Memorandum

To: Richardson Flat Site File

From: Rob Parker, RPM

Date: 6/1/2017

Subject: Summary of Previous Studies to Estimate Tailings Volume Within OU2/3 and Potential Capacity at and near the Richardson Flat Tailings Impoundment

This memo is intended to document the EPA's current understanding of the volume of tailings within the Silver Creek floodplain and upland areas in Richardson Flat OUs 2 and 3 and the potential capacity of the Richardson Flat tailings impoundment and neighboring areas in and around the Richardson Flat tailings impoundment. This memo references six previous studies by multiple parties pertaining to these estimates.

The first portion of this memo references three studies that estimated the volume of tailings in the OU2/3 study area. These studies resulted in estimates of approximately 1.5 million, 2 million and 2.6 million cubic yards.

The second portion of this memo references three studies related to capacity. Two studies estimated capacity of potential repositories on United Park City Mines owned parcels; they resulted in estimates of between 1.35 million – 2 million and between 1.35 million – 1.825 million cubic yards. One study estimated capacity of the Richardson Flat tailings impoundment and resulted in an estimate of 3.5 million cubic yards.

1. *Estimates of OU2/3 Tailings Deposits*

Three studies have been undertaken to estimate the volume of tailings in OU2/3 study area.

Tetra Tech, 2008[1]

Field activities occurred from August to December 2007. The field work included collecting samples and logging every 250 to 500 feet along six transects and 22 test pits spanning the study area.

> "Sampling stations were to be located every 250 feet across the floodplain portion of each transect and every 500 feet in the uplands areas. At each transect, between two and twelve sample stations were identified within the floodplain area and between one and five sample stations were established in the uplands. A Geoprobe was used in the floodplain area to collect subsurface soil samples and to assess the thickness of tailings material. In areas where tailings were present, samples were collected from the tailings profile and from the material underlying the tailings, if practicable. The Geoprobe investigation was intended to help quantify the volume of tailings present." (p.4)

[1] Draft Lower Silver Creek Data Summary Report, Tetra Tech, March 31, 2008. SEMS ID # 08-1769467. "Partial Version" (without appendices) SEMS ID # 08-1079767.

> "A total of 22 test pits were dug to further delineate the extent of tailings material within the primary floodplain (tailings depositional) area." (p.7)

> "A preliminary tailings volume of approximately 1,479,000 cubic yards (CY) of tailings was estimated in the LSC Site based on the extents and tailings depth" (p.10)

United Park City Mines, 2017 [2], [3]

Soil sampling field activities occurred from 2014 to 2015. United Park collected 559 surface and soil samples within OU2 and OU3.

> "Tailings samples were collected from each soil sample location where visually evident tailings were present. Depths of tailings were noted during sample collection." (Draft Site Characterization Report, p.7)

> "With regard to the total volume of material that could come to the repository from the OU2/3 project, after extensive sampling United Park provided the EPA with an estimate of just under 2 Million [sic] cubic yards of material within OU2/3." (Letter to EPA, p.2)

Tetra Tech, 2017 [4]

In April 2017, Tetra Tech utilized field reporting from United Park's 2014 and 2015 sampling effort to estimate tailings on each parcel and overall within OU 2/3.

> "Inverse Distance Weighting (IDW) interpolation was selected as the method to estimate the tailings volume across parcels. IDW creates a smooth, continuous surface of a specified measurable variable using control points. Control points represent the provided soil sample locations and added points (as described above) and the measurable value corresponds to tailing thickness for each location, given by [United Park] in feet. IDW interpolates the thickness across all portions of relevant parcels that are within the OU 2/3 boundaries. IDW was selected to mitigate the sparse data across the majority of OU2/3 and create an estimate for each parcel—even those parcels without soil sampling sites within their boundaries." (p.4)

Tetra Tech's estimate for the entire OU2/3 area is 2.6 million cubic yards of tailings. This estimate is likely biased high due to the fact that the lateral extent of tailings was not well defined and the IDW model does not account for topography with regard to the extent of depositional environments.

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[2] Draft Site Characterization Report, United Park City Mines, August 10, 2016. SEMS ID # 08-1828315.
[3] Letter to EPA, United Park City Mines, April 3, 2017. SEMS ID # 08-1883397.
[4] Silver Creek OU2/3 Tailing Volume Estimate, Tetra Tech, April 24, 2017. SEMS ID # 08-1883248.

2. ***Capacity at Richardson Flat tailings impoundment and nearby parcels***

Two studies have been undertaken to identify potential areas on United Park owned parcels that could be used as repository for OU2/3 tailings, pursuant to applicable federal, state and/or local regulations.

Tetra Tech, 2015[5]

> "For this assessment of additional waste disposal areas, other vacant portions of Parcels SS-87 and SS-88 have been delineated and evaluated against a variety of siting criteria [geologic slope of native material, topography, soils composition and hydraulic conductivity, surface water and floodplain areas, groundwater migration and contamination, wildlife vegetation, unique habitat (wetlands), land use and zoning] used to select mine waste disposal areas. The area occupied by the main impoundment has not been considered for disposal of additional wastes." (p.1)

Three sub-parcels were selected for further analysis based on a screening effort of the various siting criteria. These parcels are generally to the south and east of the current OU1 repository.

> "Following the delineation of the areas and a preliminary estimate of volume, more specific digital elevation data and contours were used to estimate the capacity of each area assuming two separate thicknesses for the waste disposal area of 10 ft. and 15 ft." (p.10)

> "The capacity estimates for the selected sub-parcels in total ranged from 1,350,000 to 2,000,000 depending on the depth of 10 ft. or 15 ft." (p.11)

United Park City Mines, 2017[6]

> "United Park has outlined 8 areas where it believes materials could be reposited. These areas have been located consistent with the same guidelines as those described in the [Tetra Tech, 2015] Memo." (p.4)

The areas outlined by United Park are generally south and west of the current OU1 repository.

> "United Park's evaluation . . . estimates the capacity of additional material that can be accommodated at Richardson Flat (outside of the current physical impoundment to be between 1,343,000 and 1,825,501 cubic yards." (p.2)

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[5] Evaluation of UPCM Parcels SS-87 and SS-88 for Siting Waste Disposal Areas, Tetra Tech, October 9, 2015. SEMS ID # 08-1829640.

[6] Letter to EPA, United Park City Mines, April 3, 2017. SEMS ID # 08-1883397.

United Park City Mines, 2016[7]

On behalf of United Park, Golder Associates completed an estimate of available volume at the existing repository.

> "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." (p.3)

Golder Associates included a 250-foot setback up gradient of the tailings embankment to mitigate potential development of excess pore pressure to potentially mitigate risk of embankment instability. Golder identifies this instability risk in their report:

> "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." (p. 3)

The environmental conditions and stability of the tailings embankment within OU1 are priorities to the EPA. In addition to applicable federal, state, and/or local regulations, if United Park, pursuant to paragraph 14(c) of the OU1 Consent Decree, notifies the EPA of its desire to accept mine waste, the EPA will work with United Park to gather information necessary for the EPA's consideration.

[7] Storage Capacity Evaluation for Containment of Materials at the United Park City Mines Company's Richardson Flat Impoundment, Park City, Utah, Golder Associates, October 25, 2016. SEMS ID # 08-1829639.