Road,
Lead, South Dakota 57754-9710

Telephone:
(605) 584-4155

Local representative or contact person if different from above:
As above

#2. Legal Location of Discharge Facility, refer to ARSD 74:54:02:06 (2)
County: Lawrence
Township: 5N, **Range:** 2E, Portions of Sections 25, 26, 35 and 36, and **Township:** 4N, **Range:** 2E, Portions of Sections 1 and 2

#3. Refer to ARSD 74:54:02:06(3)

Name of the facility and Project:
American Eagle Pit, Wharf Mine.

Estimated Project Life:
The estimated life of mine is 15 years with a start date of December 12, 2011.

Type of Operation:
Mining

Description of Operation:
The American Eagle Pit, Trojan Pit and the Portland pit will cover approximately 93 acres and extend approximately 360 feet deep. Wharf Resources (USA), Inc. (Wharf) estimates that an estimated 129,295,000 tons of ore and barren rock will be mined from the Wharf Mine. With approval of this discharge permit, the mined pit will be backfilled barren rock and with spent ore that will be processed and neutralized on site in the Process Area.

PLAN

Groundwater Discharge Current and Permit Post-Closure Monitoring Plan American Eagle Pit

Wharf Mine
Lead, South Dakota

April 12, 2011

Prepared by:
Wharf Resources (U.S.A.), Inc.
10928 Wharf Road
Lead, South Dakota, 57754

Presented to:
South Dakota Division of Natural Resources
Water Management Board
PMB 2020
SD DENR
Joe Foss Building
523 E Capitol
Pierre, SD 57501

1.0 *INTRODUCTION*

The Wharf Mine (formerly Annie Creek Mine) is located in the Bald Mountain Mining District of the Northern Black Hills. The Bald Mountain Mining District includes both the Portland and Ruby Basin Districts, which have been the site of mineral development since the late 1800s, mostly through underground operations. Gold mineralization at the Wharf Mine occurs adjacent to minor faults and fracture zones, primarily in the Cambrian Deadwood Formation, which consists of clastic and carbonate sedimentary rock, and in igneous sills and dikes of Tertiary age.

The mine is located in Lawrence County, approximately four miles southwest of Lead, South Dakota. The aerial photography of the mine site, major features of the mine and the mine permit boundary are shown on Figure 1.

Wharf Resources (U.S.A.), Inc. (Wharf) has owned and operated the Wharf Mine since the first surface mine operation permit was granted by the State of South Dakota in 1982. Because the process utilizes an on/off load operation, ground water discharge plans are needed for continued operation of the mine and ore processing. Currently, Wharf has an approved ground water discharge permits for the Ross Valley (GWD 1-88), Reliance (GWD1-94) and Juno/Foley (GWD 1-98) areas as required by their respective permits. (See Wharf, 2006). The ground water discharge plans allow for the disposal of neutralized spent ore in designated depositories without adversely impacting the surrounding environment. More specifically, while some potential degradation of ambient water quality may occur within the perimeter of operational pollution (POP), the beneficial uses of that water will be maintained.

As Wharf continues to expand the mine, the American Eagle Pit will be mined and backfilled with barren rock and neutralized spent ore. The American Eagle Pit located in the northeastern portion of the Wharf Mine as shown on Figure 1. Wharf is seeking authorization to discharge groundwater from the American Eagle Pit area and is concurrently submitting a Ground Water Discharge Permit Application to the South Dakota Department of Natural Resources Water Management Board (Wharf, 2011). In accordance with requirement 9B(E) of the discharge permit application and South Dakota administrative rule ARSD 74:54:02:06 (9)(E), Wharf is submitting this post-closure monitoring plan concurrently with the American Eagle Pit Ground Water Discharge Permit application (the application). The application includes the report, Potential Impact of Spent Ore Disposal in the American Eagle Pit (ERM, 2011) and Section 4.0 of that report provides a detailed summary of the water quality in the project area.

Table X-1
Barren Rock Bottle Roll Analytical Results
Wharf Mine
Lead, South Dakota

Sample Number	*Sample Date*	*Nitrate (mg/Kg)*
AE - 51	9/27/2011	0.228
AE - 52	9/27/2011	0.17
AE - 53	9/27/2011	0.137
AE - 54	9/27/2011	1.72
AE - 55	9/27/2011	2.61
AE - 56	9/27/2011	0.197
AE - 57	9/27/2011	0.207
AE - 58	9/27/2011	0.666
AE - 59	9/27/2011	0.087
AE - 60	9/27/2011	0.733
AE - 61	9/27/2011	0.139
AE - 62	9/27/2011	0.223
AE - 63	9/27/2011	0.142
AE - 64	9/27/2011	0.293
AE - 65	9/27/2011	0.22
AE - 66	9/27/2011	0.151
AE - 67	9/27/2011	0.093
AE - 68	9/27/2011	0.178
AE - 69	9/27/2011	2.72
AE - 70	9/27/2011	3.83
Average		0.7372

Notes:
Estimated nitrate concentration in barren rock pore water at offload:
NO_3 = 0.7372 mg/Kg x Rock:Water Ratio
Rock:Water Ratio at 4% moisture content (100%/4%) = 25
NO_3 = 18.42 mg/L

Table X-2
Meteoric Water Mobility Test Results
Wharf Mine
Lead, South Dakota

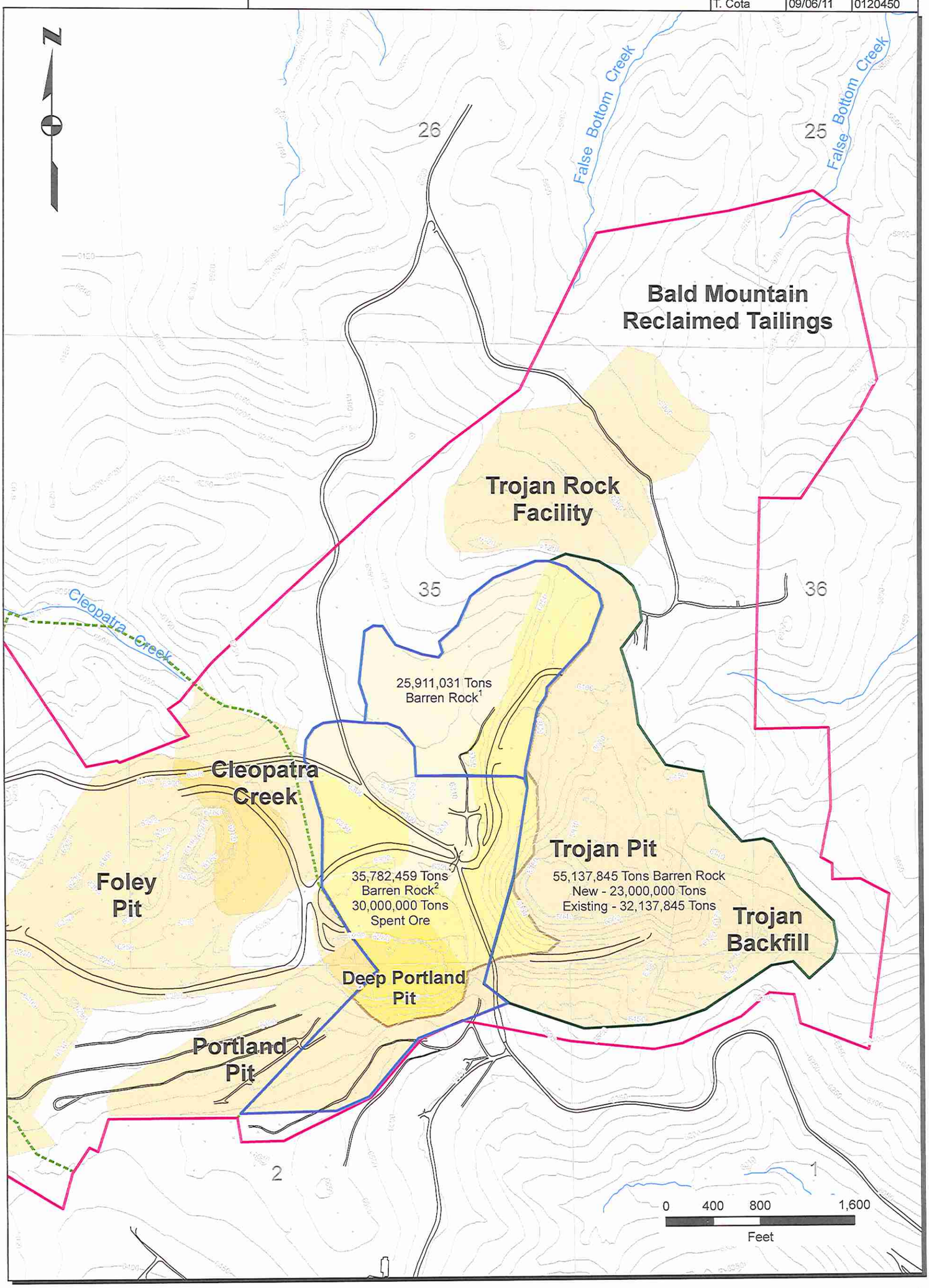
Rock Type	*Hole-ID*	*Depth*		*Arsenic*
		From	*To*	*(mg/L)*
Upper Deadwood	FX3361	130	140	0.223
	FX3367	350	360	0.038
	FX3413	280	290	0.066
	FX3435	70	80	0.012
	FX3450	80	90	0.034
	FX3677	30	40	0.007
	FX3745	70	80	0.036
	FX3456	50	60	0.016
	FX3445	0	10	0.027
Intermediate Deadwood	FX3351	220	230	0.091
	FX3418	130	140	0.006
	FX3519	90	100	<0.005
	FX3635	140	150	0.225
	FX3655	60	70	0.103
	FX3684	30	40	0.251
	FX3669	160	170	<0.005
	FX3658	190	200	0.04
	FX3661	140	150	0.182
	FX3703	160	170	0.01
	FX3773	90	100	0.007
	FX3466	370	380	<0.005
	FX3642	160	170	<0.005
	FX3563	210	220	0.009
	FX3673	190	200	<0.005
	FX3713	80	90	<0.005
	FX3719	130	140	<0.005
	FX3706	160	170	0.007
	FX3729	150	160	<0.005
	FX3751	300	310	<0.005
	FX3757	300	310	<0.005
	FX3771	180	190	<0.005
Prophyry	FX3285	260	270	0.011
	FX3362	240	250	0.406
	FX3371	330	340	0.036
	FX3383	240	250	<0.005
	FX3496	190	200	0.025
	FX3455	540	550	0.014
	FX3447	150	160	0.02
	FX3533	120	130	<0.005
	FX3501	30	40	<0.005
	FX3473	260	270	0.025
	FX3480	550	560	0.022
	FX3571	270	280	0.022
	FX3587	170	180	0.088
	FX3627	60	70	0.041
	FX3643	40	50	0.012
	FX3649	230	240	0.018
	FX3656	140	150	0.007
	FX3657	80	90	0.035
	FX3555	90	100	0.064
	FX3665	120	130	<0.005
	FX3663	170	180	0.323
	FX3680	330	340	<0.005
	FX3725	60	70	<0.005
	FX3711	30	40	<0.005
	FX3700	30	40	<0.005
	FX3757	140	150	<0.005
	FX3748	200	210	0.014
	FX3775	90	100	0.027
	FX3778	70	80	0.025
	FX3416	100	110	0.009
	FX3508	390	400	0.013
	FX3551	60	70	<0.005
	FX3737	80	90	0.007
Lower Deadwood	FX3495	250	260	0.008
	FX3716	230	240	0.054
Precambrian	FX3720	260	270	<0.005
Average				**0.060**

Table X-3
Nitrate Tonnage in Spent Ore and Barren Rock at Offload in American Eagle/Deep Portland Pit Area[1]
Nitrate Geochemical Mixing Cell Models
Wharf Mine
Lead, South Dakota

	Spent Ore					Barren Rock											
Year	*Portland Overlap*	*American Eagle/South Trojan Overlap 02*	*Central American Eagle 02*	*American Eagle Extended*	*Deep Portland Overlap*	*Portland Overlap*	*American Eagle/South Trojan Overlap 02*	*Central American Eagle Pit 02*	*American Eagle Extended*	*Deep Portland Overlap*	*Northwest American Eagle Pit*	*North American Eagle Pit*	*American Eagle/Trojan Overlap 01*	*Central American Eagle Pit 01*	*American Eagle/North Trojan Overlap 02*	*Trojan Pit*	*Trojan Pit Backfill Area*
2012	1.702	1.167	1.560	1.382	2.064	0.390	0.267	0.357	0.316	0.472	0.096	0.192	0.194	0.163	0.091	--	--
2013	1.702	1.167	1.560	1.382	2.064	0.390	0.267	0.357	0.316	0.472	0.096	0.192	0.194	0.163	0.091	--	--
2014	1.702	1.167	1.560	1.382	2.064	0.390	0.267	0.357	0.316	0.472	0.096	0.192	0.194	0.163	0.091	--	--
2015	1.702	1.167	1.560	1.382	2.064	0.390	0.267	0.357	0.316	0.472	0.096	0.192	0.194	0.163	0.091	--	--
2016	1.702	1.167	1.560	1.382	2.064	0.390	0.267	0.357	0.316	0.472	0.096	0.192	0.194	0.163	0.091	3.187	0.205
2017	1.702	1.167	1.560	1.382	2.064	0.390	0.267	0.357	0.316	0.472	0.096	0.192	0.194	0.163	0.091	3.187	0.205
2018	1.702	1.167	1.560	1.382	2.064	0.390	0.267	0.357	0.316	0.472	0.096	0.192	0.194	0.163	0.091	3.187	0.205
2019	1.702	1.167	1.560	1.382	2.064	0.390	0.267	0.357	0.316	0.472	0.096	0.192	0.194	0.163	0.091	3.187	0.205
2020	1.702	1.167	1.560	1.382	2.064	0.390	0.267	0.357	0.316	0.472	0.096	0.192	0.194	0.163	0.091	3.187	0.205
Totals	15.320	10.502	14.042	12.438	18.573	3.506	2.403	3.213	2.846	4.250	0.868	1.731	1.749	1.468	0.819	15.933	1.023
Total All Areas	**110.684**																

Notes:
[1]From Cell 1, Variable L1, Chemicals in New Porewater, nitrate geochemical models

GIS File:	Drawn By: T. Cota	Date: 09/06/11	Project No. 0120450



SOURCE: Base map provided by Wharf Resources (U.S.A), Inc., May 2008.

LEGEND

- American Eagle/Deep Portland Pit
- Roads
- Streams
- Juno_Foley_POP
- Mining Permit Boundary

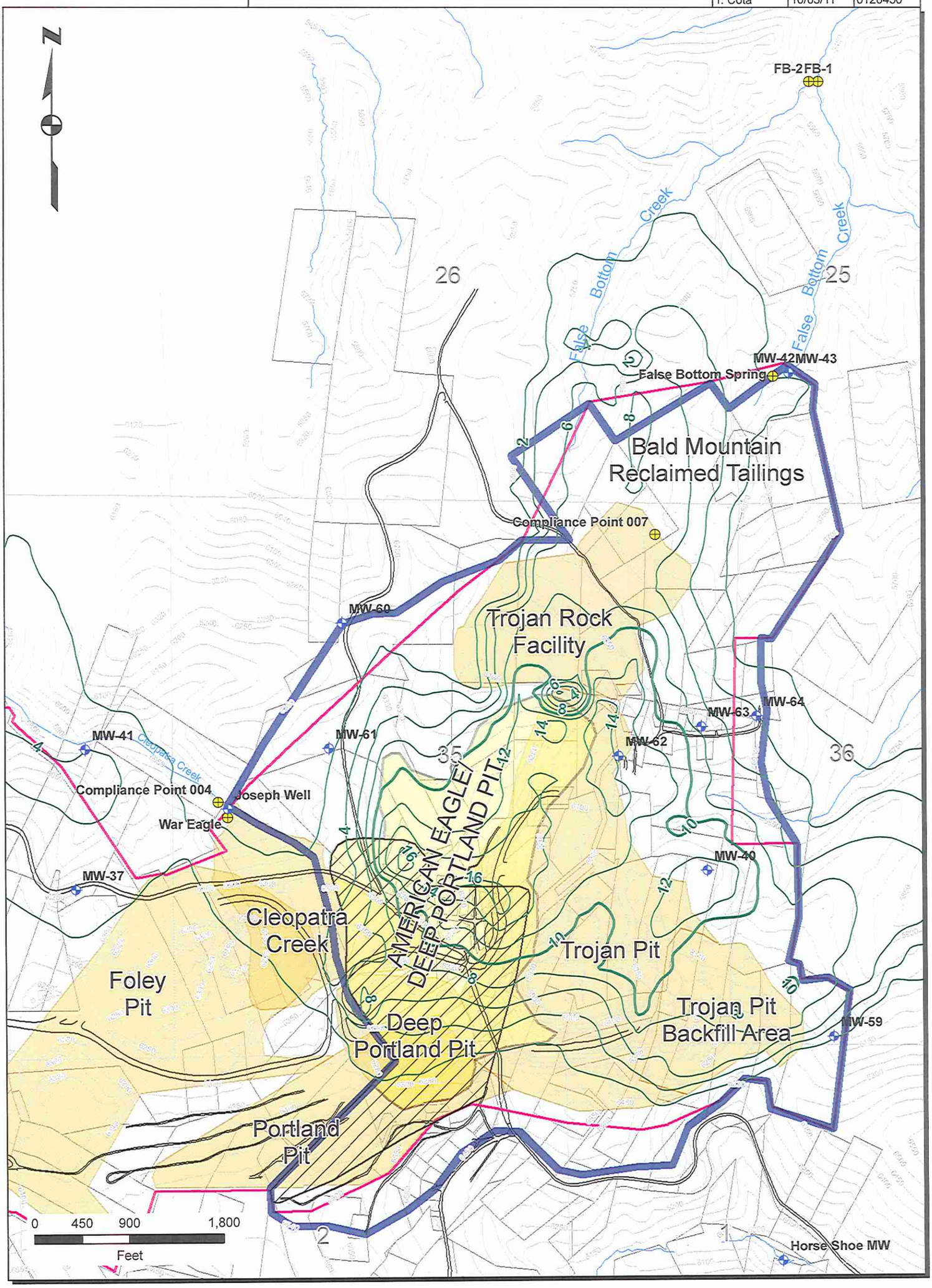
Notes:
[1] Includes portions of barren rock previously deposited in Cleopatra Creek Rock Facility and Trojan Pit
[2] Includes portions of barren rock previously deposited in Portland Pit, Deep Portland Pit and Trojan Pit

Figure 1

Revised Summary of Spent Ore and Barren Rock Disposal
Used in Geochemical Models
American Eagle/Deep Portland Pit
Wharf Mine
Wharf Resources
10928 Wharf Road
Lead, South Dakota

ERM 09/11

GIS File:	Drawn By: T. Cota	Date: 10/03/11	Project No. 0120450



SOURCE: Base map provided by Wharf Resources (U.S.A), Inc., May 2008.

LEGEND

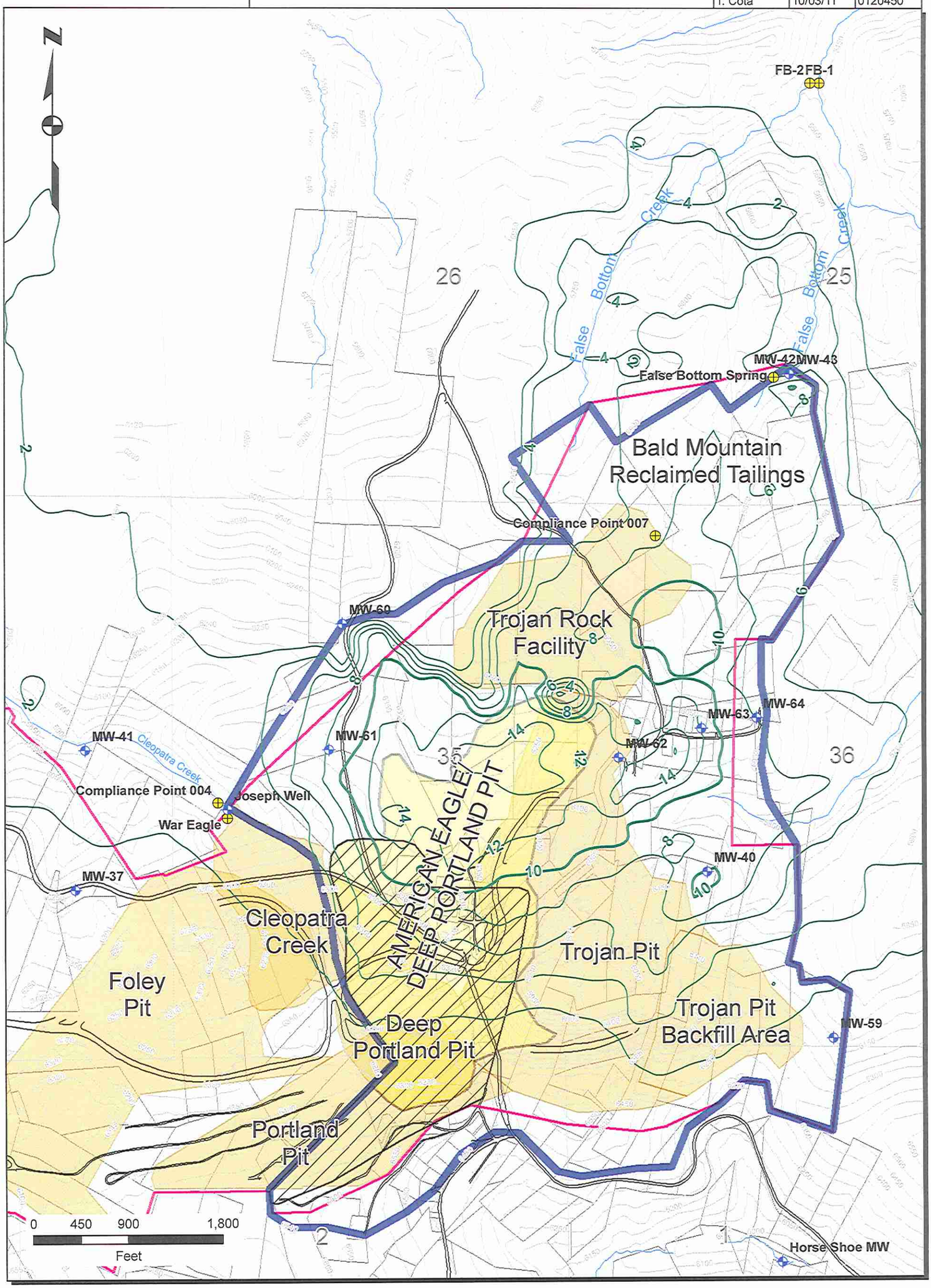
- Nitrate Concentration (mg/L) - Year 2020
- Spent Ore Disposal Area
- American Eagle/Deep Portland Pit
- Monitoring Well
- Surface Water Monitoring Station
- Roads
- Streams
- Wharf Land Ownership
- Mining Permit Boundary
- Proposed Perimeter of Operational Pollution

Figure X-1

Revised Nitrate Concentration Solution - Year 2020
Precambrian Bedrock (Layer 5)
Wharf Mine
Wharf Resources
10928 Wharf Road
Lead, South Dakota

ERM 10/11

GIS File:	Drawn By: T. Cota	Date: 10/03/11	Project No. 0120450



SOURCE: Base map provided by Wharf Resources (U.S.A), Inc., May 2008.

LEGEND

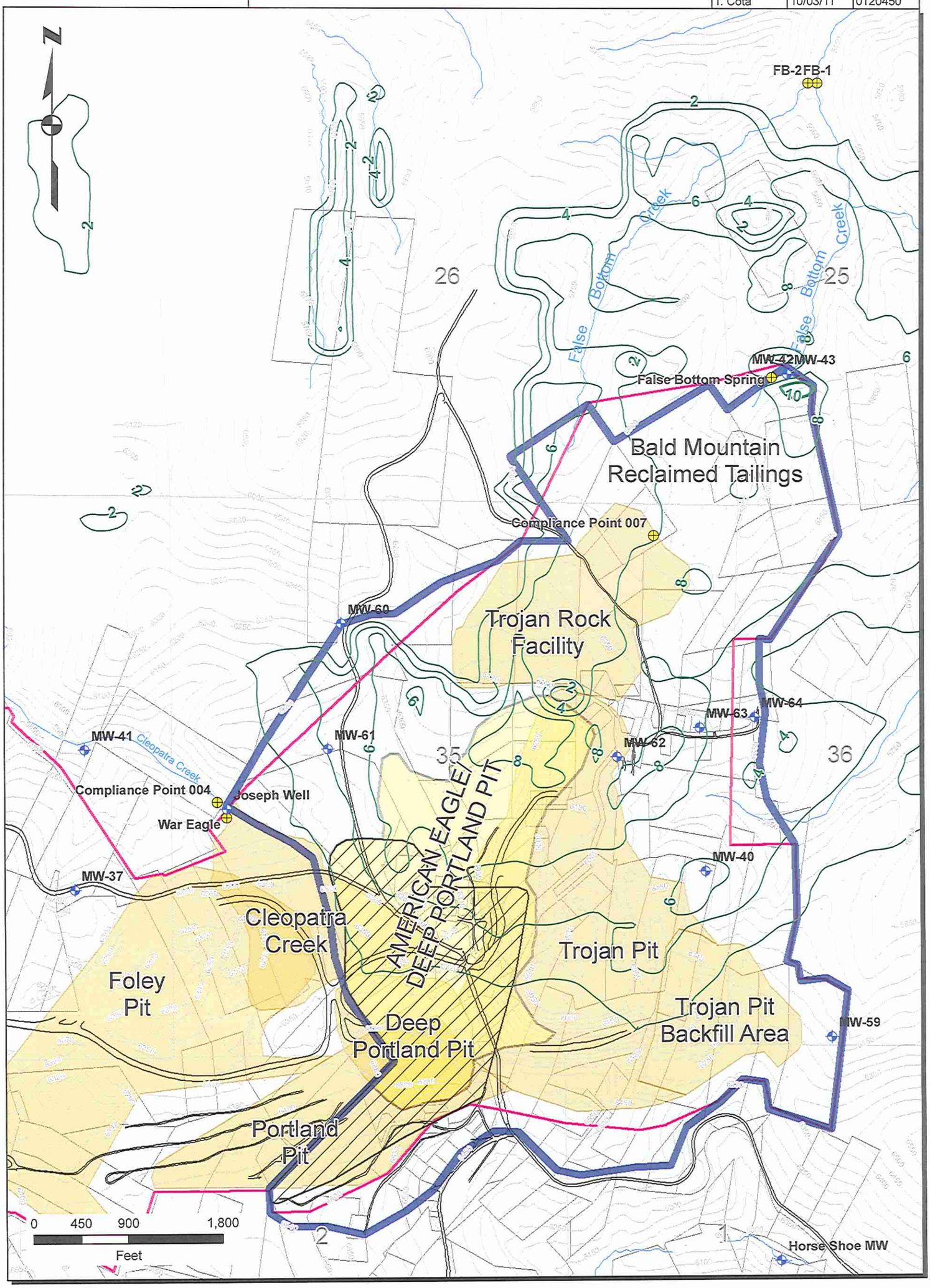
- Nitrate Concentration (mg/L) - Year 2040
- Spent Ore Disposal Area
- American Eagle/Deep Portland Pit
- Monitoring Well
- Surface Water Monitoring Station
- Roads
- Streams
- Wharf Land Ownership
- Mining Permit Boundary
- Proposed Perimeter of Operational Pollution

Figure X-2

Revised Nitrate Concentration Solution - Year 2040
Precambrian Bedrock (Layer 5)
Wharf Mine
Wharf Resources
10928 Wharf Road
Lead, South Dakota

ERM 10/11

GIS File:	Drawn By: T. Cota	Date: 10/03/11	Project No. 0120450



SOURCE: Base map provided by Wharf Resources (U.S.A), Inc., May 2008.

LEGEND

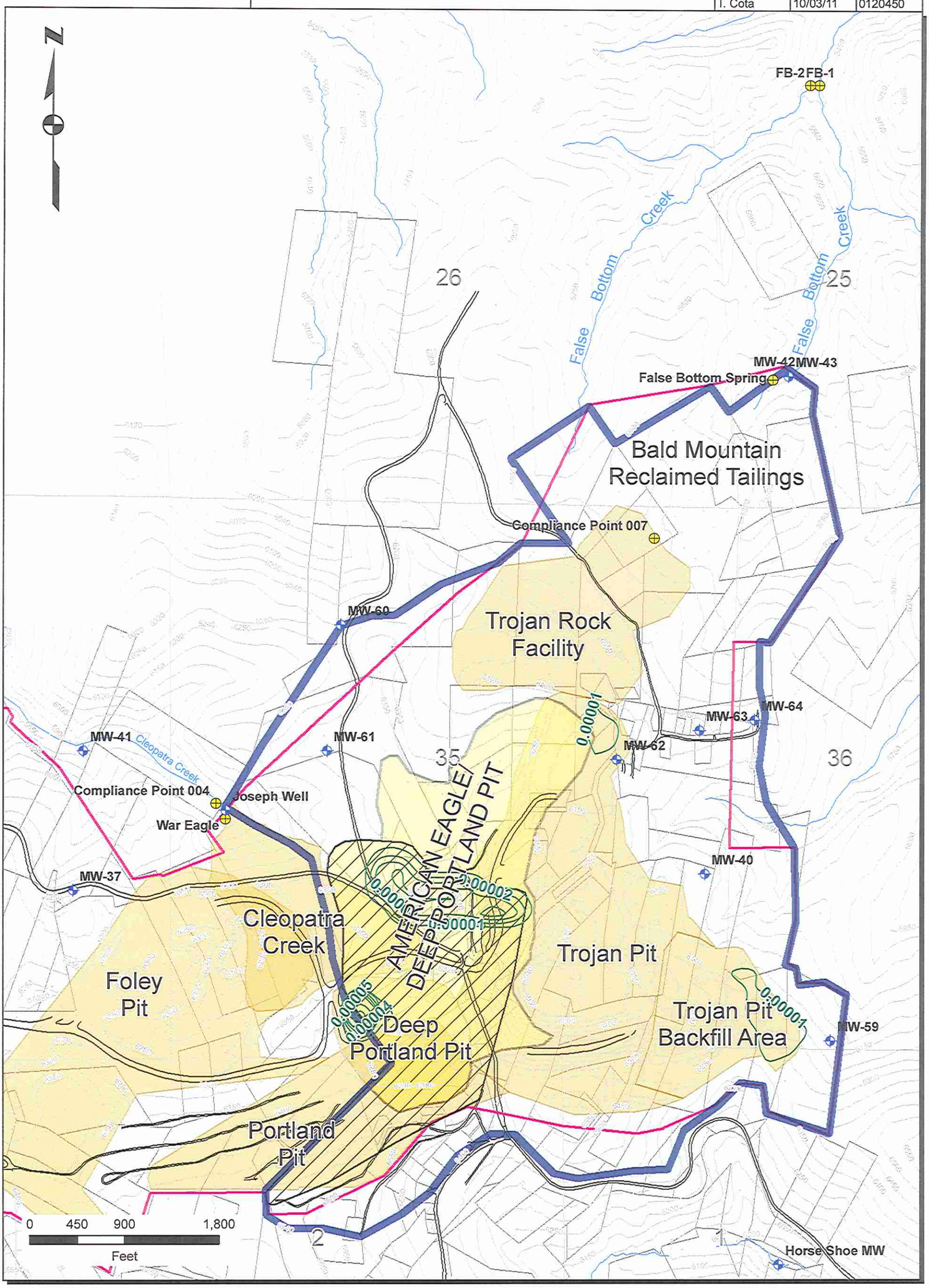
- Nitrate Concentration (mg/L) - Year 2060
- Spent Ore Disposal Area
- American Eagle/Deep Portland Pit
- Monitoring Well
- Surface Water Monitoring Station
- Roads
- Streams
- Wharf Land Ownership
- Mining Permit Boundary
- Proposed Perimeter of Operational Pollution

Figure X-3

Revised Nitrate Concentration Solution - Year 2060
Precambrian Bedrock (Layer 5)
Wharf Mine
Wharf Resources
10928 Wharf Road
Lead, South Dakota

ERM 10/11

GIS File:	Drawn By: T. Cota	Date: 10/03/11	Project No. 0120450



SOURCE: Base map provided by Wharf Resources (U.S.A), Inc., May 2008.

LEGEND

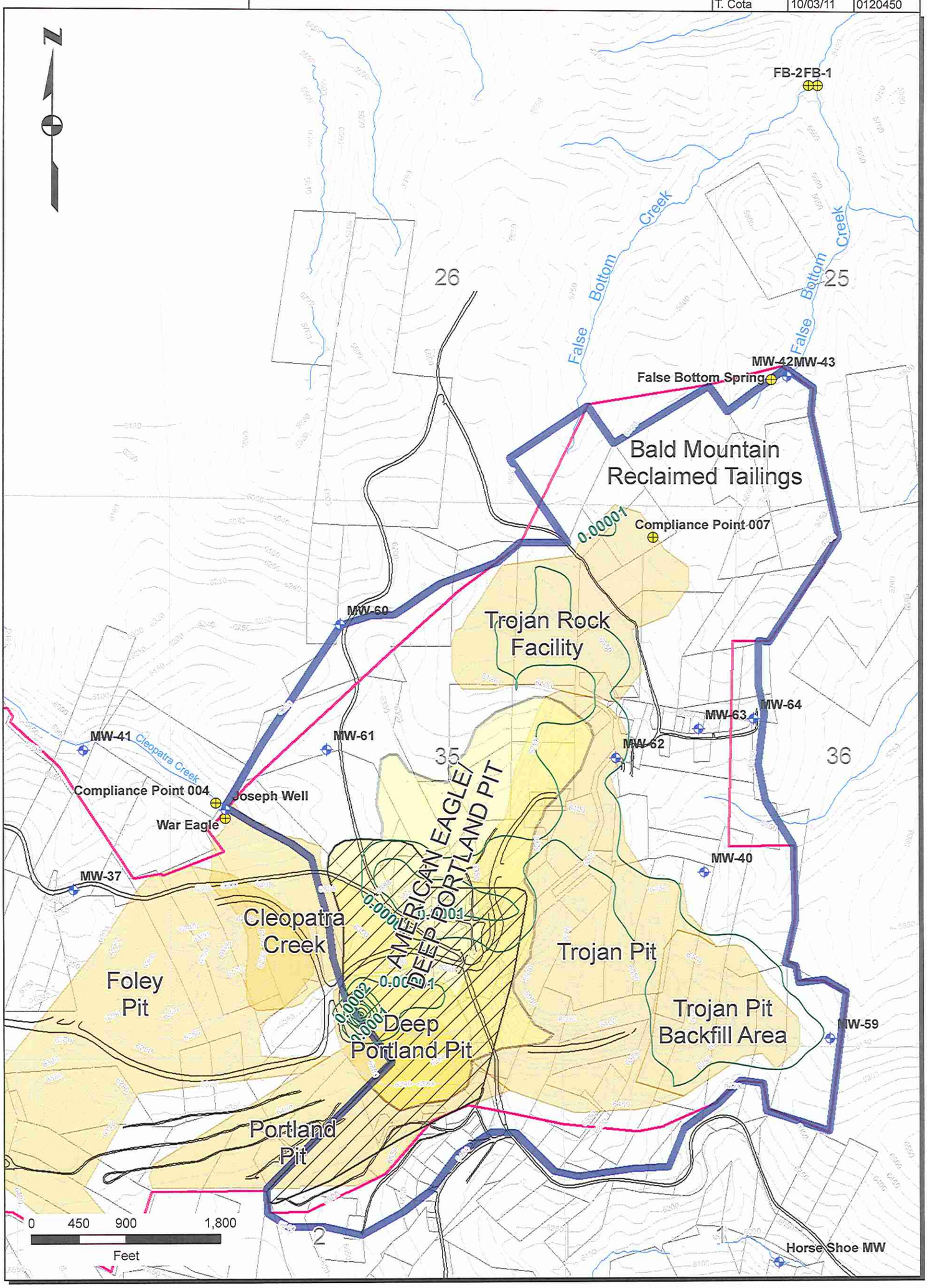
- Arsenic Concentration (mg/L) - Year 2020
- Spent Ore Disposal Area
- American Eagle/Deep Portland Pit
- Monitoring Well
- Surface Water Monitoring Station
- Roads
- Streams
- Wharf Land Ownership
- Mining Permit Boundary
- Proposed Perimeter of Operational Pollution

Figure X-4

Revised Arsenic Concentration Solution - Year 2020
Precambrian Bedrock (Layer 5)
Wharf Mine
Wharf Resources
10928 Wharf Road
Lead, South Dakota

ERM 10/11

GIS File:	Drawn By: T. Cota	Date: 10/03/11	Project No. 0120450



SOURCE: Base map provided by Wharf Resources (U.S.A), Inc., May 2008.

LEGEND

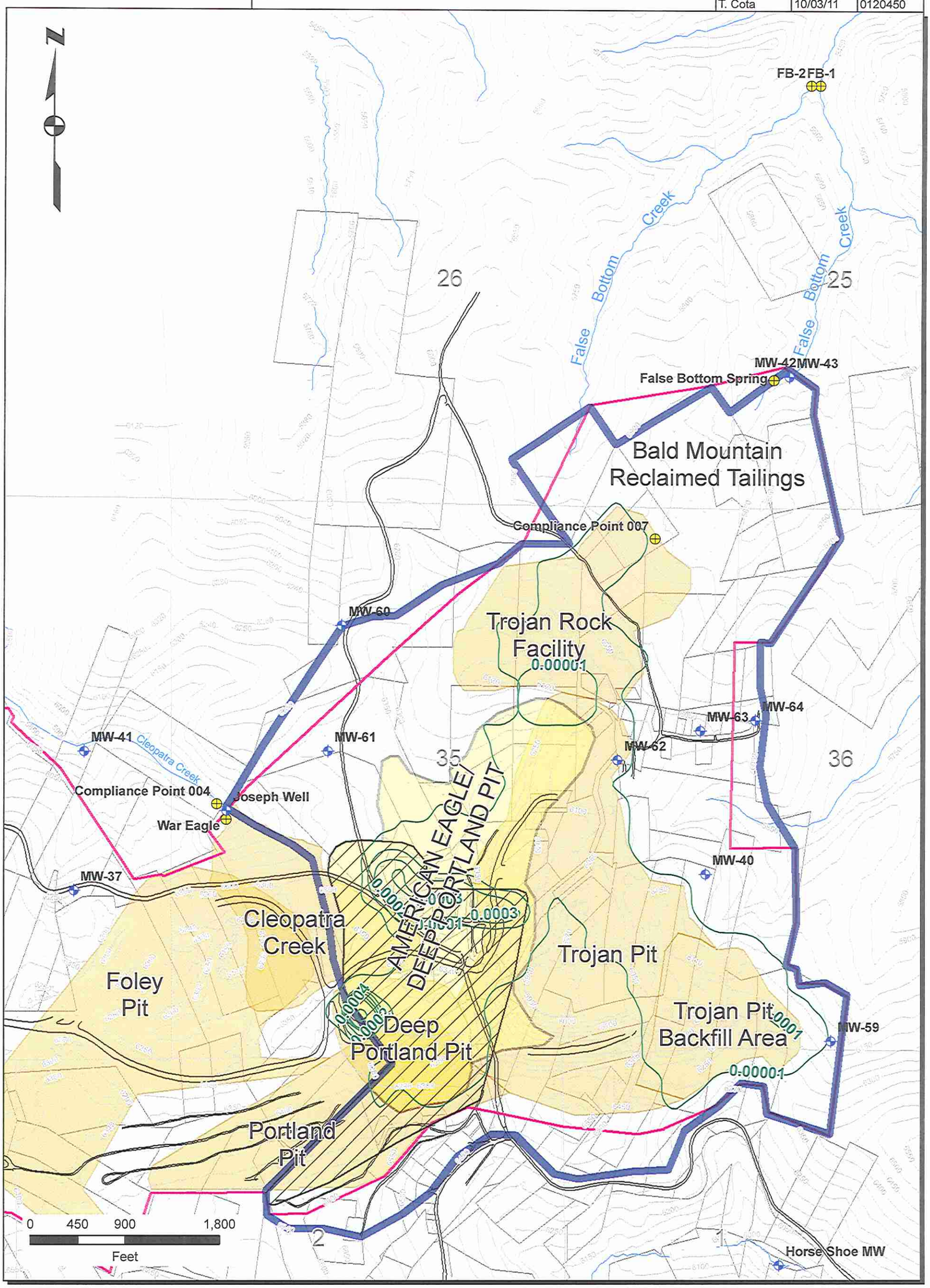
- Arsenic Concentration (mg/L) - Year 2020
- Spent Ore Disposal Area
- American Eagle/Deep Portland Pit
- Monitoring Well
- Surface Water Monitoring Station
- Roads
- Streams
- Wharf Land Ownership
- Mining Permit Boundary
- Proposed Perimeter of Operational Pollution

Figure X-5

Revised Arsenic Concentration Solution - Year 2040
Precambrian Bedrock (Layer 5)
Wharf Mine
Wharf Resources
10928 Wharf Road
Lead, South Dakota

ERM 10/11

GIS File:	Drawn By: T. Cota	Date: 10/03/11	Project No. 0120450



SOURCE: Base map provided by Wharf Resources (U.S.A), Inc., May 2008.

LEGEND

- Arsenic Concentration (mg/L) - Year 2020
- Spent Ore Disposal Area
- American Eagle/Deep Portland Pit
- Monitoring Well
- Surface Water Monitoring Station
- Roads
- Streams
- Wharf Land Ownership
- Mining Permit Boundary
- Proposed Perimeter of Operational Pollution

Figure X-6

Revised Arsenic Concentration Solution - Year 2060
Precambrian Bedrock (Layer 5)
Wharf Mine
Wharf Resources
10928 Wharf Road
Lead, South Dakota

ERM 10/11