# APPENDIX 11.1

## BIOPHYSICAL AND VEGETATION TECHNICAL REPORT

Report to:

**MANITOBA HYDRO**


# Dorsey - Portage South Transmission Line Project

## Biophysical and Vegetation Technical Report

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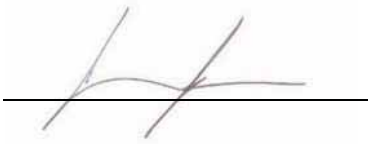
Report to:

MANITOBA HYDRO

# DORSEY - PORTAGE SOUTH TRANSMISSION LINE PROJECT

# BIOPHYSICAL AND VEGETATION TECHNICAL REPORT

MARCH 2012

Prepared by  Date March 26, 2012

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# EXECUTIVE SUMMARY

The proposed Dorsey to Portage South Transmission Line Project (hereafter 'the Project') is the final phase of development required to provide transmission improvements in voltage support to southwest Manitoba. The proposed Project includes a new 230-kilovolt (kV) alternating current transmission line approximately 70 km long. The transmission line is planned to originate from the 230 kV switchyard at the Dorsey Station, located at the community of Rosser, and is planned to terminate at the Portage South Station, located approximately 5.5 km southeast of Southport. The Project is located in the Manitoba Lowland physiographic region. Surficial geology in the study area is dominated by offshore glaciolacustrine sediments from glacial Lake Agassiz and alluvial sediments of the Portage la Prairie alluvial fan. Soils consist largely of clayey lacustrine sediments derived from glacial Lake Agassiz, along with stratified alluvial deposits which occur in the floodplain adjacent to the Assiniboine River and along the Portage la Prairie alluvial fan.

The Project traverses two major watersheds: the Assiniboine River (20%) and the Red River (80%). The Assiniboine River originates near Kelvington, Saskatchewan, and flows southeast 1,070 km to the confluence with the Red River at Winnipeg. Surface drainage between the Dorsey Station and the Assiniboine River is conducted through a series of small tributaries flowing southeast and parallel to the Assiniboine River and discharge into the river immediately downstream of the study area. In the vicinity of the Project, the Red River watershed is comprised of the La Salle River sub-watershed. The LaSalle River begins 4.3 km east of Portage la Prairie and discharges into the Red River south of Winnipeg at St. Norbert. Both the Assiniboine and La Salle rivers experienced an extreme and extended flood event in 2011 and was in flood stage throughout most of the year; unofficial estimates placed the magnitude of the flood as a 1 in 300 year event.

The banks of all Assiniboine River tributaries in the vicinity of the Project have been cleared of historic native vegetation cover. Agricultural activities, including cultivation, pastures, and haying, occur to the waterline of the watercourses. Therefore, the riparian areas are periodically disturbed and native species, especially shrubs and trees, are unable to colonize the riparian zones. The extensive 2011 flood event affected the riparian vegetation along both banks of the Assiniboine River. Riparian areas were flooded throughout the spring and summer leading to the loss or damage to the undergrowth and shrub species. Riparian areas along unaltered watercourse sections such as the La Salle River, Scott Coulee, and upper Elm River are more diverse and alternate between deforested and forested areas.

North of the Assiniboine River all the watercourses passing through the study area have been realigned to serve as agricultural drains, resulting in simple fish habitat. The majority of the fish habitat in the Assiniboine River in the study area consists of low-velocity runs with occasional snags of large woody debris. South of the Assiniboine River tributary watercourses include Barickman Coulee and agricultural drains. The majority of the agricultural drains have been

classified as indirect fish habitat. The lower reach of Barickman Coulee provides complex habitat for forage species while the upper reach has been realigned and provides only simple habitat. The La Salle River mainstem provides complex habitat for indicator species. Habitat quality in the minor La Salle River tributaries declines with distance from the mainstem, the degree of modification into agricultural drains, and persistence of stream flow. The eight dams on the La Salle River between St. Norbert and Elie are comprised of three stop-log structures and five fixed-crest weirs constructed of sheet piling and rock fill. All dams are barriers to upstream fish passage, isolating fish communities in the upper reaches from the downstream reaches, and preventing stream use by the Red River fish community.

Most fish species expected to occur in the Project vicinity spawn in the spring or summer. North of the Assiniboine River only the Sturgeon Creek mainstem is known to support large-body fish species within the study area (e.g., Northern Pike, *Esox lucius*). Three watercourses, all tributaries of Sturgeon Creek, are known to support small-body species. The remaining watercourses do not provide direct fish habitat. Large-body species have not been documented in tributary watercourses south of the Assiniboine River. Small-body species are known to occur in Barickman Coulee and an agricultural drain east of Dakotah and the remaining watercourses do not directly support fish communities. Within the La Salle River watershed, the mainstems of the La Salle and Elm rivers support large-body species. Larger tributaries and lower reaches of smaller tributaries support small-body fish species. Fish community diversity declines from the mouth of the La Salle River to the upstream reaches. Twenty-three species occurring in the Red River could be expected (based on habitat requirements) to utilize the La Salle River; however, only thirteen species have been observed in the lower La Salle River, upstream of the first barrier.

There are six aquatic species potentially occurring in the study area that have status under the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) or the federal *Species at Risk Act* (SARA): Mapleleaf Mussel (*Quadrula quadrula),* Chestnut Lamprey (*Ichthyomyzon castaneus*), Lake Sturgeon (Red-Assiniboine Rivers – Lake Winnipeg populations; *Acipenser fulvescens*), Silver Chub (*Macrhybopsis storeriana*), Bigmouth Buffalo (*Ictiobus cyprinellus*), and Bigmouth Shiner (*Notropis dorsalis)*. There are no aquatic species listed under Manitoba's *Endangered Species Act* (MBESA).

The Project is located in the flat and rural Prairies Ecozone of southwestern Manitoba. This Ecozone contains the majority of Canada's productive agricultural cropland, pasture, and rangeland. As such, agriculture dominates this ecozone, covering approximately 94% of the landbase and making this one of the most altered landscapes in Canada. Eleven plant species that may occur in Manitoba are listed under SARA and 13 plant species are listed under MBESA. In addition, the Manitoba Conservation Data Centre (MBCDC) lists plant species and communities of conservation concern on the basis of their global (G) and provincial (S) status; these species are not necessarily federally or provincially protected, but are considered rare on the landscape in Manitoba. Rare plant surveys were conducted from July 13 to 16, 2011 and August 17 to 21, 2011 using a random meander search pattern. No federally or provincially listed species and three MBCDC species of conservation concern were identified during the 2011 field investigations.

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# 1.0 INTRODUCTION

## 1.1 BACKGROUND

The proposed Dorsey to Portage South Transmission Line Project (D83P, hereafter 'the Project') is the final phase of development required to provide transmission improvements in voltage support to southwest Manitoba. This report was prepared to support the Environmental Impact Statement for the Project.

## 1.2 SCOPE

This report describes the existing bio-physical environment in which the Project is located, and presents the baseline vegetation studies that were conducted for the Project. This report was prepared using existing available information, as well as information gathered during 2011 field studies.

## 1.3 OVERVIEW

The proposed D83P Project includes a new 230-kilovolt (kV) alternating current (AC) transmission line approximately 70 km long. The transmission line is planned to originate from the 230 kV switchyard at the Dorsey Station, located at the community of Rosser, and is planned to terminate at the Portage South Station, located approximately 5.5 km southeast of Southport. The study area was defined as the area enclosing all technically and economically feasible potential routes between the Dorsey and Portage South stations. Field studies and analysis of existing information were conducted for the study area (Map 1).

# Dorsey To Portage South D83P Transmission Project

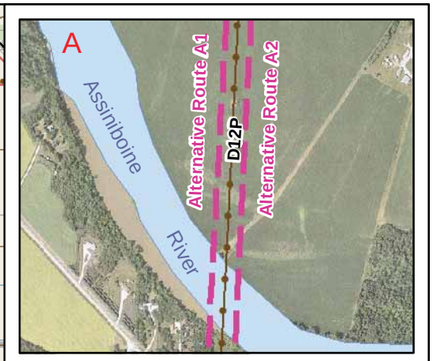
**Project Infrastructure**
- Alternative Route A1 + A2
- Alternative Route B
- Alternative Route C
- Project Study Area

**Existing Infrastructure**
- Converter Station
- Transformer Station
- Transmission Line

**Landbase**
- Community
- Provincial HWY / Road
- Railway
- Watercourse
- Waterbody
- Treed Vegetation
- Rural Municipality

RM OF PORTAGE LA PRAIRIE
CN9
D54C
D54C / CP17
CP17
RP16
Warren
CW8
Marquette
RM OF WOODLANDS
RM OF ROSSER
RM OF ST. FRANCOIS XAVIER
Poplar Point
ASSINIBOINE
RIVER
Meadows
Dorsey Converter Station
BPI / BPII
Mill Creek
RM OF CARTIER
D12P
Rosser
St. Eustache
D11Y/D15Y/D55Y
RM OF ST. FRANCOIS XAVIER
LaSalle River
Oakville
Fortier
Newton
Elm River
Bénard
Elie
St. François Xavier
RM OF HEADINGLEY
Portage South Transformer Station
P81C
D12P
Dacotah
La Salle River
RM OF PORTAGE LA PRAIRIE
RM OF CARTIER

A




0 250 500 Meters
1:15,000

Manitoba Hydro

Coordinate System: UTM Zone 14 NAD 83
Data Source: MBHydro, Stantec, ProvMB, NRCan
Date Created: October 4, 2011

0 2.5 5 Kilometres
0 2.5 5 Miles

1:150,000

## Project Study Area and Alternative Route Options

Map 1

# 2.0 EXISTING ENVIRONMENT

## 2.1 PHYSICAL ENVIRONMENT

### 2.1.1 *CLIMATE*

Manitoba has a mid-continental climate characterized by four seasons with long, cold winters and short, hot summers. Climate data for the study area were obtained from two Environment Canada (EC) meteorological stations bordering the study area, located at the James Armstrong Richardson International Airport in Winnipeg (49° 55' N / 97° 14' W) and the Portage Southport station just south of Portage la Prairie (49° 54' N / 98° 17' W).

Data were assembled for the most recent 30-year period: Winnipeg station (1978-2007) and Portage Southport station (1971-1992, 1996-2007). Portage Southport data for 1993 to 1995 were not available and data for 2008 to 2010 from both stations were not included as EC has only completed preliminary quality reviews for these data sets. Monthly averages (Table 1) were calculated from the available daily data.

Hourly wind data were assembled for 2006 to 2010. Monthly averages (Table 2) were calculated from hourly data supplied by EC. Windrose PRO Ver 2.3.42 was used to create windrose plots and determine prevailing wind direction for the region. Mean monthly wind speed was higher in Winnipeg (18 km/hr) compared to Portage la Prairie (14 km/hr). At both stations, wind speed varied little over the year, ranging from the lowest speeds in summer (16 km/hr in Winnipeg and 11 km/hr in Portage la Prairie) to the highest speeds in spring (19 km/hr in Winnipeg and 16 km/hr in Portage la Prairie). Maximum wind gusts reached 119 km/hr in Winnipeg and 113 km/hr in Portage la Prairie. The prevailing wind direction differs between the two cities; the wind is primarily from the south in Winnipeg and primarily from the west and northwest in Portage la Prairie (Table 2; figures 1 and 2).

Annual average precipitation ranges from 511 mm to 512 mm with peak precipitation occurring from June to August (Table 1). In winter, precipitation in the study area falls primarily as snow with the greatest snowfalls occurring in November, December and January. The most recent rainfall frequency data were available up to the year 1996 in Winnipeg and 1991 in Portage la Prairie. Mean 24-hour rainfall intensity ranged from 55.1 mm to 52.9 mm (Tables 3 and 4).

**Table 1: Summary of historical meteorological data collected at Winnipeg, MB, 1978-2007, and Portage la Prairie, MB, 1975-1992 and 1996-2007 (Environment Canada 2011).**

| Month | | Temperature Mean (°C) | Temperature Mean Min (°C) | Temperature Extreme Min (°C) | Temperature Mean Max (°C) | Temperature Extreme Max (°C) | Total Rain (mm) | Total Snow (cm) | Total Precipitation (mm) [a] | Wind Gust Maximum (km/nr) |
|---|---|---|---|---|---|---|---|---|---|---|
| January | Winnipeg | -16.8 | -21.8 | -41.0 | -11.7 | 7.3 | 0.2 | 22.8 | 19.4 | 106 |
| | Portage | -15.5 | -20.4 | -38.1 | -10.6 | 8.5 | 0.4 | 24.8 | 20.4 | 109 |
| February | Winnipeg | -13.7 | -18.8 | -41.8 | -8.6 | 9.0 | 2.4 | 12.8 | 13.9 | 80 |
| | Portage | -12.1 | -17.1 | -39.8 | -7.2 | 11.2 | 2.5 | 18.8 | 19.0 | 91 |
| March | Winnipeg | -6.2 | -11.2 | -37.4 | -1.1 | 17.0 | 9.3 | 16.7 | 24.3 | 106 |
| | Portage | -5.7 | -10.7 | -34.0 | -0.8 | 17.2 | 8.7 | 22.8 | 29.7 | 96 |
| April | Winnipeg | 4.3 | -2.1 | -26.3 | 10.7 | 34.3 | 19.5 | 10.4 | 30.2 | 104 |
| | Portage | 4.6 | -1.6 | -23.3 | 10.6 | 34.8 | 21.1 | 12.0 | 32.1 | 90 |
| May | Winnipeg | 11.7 | 4.6 | -10.1 | 18.7 | 37.0 | 55.7 | 2.7 | 58.5 | 98 |
| | Portage | 11.9 | 5.3 | -9.4 | 18.4 | 37.8 | 55.5 | 2.8 | 58.3 | 85 |
| June | Winnipeg | 16.9 | 10.6 | -1.0 | 23.2 | 37.8 | 86.4 | 0.0 | 86.4 | 115 |
| | Portage | 16.8 | 10.9 | -1.6 | 22.7 | 37.3 | 84.9 | 0.0 | 84.9 | 113 |
| July | Winnipeg | 19.7 | 13.5 | 2.7 | 25.9 | 35.9 | 75.1 | 0.0 | 75.1 | 109 |
| | Portage | 20.1 | 14.0 | 3.5 | 26.1 | 37.2 | 71.8 | 0.0 | 71.8 | 107 |
| August | Winnipeg | 18.6 | 12.0 | 0.0 | 25.1 | 38.7 | 76.1 | 0.0 | 76.1 | 98 |
| | Portage | 18.4 | 12.0 | 1.4 | 24.7 | 40.2 | 59.5 | 0.0 | 59.5 | 93 |
| September | Winnipeg | 12.8 | 6.4 | -7.0 | 19.0 | 38.8 | 47.4 | 0.2 | 47.6 | 98 |
| | Portage | 12.8 | 6.8 | -5.8 | 18.7 | 37.8 | 50.7 | 0.8 | 51.5 | 83 |
| October | Winnipeg | 5.0 | -0.5 | -17.0 | 10.5 | 30.5 | 30.4 | 4.5 | 34.8 | 119 |
| | Portage | 5.4 | 0.1 | -20.1 | 10.6 | 28.9 | 29.6 | 7.8 | 36.4 | 106 |
| November | Winnipeg | -4.9 | -9.3 | -34.0 | -0.5 | 18.2 | 6.6 | 20.3 | 25.2 | 106 |
| | Portage | -4.2 | -8.5 | -34.5 | 0.2 | 22.8 | 6.4 | 21.6 | 24.0 | 107 |
| December | Winnipeg | -13.3 | -18.0 | -37.0 | -8.6 | 9.7 | 1.5 | 22.0 | 20.8 | 98 |
| | Portage | -12.5 | -17.1 | -37.0 | -7.8 | 11.2 | 1.9 | 27.1 | 23.6 | 89 |
| **Annual** | **Winnipeg** | **2.8** | **-2.9** | **-41.8** | **8.6** | **38.8** | **410.6** | **112.3** | **512.4** | **119** |
| | **Portage** | **3.3** | **-2.2** | **-39.8** | **8.8** | **40.2** | **393.0** | **138.6** | **511.2** | **113** |

[a] The sum of the total rainfall and the water equivalent of the total snowfall observed during the day. In most cases a 10:1 ratio can be applied to the amount of snow to determine its water equivalent.

**Table 2: Monthly prevailing wind conditions at Winnipeg and Portage la Prairie, MB, 2006 to 2010 (Environment Canada 2011).**

| Month | | Wind Speed Mean (km/hr) | Wind Speed Maximum (km/hr) | Wind Direction |
|---|---|---|---|---|
| January | Winnipeg | 18 | 80 | S |
| | Portage | 14 | 65 | W & NNW |
| February | Winnipeg | 16 | 59 | S |
| | Portage | 14 | 48 | NW & W |
| March | Winnipeg | 19 | 59 | S |
| | Portage | 15 | 52 | NNW & W |
| April | Winnipeg | 19 | 56 | S |
| | Portage | 16 | 50 | N & NNW |
| May | Winnipeg | 19 | 59 | N & S |
| | Portage | 16 | 57 | N |
| June | Winnipeg | 16 | 63 | S |
| | Portage | 12 | 52 | N & W |
| July | Winnipeg | 16 | 56 | W & S |
| | Portage | 11 | 41 | W & NW |
| August | Winnipeg | 16 | 57 | S |
| | Portage | 12 | 39 | W & S |
| September | Winnipeg | 17 | 59 | S |
| | Portage | 13 | 48 | S & NW |
| October | Winnipeg | 18 | 63 | S |
| | Portage | 14 | 63 | W & NW |
| November | Winnipeg | 19 | 63 | S |
| | Portage | 14 | 43 | W & NW |
| December | Winnipeg | 17 | 52 | S |
| | Portage | 13 | 48 | W & NW |
| **Annual** | **Winnipeg** | **18** | **80** | **S** |
| | **Portage** | **14** | **65** | **W & NW** |

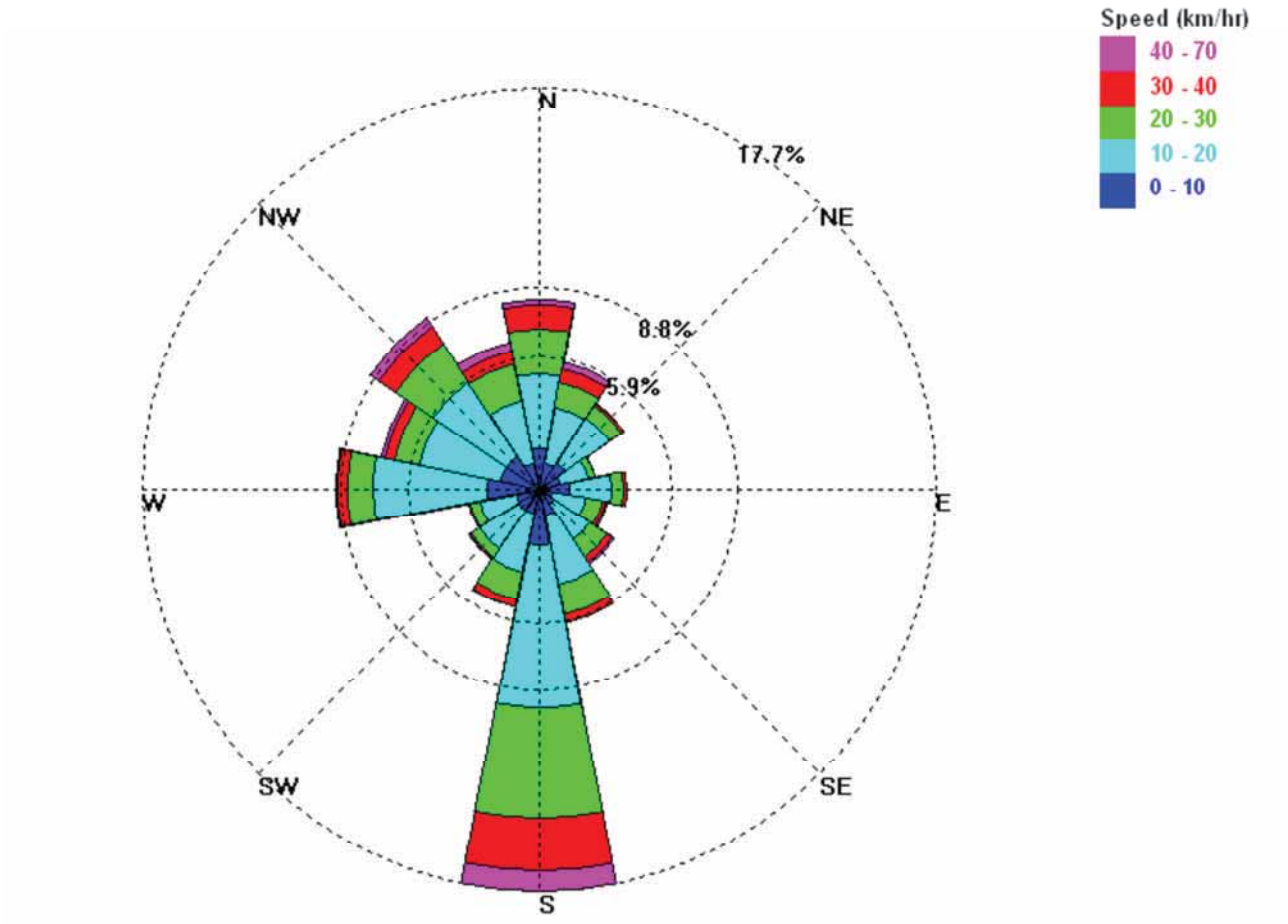



**Figure 1: Windrose showing wind direction and speed at Winnipeg from 2006 to 2010.**

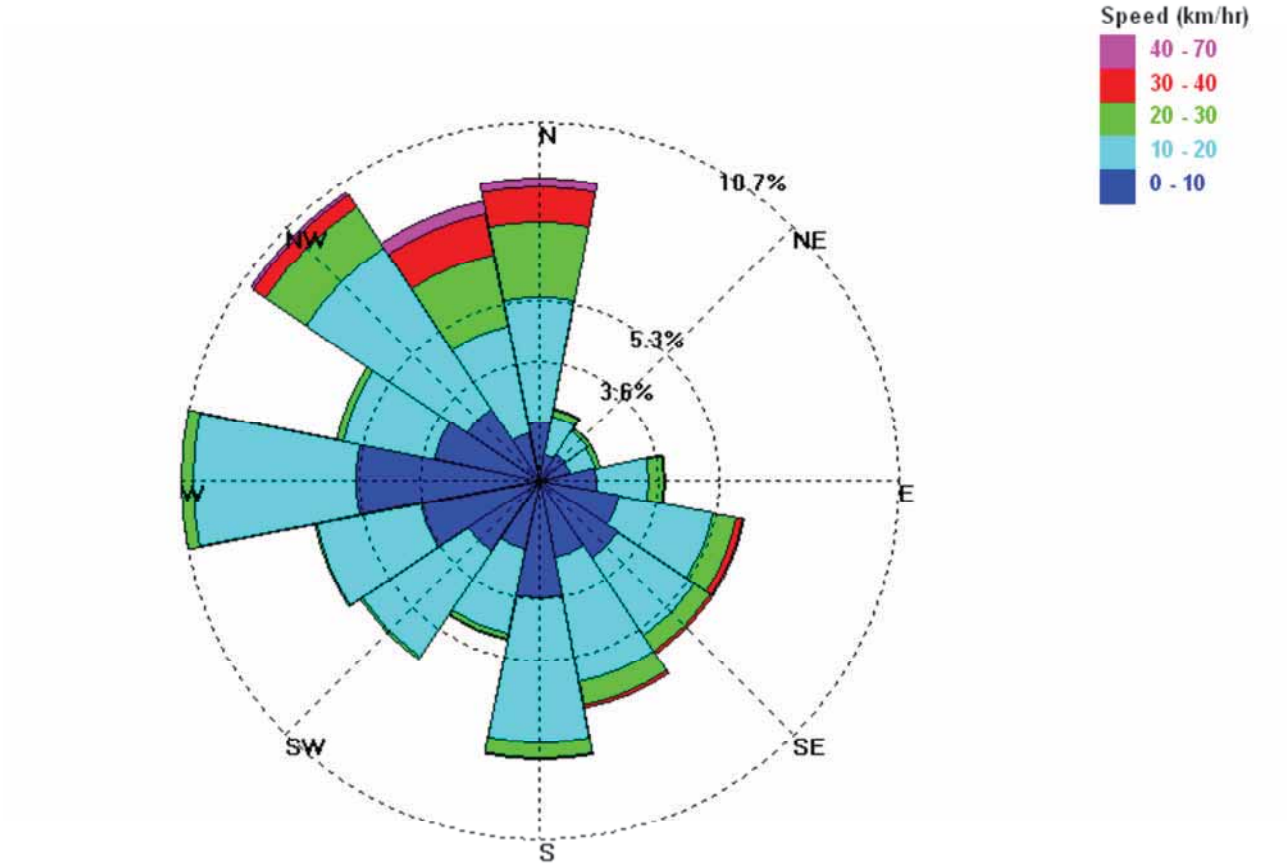



**Figure 2: Windrose showing wind direction and speed at Portage la Prairie from 2006 to 2010.**

**Table 3: Rainfall intensity (mm) at Winnipeg, MB, 1967-1996 (Environment Canada 2011).**

| Year | 5 Min | 10 Min | 15 Min | 30 Min | 1H | 2H | 6H | 12H | 24H |
|---|---|---|---|---|---|---|---|---|---|
| 1967 | 12.2 | 24.1 | 25.9 | 31.7 | 33.0 | 57.9 | 63.2 | 63.5 | 63.5 |
| 1968 | 17.8 | 24.6 | 35.3 | 39.4 | 39.4 | 39.4 | 48.3 | 61.2 | 84.3 |
| 1969 | 7.1 | 10.4 | 12.7 | 15.2 | 21.8 | 23.4 | 25.4 | 39.1 | 49.3 |
| 1970 | 11.2 | 20.8 | 29.0 | 37.8 | 41.1 | 49.8 | 54.9 | 60.5 | 62.2 |
| 1971 | 4.6 | 6.1 | 8.4 | 11.7 | 14.5 | 19.8 | 25.4 | 29.0 | 31.0 |
| 1972 | 9.1 | 16.5 | 20.3 | 35.6 | 35.6 | 35.8 | 35.8 | 35.8 | 35.8 |
| 1973 | 6.3 | 10.4 | 14.5 | 19.8 | 29.7 | 40.4 | 45.7 | 45.7 | 45.7 |
| 1974 | 9.4 | 16.3 | 18.8 | 25.1 | 28.7 | 33.0 | 37.1 | 38.9 | 55.4 |
| 1975 | 9.4 | 14.5 | 17.8 | 22.6 | 27.9 | 27.9 | 44.7 | 53.8 | 54.4 |
| 1976 | 15.0 | 15.7 | 18.0 | 21.8 | 22.1 | 24.1 | 26.2 | 33.3 | 42.7 |
| 1977 | 7.4 | 12.4 | 15.2 | 19.8 | 21.6 | 32.5 | 50.3 | 57.7 | 61.7 |
| 1978 | 10.6 | 17.6 | 21.6 | 24.5 | 28.0 | 41.7 | 52.6 | 52.6 | 60.4 |
| 1979 | 10.6 | 19.1 | 25.4 | 36.3 | 39.3 | 39.8 | 40.7 | 40.7 | 40.7 |
| 1980 | 7.4 | 8.8 | 10.4 | 15.0 | 19.3 | 24.5 | 25.6 | 26.6 | 30.5 |
| 1981 | 10.6 | 12.4 | 15.9 | 18.2 | 24.1 | 29.0 | 53.3 | 53.4 | 63.0 |
| 1982 | 8.6 | 13.0 | 16.2 | 22.6 | 22.7 | 22.7 | 32.5 | 34.9 | 36.8 |
| 1983 | 13.2 | 17.2 | 19.3 | 23.2 | 28.0 | 30.9 | 51.9 | 52.3 | 52.3 |
| 1984 | 12.6 | 19.0 | 22.8 | 39.5 | 56.2 | 56.9 | 60.2 | 69.5 | 69.7 |
| 1985 | 5.0 | 7.3 | 9.3 | 12.4 | 18.4 | 33.1 | 61.5 | 84.0 | 97.4 |
| 1986 | 10.0 | 11.8 | 13.9 | 16.7 | 18.5 | 19.7 | 28.7 | 35.4 | 41.6 |
| 1987 | 7.1 | 9.0 | 10.4 | 20.8 | 24.8 | 36.6 | 46.2 | 57.2 | 57.3 |
| 1988 | 7.9 | 15.8 | 18.5 | 22.7 | 34.8 | 36.9 | 39.7 | 49.7 | 49.7 |
| 1989 | 4.4 | 7.7 | 10.4 | 12.3 | 14.1 | 16.2 | 34.6 | 41.1 | 53.5 |
| 1990 | 9.8 | 12.7 | 16.2 | 19.0 | 22.0 | 22.0 | 22.0 | 22.5 | 36.9 |
| 1991 | 11.6 | 16.4 | 18.0 | 18.2 | 19.3 | 31.2 | 43.1 | 43.5 | 64.0 |
| 1992 | 8.6 | 10.2 | 11.2 | 17.2 | 18.0 | 19.3 | 21.2 | 25.2 | 35.6 |
| 1993 | 6.2 | 12.4 | 18.6 | 29.0 | 41.6 | 70.1 | 72.2 | 78.4 | 87.4 |
| 1994 | 8.8 | 13.1 | 15.4 | 24.2 | 32.2 | 55.5 | 67.0 | 68.2 | 68.2 |
| 1995 | 7.5 | 9.9 | 12.0 | 18.0 | 23.0 | 23.4 | 35.6 | 44.0 | 63.9 |
| 1996 | 8.1 | 16.1 | 21.9 | 43.8 | 58.6 | 58.6 | 58.8 | 58.8 | 58.8 |
| MEAN | 9.3 | 14.0 | 17.4 | 23.8 | 28.6 | 35.1 | 43.5 | 48.6 | 55.1 |
| SD | 3.0 | 4.7 | 6.1 | 8.9 | 11.0 | 13.9 | 14.3 | 15.6 | 16.4 |

**Table 4: Rainfall intensity (mm) at Portage la Prairie, MB, 1964-1991 (Environment Canada 2011).**

| Year | 5 Min | 10 Min | 15 Min | 30 Min | 1H | 2H | 6H | 12H | 24H |
|---|---|---|---|---|---|---|---|---|---|
| 1964 | 26.4 | 33.5 | 35.1 | 36.1 | 36.1 | 36.1 | 36.1 | 47 | 49.5 |
| 1965 | 5.6 | 7.4 | 7.9 | 11.7 | 15.5 | 20.1 | 34.8 | 34.8 | 34.8 |
| 1966 | 5.8 | 11.4 | 14 | 16.3 | 18.8 | 19.3 | 33 | 33.5 | 42.4 |
| 1967 | 22.6 | 27.2 | 28.7 | 33.8 | 33.8 | 33.8 | 33.8 | 33.8 | 33.8 |
| 1968 | 9.9 | 14 | 19.6 | 25.1 | 25.1 | 25.1 | 31.7 | 47 | 48.8 |
| 1969 | 10.4 | 16 | 21.1 | 38.1 | 49 | 67.6 | 78.7 | 82 | 82 |
| 1970 | 5.8 | 9.4 | 12.2 | 19.3 | 19.3 | 19.8 | 35.6 | 35.6 | 36.1 |
| 1971 | 7.1 | 9.7 | 10.9 | 13.2 | 23.6 | 37.1 | 41.1 | 42.9 | 52.8 |
| 1972 | 12.4 | 24.6 | 30.2 | 47.8 | 60.5 | 67.1 | 70.1 | 79.2 | 86.9 |
| 1973 | 8.6 | 10.2 | 12.2 | 14.2 | 16 | 18.3 | 25.7 | 33.5 | 38.4 |
| 1974 | 11.9 | 15.7 | 15.7 | 15.7 | 15.7 | 15.7 | 17.3 | 19.8 | 30.2 |
| 1975 | 10.4 | 13.5 | 14.5 | 18 | 24.6 | 25.1 | 35.6 | 37.3 | 37.3 |
| 1976 | 4.3 | 8.4 | 10.2 | 10.9 | 16.5 | 17.3 | 33.3 | 33.3 | 33.5 |
| 1977 | 9.9 | 10.4 | 12.7 | 17.5 | 23.1 | 25.7 | 26.7 | 34 | 43.2 |
| 1978 | 9.3 | 17.1 | 21.9 | 27.5 | 34.3 | 39.2 | 43.2 | 43.2 | 56.4 |
| 1979 | 5.9 | 7.3 | 9.6 | 14.5 | 17.7 | 18.2 | 36.5 | 50.3 | 55.1 |
| 1980 | 5.2 | 9.2 | 11.2 | 14.5 | 18.4 | 29.2 | 51.8 | 89.4 | 98.9 |
| 1981 | 10.8 | 14.8 | 18.7 | 25 | 25.4 | 25.7 | 26.9 | 32.9 | 57 |
| 1982 | 4.3 | 6.9 | 6.9 | 7.8 | 9.8 | 12.1 | 25.3 | 35.6 | 41.6 |
| 1983 | 1 | 1.6 | 2.4 | 3.4 | 6.6 | 9.5 | 18.7 | 19.3 | 23.4 |
| 1984 | 6.9 | 9.7 | 11.9 | 17.5 | 24.4 | 28.7 | 38.5 | 47.1 | 51.4 |
| 1985 | 5.9 | 6.9 | 9.8 | 13.7 | 17.7 | 30.6 | 70.9 | 108.8 | 121.4 |
| 1986 | 9.7 | 15.5 | 21.3 | 24.7 | 29.2 | 30.8 | 30.8 | 30.8 | 45.2 |
| 1987 | 9.4 | 11.8 | 13.7 | 17.3 | 20.4 | 33.8 | 63.1 | 85.7 | 86.4 |
| 1988 | 6.4 | 6.7 | 8.1 | 11.6 | 14.1 | 17.2 | 25.8 | 33 | 41.5 |
| 1989 | 4.5 | 5.9 | 8.2 | 8.8 | 9.6 | 11.2 | 22.2 | 36.3 | 45.7 |
| 1990 | 4.4 | 7.6 | 8.5 | 10.6 | 12.6 | 22 | 25 | 39.1 | 51 |
| 1991 | 11 | 22 | 29.6 | 38.2 | 49.4 | 51.2 | 51.2 | 51.8 | 56.6 |
| MEAN | 8.8 | 12.7 | 15.2 | 19.7 | 23.8 | 28.1 | 38.0 | 46.3 | 52.9 |
| SD | 5.3 | 7.1 | 8.0 | 10.7 | 12.7 | 14.5 | 16.0 | 22.1 | 22.6 |

### 2.1.2 GEOLOGY AND HYDROGEOLOGY

The study area is located in the Manitoba Lowland physiographic region, an area of gentle relief east of the Manitoba Escarpment (Betcher et al. 1995). The Manitoba Lowland is underlain by gently southwest dipping Paleozoic and Mesozoic sediments consisting primarily of carbonate rocks with some clastic and argillaceous units that form the eastern edge of the Western Canada Sedimentary Basin. Bedrock is overlain by glacial tills and proglacial lacustrine sediments. Stratigraphy in southern and central Manitoba includes the following units (Figure 3; Betcher et al. 1995):

**Quaternary deposits**: The upper clastic unit is overlain by unconsolidated pre-glacial and Quaternary sediments of variable thickness which contain significant overburden aquifers in the study area. These sediments consist of sand or sand and gravel aquifers interlayered with less permeable tills or clays. They often have limited areal distribution, but form an important source of groundwater supply in rural areas where the carbonate aquifer is not present.

**Upper clastic unit**: The carbonate-evaporite unit is overlain by thick shales, sandstones, and evaporates of Mesozoic and Cenozoic age which form the upper clastic unit.

**Paleozoic carbonate-evaporite unit:** The Winnipeg Formation transitions conformably into the overlying carbonate-evaporite unit. The carbonate-evaporite unit consists of gently dipping layered sequence of dolostones and limestones with minor shales and evaporites of Ordovician through Mississipian age. This unit forms the most extensive aquifer system in the province. Groundwater flow direction is towards the east in the study area.

**Basal clastic unit (Winnipeg Formation):** The basal clastic unit overlies Precambrian bedrock and consists of marine silica sandstones and shales of the Winnipeg Formation. Groundwater flow in this unit is towards the east/northeast.

**Precambrian basement:** Precambrian basement consists of igneous and metamorphic crystalline rock. Groundwater flow in these rocks is predominantly through fractures.

### 2.1.3 *Surficial Geology and Soils*

Surficial geology in the study area is dominated by offshore glaciolacustrine sediments from glacial Lake Agassiz and alluvial sediments of the Portage la Prairie alluvial fan (Map 2; GIS Map Gallery 2006). Distal glaciofluvial sediments occur in the southwest corner of the study area and alluvial deposits occur adjacent to the Assiniboine River.

Soils in the study area dominantly consist of clayey lacustrine sediments derived from glacial Lake Agassiz, along with stratified alluvial deposits which occur in the floodplain adjacent to the Assiniboine River and along the Portage la Prairie alluvial fan (Map 3). The flat topography throughout the area and the high clay content of the soils in the study area result in the majority of the soils being classified as imperfectly to poorly drained. The clay-rich soils are dominantly classified as Black Chernozems and Gleysols, whereas the soils along the alluvial deposits are dominantly classified as Regosols.

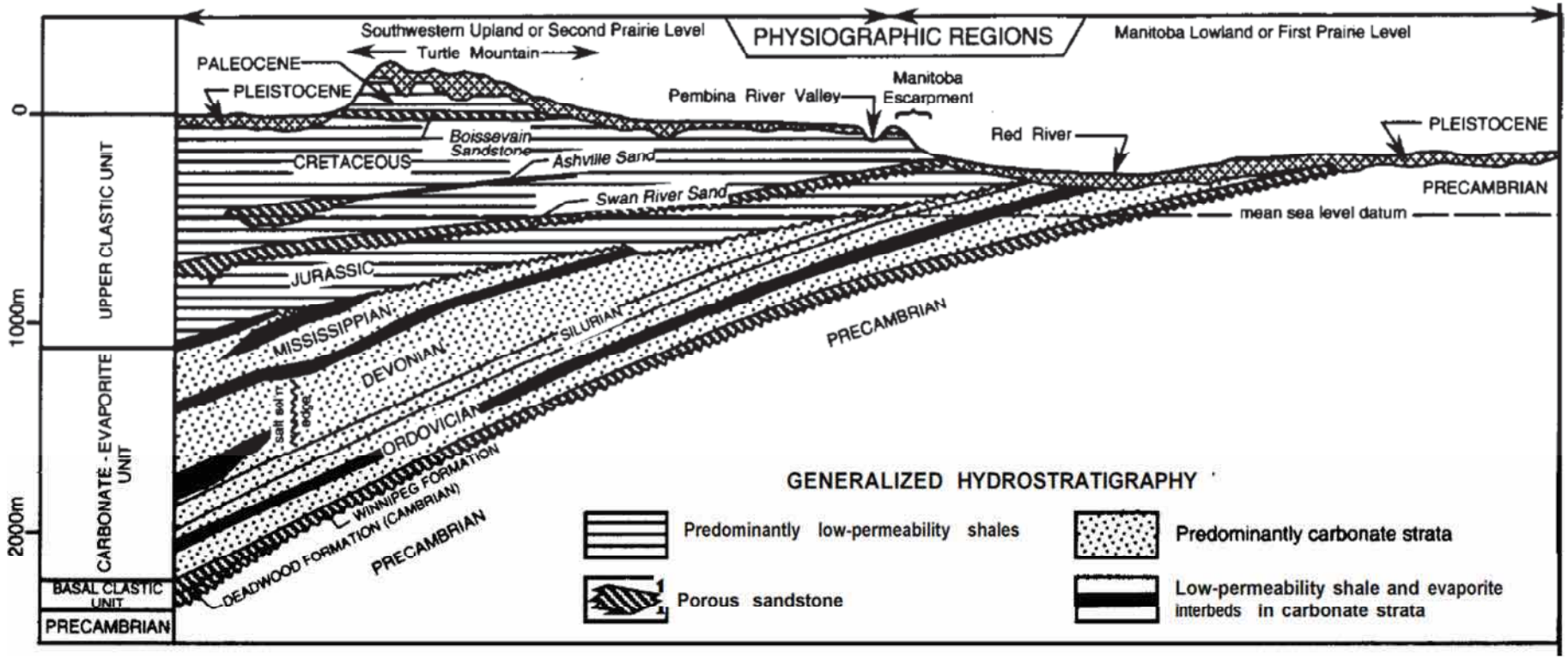



**Figure 3: Geologic crosssection along the Manitoba-U.S.A border. Vertical exaggeration approximately 50:1 (Betcher et al. 1995).**

# Dorsey To Portage South D83P Transmission Project

## Project Infrastructure

- Alternative Route A1 + A2
- Alternative Route B
- Alternative Route C
- Project Study Area

## Existing Infrastructure

- Converter Station
- Transformer Station
- Transmission Line

## Landbase

- Community
- Provincial HWY / Road
- Railway
- Treed Vegetation
- Rural Municipality

## Surficial Geology *

- Alluvial Sediments
- Proximal Glaciofluvial Sediments
- Distal Glaciofluvial Sediments
- Offshore Glaciolacustrine Sediments
- Marginal Glaciolacustrine Sediments

* Source: Geological Survey of Canada; Surficial Geology

RM OF PORTAGE LA PRAIRIE
CN9
D54C
D54C / CP17
RP16
Warren
CW8
CW8
CP17
D54C
RP16
Marquette
RM OF WOODLANDS
RM OF ROSSER
Grosse Isle
Poplar Point
ASSINIBOINE
RIVER
RM OF ST. FRANCOIS XAVIER
Meadows
BPI / BPII
Dorsey Converter Station
Mill Creek
RM OF CARTIER
D12P
Rosser
St. Eustache
RM OF ST. FRANCOIS XAVIER
D11Y/D15Y/D55Y
La Salle River
Oakville
Fortier
Elm River
Newton
Bénard
Elie
St. François Xavier
RM OF HEADINGLEY
Portage South Transformer Station
P81C
D12P
Dacotah
La Salle River
RM OF PORTAGE LA PRAIRIE
RM OF CARTIER

Coordinate System: UTM Zone 14 NAD 83
Data Source: MBHydro, Stantec, ProvMB, NRCan
Date Created: October 4, 2011

0 2.5 5 Kilometres
0 2.5 5 Miles

1:150,000

# Surficial Geology

## Within Project Study Area

Map 2

# Dorsey To Portage South
# D83P Transmission Project

## Project Infrastructure

- Alternative Route A1 + A2
- Alternative Route B
- Alternative Route C
- Project Study Area

## Existing Infrastructure

- Converter Station
- Transformer Station
- Transmission Line

## Landbase

- Community
- Provincial HWY / Road
- Railway
- Watercourse
- Waterbody
- Rural Municipality

## Soil Classification *

- Urban, Modified, or Unclassified
- Water
- Sand and Gravel
- Sandy Lacustrine
- Variable Textured Alluvium (Regosols)
- Sandy Loam Lacustrine
- Loamy Lacustrine
- Clayey Lacustrine (Black Chernozems)
- Sandy Lacustrine (Gleysols)
- Loam Lacustrine (Gleysols)
- Clayey Lacustrine (Gleysols)
- Marsh
- Variable Textured Alluvium (Gleysols)
- Clayey Lacustrine (Luvisols and Dark Gray Chernozems)

* Source: *Manitoba Land Initiative; Geospatial data warehouse*

Warren
CW8
CW8
CP17
D54C
RP16
Marquette
RM OF WOODLANDS
RM OF ROSSER
RM OF ST. FRANCOIS XAVIER
Grosse Isle
BPI / BPII
ASSINIBOINE
RIVER
Meadows
Dorsey Converter Station
Mill Creek
RM OF CARTIER
D12P
Rosser
St. Eustache
RM OF ST. FRANCOIS XAVIER
D11Y/D15Y/D55Y
LaSalle River
Oakville
Fortier
Elm River
Newton
Bénard
Elie
St. François Xavier
RM OF HEADINGLEY
Portage South Transformer Station
P81C
D12P
Dacotah
La Salle River
RM OF PORTAGE LA PRAIRIE
RM OF CARTIER

Coordinate System: UTM Zone 14 NAD 83
Data Source: MBHydro, Stantec, ProvMB, NRCan
Date Created: October 4, 2011

0 2.5 5 Kilometres
0 2.5 5 Miles

1:150,000

## Soils

### Within Project Study Area

Map 3

## 2.2 AQUATIC ENVIRONMENT

### 2.2.1 *SURFACE HYDROLOGY*

The study area includes two major watersheds: the Assiniboine River (20% of the study area) and the Red River (80%; Betcher et al. 1995).

#### 2.2.1.1 *ASSINIBOINE RIVER SYSTEM*

The Assiniboine River originates near Kelvington, Saskatchewan, and flows southeast 1,070 km to the confluence with the Red River at Winnipeg. The Assiniboine River flows southeast through the study area. Surface drainage between the Dorsey Station and the Assiniboine River is conducted through a series of small tributaries flowing southeast and parallel to the Assiniboine River and discharge into the river immediately downstream of the study area (Map 1). There are seven watercourses north of the Assiniboine River: First Creek, Second Creek, Fourth Creek (a tributary of Sturgeon Creek), Sturgeon Creek, and three unnamed tributaries of Sturgeon Creek (Map 1). All watercourses have been extensively modified into agricultural drains to carry surface drainage away from the adjacent and upstream farmlands. The largest tributary north of the river is Sturgeon Creek. Sturgeon Creek originates northwest of the Dorsey Station near Woodlands. Upstream of the study area Sturgeon Creek flows through agricultural lands and has diverted around Grants Lake, a remnant of the once extensive pre-agricultural marshes in the region. A control dam and backwatering system on Sturgeon Creek is used to modify water levels within the marsh. Downstream of the study area Sturgeon Creek and its tributaries remain extensively modified as agricultural drains. Sturgeon Creek enters the City of Winnipeg at the Perimeter Highway (PTH 101) where it passes through the Centre Port Canada construction site. South of Saskatchewan Avenue, Sturgeon Creek is characterized as an urban watercourse before discharging into the Assiniboine River in the Neighbourhood of Woodhaven. The Assiniboine River also receives surface drainage from the study area between the river and Dakotah (Map 4). Surface drainage is received by the Assiniboine River through a series of agricultural drains the largest of which is Barickman Coulee.

There are approximately 67 km of dikes on either side of the Assiniboine River east of Portage la Prairie constructed to protect property from Assiniboine River flooding events. The most significant influence on the surface hydrology in the study area is the Portage Diversion Channel. The Portage Diversion originates 1.5 km upstream and southwest of Portage la Prairie and discharges 29 km north into Lake Manitoba. The channel was designed to divert up to 708 $m^3/s$ of water from the Assiniboine River. The diversion channel is operated as required to attenuate the effects of flooding events on downstream property including Portage la Prairie and Winnipeg.

#### 2.2.1.2 *LASALLE RIVER SYSTEM*

The Red River originates at Lake Traverse in South Dakota, United States and flows north 877 km to discharge into Lake Winnipeg. Within the study area, the Red River

watershed is comprised of the La Salle River sub-watershed (Map 4). The LaSalle River begins 4.3 km east of Portage la Prairie and discharges into the Red River south of Winnipeg at St. Norbert. The LaSalle River main stem has a channel length of approximately 180 km, a drainage area of 2,407 $km^2$, and drops approximately 36 m between the origin and confluence with the Red River (Graveline and Larter 2006).

Surface water in the study area between Dakotah and the Portage South Station drains into the LaSalle River, a tributary of the Red River. The principle tributaries of the LaSalle River are the Elm River, Scott Coulee, and Crooked Lake Channel (a branch of the Elm Creek Channel; Map 1). As with the study area north of the Assiniboine River, drainage and surface water flow patterns in the study area south of the river have been extensively modified over the past one hundred years through the construction of agricultural drainage channels and the modification of existing watercourses into agricultural drains to dewater marshes/swamps and extend agricultural land.

Beginning in the 1940s, the Prairie farm Rehabilitation Administration (PFRA) constructed a series of eight dams along the LaSalle River to impound water for community and agricultural use. These dams are now provincially owned. The dam furthest upstream is located in the study area south of Elie and immediately upstream of the confluence with Elm River (Map 1; Figure 4). The remaining seven dams are located downstream of the study area between Starbuck and St. Norbert. The dams continue to impound water however siltation since construction has significantly reduced the reservoir capacity of the impoundments.

**Figure 4: Stop-log dam on the La Salle River south of Elie.**

There are 12 hydrometric stations along the La Salle River; however, actual volume of water carried along the river is difficult to determine as water is removed for irrigation, livestock watering, and domestic consumption at various locations along the river system. The largest point source withdrawal from the La Salle River is the RM of MacDonald Regional Water Treatment Plant at Sanford. The regional water system requires the equivalent of 0.04 $m^3/s$ to meet demands during the peak month of June (RM of MacDonald 2009). Beginning in 1984, the La Salle River flow has been augmented through water transfers from the Assiniboine River in order to meet water demands (Lowman 2001). Flow augmentation is conducted at three pump stations upstream of the study area: the Elm River at Hoop and Holler Bend; the LaSalle River upstream of Norquay Provincial Recreation Park; and Mill Creek (La Salle River tributary) downstream of the Assiniboine River PTH 430 crossing (Graveline and Larter 2006). Together these stations on average contribute 0.70 $m^3/s$ to the LaSalle River system and may operate seasonally or year round depending upon water levels in the river (Graveline and Larter 2006). Flows in the La Salle River system are managed to maintain a supply through a system of hydrometric stations and flow augmentation pumps although consumption is not accurately recorded.

Graveline and Larter (2006) analyzed 25 years (1979 to 2004) of hydrometric data for the LaSalle River at Elie (within the study area) and found that flows peaked in early April (mean of 1.52 $m^3/s$, range of 0.04 to 4.63 $m^3/s$), decreased rapidly in early May, and then remained relatively stable through to August (mean of 0.25 $m^3/s$, range of 0.0 to 1.12 $m^3/s$). Without accurate water withdrawal records it is not possible to determine what contributions natural surface flows contribute to the recorded flows.

#### 2.2.1.3 *2011 Flood Event*

The Assiniboine River flows between Portage la Prairie and Winnipeg are managed through a number of flood control structures. A system of dikes, first begun in 1912, have been extended 67 km downstream of Portage la Prairie along the river banks and are designed to protect adjacent properties from flooding. The south bank dikes also prevent the Assiniboine River in flood stage from discharging into the La Salle River. As a consequence of the dike construction the river channel capacity has been progressively reduced from 680 $m^3/s$ in the 1970s to the present 538 $m^3/s$. The Portage Diversion inlet is located immediately upstream of Portage la Prairie and is designed to maintain downstream flows of less than 538 $m^3/s$ by diverting flood waters from the Assiniboine River into Lake Manitoba. The diversion structure and channel were completed in 1970 with a capacity of 708 $m^3/s$. The capacity of the diversion can be increased to 963 $m^3/s$ through the construction of secondary dikes along the channel banks.

The Assiniboine River at the study area experienced an extreme and extended flood event in 2011 and was in flood stage throughout most of the year (Figure 5). Unofficial estimates placed the magnitude of the flood as a 1 in 300 year event (WFP 2011). The Assiniboine River flow at Portage Southport in January 2011 was already in a high flood stage, exceeding the upper quartile of the trailing 25 year spring freshet flows (Figure

5). Flows generally declined through the winter and early spring and declined rapidly once the Portage Diversion was activated on 5 April 2011 (Figure 5). As upstream flood control structures, such as the Shellmouth Dam, reached capacity and tributary flood crests reached the Assiniboine River, flows increased rapidly after 12 April 2011. Secondary dikes were constructed along the diversion channel to increase the flow capacity and to maintain downstream flows below the river channel capacity (538 $m^3/s$). As the Portage Diversion reached the augmented capacity the south bank dike was intentionally breached on 14 May 2011 at Hoop and Holler Bend to divert Assiniboine flow to the La Salle River via Elm River and to prevent a dike failure farther downstream (Map 1). The breach was closed on 20 May 2011 after it was determined the flood had crested on 12 May 2011 and the risk of a dike failure had declined. River flows downstream of the Portage la Prairie had reached 534 $m^3/s$. Assiniboine River flows downstream of Portage la Prairies remained above 450 $m^3/s$ for the rest of the summer and the diversion remained in operation until 5 August 2011. Normal summer water levels were not observed in the study area until late September 2011.

Flooding also occurred in the La Salle River system although with a much smaller watershed than the Assiniboine River the duration was reduced. However, residents installed temporary dikes around infrastructure in preparation for an uncontrolled dike breach along the Assiniboine River. Temporary dikes were maintained until the threat of an Assiniboine dike breach had subsided and flows from the Hoop and Holler breach had passed through the La Salle River system.

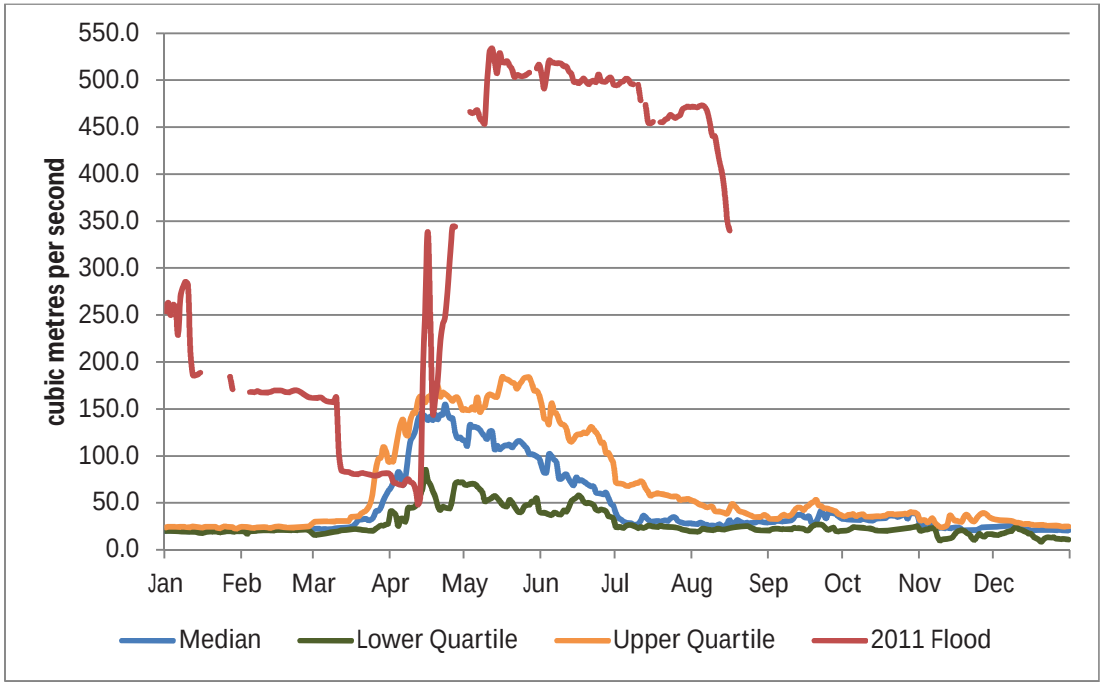



**Figure 5: 25 year median, lower quartile, upper quartile, and 2011 flood event flows at Portage Southport on the Assiniboine River.**

### 2.2.2 WATER QUALITY

#### 2.2.2.1 ASSINIBOINE RIVER SYSTEM

Manitoba Conservation – Water Quality Management Section has conducted a long-term trend analysis of total nitrogen (TN) and total phosphorus (TP) at various locations along the Assiniboine River (Jones and Armstrong 2001). The study found that between 1973 and 1999 there was an incremental increase in TN and TP with increasing distance downstream between Brandon and Winnipeg (Jones and Armstrong 2001). At the PTH 334 crossing at Headingly, the nearest downstream sampling site to the study area, flow-adjusted concentrations of TN and TP increased 54.5% and 62.2%, respectively, over the period of study (Jones and Armstrong 2001). Jones and Armstrong (2001) attributed the change to increases in anthropogenic loading. Bourne et al. (2002) concluded that 29% of the TN load and 25% of the TP load observed at Headingly were attributable to municipal and industrial processes. The Water Quality Management Section is conducting several ongoing monitoring and modeling studies on the Assiniboine River but has not as yet published the results.

#### 2.2.2.2 LA SALLE RIVER SYSTEM

Jones and Armstrong (2001) found that between 1974 and 1999 there was a 145.5% increase in TN and a 193.8% increase in TP flow-adjusted concentrations over the study period. Jones and Armstrong (2001) considered the increase dramatic and attributed the change to increases in anthropogenic loading. Hughes (2001) conducted a multi-year study to assess the water and biological quality in the La Salle River. The study was conducted from 1995 through to 1998 and was designed to use the Canadian Water Quality Index (CWQI; CCME 2001). The study results reported by Hughes (2001) indicated water quality in the La Salle River was marginal during 1995, 1997, and 1998 and was fair in 1996 (CCME 2001; Hughes 2001). The CWQI defines marginal water quality as frequently threatened or impaired with conditions often departing from natural or desirable levels (CCME 2001). The CWQI defines fair water quality as usually protected but occasionally threatened or impaired with conditions sometimes departing from natural or desirable levels.

Lowman (2001) conducted a post-hoc assessment of the Assiniboine-La Salle diversion project with an emphasis on the predictions for water quality. The intent of the diversion was relieve the existing chronic water shortages and low water quality through maintaining live streams and providing dependable, stabilized flows in the La Salle River system (Lowman 2001). Water quality was expected to improve primarily by increasing the assimilative capacity of the river system through increased flows (Lowman 2001). Overall, water quality was not observed to have improved since the commissioning of the water diversion project (Lowman 2001). Lowman (2001) hypothesized that the lack of improvement in water quality was due to an increase in development facilitated by the water diversion. The La Salle River system flows are managed to meet a minimum flow; therefore, increases in water use for activities such as irrigation result in an increase in the return flow towards the river system, the

transport of nutrients, sediment, and other substances which could degrade water quality, while not providing any additional assimilative capacity (Lowman 2001).

More recently, Graveline and Larter (2006) conducted an assessment of the La Salle River system in which they undertook field studies and reviewed historic physical, hydrological, water quality, and fish and fish habitat data. Graveline and Larter (2006) concluded that the La Salle River system is eutrophic and stressed with water quality significantly affected by historic and ongoing point- and non-point source anthropogenic inputs (e.g., cultivation, livestock operations, sewage lagoon discharges, recreational sites, urban storm drains, riparian zone reductions).

### 2.2.3 *Fish and Fish Habitat*

#### 2.2.3.1 *Riparian Habitat*

North of the Assiniboine River the banks of all the watercourses passing through the study area have been cleared of historic native vegetation cover. Agricultural activities, including cultivation, pastures, and haying, occur to the waterline of the watercourses. Therefore, the riparian areas are periodically disturbed and native species, especially shrubs and trees, are unable to colonize the riparian zones.

The extensive flood event in 2011 affected the riparian vegetation along both banks of the Assiniboine River. Riparian areas were flooded throughout the spring and summer leading to the loss or damage to the undergrowth and shrub species (Figures 6 and 7).

The riparian zone within the study area along the north bank of the Assiniboine River is 10.1 km and characterized by an almost continuous, band of riverbottom forest (Figure 6). This forest cover is interrupted in a number of areas, the six largest of which range from 30 to 275 m in bank length. Where there is forest cover it ranges from 5 to 90 m in width. Riparian zone vegetation is comprised of 92.1% (9,298 m) riverbottom forest and 7.9% (802 m) agricultural land or residential clearings. The D12P right of way clearing represents 3.7% (30 m) of the non-forested bank or 0.3% of the north bank riparian zone.

The riparian zone within the study area along the south bank of the Assiniboine River is 10.1 km and composed primarily of riverbottom forest (Figure 6). This forest cover is interrupted in a number of areas, the nine largest of which range from 30 to 745 m in bank length. Where there is forest cover it ranges from 5 to 170 m in width. Riparian zone vegetation is comprised of 75.1% (7,586 m) riverbottom forest and 24.9% (2,514 m) agricultural land or residential clearings. The D12P right of way clearing represents 1.2% (30 m) of the non-forested bank or 0.3% of the north bank riparian zone.

South of the Assiniboine River all altered watercourses passing through the study area have been cleared of historic native vegetation cover and agricultural activities, including cultivation, pastures, and haying, occur to the waterline of the watercourses. The riparian areas along the altered watercourses are periodically disturbed and native

**Figure 6: Typical riverbottom forest on the south bank of the Assiniboine River at the proposed Route Alternative B crossing.**

**Figure 7: Riverbottom forest undergrowth on the north bank of the Assiniboine River at the proposed Route Alternative C crossing.**

species, especially shrubs and trees, are unable to colonize the riparian zones. Riparian areas along unaltered watercourse sections such as the La Salle River, Scott Coulee, and upper Elm River are more diverse and alternate between deforested and forested areas (Map 4). Where forest clearing has occurred, bank vegetation ranges from cultivated plants to grasses and sedges. Forested riparian areas range in width from one or two trees to 50 m where the watercourses pass through woodlots.

#### 2.2.3.2 *FISH HABITAT*

The Province of Manitoba and Fisheries and Oceans Canada (DFO) are in the process of compiling watershed information into a National Hydrographic Network map set (Schwartz pers. comm.). Data sources include the Provincial Designated Drains (DES) map set and the Fish Habitat Classification for Manitoba Agricultural Watersheds (FHCMAW) map set prepared by DFO using unpublished field data. The FHCMAW classifies fish habitat in waterbodies based on the presence of habitat components, habitat complexity, and the presence or absence of indicator species (Table 5; DFO unpubl. data). Habitat sensitivity and risk due to works decreases from Type A to Type E (Schwartz pers. comm.). Watercourses where there are data gaps or inconsistencies between the DES and FHCMAW map sets remain unclassified. The definition of terms used in habitat classification is as follows (DFO unpubl. data):

- Indicator Species: species that are harvested through the sport, commercial, and domestic fisheries or species on Schedule 1 of the *Species at Risk Act* (SARA). These species tend to be large-bodied although commercial bait fisheries for small-body fishes are present in some larger Manitoba lakes.
- Forage Species: small-body species that generally provide a forage base for predatory indicator species.
- Direct Habitat: waterbody provides one or more habitat components necessary for maintaining a fish population (i.e. spawning, rearing, feeding, overwintering, and migration habitat).
- Indirect Habitat: waterbody does not provide spawning, rearing, feeding, overwintering, or migration habitat but may contribute to downstream habitat through water flow, nutrient transport or drift (invertebrate food items).
- Complex Habitat: generally a natural waterbody with little to no disturbance and a variety of channel features that provide direct habitat components for one or more fish species.
- Simple Habitat: generally a highly modified or human constructed channel of uniform construction that provides little to no variety in channel features.

##### *Assiniboine River System*

North of the Assiniboine River all the watercourses passing through the study area have been realigned to serve as agricultural drains, resulting in simple fish habitat (Map 4). Of the nine watercourses, one contains indicator species (Sturgeon Creek), three contain

forage species (unnamed Sturgeon Creek tributaries), and five are classified as indirect fish habitat (including First, Second, and Fourth creeks; Map 4).

# Dorsey To Portage South
# D83P Transmission Project

## Project Infrastructure

- Alternative Route A1 + A2
- Alternative Route B
- Alternative Route C
- Project Study Area

## Existing Infrastructure

- Converter Station
- Transformer Station
- Transmission Line

## Landbase

- Community
- Provincial HWY / Road
- Railway
- Watercourse
- Waterbody
- Rural Municipality

## Fish Habitat Classification Types *

- A: Indicator Species, Complex Habitat
- B: Indicator Species, Simple Habitat
- C: Forage Species, Complex Habitat
- D: Forage Species, Simple Habitat
- E: Indirect Fish Habitat
- Unclassified

* *Source: DFO, 2011*

Warren
CW8
CW8
CP17
D54C
RP16
Marquette
RM OF WOODLANDS
RM OF ROSSER
RM OF ST. FRANCOIS XAVIER
Grosse Isle
BPI / BPII
ASSINIBOINE
RIVER
Meadows
Dorsey Converter Station
Mill Creek
RM OF CARTIER
D12P
Rosser
St. Eustache
Fourth Creek
Sturgeon Creek
RM OF ST. FRANCOIS XAVIER
Second Creek
First Creek
D11Y/D15Y/D55Y
Barickman Coulee
St. François Xavier
RM OF HEADINGLEY
LaSalle River
Oakville
Fortier
Elm River
Newton
Bénard
Elie
Portage South Transformer Station
P81C
D12P
Dacotah
Crooked Lake Channel
Scott Coulee
RM OF PORTAGE LA PRAIRIE
RM OF CARTIER
La Salle River
Elm Creek Channel

Coordinate System: UTM Zone 14 NAD 83
Data Source: MBHydro, Stantec, ProvMB, NRCan, DFO
Date Created: January 19, 2012

0 2.5 5 Kilometres
0 2.5 5 Miles

1:150,000

# Fish Habitat Classification for Waterbodies

## Within Project Study Area

Map 4

**Table 5 Fish habitat classification types for Manitoba agricultural watersheds (DFO unpubl. data).**

| Classification | Fish Community | Habitat Complexity |
|---|---|---|
| Type A | Indicator Species | Complex |
| Type B | Indicator Species | Simple |
| Type C | Forage Species | Complex |
| Type D | Forage Species | Simple |
| Type E | None | Indirect (none) |

Hughes and Gurney (2001) conducted a rapid bioassessment study in 1997 and1998 in lower Sturgeon Creek between the Perimeter Highway and the confluence with the Assiniboine River. The methods were based on Plafkin *et al*. (1989). The study found that Sturgeon Creek was moderately to slightly impaired within the City of Winnipeg (Hughes and Gurney 2001). Moderately impaired is defined as a reduction in species present due to the absence of pollution intolerant species while slightly impaired is defined as a community structure less than expected due to the absence of some intolerant species and an increase in tolerant species (Plafkin *et al*. 1989).

The Assiniboine River within the study area is a typical low-gradient, low-velocity, meandering prairie river (Stewart and Watkinson 2004). The majority of the fish habitat in the study area consists of low-velocity runs with occasional snags of large woody debris (LWD). Channel substrate ranges from clay and silt to sand, gravel, cobble, boulders, and submerged LWD (Stewart and Watkinson 2004). The Assiniboine River channel within the study area has not been modified.

South of the Assiniboine River tributary watercourses include Barickman Coulee and agricultural drains (Map 4). The majority of the agricultural drains have been classified as indirect fish habitat (Table 5; Map 4). The lower reach of Barickman Coulee provides complex habitat for forage species while the upper reach has been realigned and provides only simple habitat (Map 4).

### *La Salle River System*

The La Salle River is the principle watercourse in the study area south of the Assiniboine River. There are three major La Salle tributaries within the study area: Elm River, Scott Coulee, and Crooked Lake Channel (Map 4). The La Salle River mainstem provides complex habitat for indicator species (Type A). Habitat quality in the minor La Salle River tributaries declines with distance from the mainstem, the degree of modification into agricultural drains, and persistence of stream flow (Map 4). Smaller watercourses to the east of the La Salle River mainstem are generally classified as indirect fish habitat (Type E) while larger watercourses to the west support forage species within modified channels (Type D; Map 4).

The eight dams on the La Salle River between St. Norbert and Elie are comprised of three stop-log structures and five fixed-crest weirs constructed of sheet piling and rock fill. All dams are barriers to upstream fish passage, isolating fish communities in the upper reaches from the downstream reaches, and preventing stream use by the Red River fish community (Graveline and Larter 2006). The habitat in the impounded areas has therefore been altered from riverine to a series of impoundments (Graveline and Larter 2006). The impoundments have filled with sediment and resulted in homogeneous habitat with similar velocities, depths, substrate, and shoreline conditions (Graveline and Larter 2006).

Elm River supports indicator species; however, extensive channel modifications in the lower reach has resulted in simple habitat (Type B) while the upstream reach has remained relatively unmodified and contains complex habitat (Type A; Map 4). The Scott Coulee channel within the study area remains relatively unmodified and supports forage species (Type C). Crooked Lake Channel receives surface drainage from the study area surrounding the Portage South station and supports fish species as far upstream as the D12P crossing. Within the study area Crooked Lake Channel is comprised of equal sections of complex and simple habitat (Map 4).

Hughes (2001) conducted a rapid bioassessment study from 1995 through 1998 in the La Salle River at St. Norbert using benthic invertebrate species. The methods were based on Plafkin *et al*. (1989). The study found that the La Salle River was moderately impaired in 1995 and 1997 and by 1998 was considered moderately to severely impaired (Hughes 2001). Moderately impaired is defined as a reduction in species present due to the absence of intolerant species and severely impaired is defined as few species present and if high densities are observed they are dominated by one or two species (Plafkin *et al*. 1989). A survey conducted by Graveline and Larter (2006) at three locations along the La Salle River found primarily pollution tolerant and somewhat tolerant benthic invertebrate species. Even though Graveline and Larter (2006) did not replicate the methods of Hughes (2001), the dominance of pollution-tolerant species indicates the La Salle River remains biologically impaired.

#### 2.2.3.3 *FISH COMMUNITIES*

The Red River watershed in Manitoba supports a diverse fish community of 70 native and non-native species (Table 6; Stewart and Watkinson 2004). Fifty species are known to occur in the Assiniboine River at or near the study area (Table 6). Based on the occurrences and habitat requirements provided in Stewart and Watkinson (2004), 23 species would be expected to occur in the La Salle River watershed (Table 6). Most fish species expected to occur in the study area spawn in the spring or summer (Stewart and Watkinson 2004). The exception is Burbot (*Lota lota*) which spawns in midwinter, broadcasting semipelagic, non-adhesive eggs over sand or gravel substrates (Stewart and Watkinson 2004).

North of the Assiniboine River only the Sturgeon Creek mainstem is known to support large-body fish species within the study area (DFO unpubl data; Map 4). Species utilizing the creek include Northern Pike (*Esox lucius*) and White Sucker (*Catostomus commersoni*), both of which are commonly observed in the lower reaches (Penner 2005, 2007). Three watercourses, all tributaries of Sturgeon Creek are known to support small-body species (DFO unpubl data; Map 4). Based on sample records downstream of the study area it is likely the fish communities in these tributaries is almost entirely composed of Brook Stickleback (*Culea inconstans*; Penner 2005, 2007). The remaining watercourses do not provide direct fish habitat (DFO unpubl data; Map 4).

South of the Assiniboine River tributary watercourses are not known to support large-body species (DFO unpubl data; Map 4). Small-body species are known to occur in Barickman Coulee and an agricultural drain east of Dakotah and the remaining watercourses do not directly support fish communities (DFO unpubl data; Map 4).

Within the La Salle River watershed, the mainstems of the La Salle and Elm rivers support large-body species (DFO unpubl. data; Map 4). Larger tributaries and lower reaches of smaller tributaries support small-body fish species (DFO unpubl. data; Map 4). Fish community diversity declines from the mouth of the La Salle River to the upstream reaches (Graveline and Larter 2006). Twenty-three species occurring in the Red River could be expected to utilize the La Salle River; however only, thirteen species have been observed in the lower La Salle River, upstream of the first barrier (Table 6; Manitoba Water Stewardship – Fisheries Branch unpubl. data). The number of observed species declined to seven within the study area near Elie (Graveline and Larter 2006).

The fish community in the La Salle River mainstem was most recently surveyed during the spring and summer of 2005. During the spring the fish community at Elie was observed to be comprised of Black Bullhead (*Ameiurus melas*), White Sucker, Northern Pike, Black Crappie (*Pomoxis nigromaculatus*), and Common Carp (*Cyprinus carpio*; Graveline and Larter 2006). By summer only Central Mudminnow (*Umbra limi*) and Brook Stickleback were observed at the same location. Brook Stickleback and Central Mudminnow are both tolerant of low-oxygen environments and are known to colonize marshy areas of upper watersheds where low-oxygen conditions can occur frequently (Stewart and Watkinson 2004).

**Table 6: Fish species known to occur in the Red, Assiniboine, and La Salle rivers.**

| Common Name | Scientific Name | Red | Assiniboine | LaSalle |
|---|---|---|---|---|
| *Petromyzontidae* | | | | |
| Chesnut Lamprey | *Ichthyomyzon castaneus* | N | N | |
| Silver Lamprey | *Ichthyomyzon unicuspis* | N | N | N |
| *Acipenseridae* | | | | |
| Lake Sturgeon | *Acipenser fulvescens* | N-R | NE-RI | |
| *Hiodontidae* | | | | |
| Goldeye | *Hiodon alosoides* | N | N | N |
| Mooneye | *Hiodon tergisus* | N | N | N |
| *Cyprinidae* | | | | |
| Goldfish | *Carassius auratus* | I | I | |
| Lake Chub | *Couesius plumbeus* | N-R | | |
| Spotfin Shiner | *Cyprinella spiloptera* | N | N | |
| Common Carp | *Cyprinus carpio* | I | I | I |
| Brassy Minnow | *Hybognathus hankinsoni* | N-T | | |
| Common Shiner | *Luxilus cornutus* | N-T | N-T | N |
| Silver Chub | *Macrhybopsis storeriana* | N | N | N |
| Pearl Dace | *Margariscus margarita* | N-T | N-T | |
| Hornyhead chub | *Nocomis biguttatus* | N-E | N-E | |
| Golden Shiner | *Notemigonus crysoleucas* | N-R | | |
| Emerald Shiner | *Notropis atherinoides* | N | N | |
| River Shiner | *Notropis blennius* | N | N | N |
| Bigmouth Shiner | *Notropis dorsalis* | N-T | | |
| Spottail Shiner | *Notropis hudsonius* | N | N | |
| Sand Shiner | *Notropis stramineus* | N-U | N-U | N-U |
| Northern Redbelly Dace | *Phoxinus eos* | N-T | | |
| Finescale Dace | *Phoxinus neogaeus* | N-T | | |
| Bluntnose Minnow | *Pimephales notatus* | N-1R | | |
| Fathead Minnow | *Pimephales promelas* | N | N | N |
| Flathead Chub | *Platygobio gracilis* | N | N | |
| Longnose Dace | *Rhinichthys cataractae* | N | N | N |
| Western Blacknose Dace | *Rhinichthys obtusus* | N | | |
| Creek Chub | *Semotilus atromaculatus* | N-U | N-U | N-U |
| *Catostomidae* | | | | |
| Quillback | *Carpiodes cyprinus* | N | N | |
| White Sucker | *Catostomus commersoni* | N | N | N |
| Bigmouth Buffalo | *Ictiobus cyprinellus* | N | N | N |
| Silver Redhorse | *Moxostoma anisurum* | N | N | |
| Golden Redhorse | *Moxostoma erythrurum* | N | N | |
| Shorthead Redhorse | *Moxostoma macrolepidotum* | N | N | N |
| *Ictaluridae* | | | | |

| Common Name | Scientific Name | Red | Assiniboine | LaSalle |
|---|---|---|---|---|
| Black Bullhead | *Ameiurus melas* | N | N | N |
| Brown Bullhead | *Ameiurus nebulosus* | N | N | N |
| Channel Catfish | *Ictalurus punctatus* | N | N | |
| Stonecat | *Noturus flavus* | N | N | |
| Tadpole Madtom | *Noturus gyrinus* | N | N | N |
| *Esocidae* | | | | |
| Northern Pike | *Esox lucius* | N | N | N |
| *Umbridae* | | | | |
| Central Mudminnow | *Umbra limi* | N | N | N |
| *Osmeridae* | | | | |
| Rainbow Smelt | *Osmerus mordax* | I-1R | | |
| *Salmonidae* | | | | |
| Cisco | *Coregonus artedi* | N | | |
| Lake Whitefish | *Coregonus clupeaformis* | N | | |
| Cutthroat Trout | *Oncorhynchus clarki* | I-T | | |
| Rainbow Trout | *Oncorhynchus mykiss* | I-T | | |
| Brown Trout | *Salmo trutta* | I-T | | |
| Brook Trout | *Salvelinus fontinalis* | I-Tr | | |
| *Percopsidae* | | | | |
| Trout-perch | *Percopsis omiscomaycus* | N | N | |
| *Gadidae* | | | | |
| Burbot | *Lota lota* | N | N | |
| *Fundulidae* | | | | |
| Banded Killifish | *Fundulus diaphanus* | N-1R | | |
| *Gasterosteidae* | | | | |
| Brook Stickleback | *Culea inconstans* | N | N | N |
| Ninespine Stickleback | *Pungitius pungitius* | N | N | |
| *Moronidae* | | | | |
| White Bass | *Morone crysops* | I | | |
| *Centrarchidae* | | | | |
| Rock Bass | *Amboplites rupestris* | N | N | |
| Pumpkinseed | *Lepomis gibbosus* | Tr-T | Tr-T | |
| Bluegill | *Lepomis macrochirus* | N | N | |
| Smallmouth Bass | *Micropterus dolomieu* | I | I | |
| Largemounth Bass | *Micropterus salmoides* | I | I | |
| White Crappie | *Pomoxis annularis* | N-R | | |
| Black Crappie | *Pomoxis nigromaculatus* | N | | |
| *Percidae* | | | | |
| Iowa Darter | *Ethiostoma exile* | N | N | |
| Johnny Darter | *Ethiostoma nigrum* | N | N | |
| Yellow Perch | *Perca flavescens* | N | N | N |
| Logperch | *Percina caprodes* | N | | |
| Blackside Darter | *Percina maculata* | N | N | |

| Common Name | Scientific Name | Red | Assiniboine | LaSalle |
|---|---|---|---|---|
| River Darter | *Percina shumardi* | N | N | |
| Sauger | *Sander canadensis* | N | N | N |
| Walleye | *Sander vitreus* | N | N | N |
| *Sciaenidae* | | | | |
| Freshwater Drum | *Aplodinotus grunniens* | N | N | |
| Total | | 70 | 50 | 23 |

N - native; I - introduced; Tr - transfer

1R - 1 record; E - erroneous?; R - rare; T - tributaries only; U - uncommon

### 2.2.3.5 SPECIES OF CONSERVATION CONCERN

For the purposes of this report, species of conservation concern were defined as listed species (i.e., listed under federal or provincial legislation).

#### Federal

Under Section 32 of the SARA, it is prohibited to kill, harm, harass, capture, take, possess, collect, buy, sell or trade an individual of a wildlife species (or any part of) an individual of a wildlife species that is listed as endangered, threatened, or extirpated. It is also prohibited under Section 33 to damage or destroy the residence of one or more individuals of a wildlife species that is listed as an endangered species or a threatened species. SARA applies to all federal lands in Canada.

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) is responsible, under SARA, for assessing the status of each wildlife species considered by COSEWIC to be at risk as extinct, extirpated, endangered, threatened, or of special concern (or to indicate that there is insufficient data for a classification, or that the species is not currently at risk). Category definitions are listed below (GOC 2011):

- Endangered: a wildlife species that is facing imminent extirpation or extinction.
- Threatened: A wildlife species that is likely to become endangered if nothing is done to reverse the factors leading to its extirpation or extinction.
- Special Concern: a wildlife species that is likely to become a threatened or an endangered species because of a combination of biological characteristics and identified threats.

Species are assigned to a schedule under SARA through a Governor in Council order or by order of the Minister of Environment. The schedules are defined as follows (GOC 2011):

> Schedule 1: the official list of species that are classified as extirpated, endangered, threatened, and of special concern.
>
> Schedule 2: species that had been designated as endangered or threatened, by COSEWIC and have yet to be re-assessed using revised criteria.
>
> Schedule 3: species that had been designated as special concern, by COSEWIC and have yet to be re-assessed using revised criteria.

There are six aquatic species potentially occurring in the study area that have status under COSEWIC, SARA, or both (Table 7). COSEWIC assigned the Red-Assiniboine Rivers – Lake Winnipeg populations of Lake Sturgeon the status Endangered in 2006 (COSEWIC 2006a); however, this species has not been assigned to a SARA schedule therefore it has no status or protection under SARA. Two fish species have been assigned Special Concern by COSEWIC: Silver Chub and Bigmouth Buffalo. Silver Chub was assigned Special Concern by COSEWIC in 1985 and added to Schedule 1 as Special Concern when SARA was enacted in 2002. A management plan has been

developed but critical habitat has not been identified (Boyko and Staton 2010). Bigmouth Buffalo was assigned Special Concern in 2009 by COSEWIC (2009) and added to Schedule 1 of SARA under Special Concern in 2011. Chestnut Lamprey was assigned Special Concern by COSEWIC in 1991 but was reassigned as Data Deficient in 2010 following an evaluation of existing data (COSEWIC 2010). However, Chestnut Lamprey remains in Schedule 3 under SARA as the species had already been assigned Special Concern by COSEWIC at the time when SARA was enacted. Bigmouth Shiner was originally designated as Special Concern by COSEWIC in 1985 but was reevaluated in 2003 and downgraded to Not at Risk (COSEWIC 2003). However, this species remains on Schedule 3 under SARA with the status of Special Concern. Schedule 3 does not provide official protection under SARA but provides a holding area until species are reassessed. The Mapleleaf Mussel is known to occur in the Assiniboine River upstream and downstream of the study area; however, a field survey within the study area did not result in any observations (COSEWIC 2006b). COSEWIC assigned the Saskatchewan – Nelson Rivers population of Mapleleaf Mussel a status of Endangered in 2006 (COSEWIC 2006b); however, this species has not been scheduled and therefore has no status or protection under SARA.

### Provincial

There are no aquatic species listed under Manitoba's *Endangered Species Act* (MBESA).

**Table 7: COSEWIC and SARA status of aquatic fauna in the Red, Assiniboine, and La Salle rivers.**

| Common Name | Scientific Name | COSEWIC Status | SARA Schedule | SARA Status |
|---|---|---|---|---|
| Mapleleaf Mussel | *Quadrula quadrula* | Endangered | None | None |
| Chestnut Lamprey | *Ichthyomyzon castaneus* | Data Deficient | 3 | Special Concern |
| Lake Sturgeon | *Acipenser fulvescens* | Endangered | None | None |
| Silver Chub | *Macrhybopsis storeriana* | Special Concern | 1 | Special Concern |
| Bigmouth Shiner | *Notropis dorsalis* | Not at Risk | 3 | Special Concern |
| Bigmouth Buffalo | *Ictiobus cyprinellus* | Special Concern | 1 | Special Concern |

## 2.3 TERRESTRIAL ENVIRONMENT

### 2.3.1 REGIONAL VEGETATION DESCRIPTION

The Project is located in the flat and rural Prairies Ecozone of southwestern Manitoba. This Ecozone contains the majority of Canada's productive agricultural cropland, pasture, and rangeland. As such, agriculture dominates this ecozone, covering approximately 94% of the landbase and making this one of the most altered landscapes in Canada (Environment Canada 1996).

Within the Prairies Ecozone, the study area is located within the Lake Manitoba Plain Ecoregion. This ecoregion is transitional between the northern boreal forests and the south aspen parkland. Mean annual precipitation ranges from 450-700 mm, and the region is a mosaic of trembling aspen / oak groves and rough fescue grasslands. Moist sites are often characterized by trembling aspen and shrubs, with bur oak and grass species occurring on drier sites, and willow and sedge communities occurring on poorly drained Gleysolic soils (Environment Canada 1996).

### 2.3.2 DATA/INFORMATION SOURCES

A review of existing information was completed using available public mapping services, GIS-mapping databases (e.g., Orientis), plant species and ecosystems listed by the Manitoba Conservation Data Centre (MBCDC), plant species and ecosystems listed under the COSEWIC species database and the SARA registry, and through review of external research on local species and habitats of interest.

### 2.3.3 LAND COVER CLASSIFICATION

Cover classes used to represent the communities and habitats within the Project study area were from the Land Cover Classification Enhanced for Bipole (LCCEB). The LCCEB was developed for the Biopole III project and represents an enhancement of the national landcover spatial database developed by the federal government Land Cover Classification (LCC). The LCC is a mapping layer that has been harmonized across the major federal departments involved in land management or land change detection that includes Agriculture and Agri-Foods Canada, Canadian Forest Service, and Canadian Centre for Remote Sensing. The LCCEB also includes an integration of the National Stratification Working Group ecological framework database (Joro Consultants Inc. 2010, Szwaluk Environmental Consulting Ltd. 2011).

Over 96% of the land in the study area has been disturbed (cultivated agricultural land - 66.7%, developed land - 27.2%, and annual cropland - 2.2; Map 5, Table 8).

# Dorsey To Portage South
# D83P Transmission Project

**Project Infrastructure**

- Alternative Route A1 + A2
- Alternative Route B
- Alternative Route C
- Project Study Area

**Existing Infrastructure**

- Converter Station
- Transformer Station
- Transmission Line

**Landbase**

- Community
- Provincial HWY / Road
- Railway
- Watercourse
- Waterbody
- Rural Municipality

**Land Cover Classification ***

- Annual Crops
- BroadLeaf
- BroadLeaf Dense
- BroadLeaf Open
- Cultivated Agricultural Land
- Developed
- Exposed Land
- Grassland
- Herb
- Shrub Tall
- Shrubland
- Water
- Wetland
- Wetland Shrub
- Missing Data

** Source: Natural Resources of Canada; Land Cover Classification*

Warren
CW8
CW8
D54C / CP17
CP17
D54C
RP16
Marquette
RM OF WOODLANDS
RM OF ROSSER
RM OF ST. FRANCOIS XAVIER
Grosse Isle
Poplar Point
ASSINIBOINE
RIVER
Meadows
BPI / BPII
Dorsey Converter Station
D12P
Rosser
Mill Creek
RM OF CARTIER
St. Eustache
RM OF ST. FRANCOIS XAVIER
D11Y/D15Y/D55Y
LaSalle River
Oakville
Fortier
Elm River
Newton
Bénard
Elie
St. François Xavier
RM OF HEADINGLEY
Portage South Transformer Station
P81C
D12P
Dacotah
La Salle River
RM OF PORTAGE LA PRAIRIE
RM OF CARTIER

Coordinate System: UTM Zone 14 NAD 83
Data Source: MBHydro, Stantec, ProvMB, NRCan
Date Created: October 4, 2011

0 2.5 5 Kilometres
0 2.5 5 Miles

1:150,000

## Land Cover Classification

**Within Project Study Area**

Map 5

**Table 8: Description and quantity of LCCEB cover classes in the Project Study area.**

| Cover Class | Description | Amount of Cover Class in Project Study Area |
|---|---|---|
| Annual Cropland | Annually cultivated cropland and woody perennial crops. Includes annual field crops, vegetables, summer fallow, orchards and vineyards. Comments: Classification process primarily detects and delineates lands that change from bare cover to green/vegetated cover during the growing season. | 2.2% |
| Broadleaf | Broadleaf Dense - Greater than 60% crown closure; broadleaf trees are 75% or more of total basal area.<br><br>Broadleaf Open - 26-60% crown closure; broadleaf trees are 75% or more of total basal area. | 1.3% |
| Cultivated Agricultural Land | Agricultural land, including annual and perennial crops; and would exclude grassland. | 66.7% |
| Developed | Land that is predominantly built-up or developed and vegetation associated with these land covers. This includes road surfaces, railway surfaces, buildings and paved surfaces, urban areas, industrial sites, mine structures and farmsteads. | 27.2% |
| Exposed Land | River sediments, exposed soils, ponds or lake sediments, reservoir margins, beaches, landings, burned areas, road surfaces, mudflat sediments, cutbanks, moraines, gravel pits, tailings, railway surfaces, buildings and parking, or other non-vegetated surfaces. | <0.01% |
| Grassland | Predominantly native grasses and other herbaceous vegetation may include some shrubland cover. Land used for range or native unimproved pasture may appear in this class. | 2.0% |
| Herb | Vascular plant without woody stem (grasses, crops, forbs, graminoids); minimum of 20% ground cover or one-third of total vegetation must be herb. | 0.1% |
| Shrub Tall | At least 20% ground cover which is at least one-third shrub; average shrub height greater than or equal to 2 m. In the north, moist to wet erect tall shrub > 40 cm forming more than 25% of the vegetated cover, consisting mainly of dwarf birch (*Betula*), willow (*Salix*) and/or alder (*Alnus*). Remaining cover consists of graminoids, lichen and may contain < 10% prostrate dwarf shrubs and bare soil. | 0.1% |
| Shrubland | Predominantly woody vegetation of relatively low height (generally ±2 meters). Comments: May include grass or grassland wetlands with woody vegetation, regenerating forest. | <0.01% |
| Water | Lakes, reservoirs, rivers, streams, or salt water. | 0.3% |
| Wetland | Land with a water table near/at/above soil surface for enough time to promote wetland or aquatic processes (semi-permanent or permanent wetland vegetation, including fens, bogs, swamps, sloughs, marshes, etc.). Comments: This class is mapped based on cover properties corresponding with image date(s) conditions. | 0.01% |

| Cover Class | Description | Amount of Cover Class in Project Study Area |
|---|---|---|
| Wetland – Shrub | Land with a water table near/at/above soil surface for enough time to promote wetland or aquatic processes; the majority of vegetation is tall, low, or a mixture of tall and low shrub. | <0.01% |

*Source: Geobase 2009*

### 2.3.4 SPECIES OF CONSERVATION CONCERN

For the purposes of this report, species of conservation concern were defined as listed species (i.e., listed under federal or provincial legislation) and species that are considered rare throughout their range in Manitoba.

#### Federal

Eleven plant species that may occur in Manitoba are listed under SARA.

#### Provincial

Thirteen plant species are listed under the MBESA. Under the MBESA, it is prohibited to, without a permit, kill, injure, possess, disturb or interfere with an endangered species, a threatened species, or an extirpated species that has been reintroduced; destroy, disturb or interfere with the habitat of an endangered species, a threatened species or an extirpated species that has been reintroduced; or damage, destroy, obstruct or remove a natural resource on which an endangered species, a threatened species or an extirpated species that has been reintroduced depends for its life and propagation. Exemptions can be made for existing and proposed developments if the minister is satisfied that protection and preservation of the species or the habitat is assured, or that appropriate measures are established, or will be established, to reduce to a minimum the impact of the development upon an endangered or threatened species or their habitat. Under the MBESA, an endangered species is a species indigenous to Manitoba is threatened with imminent extinction or with extirpation throughout all or a significant portion of its Manitoba range; a threatened species is a species indigenous to Manitoba that is likely to become endangered, or is, because of low or declining numbers in Manitoba, particularly at risk if the factors affecting its vulnerability do not become reversed.

In addition, the Manitoba Conservation Data Centre (MBCDC) lists plant species and communities of conservation concern on the basis of their global (G) and provincial (S) status (Table 9). These species are not necessarily federally or provincially protected, but are considered rare on the landscape in Manitoba.

**Table 9: Manitoba Conservation Data Centre ranking system (MBCDC 2011).**

| Rank | Definition |
|---|---|
| 1 | Very rare throughout its range or in the province (5 or fewer occurrences, or very few remaining individuals). May be especially vulnerable to extirpation. |
| 2 | Rare throughout its range or in the province (6 to 20 occurrences). May be vulnerable to extirpation. |
| 3 | Uncommon throughout its range or in the province (21 to 100 occurrences). |
| 4 | Widespread, abundant, and apparently secure throughout its range or in the province, with many occurrences, but the element is of long-term concern (> 100 occurrences). |
| 5 | Demonstrably widespread, abundant, and secure throughout its range or in the province, and essentially impossible to eradicate under present conditions. |
| U | Possibly in peril, but status uncertain; more information needed. |
| H | Historically known; may be rediscovered. |
| X | Believed to be extinct; historical records only, continue search. |
| SNR | A species not ranked. A rank has not yet assigned or the species has not been evaluated. |
| SNA | A conservation status rank is not applicable to the element. |

### 2.3.5 *TARGET SPECIES*

Target terrestrial species of conservation concern were identified for the study area based on their range and on historical occurrence data in this area (i.e., within approximately 16 km of the existing line), from available information from the MBCDC and Orientis databases (Table 10). Focus was placed on species that had been historically identified in this area; however, all plant species of conservation concern that could potentially occur in the Lake Manitoba Plain (MBCDC 2011) were considered.

Plant communities of conservation concern (Table 10) were also considered; however, emphasis was not placed on identifying these communities in the field since the classification and identification of these communities has not been updated since the mid-1990s. Also, presence of these communities in the general Project area was based on a desktop survey and was not confirmed in the field (C. Friesen, pers. comm.).

**Table 10: Target species identified for the Project study area.**

| Species of Conservation Concern | | Conservation Status | | | | Habitat |
|---|---|---|---|---|---|---|
| Scientific Name | English Name | MBESA | SARA | COSEWIC | MBCDC | |
| *Agalinis aspera* | Rough Agalinis (Rough Purple False-foxglove) | Not listed | Endangered Schedule 1 | Endangered | S1S2 | Basic soils, dry rocky or sandy prairies on limestone or limestone-capped bluffs, steep sandy hillsides and sandy-gravelly moraines |
| *Asclepias verticillata* | Whorled Milkweed | Not listed | Not listed | Not listed | S2 | Dry fields, openings in rocky upland forests, forest edges. Occasionally found on moist gravelly banks along rivers. |
| *Boltonia asteroides* var. *recognita* | White Boltonia (White Doll's Daisy) | Not listed | Not listed | Not listed | S2S3 | Openings in floodplain forests, soggy thickets, alluvial meadows, poorly drained areas of black soil prairies, marshes, and ditches |
| *Bouteloua curtipendula* | Side-oats Grama | Not listed | Not listed | Not listed | S2 | Dry open grasslands, dry prairies and sandhills |
| *Carex tetanica* | Rigid Sedge | Not listed | Not listed | Not listed | S2 | Meadows and low woods |
| *Carex tribuloides* | Blunt Broom Sedge | Not listed | Not listed | Not listed | SNA | Wet woods and meadows |
| *Chamaesyce geyeri* | Prostrate Spurge | Not listed | Not listed | Not listed | S1 | Sandy prairies and dunes |
| *Circaea lutetiana* ssp. *canadensis* | Large Enchanter's-nightshade | Not listed | Not listed | Not listed | S2 | Moist woods |
| *Cornus alternifolia* | Alternate-leaved Dogwood | Not listed | Not listed | Not listed | S3 | Rich woods and thickets |
| *Cyperus schweinitzii* | Schweinitz's Flatsedge | Not listed | Not listed | Not listed | S2 | Lowland prairies or sand hills, sandy soils |
| *Dalea villosa var. villosa* | Hairy Prairie Clover | Threatened | Threatened Schedule 1 | Threatened | S2 | Mixed-grass Prairie region, areas of shifting or partially stabilized sand dunes and sand blowouts |
| *Festuca hallii* | Plains Rough Fescue | Not listed | Not listed | Not listed | S3 | Prairies, hillsides, and open woods |
| *Gentiana puberulenta* | Downy Gentian | Not listed | Not listed | Not listed | S2 | Prairies and dry upland woods |
| *Helianthus pauciflorus ssp. pauciflorus* | Stiff Sunflower | Not listed | Not listed | Not listed | SU | Prairies and roadsides |
| *Hudsonia tomentosa* | False Heather | Not listed | Not listed | Not listed | S3 | Sandy habitats |
| *Hypoxis hirsuta* | Yellow Stargrass | Not listed | Not listed | Not listed | S3 | Dry open woods |
| *Leersia oryzoides* | Rice Cutgrass | Not listed | Not listed | Not listed | S3? | Swamps, wet meadows, muddy soil |
| *Lotus unifoliolatus* | Prairie Trefoil (Bird's-foot trefoil) | Not listed | Not listed | Not listed | S2S3 | Roadsides, moist edges |
| *Nassella viridula* | Green Needle Grass | Not listed | Not listed | Not listed | S3 | Foothills, open hillsides and parks, open woodlands, disturbed sites |
| *Orobanche ludoviciana* | Louisiana Broom-rape | Not listed | Not listed | Not listed | S2 | Dry sandy soil, open slopes |
| *Phryma leptostachya* | Lopseed | Not listed | Not listed | Not listed | S3 | Moist woods |
| *Polygala verticillata* | Whorled Milkwort | Not listed | Not listed | Not listed | S2 | Moist, sandy soil, grasslands, and woods |
| *Ranunculus cymbalaria var. saximontanus* | Seaside Crowfoot | Not listed | Not listed | Not listed | S1S2 | Mud, brackish water of sloughs, ponds, ditches, lakes and slow moving streams |
| *Sanguinaria canadensis* | Blood-root | Not listed | Not listed | Not listed | S2 | Moist, rich woodlands |
| *Shinnersoseris rostrata* | Annual Skeletonweed | Not listed | Not listed | Not listed | S1S2 | Open sandy soils |
| *Symphyotrichum sericeum* | Western Silvery Aster | Threatened | Threatened Schedule 1 | Threatened | S2 | Well-drained calcareous (alkaline) soils in dry prairies and fields, glacial sand and gravel deposits, dry banks and open oak savannas. |
| *Verbena bracteata* | Bracted Vervain | Not listed | Not listed | Not listed | S3 | Prairies, fields, roadsides, and waste places |
| Plant Communities | | | | | | |
| *Andropogon gerardii-sporobolus heterolepis-andropogon scoparius* herbaceous vegetation | Big Bluestem-prairie Dropseed-little Bluestem Herbaceous Vegetation | Not listed | Not listed | Not listed | S1 | Dry-mesic tallgrass prairie, featuring *Andropogon gerardii*, *Sporobolus heterolepis*, and *Schizachyrium scoparium* as the dominant graminoid species. This community is found on clay-loam soils with a medium to heavy texture, although soils with a coarse texture may also be found. Drainage is primarily moderate with the occasional site having poor drainage. |
| *Fraxinus pennsylvanica-ulmus americana-(celtis occidentalis, tilia americana)* forest | Green Ash-American Elm-(Hackberry, Basswood) Forest | Not listed | Not listed | Not listed | S2 | Closed canopy dominated by *Fraxinus pennsylvanica* and *Ulmus americana*. *Tilia americana* and/or *Celtis occidentalis* may also be characteristic trees, but their provincial distributions are limited. Soils in this community may moderately to rapidly drained. Significant leaf litter may be present, underlain by soils ranging in texture from silty clays to sandy loams. |
| *Salix exigua* shrubland | Sandbar Willow Shrubland | Not listed | Not listed | Not listed | S3S4 | Temporarily flooded pioneer shrubland found on sand or gravel bars, or newly exposed shorelines adjacent to water bodies. *Salix exigua* is the dominant species, forming dense thickets. Few other species are typically found in the area due to the potential damage caused by flooding, wave action, and ice scouring. Soils are newly deposited sands, gravels and silts. |

Sources: Gleason and Cronquist 1991, Greenall 1996, GOC 2011, MBCDC 2011

# 3.0 VEGETATION SURVEYS

## 3.1 METHODOLOGY

### 3.1.1 *PRELIMINARY SITE INVESTIGATION*

A preliminary site investigation (PSI) was completed in the study area to verify the major habitat types identified within the Project area, and to identify suitable sites to conduct rare plant surveys. The PSI was conducted from July 12 to 16, 2011, with follow-up efforts conducted on August 19, 20 and September 28, 2011.

During the PSI, plots were selected using LCCEB data in order to ensure that a variety of habitat types were visited. Plot location was also based on access and landowner permission. At each plot, the UTM was recorded using a Garmin GPSmap 60Csx/60Cx (NAD83, 14U) and representative photographs were taken and a description of the habitat type, potential for rare plants, and a list of characteristic species were recorded. If the plot was a forested site, it was classified using the Forest Ecosystem Classification for Manitoba Field Guide (Zoladeski et al. 1995). Incidental observations of wildlife were recorded during the PSI and have been included in the wildlife technical report. Habitat types recorded were then separated into broad categories (e.g., cultivated field, broadleaf). Accessible habitats along the Assiniboine River were visited; however, plots were not conducted at these locations because conditions along the river were not typical due to the flooding events of spring 2011.

### 3.1.2 *RARE PLANT SURVEYS*

Rare plant surveys were conducted in habitats identified during the PSI as having habitat characteristics that could potentially support target species (Table 10). Emphasis was placed on identifying species that are federally and/or provincially listed. Access to these sites was dependent on landowner permission; as such, not all sites identified for rare plant surveys were visited.

Since Manitoba does not have standardized methodology published for conducting rare plant searches, surveys were conducted in accordance with Saskatchewan's 'Standardized Methodology for Surveys of Rare Plants' (Saskatchewan CDC 2009) (C. Friesen, pers. comm.). Early season surveys were not completed, as survey periods were limited by the flood of the Assiniboine River and landowner sensitivities.

Surveys were conducted from July 13 to 16, 2011 and August 17 to 21, 2011 using a random meander search pattern (Saskatchewan CDC 2009). At each rare plant survey location, a UTM, representative photographs, slope, aspect, elevation, and soil type of were recorded, along with a summary of the surrounding habitat and dominant species.

If a target species was identified, species abundance and coverage (per $m^2$) and species health were recorded, and photos of the plant were taken. Incidental observations of wildlife were also recorded.

## 3.2 RESULTS

### 3.2.1 *PRELIMINARY SITE INVESTIGATION*

A total of 30 habitat classification plots were completed during the 2011 field investigations, and habitat types identified were consistent with those identified by the LCCEB (Table 9). Nine of the major habitat types identified in the study area are outlined in Appendix A. A total of 162 plant species were identified during field investigations, of which 122 species were native and 40 were non-native (Appendix B). Most sites had some level of weed encroachment by both native and non-native weed-species.

### 3.2.2 *RARE PLANT SURVEYS*

A total of 16 rare plant surveys were completed during the 2011 field investigation (Map 6). Surveys were conducted in a variety of habitats, including riparian forested areas, woodlots, native prairie grasslands, and along watercourses and ditches.

#### Listed Plant Species

No federally or provincially listed species were identified during the 2011 field investigations.

#### Species of Conservation Concern

Three species of conservation concern were identified during field investigations (Table 11), including blunt broom sedge (Figure 8), stiff sunflower (Figure 9), and Bird's-foot trefoil (Figure 10). Two possible species of conservation concern (lopseed, Enchanter's nightshade) were located along the La Salle River during the July 2011 surveys; however, at that time the plants were not developed enough to make a positive identification. The site was re-visited on 17 August, 2011 and the area appeared to have been negatively affected (possibly herbicide runoff from the adjacent field). As such, the plants were highly stressed and definitive identification was not possible.

# Dorsey To Portage South
# D83P Transmission Project

## Project Infrastructure

- Alternative Route A1 + A2
- Alternative Route B
- Alternative Route C
- Project Study Area

## Existing Infrastructure

- Converter Station
- Transformer Station
- Transmission Line

## Survey Locations

- Rare Plant Survey Locations

## Landbase

- Community
- Provincial HWY / Road
- Railway
- Watercourse
- Waterbody
- Rural Municipality

## Land Cover Classification *

- Annual Crops
- BroadLeaf
- BroadLeaf Dense
- BroadLeaf Open
- Cultivated Agricultural Land
- Developed
- Exposed Land
- Grassland
- Herb
- Shrub Tall
- Shrubland
- Water
- Wetland
- Wetland Shrub
- Missing Data

** Source: Natural Resources of Canada; Land Cover Classification*

Warren
CW8
CW8
D54C / CP17
CP17
D54C
RP16
Marquette
RM OF WOODLANDS
RM OF ROSSER
RM OF ST. FRANCOIS XAVIER
Grosse Isle
Poplar Point
ASSINIBOINE
RIVER
Meadows
BPI / BPII
Dorsey Converter Station
RM OF CARTIER
Mill
Creek
D12P
Rosser
St. Eustache
RM OF ST. FRANCOIS XAVIER
D11Y/D15Y/D55Y
LaSalle River
Oakville
Fortier
Elm River
Newton
Bénard
Elie
St. François Xavier
RM OF HEADINGLEY
Portage South Transformer Station
P81C
D12P
Dacotah
La Salle River
RM OF PORTAGE LA PRAIRIE
RM OF CARTIER

Manitoba Hydro

Coordinate System: UTM Zone 14 NAD 83
Data Source: MBHydro, Stantec, ProvMB, NRCan, TetraTech
Date Created: October 4, 2011

0 2.5 5 Kilometres
0 2.5 5 Miles

1:150,000

## Locations of Rare Plant Surveys

### Within Project Study Area

Map 6

**Table 11: Species of conservation concern identified in the Project study area during 2011 field investigations.**

| Species of Conservation Concern | | MBCDC Status | Location (NAD 83, 14U) | | Species Abundance | Species Coverage | Species Health | Surrounding Habitat |
|---|---|---|---|---|---|---|---|---|
| Scientific Name | English Name | | Easting | Northing | | | | |
| *Carex tribuloides* | Blunt Broom Sedge | SNA | 563141 | 5525538 | ~20 plants per $m^2$ | 10-15% | Good | Field that had been grazed by cattle earlier in the year. Field had wet depressions in July, but these depressions were dry during the August survey. |
| *Helianthus pauciflorus ssp. pauciflorus* | Stiff Sunflower | SU | 599228 | 5526279 | ~2-5 plants per $m^2$ | 2-3% | Good | Along ditch surrounded by cultivated fields. Ditch edges indicative of prairie habitat, though edges were mowed and weeds were encroaching into this area. The ditch was dry during the time of survey (August 2011). |
| *Lotus unifoliolatus* | Prairie Trefoil (Bird's-foot trefoil) | S2S3 | 601476<br>587490 | 5531117<br>5526731 | ~2-5 plants per $m^2$<br>~20 plants per $m^2$ | 2-3%<br>10-15% | Good | Observed in roadside ditch and along edge of Elm River (human-altered). |

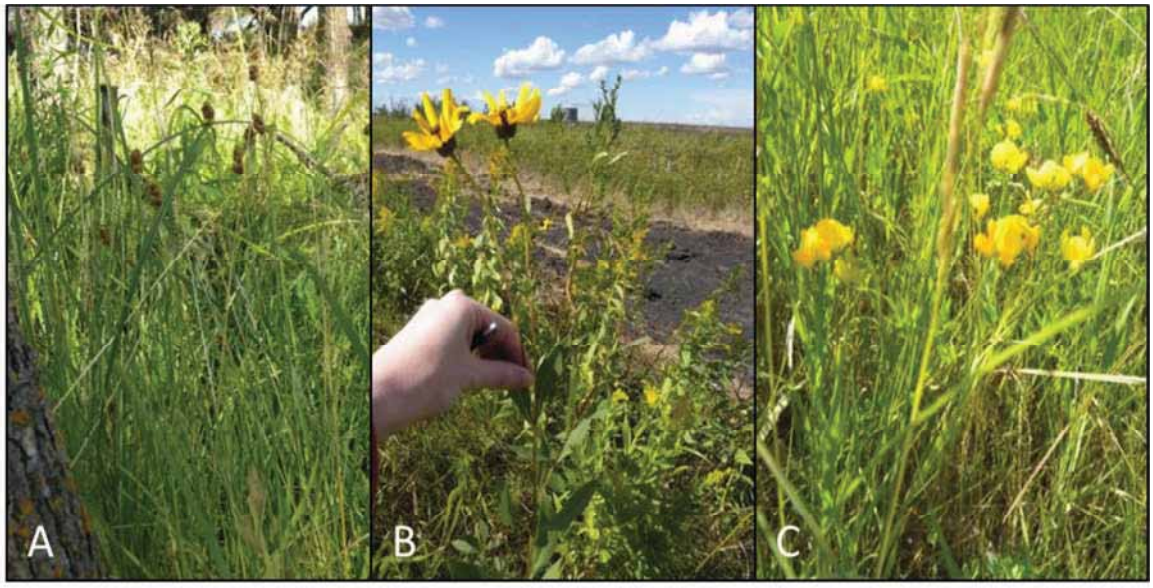



**Figure 8: Representative MDCDC plants – A:Blunt Broom Sedge; B:Stiff Sunflower; C:Bird's-foot Trefoil**

## 3.3 ALTERNATIVE ROUTES ASSESSMENT

The three alternative routes (A, B and C) were buffered by 200 m on either side of the centre line to determine land cover type (LCCEB) within the buffered route options (Table 12). Cultivated agricultural land was the most common cover type for all three route options, followed by developed land and annual crops. Route A contains the least amount of grassland and broadleaf habitat, which could potentially support plant species of conservation concern.

**Table 12: LCCEB cover types found in three potential routes for the D83P Transmission Line.**

| LCCEB Cover Type | Area ($km^2$) | | |
|---|---|---|---|
| | Route A | Route B | Route C |
| Annual Crops | 0.83 | 0.87 | 0.96 |
| Broadleaf | 0.10 | 0.16 | 0.17 |
| Cultivated Agricultural Land | 23.75 | 23.23 | 24.18 |
| Developed | 1.28 | 1.66 | 0.96 |
| Exposed Land | 0 | 0 | 0.03 |
| Grassland | 0.55 | 0.76 | 0.58 |
| Herb | 0.04 | 0.00 | 0.03 |
| Shrub Tall | 0.00 | 0 | 0.03 |
| Water | 0.05 | 0.05 | 0.06 |
| **Total** | 26.71 | 26.88 | 27.17 |

In addition, crossing the Assiniboine River with Route A would require the least amount of clearing of riparian, bottomland forest.

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TETRA TECH

# APPENDIX A

# REPRESENTATIVE HABITAT TYPES IDENTIFIED IN THE PROJECT STUDY AREA

### *Cultivated Agricultural Land and Cropland*

The majority (>50%) of the study area was dominated by cultivated agricultural land and cropland. Roadside ditches were common along agricultural fields, and shelterbelts and small woodlots were also common. This habitat type was not considered suitable for supporting rare plants or rare plant communities, though rare plant species may potentially be found along roadside ditches.

### *Developed Land*

Developed land included land with buildings, roads, industrial surfaces, farmsteads, and paved surfaces. Much of the study area (~25%) was developed.

*Broadleaf Forest – V2, Black Ash (White Elm) Hardwood*

This habitat type commonly occurred along streams and small rivers in moist to wet drainage.

*Broadleaf Forest – V3, Miscellaneous Hardwoods*

This habitat type was common in woodlots that were surrounded by cultivated fields, with site conditions varying between dry and dry-mesic, and imperfectly drained sites.

*Grassland Habitat*

Native grassland habitat was uncommon in the study area, with one large area of relatively unaltered grassland occurring to the south of the existing Portage South substation.

*Sandhills*

One sandhill site was identified south of the existing Portage South substation.

*Water - Riparian Drainage Channel (Human-altered)*

Human-altered drainage channels were common throughout the study area. Weed species often encroached into these areas.

*Water - Wetlands*

Several small wetlands were identified in the study area. Plant species diversity was commonly high in these areas; however, all wetland areas showed evidence of human disturbance (e.g., eutrophication, weed encroachment).

*Water – Assiniboine River*

The forested area along the Assiniboine was classified as V2 forest. Vascular plant species could not be identified due to flooding, and at the time of surveys, floodwater was still very high, and conditions in this area were not typical. As such, a complete assessment of this habitat type could not be completed.

TETRA TECH

# APPENDIX B

# PLANT SPECIES IDENTIFIED IN THE PROJECT STUDY AREA

| Scientific Name | English Name | Native or Non-Native |
|---|---|---|
| *Acer negundo* | Manitoba maple | Native |
| *Achillea millefolium* | Common yarrow | Native |
| *Agrostis scabra* | Ticklegrass | Native |
| *Agrostis stolonifera* | Redtop | Native |
| *Alisma* spp. | Water plantain | Native |
| *Alnus incana* | Speckled alder | Native |
| *Alnus* spp. | Alder spp. | Native |
| *Alnus spp.* | Aster spp. | Native |
| *Alnus viridis* | Green alder | Native |
| *Amelanchier alnifolia* | Saskatoon berry | Native |
| *Andropogon gerardii* | Big blue stem | Native |
| *Anemone canadensis* | Canadian anemone | Native |
| *Apocynum androsaemifolium* | Spreading dogbane | Native |
| *Argentina anserina* | Silver weed | Native |
| *Artemisia frigida* | Pasture sage | Native |
| *Artemisia ludoviciana* | Prairie sage | Native |
| *Asclepias speciosa* | Showy milkweed | Native |
| *Aster conspicuus* | Showy aster | Native |
| *Astragalus* spp. | Milkvetch | Native |
| *Beckmannia syzigachne* | Slough grass | Native |
| *Calamagrostis stricta* | Narrow reed grass | Native |
| *Calamagrostis stricta* | Northern reed grass | Native |
| *Calla palustris* | Water calla | Native |
| *Caltha palustris* | Marsh marigold | Native |
| *Caltha palustris* | Yellow marsh marigold | Native |
| *Campanula rotundifolia* | Harebell | Native |
| *Carex* spp. | Sedge spp. | Native |
| *Carex tribuloides* | Blunt broom sedge | Native |
| *Cerastium* | Chickweed | Native |
| *Chamerion angustifolium* | Fireweed | Native |
| *Cicuta* spp. | Water hemlock | Native |
| *Cornus sericea* ssp. *sericea* | Redosier dogwood | Native |
| *Crataegus* spp. | Hawthorn | Native |
| *Deschampsia caespitosa* | Tufted hair grass | Native |
| *Elymus trachycaulus* | Slender wheat grass | Native |
| *Equisetum* spp. | Horse tail spp. | Native |
| *Erigeron* spp. | Fleabane spp. | Native |
| *Erigeron strigosus* | Rough fleabane | Native |
| *Eurybia divaricata* | White wood aster | Native |
| *Festuca hallii* | Plains rough fescue | Native |
| *Festuca* spp. | Fescue spp. | Native |
| *Fragaria virginiana* | Wild strawberry | Native |
| *Fragaria virginiana* | Smooth wild strawberry | Native |
| *Fraxinus pennsylvanica* | Green ash | Native |

| Scientific Name | English Name | Native or Non-Native |
|---|---|---|
| *Galium boreale* | Northern bedstraw | Native |
| *Galium palustre* | Marsh bedstraw | Native |
| *Galium triflorum* | Whorled or sweet scented bedstraw | Native |
| *Geranium carolinianum* | Caroline geranium | Native |
| *Glyceria grandis* | Tall manna grass | Native |
| *Glycyrrhiza lepidota* | American licorice | Native |
| *Grindelia squarrosa* | Curly cup gum weed | Native |
| *Helianthus pauciflorous* spp. *subhomboideus* | Stiff sunflower | Native |
| *Helianthus salicifolius* | Narrow leaved sunflower | Native |
| *Heliopsis helianthoides* | Oxeye sunflower | Native |
| *Heracleum maximum* | Cow parsnip | Native |
| *Heterotheca (Chrysopsis) villosa* | Hairy false golden aster | Native |
| *Hylocomium splendens* | Stair-step moss | Native |
| *Juncus* spp. | Rush spp. | Native |
| *Juniperus horizontalis* | Creeping juniper | Native |
| *Koeleria* Pers. | June grass | Native |
| *Lathyrus ochroleucus* | Cream-colored vetching | Native |
| *Lathyrus venosus* | Wild peavine | Native |
| *Leersia* spp. | Cutgrass spp. | Native |
| *Lemna minor* | Common duckweed | Native |
| *Lithospermum incisum* | Fringed gromwell | Native |
| *Maianthemum canadense* | Wild lily-of-the-valley | Native |
| *Maianthemum racemosum* | False solomon's seal | Native |
| *Matteuccia struthiopteris* | Ostrich fern | Native |
| *Mentha arvensis* | Wild mint | Native |
| *Menyanthes trifoliata* | Buckbean | Native |
| *Mertensia paniculata* | Tall lungwort or Tall bluebells | Native |
| *Mertensia spp.* | Lungwort spp. | Native |
| *Oligoneuron rigidum* | Stiff goldenrod | Native |
| *Oxytropis splendens* | Showy locoweed | Native |
| *Petalostemon purpureum* | Purple prairie-clover | Native |
| *Petasites frigidus* var *sagittatus* | Arrow leaved coltsfoot | Native |
| *Petasites frigidus* var. *palmatus* | Palmate-leaved colt's foot | Native |
| *Phragmites australis* | Common reedgrass | Native |
| *Picea glauca* | White spruce | Native |
| *Pinus banksiana* | Jack pine | Native |
| *Polygonum amphibium* var. *stipulaceum* | Water smartweed | Native |
| *Populus balsamifera* | Balsam poplar | Native |
| *Populus tremuloides* | Trembling aspen | Native |
| *Prunus pensylvanica* | Pin cherry | Native |
| *Prunus virginiana* | Chokecherry | Native |
| *Quercus macrocarpa* | Bur oak | Native |

| Scientific Name | English Name | Native or Non-Native |
|---|---|---|
| *Ratibida columnifera* | Prairie coneflower | Native |
| *Ribes oxyacanthoides* | Northern gooseberry | Native |
| *Rosa acicularis* | Prickly rose | Native |
| *Rosa californica* | Wild rose | Native |
| *Rubus idaeus* | Wild red raspberry | Native |
| *Rudbeckia hirta* | Black-eyed susan | Native |
| *Rumex occidentalis* | Western dock | Native |
| *Salix amygdaloides* | Peach-leaved willow | Native |
| *Salix* spp. | Willow spp. | Native |
| *Scirpus* spp. | Bulrush | Native |
| *Scutellaria epilobiifolia* | Marsh skull cap | Native |
| *Smilacina stellata* | Starry false Solomon's seal | Native |
| *Smilax aristolochiifolia* | Sarsaparilla or Wild sarsaparilla | Native |
| *Solidago canadensis* | Canada goldenrod | Native |
| *Solidago gigantea* | Late goldenrod | Native |
| *Spartina gracilis* | Alkaline cord grass | Native |
| *Spartina pectinata* | Prairie cord grass | Native |
| *Stachys pilosa* var. *arenicola* | Hairy hedgenettle | Native |
| *Symphoricarpos occidentalis* | (Buckbush) or Western snowberry | Native |
| *Symphotrichum ciliolatum* | Lindley's aster | Native |
| *Symphyotrichum campestre* | Meadow aster | Native |
| *Symporicarpos albus* | Northern snowberry | Native |
| *Thalictrum pubescens* | Tall meadow rue | Native |
| *Thalictrum* spp. | Meadow rue | Native |
| *Thalictrum venulosum* | Veiny meadow rue | Native |
| *Thalictrum venulosum* | Veiny meadow rue | Native |
| *Toxicodendron rydbergii* | Poison ivy | Native |
| *Trientalis borealis* | Starflower | Native |
| *Typha* spp. | Cattail | Native |
| *Ulmus americana* | White elm | Native |
| *Urtica* spp. | Nettle spp. (juvenile) | Native |
| *Utricularia* | Bladderwort spp. | Native |
| *Viburnum edule* | Highbush cranberry | Native |
| *Vicia americana* | American vetch | Native |
| *Vicia* spp. | Vetch spp. | Native |
| *Viola* spp. | Violet spp. | Native |
| *Agropyron repens* | Quack grass | Non-Native |
| *Alopecurus pratensis* | Meadow foxtail | Non-Native |
| *Amaranthus hybridus* | Pigweed | Non-Native |
| *Ambrosia* spp. | Rag weed | Non-Native |
| *Arctium minus* | Lesser burdock | Non-Native |
| *Artemisia absinthium* | Absinthe | Non-Native |
| *Bromus inermis* | Smooth brome | Non-Native |

| Scientific Name | English Name | Native or Non-Native |
|---|---|---|
| *Capsella bursa-pastoris* | Shepherd's purse | Non-Native |
| *Carduus nutans* | Nodding thistle | Non-Native |
| *Chrysanthemum leucanthemum* | Oxeye daisy | Non-Native |
| *Cirsium arvense* | Canada thistle | Non-Native |
| *Convolvulus arvensis* | Field bindweed | Non-Native |
| *Eriogonum* spp. | Wild buckwheat | Non-Native |
| *Fagopyrum esculentum* | Buckwheat | Non-Native |
| *Galeopsis tetrahit* | Hemp nettle | Non-Native |
| *Hordeum jubatum* | Foxtail barley | Non-Native |
| *Kochia scoparia* | Kochia | Non-Native |
| *Lepidium densiflorum* | Pepper grass | Non-Native |
| *Lotus corniculatus* | Bird's-foot trefoil | Non-Native |
| *Lythrum salicaria* | Purple loosestrife | Non-Native |
| *Malva pusilla* | Round-leaved mallow | Non-Native |
| *Medicago* spp. | Alfalfa | Non-Native |
| *Melilotus* spp. | Sweetclover | Non-Native |
| *Neslia paniculata* | Ball Mustard | Non-Native |
| *Phalaris arundinacea* | Reed canary grass | Non-Native |
| *Phleum pratense* | Timothy | Non-Native |
| *Plantago major* | Common plantain | Non-Native |
| *Polygonum persicaria* | Lady's-thumb | Non-Native |
| *Saponaria vaccaria* | Cow cockel | Non-Native |
| *Silene Vulgaris* | Bladder champion | Non-Native |
| *Sium suave* | Water-parsnip | Non-Native |
| *Sonchus arvensis* | Sow thistle | Non-Native |
| *Spirodela polyrhiza* | Duck weed | Non-Native |
| *Stachys palustris* | Marsh hedgenettle | Non-Native |
| *Syngonium podophyllum* | Arrow head | Non-Native |
| *Thlaspi arvense* | Stinkweed | Non-Native |
| *Tragopogon dubius* | Yellow goat's beard | Non-Native |
| *Trifolium hybridum* | Alsike clover | Non-Native |
| *Trifolium pratense* | Red clover | Non-Native |
| *Urtica dioica* | Stinging nettle | Non-Native |