DRAFT PENDING CLIENT REVIEW

BASELINE WETLAND DELINEATION AND WATERBODY SURVEY
BLACK BUTTE COPPER PROJECT
MEAGHER COUNTY, MONTANA

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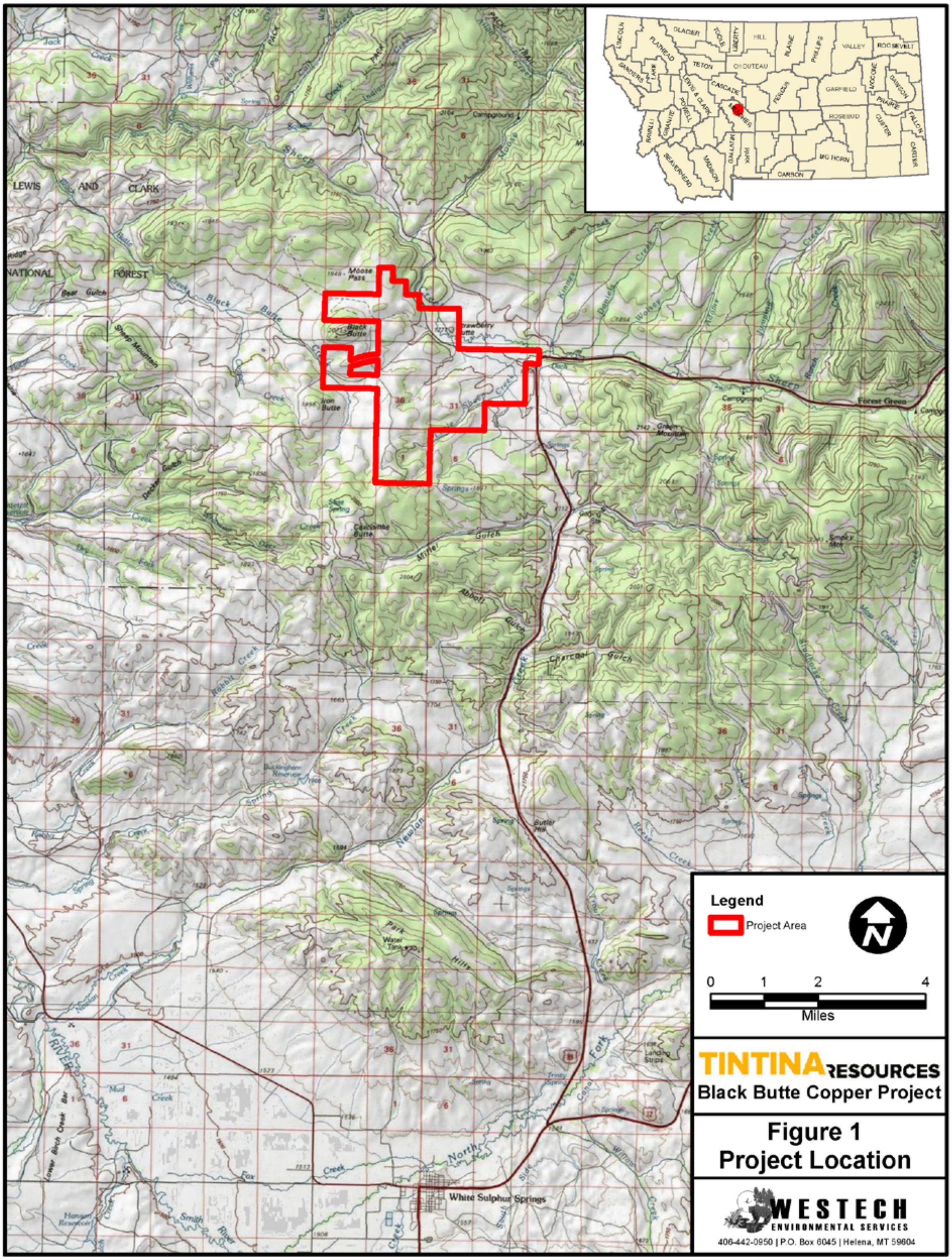
1.0 INTRODUCTION

Tintina Resources, Inc. intends to develop the Black Butte Copper Project (Project), a copper mine approximately 16 miles north of White Sulphur Springs, Montana in Meagher County. WESTECH Environmental Services, Inc. (WESTECH) delineated wetlands and surveyed waterbodies within the Project area to facilitate environmental review and permitting. Specifically, this inventory will be used to help prepare a 404 Application to the U.S. Army Corps of Engineers (USACE), including functional assessments and mitigation planning. The wetland delineation presented in this report and map will be reviewed by USACE, who will then provide jurisdictional determinations of Waters of the U.S. (WUS). Some of the wetlands discussed in this report may not be jurisdictional.

The Project area is shown on Figure 1, including all or portions of Sections 23-26 and 35-36 of T12N R6E; Sections 19, 29, 30, 31, and 32 of T12N R7E; and Section 1 of T11N R6E. The study area climate is continental, having cold winters and warm summers with a growing season extending from mid-May to late-September in most years (USDA 2014).

The wetland delineation and waterbody survey was conducted over 10 days between August 14 and September 4, 2014. Field delineation was completed by John Beaver, Ken Scow, Lisa Larsen, and Dean Culwell assisted by Dan Culwell, Dave Hagen, Drake Barton, and Dr. Steve Cooper,. Primary wetland investigators on each crew had a minimum of 20 years' experience delineating wetlands.

Data analysis and report preparation were conducted by John Beaver, Ken Scow, Jessica Allewalt, and Nancy Scow, with GIS analysis and graphic support by Dan Culwell.



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2.0 METHODS

Wetlands were identified and delineated using the routine on-site approach described in the 1987 U.S. Army Corps of Engineers (USACE) *Wetland Delineation Manual* (Environmental Laboratory 1987) and the final *Regional Supplement to the Corps of Engineers Manual: Western Mountains, Valleys, and Coast Region (Version 2.0)* (USACE 2010) termed Regional Supplment in this report. Wetlands were classified according to the Cowardin classification system (Cowardin *et al*. 1979). Non-wetland waterbodies, such as streams, were classified according to flow regime (perennial, seasonal, etc.) and substrate (e.g., unconsolidated bottom, rock bottom, etc.) according to the Cowardin system (Cowardin *et al*. 1979).

Background and supplementary sources of data for the delineation were obtained from various environmental baseline studies conducted for the Project and publicy available data. Background Project specific data, including hydrology, wetlands, and soils data, are contained in the *Amendment to Exploration License 00710 Tintina Alaska Exploration, Inc. Exploration Decline for Underground Drilling and Bulk Sampling Black Butte Copper Project, Meagher County, Montana* (Tintina 2013). Publicly available resources included high-resolution aerial photographs (true color and IR), USGS topographic maps, National Wetland Inventory (NWI) mapping, and Natural Resource Conservation Service (NRCS) soils mapping.

Data from the sources cited above were used to assist in determining areas to be field-surveyed. All areas with potential wetlands or waterbodies were observed via pedestrian survey. Wetland and upland plots were sampled to identify wetland boundaries. In several cases, paired plots were used to distinguish mesic, non-wetland (i.e., upland sites) from wetlands. Once a boundary was determined, additional wetland plots were often completed to further characterize wetland vegetation, hydrology, and soils within an area. Numerous wetland plots were recorded in large, complex wetlands.

Wetland data were recorded on USACE wetland determination field forms (Appendix C), which serve as worksheets for determining the presence/absence of wetland hydrology, hydric soils, and hydrophytic vegetation. Supplementary wetlands determination data were recorded in field maps and notebooks. A total of 45 wetland plots and 50 upland plots (with 2 upland subplots for additional soil investigation) were completed. Photographs of each plot are included in Appendix D.

Once reliable indicators of a wetland boundary were determined from the upland and wetland plots, wetland boundaries were walked and mapped using sub-meter GPS units. Mapped wetlands and waterbodies were assigned unique labels based on ordinal stream names and were characterized according to the Cowardin classification system (Cowardin *et al.* 1979).

Wetland hydrology indicators, hydric soils indicators, and hydrophytic vegetation are used in combination to determine whether an area meets USACE criteria for wetlands (Enviornmental Laboratory 1987; USACE 2010). The next 4 sections discuss how the 3 wetland components were assessed in the field and how they were integrated to delineate wetlands. The fifth section discusses methods for identifying non-wetland waterbodies.

2.1 Wetland Hydrology

The presence of wetland hydrology is inferred from hydrologic indicators of repeated, extended episodes of inundation or soil saturation (e.g., surface water, saturation, oxidized rhizospheres along living roots, drainage patterns, geomorphic position, and frost-heave hummocks) (USACE 2010). The Project's baseline hydrologic investigation (Tintina 2013) informed the Wetland/WUS delineation and indicated drainages and other areas where wetland hydrology may be present within the Project boundary. Field investigations included walking all areas that were determined to potentially support wetlands and noting the presence and extent of hydrologic indicators. In particular, shallow pits (at least 18 inches deep) excavated for hydric soil investigations at wetland plots and adjacent upland sites were also used to determine presence and depth to a shallow water table, depth to soil saturation, or oxidized rhizospheres along living roots.

2.2 Hydric Soils

Hydric soils are defined as soils that are saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions in the upper part (USDA Soil Conservation Service 1991). Generally, hydric soils are saturated, flooded, or ponded for one week or more during the period when soil temperatures are above biologic zero (41 degrees Fahrenheit or 5 degrees Celsius), as defined in USDA Soil Conservation Service (1975). These soils typically support hydrophytic vegetation and exhibit distinctive characteristics (e.g. redox features, gleying, histic epipedons) that result from repeated, extended periods of saturation; these characteristics tend to persist in the soils during both wet and dry periods. A recent compilation of hydric soils indicators is included in USDA Natural Resources Conservation Service (2005, 2006). Region-specific indicators are discussed in USACE (2010). As with wetland hydrology, supplemental resources (aerial imagery, NWI data, NRCS soils mapping, etc.) were reviewed to determine if hydric soils might be present.

Shallow pits at least 18 inches deep were dug at each wetland or upland plot to typify soils and determine if hydric indicators were present. Soil horizons and characteristics were described and any hydric soil indicators present were recorded according to criteria noted in the Regional Supplement (USACE 2010). In some cases, numerous pits were dug at a single wetland site if the wetland boundary was difficult to identify.

2.3 Hydrophytic Vegetation

The USACE wetlands delineation methodology uses a plant community approach to determine whether a site has hydrophytic vegetation, dominated by species that require or can tolerate prolonged inundation or soil saturation during the growing season (Environmental Laboratory 1987; USACE 2010). The USACE, in cooperation with the US Fish and Wildlife Service (USFWS), NRCS, and the Environmental Protection Agency (EPA), developed the "National Wetland Plant List", in which vascular plant species are assigned a wetland indicator status based on frequency of occurrence in wetlands (Lichvar 2012). Final status was determined by a National Panel and ten Regional Panels. The major indicator status categories include obligate wetland species (OBL), facultative wetland species (FACW), facultative species (FAC), facultative upland species (FACU) and upland species (UPL), as briefly explained below:

Wetland Indicator Status	Definition*
Obligate Wetland (OBL)	Almost always occur in wetlands
Facultative Wetland (FACW)	Usually occur in wetlands, but may occur in non-wetlands
Facultative (FAC)	Occur in wetlands or non-wetlands
Facultative Upland (FACU)	Usually occur in non-wetlands, but may occur in wetlands
Obligate Upland (UPL)	Almost never occur in wetlands

**More complete definitions are given by Lichvar et al. (2012).*

The facultative categories include species that occur in both wetlands and non-wetlands to varying degrees. Any species not on the list is presumed to be an upland species. The National List is composed of ten region-specific subsets of the list; the Western Mountain, Valleys, and Coast Region list (Lichvar 2012) was used for the Project.

Vascular plant species were tallied on plots (typically 0.01-acre circular plots) at each sampling site by structural stratum (tree, sapling/shrub, herb, or woody vine). USACE formulas were used to determine dominant species in each stratum based on ocular estimates of percent cover for each species. An area has hydrophytic vegetation when more than 50 percent of the dominant species across all strata are OBL, FACW, and/or FAC species (the dominance test). In addition to the dominance test, a prevalence index was calculated for each sample site; this test is based on all species recorded, not just dominant species. Visual observations of other hydrophytic vegetation indicators such as plant morphological adaptations to prolonged wet conditions and presence of wetland non-vascular plants were also incorporated into hydrophytic vegetation determinations. A species list of plants encountered on wetland and upland inventory plots, as well as incidental species within the area, is included as Appendix B. Taxonomic nomenclature follows Lesica (2012).

2.4 Integration of Wetland Components

Generally, indicators of all three wetland components must be present for an area to be considered a wetland. The 1987 USACE manual states:

> "Except in certain situations defined in this manual, evidence of a minimum of one positive wetland indicator from each parameter (hydrology, soil, and vegetation) must be found in order to make a positive wetland determination."

Wetland determinations were made using methods and guidance in the 1987 USACE manual (Environmental Laboratory 1987) and the Regional Supplement (USACE 2010).

2.5 Waterbodies

Waterbodies (often termed "streams" by the USACE even if flowing water is not present) were searched for using guidance from the *U.S. Army Corps of Engineers Jurisdictional Determination Form Instructional Guidebook* (USACE and EPA 2007) in conjunction with the definition of OHWM in §33 CFR 328.3(e) which states:

> "The term *ordinary high water mark* means that line on the shore established by the fluctuations of water and indicated by physical characteristics such as clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas."

Surveyors mapped non-wetland waterbodies using sub-meter GPS, or drew the waterbody onto high-quality aerial imagery where the feature was large enough to accurately map on a photo. Each waterbody was classified according to hydrologic regime (perennial, seasonal, intermittent, and ephemeral) and substrate per Cowardin *et al.* (1979).

3.0 RESULTS

3.1 Results by Wetland Component

The following discussion provides an overview for each of the three wetland components inventoried throughout the Project. A line list of wetlands and waterbodies by Cowardin type along with wetland acreage or stream length (feet) is provided in Appendix A according to standard USACE format. This list is organized by the Project-specific stream or tributary watershed (termed Local Waterway in Appendix A per USACE terminology) within which the wetland or stream occurs. Appendix B provides a species list compiled from all wetland and upland sample plots as well as incidental species observed during the survey. Wetland hydrology, hydric soils, and hydrophytic vegetation for each plot are shown on the wetland determination forms in Appendix C. Representative photographs from each plot (wetland or upland) are included in Appendix D. The locations of each wetland and upland plot, individual wetlands, and individual stream segments are shown on the Wetland Delineation and Waterbody Survey Map (3 sheets).

3.1.1 Wetland Hydrology

Wetland hydrology indicators within the Project are found adjacent to waterbodies, in subirrigated meadows, and at numerous springs and seeps. Flowing surface water was recorded in Sheep Creek, Little Sheep Creek, and Black Butte Creek and in many of the tributaries to these streams; flow volumes were typically lower in the tributaries than in the streams themselves. Standing surface water was noted at most wetlands throughout the Project, although in very limited quantities at many sites. Most wetlands also exhibited saturated soil within the wetland boundary. In many areas, particularly the large wetland complexes surrounding Sheep Creek and Little Sheep Creek, there appearred to be substantial intermixing between water that originates within the streams (either surface or subsurface) and groundwater discharge. This intermixing is common in headwaters areas (USACE 2014). Appendix A lists what surveyors qualitatively estimated to be the primary source of water for each wetland.

Some wetlands did not have any surface or subsurface water, or saturated soils. In these instances, wetland hydrology was inferred from secondary indicators. Important secondary indicators included frost-heave hummocks, geomorphic position, and drainage patterns. It should be noted that wetland field forms may not record surface water or saturation at the wetland plot as these plots were placed closer to the wetland margin in order to find the boundary between uplands and wetlands. Thus, wetland plots are not necessarily indicative of the wettest portion of a wetland site. Wetland hydrology indicators were often the key component in identifying wetland boundaries as most margins between wetlands and uplands contained FAC plant species that met the hydrophytic criteria for wetlands.

A summary of wetland primary and secondary indicators is provided below in Table 3.1-1.

Table 3.1-1. Summary (Count) Primary and Secondary Hydrology Indicators – Black Butte Project

Primary Hydrology Indicators										
Surface Water (A1)	High Water Table (A2)	Saturation (A3)	Water Marks (B1)	Drift Deposits (B3)	Surface Soil Cracks (B6)	Inundation Visible on Aerial Imagery (B7)	Hydrogen Sulfide Odor (C1)	Oxidized Rhizospheres along Living Roots (C3)	Presence of Reduced Iron (C4)	Other (Explain in Remarks)
11	11	25	3	2	1	2	2	2	2	1

Secondary Hydrology Indicators				
Drainage Patterns (B10)	Saturation Visible on Aerial Imagery (C9)	Geomorphic Position (D2)	FAC-Neutral Test (D5)	Frost-Heave Hummocks (D7)
7	6	36	1	18

3.1.2 Hydric Soils

Hydric soils were found within the subirrigated zone around Sheep Creek, Little Sheep Creek, Black Butte Creek, the various tributaries to these waterbodies, and springs and seeps. In most of these locations the soils were finely textured clays and clay-loams. A few areas with high organic accumulation indicative of peat or muck were identified, primarily in the Little Sheep Creek wet meadow and at a quaking fen on a spring-fed tributary to Sheep Creek. Sandy soils were recorded in the Sheep Creek willow-dominated floodplain.

Large wetlands occur in areas of hydric soils within the Mooseflat-Foxgulch-Redfish complex soil unit or the Mannixlee, rarely-flooded-Clunton, frequently flooded-Meadowcreek complex soil unit (USDA 2014a). Large wetlands within the Little Sheep Creek wet meadow occur within the Bischoff-Monaberg complex which is mapped as predominately nonhydric (USDA 2014a). However, these wetlands clearly occurred on hydric soils indicating that either the USDA soils mapping unit was inaccurately drawn or that the wetland occurred within the hydric portion of the soil unit.

Five sites with substantial organic matter accumulation were recorded in the Project. Soil at plot LST1-W2 is fibric peat 12.5 inches thick, soil at SC-W5 is a sapric peat 12.5 inches thick, soil at SCT3-W1 is a sapric peat approximately 10 inches thick, soil at plot LS-W7 is sapric muck greater than 18 inches thick, and soil at plot SCT1-W1 is fibric peat greater than 20 inches thick. Soil from plot LS-W7 was collected and sent to Energy Laboratories in Helena, Montana for physical analysis. Organic matter in this sample was 42.5 percent which is above the 35 percent threshold that qualifies the soil as a Histic epipedon. It is assumed that the other four organic soils would have over 35 percent organic matter as well. In addition, the soils at LS-W7 and SCT1-W1 have organic matter greater than 16 inches thick indicating that these soils are Histosols, i.e., organic matter soils that form in areas of continual saturation from groundwater or other sources. Soils at plots LS-W8, L-W9, LST2-W1, LST2-W2, and LS-W11 also contained some organic matter but less than 8 inches thick, the minimum for a histic epipedon.

Histosols and histic epidedons are a key indicator of fens, a relatively rare wetland type in Montana.

Hydric soil indicators that were encountered during the delineation are listed below in Table 3.1-2.

Table 3.1-2. Summary (Count) of Hydric Soil Indicators – Black Butte Project

Histosol (A1)	Histic Epipedon (A2)	Hydrogen Sulfide (A4)	Depleted Below Dark Surface (A11)	Thick Dark Surface (A12)	Sandy Mucky Mineral (S1)	Sandy Redox (S5)	Stripped Matrix (S6)	Loamy Mucky Mineral (F1)	Depleted Matrix (F3)	Redox Dark Surface (F6)
2	8	2	12	19	1	1	0	2	13	3

3.1.3 Hydrophytic Vegetation

Hydrophytic vegetation within the Project area was divided almost equally between shrub wetlands (Palustrine Scrub-Shrub or PSS) and herbaceous wetlands (Palustrine Emergent or PEM). Forested wetlands (Palustrine Forested or PFO) accounted for a limited amount of total wetland area. Small, unvegetated potholes or ponds (Palustrine Unconsolidated Bottom or PUB) occurred in very limited areas. This last type is essentially an unvegetated wetland type as hydrophytic vegetation only occurs around the pothole or pond fringe. Table 3.1-3 lists the acreage of each wetland type according to its Cowardin classification as well as the percentage of each type within the Project area.

Table 3.1-3. Wetland Acreage and Percent by Cowardin Type – Black Butte Project

Cowardin Type[1]	Acres	Percent of Total Wetlands within Project Area
Palutrine Emergent (Herbaceous wetland)	152.61	46.41
Palustrine Scrub-Shrub (Willow dominated)	90.84	27.63
Palustrine Scrub-Shrub (Shrubby cinquefoil dominated)	82.84	25.20
Palustrine Forested (Englemann spruce dominated)	1.86	0.57
Palustrine Unconsolidated Bottom (Excavated pond)	0.46	0.14
Palustrine Unconsolidated Bottom (Natural depression)	0.15	0.05
TOTAL	**328.76**	**100.00**

[1] Cowardin *et al.* (1979)

Herbaceous wetlands within the Project area are typically dominated by beaked sedge (*Carex utriculata*), Nebraska sedge (*Carex nebrascensis*), clustered field-sedge (*Carex praegracilis*), Baltic rush (*Juncus balticus*), tufted hairgrass (*Deschampsia caespitosa*), redtop (*Agrostis stolonifera*), Kentucky bluegrass (*Poa pratensis*), and fowl bluegrass (*Poa palustris*). Redtop, Kentucky bluegrass, and fowl bluegrass are more prevalent near the transition between wetland and mesic meadow, while the sedges and tufted hairgrass are more prevalent within the wetland interior. Baltic rush occurs near the wetland transition and within the wetland interior.

Shrub-dominated wetlands are comprised of two basic types: willow (*Salix sp*.) or shrubby cinquefoil (*Dasiphora fruticosa*). Within the willow-dominated wetlands, common willow species are Bebb willow (*Salix bebbiana*), blueberry willow (*Salix boothii*), and Drummond willow (*Salix drummondiana*). A complete list of willow species identified on the Project is provided in Appendix B. The understory within the willow-dominated type typically includes beaked sedge, Nebraska sedge, Baltic rush, woolly sedge (*Carex pellita*), bluejoint reedgrass (*Calamagrostis Canadensis*), and tufted hairgrass as well as Kentucky bluegrass and fowl bluegrass. Shrub wetlands dominated by shrubby cinquefoil typically have an understory similar to that within the willow-dominated wetlands but usually with higher amounts of Baltic rush, Kentucky bluegrass, and fowl bluegrass, and lower amounts of OBL or FACW sedges. Shrubby cinquefoil wetlands usually occur in the drier portions of a wetland while willow-dominated wetlands usually occur in the wetter portions of a wetland.

One small forested wetland was delineated on the Project. An Englemann spruce (*Picea engelmannii*) wetland (see W-SCT5-05 and 06) occurs at the base of a slope and along a small tributary to Little Sheep Creek. This wetland is a narrow stringer along the tributary with an overstory of Englemann spruce and an understory dominated by soft-leaved sedge (*Carex disperma*) and western twinflower (*Linnaea borealis*). Western twinflower is particularly common near the margin between wetland and upland.

As previously noted, hydrophytic vegetation is sparse at the Palustrine Unconsolidated Bottom depressional and excavated wetlands. Nebraska sedge typically forms a ring between the unvegetated bottom and surrounding upland vegetation at the natural depressions within the northwestern portion of the Project area (see W-BBT-11 for general location of these depressions). Typical herbaceous wetland vegetation, as previously described, surrounds the excavated pond (see W-LST5-02 for location of this pond).

3.2 Waterbodies

Several waterbodies (often termed 'streams' by the USACE even if perennially-flowing water is not present) occur within the Project boundary. Sheep Creek is the largest stream, by flow volume, within the Project while Little Sheep Creek is the longest stream within the Project. Very little stream length of Black Butte Creek occurs within the Project. Several tributaries to these streams occur within the Project. Most waterbodies within the Project area have an unconsolidated bottom with at least 25 percent streambed cover of particles smaller than stones and vegetative cover less than 30 percent. Sheep Creek has the highest amount of rock cover, but most stones are cobbles and gravels, not bedrock or boulders, placing this stream within the unconsolidated bottom type similar to most other waterbodies within the Project area. A single stream was classified as a rock bottom type. Stream segment S-BBT1-03 has a channel bed of large boulders or bedrock, water within this stream is often not visible at the surface but could be heard running below the boulders. The lower portion of this drainage contains large cobbles but flowing water has moved subsurface and there is no clear hydrologic connection between the springs and stream channel in this area with Black Butte Creek.

3.3 Potential Waters of the U.S. (WUS)

Waters of the U.S. (WUS), as defined in 33 CFR Part 328, encompass all major streams and their tributary streams, ponds, and adjacent wetlands. Wetlands are a regulatory subset of WUS that require additional investigation, delineation, and avoidance/mitigation measures to comply with Section 404(b)(1) of the Clean Water Act. All WUS are regulated under Section 404 of the Clean Water Act if there is a "significant nexus" between a WUS and a traditional navigable water (TNW). WUS without a significant nexus are determined to be "isolated" and not "jurisdictional", and are not subject to regulation under Section 404 although they may be regulated under other federal or state regulations. The USACE determines if WUS are jurisdictional, typically following a site visit with the Project team.

The TNW nearest the Project is the Smith River, into which Sheep Creek flows. Both Little Sheep Creek and Black Butte Creek flow into Sheep Creek. Sheep Creek, Little Sheep Creek, and Black Butte Creek are relatively permanent waters (RPW) as are several of the tributaries to these streams. The hydrologic and ecologic connection between RPW and TNW are key considerations for the USACE when determining jurisidiction. Based on these factors, it is reasonable to assume that most of the wetlands within the Project area will be deemed jurisdictional by the USACE, with the possible exception of isolated spring and seeps where there is no more than an "insubstantial or speculative effect on the chemical, physical, and/or biological integrity of TNWs" (USACE 2007). The majority of these potetentially isolated springs and seeps occur in the northwestern corner of the Project. Appendix A provides a preliminary assessment of wetland and stream "water type" according to USACE terminology of RPW, non-RPW, etc. This assessment is meant to facilitate USACE review.

4.0 SUMMARY

A wetland delineaton and waterbody survey of the Black Butte Copper Project area identified extensive wetlands within the Project boundary. The largest wetlands occur within the subirrigated herbaceous meadows and willow- or shrubby cinquefoil-dominated wetlands surrounding Sheep Creek and Little Sheep Creek. Upland areas within these sites are highly mesic and the boundary between wetland and upland is often indistinct. Surveyors estimated that approximately 5 percent of the area within these wetlands is upland. Very small pockets of wetland also occur within the uplands at these sites, but were estimated to account for less than 1 percent of upland area and were too small or indistinct to delineate.

The majority of the remaining wetlands in tributaries to Sheep Creek and Little Sheep Creek, as well as the wetlands surrounding Black Butte Creek, are a mosaic of shrub and herbaceous vegetation types. The hydrology at most of these wetlands appears to be primarily groundwater driven. Small streams are present but are themselves a function of local springs and did not appear to have enough water within them to support the relatively large wetlands surrounding them. Based on observations during the delineation, it appeared that very few of the wetlands within the Project were specifically dependent on streamflow hydrology.

Overall, approximately half of the wetlands within the Project are dominated by various species of willow or shrubby cinquefoil. Wetlands dominated by sedges as well as native and non-native grasslands comprise the majority of the remaining wetlands within the Project. One, small forested wetland dominated by Englemann spruce was delineated as were a series of small, depressional wetlands with minimal vegetation and an excavated pond.

Wetlands with fen characteristics were recorded within 3 wetlands on the Project, W-SCT1-02, W-LS-11, and W-LST1-06. Water samples would have to be analyzed to determine if the water at these sites is chemically consistent with fen characteristics, but soil and vegetation characteristics suggest that these sites are likely fens or contain components that are fens. Fens are a relatively rare wetland type in Montana and can result in a high wetland functional rating. A wetland functional assessment report using the Montana Department of Transportation Wetland Functional Assessment Method (Berglund and McEldowney 2008) is provided under separate cover.

Table 4.0-1 summarizes wetland acreage within the Project; Table 4.0-2 summarizes stream length (feet) within the Project. Acreages and lengths are summarized by the local watershed within which the wetland or stream occurs. These watersheds are named and organized for the purpose of identifying and locating individual wetlands and stream segments within the Project area, and equate to the USACE terminology of “Local Waterways” in Appendix A. With the exception of Black Butte Creek and Sheep Creek, these watersheds do not relate to larger order watersheds.

Table 4.0-1. Summary of Wetland Acreage by Cowardin Type and Project Watershed – Black Butte Project

Project Watershed[1]	Cowardin Type[2]					Total by Project Watershed
	Palustrine Emergent	Palustrine Shrub (Willow)	Palustrine Shrub (Shrubby Cinquefoil)	Palustrine Forested	Palustrine Unconsolidated Bottom	
Black Butte Creek	10.69	7.86	1.61	0.00	0.00	20.16
Black Butte Creek Total	**10.69**	**7.86**	**1.61**	**0.00**	**0.00**	**20.16**
Black Butte Creek Tributary 1	2.06	0.00	0.00	0.00	0.14	2.20
Black Butte Creek Tributary 2	0.02	0.00	0.00	0.00	0.00	0.02
Black Butte Creek Tributary 3	0.71	0.15	0.00	0.00	0.00	0.86
Black Butte Creek Tributaries Total	**2.79**	**0.15**	**0.00**	**0.00**	**0.14**	**3.08**
Little Sheep Creek	51.03	5.16	62.95	0.00	0.09	119.23
Little Sheep Creek Total	**51.03**	**5.16**	**62.95**	**0.00**	**0.09**	**119.23**
Little Sheep Creek Tributary 1	8.57	3.33	3.13	0.00	0.00	15.03
Little Sheep Creek Tributary 2	4.12	3.59	5.33	0.00	0.00	13.04
Little Sheep Creek Tributary 3	0.00	0.00	0.35	0.00	0.00	0.35
Little Sheep Creek Tributary 4	1.27	0.00	0.00	0.00	0.00	1.27
Little Sheep Creek Tributary 5	10.62	0.47	0.00	0.00	0.38	11.47
Little Sheep Creek Tributary 7	0.01	0.00	0.00	0.00	0.00	0.01
Little Sheep Creek Tributaries Total	**24.59**	**7.39**	**8.81**	**0.00**	**0.38**	**41.17**
Sheep Creek	52.77	53.87	0.00	0.00	0.00	106.64
Sheep Creek Total	**52.77**	**53.87**	**0.00**	**0.00**	**0.00**	**106.64**
Sheep Creek Tributary 1	4.32	0.81	1.87	0.00	0.00	7.00
Sheep Creek Tributary 2	0.94	0.00	3.51	0.00	0.00	4.45
Sheep Creek Tributary 3	1.17	1.04	0.94	0.00	0.00	3.15
Sheep Creek Tributary 4	0.93	0.00	0.00	0.00	0.00	0.93
Sheep Creek Tributary 5	3.38	14.56	3.15	1.86	0.00	22.95
Sheep Creek Tributaries Total	**10.74**	**16.41**	**9.47**	**1.86**	**0.00**	**38.48**
Project Total	**152.61**	**90.84**	**82.84**	**1.86**	**0.61**	**328.76**

[1] Project watersheds are the specific, in many cases very small, watersheds within the Project area. With the exception of Sheep Creek and Black Butte Creek these watersheds do not correspond to larger order watersheds. In some cases, (e.g., Little Sheep Creek Tributary 6) a tributary is not listed in sequential order indicating that there were no wetlands, only streams, within that tributary.

[2] See Cowardin *et al.* (1979) for further discussion. Note that emergent wetlands are dominated by herbaceous species such as sedges and grasses. Unconsolidated bottom wetlands are those with a mud/silt bottom with limited vegetation.

Table 4.0-2. Summary of Stream Length (feet) by Cowardin Type and Project Watershed – Black Butte Project

Project Watershed[1]	Cowardin Type[2]					Total by Project Watershed
	R3UB	R3RB	R3SB	R3AB	R4SB	
Black Butte Creek	3,256	0	0	0	0	3,256
Black Butte Creek Total	**3,256**	**0**	**0**	**0**	**0**	**3,256**
Black Butte Creek Tributary 1	0	3,226	0	0	852	4,078
Black Butte Creek Tributaries Total	**0**	**3,226**	**0**	**0**	**852**	**4,078**
Little Sheep Creek	29,606	0	0	0	0	29,606
Little Sheep Creek Total	**29,606**	**0**	**0**	**0**	**0**	**29,606**
Little Sheep Creek Tributary 1	4,862	0	0	0	2,903	7,765
Little Sheep Creek Tributary 2	713	0	0	0	0	713
Little Sheep Creek Tributary 4	0	0	0	0	2,307	2,307
Little Sheep Creek Tributary 5	1,215	0	0	0	0	1,215
Little Sheep Creek Tributary 6	709	0	0	0	0	709
Little Sheep Creek Tributary 7	0	0	0	0	1,373	1,373
Little Sheep Creek Tributaries Total	**7,499**	**0**	**0**	**0**	**6,583**	**14,082**
Sheep Creek	6,663	0	0	0	0	6,663
Sheep Creek Total	**6,663**	**0**	**0**	**0**	**0**	**6,663**
Sheep Creek Overflow	0	0	0	0	9,446	9,446
Sheep Creek Overflow Total	**0**	**0**	**0**	**0**	**9,446**	**9,446**
Sheep Creek Overflow Tributaries	710	0	0	0	0	710
Sheep Creek Overflow Trib. Total	**710**	**0**	**0**	**0**	**0**	**710**
Sheep Creek Tributary 1	3,699	0	0	401	0	4,100
Sheep Creek Tributary 2	889	0	0	0	0	889
Sheep Creek Tributary 5	11,451	0	0	0	2,150	13,601
Sheep Creek Tributaries Total	**16,039**	**0**	**0**	**401**	**2,150**	**18,590**
Project Total	**63,773**	**3,226**	**0**	**401**	**19,031**	**86,431**

[1] Project watersheds are the specific, in many cases very small, watersheds within the Project area. With the exception of Sheep Creek and Black Butte Creek these watersheds do not correspond to larger order watersheds. In some cases, (e.g., Little Sheep Creek Tributary 3) a tributary is not listed in sequential order indicating that there were no streams, only wetlands, within that tributary.
[2] See Cowardin *et al.* (1979) for further discussion. Note: R = Riverine; 3 = Upper Perennial; 4 = Intermittent; UB = Unconsolidated Bottom; RB = Rock Bottom; SB = Streambed; and AB = Aquatic Bed.

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