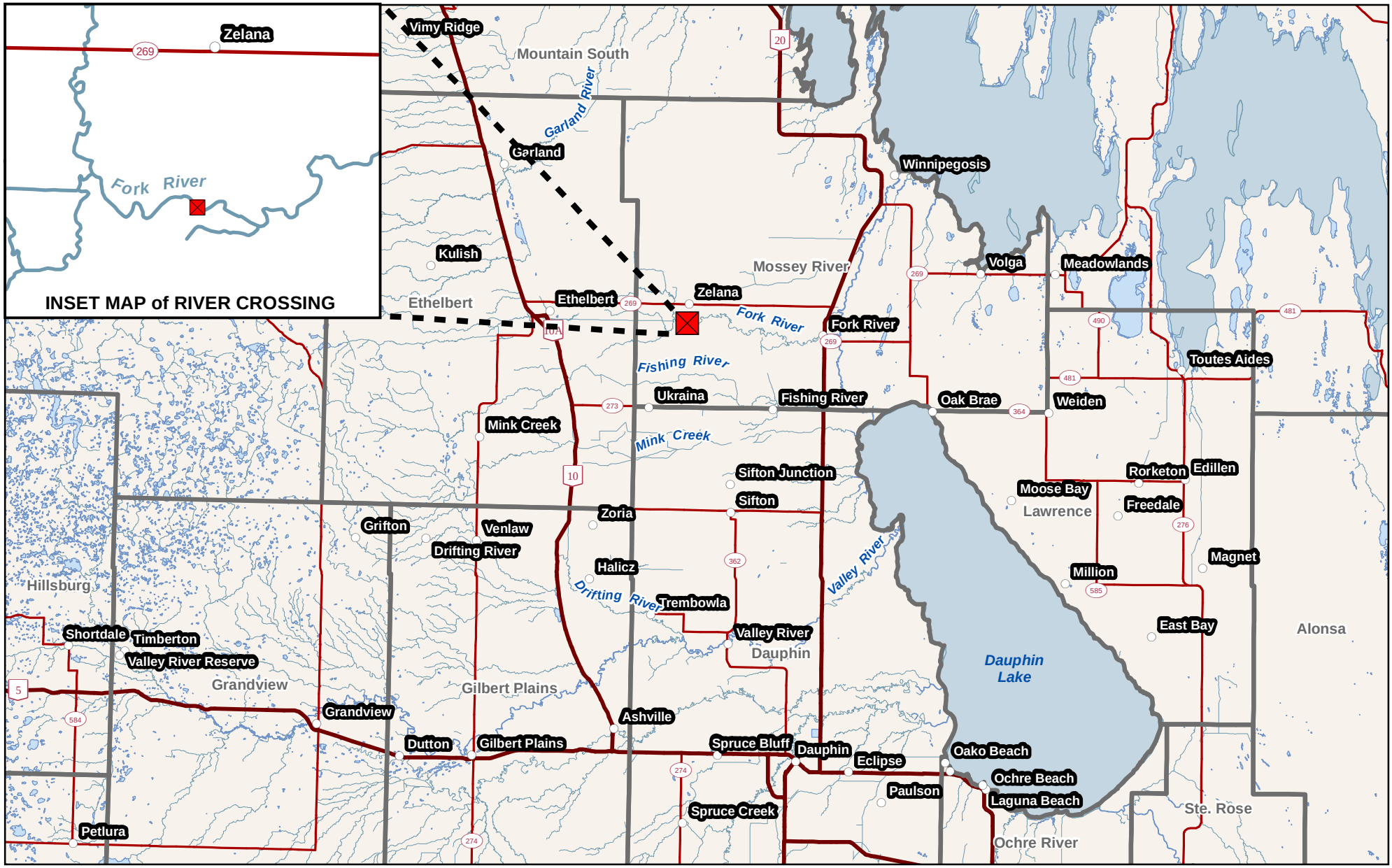
1.0 Introduction

The Rural Municipality (RM) of Mossey River proposes to replace an existing flood-damaged low-level crossing over the Fork River (Photograph 1-1), which is located on a mile road west of the town of Fork River, approximately eight miles (13 km) west of Provincial Trunk Highway (PTH) 20 and one mile (1.6 km) south of Provincial Road (PR) 269 (legal land location: NW 27-29-20W; UTM: Zone 14U: X-416346, Y-5708405; Map 1-1) with a new curbed low-level crossing ("the Project").

The existing structure, consisting of ten 800-mm diameter corrugated steel culverts with a concrete slab, is in a bad state of repair due to flood damage sustained in June 2010 (Photograph 1-1).

Photograph 1-1 The Fork River Low-Level Crossing

Source: UNIES 2012

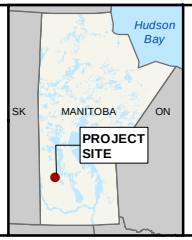


DRAFT

Study Area

LEGEND

- River Crossing Area
- Community
- Rural Municipalities
- Provincial Highway
- Provincial Road



DATA SOURCE:
GEOBASE CANADA, MLI, CANVEC,
STANTEC CONSULTING LTD.

0 5 10 Kilometres
0 2.75 5.5 Miles

Stantec

COORDINATE SYSTEM	NAD 1983 UTM Zone 14N
DATE	May 02, 2013
PROJECT	1137 31800
MAP	1-1
DRAWN	AC
QA/QC	MOD
APPROVED	CA

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1.1 THE PROPONENT

For the purposes of development licensing, the proponent of the Project is the RM of Mossey River (hereafter "the Proponent").

For further information regarding the RM of Mossey River, please contact the following:

Mr. Bill Hildebrand, Chief Administrative Officer
Rural Municipality of Mossey River
100-2nd Avenue East
Fork River, MB R0L 0V0
Telephone: (204) 657-2331
Fax: (204) 657-2202

This Environmental Impact Assessment was prepared by Stantec Consulting Ltd. (Stantec). The local contact is:

Mrs. Carmen Anseeuw, B.Env.St.
Environmental Planner
Stantec Consulting Ltd.
603-386 Broadway
Winnipeg, MB R3C 3R6
Telephone: (204) 928-8809
Fax: (204) 942-2548
Email: carmen.anseeuw@stantec.com

1.2 BACKGROUND

At the request of Manitoba Emergency Measures Organization (MEMO), and on behalf of the RM of Mossey River, Stantec conducted visual inspections of flood-damaged bridges and a low-level crossing located within the RM of Mossey River. The existing crossing over the Fork River, estimated to have been constructed between 1940-1950, is a vented, low-level crossing with concrete deck. The crossing sustained damage during heavy rains on June 17 and 18, 2010. The rains caused water levels to rise considerably, with the resultant fast moving water and associated debris undermining the structural stability of the crossing.

The inspections were performed by Mr. Ruijin Zhang, P.Eng., of Stantec accompanied by Mr. Ken Warkentin of the RM of Mossey River on August 25, 2010. During the inspection, the following items were noted as damage to the existing crossing:

- The concrete deck deflected down on the upstream side (Photograph 1-2).
- Debris was found upstream, blocking the inlets of some culverts.
- The settled concrete was under water.

Photograph 1-2 Upstream – Damaged Deck

Source: Stantec

Manitoba Conservation and Water Stewardship has indicated to Stantec, in a letter dated August 28, 2012 that the replacement of the flood-damaged low-level crossing over the Fork River is considered a "Class 2 Development" pursuant to s. 11 of *The (Manitoba) Environment Act* (1987) and thereby requires an *Environment Act* Licence prior to construction, operation and alteration.

Stantec submits this environmental assessment to Manitoba Conservation and Water Stewardship for a low-level crossing replacement project on behalf of the owner, the RM of Mossey River.

1.3 PROJECT NEED AND PURPOSE

The current structure has several plugged culverts and the concrete slab has cracked and settled in several locations. The structure is reported to be regularly out service for short periods and the blocked culverts make it difficult for fish to pass in normal conditions (UNIES 2012). The proposed replacement will help to improve local infrastructure by returning the crossing to its pre-flood condition and provide a reliable means of crossing the Fork River. The addition of new culverts will also improve the ability of fish to navigate the crossing. In their hydrologic assessment report, consulting engineers UNIES Ltd. (2013) concluded that the replacement low-level crossing is not expected to change the ongoing streambank and bottom processes.

1.4 PROJECT ALTERNATIVES

The following Project alternatives were considered during planning:

1) *Repair*: The condition of the crossing has been steadily deteriorating over the years. Repair was seen as a temporary measure that would not provide a long- term solution.

2) *Replace the Existing Crossing with a Bridge*: Because the crossing is in a valley, the required bridge structure would be of considerable length. Based on conceptual level design, the cost for a bridge was estimated to be approximately $1.5M - $2.0M. This option was cost prohibitive for the RM. The replacement crossing also presents a practical solution because of the shallow flow and the length of any replacement roadway structure for the site would need to be long, and thus costly, due to the high angle of skew (UNIES 2012).

3) *Leave As-Is*: The poor condition of the crossing makes it unusable several times every year; therefore, the RM did not see this as an option.

Replacing the existing low-level crossing with a new low-level crossing was determined to be the preferred approach as it is an efficient and cost effective means of fording the river. The design will also meet all fish passage requirements by facilitating movement of fish and other aquatic organisms through the culverts.

2.0 Project Description

2.1 PROJECT SUMMARY

The existing Fork River Low-Level Crossing (Photograph 1-1) consists of ten 800-mm diameter corrugated steel culverts with a concrete slab above. The crossing is approximately 10 m in width and 20 m in length. The replacement structure is proposed to consist of ten, 17.5-m-long and 700-mm x 1,100-mm-wide arched Corrugated Metal Pipes (CMP) with a curbed cast-in-place concrete deck (see Dwg-SB701). The existing low-level crossing will be completely removed and the replacement structure will be constructed in the same location. The replacement structure will have a similar in-water footprint as the existing crossing; the hydraulics of the replacement structure crossing will meet all Department of Fisheries and Oceans (DFO) fish passage requirements during high and low flows (see Section 2.1.5); and the hydraulic opening will be greater than the existing crossing.

As part of the low-level crossing replacement, the north and south embankments of the Fork River will be partially reshaped to suit site conditions. The embankments will be shaped locally around the low-level crossing to provide a stable slope, suit riprap placement and match the natural slopes of the river upstream and downstream. A rock launch apron will be placed 1.00 m from the inlet and outlet and be installed 0.60 m below the stream bed. A cofferdam will be used to protect and isolate the stream from any work occurring in the water. The embankments will be protected by 300 mm nominal diameter field stone riprap. The riprap will be clean and free of fines prior to placing.

2.1.1 Project Location

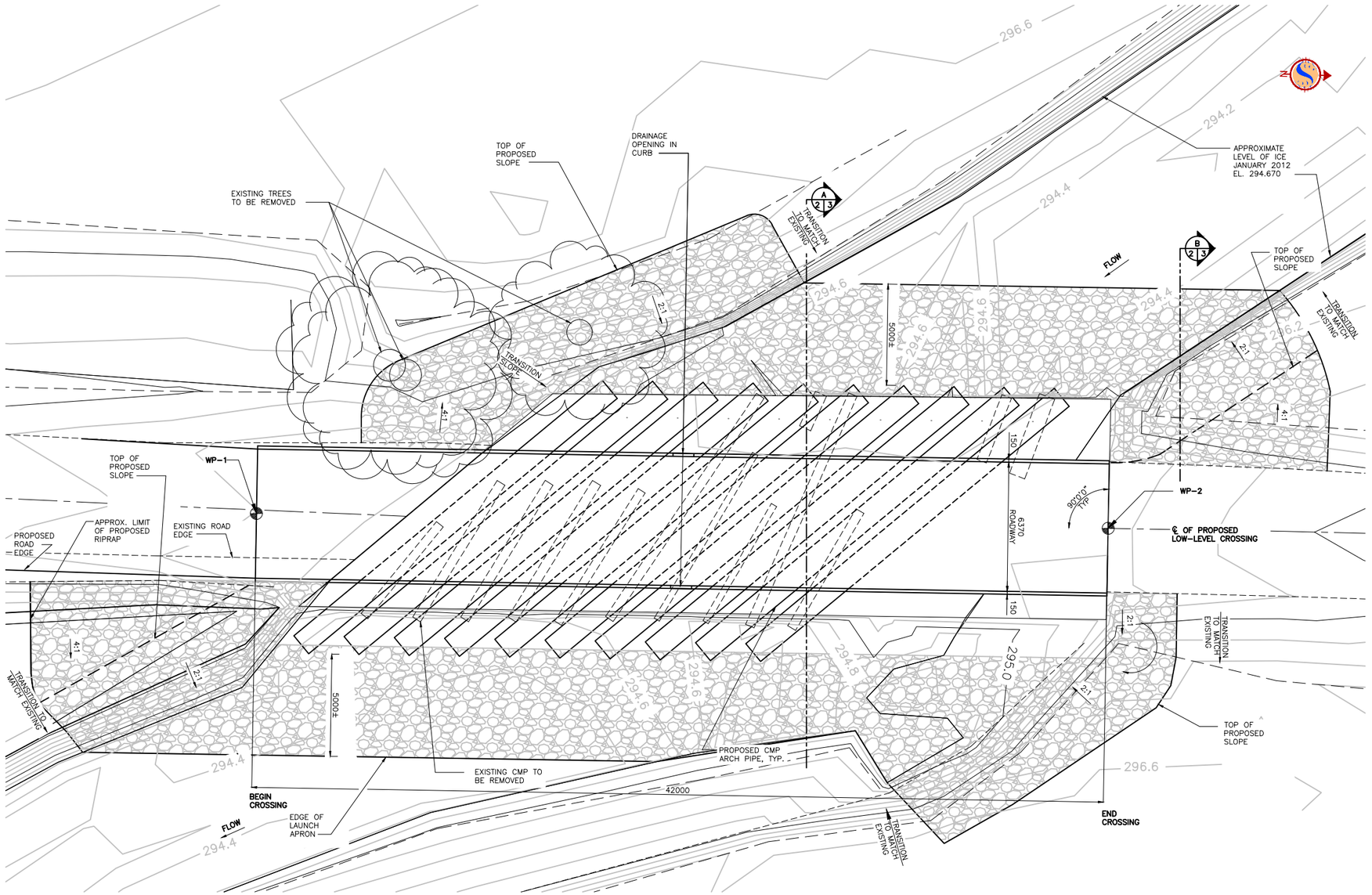
The Project is located on a mile road west of the town of Fork River, eight miles (13 km) west of PTH 20 and one mile (1.6 km) south of PR 269, within the RM of Mossey River (Map 1-1). Coordinates of the Project Site are as follows: X-416346, Y-5708405 (UTM Zone 14U); legal land location: NW 27-29-20W.

2.1.2 Construction Footprint

The construction “footprint” will include the replacement structure, rip rap erosion protection area and cleared areas and is estimated to be approximately 660 m^2. There will also be one lay-down area, which will utilize the existing road, for the receiving and distributing of equipment.

2.1.3 Project Phases and Schedule

Construction will be undertaken in two phases: 1) Phase 1 is anticipated to begin in October 2013 and end in December 2013 and will involve the removal of half of the existing crossing and installation of the first five arch culverts of the replacement crossing. The opposite side of the



SITE PLAN

BENCH MARK LOCATION				
BM.	NORTHING	EASTING	ELEVATION	DESCRIPTION
WP-1	5708400.698	416343.875	295.860	BEGIN CROSSING
WP-2	5708442.691	416344.604	295.860	END CROSSING

V:\113731800\active\113731800\drawing\402_design\sheet_files\2012-07-13\31800_sb701-781.dwg
Date: 2012 Aug 22 2:58pm Login: Gelie, Judi

11/781

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100-1355 Taylor Avenue
Winnipeg MB Canada
R3M 3Y9
Tel. 204.928.8840
Fax. 204.284.4795
www.stantec.com

Consultants

Legend

c/w	COMPLETE WITH
MK.	MARK
EL.	ELEVATION
N.H.W.L.	NORMAL HIGH WATER LEVEL
P.P.C.C.	PRESTRESSED PRECAST CONCRETE CHANNEL
T/O	TOP OF
A/F	ACROSS FLATS
SU.	SUBSTRUCTURE UNIT
C.I.P.	CAST IN PLACE
℄	CENTRE LINE
CL.	CLEAR COVER
TYP.	TYPICAL
I.F.	INSIDE FACE
U/S	UNDERSIDE
EA.	EACH
PS	PRESTRESSED
PC	PRECAST
DIM.	DIMENSION

Notes

METRIC
WHOLE NUMBERS INDICATE MILLIMETRES
DECIMALIZED NUMBERS INDICATE METRES

Revision	By	Appd.	YY.MM.DD
A ISSUED FOR TENDER AND CONSTRUCTION	J.B.G.		
Issued	By	Appd.	YY.MM.DD
File Name: 31800_SB701_781.dwg	J.B.G. Dwn.	J.M.B. Chkd.	S.S.Y Dsgn.	12.08.13 YY.MM.DD

Permit-Seal

APEGM
Certificate of Authorization
Stantec Consulting Ltd.
No. 1301

Client/Project
R.M. OF MOSSEY RIVER

LOW-LEVEL CROSSING REPLACEMENT
OVER FORK RIVER
R.M. of Mossey River, MB Canada

Title
GENERAL ARRANGEMENT
SITE PLAN

Project No.	Scale	
113731800	1:100	
Drawing No.	Sheet	Revision
SB701	2 of 7	0

existing low-level crossing will be left open during the installation for fish and aquatic organism passage; 2) Phase 2 is anticipated to begin in January 2014 and end in March 2014 and will involve the removal of the existing crossing and installation of the remaining arch culverts. During Phase 2, the arch culverts installed in the first phase will provide fish and aquatic organism passage. Once all the arch culverts have been installed, the reinforced cast-in-place concrete deck will be constructed.

In summary, to replace the structure, construction will involve the following:

- Remove any loose concrete from the slab.
- Remove debris under the slab and in the culverts.
- Construct/install a cofferdam.
- Install culverts.
- Supply and install riprap.
- Cast new concrete slab to provide crossing surface.

2.1.4 Installation Elevations

The arch culverts will have an invert elevation of approximately 294.35 metres above sea level (masl) and an obvert elevation of 295.05 masl. The stream bed is 294.50 masl. The top-deck will have an elevation 295.86 masl, with a 1% slope towards the centre of the structure and a drain opening in the curb (295.65 masl) to allow for water drainage.

2.1.5 Flow Velocity

The river is expected to flow through the culverts at 10.2 Cubic Metres per Second (CMS) at an average velocity of 1.64 metres per second (m/s; UNIES 2012). This is in accordance with fish passage guidelines for culverts less than 25 metres in length (average velocity of 1.0 m/s; Schwartz, pers. comm. 2013).

2.2 PROJECT CONSTRUCTION AND WORKFORCE

2.2.1 Workforce

It is anticipated that approximately three to six workers will be employed at any one time during Project construction. The Project construction contractor(s) will be selected through a tender and bidding process.

2.2.1.1 Equipment/Materials

The following equipment is anticipated to be used during construction:

- An excavator.
- A front end loader.
- Dump trucks.
- Semi-trucks for transportation of machinery and culverts.
- Concrete trucks.
- A concrete pumper truck.

The following materials are anticipated to be used during construction:

- Riprap – will consist of approximately 400 m^3 of 350 class (350 mm) fieldstone rocks.
- Culverts – ten 17.5-m-long and 700-mm x 1,100-mm-wide arched CMP.
- Concrete – up to approximately 70 m^3.
- Non-woven Geotextile – approximately 660 m^2.

2.2.1.2 Traffic, Fuel-handling and Equipment Storage

Equipment and materials will be transported to the Project site by truck. The number of trucks required will vary, depending upon the type of equipment and materials to be delivered. The crossing will be inoperable during demolition and construction; as a result traffic will be required to reroute during the duration of the Project.

There will be some fuel storage at the Project site during the Construction Phase. A mobile service truck will likely be used to refuel larger construction equipment.

2.2.1.3 Temporary Storage Facilities and Waste Management

A temporary lay-down area will be established at least 100 m from the Fork River on the existing road during the construction phase. The lay-down sites will be used for storage of materials and equipment, refueling and maintenance, and vehicle parking and waste disposal.

During removal and construction waste materials will be generated (e.g. concrete rubble, rebar packing materials, cardboard, construction material overages, etc.). In addition, mobile sanitary facilities will be located at the Project site for the construction workers.

2.2.1.4 Project Activities

Table 2-1 provides an overview of the activities associated with constructing the Project.

Table 2-1: Major Project Activities Anticipated to Construct the Replacement Crossing

Major Project Activity	Description
Clearing and Stripping	Approximately three trees will be cleared on the southwest bank area in accordance with contract specifications to prepare the Project site. Approximately 300 m^2 will stripped in preparation for laying riprap.
Grading	Embankments will be shaped around the proposed low-level crossing to provide a stable slope, suit riprap placement and match the natural slopes of the river upstream and downstream.
Constructing a Cofferdam	To facilitate working in the dry for crossing removal and construction. The coffer dam will be made of non-earthen material such as aqua-dams, sand bags, sheet pile or clean granular material wrapped in poly-plastic or other suitable isolation materials. The dams will be in place for the duration of the removal and construction phase.
Dewatering / draining / pumping	Dewatering / draining / pumping will be required to remove water from isolated coffer dam areas during construction of the crossing.
Demolishing the Existing Crossing	Removal of the existing structure will be achieved through the use of a back-hoe/excavator. The use of cofferdams will facilitate removing the crossing 'in the dry' in a phased manner and permit continued flow of the river.
Road Widening	The road will be widened on the south side of the crossing.
Compacting Granular Material	Compacting granular material for road improvements and the replacement structure base.
Constructing Concrete Forms	Building of concrete form work with untreated lumber.
Pouring Concrete	Pouring and finishing concrete.
Placing Riprap	Laying of slope protection 350 class fieldstone riprap (400 m^3). The riprap will extend 5 m from the inlet and outlet and be installed 0.30 m below the original stream bed.
Operating equipment / vehicles	Operation of heavy equipment and use of heavy trucks will be required for construction and material transportation.
Transporting materials / equipment	Material transportation via heavy truck from suppliers and borrow sources will be required.
Storing / dispensing fuel	Specific areas or transportable storage systems will be utilized in the storing and dispensing of fuels.

Table 2-1: Major Project Activities Anticipated to Construct the Replacement Crossing

Major Project Activity	Description
Transporting solid construction waste	After collection and temporary storage, solid waste will be transported to an approved waste disposal ground.
Disposing solid construction waste	Solid waste will be disposed of at an approved waste disposal ground.
Disposing liquid waste / sewage	A certified disposal contractor will handle and dispose of all liquid and sewage wastes associated with mobile sanitary facilities used during construction.
Revegetation and Landscaping	Revegetation will be conducted to stabilize disturbed areas.
Storing materials / equipment	Storage for materials and equipment is expected to be maintained on-site within a controlled area.

2.3 PROJECT OPERATION

2.3.1 Routine Maintenance

Culvert maintenance will be conducted by the RM. The maintenance will be carried out in accordance with DFO Manitoba Operational Statement for Culvert Maintenance (Appendix A). Maintenance, conducted as required, will include the removal of accumulated debris (e.g., logs, boulders, garbage, ice build-up) that may prevent the efficient passage of water and fish through the structure.

Routine (i.e., non-emergency) maintenance activities should not be conducted between April 1 and June 15 of any given year.

2.4 PROJECT DECOMMISSIONING

There are no plans to decommission the Project along a specified schedule. The low-level crossing has a design life of 75 years.

3.0 Public Consultation

Advertisements regarding the Project were placed in the *Winnipeg Free Press* (Appendix B), the *Dauphin Herald* (Appendix C) and the *Canada Gazette* (Appendix D) on December 15, 18 and 22, 2012, respectively. The advertisements, made in accordance with the *Navigable Waters Protection Act* and Transport Canada requirements, gave notice that an application had been made with the Minister of Transport, Infrastructure and Communities to replace the existing low-level crossing. The advertisements also included a brief project description and invited readers to provide comments in writing and share any concerns with the regional manager of the Navigable Waters Protection Program, Edmonton. To date, Stantec understands that no public enquiries or comments were received.

4.0 Existing Environment

4.1 REGIONAL OVERVIEW

Situated within the Lake Manitoba Plain Ecoregion and the Prairie Ecozone of south-central Manitoba, the Project lies within the Dauphin Ecodistrict. The city of Dauphin is the largest community in the Ecodistrict and is the service and administrative centre for this and adjacent ecodistricts. Originally a mixture of tree bluffs and grassland (Smith *et al*. 1998), the natural vegetation in the ecodistrict has been strongly altered by agricultural development. Most of the soils are cultivated for the production of spring wheat, other cereal grains, oilseeds and hay crops. Wooded strips of land are located along creeks and rivers and provide wildlife habitat and recreational sites (Smith *et al*. 1998).

4.2 PHYSICAL ENVIRONMENT

4.2.1 Climate

Climate within the Dauphin Ecodistrict is consistent with that throughout the Lake Manitoba Plain Ecoregion and is characterized by relatively short, warm summers and long cold winters (Smith *et al.* 1998). The mean annual temperature is around 1.8°C.

The mean annual precipitation is approximately 500 mm of which approximately one-quarter falls as snow. The maximum daily precipitation recorded at the Dauphin weather station was 100.3 mm, which fell on June 18, 1956. Precipitation varies greatly from year to year and is highest from late spring through summer. The average yearly moisture deficit is about 160 mm (Smith *et al.* 1998).

Table 4-1 provides climate normals for the city of Dauphin, Manitoba, located 42 km south of the Project site.

Table 4-1: Climate Normals for Dauphin, Manitoba (1971-2000)

Parameter	Month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily Avg. Temp. °C	-17.3	-13.4	-6.4	3.1	11	15.8	18.4	17.3	11.3	4.7	-5.6	-14.4
Daily Max. °C	-11.9	-7.8	-0.9	9.5	18.2	22.4	24.9	24.2	17.5	10.4	-0.9	-9.3
Daily Min.°C	-22.6	-18.9	-12	-3.3	3.7	9.1	11.9	10.4	5	-1.1	-10.2	-19.5
Total Precip. (mm)	17.5	13.2	25.3	28.2	54.3	87.1	75.9	60.4	67.6	36.1	22.1	20.1
Rainfall (mm)	0.3	0.2	4.4	15.1	15.1	86.9	75.9	60.4	66.1	30.2	3.4	0.7
Snowfall (cm)	20.1	16.5	22.9	13.6	4.2	0.2	0	0	1.6	6	20.7	23

Table 4-1: Climate Normals for Dauphin, Manitoba (1971-2000)

Parameter	Month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Extreme Daily Rainfall (mm)	6.4	3.8	52.1	40.4	61.5	100.3	90.9	74.9	83.3	51.3	18.6	6.4
Date of Extreme Rainfall	1953/09	1958/23	1945/26	1963/16	1942/27	1956/18	1964/15	1985/12	1975/18	1953/21	2000/01	1973/08
Source: Environment Canada, National Data and Information Archive. 2013. Station: Dauphin. Accessed April 2013. URL: http://www.climate.weatheroffice.gc.ca/climate_normals/results_e.html?stnID=3780&prov=&lang=e&dCode=3&dispBack=1&StationName=Dauphin_&SearchType=Contains&province=ALL&provBut=&month1=0&month2=12												

4.2.2 Physiography

The Lake Manitoba Plain Ecoregion stretches northwestward from the International Boundary to Lake Dauphin in southern Manitoba. The Manitoba Escarpment marks its western boundary. Before settlement, this ecoregion was a mosaic of trembling aspen/oak groves and rough fescue grasslands (Smith *et al.* 1998).

The Dauphin Ecodistrict is characterized by smooth, level to very gently sloping glaciolacustrine plains with slopes ranging from level to less than 2% (Smith *et al.* 1998). Lower and smoother than the Saskatchewan Plain to the west, the plain has an elevation ranging from about 410 metres above sea level (masl) near the Manitoba Escarpment to about 240 masl near Lake Winnipeg (Smith *et al.* 1998).

4.2.3 Geology

The Lake Manitoba Plain Ecoregion is underlain by low-relief, flat-lying Paleozoic limestone bedrock and is covered by glacial till and by silts and clays deposited by glacial Lake Agassiz. Lake Dauphin and the southern half of Lake Manitoba are part of this ecoregion.

4.2.4 Soil Quality

Nearly all of the soils in the Lake Manitoba Plain are imperfectly drained Gleyed Rego Black Chernozems that have developed on shallow, very strongly calcareous, loamy-sand to clayey sediments. The sandy and silty soils are shallower and are also more susceptible to wind erosion than the clayey soils. Local areas of imperfectly drained Regosolic soils, poorly structured Solonetzic Black Chernozems and poorly drained Gleysolic soils also occur (Smith *et al.* 1998).

4.2.5 Seismicity

Southern Manitoba has the lowest frequency of earthquakes of any area in Canada. The Geological Survey of Canada has never recorded an earthquake perceptible to humans in this region (Department of Energy, Mines and Resources 1994). Further, the National Building Code of Canada lists Southern Manitoba in the lowest category in its Seismic Zoning Map (GSC 2002). The threat of earthquake in Southern Manitoba is therefore negligible, and is not considered to be of concern for this Project.

4.2.6 Groundwater and Hydrogeology

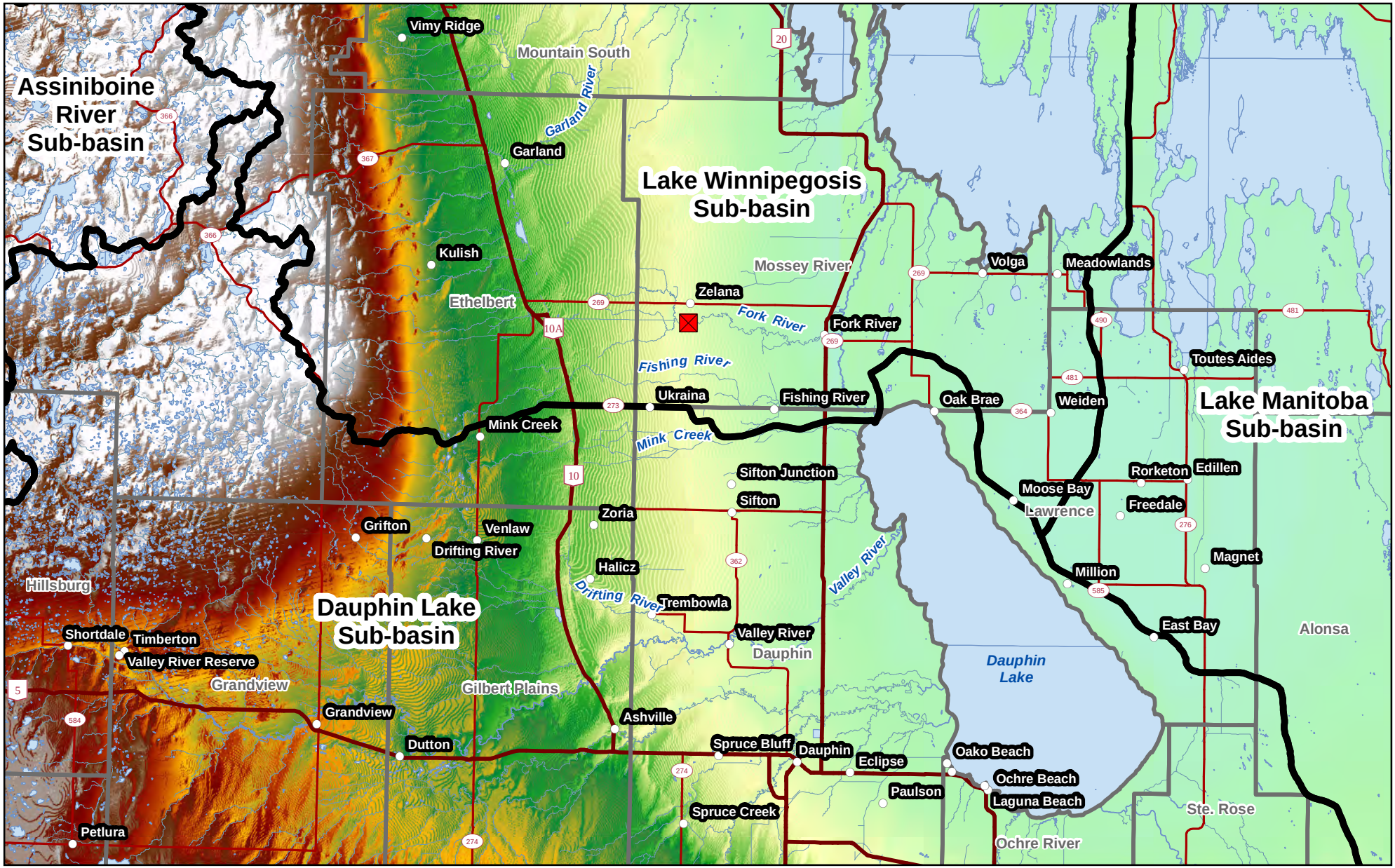
Bedrock in the vicinity of the Project site consists of Jurassic shale, sandstone, limestone and dolomite. Groundwater from bedrock aquifers ranges from brackish to saline and regionally flows to the northeast (Betcher 1986). The bedrock is overlain by overburden (till), which is between 20 and 40 m thick. Sand and gravel aquifers were documented within the overburden; these aquifers range in lateral extent and water quality (Little 1973).

To obtain information about groundwater wells within a one-mile (1.6 km) radius of the Project location, Stantec conducted a search of the Manitoba Conservation and Water Stewardship "GWDRILL" database (MWSD 2012). The search identified five records of production wells within this radius used for livestock and domestic supply. Four of these wells were installed in the overburden and screened between 15 and 32.3 meters below ground surface (mbgs), within sand and gravel layers. One well penetrated the bedrock shale at 59 mbgs and was screened in limestone below shale.

4.2.7 Surface Water and Hydrology

The Project area is located within Dauphin River Watershed of the Mossey River Division. Tributaries feeding the Fork River start above the Duck Mountain escarpment at elevations above 700 masl (UNIES 2012). These tributaries carry spring freshet and precipitation event waters to the Fork River eastward to a large low-lying wetland area that runs parallel to PTH 10. The outlet from this wetland area (north of the town of Ethelbert), along with other channelized agricultural drains, flow into an almost 15-km long heavily channelized segment of the Fork River and continue eastward to more natural channels, ultimately ending at the Mossey River (Map 4-1). This heavily channelized portion (classified as a 5th order drain) of the Fork River is likely a flood protection measure for the town of Ethelbert, should the low-lying wetland area become overwhelmed in high precipitation years (Map Manitoba Land Initiative 2004a and b; Schwartz *pers. comm*. 2013).

Fork River tributaries converge and are brought together and flow through the village of Ethelbert through sections of an excavated drain. This water course, known as the Fork River, flows for approximately 12 km at an average gradient of about 0.003 (UNIES 2012) and eventually empties into Lake Winnipegosis.



DRAFT

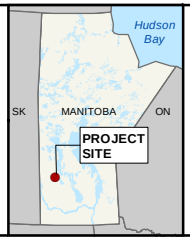
Watersheds and Digital Elevation Model

LEGEND

- Community
- River Crossing Area
- Sub-basins
- Rural Municipalities

Elevation (m)

- High : 825
- Low : 243



DATA SOURCE:
GEOBASE CANADA, MLI, CANVEC,
STANTEC CONSULTING LTD.

0 5 10 Kilometres
0 2.5 5 Miles

Stantec

COORDINATE SYSTEM	NAD 1983 UTM Zone 14N				
DATE	May 08, 2013			PROJECT	MAP
DRAWN	QA/QC	APPROVED		1137 31800	4-1
AC	MOD	CA			

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4.3 TERRESTRIAL ENVIRONMENT

For the purposes of this environmental assessment, the terrestrial Study Area and Local Study Area (LSA) are defined as:

- Study Area – the Dauphin Ecodistrict.
- Local Study Area (LSA) – land within a 20 km radius of the Project site.

Prior to European settlement, the ecodistrict was characterized by stretches of grassland interspersed with treed bluffs. Very little of these native plant communities persist amidst current agricultural development. Forest cover remains along larger watercourses, such as the Fork River. These stretches of mature trees form a riparian belt that also maintains pre-settlement shrub and herbaceous plant species, and provides movement corridors for wildlife dispersing between larger fragments of the native prairie ecosystem.

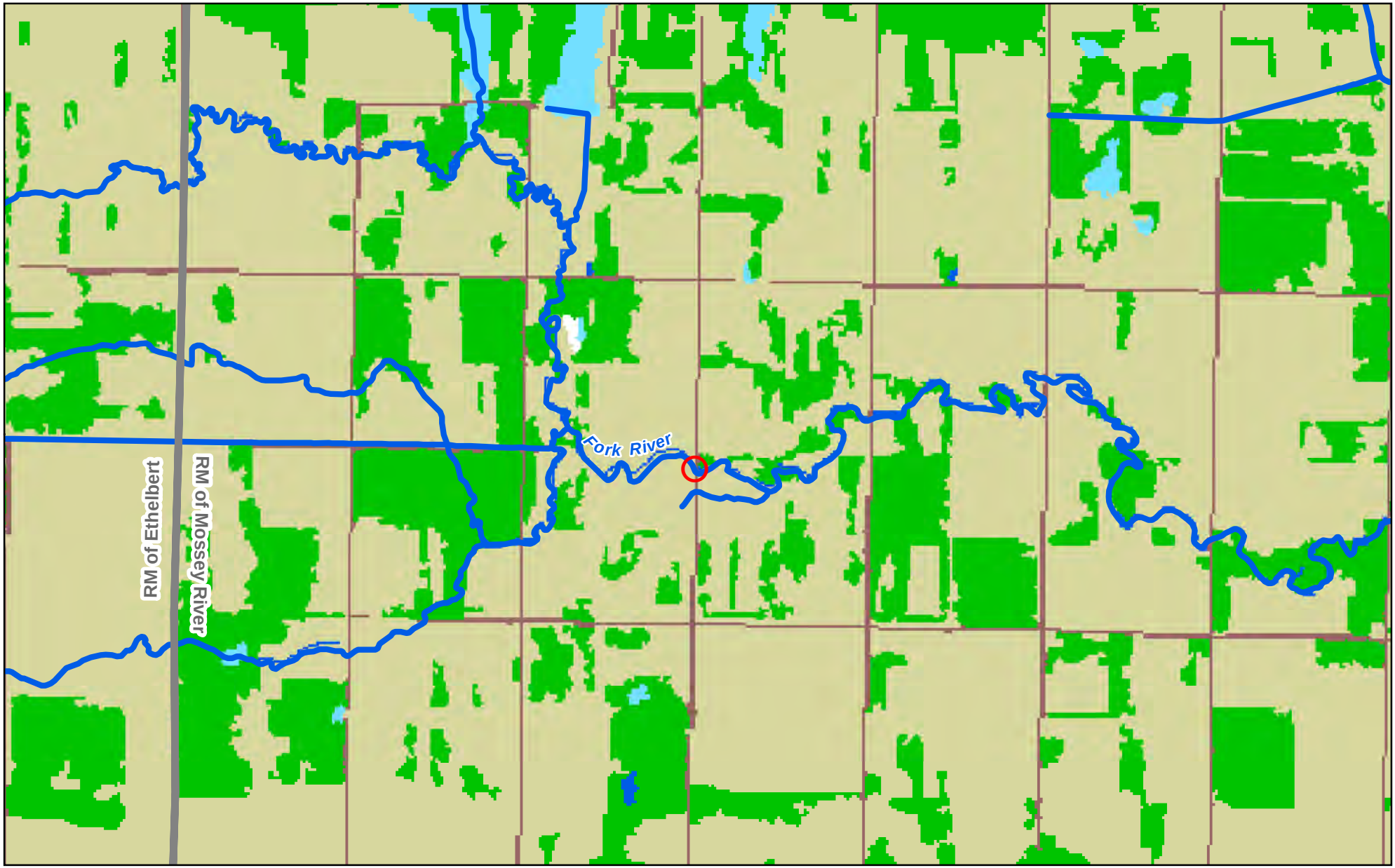
4.3.1 Flora

Historically, wooded habitat of the Dauphin Ecodistrict was dominated by trembling aspen, with an understory of beaked hazelnut, rose, Saskatoon, pin cherry, high bush cranberry and red osier dogwood. Flood plains and poorly drained sites supported Manitoba maple, balsam poplar, green ash, white elm and willow (Smith *et al.* 1998).

The majority of the Project area currently consists of annual cropland (Map 4-2), and is predominantly utilized for cattle ranching, or in the cultivation of oilseed and soybeans, wheat and other grains (Statistics Canada 2011). Agricultural practices are also prevalent in the vicinity of the Project site and throughout adjacent lands. The dominant vegetated land-cover type within the LSA is agriculture (75%), followed by deciduous forests or wetlands (22%) where native vegetation communities might persist (Map 4-2).

Although fragments of native grasslands in the Study Area contain species such as plains rough fescue, western porcupine grass, timber and Hooker's oat grass, pasturelands that might support these species do not occur within the Study Area (GeoBase Canada 2012).

Aquatic plant communities in the Study Area exist in association with a few small wetlands and along the Fork River margins. Common emergent aquatic plants include bulrush, cattail, sedge, marsh reed, and spike rush. Common submergent aquatic plants include stonewort, bur reed, various pondweeds, water plantain, arrowhead, coontail, water milfoil, and bladderwort (Pip 1984, MB CDC 2013). Wetland and other aquatic plant communities represent approximately 3% of the land cover in the Study Area.



DRAFT

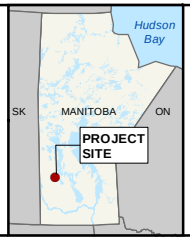
Land Cover Types

LEGEND

- River Crossing Area
- Rural Municipalities

Land Cover Classes

- Water
- Exposed Land
- Wetland
- Annual Cropland
- Deciduous Forest



DATA SOURCE:
GEOBASE CANADA, MLI, CANVEC,
STANTEC CONSULTING LTD.

0 0.5 1 Kilometres
0 0.25 0.5 Miles

Stantec

COORDINATE SYSTEM	NAD 1983 UTM Zone 14N				
DATE	May 08, 2013			PROJECT 1137 31800	MAP 4-2
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4.3.2 Fauna

Wildlife habitat in the Study Area has been highly impacted by clearing of wooded land and wetland draining associated with agricultural development. Although 200 species of birds, 58 mammals, 6 reptiles and 9 amphibians may potentially occur within the Lake Manitoba Plain Ecoregion (MB CDC 2013; Appendix E), wildlife presence is expected to be low and comprised mainly of species moving through, rather than residing within the Study Area.

The LSA lies 40 km east of Duck Mountain Provincial Park, which provides high quality habitat for a diversity of wildlife species. Similarly, a large Prairie Farm Rehabilitation Administration (PFRA) Area and the Pointe River Wildlife Management Area (WMA) are located 8 and 15 km west and north of the LSA, respectively, and are expected to support wildlife populations (Map 4-3). The Park includes high quality habitat for mammals such as moose, black bear, deer, wolves, coyotes, lynx and fox. The Pointe River WMA supports many of these species, and provides important winter habitat for upland game birds (MB Conservation 2011). PFRA land is known to play a key role in the maintenance of grassland biodiversity through ecological processes including maintenance of food web interactions and support of prey species for avian and mammalian predators (Schmutz 2001; Alberta Agriculture and Food 2007). Pastureland preserved in PFRAs provides habitat for hares, ground squirrels, mice, voles and invertebrates, which are staple prey for coyotes, badger, bobcat, fox, hawks and owls.

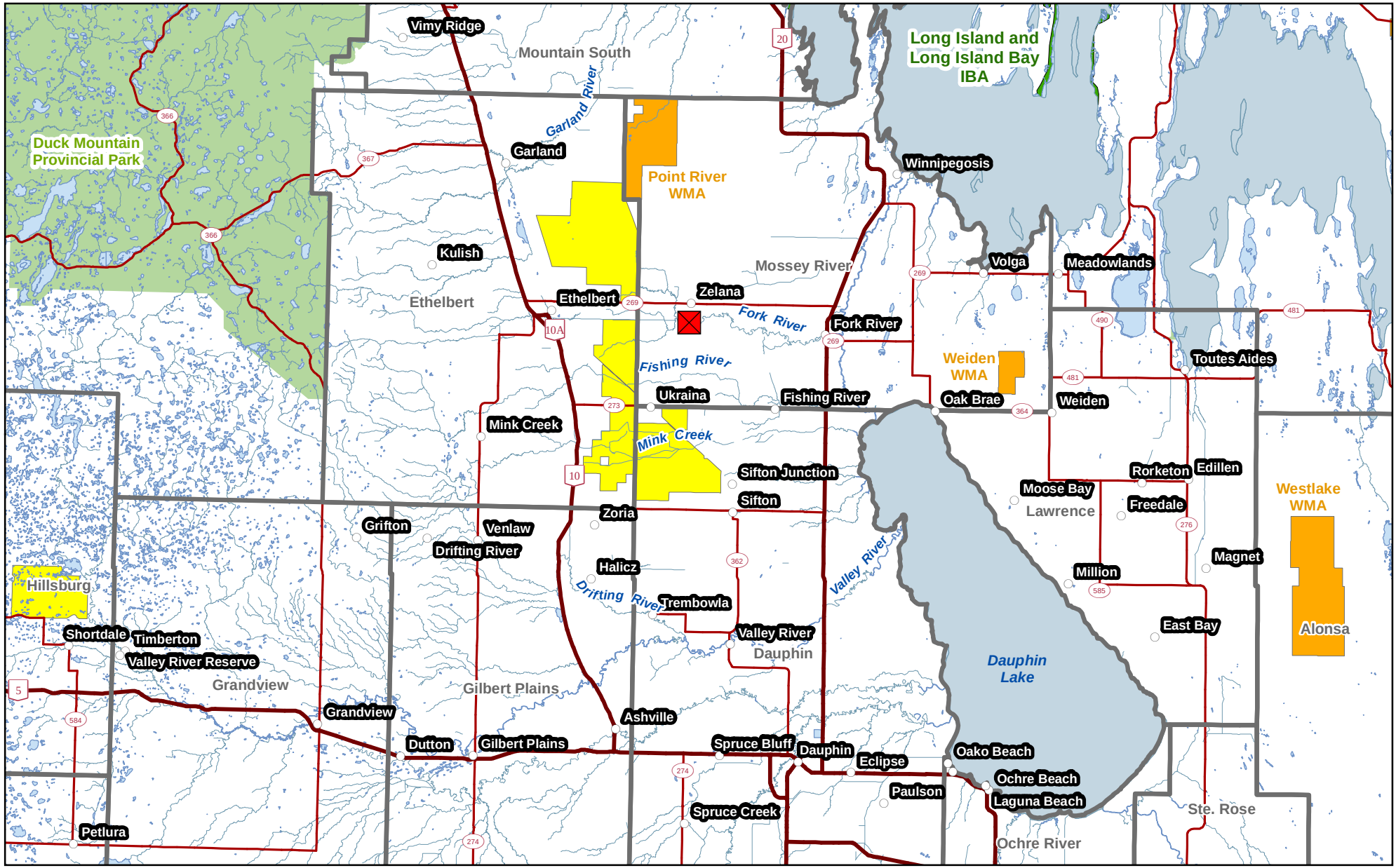
Although wildlife presence is expected to be concentrated around these areas, cropland maintenance has substantially reduced the quality of wildlife habitat east and south-southeast of the Project site. Despite reductions in habitat quality resulting from agricultural development, the position of the Project site within a riparian corridor may increase wildlife use of the site compared to that of adjacent croplands. During bridge inspections in July 2010, Stantec observed a black bear along Highway 10 within the RM of Mountain approximately 40 km northwest of the Project Site.

4.3.3 Species at Risk

Plant and wildlife Species at Risk (SAR) generally become rare due to loss of adequate cover, forage or breeding habitat. Due to agricultural development, availability of such habitat is limited in the Study Area and is generally confined to right of ways (ROWs), small wetlands and woodland or riparian forest fragments. Fragments of forest or patches of wetland plant species in the LSA may act as stepping stones between larger patches of suitable habitat (Beier and Noss 1998; Bennett 1999; Fahrig 2003; Boscolo *et al.* 2008).

4.3.3.1 Flora

The Conservation Data Centre (CDC) database lists 74 upland and wetland plant species of conservation concern expected to occur in the Study Area (MB CDC 2013; Appendix E). Of these, four are protected by the *Manitoba Endangered Species Act* (*MB ESA* 1990) and/or the federal *Species at Risk Act* (*SARA*, 2002; Appendix E).

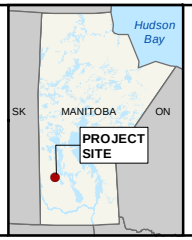


DRAFT

Sensitive Features

LEGEND

- Community
- River Crossing Area
- Rural Municipalities
- Important Bird Area
- Wildlife Management Area
- Provincial Park
- PFRA



DATA SOURCE:
GEOBASE CANADA, MLI, CANVEC,
STANTEC CONSULTING LTD.

0 5 10 Kilometres
0 2.5 5 Miles

Stantec

COORDINATE SYSTEM	NAD 1983 UTM Zone 14N
DATE	May 07, 2013
PROJECT	1137 31800
MAP	4-3
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Small white lady's slipper (Endangered, *MB ESA* and *SARA*) and Riddle's goldenrod (Threatened, *MB ESA*; Special Concern, *SARA*) typically grow in calcium-rich soils of relatively undisturbed grassland habitats, but can also be found in minimally disturbed sites such as roadsides and ditches. Hackberry (Threatened, *MB ESA*) is found on sandy ridges and in dry prairie habitats. Western ironweed (Endangered, *MB ESA*) is found in riparian areas, wet prairies and moist prairie depressions.

The MB CDC has indicated that no recorded observations of these species exist within 15 km of the Project site (Friesen pers. comm. 2013).

4.3.3.2 Fauna

The Study Area has the potential to support one reptile, one amphibian, two invertebrates, and one mammal protected by the *MB ESA* and/or *SARA* (Appendix E). SAR use of the Project area is expected to be low and to occur predominantly as sub-adult dispersal and/or transitory passage through the riparian corridor associated with the Fork River between larger patches of suitable habitat. Dispersal is a life-phase phenomenon at which time movement of nearly mature wildlife leave the area of their birth to locate territories in which they will breed. Dispersal is a period of high-risk in an animal's life phase as these individuals have limited experience with highways, hunters, predators and other potential threats.

Nine bird SAR may potentially breed within the Study Area (Appendix E). These species are listed in the *SARA*. In addition to these federal and provincial regulatory acts, the *Migratory Bird Convention Act* (1994) provides protection for many migratory birds not listed by *SARA* or *MB ESA* through prohibitions against disturbance of active nests or individuals (see Section 5.2 for further discussion). Within the Project site, the riparian corridor associated with the Fork River is likely to provide suitable breeding habitat for bird species protected by the *Migratory Bird Convention Act* (1994).

The MB CDC has indicated that no recorded observations of these species exist within 15 km of the Project site (Friesen pers. comm. 2013).

4.3.4 Provincially Rare and Uncommon Species

The MB CDC lists 74 plant and 14 wildlife species of conservation concern that historically occurred in the Study Area (Appendix E). As defined by the MB CDC (2013), the term 'species of conservation concern' includes *"species that are rare, disjunct, or at risk throughout their range or in Manitoba and in need of further research. The term also encompasses species that are listed under the MB ESA, or that have a special designation by the Committee on the Status of Endangered Wildlife in Canada* (COSEWIC)."

Many of these species only occur in native prairie, sand dunes or other rare ecosystem types not present in lands adjacent to or within the boundaries of the Project site. Results of an information request submitted to the MB CDC indicated that no recorded observations of rare

plant or wildlife species exist within the Project site or within a 15-km radius of the Project site boundaries (Friesen *pers. comm*. 2013).

4.4 AQUATIC ENVIRONMENT

4.4.1 Aquatic Biota

Fisheries inventories have indicated the presence of at least 18 fish species in the Fork River (Appendix F) of which none are protected under provincial or federal statues or regulations (Manitoba Water Stewardship 2013). It is anticipated that these species range throughout the entire system; however, historic (i.e., permanent water development and control structures), current agricultural land modifications (i.e., creation of local drains diverting water from private land) to the river, and the reported considerable amount of beaver activity along the Fork River contribute to limited fish movement (Manitoba Conservation and Water Stewardship 2013; Schwartz *pers. comm*. 2013). A limited recreational fishery exists in the area.

General water-quality parameters (random samples collected in spring/summer between 2001 and 2004) indicate dissolved oxygen and pH levels historically observed in the Fork River fall within Manitoba Water Stewardship (2011) Tier II–Water Quality Objectives for cold water aquatic life and wildlife (Manitoba Conservation and Water Stewardship 2013). As no major changes to surface water use in the watershed area has been reported in recent years (i.e., no developments that would alter receiving water chemistry), it is likely that discharges from agricultural and non-point sources remains a minor concern (Manitoba Conservation Water Stewardship 2013).

4.4.2 Aquatic Habitat

Though access by fish has been limited over time by historical structures, channelization and beaver activity, fish habitat occurs along the entire length of the Fork River. Natural river segments are characterized by both submerged and overhanging riparian vegetation while channelized river segments are generally grassed ditches. In general, aquatic habitat along the Fork River and its tributaries are classified as “Type A,” “B” and “C” Habitats and are characterized by intermittent[1]and perennial flows with simple or complex in-stream and riparian habitat (Department of Fisheries and Oceans 2013). In general, channelized sections are considered simple fish habitat (“Type B”) with shoreline riparian vegetation commonly consisting of grass and sedge species and the presence of indicator fish species (e.g., suckers, northern pike). The 15-km heavily channelization section of the Fork River, located approximately two km upstream of the Project site, is classified as “Type B” Habitat (Department of Fisheries and Oceans 2013).

[1] **Intermittent** streams that go dry during protracted rainless periods when percolation depletes all flow (Government of Alberta 2009). **Perennial** is indicative of a stream or river (channel) that has continuous flow in parts of its stream bed all year round during years of normal rainfall.

Tributaries draining to the Fork River generally consist of likely intermittent remnant channel scars and are considered complex fish habitat ("Type C"; Fisheries and Oceans 2013). They are anticipated to contain dense and diverse riparian vegetation consisting of large diameter standing dead and live trees, shrubs, sedges and grasses (United States Forestry Service 1990). While considered complex fish habitat capable of providing suitable habitat for forage fish species, the historic and intermittent nature of flow in these tributary channel scars likely indicates that while the potential for fish habitat exists, actual water levels and flow are limiting factors for the presence of fish species. During periods of high flows and precipitation events, the presence of forage fish (e.g., brassy minnow, common shiner, pearl dace, blacknose shiner, northern redbelly dace, finescale dace, fathead minnow, blacknose dace, longnose dace, creek chub) would be anticipated; however, these species would likely move into natural segments of the river as water supplies diminish with diminishing water supplies (Schwartz pers. comm. 2013).

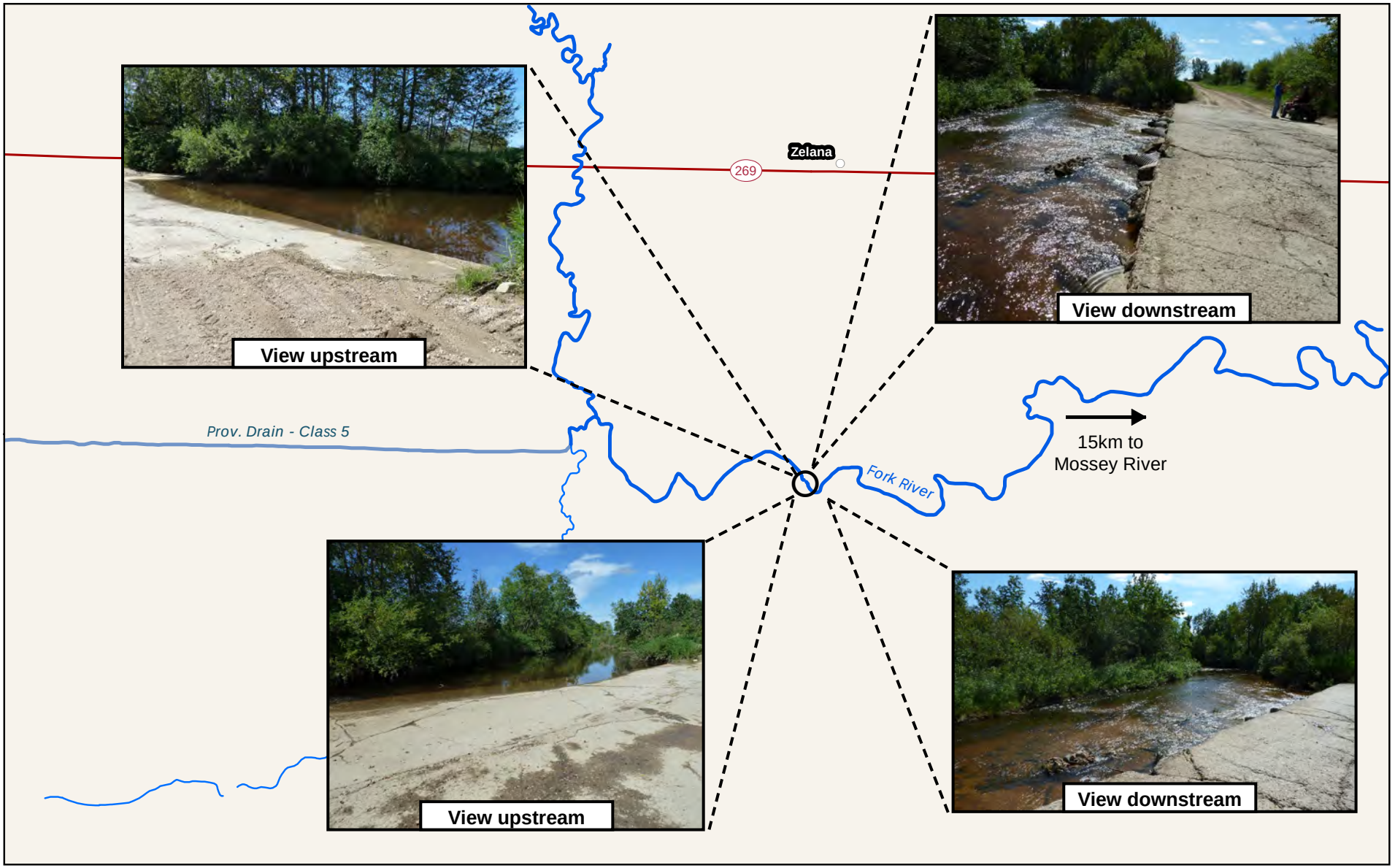
The natural river segments of the Fork River are considered complex habitat providing suitable habitat for large-bodied indicator fish species such as sucker species and northern pike ("Type A"; Fisheries and Oceans 2013). Riparian and in-stream vegetation along these segments are anticipated to consist of emergent aquatic vegetation, sedges, rushes, and shrubs, and deciduous and coniferous trees. This complex riparian ecosystem contributes shade for water temperature control, stable stream banks and controlled sediment dispersal providing a long-term supply of large woody material for in-stream fish habitat and channel stability (United States Forestry Service 1990).

While numerous water developments and control activities have occurred on the Fork River (i.e., channelization, water control structures, flood control works, etc.), the Project site is located in complex fish habitat evidenced by large-bodied indicator fish species. Riparian vegetation at the Project site consists of overhanging vegetation and vegetated stream banks (Figure 4-1). This habitat has the potential to provide adequate forage, spawning and rearing habitat for spring spawning species (e.g., northern pike and yellow perch).

4.5 SOCIO-ECONOMIC ENVIRONMENT

The Project is located within the RM of Mossey River. Nearby communities include the settled areas of Zelana and Ukraina and the villages of Ethelbert and Fork River (Map 1-1). It is anticipated that the Fork River low-level crossing primarily services local traffic within the vicinity of the Project site. It is not anticipated that residents of surrounding communities regularly use the crossing; therefore, the RM of Mossey River is the focus of this socio-economic environment.

The 2011 Census Data (Statistics Canada 2012a) has been released for selected criteria and has been used throughout this section. Where 2011 data was not available, 2006 Census data (Statistics Canada 2007) was used.



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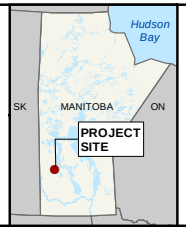
River Crossing Surrounding Habitat

LEGEND

- Community
- River Crossing Area
- Perennial River
- Intermittent River
- Provincial Drain - class 5
- Provincial Road



DATA SOURCE:
GEOBASE CANADA, MLI, CANVEC,
STANTEC CONSULTING LTD.

0 0.25 0.5 Kilometres
0 0.1 0.2 Miles

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COORDINATE SYSTEM	NAD 1983 UTM Zone 14N
DATE	Apr 19, 2013
PROJECT	1137 31800
FIGURE	4-1
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4.5.1 Population and Demographics

The population in the RM of Mossey River declined 12.2% from 2006 to 2011 (i.e. from 614 to 539 people; Table 4-2). The population density remained constant at 0.5 people per km^2.

Table 4-2: Population Characteristics for the RM of Mossey River, Manitoba (2006 and 2011)

	RM of Mossey River
Population 2011	539
Population 2006	614
Percent Change (%)	-12.2
Population Density per km^2 (2006 and 2011)	0.5
Source: Statistics Canada 2012	

The 2011 Statistics Canada population breakdown by percentage groups in the RM of Mossey is shown in Appendix G. The median age of the population increased from 45.5 years in 2006 to 50.4 years in 2011; whereas, in Manitoba the median age of the population was lower, remaining constant at 38 years from 2006 to 2011. The percent of population over the age of 15 (87% in 2011) was higher than Manitoba (81%).

Closer examination of the population demographics in 2011 indicates that the population in the RM of Mossey is older compared to Manitoba, with 41% of the population in the RM of Mossey over the age of 55, compared to Manitoba at 27%.

4.5.1.1 Income

Median income levels for individuals, families and households in the RM of Mossey River were lower in 2005 when compared with Manitoba (Table 4-3). The RM of Mossey River had a lower percentage of low income earners before tax (10.7%) than Manitoba (16.7%). The unemployment rate in the RM of Mossey River (6.3%) was also higher than Manitoba (5.5%).

Table 4-3: Income Statistics for the RM of Mossey River, Manitoba (2006)

	RM of Mossey River	Province of Manitoba
2006 number of households	240	448,780
Total number of census families	185	312,805
Average household size (persons)	2.6	2.5
No. of persons over 15 with income (counts)	515	923,225
Median income in 2005 – all private households ($)	34,256	47,875
Median income 2005 – persons 15 years and older ($)	15,642	24,194
Median family income 2005 (all census families) ($)	41,377	58,816
% in low income before tax – all persons	10.7	16.7
Unemployment rate (%)	6.3	5.5
Source: Statistics Canada 2007		

The composition of income in the RM of Mossey River is more reliant on government transfers as a total percentage of total income (17.9%) compared to Manitoba (12.5%) and less reliant on earnings and “other” money (Table 4-4).

Table 4-4: Composition of Income for the RM of Mossey River, Manitoba (2006)

	RM of Mossey River	Province of Manitoba
Composition of total income (100%)	100	100
Earnings – as a % of total income	71.4	75.2
Government transfers – as a % of total income	17.9	12.5
Other money – as a % of total income	10.8	12.3
Source: Statistics Canada 2007		

4.5.1.2 Education

Overall, 75% of the population in the RM of Mossey River, compared to 80% of the population in Manitoba, reported having attained a high-school certificate and/or some level of post-secondary education (Table 4-5). The RM of Mossey River reported a higher percentage of the population with a high-school certificate or equivalent (33%), apprenticeship or trades certificate or diploma (20%) and university certificate or diploma below the bachelor level (8%) compared to Manitoba (20%, 25% and 5% respectively). The RM of Mossey River reported a lower

percentage of the population with college or other non-university certificate programs (3%) and university certificates, diplomas or degrees (11%) compared to Manitoba (19% each).

Table 4-5: Educational Levels for the Population Aged 25 to 64 for the RM of Mossey River and Manitoba (2006)

	RM of Mossey River (%)	Province of Manitoba (%)
Total population between 25 to 64 years	320	595,940
No certificate, diploma or degree	25	20
High school certificate or equivalent	33	25
Apprenticeship or trades certificate or diploma	20	11
College, CEGEP, or other non-university certificate program	3	19
University certificate or diploma below bachelor level	8	5
University certificate, diploma or degree	11	19
Source: Statistics Canada 2007		

The population in the RM of Mossey has a higher percentage of individuals trained in health, parks and recreation (28%), agriculture and natural resources (14%) and physical and life sciences (10%) compared to Manitoba (17%, 3% and 3%, respectively: Table 4-6).

Table 4-6: Percent Labour Supply Distribution by Field of Study for the RM of Mossey River and Manitoba (2006)

	RM of Mossey River (%)	Province of Manitoba (%)
Education	7	10
Visual and Performing Arts	0	3
Humanities	0	5
Social, Behavioural Sciences and Law	0	9
Business, Management and Public Admin	14	20
Physical and Life Sciences	10	3
Math, Computer and Information Sciences	0	4
Architecture, Engineering and related studies	14	21
Agriculture and Natural Resources	14	3
Health, Parks, Recreation and Fitness	28	17
Personal, Protective and Transportation Services	14	6
Other	0	0
Source: Statistics Canada 2007		

4.5.2 Settlement and Land Use

The Project site falls within Census Division No. 17 and Agricultural Region 6 (Statistics Canada 2012b). Nearby population concentrations include the settled areas of Zelana (located approximately 2 km north overland from the Project site) and Ukraina (located approximately 9 km southwest overland from the Project site) and includes the villages of Ethelbert (located approximately 11 km west overland from the Project site) and Fork River (located approximately 13 km east overland from the Project site; Map 1-1). There are two residential homes located within 200 m of the Project site.

The Project site is located in a predominantly rural agricultural area. In 2011, there were 103 reported farms in the RM of Mossey River. Farm size ranged from under 10 acres (1 farm reported to be this size) to over 3,520 acres (12 farms reported to be this size). The most common sizes of farms were between 1,600 to 2,239 acres and 3,520 acres and over. Of the 103 reported farms, 49 farm operations were reported as “cattle ranching and farming,” 23 were reported as “oilseed and grain farming” and 22 were reported as “other farming,” while 7 farms reported “other animal production,” 1 farm reported “goat and sheep farming” and 1 farm reported “greenhouse/nursery/floriculture production” (Statistics Canada 2012b).

4.5.3 Conservation and Recreation Areas

The Project site is not located within a Provincial or National Park. The closest Provincial Park is the Duck Mountain Provincial Park, located approximately 30 km west from the Project site. The closest National Park is Riding Mountain National Park, located approximately 25 km south of the Project site.

4.5.4 Heritage, Cultural and Archaeological Sites

No archaeological sites have been previously recorded at the Project site. The closest previously recorded site is Borden No. EjMa-2, located 4 km southeast of the Project area. The heritage site was recorded by the Dauphin Chapter of the Manitoba Archaeological Society after heritage resources were collected from the surface of a cultivated field. Several of the projectile points recovered from the site are diagnostic of the Pelican Lake cultural group which dates from about 4000 to 1500 years Before Present (BP) on the western plains (Wright 1999). In Manitoba, sites with Pelican Lake projectile points have been radio-carbon dated between 3500 to 2000 years ago (Morlan 2000). This cultural group was primarily adapted to bison hunting with a secondary reliance on seasonally-available flora and fauna. Bison remains dating to approximately 5460 BP have been recorded in the Bowsman area approximately 105 km northwest of the Project site (Morlan 2000).

Triangular projectile points diagnostic of the Middle to Late Precontact Period, which dates from approximately 1500 to 500 years BP have also been recovered from EjMa-2. This suggests that First Nation cultural groups were accessing the general Project area for the past 4,000 years.

The first fur trade post in the general area was Fort Dauphin, built in the autumn of 1741 by Pierre de la Verendrye, eldest surviving son of Pierre Gaultier De Varennes La Vérendrye, near the present-day town of Winnipegosis (Burpee 1927). William Tomison of the Hudson's Bay Company conducted a small exploratory expedition through this area in 1770 and records visiting an encampment of about 100 tents along the Mossey River south of its mouth on Lake Dauphin (Burpee 1927). The groups encountered by both La Verendrye and Tomison during this time consisted of Cree or Assiniboine groups. Peter Pond wintered at Fort Dauphin somewhere in the vicinity of the mouth of the Mossey River in 1775 (Burpee 1927). During the early 1790s until *ca*. 1820, both the Hudson's Bay Company and the North West Company maintained a Fort Dauphin adjacent to the Valley River near its mouth on Lake Dauphin (Tyrell 1916). The post was approximately 40 km southeast of the Project area. Human burial sites have been recorded along major tributaries of Lake Dauphin on the west side of the lake south and southwest of the Project area. Several burials contained trade silver that would have been acquired from the North West Company post at Fort Dauphin (McLeod 2000).

The first land survey of the township was completed in 1887. At that time, Section 27-29-20 WPM is described as level country covered with poplar, alder, willows and scattered spruce. The "Trail to Fork River" is identified on the north bank of the Fork River through Sections 34-, 35- and 36-27-29 WPM. Sections of this trail appear to be currently intact but are well-removed from the river crossing. The Fork River is first named and depicted in a John Palliser map of 1865 (Hamm 1980). The Village of Fork River was originally named Minnokin but was changed to its present name in 1899 (Hamm 1980).

4.6 FIRST NATIONS AND ABORIGINAL LAND INTEREST AND LAND USE

There are two Aboriginal communities within the vicinity of the Project: Pine Creek First Nation (Reserve Parcel 66A) and Valley River First Nations (Reserve Parcel 63A).

Pine Creek First Nation is located along the southwestern shore of Lake Winnipegosis, approximately 52 km north of the Project site.

Valley River First Nation is located approximately 50 km southwest of the Project site.

4.7 VISUAL LANDSCAPE

Agriculture is the primary industry in the Project area. Ecological features in this area are consistent with those in the surrounding area and exhibit relatively uniform vegetation. There is some intensity of colour through the seasons as a result of the presence of occasional windbreaks and wooded areas near water courses. Agricultural development has markedly altered the original visual landscape which now consists of horizontal elements linked with butt edges and transitional edges. In this landscape, the Project would primarily be visible from the north or the south from along the mile road on which it is located.