October 18, 2013

Geotechnical
Environmental
Water Resources
Ecological

Mr. Michael Friend, P.E.
Staff Engineer III
Special Projects Branch
Bureau of Corrective Actions
Nevada Division of Environmental Protection
2030 E. Flamingo Road, Suite 230
Las Vegas, Nevada 89119-0818

Re: Titanium Metals Corporation
Henderson, Nevada Facility
NDEP Facility ID # 000537
Proposed Design Changes for First Water-Bearing Zone Groundwater Remediation Program and Response to NDEP Comments Dated September 18, 2013

Dear Mr. Friend:

Titanium Metals Corporation (TIMET) is in receipt of the Department's letter dated September 18, 2013 presenting comments on the above-captioned submittal. On behalf of TIMET, GEI Consultants is pleased to submit the revised deliverable (below) which contains TIMET's response to these comments (Attachment A).

INTRODUCTION

On June 20, 2013, a meeting between representatives of NDEP, TIMET, PCC and GEI was held at the TIMET Facility in Henderson, Nevada. The purpose of the meeting was to discuss potential changes to the existing groundwater remediation system design for the TIMET Facility. Prior to the meeting, GEI conducted a review of the existing design and developed recommendations for modifications. This submittal presents the recommended design changes in detail for NDEP review and approval.

Briefly, the proposed design changes are as follows:

1. Barrier wall alignment: The western portion of the alignment of the barrier wall (slurry wall) is altered to more closely parallel the northern property boundary (the bend to the south was eliminated), and the slurry wall was extended approximately 300 feet further to the east.
2. Barrier wall profile: The slurry wall depth is increased to penetrate deeper into the Upper Muddy Creek formation (UMCf).
3. Barrier wall hydraulic conductivity objective is 1×10^{-6} cm/sec.
4. The "effective top" of the slurry wall occurs at 20 feet below ground surface (bgs).
5. Groundwater extraction is from a line of 16 extraction wells screened in the Quaternary alluvium (Qal) and extending approximately 3 to 5 feet into the UMCf.

GEI Consultants, Inc.
90B John Muir Drive, Suite 104, Amherst, NY 14228
716.204.7154

6. For an interim period of approximately 2 years during which time the metals/dissolved solids groundwater treatment units will be designed, procured and constructed, treated groundwater discharge will be to a series of temporary injection trenches located within the Qal along the downgradient side of the slurry wall.

The proposed recharge trenches are located to recharge groundwater within the central portion of the total dissolved solids (TDS) plume. The injection will be a temporary condition lasting no longer than two years. In the area of the former Beta Ditch and Northwest Ditches, post-excavation soil sampling data will be compared to LSSLs. TIMET will review these data with respect to the placement of the recharge trenches. Decisions regarding recharge trench alignment adjustments, if necessary, would be made in concert with NDEP.

These are the only changes to the current design being proposed by TIMET at this time. Additional details are provided below.

MODIFICATION 1: BARRIER WALL ALIGNMENT

The proposed slurry wall alignment is shown on Drawing 01. Compared to the previous design, the western portion of the barrier wall was straitened to parallel the northern property line. This places the barrier wall downgradient of potential impacts (if any) which could be associated with the Northern Storage Area and generally will result in a barrier as close to the downgradient perimeter of the property as can be practically achieved. Repositioning of the west end of the slurry wall to more closely align with the northern site perimeter is expected to have little effect on the efficacy of capture efficiency as inferred in the Remedial Alternatives Study (RAS) previously submitted by TIMET (September 15, 2008). The hydraulic effect of the change proposed is to create the physical barrier and hydraulic depression as close to the downgradient perimeter of the site as possible. The effectiveness of the combined physical/hydraulic barrier provided by the slurry wall and extraction system will be equivalent to the prior design with respect to preventing groundwater flow through the barrier. However, since the orientation of the proposed (straightened) slurry wall is somewhat less parallel to the natural unstressed equipotentials (compared to the prior design), extraction rates at the west end of the wall may be slightly higher in order to prevent flow around the wall to the west. The westernmost extraction wells will be operated accordingly.

The barrier wall is also extended approximately 300 feet to the east. This extends the eastern extent of the physical barrier as much as allowable without de-energizing power lines supplying the Facility. By extending the slurry wall to the east, the hydraulic depression in this part of the property can be deepened without excessive pumping. The objective is to extend the capture zone to encompass the eastern margin of the contaminant plumes without pumping from extraction wells east of the eastern terminus of the slurry wall. The capture zone to the east is targeted to extend to the vicinity of monitoring well TIMETMW-4. TIMET recognizes that it will be required to demonstrate adequate containment to the east and may be required to add additional monitoring wells and/or extraction wells in the future.

MODIFICATION 2: BARRIER WALL PROFILE

The proposed slurry wall profile is shown on Drawings 02 and 03. GEI's objective in redesigning the key profile of the barrier is to provide a more uniform gently sloping base which is keyed into the UMCf below the screened interval of the extraction wells to be pumped. The previous design provides for a more variable base which attempts to mimic the irregular surface of the Qal/UMCf contact (see Drawings 02 and 03).

The modified wall as shown on Drawings 02 and 03 extends deeper into the UMCf and should provide an improved barrier in the upper portion of the UMCf. Combined with the Qal pumping, upward vertical gradients from the UMCf to the Qal will increase in magnitude.

The combination of the vertical barrier extending deeper in to the UMCf (increasing the head within the UMCf on the upgradient side of the wall) and groundwater extraction from the Qal and upper few feet of the UMCf (decreasing head within the Qal on the upgradient side of the slurry wall) will increase the magnitude of the upward hydraulic gradient from the UMCf to the Qal.

MODIFICATION 3: BARRIER WALL HYDRAULIC CONDUCTIVITY

TIMET proposes that the hydraulic conductivity objective be increased from the value of 1×10^{-7} cm/sec (as specified in the previous design) to 1×10^{-6} cm/sec. The higher hydraulic conductivity will not significantly lessen the performance of the physical/hydraulic barrier as the head loss across the wall (in either direction) cannot be sustained at more than about 3 feet (given the small saturated thickness and high hydraulic conductivity of the Qal). Therefore, the driving force for water flow through the barrier wall is limited by a maximum hydraulic gradient of approximately 1 ft/ft.

The purpose of the slurry wall is to reduce the rate of groundwater extraction required to create a hydraulic barrier. Higher hydraulic conductivity of the slurry wall equates to higher flows required from the extraction wells to achieve containment. TIMET has agreed to extract groundwater at a rate sufficient to maintain the hydraulic barrier behind the slurry wall.

The proposed hydraulic conductivity of 1×10^{-6} cm/sec is consistent with what has been required at the adjacent NERT Site.

MODIFICATION 4: EFFECTIVE TOP OF BARRIER WALL

The effective top of the slurry wall is specified to be 20 feet bgs (Drawing 02). It was not specified in the previous design. By effective top, we are not referring to the actual top of the slurry mixture, which will be brought to the ground surface. The effective top simply refers to the level below which the Construction Quality Assurance (CQA) testing will be performed (and where the hydraulic conductivity criteria will be attained).

MODIFICATION 5: EXTRACTION WELL NETWORK FOR WATER-BEARING ZONE 1

The proposed design specifies pumping from 16 groundwater extraction wells which screen the Qal and penetrate approximately 3 to 5 feet into the UMCf. The proposed extraction well line is shown on Drawing 01. It consists of 12 existing extraction wells installed from November 2009 through January 2010, and 4 wells which will be re-installed along the modified western end of the slurry wall.

The previous design specified a line of additional extraction wells screened only in the MCf, some to depths of 80 feet or more below the Qal/UMCf contact. The proposed design eliminates these wells.

TIMET believes the proposed design modification complies with the ROD in that extraction wells will pump from the Qal and from the uppermost portion of the xMCf. The above-referenced RAS presents water balance calculations indicating remediation of the xMCf utilizing the natural and induced upward gradients would be effective while making efficient use of existing conditions at the site. Off-site horizontal groundwater flow in the Qal was calculated in the RAS to be 30.9 gpm. Off-site horizontal flow in the xMCf was calculated to be 0.56 gpm. The xMCf accounts for less that 2% of the combined off-site horizontal flow in the first WBZ at the downgradient site boundary. Flow upward, through the xMCf to the Qal, was calculated to be 14.6 gpm, exceeding horizontal flow by a factor of 26. The water balance suggests 98% of the off-site groundwater flow in the first WBZ can be controlled by pumping from the Qal. Given the lower chemical concentrations in the xMCf, the control of chemical migration (on a mass basis) would be higher than 98%.

The contaminants consistently exceeding BCLs in deeper samples from the xMCf/UMCf are perchlorate and chloroform. The major sources of both these chemicals are located off-site to the west of TIMET. The 17 xMCf/UMCf extraction wells included in the previous design are screened up to 80 feet below the Qal/xMCf contact. It is certainly open to question whether these wells are appropriate for remediation of the first WBZ. TIMET notes that there has been no effort on the sites located to the west to directly pump groundwater from this depth. Therefore, to the extent perchlorate and chloroform have migrated horizontally to TIMET from the west, this migration would only be increased by pumping from deep xMCf/UMCf extraction wells located on the TIMET property.

The proposed extraction well network design (16 Qal extraction wells partially penetrating the UMCf) coupled with the deeper penetration of the barrier wall is expected to enhance the natural upward hydraulic gradients from the UMCf while posing no risk of increasing contaminant levels in the UMCf.

MODIFICATION 6: TEMPORARY DISCHARGE OF TREATED GROUNDWATER

There is a current lack of evaporation capacity at the TIMET Facility and no practical means to dispose of reverse osmosis (RO) reject streams that do not involve evaporation as a final treatment step. The TIMET Facility treats for dissolved solids as part of its manufacturing operations (high TDS wastewater streams). Currently, evaporation capacity at the facility is unable to meet the facilities wastewater treatment requirements. Additional evaporation ponds are planned to the extent practical based on the available land, but these alone will not provide sufficient evaporation capacity to handle groundwater and production requirements. TIMET has established the implementation of evaporation systems capable of handling all RO reject streams (including groundwater) as a high priority. Thermal evaporation and crystallization systems are currently being evaluated and the

Facility has established a schedule to have the evaporation systems operational in 2015.

Treatment for total dissolved solids is a key component of the groundwater remediation system. However, rather than delay start-up of the extraction system, TIMET has proposed to install and start-up the extraction system as scheduled during the spring of 2014. Extracted groundwater would be treated by air stripping and the treated water would be recharged to the Qal on the downgradient side of the slurry wall under an Underground Injection Control (UIC) Permit issued by NDEP. As indicated above, sampling data generated from the Beta Ditch and Northwest Ditches excavation project will be reviewed by TIMET and discussed with NDEP prior to finalization of the recharge trench locations.

The UIC discharge would be a temporary condition. In 2015, when the facility evaporation system is operational, the groundwater would be pumped from the air stripper to the RO unit located within (or in the vicinity of) the facility's Water Conservation Facility for dissolved solids treatment. At that time, and thereafter, the treated groundwater would be discharged via the Facility's NPDES permit and use of the injection trenches would be terminated. The UIC Permit Application has been submitted to NDEP.

The layout of the proposed injection trenches are shown on Drawing 01. Drawings 04 and 05 present construction details for the injection trenches.

Upon your authorization, final design and construction of the slurry wall would proceed according to schedule. Thank you for your consideration of these revisions.

Sincerely yours,
GEI CONSULTANTS, INC.

Kelly R. McIntosh, Ph.D., P.E.

George Onorato, P.E.

Enclosure

JURAT

I hereby certify that I am responsible for the services described in this document and for the preparation of this document. The services described in this document have been provided in a manner consistent with the current standards of the profession and to the best of my knowledge comply with all applicable federal, state and local statutes, regulations and ordinances.

For the services provided and attested to with this Jurat including preparation of this proposal to alter the design of the TIMET WBZ-1 groundwater remediation system:

GEI CONSULTANTS, INC.
Kelly R. McIntosh
Senior Consultant
Nevada Certified Environmental Manager
EM No. 2199; Expires September 24, 2015
Date Signed: October 18, 2013

cc:
Richard Pfarrer – TIMET, hard copy and on disk
J.D. Dotchin, Nevada Division of Environmental Protection, Las Vegas, Nevada, on disk
Greg Lovato, Nevada Division of Environmental Protection, Carson City, Nevada, on disk
BMI Compliance Coordinator, Nevada Division of Environmental Protection, Las Vegas, Nevada, hard copy and on disk
Nevada Division of Environmental Protection, c/o McGinley and Associates, Inc., 815 Maestro Drive, Reno, Nevada 89511, hard copy only
Nevada Division of Environmental Protection, c/o McGinley and Associates, Inc., 6280 South Valley View Boulevard, Suite 604, Las Vegas, Nevada 89118, hard copy and on disk
Mark Paris – BRC, by electronic mail
Ranajit Sahu – BRC, by electronic mail
Ed Modiano – de maximis, by electronic mail
Joe Kelly – Montrose, by electronic mail
Paul Sundberg – representing Montrose, by electronic mail
Lynne Preslo – representing Montrose, by electronic mail
Brian Waggle – representing Montrose, by electronic mail
Curt Richards – Olin, by electronic mail
Chuck Elmendorf – Stauffer, by electronic mail
Nick Pogoncheff – representing Stauffer, by electronic mail
George Crouse – Syngenta, by electronic mail
Jay Steinberg – bankruptcy trustee, by electronic mail
Allan DeLorme – ENVIRON International Corp, by electronic mail
Mark Travers - ENVIRON International Corp, by electronic mail
Jeff Gibson – AMPAC, by electronic mail

Drawings

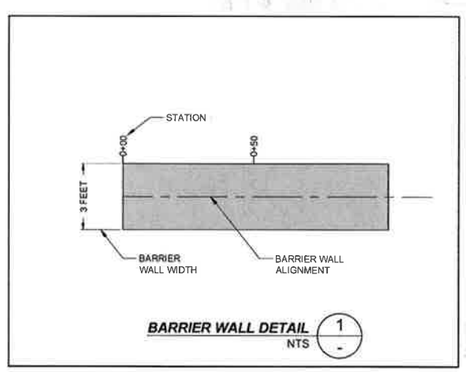
01 Barrier Wall Overview and Extraction Well Location Plan

02 Barrier Wall Profile STA 0+00 to STA 12+60

03 Barrier Wall Profile STA 12+60 to STA 24+03

04 Injection Trench Detail

05 Injection Trench Section



LEGEND:

- PROPERTY LINE
- WALL ALIGNMENT
- EWQal-07 — EXTRACTION WELL
- TMSB-139, TMPZ-108 — EXPLORATION - BY OTHERS
- PDI-04 — EXPLORATION - BY GEI
- 1 — CONSTRUCTION CONTROL POINT

CONSTRUCTION CONTROL POINTS

POINT #	NORTHING	EASTING	ELEVATION
1	26721012.74	826778.78	1737
2	26720627.39	827637.66	1750
3	26720633.37	828868.24	1765
4	26720432.79	829117.09	1775

EXTRACTION WELLS

WELL ID	NORTHING	EASTING	ELEVATION
*EWQal-01	26720412	828845	1737
*EWQal-02	26720308	828953	1737
*EWQal-03	26720247	829090	1744
*EWQal-04	26720185	829227	1743
*EWQal-05	26720124	829363	1748
EWQal-06	2672031	829535	1748
EWQal-07	26719986	826666	1749
EWQal-08	26719921	829796	1752
EWQal-09	26719857	829925	1755
EWQal-10	26719857	830051	1759
EWQal-11	26719719	830204	1761
EWQal-12	26719658	830330	1764
EWQal-13	26719585	830475	1766
EWQal-14	26719504	830577	1767
EWQal-15	26719420	830673	1771
EWQal-16	26719310	830807	1775

NOTE:
WELLS MARKED WITH AN (*) REPRESENT RELOCATED WELLS. COORDINATES LISTED IN TABLE ARE APPROXIMATE AND ARE TO BE DETERMINED.

0 100 200
SCALE, FEET

Attention:
0 1"
If this scale bar does not measure 1" then drawing is not original scale.

NO.	DATE	ISSUE/REVISION	APP
1		NOT FOR CONSTRUCTION	GAO

Designed: K. McIntosh
Checked: G. Onorato
Drawn: T. Morton
Submittal Date: 10/16/2013

GEI Consultants
1620 I Street
N.W. Suite 800
Washington, DC 20006
202-628-6510

TITANIUM METALS CORPORATION
181 NORTH WATER STREET
BLACK MOUNTAIN
INDUSTRIAL CENTER
HENDERSON, NEVADA 89015

GEI Project 1323080

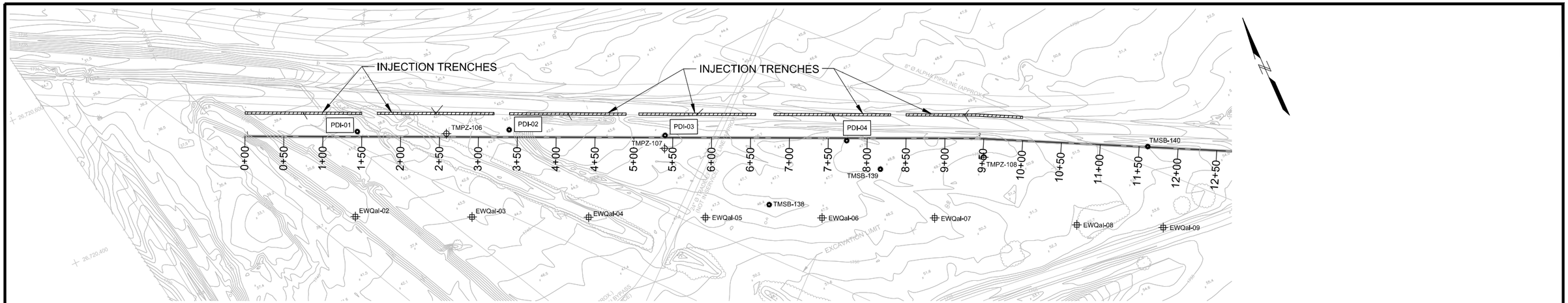
REMEDIAL DESIGN PLAN

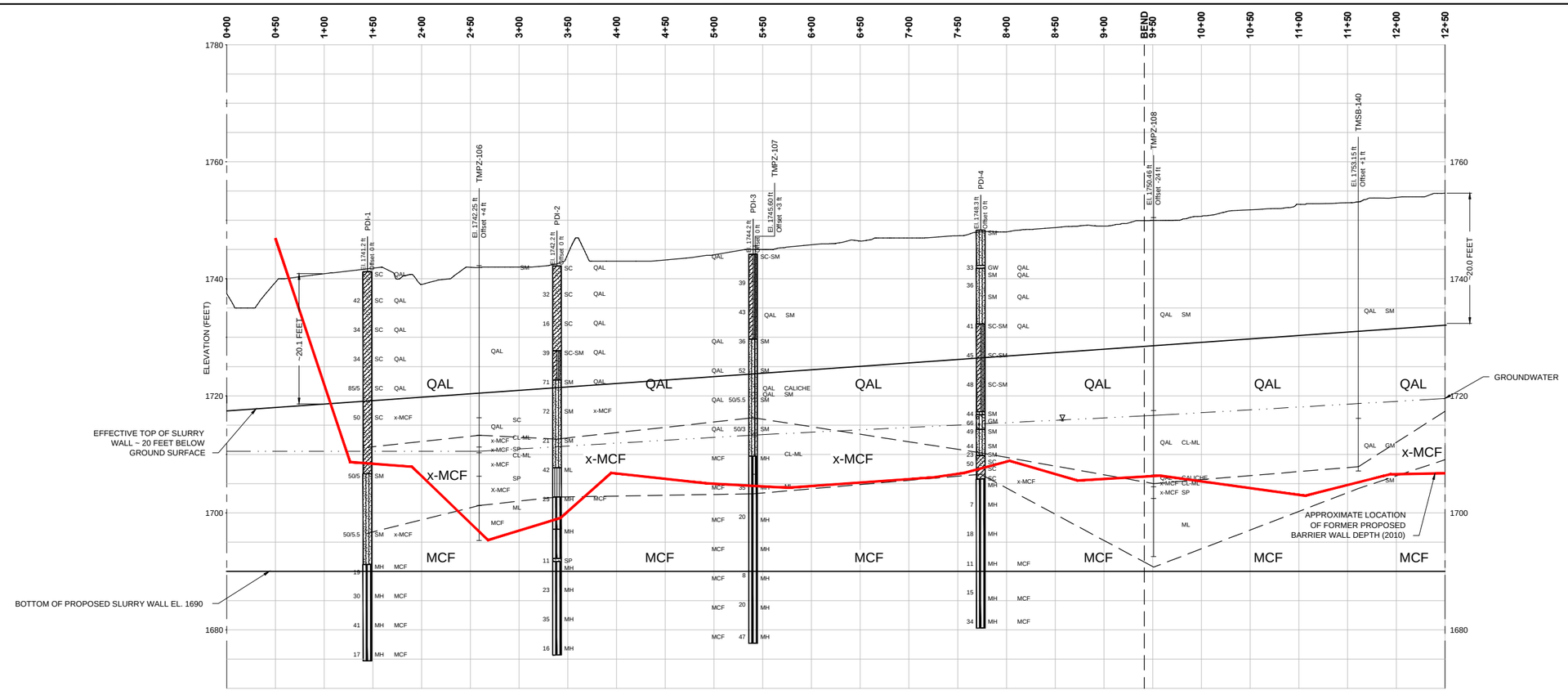
BARRIER WALL OVERVIEW AND EXTRACTION WELL LOCATION PLAN

DWG. NO. 01

REV 0

X:\2013\1323080 - TIMET\CAD\Drawings\C1 Barrier Wall Plan



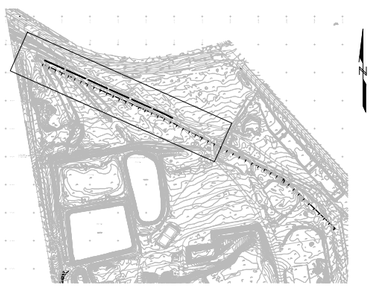


LITHOLOGY:

- MODERATE TO HIGHLY PLASTIC ORGANIC SILTS AND CLAYS (OH)
- FAT CLAY (CH)
- ELASTIC SILT (MH)
- LOW PLASTICITY ORGANIC SILTS AND CLAYS (OL)
- LEAN CLAY OR SANDY LEAN CLAY (CL)
- SILT OR SANDY SILT (ML)
- CLAYEY SAND (SC)
- SILTY SAND, SILTY SAND WITH GRAVEL (SM)
- POORLY GRADED SAND, POORLY GRADED SAND WITH GRAVEL (SP)
- WELL GRADED SAND, WELL GRADED AND WITH GRAVEL (SW)
- CLAYEY GRAVEL (GC)
- SILTY GRAVEL, SILTY GRAVEL WITH SAND (GM)
- POORLY GRADED GRAVEL, POORLY GRADED GRAVEL WITH SAND (GP)
- WELL GRADED GRAVEL, WELL GRADED GRAVEL WITH SAND (GW)
- WATER LEVEL READING AT TIME OF DRILLING

SM	SILTY SAND
SC	CLAYEY SAND
CL-ML	SILTY CLAY
SP	POORLY GRADED SAND
CALICHE	CALICHE
QAL	QUARTERNARY ALLUVIUM STRATUM
x-MCF	TRANSITIONAL MUDDY CREEK FORMATION
MCF	MUDDY CREEK FORMATION

SCALE, FEET
NOTE: 6X VERTICAL EXAGGERATION



KEY MAP

NOTES:

1. ELEVATIONS ARE APPROXIMATE.
2. SOIL LITHOLOGY SHOWS A SIMPLIFICATION OF THE SUBSURFACE.
3. INTERPOLATED STRATIGRAPHY LINES HAVE BEEN ADDED FOR VISUAL PRESENTATION ONLY, AND SHOULD NOT BE RELIED UPON FOR ASSESSMENT AND/OR DESIGN PURPOSES AS ACTUAL SITE CONDITIONS MAY DIFFER.

Attention: 0 1"
If this scale bar does not measure 1" then drawing is not original scale.

NO.	DATE	ISSUE/REVISION	APP
1	7/16/13	NOT FOR CONSTRUCTION	GAO

Designed: G. Onorato
Checked: G. Onorato
Drawn: D. Eddy
Submittal Date: 07/16/2013

GEI Consultants
1620 I Street
N.W. Suite 800
Washington, DC 20006
202-828-9510

TITANIUM METALS CORPORATION
181 NORTH WATER STREET
BLACK MOUNTAIN
INDUSTRIAL CENTER
HENDERSON, NEVADA 89015

GEI Project 1323080

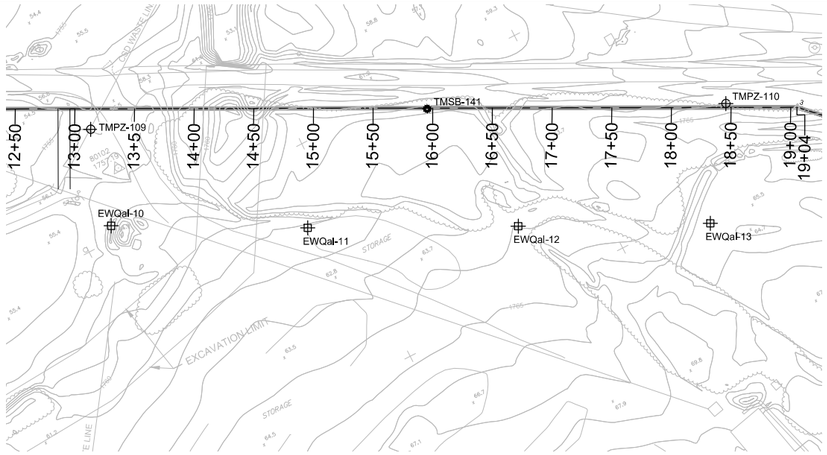
REMEDIAL DESIGN PLANS

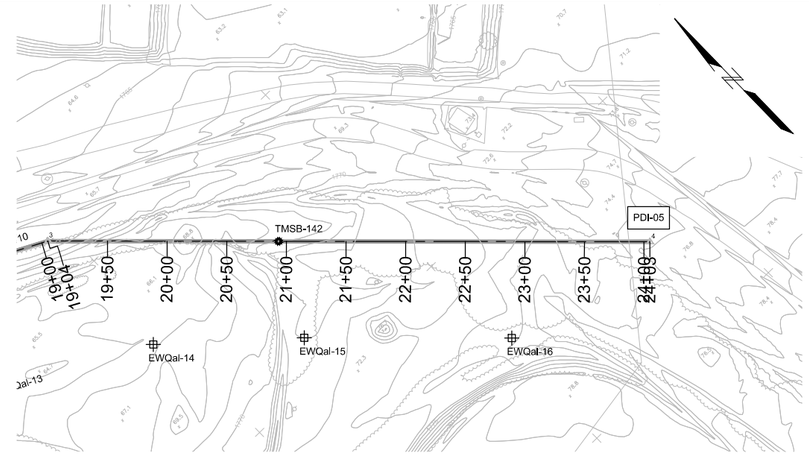
BARRIER WALL PROFILE
STA 0+00 TO STA 12+50

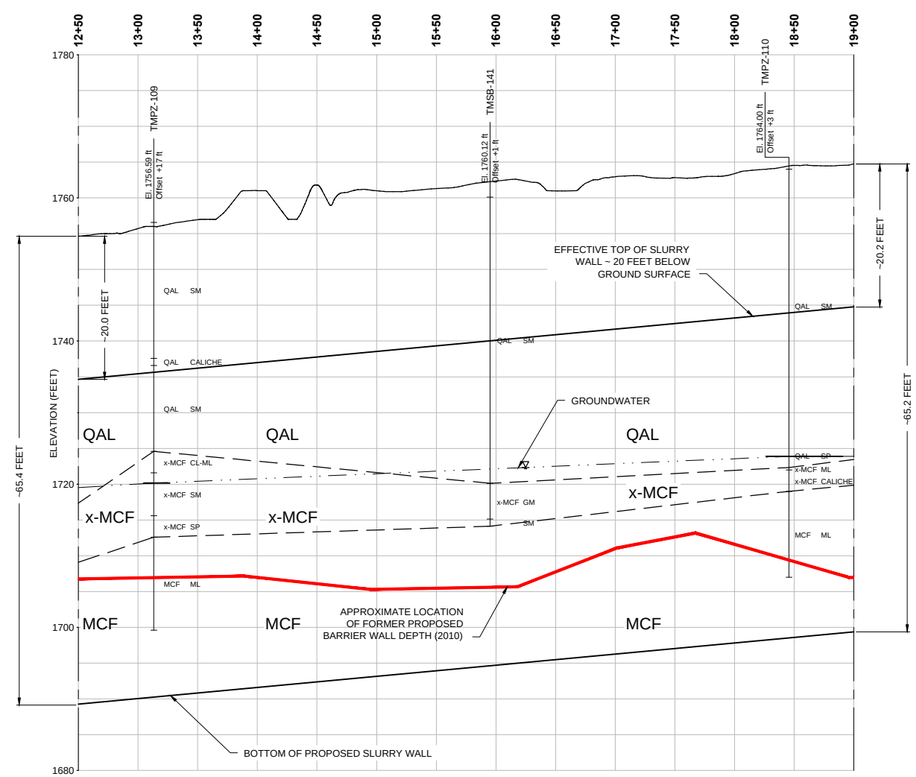
DWG. NO. 02
REV 0

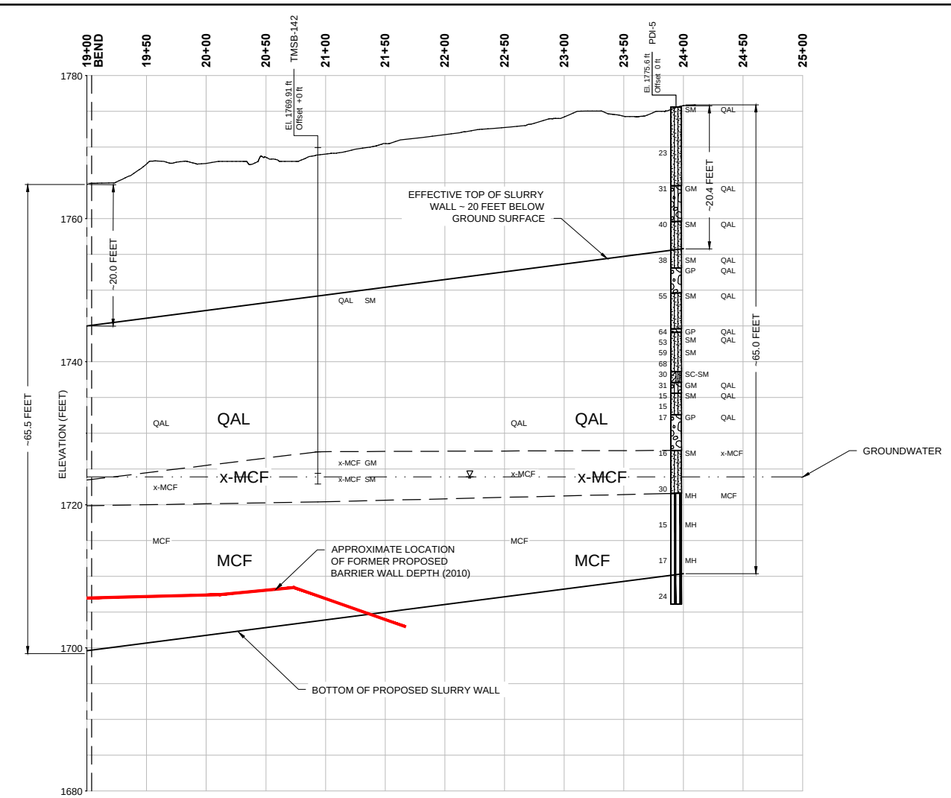
P:\WDC - 1323080 - TIMET\Civil\Production Drawings\Working Drawings\C7 Barrier Wall Plan_Profile With Previous Barrier Wall

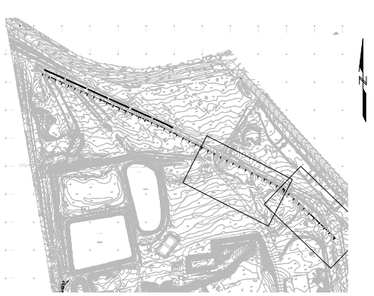
P:\WDC - 1323080 - TIMET\CIVIL\PRODUCTION DRAWINGS\WORKING DRAWINGS\C7 BARRIER WALL PLAN_PROFILE WITH PREVIOUS BARRIER WALL.DWG



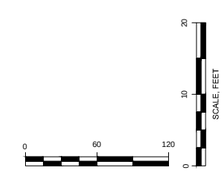








KEY MAP



Attention: If this scale bar does not measure 1" then drawing is not original scale.	NO.	DATE	ISSUE/REVISION	APP
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Designed: G. Onorato
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Drawn: D. Eddy
Submittal Date: 07/16/2013

GEI Consultants
1620 I Street
N.W. Suite 800
Washington, DC 20006
202-828-9510

TITANIUM METALS CORPORATION
181 NORTH WATER STREET
BLACK MOUNTAIN
INDUSTRIAL CENTER
HENDERSON, NEVADA 89015

GEI Project 1323080

REMEDIAL DESIGN PLANS

BARRIER WALL PROFILE
STA 12+50 TO STA 24+03

DWG. NO. 03

REV 0

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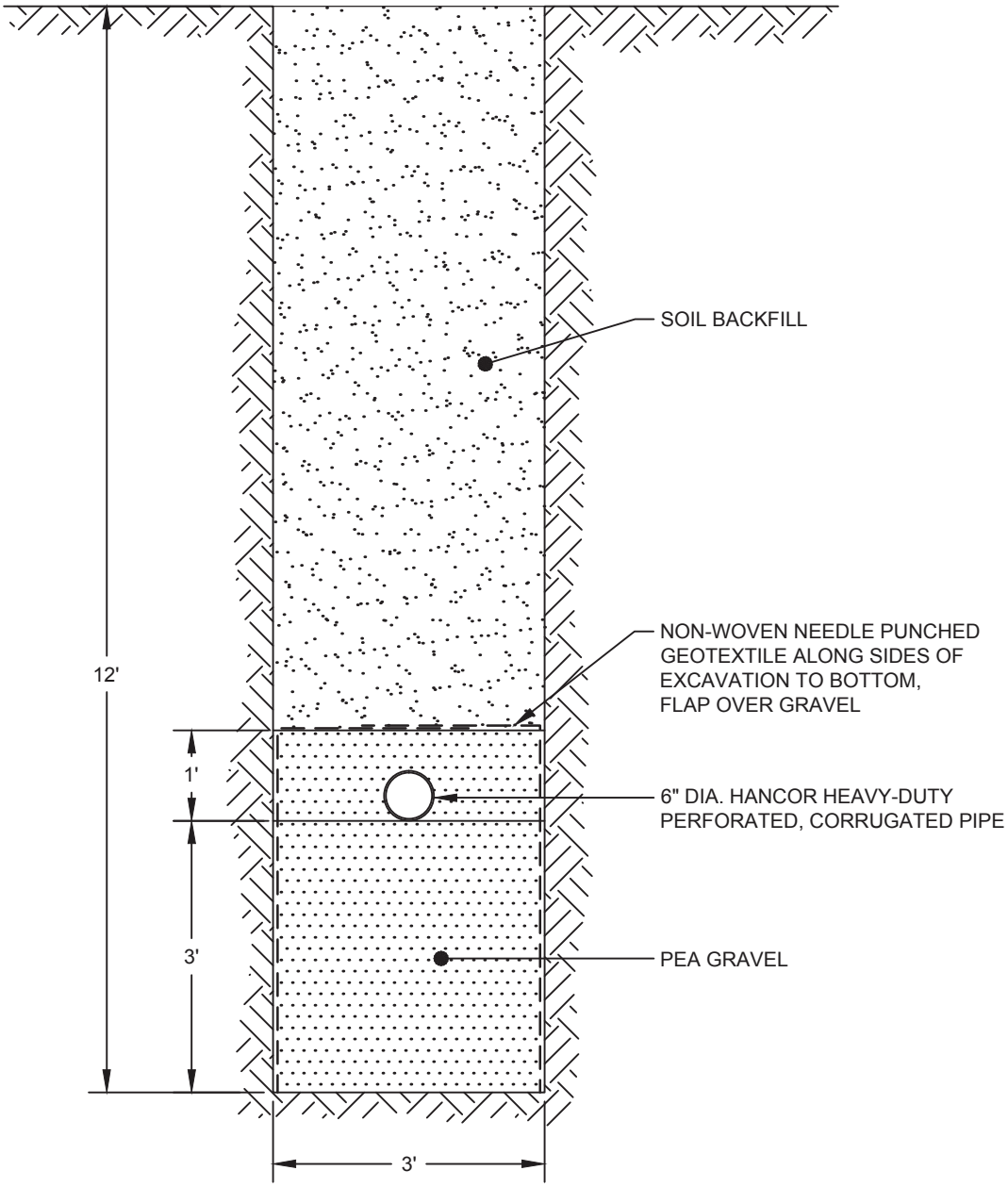
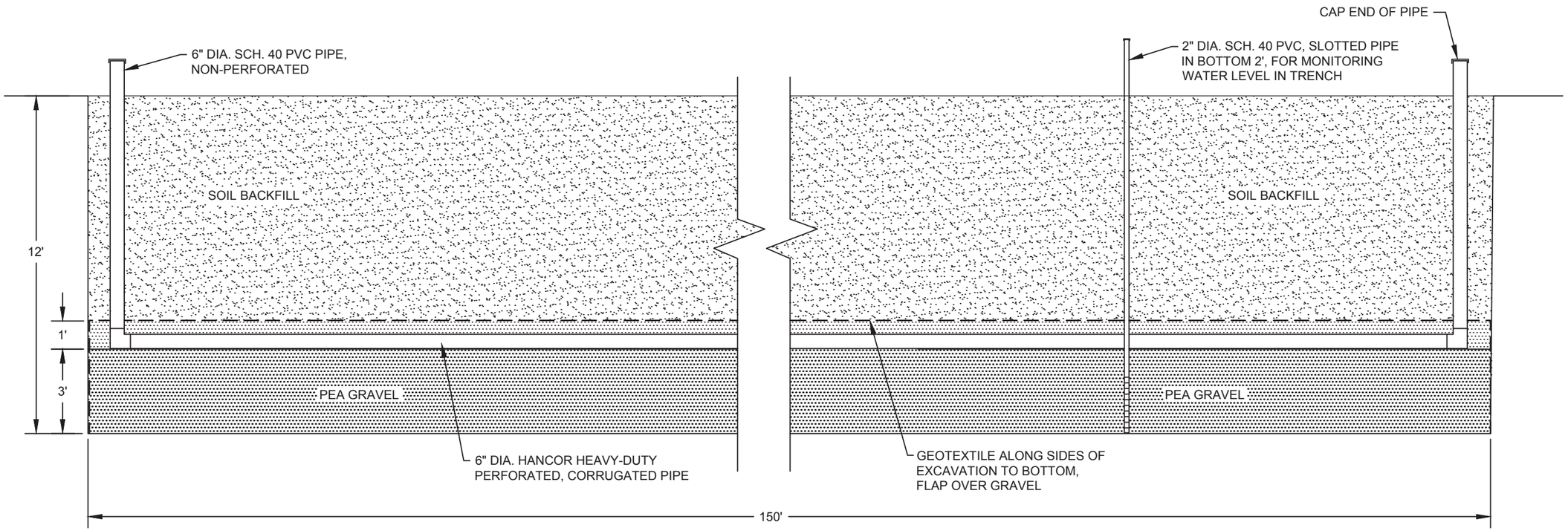


INJECTION TRENCH DETAIL

SCALE: 1"=2'

Titanium Metals Corporation Black Mountain Industrial Center	GEI Consultants	INJECTION TRENCH
181 North Water Street Henderson, Nevada	Project 1323080	July 2013 Drawing 04



INJECTION TRENCH SECTION

SCALE: 1"=4'

NOTES

1) INJECTION TRENCHES (6) WILL BE 150' LONG SEPARATED BY 20' OF NATIVE SOIL.

2) INJECTION TRENCHES (6) WILL BE LOCATED 30' DOWN GRADIENT OF SLURRY WALL UNLESS SITE CONDITIONS / POWER LINE OFFSET REQUIREMENTS FORCE A CHANGE IN A LOCATION.

Titanium Metals Corporation Black Mountain Industrial Center	GEI Consultants	INJECTION TRENCH
181 North Water Street Henderson, Nevada	Project 1323080	July 2013 Drawing 05

Attachment A

TIMET Response to NDEP Comments dated September 18, 2013

Attachment A

<u>NDEP Comment 1:</u> General Comment, in discussions between the NDEP and TIMET on September 17, 2013, it was agreed upon that TIMET could closely monitor the performance of the proposed revised system against NDEP guidelines and standards in response to NDEP's comments below. If the system was not demonstrating proper capture and containment, TIMET would be required to implement the portions of the original design that are being omitted in the proposed design changes such as the deeper extraction wells. Please note this may require additional monitoring in addition to what is proposed in the *Groundwater Remedial Action Operations and Maintenance Monitoring Sampling and Analysis Plan* dated August 2013; comments regarding monitoring will be provided in a separate review for that Deliverable.

<u>TIMET Response:</u> Noted.

<u>NDEP Comment 2:</u> Introduction, page 1, the Deliverable states that "For an interim period of approximately 2 years during which time the metals/dissolved solids groundwater treatment units will be designed, procured and constructed, treated groundwater discharge will be to a series of temporary injection trenches located within the Qa along the downgradient side of the slurry wall." Please explain how this change will affect the soil leaching to groundwater pathway and the recent changes to the Beta and Northwest Ditches excavation plan.

<u>TIMET Response:</u> The injection will be a temporary condition lasting no longer than two years. In the area of the former Beta Ditch and Northwest Ditches, post-excavation soil sampling data will be compared to LSSLs. TIMET will review these data with respect to the placement of the recharge trenches. Decisions regarding recharge trench alignment adjustments, if necessary, would be made in concert with NDEP.

<u>NDEP Comment 3:</u> Modification 1: Barrier Wall Alignment, page 2, TIMET should add clarifying discussions which explains why the extension of the barrier wall to the east is beneficial and how this relates to hydraulic control of the southeastern portion of the plume. For example, will hydraulic control absent the barrier wall still be relied upon or not? In addition, please add clarifying discussion as to why moving the barrier wall to the north is beneficial. How do these changes affect the groundwater flow regime and inferred capture efficacy as detailed in the Remedial Alternatives Study (RAS) and supporting Deliverables?

<u>TIMET Response:</u> The clarifying discussions have been added.

<u>NDEP Comment 4:</u> Modification 2: Barrier Wall Profile, page 2, it would be helpful to show the previous slurry wall depth on the referenced figures to fully understand and support TIMET's statements. No information has been provided to date that supports TIMET's statements that this redesign will increase the magnitude of the vertical gradients from the Upper Muddy Creek formation (UMCf) to the Quaternary alluvium (Qal). One of the reasons that pumping within the transition Muddy Creek formation (xMCf) was part of the original design was due to the presence of contaminants and the very limited upward gradients that could be induced by the Qal pumping. Please explain how this modification is consistent with the ROD and the RAS.

TIMET Response: The referenced figures have been revised to show the previous slurry wall depth.

The 1 X 10^{-6} cm/s vertical barrier extending deeper in to the UMCf will cause an increase in head within the UMCf on the upgradient side of the wall. The groundwater extraction from the Qal and upper few feet of the UMCf will be operated to create a hydraulic depression within these units. As a result, the magnitude of the upward hydraulic gradients will increase.

TIMET believes the proposed design modification complies with the ROD in that all extraction wells will pump from the Qal and from the uppermost portion of the xMCf. The RAS (Appendix B) presents water balance calculations indicating remediation of the xMCf utilizing the natural and induced upward gradients would be effective while making efficient use of existing conditions at the site. Off-site horizontal groundwater flow in the Qal was calculated to be 30.9 gpm. Off-site horizontal flow in the xMCf was calculated to be 0.56 gpm. The xMCf accounts for less that 2% of the combined off-site horizontal flow in the first WBZ at the downgradient site boundary. Flow upward, through the xMCf to the Qal, was calculated to be 14.6 gpm, exceeding horizontal flow by a factor of 26. The water balance suggests 98% of the off-site groundwater flow in the first WBZ can be controlled by pumping from the Qal. Given the lower chemical concentrations in the xMCf, the control of chemical migration (on a mass basis) would be higher than 98%.

The contaminants consistently exceeding BCLs in deeper samples from the xMCf/UMCf are perchlorate and chloroform. The major sources of both these chemicals are located off-site to the west of TIMET. The 17 xMCf/UMCf extraction wells included in the previous design are screened up to 80 feet below the Qal/xMCf contact. It is certainly open to question whether these wells are appropriate for remediation of the first WBZ. TIMET notes that there has been no effort on the sites located to the west to directly pump groundwater from this depth. Therefore, to the extent perchlorate and chloroform have migrated horizontally to TIMET from the west, this migration would only be increased by pumping from deep xMCf/UMCf extraction wells located on the TIMET property.

The text of the revised deliverable (Modifications 2 and 5) has been revised accordingly.

NDEP Comment 5: Modification 3: Barrier Wall Hydraulic Conductivity, page 2, please provide citations from other RODs and or decision documents for remedies which allow a hydraulic conductivity of 1E-6 cm/sec. Also, please discuss how this reduced hydraulic conductivity is expected to react with the extremely saline environments in the sub-surface at the site. No supporting documentation has been provided to support TIMET's assertions and calculations in this section. Please provide this supporting information in a revised Deliverable.

TIMET Response: Based on a memorandum from Northgate Environmental Management, Inc. to NDEP dated September 29, 2010, the hydraulic conductivity design criterion for the NERT slurry wall was 1E-6 cm/s. This criterion was attained at 3 of the 4 locations, reflecting the difficulty of slurry wall construction in the extremely saline environments. GEI is currently conducting long term compatibility studies to develop a mix design that will be stable in contact with site groundwater. We are confident we can construct a slurry wall meeting the 1E-6 cm/s design criterion. However, the consistent attainment of a lower hydraulic conductivity may not be feasible for the reasons NDEP notes.

The purpose of the slurry wall is to reduce the rate of groundwater extraction required to create a hydraulic barrier. Higher hydraulic conductivity of the slurry wall equates to higher flows required from the extraction wells. The deliverable included a simple one-dimensional flow calculation across the slurry wall using Darcy's Law with an assumed (inward) gradient to show the difference in required extraction rate (between slurry walls of 1E-6 cm/s and 1E-7 cm/s) will not be significant. However, since TIMET has agreed to extract groundwater at a rate sufficient to maintain the hydraulic barrier behind the slurry wall, this calculation is superfluous and has been removed from the deliverable.

<u>NDEP Comment 6:</u> Modification 5: Extraction Well Network for FWBZ, page 3, NDEP provides the following comments:

a. **This discussion appears to disregard the existence or significance of the xMCf. No documentation or calculations have been provided to support TIMET's statements. Please provide the necessary documentation and/or calculations to support TIMET's statements.**
b. **NDEP requests that an additional extraction well (EWQal-01) be added to the northwest of extraction well EWQal-02. NDEP and TIMET can discuss how this well might operate in guaranteeing the contaminant plume is fully contained.**
c. **The Deliverable states that "Pumping from wells screened in the MCf would not only reverse the current (unstressed conditions) upward gradients from the MCf to Qal but could induce migration from sites located to the west which do not pump from this zone." TIMET has previously documented that trespass SRCs have already migrated on-site from the west. Please explain how these proposed changes will protect against these chemicals from migration off-site to the north?**
d. **The Deliverable states that "The proposed extraction well network design (15 Qal extraction wells partially penetrating the UMCf) coupled with the deeper penetration of the barrier wall is·expected to enhance the natural upward hydraulic gradients from the UMCf while posing no risk of increasing contaminant levels in the UMCf." Please provide calculations and/or model to demonstrate the efficacy of vertical capture given the low hydraulic conductivity of the UMCf.**

<u>TIMET Responses:</u>

a. The existence of the xMCf was not disregarded and is acknowledged by TIMET. However, the discussion presented in the deliverable does accurately reflect a difference of opinion on the significance of the xMCf with respect to horizontal flow and contaminant transport. TIMET's response to NDEP Comment 4 (above) explains the logic for utilizing extraction wells screened in the Qal and penetrating into the upper few feet of the xMCf. The text of the deliverable has been modified accordingly.
b. TIMET agrees. The additional extraction well (EWQal-01) has been added to Drawing 01.
c. Based on the RAS (Appendix B) groundwater flow and chemical transport in the MCf is not likely to be significant. The upward flow induced by the proposed Qal/xMCf groundwater extraction system will reduce whatever migration does occur.
d. The statement quoted by NDEP is axiomatic. TIMET intends to demonstrate adequate containment based on operational data rather than theoretical and (necessarily) simplified simulations.

<u>NDEP Comment 7:</u> Modification 6: Temporary Discharge of Treated Groundwater, pages 3 and 4, NDEP provides the following comments:

a. **TIMET should briefly discuss that they have considered other possible interim or final measures such as construction of additional evaporation ponds and why they have chosen the proposed temporary discharge measure.**
b. **TIMET states that it is a "goal" to have the evaporation systems operational in 2015. NDEP requires a firm schedule and commitment to be established and submitted by the end of the year stating the groundwater remediation system will be fully functional and operational by discontinuing the temporary underground injection of the pretreated groundwater and will send the groundwater to an evaporation system by the end of 2015.**

<u>TIMET Responses:</u>

a. The text of the deliverable has been modified accordingly.
b. TIMET Agrees.