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## 2.7 Pre-mining Land Use and Vegetation

### 2.7.1 Pre-mining Land Use

In accordance with portions of the following regulations related to land use:

- Section 38-14.1-14(2)(a), North Dakota Century Code (NDCC); and
- Section 69-05.2-08-08, North Dakota Administrative Code (NDAC).

#### 2.7.1.1 *Introduction*

This section describes the pre-mining land uses present within the Permit Boundary. The land use Study Area ([Figure 2.7.1-1](#)) includes the area within the Permit Boundary and adjacent areas. The land uses were initially determined through air photo interpretation and subsequently verified through onsite surveys and landowner interviews. The use of all areas and the production of harvested and grazed areas were determined for the years of 2002 through 2006.

#### 2.7.1.2 *Objectives*

The primary objective of this study was to collect data that document the land uses that have existed within the Permit Boundary for at least the prior five years (2002 through 2006) and to document the production of the cropland and grazing land tracts during that period. Related survey objectives were to generate data sufficient to serve additional purposes including:

- Evaluation of the productivity and relative importance of areas potentially classified as Alluvial Valley Floors (AVFs); and
- Preparation of an environmental review document (e.g., Environmental Impact Statement) for the South Heart Lignite Mine (SHLM), if necessary.

Data provided in this Baseline Study Report, combined with existing data and supporting information, may be used by project scientists and engineers to accomplish the foregoing. In order to ensure data are suitable for these uses, all data were collected in compliance with applicable standards and regulations cited herein.

### 2.7.1.3 *Methods*

This study was completed by first interpreting aerial photography and subsequently conducting field investigations to verify these interpretations. The field investigations, including landowner interviews were used to refine the field map and fully document the uses and management history for the prior five years. The following sections include a more detailed description of these methods.

#### 2.7.1.3.1 Land Use Mapping

Aerial photographs from 2006 were reviewed and all land uses were digitized at a scale of greater than 1:4,800. In addition to delineating the uses defined by the applicable sections of the NDAC, other features including the footprint of structures and other miscellaneous uses were also identified and separated from adjoining areas. The goal of the land use map was to separate all readily identifiable features that indicated either unique uses or reflected historic anthropogenic influences that affect the capability or use of the site.

Onsite investigations resulted in a number of corrections to the digitized land use boundaries. Additional boundaries were added and others were removed in an attempt to refine the use patterns in the Study Area. The findings of the wetland and vegetation surveys were also incorporated to ensure agreement between the various delineations and use classifications.

In addition to describing the details of structures within the Permit Boundary, the location and current use of all structures within 0.5 miles of the Permit Boundary were also investigated in accordance with Section 69-05.2-08-02, NDAC. Locations and preliminary use determinations were made through air photo interpretation. The uses were field verified to the extent possible through observation from public access points

#### 2.7.1.3.2 Operator and Landowner Interviews

Following refinement of the land use maps, the landowners or current agricultural operators were interviewed in June and July of 2007 regarding their use of the land in the Study Area. The interviews were completed in a consistent manner by asking a series of questions related to all uses with specific focus on cropland use and production, grazing land use and production, recreational uses (including hunting), wildlife and habitat, structure use and condition (including

residences), and the surface and groundwater features and developments and their respective use characteristics. In addition, all persons interviewed were asked to review the delineations on the land use map to identify other important features related to their use and to ensure that boundaries coincide with their existing uses.

#### 2.7.1.3.3 Land Capability Classification (LCC)

The capability of tracts within the Study Area to support land uses was determined by classifying all soil map units using the United States Department of Agriculture (USDA) LCC system (Klingebiel and Montgomery 1961, USDA 2007a). The LCC includes eight classes of land designated by Roman numerals I through VIII and four subclasses which signify special limitations such as (e) erosion, (w) excess wetness, (s) problems in the rooting zone, and (c) climatic limitations. The first four classes are arable land in which the limitations on their use and necessity of conservation measures and careful management increase from I through IV. The criteria for placing a given area in a particular class involve the landscape location, slope of the field, depth, texture, and reaction of the soil. The remaining four classes, V through VIII, are not to be used for cropland, but may have uses for pasture, range, woodland, grazing, wildlife, recreation, and esthetic purposes. These classes are more fully discussed below.

**Class I** – Class I land has few or no conditions that limit its use for most common agricultural crops; it can be safely cultivated without special conservation treatment. There are no subclasses in Class I land. Soils in Class I land are suited to a wide range of plants and may be used safely for cultivated crops, pasture, range, woodland, and wildlife. They have deep soils, are generally well drained, and easily worked. They hold water well and are either fairly well supplied with plant nutrients or highly responsive to fertilizer. These soils are not subject to damaging overflow. Class I land is productive and suited to intensive cropping. The local climate is favorable for growing most common field crops. Class I land that is used for crops needs only ordinary management practices to maintain it. Class I land is level and is not subject to accelerated erosion. It does not have a wetness problem or other unfavorable soil characteristics in the root zone.

**Class II** – Class II land has some natural conditions that require some conservation practices when it is cultivated or that limit the kinds of plants it can produce. Soils in Class II require more careful management than do those of Class I land, including conservation practices, to prevent deterioration or to improve air and water relations when the soils are cultivated. The limitations are slight,

however, and the practices are easy to apply. Although this land can be used for cultivated crops, pasture, range, wildlife food and cover, woodland, or outdoor recreation, the farm operator has less latitude in the choice of crops and management practices than with Class I land.

Class III – Class III land has one or more moderate limitations on its use. These soils are more restricted in the crops that can be produced than are those in classes I and II. When cultivated, conservation practices are more difficult to implement, and/or maintenance is usually required. Class III lands may be used for cultivated crops, pastures, range, wildlife food and cover, woodland, or recreation. Limitations of soils in Class III restrict the amount of clean cultivation; time of planting, tillage or harvesting operations; choice or yield of crops; or a combination of these. These limitations may be a result of erosion due to past or present land uses, or natural occurrences; such as steep slopes or changes in the hydrologic regimes.

Class IV – Class IV land is suitable for only occasional or limited cultivation. It has one or more severe limitations that restrict its use. Soils in Class IV have very severe limitations that restrict the kinds of plants that can grow. When cultivated, they require very careful management, and conservation practices are more difficult to apply and maintain than on soils in classes II and III.

Class IV land includes soils in areas where flooding may preclude planting or harvesting crops during unfavorable years. Many sloping soils in Class IV in humid areas are suited to occasional, but not regular, cultivation because of the severe erosion hazard. Some of the poorly drained, nearly level soils are not subject to erosion but are poorly suited to some crops because of wetness, frequency of flooding, or low productivity for cultivated crops. Some hilly soils in Class IV are well suited to one or more special crops such as fruits or ornamental trees and shrubs.

Class V – Class V land is level but has some conditions that limit its use to pasture or range, woodland, recreation, watershed protection, or wildlife habitat. The soils in Class V land have limitations other than erosion that restrict the kinds of plants that can be grown and/or that prevent tillage of cultivated crops. Examples of limitations are: a) subject to frequent flooding, b) stony or rocky soils, and c) ponded areas where drainage is not feasible.

Class VI – Class VI land has soils with very severe limitations that make it generally unsuited for cultivation and restrict its use to pasture, range, woodland, recreation, watershed protection, or wildlife habitat. It may be well or poorly suited to woodland, depending on the characteristics of the

soil. The soils are such that it is practical to apply range or pasture improvement such as seeding, liming, fertilization, or water control by means of contour furrows, drainage ditches, diversions, or water spreaders. Some soils in Class VI are well adapted to long-term meadows and sodded orchards that do not require cultivation or to special crops such as blueberries that require soil conditions unlike those demanded by most cultivated crops.

Class VII – Class VII land has soils with very severe limitations that make it unsuited for cultivation and restrict its use to pasture, range, woodland, recreation, watershed protection, or wildlife habitat. Even in these the soils require careful management. Soils in this Class VII land have restrictions more severe than those in Class VI because of one or more limitations that cannot be modified. These conditions make the land unsuited for common cultivated crops, although some special crops with unusual management practices can be grown. Physical conditions of the soils make it impractical to apply such pasture or range improvements as seeding, liming, or fertilization, and water control measures such as contour furrows, ditches, diversions, or water spreaders. Soils in this class range from well to poorly suited for woodland.

Class VIII – Class VIII land has soils with severe limitations that prevent its use for commercial plant production. Soils and landforms in Class VIII cannot be expected to return significant on-site benefits from management for crops, grasses, or trees, although benefits from wildlife use, watershed protection, or recreation may be possible. Rock outcrops, sand beaches, river wash, mine tailings, and other nearly barren areas are included in Class VIII.

The class and subclass determinations were determined in conjunction with the Soil Survey ([Section 2.4](#)). All classifications were completed by Mr. Kenneth Thompson (Registered Professional Soil Classifier ND, No. 14) with input from local Natural Resources Conservation Service (NRCS) soil survey staff. Wetlands, water bodies and areas previously disturbed were not assigned a land capability rating.

#### 2.7.1.3.4 Reporting

Following the interviews, the maps were corrected and the data collected were tabulated and summarized to prepare this report. In addition to the data presented herein, the data relating to crop production and structure characteristics were compiled into a GIS database for future use.

Additional information was collected as necessary to interpret the findings of the study. All of the information related to the uses of areas within the Permit Boundary is presented in this report.

#### 2.7.1.4 *Results*

The current and historic uses of the land comprising the Study Area are the same and have not changed appreciably for at least five years prior to 2007. Discussions with operators and visual observation within the Study Area, suggest that land uses have not changed significantly for several decades. The most notable changes likely to have occurred relate to the specific cropping practices, including the crop rotations, agricultural inputs, and equipment, and the portion of the area cultivated each year. The vast majority of the area is regularly cultivated or has been previously tilled and is now seeded to perennial species used for grazing (i.e., tame pastureland) or conservation purposes. Undisturbed grassland tracts are distributed throughout the Study Area in flood-prone areas, areas with poor soils or steep slopes, and near fences and property lines on the fringes of cropland tracts. Depending on the species composition, these undisturbed areas are either tame pastureland or native grasslands as further described in the Vegetation Baseline Study Report ([Section 2.7.2](#)). The majority of the remaining area is used for transportation infrastructure, agricultural facilities, residences and farmsteads, and developed water resources. Minor portions of the Study Area are used for utilities or mining.

Land uses within the Permit Boundary that directly compare to the uses defined in the NDAC Section 69-045.2-01-02 and 69-05.2-23 are described in the following section. Additional uses of the land within the Permit Boundary that do not directly correlate to these uses are also described at the end of this section. It may be appropriate to combine all or portions of these “additional uses” with other NDAC specified uses when evaluating the acreages of the uses within the Permit Boundary. The total pre-mine acreage of each land use category within the Permit Boundary is provided in [Table 2.7.1-1](#). The acreage of cropland and tame pastureland within the Permit Boundary is summarized by landowner for each mapping unit in [Appendix 2.7.1-1](#). A comparison of pre-mine and post-mine acreage by landowner is presented in [Section 4.2](#).

##### 2.7.1.4.1 Cropland

Croplands are areas used for the production of adapted crops for harvest. This use includes areas currently or recently cultivated for the production of annual crops or hay-land. Included in this use

category is a related use as grassed waterways (designated Cropland Waterway). These waterways are areas that were once tilled but are now permanently vegetated and often hayed or grazed in conjunction with aftermath (crop residue following harvest) grazing. Cropping rotations and practices are not rigid and generally follow the needs of the operator, farm program requirements, commodity prices, and suitability of the tract to support the types of crops available. Continuous cropping is practiced on all tracts, with no areas left for fallow in any of the five years prior to 2007.

Spring wheat (SW) is the most common crop in the Study Area; followed by mixed hay (MH), grass hay (GH), and alfalfa hay (AH). A number of other crops were occasionally planted and harvested during the previous five years and also planted in 2007. These crops include safflower (SA), oat hay (OTH), barley hay (BLH), oats (OT), corn silage (CS), pasture (PSTR; mixed hay that was grazed rather than harvested), millet hay (MTH), and barley (BL), in order of decreasing frequency. With the exception of mixed, grass, and alfalfa hay crops, all of the crops are annuals that must be re-planted each year.

Although not specifically a crop, a very common use of cropland in the Study Area (second only to spring wheat) is enrollment in the Conservation Reserve Program (CRP), discussed later in this section. While these tracts are not harvested every year, CRP tracts are occasionally cut for hay during periods of drought (emergency purposes) or under farm bill provisions that allow managed harvesting or grazing in one of every three years. In accordance with the managed harvest requirements, the amount of harvest is commonly one-third of the enrolled tract each year. Most tracts enrolled in CRP may be considered mixed hay for comparison to other production records.

The production of all cropland within the Permit Boundary, including hay from CRP, was documented through direct interview of landowners. These production records are provided in [Table 2.7.1-2](#), with the field identifications corresponding to the unique field identifications on [Figure 2.7.1-2A](#), [Figure 2.7.1-2B](#) and [Figure 2.7.1-2C](#) and the crop codes corresponding to those previously noted in this sub-section. The crop and production for each year from 2002 through 2006 (five years) and crop planted in 2007 were documented for all cropland fields. In addition, agricultural operators were asked to estimate the average yield for the crop most commonly grown on each tract. The “average” yields are based on the operator’s familiarity with the fields across many

years rather than a simple average of the prior five years. These values provide a basis for comparing the production of the fields to each other.

The cropland mapping units occurring within the Permit Boundary were identified during the baseline soil survey. The occurrence of the mapping units within each landowner's cropland within the Permit Boundary are provided in [Appendix 2.7.1-1](#).

The 30-year average yield for various crops and cropping practices in Stark County is provided in [Table 2.7.1-3](#) (USDA 2007b). The summary also provides the number of years each crop and cropping practice was reported from 1977 to 2007 and the average acres planted each year. The "Total for Crop" statistic is an average of the annual total production data for each crop regardless of practice and is not an average of the data presented in the table. Safflower and grain hay are among those crops regularly grown in the Study Area that do not have corresponding county yield statistics.

The average long-term yield estimates per acre were also determined for each of the cropland mapping units within the Study Area using the productivity indexes (PI) and county data presented in the Standards for Evaluation of Revegetation Success and Recommended Procedures for Pre- and Post-Mining Vegetation Assessments (PSC 2003). The PI's (determined from soil type and average slope) and average long term-yields for Spring Wheat, Oats, and Barley are presented in [Table 2.7.1-4](#). These values can be used in conjunction with [Appendix 2.7.1-2](#) to evaluate average potential yield by landowner.

These average yield statistics in [Table 2.7.1-3](#) and [Table 2.7.1-4](#) can be compared to the annual and average production reported by operators for the various crops in [Table 2.7.1-2](#).

#### 2.7.1.4.2 Tame Pastureland

The use of land within the Study Area for tame pastureland includes areas with varying composition by tame (i.e., introduced) grasses and forbs for livestock grazing. Areas nearly totally comprised of introduced species are identified as Tame Pastureland, but other areas with a notable extent of native or woody species are identified as composite units (e.g., Native Grassland-Tame Pastureland or Tame Pastureland-Woodland) that are further described in the Vegetation Baseline Study Report ([Section 2.7.2](#)). Most tracts of tame pastureland occur in areas with relatively low productivity soils or topographic features that limit their usefulness as cropland. In the Study Area the vast majority of

tame pastureland tracts are grazed except those that are within the same fenced unit as cropland tracts enrolled in CRP or outside of fenced units. None of the operators managing tracts of tame pastureland reported haying these tracts from 2002 through 2006.

The tame pastureland (pure tame pastureland; not including composite uses) mapping units occurring within the Permit Boundary were identified during the baseline soil survey. The occurrence of the mapping units within each landowner's tame pastureland within the Permit Boundary are provided in [Appendix 2.7.1-1](#).

The productivity of tame pastureland is largely dependent on the suitability of the individual mapping units (i.e., soil types). [Table 2.7.1-4](#) presents the pasture and hayland suitability group (PHSG) and median production estimate for each mapping unit (PSC 2003). In addition, the forage suitability group (FSG) is provided in [Table 2.7.1-4](#) for each mapping unit, with corresponding yield ranges presented in [Table 2.7.1-5](#). These estimated yields can be compared to the description of species composition and actual yields presented in the Vegetation Baseline Study Report ([Section 2.7.2](#)) and the grazing utilization of pastures presented in [Appendix 2.7.1-2](#).

#### 2.7.1.4.3 Native Vegetation

For the purposes of this study, native grasslands include areas where the vegetation is almost entirely comprised of native species. Areas with notable presence of introduced species are identified as composite units (e.g., native vegetation-tame pastureland) that are further described in the vegetation section. Native vegetation units and associated composite units usually have not been historically cultivated (usually because they are unsuitable for cultivation) and often utilized for livestock grazing. Most of tracts of native grassland occur in areas with steep slopes, saline or sodic soils, along stream channels river bottoms (in association with woodlands), or as buffer strips and exclusions found in association with cropland and shelterbelts. Additional smaller areas are included as small fenced lots adjacent to farmsteads with variable uses supporting agricultural operations including equipment storage, hay lots, and other miscellaneous uses. A more detailed description of the composition of native grasslands, tame pastureland, and composite units is provided in the Vegetation Baseline Study Report ([Section 2.7.2](#)).

#### 2.7.1.4.4 Shelterbelts

Use of land within the Permit Boundary for shelterbelts includes parcels where tree and/or shrub species have been planted to serve as wind and snow breaks. These shelterbelts provide wildlife habitat, and serve other related purposes. Shelterbelts most commonly occur in the immediate vicinity of active and historic farmsteads.

#### 2.7.1.4.5 Recreational

While no areas within the Permit Boundary are dedicated solely to recreational use, nearly all of the agricultural operators interviewed stated that hunting is an allowed recreational use within the Permit Boundary. However, they attribute no economic or other value to recreational land use or wildlife management and categorize this use as ancillary to the agricultural uses on the same tracts. No landowners have specific plans in place for wildlife or habitat management except for the objectives and use constraints associated with the conservation easements that attend enrollment in conservation programs discussed later in this section.

#### 2.7.1.4.6 Residential

This land use would generally include residences and their associated structures and yards. However, several farmsteads, which include residences, occur within the Permit Boundary. Most of the sites of residences have other adjacent land uses more appropriately classified in one of the other categories listed in the “Other Uses” section below. These uses can be combined with adjacent residences for determination of the residential acreages as appropriate. The size, year constructed, and condition of residences shown on [Figure 2.7.1-2A](#), [Figure 2.7.1-2B](#) and [Figure 2.7.1-2C](#) are provided with other structure-specific data in [Table 2.7.1-6](#).

#### 2.7.1.4.7 Industrial and Commercial

No sites of manufacturing or sales businesses are located within the Permit Boundary. The only uses that are appropriate for inclusion in this category are the location of electrical transmission structures and similar utility facilities (identified as Industrial / Utilities). These areas are generally isolated and very small in size.

#### 2.7.1.4.8 Woodlands

Woodlands include areas where the primary pre-mining natural vegetation is trees or shrubs. These areas are commonly grazed as part of established pastures. The composition, classification, density and production of woodlands are described in detail in the Pre-mining Vegetation Report ([Section 2.7.2](#)).

#### 2.7.1.4.9 Developed Water Resources

Developed Water Resources include areas where water is ponded upgradient from a constructed embankment or in an excavated (not natural) basin. The areas identified as developed water resources are periodically inundated by water and can be devoid of vegetation below the high water mark. This land use includes many areas classified as wetlands in the Pre-Mining Vegetation Report ([Section 2.7.2](#)).

#### 2.7.1.4.10 Wetlands

Wetland land uses include areas identified as non-temporary (i.e., classes other than Class I or Class II) wetlands in conjunction with the baseline wetland survey (see [Section 2.10](#)). Wetland land uses do not include wetlands identified as diked/impounded (h modifier) or excavated (x modifier) in the Pre-Mining Wetland Report as these wetlands are more appropriately assigned to the developed water resource land use (Section 2.7.1.4.9).

#### 2.7.1.4.11 Other Uses

While not specifically identified as separate land uses by the NDAC, there are a number of discrete land uses that were noted to occur and delineated within the Permit Boundary. These uses and a brief description follow:

- Corrals / Feedlots – Tracts dedicated to confinement of livestock for feeding or other activities related to their management.
- Driveways – Areas with maintained gravel or graded surfaces found in conjunction with farmsteads.

- Farmstead Yard – Vegetated tracts within or adjacent to farmsteads, but not necessarily adjacent to residences, that do not have an apparent use other than as open space, equipment parking, or other miscellaneous uses.
- Feed / Hay Lots – Tracts dedicated to the storage of livestock feed, including hay.
- Gardens – An area dedicated to production of fruits and vegetables for direct human consumption.
- Mines – Small tracts of industrial use composed of historic excavations for gravel, scoria, or coal;
- Rights-of-Way and Lanes – Tracts including borrow ditches and unsurfaced routes (i.e., no gravel) commonly found adjacent to surfaced roads or along section lines.
- Road Surfaces – Major transportation facilities with maintained gravel surfaces (not including farmstead and residence driveways) often with rights-of-way on either side.
- Structures – Buildings not including residences, all of which are used for storage or support of agricultural operations. The size, year constructed, and condition of all structures shown on [Figure 2.7.1-2A](#), [Figure 2.7.1-2B](#) and [Figure 2.7.1-2C](#) are provided with other structure-specific data in [Table 2.7.1-6](#).
- Waste Dumps – Tracts appearing to be dedicated to the disposal of waste, old equipment, and other items of little or no value or use.

#### 2.7.1.5 Additional Information

The following additional information applies to the area within the Permit Boundary as a whole and does not pertain to specific tracts or any single land use category defined in Section 2.7.1.4. Instead, this information provides a broader description of the uses and circumstances known to exist within the Permit Boundary.

##### 2.7.1.5.1 Grazing Use

The use of native grasslands, tame pastureland, woodlands, and cropland for grazing is reported in the various agricultural operation summaries. Most of the agricultural operators own livestock that are used to graze these areas from May to September. Following crop harvest these herds graze crop aftermath (crop residue following harvest) and adjacent cropland exclusions and buffers. This results in effective utilization of nearly all non-cropland (and cropland) production within the Permit Boundary. The only

notable exception to this grazing use is in areas fenced in conjunction with cropland enrolled in CRP. None of these CRP-related areas were reported as grazed from 2002 to 2006.

The stocking rates for pastures<sup>1</sup> without cropland inclusions vary considerably with the landscape position. Based on the findings of these investigations, pastures located in areas including uplands and small tributaries are utilized at an average rate of 0.42 animal unit months per acre (AUMs/ac), while the forage of river bottom pastures was utilized at a rate of approximately 1.0 AUMs/ac. This suggests that the herbaceous production of the river bottoms is significantly greater than that of the uplands. All of the native grassland and tame pastureland tracts identified within the Permit Boundary are grazed each year with the exception of those that are fenced within the same unit as cropland tracts enrolled in CRP.

#### 2.7.1.5.2 Conservation Uses

Some cropland tracts and shelterbelt plantings within the Permit Boundary are enrolled in conservation programs that secure an easement against unauthorized uses aimed at improving soil and water quality, conserving resources, and providing wildlife habitat, among other purposes. The CRP administered by the USDA Farm Service Agency (FSA) is the most common of these programs. The list of fields enrolled in CRP and their enrollment reason and status are provided in [Table 2.7.1-7](#).

One very small (approximately 0.1 acre) tract within the Permit Boundary is enrolled in the CoverLocks Program. This program is administered by the North Dakota Game and Fish Department (NDGFD) to create financial incentives for landowners to establish high quality wildlife habitat and provide public access. Tracts enrolled in the program include 160 acres of land on which a 20-acre CoverLock is established and enrolled in the Conservation Reserve Enhancement Program (CREP) administered by the FSA. The CoverLock and CREP enrollment consists of 15 acres of unharvested herbaceous cover and five acres of tree plantings. The remainder of the 160 acres may continue to be used for agricultural purposes. However, the landowner agrees to a 30-year public access easement on the entire enrolled tract (160 acres). The CoverLocks program is one of several programs collectively referred to as Conservation PLOTS (Private Land Open To Sportsmen) Programs. Areas enrolled in the PLOTS programs are marked in the field with yellow triangular signs.

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<sup>1</sup> Pastures are areas fenced for livestock grazing, which is not the same as tame pastureland.

Prior to disturbance within the Permit Boundary, SHC will coordinate with surface owners and the agencies administrating the CRP, CREP, PLOTS and CoverLocks programs to evaluate unenrollment from the subject programs or other options to allow mining to proceed.

#### 2.7.1.5.3 Noxious Weeds

Several species of state-listed noxious weeds and other troublesome weeds were noted by agricultural operators to occur within the Permit Boundary, especially adjacent to the Heart River and the South Branch Heart River. Noxious weeds reported as occurring within the Permit Boundary include leafy spurge (*Euphorbia esula*), Canada thistle (*Cirsium arvense*), and absinth wormwood (*Artemisia absinthium*). These species are commonly sprayed to prevent the population from further spreading. Some landowners noted that the common burdock (*Arctium minus*) and black henbane (*Hyoscyamus niger*) also require some level of regular control. Although not noted by any landowners, the Vegetation Baseline Study Report noted the presence of spotted knapweed (*Centaurea maculosa*) within the Permit Boundary.

#### 2.7.1.5.4 Flooding and Irrigation

All operators stated that no irrigated acreages occur on lands owned or under their control or management, either within or proximate to the Permit Boundary. None of the operators have considered installing or constructing irrigation systems for agricultural production because of limited water supply and poor water quality.

No subirrigation was reported to occur along the South Branch Heart River or anywhere else within the Permit Boundary.

Operators were asked whether natural flooding occurred and if so whether it was beneficial or detrimental to agricultural operations. The operators with operations along the South Branch Heart River within the Permit Boundary offered the following comments:

- Mr. Pat Kuylen – Flooding is generally beneficial. However, sediment deposition during flood events reduces grass and alfalfa production. Harrowing is frequently required to minimize production loss following flood events. Mr. Kuylen reported that prior to the construction of the major bridges across the South Branch Heart River approximately 10 years ago; terraces were flooded nearly every year. Now flooding is much more infrequent.

- Mr. James Perdaems – Flooding is beneficial to pasture growth on lands adjacent to the South Branch Heart River, which floods one out of seven years.

#### 2.7.1.5.5 Structures within One-Half Mile of the Permit Boundary

The structures within 0.5 miles of the Permit Boundary (not including the previously discussed structures within the boundary) are shown on [Figure 2.7.1-2A](#), [Figure 2.7.1-2B](#) and [Figure 2.7.1-2C](#) and described in [Table 2.7.1-8](#).

#### 2.7.1.6 Land Capability Classification

The soil units described in the soil survey report ([Section 2.4](#)) were classified according to the protocol referenced in this study, with the capability classification presented in conjunction with the map unit descriptions in [Table 2.4-4](#). A map of the distribution of land capability classifications is shown on [Figure 2.7.1-3A](#), [Figure 2.7.1-3B](#) and [Figure 2.7.1-3C](#). The area of the land capability classifications within the Permit Boundary is summarized in [Table 2.7.1-9](#).

These results indicate that all soils within the Permit Boundary are at least “moderately limited” for crop production. Approximately, one-third of the soils have only moderate limitations, with the remaining two-thirds having either severe to very severe limitations. The degree of soil salinity and sodicity, presence of shallow bedrock, and frequent occurrence of flooding are common reasons why soils are rated as severe (Class 3) or higher. As specified by the LCC guidance (USDA 2007), the distance to market, quality of access, size and shape of the soil areas, locations within fields, skill or resources of individual operators, and other characteristics of land-ownership patterns are not criteria for capability groupings.

#### 2.7.1.7 Operator Interviews and Land Management

In addition to that previously described in this section and presented on [Figure 2.7.1-2A](#), [Figure 2.7.1-2B](#) and [Figure 2.7.1-2C](#), the management information collected through direct interviews and pertaining to areas within the Permit Boundary is presented in [Appendix 2.7.1-2](#). The interview findings are presented in alphabetical order by the name of the person interviewed, with further separation by landowner or operation where appropriate. In all cases, the individuals interviewed were the landowners or tenants responsible for, or otherwise most familiar with, the use and land management practiced on each parcel within the Permit Boundary. Unless otherwise noted, the location (i.e., legal description) for all sections described is Township 139 North, Range 98 West. The distribution of land ownership and the land uses are shown on [Figure 2.7.1-2A](#), [Figure 2.7.1-2B](#) and [Figure 2.7.1-2C](#).

## TABLES

## FIGURES

## **APPENDICES**

APPENDIX 2.7.1-1

SUMMARY OF PRE-MINING LAND USE ACREAGE AND SOIL MAPPING UNIT  
INFORMATION BY LANDOWNER WITHIN THE PERMIT BOUNDARY

APPENDIX 2.7.1-2

PRE-MINE LAND MANAGEMENT INFORMATION