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1.0 STUDY APPROACH AND METHODS

Waters of the U.S. (including wetlands) were identified and delineated May 15-18, June 12-15, and August 14, 2007 using the routine on-site approach as described in the 1987 U.S. Army Corps of Engineers (USACE) Wetland Delineation Manual (Environmental Laboratory 1987) and Interim Regional Supplement to the USACE Manual for the Great Plains Region (USACE 2006). As recently requested by the USACE (Omaha District), wetlands were classified using a combination of hydrogeomorphic classes (Brinson 1993, 1995, Smith *et al.* 1995), vegetation types and water regimes (Cowardin *et al.* 1979).

Data forms assessing wetland hydrology, hydric soils and hydrophytic vegetation were completed at potentially jurisdictional sites along drainages, floodplains, saturated areas, at springs or seeps and around ponds and closed basins.

Specific methods to conduct the inventory are presented below.

1.1 Review Existing Information and Data Collected from Pertinent Baseline Inventories

Existing resources that were reviewed include:

- high resolution color and infrared aerial photos (June 2006);
- U.S. Geological Survey (USGS) and site-specific topographic maps;
- Stark County soil survey; and
- U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) maps.

Additionally, baseline data collected for the South Heart Lignite Mine (vegetation, soils, geomorphology and surface water hydrology) provided useful information for wetland identification.

A comprehensive baseline vegetation inventory of the Study Area was conducted during August and September 2006. Sample plots were located randomly throughout the Study Area to characterize vegetation types. Data from the 2006 inventory were grouped by vegetation type and evaluated to calculate percent hydrophytic composition using three methods including the dominance test,

prevalence index, and relative cover of hydrophytic species. Representative plots indicating hydrophytic vegetation using any one of the three methods were selected for evaluation of hydric soils and wetland hydrology during spring 2007. In addition to the 2006 vegetation plots that were re-sampled for wetland parameters in 2007, additional wetland plots were located in 2007 to sample potential wetlands observed during the 2006 vegetation inventory. Sampling was designed to provide geographic coverage of the Study Area and sample the range of hydrogeomorphic classes, vegetation types and water regimes.

1.2 Consult with Applicable Agencies

In addition to North Dakota Public Service Commission (PSC), other agencies involved in wetland regulation or management were consulted. These include the United States Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) and North Dakota Game and Fish Department (NDGFD). The USACE will be consulted during the 404 permitting process.

1.3 Assess Hydrophytic Vegetation

The USFWS, in cooperation with other agencies, published the "National List of Plant Species That Occur in Wetlands" from a review of the scientific literature and review by wetland experts and botanists (Reed 1997). The list separates vascular plants into five basic groups, commonly called "wetland indicator status," based on a plant species' frequency of occurrence in wetlands. If a species is not on the list, it is presumed to be an obligate upland plant. The USFWS list specific to the Study Area (Region 4, North Plains) was used to determine wetland indicator status.

Each species recorded on a plot was assigned a wetland indicator status using the following categories based on their relative fidelity to wetlands:

> *Obligate Wetland Plants (OBL)*: These plants almost always (estimated probability > 99 percent) grow in wetlands under natural conditions.
>
> *Facultative Wetland Plants (FACW):* These plants usually grow in wetlands (estimated probability 67 to 99 percent), but occasionally grow in non-wetlands.

Facultative Plants (FAC): These plants are equally likely to grow in wetlands or non-wetlands (estimated probability 34 to 66 percent). A positive (+) or negative (-) sign more specifically defines the regional frequency of occurrence in wetlands. A FAC+ species is more frequently found in wetlands while a FAC- species is less frequently found in wetlands.

Facultative Upland Plants (FACU): These plants usually grow in non-wetlands (estimated probability 67 to 99 percent), but are occasionally found in wetlands (estimated probability 1 to 33 percent).

Obligate Upland Plants (UPL): These plants almost always occur in non-wetlands (estimated probability > 99 percent).

Cover was estimated by species on 0.01-hectare circular plots except where wetlands were too small to allow a circular plot. For smaller or irregular stands, plot shape was adjusted to fit the wetland configuration while maintaining approximate plot size.

Percent hydrophytic composition was calculated for each plot using three methods: 1) the USACE dominance test (Environmental Laboratory 1987) that specifies an area has hydrophytic vegetation when more than 50 percent of the dominant species are obligate wetland (OBL), facultative wetland (FACW) and/or facultative (FAC, excluding FAC-) species; 2) the USACE prevalence index (USACE 2006) which is a weighted average of at least 80 percent of vegetation cover and an index value of $\leq$ 3.0 must be obtained to indicate hydrophytic vegetation (methods for calculating the index are presented in USACE 2006); and 3) percent composition of hydrophytic species based on relative cover where more than 50 percent of total relative cover must be comprised of hydrophytic species.

An area also has hydrophytic vegetation where morphological adaptations of facultative upland (FACU) species are evident and these species are reclassified as facultative and the dominance test or prevalence index test is satisfied. Morphological adaptations in the Great Plains include adventitious roots, multi-stemmed trunks, shallow root systems or buttressing of tree trunks (USACE 2006).

Taxonomic references and wetland field guides that were used to identify species include Great Plains Flora Association (1986), Hitchcock and Cronquist (1973), Hitchcock *et al*. (1955-1969), Larson (1993) and USDA NRCS (no date).

1.4 Evaluate 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 NRCS 2006). In general, hydric soils are flooded, ponded or saturated for usually one week or more during the period when soil temperatures are above biologic zero (41 degrees Fahrenheit or 5 degrees Celsius). These soils usually support hydrophytic vegetation.

The National Technical Committee for Hydric Soils (NTCHS) has developed criteria for identifying hydric soils, and has compiled a list of the nation's hydric soils (USDA 1991 revised 2002). In addition, the NRCS has listed hydric soils specific to North Dakota including Stark County (USDA NRCS 2006). Hydric soil indicators potentially include low chroma matrix colors, presence of mottling or gleying, and/or high organic matter content. The USACE (2006) has identified 21 hydric soil indicators plus several indicators for problem soils in the Great Plains.

Field verification of hydric soils consisted of digging shallow pits shown on the Soils Figure 2.4-2A, Figure 2.4-2B, and Figure 2.4-2C (at least 20 inches deep where possible) and recording presence or absence of hydric indicators. Soil descriptions were compiled at each wetland plot. A North Dakota soil classifier assisted with the baseline soil survey for the Study Area.

1.5 Assess Wetland Hydrology

Wetland hydrology was assessed by evaluating drainages, stream terraces and floodplains, impoundments and spring/seep areas. Hydrologic indicators, listed in the Great Plains supplement to the 1987 USACE Manual, were noted on field data forms. This list includes water marks, drift lines, sediment deposits and drainage patterns. The extent of surface inundation or soil saturation was also recorded.

1.6 Identify and Delineate Non-wetland Waters of the U.S.

Concurrently with the site evaluation for wetlands, field personnel identified areas meeting criteria for non-wetland Waters of the United States. Integral to the delineation of non-wetland Waters of the U.S. is identification of the "ordinary high water mark" (OHWM) defined as that line on shore established by fluctuations of water and indicated by physical characteristics. These include presence

of a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, presence of litter and debris, or other appropriate means that consider characteristics of surrounding areas.

Non-wetland Waters of the U.S. in the Study Area include non-vegetated drainage bottoms with defined bed and banks, and stockwater ponds located in drainage bottoms where flow may eventually reach a navigable waterbody. Stockwater ponds are included in the wetlands assessment since they may meet USACE jurisdictional requirements; however, these artificial impoundments are considered developed water resources under PSC guidelines.

1.7 Integrate Wetland Components/Delineate Waters of the U.S.

Wetlands were delineated where a minimum of one positive indicator from each parameter (vegetation, soil and hydrology) was present. Where boundaries were indistinct, a transect across the boundary was established to verify the edge of the wetland.

Since wetland mitigation is generally tied to wetlands impacted, wetland boundaries were precisely identified using a sub-meter Global Positioning System (GPS) device (Trimble GeoXT) to ensure accurate acreage calculation.

Wetland delineation took into account recent U.S. Supreme Court decisions (Rapanos v. U.S. and Carabell v. U.S) that remove wetlands from USACE jurisdiction if the wetland is isolated or does not have a significant nexus with traditional navigable waters. Potentially isolated wetlands are, however, shown on the wetland map (Exhibit 1A, Exhibit 1B, and Exhibit 1C) and indicated as PI.

1.8 Assess Water Quality

A total of 33 sites were identified for wetland sampling within the Study Area (Exhibit 1A, Exhibit 1B, and Exhibit 1C). These sites included slope wetlands within seeps/springs and depressional areas within streams, reservoirs, and additional depressional wetlands identified from the 2006 wetlands baseline study and NWI maps (USFWS 2007). Of these, water quality data was collected from 21 different sites and analyzed for multiple parameters.

Twelve of the 33 sites (including SHRES 21A, SHRES-27, SHSS-17C, SHSS-17E, SHSS-20A, SHSS-27, SHUN-01, SHUN-02, SHW-03, SHW-07, SHW-10, and SHW-11) identified at the beginning of the study were found to be dry from April through November or otherwise did not contain a sufficient quantity of water for sampling. Water quality samples were not collected at these sites. Procedures for collecting samples followed recommendations from PSC and are based on the Stewart and Kantrud wetland classification types.

For Class IV semi-permanent wetlands (SHW-01A-C and SHW-05A-C), three randomly located samples were taken from each location. The three water quality samples were then analyzed and reported as individual results. For the Class III wetland sites, (SHW-06A-C; SHW-08A-C, and SHW-09A-C), three grab samples were composited by the lab creating just one water quality analysis. The wetland sampling sites and their corresponding wetland type are presented in Exhibit 1A, Exhibit 1B, and Exhibit 1C.

2.0 RESULTS

As a precursor to the wetland inventory, a comprehensive vegetation inventory conducted in 2006 resulted in the classification of vegetation types potentially dominated by hydrophytic species. These preliminary types included wet emergent, mesic emergent, saline emergent, scrub/shrub and riparian woodland. The 2006 data were evaluated for percent hydrophytic vegetation composition using the three evaluation methods. Table 2.0-1 lists the number of plots by vegetation type meeting hydrophytic vegetation criteria using any one of the three methods. Appendix A is a list of all species encountered on wetland evaluation plots with binomial, six-letter code, common name and wetland indicator status from Reed (1997).

TABLE 2.0-1

NUMBER OF 2006 VEGETATION PLOTS MEETING HYDROPHYTIC CRITERIA

Vegetation Type	2006 Sample Size	Number of Plots With Hydrophytic Vegetation	Percent
Wet Emergent	19	19	100
Mesic Emergent	10	0	0
Saline Emergent	9	7	78
Scrub/Shrub	24	0	0
Riparian Woodland	32	9	28
Total	**94**	**35**	**37**

Results of the 2006 inventory are presented in Appendix B. All 19 wet emergent plots sampled in 2006 were dominated by hydrophytic species. In contrast, none of the mesic emergent or scrub/shrub plots had a prevalence of wetland vegetation. Seven of nine (78 percent) saline emergent plots were hydrophytic, and nine of 32 (28 percent) riparian woodland plots were hydrophytic. Riparian woodland plots were, however, marginally hydrophytic. These plots met criteria for only one of the three evaluation methods (no plots were hydrophytic using the USACE prevalence index method).

Because the 2006 vegetation sampling occurred late in the growing season (August-September), the wetland inventory was deferred until spring 2007 to better assess wetland hydrology. In addition to sampling plots selected for the 2007 wetland assessment, many of the plots with hydrophytic

vegetation from 2006 were re-evaluated to assess hydric soils and wetland hydrology. Plots assessed during the 2007 inventory are summarized in Table 2.0-2.

TABLE 2.0-2

NUMBER OF PLOTS EVALUATED IN 2007 MEETING WETLAND CRITERIA

Vegetation Type	2006 Plots Re-evaluated In 2007	2007 Plots	Total Plots Sampled in 2007	Plots Meeting Wetland Criteria	Percent Meeting Wetland Criteria-2007 Sampling	Percent Meeting Wetland Criteria-2006 and 2007 Sampling
Wet Emergent	19	22	41	40	98	98
Mesic Emergent	0	12	12	3	25	14
Saline Emergent	7	1	8	7	87	70
Scrub/Shrub	0	5	5	3	60	10
Riparian	10	3	13	1	8	3
Woodland Forested Wetland	0	1	1	1	100	100
Total	**36**	**44**	**80**	**55**	**69**	**40**

Vegetation data for 2007 plots are presented in Appendix C. Appendix D includes field forms and Appendix E includes plot photographs.

The wet emergent type is almost always a wetland. One plot with hydrophytic vegetation did not have hydric soils or wetlands hydrology. This site is an old saline seep that has dried up as cropping practices have changed (R. Kuylen 2007)

The mesic emergent type is generally non-wetland although some depressional areas hold water long enough to have developed marginal wetland characteristics.

The saline emergent type generally meets wetland criteria although some areas with hydrophytic vegetation do not have hydric soils and/or wetland hydrology.

The scrub/shrub type is generally non-wetland, especially where western snowberry or silver sagebrush dominate. Some western snowberry depressional areas, however, have hydrophytic

species in the understory and marginally meet wetland criteria. In the few areas where sandbar willow is present, the scrub/shrub type meets wetland criteria.

The riparian woodland type very rarely meets wetland criteria, with only one plot classified as a wetland. In this case, tree canopy cover was enough to classify the site as a woodland type; however, the trees were not rooted in the wetland.

Table 2.0.3 presents a list of plots sampled with wetland status, vegetation type and community type based on dominant species.

2.1 Hydrogeomorphic Classes

Four hydrogeomorphic classes were identified in the Study Area: riverine, depressional, slope and mineral flat.

Riverine wetlands occur along streams and include the stream channel and adjacent fringe wetlands. Riverine wetlands are subdivided into riverine-lower perennial and riverine-non-perennial, reflecting nature of stream flow. The Heart River is perennial, with the South Branch Heart River and tributaries to the Heart and South Branch Heart rivers being non-perennial (intermittent or ephemeral).

Stream flows are flashy with overbank flooding during spring runoff and high intensity or prolonged precipitation events. Flows typically diminish rapidly following runoff. During field observations of non-perennial streams, water was usually found only in discontinuous channel depressions shortly after runoff events.

Flows in the Heart River likewise decrease rapidly after spring runoff. In late May-early June 2007 lower terraces and fringe wetlands were inundated, however by July 2007; flow had dropped exposing the sedge-dominated fringe.

Both the Heart and South Branch Heart rivers are incised several feet (ft) below adjacent terraces, hence wetland hydrology is narrowly restricted to channel banks and terraces within one to two ft above the typical runoff flow elevation. The extensive terraces along both rivers are elevated too high

to have wetland hydrology or support hydrophytic vegetation. These terraces flood only during exceptional runoff events with intervals of five to 100 years.

Depressional wetlands are common in the Study Area occurring as scoured or low areas in drainages, in historic channels of the South Branch Heart River and around stockwater ponds. Depressional wetlands can be 1) closed in the case of stockwater ponds that rarely overflow, 2) semi-closed in the case of a topographic depression where surface water outflows after major flow events or, 3) open in the case of a channel depression that has inflow and outflow during runoff events.

On the South Branch Heart River and the South Tributary, wetlands are mapped as a combination of riverine and depressional classes. During runoff events, usually of a relatively short duration, wetlands are riverine; however, fairly early in the growing season, flow diminishes or stops and wetland hydrology is restricted to channel depressions which hold water longer into the growing season.

Depressional wetland is the dominant wetland class in the West Tributary of the South Branch Heart River in sections 15, 16, 17 and 22, T139N, R98W. Although this nonperennial drainage could be classified as riverine, wetlands occur only in channel depressions and around constructed ponds, hence they were classified as depressional. The channel is discontinuous without a defined bank or beds between depressional areas. Large stockwater ponds intercept most seasonal flow so that areas below the ponds receive only occasional input via the channel with most water originating from slope run-in.

Slope wetlands are fed primarily from subsurface flow and occur at springs and seeps and below ponds where infiltration from the pond surfaces on a slope below the pond.

Slope wetlands are not common in the Study Area, occurring at spring/seep areas in the northwestern portion (sections 9, 16 and 17, T139N, R98W) and below stormwater ponds associated with the Western Area Power Administration substation in section 20, T139N, R98W.

The largest slope wetland is associated with a broad seep area (SHSS-16) along a coal outcrop on the section line between sections 9 and 16, T139N, R98W. A portion of this site has been developed for

livestock use by installing a PVC pipe which produces flows less than one gallon per minute (Ground Water Section 2.5).

Mineral flat wetlands are also relatively limited in the Study Area occurring on relatively flat ground below slope wetlands or on saturated terraces of drainages below ponds or adjacent to smaller streams. Mineral flat wetlands in the Study Area are generally sparsely vegetated by hydrophytic species and would formerly be classified as saline lowlands.

Hydrologic input is primarily from upslope seeps and springs or via temporary flooding and saturation from adjacent stream channels.

2.2 Wetland Vegetation Types

Emergent (herbaceous), scrub-shrub and forested wetland vegetation types occur in the Study Area. These three broad vegetation types are described in the following paragraphs.

Emergent (herbaceous) vegetation is the dominant type associated with wetlands occurring in riverine, depressional, slope and mineral flat hydrogeomorphic classes. Species composition varies with moisture regime and hydrogeomorphic class. The wetland fringe along the Heart and South Branch Heart rivers is dominated by sedges, primarily water sedge (*Carex aquatilis*). Prairie cordgrass (*Spartina pectinata*) is a common component in this type. The water sedge community type reflects riverine conditions where flowing water provides inundation or saturation for the majority of the growing season. This densely vegetated type provides bank stability during high flows.

Depressional wetlands exhibit a wide range of emergent vegetation communities reflecting moisture regime and soils. The wettest vegetation community is dominated by cattails (*Typha latifolia* or *Typha angustifolia*) and occurs peripherally to semi-permanently flooded ponds (see plot 1095, Appendix C1). Wetlands that are flooded or saturated for the majority of the growing season support vegetation communities dominated by common spikesedge (*Eleocharis xyridiformis*), prairie cordgrass, water ladysthumb (*Polygonum amphibium*), and willow dock (*Rumex mexicanus*). Temporarily flooded depressions support smoothcone sedge (*Carex laeviconica*), clustered field sedge (*Carex praegracilis*), foxtail barley (*Hordeum jubatum*), Baltic rush (*Juncus balticus*), and have a much higher percentage of facultative upland or upland species.

Slope wetlands are generally saturated for most of the growing season and typically support salt-tolerant species including inland saltgrass (*Distichlis spicata*), Nuttall's alkaligrass (*Puccinellia nuttalliana*), alkali bulrush (*Scirpus maritimus*) and Baltic rush. Less saline, wetter slope wetlands (*e.g.* plots 1006 and 1099, Appendix C1) support plant communities dominated by lesser cattail (*Typha angustifolia*) and prairie cordgrass (plot 1006) or foxtail barley.

Mineral flat wetlands, generally located on flat to gently sloping ground below slope wetlands or adjacent to stream channels likewise support an herbaceous vegetation community of salt-tolerant species. Dominant species include inland saltgrass, Nuttall's alkaligrass, foxtail barley, sea blite (*Suaeda depressa*), and Belvedere summercypress (*Kochia scoparia*). Most mineral flat wetlands are sparsely vegetated with low canopy cover and diversity.

The **scrub-shrub** vegetation type is limited in the Study Area occurring only in the riverine and depressional hydrogeomorphic classes. A sandbar willow (*Salix exigua*) community type is present on the banks and terraces above the South Tributary in section 34, T139N, R98W (see plot 1107, Appendix C4). Other common species in this type include western snowberry (*Symphoricarpos occidentalis*), Wood's rose (*Rosa woodsii*), silver buffaloberry (*Shepherdia argentea*), Kentucky bluegrass (*Poa pratensis*), prairie cordgrass and Baltic rush. Portions of the sandbar willow type extending up the slope adjacent to the terrace lose hydrophytic understory species and hydric soil characteristics, hence the wetland portion of the type is narrowly restricted to the banks adjacent to the channel and terraces less than two ft above the channel.

A common snowberry/smoothcone sedge community type occurs in a few depressional wetlands. Common snowberry is generally a poor indicator of wetland conditions and 10 plots sampled in snowberry stands in 2006 did not have hydrophytic vegetation but were dominated in the understory by upland species including western wheatgrass (*Agropyron smithii*), green needlegrass (*Stipa viridula*), needle-and-thread (*Stipa comata*), and Kentucky bluegrass (Appendix B4).

Two snowberry plots (1103 and 1110, Appendix C4) sampled in 2007 had understories comprised predominantly of hydrophytic species. In addition to smoothcone sedge, common species included water ladysthumb, Kentucky bluegrass and common dandelion (*Taraxacum officinale*). Western snowberry occurred on mounds within the stand or formed a ring around the drier edge of the depression. The western snowberry/smoothcone sedge community type has marginal wetland

characteristics for vegetation, soils and hydrology and is at the drier end of the wetland scale for the Study Area.

Forested wetlands are uncommon in the Study Area and were delineated at only four small sites, all within the depressional hydrogeomorphic class. One forested wetland occurs in an old mine pit excavation in the NE ¼ NW ¼ Section 16, T139N, R98W and was sampled at plot 1104 (Appendix C5). Plains cottonwood (*Populus deltoides*) dominates the overstory with clustered field sedge, foxtail barley and willow dock comprising the understory. Plains cottonwood also occurs as a fringe around some stock ponds; one such site was delineated within the Study Area.

Two natural depressional forested wetlands were delineated where green ash (*Fraxinus pennsylvanica*), American elm (*Ulmus americana*) or boxelder (*Acer negundo*) were present in the overstory. The understory includes clustered field sedge, Kentucky bluegrass and western snowberry. These sites were only temporarily flooded and have marginal wetland characteristics.

The broad floodplain of the South Branch Heart River supports extensive riparian woodland dominated by boxelder and green ash with some American elm. The riparian woodland was intensively sampled in 2006 in conjunction with the baseline vegetation inventory. Of the 32 plots sampled in this type during 2006, nine plots exhibited hydrophytic characteristics primarily resulting from the classification of the three tree species as facultative (Appendix B5). The riparian woodland was re-evaluated in 2007 to assess hydric soils and wetland hydrology (Appendix D, plots 94, 95, 97, 98, 101, 105, 106, 107, 108, 127, 1017 and 1019). None of these plots had positive indicators of hydric soils or wetland hydrology.

The South Branch Heart River is incised several ft deep through the Study Area. The floodplain terraces are elevated high enough above the ordinary high water mark that the riparian woodland is flooded only sporadically during very high runoff events. Frequency and duration of these extreme flow events are insufficient to meet wetland hydrology criteria.

The understory of the riparian woodland is dominated by upland species. In portions of the type, the understory is primarily herbaceous with common species including smooth brome (*Bromus inermis*), Kentucky bluegrass, and spearscale (*Atriplex subspicata*). Portions of the riparian woodland type have a shrub understory with common species including western snowberry, common chokecherry (*Prunus virginiana*), Wood's rose (*Rosa woodsii*), and silver buffaloberry (Appendix B5).

2.3 Water Regimes

Four water regimes were identified in the Study Area: temporarily flooded, seasonally flooded, semipermanently flooded and saturated. Water regime is shown for each wetland on the Wetland Map (Exhibit 1A, Exhibit 1B, and Exhibit 1C). Acreage of wetland mapping units for each water regime is presented in Table 2.3-1 by landowner within the Permit Boundary.

Temporarily flooded wetlands occur where surface water is present for brief periods during the growing season. This water regime is present in many depressional wetlands and along drainages that flow only for short periods. Water input is from precipitation and overland flow or, in the case of drainages, from spring runoff or precipitation events. Temporarily flooded wetlands are at the drier end of the wetland scale and facultative or upland species are common.

Seasonally flooded wetlands are present where surface water is present for extended periods, especially early in the growing season. Seasonally flooded wetlands occur as an herbaceous fringe along the Heart and South Branch Heart rivers, along larger tributaries, peripheral to seasonally or semipermanently flooded ponds and in deeper channel depressions or drainages. Vegetation reflects an intermediate moisture regime dominated by facultative wetland species.

Semi-permanently flooded wetlands occur where surface water is present throughout the growing season in most years. This water regime is uncommon in the Study Area found only at three man-made impoundments. These deeper ponds are excavated and/or impounded for livestock or wildlife water, created by previous surface coal mining or constructed as a stormwater pond for an electrical substation. Vegetation peripheral to semipermanently flooded ponds is at the wetter end of the wetland scale with dominance by obligate or facultative wetland plants.

The NWI map for the Study Area classified many of the constructed ponds as semipermanently flooded. Observations in 2006 and 2007, years of fairly typical precipitation, did not support the NWI classification as most of the ponds were dry by fall 2006 and/or had very low water in spring 2007.

Saturated wetlands are associated with slope and mineral flat wetlands where upslope seeps and springs or upstream ponds provide soil saturation, but flooding is generally not a major contribution to the water regime. Duration of saturation varies by site depending on discharge from the seeps,

springs or ponds. One site (plot 1006, Appendix C1) is saturated throughout the growing season and supports lesser cattail and prairie cordgrass. Most saturated wetlands, however, dry out earlier in the growing season and support hydrophytic species including inland saltgrass, Nuttall's alkaligrass, seablite, Belvedere summercypress, Baltic rush and foxtail barley.

Non-wetland Waters of the U.S. within the Study Area include stream channels where hydrophytic vegetation is absent. This includes the channel of the Heart River, South Branch Heart River and tributaries to these streams. The south and west tributaries of the South Branch Heart River are incised three to ten ft below adjacent terraces resulting in a lack of wetland hydrology on the terraces. Stream width varies considerably with the ordinary high water width of the Heart River between six and 50 ft depending on location. Average width of the Heart River is about 20 ft. Water depth ranges from one to six ft.

The South Branch Heart River likewise varies considerably in width ranging from five to 40 ft and averaging about 10 ft. Depth varies with width ranging from 0.5 to 4 ft.

The South Tributary varies from one to five ft wide and 0.5 to three ft deep. Minor tributaries within the Study Area are one to three ft wide and 0.5 to two ft deep. The bottom of stream channels are generally composed of mud.

The PSC (2003) specifies that wetlands be classified using the system of Stewart and Kantrud (1971). Since the Stewart and Kantrud classification system was developed for natural ponds and lakes in the glaciated prairie region and the Study Area is not glaciated and ponds are man-made, it was agreed with the PSC that a classification combining hydrogeomorphic classes and the Cowardin system is more appropriate for the Study Area. Some correlation is possible, however, between the classification used in this report and Stewart and Kantrud's classes. Temporarily flooded wetlands equate generally to Stewart and Kantrud's Class I (ephemeral ponds) and Class II (temporary ponds). Seasonally flooded wetlands are most comparable to Class III (seasonal ponds and lakes) and semipermanently flooded wetlands correlate with Class IV (semi-permanent ponds and lakes). Saturated wetlands correlate poorly with Stewart and Kantrud's classification system as surface water (ponding) is generally not present in saturated wetlands. No Class V (permanent ponds and lakes), Class VI (alkali ponds and lakes), or Class VII (fens) wetlands were identified in the Study Area.

Recommended procedures by PSC also request total acreage, land use and existing vegetation for Stewart and Kantrud's Class I and II wetlands. Assuming that Class I and Class II wetlands equate generally to temporarily flooded wetlands, total acreage for these wetlands within the Permit Boundary is 19.15 acres (Table 2.3-1). Existing vegetation is generally dominated by herbaceous species including clustered field sedge, smoothcone sedge, foxtail barley and Baltic rush. Common facultative upland and upland species in temporarily flooded wetlands are western wheatgrass, Kentucky bluegrass and common dandelion. Unlike prairie potholes which are frequently farmed, temporarily flooded wetlands within the Permit Boundary are not farmed and the primary land use is livestock grazing. These wetlands also provide wildlife habitat.

Class III wetlands, including seasonally flooded and saturated (for lack of a better fit in the Stewart and Kantrud classification) wetlands cover 37.33 acres within the Permit Boundary (Table 2.3-1). Class IV wetlands (semi-permanently flooded) cover 0.05 acre.

As opposed to prairie potholes, wetlands within the Study Area do not exhibit substantial zonation. Riverine wetlands are typically a narrow fringe along the stream comprised of a single vegetation community type, frequently dominated by water sedge. Slope and mineral flat wetlands do not exhibit zonation but have relatively homogeneous vegetation throughout. Most depressional wetlands are small channel depressions comprised of only one vegetation community type.

Some stockwater ponds have two vegetation zones, one peripheral to the ordinary high water mark and one associated with the mud pond bottom as the stockpond dries out during the summer. The pond bottom is a developed water resource under PSC guidelines and the fringe above the ordinary high water mark is comprised of one vegetation zone. The bottoms of ponds are characterized by plots 1076, 1088, 1090, 1098 and 1100 (Appendix C and Appendix D). Common species on drying pond bottoms include common cocklebur (*Xanthium strumarium*), biennial wormwood (*Artemisia biennis*), annual ragweed (*Ambrosia artemisiifolia*), curlycup gumweed, willow dock, foxtail barley and common spikesedge.

Pond perimeters (plots 1080, 1083, 1089 and 1095, Appendix C and Appendix D share floristic similarities to dried pond bottoms, however, annual and biennial forbs common to the pond bottoms are absent or much less common peripheral to the ordinary high water mark. Common species peripheral to ponds within the saturated or occasionally flooded zone include smoothcone sedge, clustered field sedge, common spikesedge, foxtail barley and willow dock.

Vegetation was sampled (Plot 1095) at a semi-permanently flooded (Class IV) pond. Common cattail dominated the pond perimeter. Species lists pertinent to each vegetation type are presented in Appendix B and Appendix C.

2.4 Water Quality

A summary of water quality results for reservoir and surface water sites within the Study Area is presented in Surface Water Section 2.6. Seep and spring water quality analyses are presented in Ground Water Section 2.5. Wetland water quality data for sites within the Study Area are presented in Table 2.4-1:

Stewart and Kantrud in their 1972 publication, "*Vegetation of Prairie Potholes, in Relation to Quality of Water and other Environmental Factors*", report the following salinity ranges for wetland basins on the Missouri Coteau such as those within the Permit Boundary.

Salinity Range	**Specific Conductance(umhos/cm)**
Fresh	400-500
Slightly Brackish	500-2,000
Moderately Brackish	2,000-5,000
Brackish	5,000-15,000

As shown in Table 2.4-1, wetlands within the Permit Boundary generally exhibit slightly brackish to moderately brackish salinity characteristics.

3.0 SUMMARY WITHIN THE PERMIT BOUNDARY

Pre-mining wetlands were identified and inventoried as part of the Wetlands Baseline Study. Wetlands are delineated on Exhibit 1A, Exhibit 1B and Exhibit 1C. An overview of wetlands and sampling locations within the Permit Boundary are shown on Figure 2-1. Each wetland plot was mapped, plant species were inventoried and wetland indicator status (Reed 1997) was listed (Appendix A).

Four water regimes were delineated within the Permit Boundary, including temporary, seasonal, semi-permanent and saturated wetlands. The PSC (2003) specifies that wetlands be classified using the system of Stewart and Kantrud (1971); however, wetlands within the Permit Boundary are outside of the glaciated prairie region and the Stewart and Kantrud classification system is poorly suited to wetlands within the Permit Boundary. As a result, it was agreed with the PSC that it would be acceptable to classify wetlands using a combination of hydrogeomorphic classes and the Cowardin system. The results described in Section 2.0 for the Study Area are representative of wetlands within the Permit Boundary. The results are summarized below for wetlands within the Permit Boundary.

Dominant species for vegetation types and mapping units for plots sampled within the Permit Boundary are listed in Table 2.0-3. Appendix B and Appendix C present species for each vegetation type. Water input and flows are described in Section 2.1 for each hydrogeomorphic class and water quality is described in Section 2.4. Acreage of wetland mapping units for each water regime is presented in Table 2.3-1 by landowner within the Permit Boundary. Land Use and successional phase are also identified in Table 2.3-1. Wetlands occupy approximately 56 acres within the Permit Boundary. This total includes acres of developed water resources. Prairie pothole features are not present within the Permit Boundary due to the absence of glacial landforms. Vegetation associated with wetland mapping units within the Permit Boundary is relatively homogeneous and comprised of one single vegetation type; as a result, vegetation does not exhibit significant zonation and maps on line drawings showing zonation are not relevant.

Vegetation associated with wetlands within the Permit Boundary has been altered by land use management, primarily grazing resulting in a departure from climax conditions. Unlike the prairie potholes region, however, depressional wetlands have not been altered by farming resulting in cropland or early successional phases. Most wetlands are in a mid to late successional phase reflecting a decrease in climax species and a corresponding increase in species that respond favorably to grazing. Common species that have increased or invaded include Kentucky bluegrass, smooth brome, Baltic

rush, foxtail barley and numerous forbs including leafy spurge. Early successional phases are less common and occur in stockwater pond bottoms (developed water resources) and depressional wetlands frequently scoured by high spring flows or temporary or seasonal inundation. Common species in the early successional phase include smooth brome, foxtail barley, common cocklebur, biennial wormwood, annual ragweed, curlycup gumweed and willow dock. Successional phase for wetlands within the Permit Boundary are listed in Table 2.3-1.

Sections 2.1, 2.2 and 2.3 discuss the relationship among vegetation, soils and hydrology. Appendix D (Field Forms) lists these parameters for each sampled plot. Observed or historical anthropomorphic use of wetlands within the Permit Boundary is related to past and current grazing and the construction of stockponds (developed water resources). Agricultural conversion of wetlands is not an anthropomorphic use of wetlands within the Permit Boundary as is common in the prairie pothole region. Table 2.3-1 lists land use for wetlands within the Permit Boundary.

Temporarily flooded wetlands correspond mostly with the Stewart and Kantrud Class I and Class II wetland classification. Temporarily flooded wetlands occupy approximately 19 acres (34 percent) within the Permit Boundary. They occur where surface water is present for brief periods during the growing season. Temporarily flooded wetlands are generally linear and there are no prairie pothole features. This water regime is present in depressional wetlands frequently occurring along drainages that flow only for short periods. Temporarily flooded wetlands are also associated with smaller developed water resources (stockponds). Temporarily flooded wetlands are at the drier end of the wetland scale and facultative or upland species are common. Most temporarily flooded wetlands are in an early to mid successional stage, exhibiting only one vegetation zone. Temporarily flooded wetlands within the Permit Boundary are not farmed or tilled and the primary land use is livestock grazing or developed water resources.

Seasonally flooded wetlands correspond mostly with the Stewart and Kantrud Class III wetland classification. Seasonal wetlands occupy approximately 31 acres (55 percent) within the Permit Boundary. They occur as an herbaceous fringe along the Heart and South Branch Heart rivers, along larger tributaries, peripheral to seasonally or semipermanently flooded ponds and in deeper channel depressions or drainages. The seasonally flooded wetlands are generally linear and there are no prairie pothole features. A few stockwater ponds are also included within the seasonal water regime and these depressional wetlands may have two vegetation zones; one associated with the ordinary high water mark and the other associated with the mud pond bottom (developed water resource). These zones are

depicted on Exhibit 1A, Exhibit 1B and Exhibit 1C. Other depressional and riverine wetlands present within the seasonally flooded water regime are comprised of the single emergent vegetation type frequently dominated by smoothcone sedge or water sedge. Successional phase varies from early to late depending on land use. Unlike prairie potholes which are frequently farmed, temporarily flooded wetlands within the Permit Boundary are not farmed or tilled and the primary land use is livestock grazing, except for stockponds, which are developed water resources.

Semi-permanently flooded wetlands correspond mostly with the Stewart and Kantrud Class III wetland classification. Semi-permanently flooded wetlands occupy approximately .05 acre within the Permit Boundary occurring where surface water is present throughout the growing season in most years. This water regime is uncommon within the Permit Boundary and found only at one man-made impoundment (developed water resource). This impoundment is present in a historic mine pit and has a narrow fringe of hydrophytic vegetation in an early to mid successional stage. Semi-permanently flooded wetlands within the Permit Boundary are not farmed or tilled. The primary land use is currently for stock watering; however, the historic mine land use was coal mining.

Saturated wetlands correspond mostly with the Stewart and Kantrud Class III wetland classification and occupy approximately four acres (.07 percent) within the Permit Boundary. They are associated with slope and mineral flat wetlands where upslope seeps and springs or upstream ponds provide soil saturation, but flooding is generally not a major contribution to the water regime. Saturated wetlands are areal or linear and there are no prairie pothole features. This water regime has a single emergent vegetation type frequently dominated by salt tolerant species (see plots 36, 52, 53 and 1102, Appendix D). Species composition reflects a mid successional phase with both increaser and decreaser species present. Saturated wetlands within the Permit Boundary are not farmed or tilled and the primary land use is livestock grazing.

As shown in Table 2.4-1, wetlands within the Permit Boundary generally exhibit slightly brackish to moderately brackish salinity characteristics. Stream flows and inflows vary for each hydrogeomorphic classification and are described in Section 2.1. In summary, large stockwater ponds intercept most seasonal flow so that areas below the ponds receive only occasional input via the channel with most water originating from slope run-in. Slope wetlands are fed primarily from subsurface flow and occur at springs and seeps, and below ponds where infiltration from the pond surfaces on a slope below the pond. Mineral flat wetlands receive input primarily from upslope seeps and springs or via temporary flooding and saturation from adjacent stream channels.

TABLES

FIGURES

EXHIBITS

APPENDIX A

LIST OF VASCULAR PLANT SPECIES IDENTIFIED

APPENDIX B

PERCENT HYDROPHYTIC COMPOSITION DETERMINED USING THREE CALCULATION PROCEDURES FOR 2006 VEGETATION PLOTS

APPENDIX C

PERCENT HYDROPHYTIC COMPOSITION DETERMINED USING THREE CALCULATION PROCEDURES FOR 2007 WETLAND PLOTS

APPENDIX D

FIELD FORMS

APPENDIX E

PLOT PHOTOGRAPHS