1829639

Golder Associates

October 25, 2016 Our Ref.: 1665790

Mr. Kerry Gee
United Park City Mines Company
7700 Marsac Avenue
PO Box 1450
Park City, Utah 84060

RE: STORAGE CAPACITY EVALUATION FOR CONTAINMENT OF MATERIALS AT THE UNITED PARK CITY MINES COMPANY'S RICHARDSON FLAT IMPOUNDMENT, PARK CITY, UTAH

Dear Kerry:

Golder Associates Inc. (Golder) is pleased to provide this letter summarizing the results of our feasibility level assessment of the volume of additional materials that can be consolidated at the United Park City Mines Company (UPCM) Richardson Flat Impoundment (Richardson Flat, or Impoundment).

1.0 SCOPE OF WORK

UPCM would like Golder to evaluate the quantity of additional materials that the Impoundment can accommodate.

Golder has completed the following activities:

- Previous site inspections have been conducted to review site conditions and constraints and potential future grading options.
- Golder has reviewed the Richardson Flat piezometer readings presented in an August 3, 2010 dated letter from Applied Geotechnical Engineering Consultants (AGEC).
- Golder has conducted a geotechnical assessment, based upon a review of available data from previous geotechnical investigations at Richardson Flat.
- A preliminary grading plan and fill isopach have been prepared to evaluate the storage capacity at the Richardson Flat Impoundment. A copy of this preliminary grading plan is provided with this letter report. The intent of providing this feasibility level design is to support advancing and ultimately finalizing an Impoundment grading plan.
- Golder has documented its evaluations in this letter.

A number of design constraints and site considerations have been identified, including the following:

- The park and ride facility has been constructed. An ACAD drawing file was provided by UPCM depicting the 2009 aerial topography, the constructed Park and Ride and the related constrained area limits.
- The approximate limits of a wetland area and future overflow channel location have been delimited based on the topographic constraints. The crest of the Impoundment will be sloped to the south (away from the wetland that is located inside the containment dike system).

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- The grading plan will incorporate geomorphic concepts to provide for a more natural looking landscape upon ultimate completion of closure and reclamation (C&R) activities.
- The north-northeast and southern boundary limits have been established by the location of the existing surface runoff diversion channel.
- A maximum slope design criteria of 3(H):1(V) has been established for compatibility with the long term C&R objectives. A 250-foot setback has been established upgradient of the retention embankment to mitigate for the potential development of excess pore pressures in this area.
- The plan contemplates vehicle access to most areas of the Impoundment, and no placement of fill on the Rail Trail.

2.0 GEOTECHNICAL REVIEW CONSIDERATIONS

Golder's Brent Bronson, P.E. conducted a geotechnical review and provided engineering recommendations for soil cover placement and a buttress design for the Richardson Flat Impoundment which is documented in a May 26, 2006 letter report to UPCM. The following information was reviewed by Golder.

- Technical reports by Dames & Moore conducted for both Noranda and Park City Ventures, which included:
  - Dames & Moore, 1974, Report of Embankment and Dike Requirements, Proposed Tailings Pond Development, near Park City, Utah: Consultants report prepared for Park City Ventures Corporation, March, 1974.
  - Dames & Moore, 1980, Report on Tailing Pond Investigation, near Park City, Utah: Consultants report prepared for Noranda Mining, Inc., November, 1980.
  - Dames & Moore, 1981, Possible Modifications to Construction Phasing Park City Tailing Pond, Consultants report prepared for Noranda Mining, Inc., November, 1980.
- Applied Geotechnical Engineering Consultants, Inc. (AGEC), 2001, Stability Evaluation, Richardson Flat Tailings Embankment, prepared for United Park City Mines Company, October, 2001.
- MWH Americas, Inc., 2002, Hydrologic Review of Richardson Flats Tailings Site, Sections 1 and 2, Township 2 South, Range 4 East, Summit County, Utah. EPA ID #UT980952840 Consultant's report prepared for Le Boeuf, Lamb, Greene & Mac Rae, LLP, March, 2002.

The most pertinent geotechnical information noted from this review is summarized in the following bullets:

- Richardson Flat was first used as a tailing impoundment during 1953 with expansions occurring via construction of containment dikes and embankments throughout the 1970s. Prior to approximately 1980, the sand fraction of the tailings was used as underground backfill so the impounded tailing prior to that period is fine grained slimes. Subsequent to 1980, tailing deposition consisted of whole tailings.
- Dames & Moore (1974) conducted a geotechnical investigation and provided design and construction recommendations for construction of the containment embankment and dikes. During this investigation, two borings were drilled through the embankment which encountered woody debris in the embankment fill underlain by 6 feet of clayey topsoil, 4 feet of silty sand, and clay which overlies bedrock.
- Dames & Moore (1980) conducted an additional investigation and concluded that the stability of the containment embankment was marginal as a result of failure to completely follow the 1974 design recommendations during raising of the dikes and embankment.

- AGEC (2001) used assumed strengths and conducted a back analysis to determine a factor of safety of 1.0. Using these parameters, three buttress configurations were developed to increase the factor of safety by 50%, or to approximately 1.5.
- MWH (2002) notes that the organic rich clayey topsoil and underlying sediments serve as an impediment to downward migration of fluids and that the lower aquifer below the site is confined, with an upward hydraulic gradient.
- The existing main embankment configuration is approximately 400 feet in length with a maximum height of approximately 26 feet on the east end of the embankment. The original exterior slope, prior to buttressing, was approximately 1.5(H):1(V), but varies along its length.
- Embankment toe seepage occurs along the toe of the embankment, where dense vegetation currently exists. This seepage undergoes evapotranspiration through consumptive use by the wetlands adjacent to the embankment.

Golder's May 26, 2006 letter report to UPCM provided a geotechnical design review and construction recommendations for construction of the toe buttress and a monitoring program for cover soil placement activities. Since that time, the downgradient retention embankment has been buttressed, cover soils have been placed to approximately 250 to 300 feet upgradient of the embankment, and localized placement of construction soil has occurred upgradient of the cover soils. The buttress and current status of cover soil placement was reviewed during a 2010 site inspection.

At the recommendation of Golder, UPCM installed five pneumatic piezometers at the Richardson Flat Impoundment in 2006 to monitor for the potential development of destabilizing pore water pressures induced by fill placement activities. Three of the piezometers were located near the downgradient buttress. Golder has reviewed the monitoring data from these piezometers as presented in an August 3, 2010 letter from AGEC to UPCM. The results from this monitoring indicate that no excess pore pressures were detected as a result of fill placement activities. This is interpreted to be the result of both the small fill heights that have been placed and because any pore pressures generated from the fill placement activities have dissipated faster than the interval between the piezometers readings. The monitoring results indicate that ground water level fluctuations in the Richardson Flat Impoundment are seasonal, with higher levels in the spring and the lowest levels in the late fall and winter.

3.0 DESIGN RESULTS AND RECOMMENDATIONS

The preliminary grading plan developed to accommodate the above design constraints and site considerations is provided as Figure 1, which accommodates placement of approximately 3,500,000 cubic yards of additional consolidated materials. A stage capacity curve is provided on Figure 1 to illustrate the additional storage volume that can be accommodated by increasing the crest height. The three dimensional surface area of the configuration shown on Figure 1 is approximately 2,733,500 square feet. Thus, a 1.5-foot thick C&R cover would require approximately 152,000 cubic yards of additional clean fill. As shown on the Fill Isopach on Figure 2, this capacity requires fill depths of approximately 77 feet. Such fill depths would be expected to result in the development of excess pore pressures that will need to be monitored as the sediment is loaded in a controlled manner. Geomorphic considerations incorporated in the grading plan design include non-linear outslopes, swales, ridge features, and top surface mounds. These geomorphic features can be further advanced and/or additional landform features added as required in connection with establishing a final grading plan. It should be noted that there is some flexibility in the design to accommodate for either more or less sediment and to provide for drainage, haulage, geomorphic shaping, and other considerations.

As previously noted, the intent of Golder's previous geotechnical assessment at the Richardson Flat Impoundment was to provide engineering recommendations for soil cover placement and a peer review of the buttress design. We anticipate that once the preliminary grading plan is advanced to a more detailed level of design, a site-specific geotechnical evaluation will be completed to support stability, consolidation and construction considerations. Once these evaluations have been completed, specific construction

recommendations can be provided for the maximum lift thickness, rate of loading and fill sequence considerations. For initial planning purposes, we anticipate that the results of the site specific geotechnical evaluation will result in a maximum lift thickness on the order of 10 to 20 feet and that fill placement will need to advance from the main embankment towards the southeast.

Several construction considerations should be anticipated during placement of the initial lift and the fill materials. During placement of the initial lift, a range of tailings material types will be encountered at various degrees of desiccation/consolidation. Few problems are expected over the majority of the Impoundment where existing cover soils have already been placed. However, where the tailing materials become softer and wetter (e.g., in the vicinity where surface water runoff is currently ponded) greater care and supervision will be required to provide safe working conditions for the equipment. The relatively low point where spring runoff ponds is also the old pond location. This area has experienced the most consolidation and is the most distal from the historic deposition location(s) and, as such, is expected to be comprised dominantly of fine grained tailing fines, referred to as "slimes." There are two opposing considerations during the placement of the initial lift in this area. The initial working layer must be thick enough to support construction equipment; however, the thickness must also be limited so that excessive differential loads are not imparted on the tailings. Failure, in the context of the initial cover placement, involves the generation of mud-waves, stuck equipment, or unsafe conditions. The consequence of any such failure is primarily one of construction delays or equipment safety concerns.

Should you have any questions or comments, please do not hesitate to contact the undersigned.

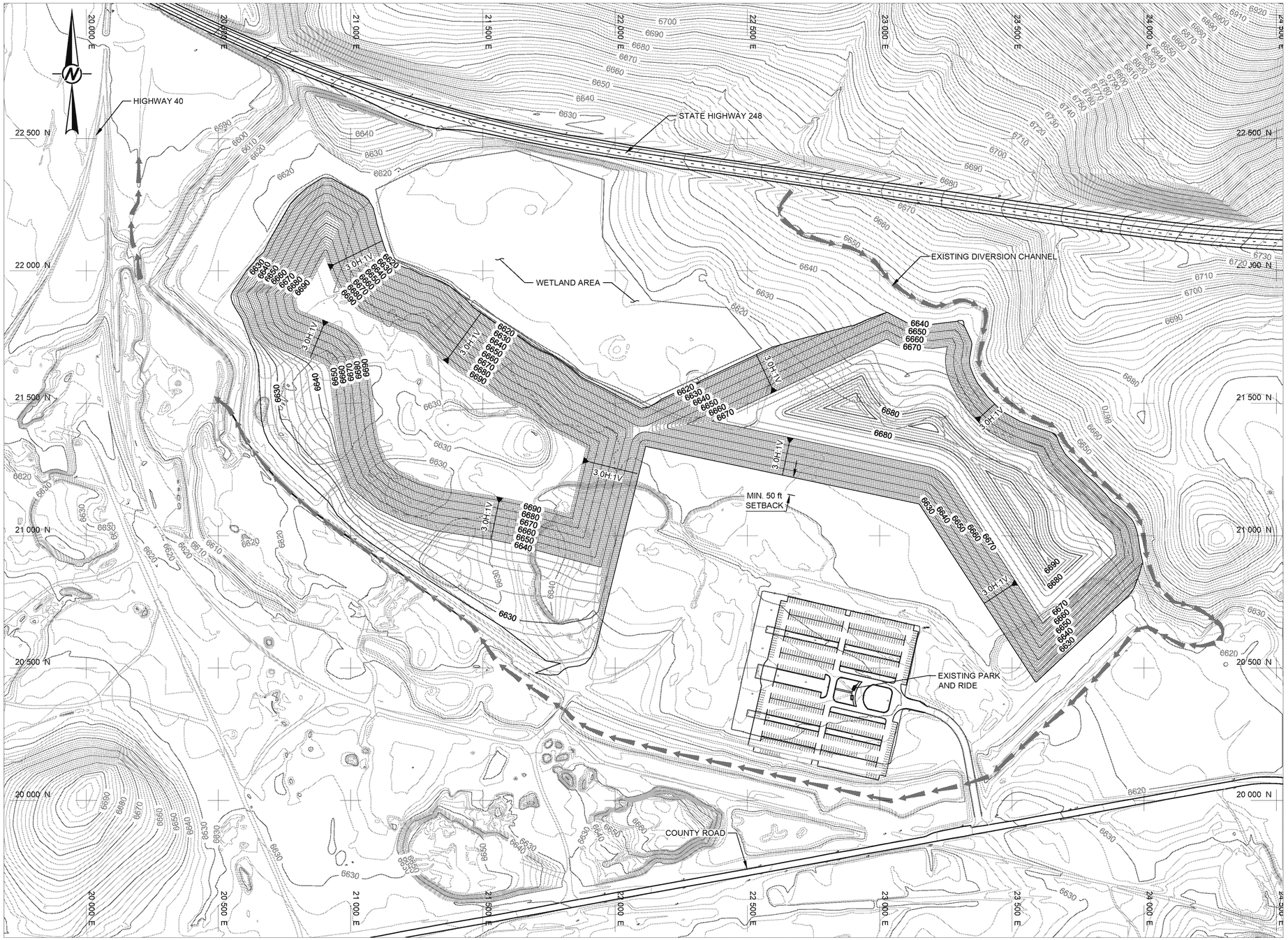
Sincerely,

GOLDER ASSOCIATES INC.

Brent Bronson, P.E.
Principal Engineer
Senior Program Manager

Attachments:
Figure 1 – Feasibility Grading Plan Design, Richardson Flat Repository
Figure 2 – Feasibility Isopach Plan, Richardson Flat Repository

FIGURES



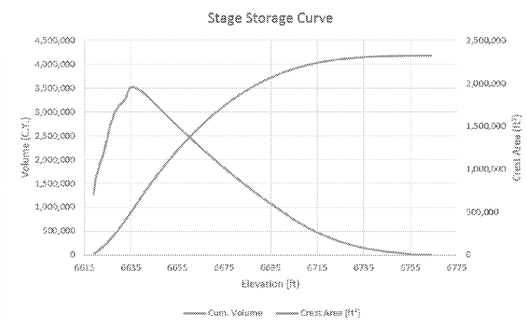
LEGEND

- EXISTING GROUND TOPOGRAPHY (SEE REFERENCE 1)
- PROPOSED FINISHED GRADE TOPOGRAPHY
- EXISTING DIVERSION CHANNEL
- TOE / CREST — SLOPE DIRECTION

REFERENCE(S)

1. EXISTING FROUND TOPOGRAPHY PROVIDED BY UPMC, 2010.

EARTHWORKS VOLUMES
FROM EXISTING GROUND 2010
CUT= 13,600 C.Y.
FILL= 3,538,600 C.Y.
NET= 3,525,000 (FILL) C.Y.



0 200 400
1" = 200' FEET

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
B	2016-10-19	ISSUED FOR FEASIBILITY LEVEL DESIGN - NOT FOR CONSTRUCTION	DET	DET	BRB	BRB

CLIENT
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PROJECT
UNITED PARK MINES COMPANY
RICHARDSON FLAT REMEDIATION PROJECT
PARK CITY, UTAH

TITLE
FEASIBILITY GRADING PLAN DESIGN RICHARDSON FLAT REPOSITORY

PROJECT NO.	CONTROL	REV.	1 of 1	FIGURE
166-5790		B		1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D

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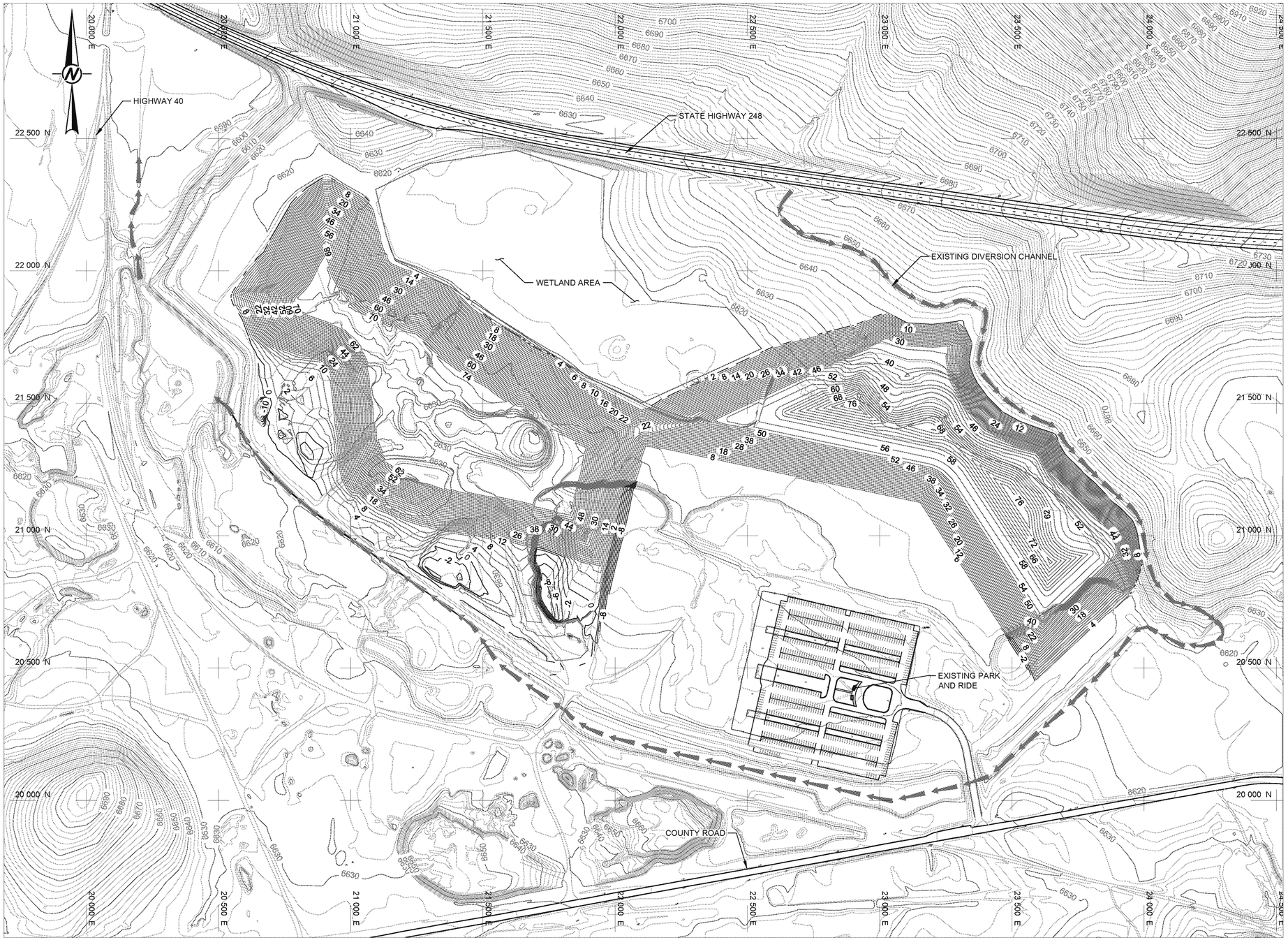

LEGEND

- EXISTING GROUND TOPOGRAPHY (SEE REFERENCE 1)
- 10 — ISOPACH CONTOURS - INDICATES FILL IN FEET ABOVE EXISTING TOPOGRAPHY
- 0 — ISOPACH CONTOURS - INDICATES NO CUT/FILL TO EXISTING TOPOGRAPHY
- -10 — ISOPACH CONTOURS - INDICATES CUT IN FEET ABOVE EXISTING TOPOGRAPHY
- EXISTING DIVERSION CHANNEL

REFERENCE(S)

1. EXISTING FROUND TOPOGRAPHY PROVIDED BY UPMC, 2010.

EARTHWORKS VOLUMES
FROM EXISTING GROUND 2010
CUT= 13,600 C.Y.
FILL= 3,538,600 C.Y.
NET= 3,525,000 (FILL) C.Y.

0 200 400
1" = 200' FEET

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
B	2016-10-19	ISSUED FOR FEASIBILITY LEVEL DESIGN - NOT FOR CONSTRUCTION	DET	DET	BRB	BRB

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PROJECT
UNITED PARK MINES COMPANY
RICHARDSON FLAT REMEDIATION PROJECT
PARK CITY, UTAH

TITLE
FEASIBILITY ISOPACH PLAN RICHARDSON FLAT REPOSITORY

PROJECT NO.	CONTROL	REV.	2 of 2	FIGURE
166-5790		B		2

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D

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