6 FISH AND FISH HABITAT

6.1 Assessment Scope

Fish and fish habitat is selected as a valued component (VC) because it is of economic and recreational importance to Canadians, and it plays a fundamental role in the functioning of natural ecosystems. Changes in the distribution or occurrence of fish or fish habitat may strongly affect ecosystem function and environmental cycles and the ability of other organisms, including humans, to use and benefit from this natural resource.

The Project in Saskatchewan and Manitoba include the conversion of TransCanada's existing NPS 42 natural gas pipeline (see Volume 14 Section 2). The fish and fish habitat scope for the Saskatchewan and Manitoba segment includes:

- construction of one watercourse crossing replacement (i.e., at the Assiniboine River)
- construction of watercourse crossings along 58 km of the Cromer lateral new pipeline (2 km in Saskatchewan, 56 km in Manitoba
- construction of facilities (i.e., Moosomin tank terminal and 21 pump stations [(12 in Saskatchewan, 9 in Manitoba])
- construction of permanent access roads to facilities
- construction activities related to the pipeline realignment around existing TransCanada facilities on the conversion pipeline
- operation and maintenance of the pipeline, facilities and permanent access roads

For a description of these project components, see Volume 14, Section 2.

6.1.1 Federal Regulatory Requirements

6.1.1.1 National Energy Board Act

Effects on fish and fish habitat associated with the Project are subject to regulatory requirements under the *National Energy Board Act* (NEB Act). The assessment scope for fish and fish habitat associated with the Project is guided by the NEB's Filing Manual, 2014-01 (NEB 2014), which provides guidance as to the type of information the NEB would typically need to make a decision pursuant to the *National Energy Board Act* (NEB Act) and the *Canadian Environmental Assessment Act* (CEAA 2012). For all requirements related to fish and fish habitat, see Table A-2 in the National Energy Board (NEB) *Filing Manual*, 2014-01 (NEB 2014). The filing requirements provide guidance to assess potential effects of the Project on:

- an assessment of fish presence and existing background fish habitat conditions at each watercourse or water body crossed by new pipeline segments

- an assessment of fish presence and existing background fish habitat conditions at each watercourse or water body within the Local Assessment Area (LAA) of a pipeline, permanent access road or facility
- an assessment of effects on fish and fish habitat from construction and operations, including construction equipment and vehicles
- a description of mitigation measures to minimize effects on fish and fish habitat

6.1.1.2 Fisheries Act

Federal management of fisheries resources is the mandate of Fisheries and Oceans Canada (DFO), the regulatory agency that is responsible for implementing the requirements of the *Fisheries Act*. Modifications to fish and fish habitat are regulated by the requirements of the *Fisheries Act,* which "aims to provide for the sustainability and ongoing productivity of commercial, recreational and Aboriginal fisheries" or fish that support such a fishery. The definitions of fish and fish habitat are established under the *Fisheries Act*:

- "fish" includes (a) parts of fish, (b) shellfish, crustaceans, marine animals and any parts of shellfish, crustaceans or marine animals, and (c) the eggs, sperm, spawn, larvae, spat and juvenile stages of fish, shellfish, crustaceans and marine animals;
- "fish habitat" means spawning grounds and any other areas, including nursery, rearing, food supply and migration areas on which fish depend directly or indirectly to carry out their life processes.

Commercial, recreational and Aboriginal fisheries are referred to in the *Fisheries Act* and involve the following:

- Commercial fisheries include fish species harvested under license for the purpose of sale
- Recreational fisheries include fish species harvested by anglers for personal use or sport, as well as coarse and forage fish that support this fishery.
- Aboriginal fisheries include fish species harvested by Aboriginal groups for subsistence, social or ceremonial purposes.

Quality of fish habitat incorporates a variety of biophysical parameters, including substrate, cover, hydrology, channel morphology, and flow. Major water quality parameters that influence habitat suitability for fish include temperature, dissolved oxygen (DO), total suspended sediment, turbidity, and pH.

Key sections of the *Fisheries Act* that apply to pipeline activities in fish habitat include:

- Sections 20 to 21, which address obstructions, fish passage, and screening of water intakes.
- Section 35, which addresses serious harm to fish.
- Section 36, which addresses deposition of deleterious substances in waters frequented by fish.

DFO's Fisheries Protection Policy Statement states that "…proponents will be required to demonstrate that measures and standards have been fully applied to first avoid, then mitigate, and then finally, offset any residual *serious harm to fish* that are part of or support commercial, recreational or Aboriginal fisheries …" (DFO 2014).

Avoidance measures are described as measures to relocate or redesign or time a project, or a component of a project, to prevent serious harm to fish. Mitigation measures are implemented during construction and operation of a project to reduce the spatial scale, duration, or intensity of serious harm to fish. Offsetting measures are implemented to counterbalance residual serious harm to fish after the application of avoidance and mitigation measures (DFO 2014).

6.1.1.3 Species at Risk Act

The status of fish species is assessed by the Committee on the Status of Endangered Wildlife Species in Canada (COSEWIC), which then recommends a designation for legal protection by being officially listed under the *Species at Risk Act* (SARA). One of the key considerations under SARA for protection of listed species at risk is protection of the species' habitat.

SARA is one part of a three-part Government of Canada strategy for the protection of species at risk (SAR), and applies to all *extirpated*, *endangered* or *threatened* fish species listed in Schedule 1 as being at risk and their critical habitat. The other two parts of this strategy include commitments under the Accord for the Protection of Species at Risk and activities under the Habitat Stewardship Program for Species at Risk. Under SARA, the protection of aquatic species at risk falls under the jurisdiction of DFO.

For the Project, federal aquatic species at risk are considered to be species that are listed federally as *endangered, threatened* or *extirpated* on Schedule 1 of SARA.There are three main prohibitions in SARA relevant to *endangered, threatened* or *extirpated* aquatic species at risk and their critical habitat:

- Section 32, which prohibits killing harming, harassing, capturing or taking an individual of a species at risk.
- Section 33, which prohibits damage or destruction of residences of species at risk.
- Subsection 58(1), which prohibits destruction of critical habitat of species at risk.

6.1.1.4 Memorandum of Understanding between NEB and DFO

While the implementation of the *Fisheries Act* and the protection of aquatic species at risk are the mandate and responsibility of DFO, under the recent Memorandum of Understanding between the NEB and DFO, the NEB will assess potential effects of the project on fish or fish habitat and aquatic species at risk (NEB 2013). If the NEB determines that a project could result in serious harm to fish or fish habitat, or adverse effects on species at risk, the NEB will notify DFO that a *Fisheries Act* authorization and SARA permit may be required.

6.1.2 Saskatchewan Regulatory Requirements

The Province of Saskatchewan has the following legislation designed to manage and protect Saskatchewan's aquatic environment.

Environmental Assessment Act

Saskatchewan's *Environmental Assessment Act* provides a systematic framework for the approval process of developments. This Act mandates an environmental impact statement to provide a description and evaluation of a given development's effect on all environments.

Environmental Management and Protection Act

Saskatchewan's *Environmental Management and Protection Act* outlines a permitting framework for enforcement and response to developments that affect the environment. This Act focuses on contamination, unauthorized releases and the protection of water quality. It requires proponents to obtain a Shoreline Alteration Permit or an Aquatic Habitat Protection Permit when constructing watercourse crossings.

Saskatchewan Watershed Authority Act

The Saskatchewan Watershed Authority is responsible for the regulation of water resources under this Act. Its mandate is to promote and enhance water quality.

Wildlife Act

Saskatchewan's *Wildlife Act* provides a framework for the management, conservation and protection of wild species, and for the designation of SAR. The Act protects wild species that have been designated as *extirpated*, *endangered* or *threatened*, and protects individuals from harm or harassment. Currently, no fish species are listed under Saskatchewan's *Wildlife Act*.

6.1.2.1 Restricted Activity Periods

Restricted activity periods (RAP) or timing windows have been identified "to protect fish during spawning and incubation periods when spawning fish, eggs and fry are vulnerable to disturbance or sediment" (DFO 2013a). In Saskatchewan, the RAP for in-water works is variable by location, determined based on DFO (2013a), and considers:

- the fish species residing in the watercourse
- the spawning period for the fish species residing in the watercourse
- the location of the watercourse in three provincial regions (i.e., the Northern Saskatchewan Region, the Central Saskatchewan Region or the Southern Saskatchewan Region). The Saskatchewan conversion segment is located in the Southern Saskatchewan Region.

For RAPs specific to each watercourse, see Appendix 6B.

6.1.3 Manitoba Regulatory Requirements

The Province of Manitoba has the following legislation designed to manage and protect Manitoba's aquatic environment.

The Environment Act

Under *The Environment Act*, licensing is required for projects that are likely to have a significant effect on the aquatic environment. Licences often include fish and fish habitat protection measures as conditions.

The Water Resources Administration Act

The Water Resources Administration Act mandates that any construction or operations that require the use of water (e.g., control, drainage, storage) must receive written authorization from the Manitoba

Government prior to construction. A permit to undertake in-water or near-shore construction is required under the Act.

The Crown Lands Act

Crown lands in Manitoba, including lands bordering a body of water, are administered through the *Crown Lands Act.* Under the Act, Provincial Work Permits are used to authorize activities taking place on Crown land.

The Water Rights Act

The Water Rights Act regulates the use or diversion of water in any manner, and requires a permit for construction works that divert water. This Act defines the term 'divert' to include "block, dam, impound, obstruct, interfere with, remove, dispose of, alter or change the course or position of, or disturb, whether wholly or partially, any water whether flowing or at rest."

Manitoba Endangered Species Act

The Manitoba *Endangered Species Act* identifies *extirpated*, *endangered*, *threatened*, and *species of special concern*, protects individuals of these species from harm or harassment, and protects their habitats from damage or destruction. The Act requires the development of recovery strategies for *threatened* and *endangered* species (as listed on the *Threatened, Endangered, and Extirpated Species Regulation* [Government of Manitoba 1998]), re-introductions of *extirpated* species, and management plans for *species of special concern*. According to the Act, no person will:

- kill, injure, possess, disturb or interfere with a member of 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
- 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

6.1.3.1 Restricted Activity Periods

Criteria for identifying RAPs are similar to those used in Saskatchewan. In Manitoba, the RAP for in-water works is variable by location, determined based on DFO (2013b), and considers:

- the fish species residing in the watercourse
- the spawning period for the fish species residing in the watercourse
- the location of the watercourse within two provincial regions (i.e., the Northern Manitoba Region and the Southern Manitoba Region). The Manitoba conversion segment is located in the Southern Manitoba Region.

For RAPs specific to each watercourse, see Appendix 6B.

6.1.4 Administrative and Technical Boundaries

Administrative boundaries exist for fish and fish habitat because the Project occurs across six provinces, and is subject to both provincial and federal regulations concerning alteration of watercourses and protection of fish and fish habitat. For consistency across provincial segments, the following Alberta guidelines were used in each province, with the exception of Québec, for aquatics assessment and to classify fish habitat. Where relevant, modifications were made to the Alberta methods to meet specific provincial and regional requirements.

Under Alberta's *Water Act*, the *Code of Practice for Pipelines and Telecommunication Lines Crossing a Water Body* governs the requirements for pipeline crossings (ESRD 2013a). Through the Code of Practice, Alberta Environment (now part of Alberta Environment and Sustainable Resource Development [ESRD]), has established guidelines for aquatic assessment in Alberta (Alberta Transportation 2009). The Alberta guidelines ensure sufficient information is collected on each watercourse to address the information requirements for a full review by DFO pursuant to the *Fisheries Act*. The Alberta *Fish Habitat Manual* (Alberta Transportation 2009) was used as a guideline to classify fish habitat.

The Canadian Council of Ministers of the Environment (CCME) has established environmental quality guidelines for contaminant concentrations in various environmental media, in its Canadian Environmental Quality Guidelines (CCME 2007). The Canadian Environmental Quality Guidelines include the Canadian Water Quality Guidelines for the Protection of Aquatic Life (Freshwater); these guidelines establish environmental quality guidelines for various parameters in freshwater systems to protect aquatic life.

Technical boundaries for fish and fish habitat include the temporal and spatial limitations of the field surveys, the effectiveness of methods and equipment used for data collection, seasonal variations affecting flows and water quality, and the detection limits of analytical instruments and processes.

6.1.5 Assessment Boundaries

The LAA boundaries for pipeline crossings and permanent access road crossings were derived from the Alberta *Code of Practice for Pipelines and Telecommunication Lines Crossing a Water Body* (ESRD 2013a) and the Alberta *Code of Practice for Watercourse Crossings* (ESRD 2013b) which governs the requirements for pipeline crossings and road crossings, respectively. The Code of Practice guidelines (AENV 2001a and AENV 2001b) establish an expected zone of influence (ZOI) for pipeline and watercourse crossings. The ZOI is the area of direct disturbance (i.e., the PDA of the crossing location) plus the area where 90% of the sediment potentially generated during construction would be expected to be deposited. For most watercourses (or water bodies) crossed by the pipeline, the LAA extends 100 m upstream of and 300 m downstream of the PDA of the pipeline crossing location. For larger rivers and rivers with greater streamflow (e.g., the Assiniboine River in Manitoba), the LAA may extend up to 500 m upstream of and 1 km downstream of the pipeline crossing location (beyond the PDA).

For permanent access roads that cross a watercourse (or water body), the LAA extends 100 m upstream of and 300 m downstream of the PDA of the permanent access road crossing location.

For facilities (e.g., pump stations and tank terminals), the LAA includes any watercourse or water body that occurs within a 30 m buffer around the facility PDA. This distance is listed in Table A-1 of the NEB Filing Manual (NEB 2014) and is standard in several regulations across Canada (e.g., British Columbia

Riparian Areas Regulation [BCMWLAP 2004], New Brunswick Watercourse and Wetland Alteration Regulation [NBDELG 2012]), and is recommended as an acceptable distance to protect the riparian area and buffer the overland effects that construction may have on the water body in several best management practices (e.g., Stepping Back from the Water [ESRD 2012] and Ontario Natural Heritage Reference Manual [MNR 2010]).

The Regional Assessment Area (RAA) is the area within which any cumulative environmental effects for fish and fish habitat are likely to occur. This includes all portions of a watercourse where the ZOI of other projects in the watershed could interact with the Project. For all watercourses or water bodies occurring within the LAA, the RAA extends 15 km upstream of and downstream of the PDA of each pipeline crossing, permanent access road crossing or facility.

6.1.6 Fish and Fish Habitat Key Indicators

To focus the assessment, two groups of freshwater aquatic species were selected as key indicators to represent the environmental effects on fish and fish habitat. These groups are commercial, recreational and Aboriginal fisheries, and species of management concern (SOMC).

6.1.6.1 Commercial, Recreational and Aboriginal Fisheries

For definitions of commercial, recreational and Aboriginal fisheries under the *Fisheries Act*, see Section 6.1.1.2. Commercial fisheries are recognized as fish species harvested under license for the purpose of sale. Recreational fisheries are recognized as fish species targeted by anglers for personal use or sport, as well as coarse and forage fish that support these fisheries. Aboriginal fisheries are recognized as fish species caught by Aboriginal groups for subsistence, social or ceremonial purposes. In the fish and fish habitat assessment, Aboriginal fisheries will be considered to be species fished recreationally and commercially. More information about Aboriginal fisheries in the RAA will be included in Traditional Land and Resource Use (see Volume 16, Part B, Section 5).

6.1.6.2 Species of Management Concern

For the Project, species of management concern (SOMC) and species at risk (SAR) have been identified and are defined as:

- **species of management concern** (SOMC): all SAR (see definition below), as well as species designated to be *extirpated, endangered, threatened, or vulnerable* by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). SOMC also include species designated by provincial authorities to be of “recognized importance” because of the status of their local populations.
- **species at risk** (SAR): A federally or provincially-listed species designated as *extirpated*, *endangered*, or *threatened* under all schedules of SARA or species designated as *extirpated*, *endangered* or *threatened* under Saskatchewan’s *Wildlife Act* or the Manitoba *Endangered Species Act*.

6.2 Baseline Summary

A baseline assessment of fish and fish habitat was conducted for each watercourse or water body potentially affected by the Saskatchewan and Manitoba segment. This section describes the approach and methods used for data collection and analysis, and summarizes the results of the field program.

Results from the 2013 and 2014 baseline assessments, including a detailed summary of the baseline fish community composition and fish habitat present in watercourses or water bodies with the potential to be affected by the Project, are provided in the Saskatchewan and Manitoba Fish and Fish Habitat Technical Data Report (TDR) in Volume 22. Results from assessments completed after 2014 are provided in the Environmental Protection Plans (EPPs) and alignment sheets in Volume 21.

6.2.1 Approach and Methods

6.2.1.1 Use of Existing Data

WATERCOURSE CROSSING REPLACEMENTS

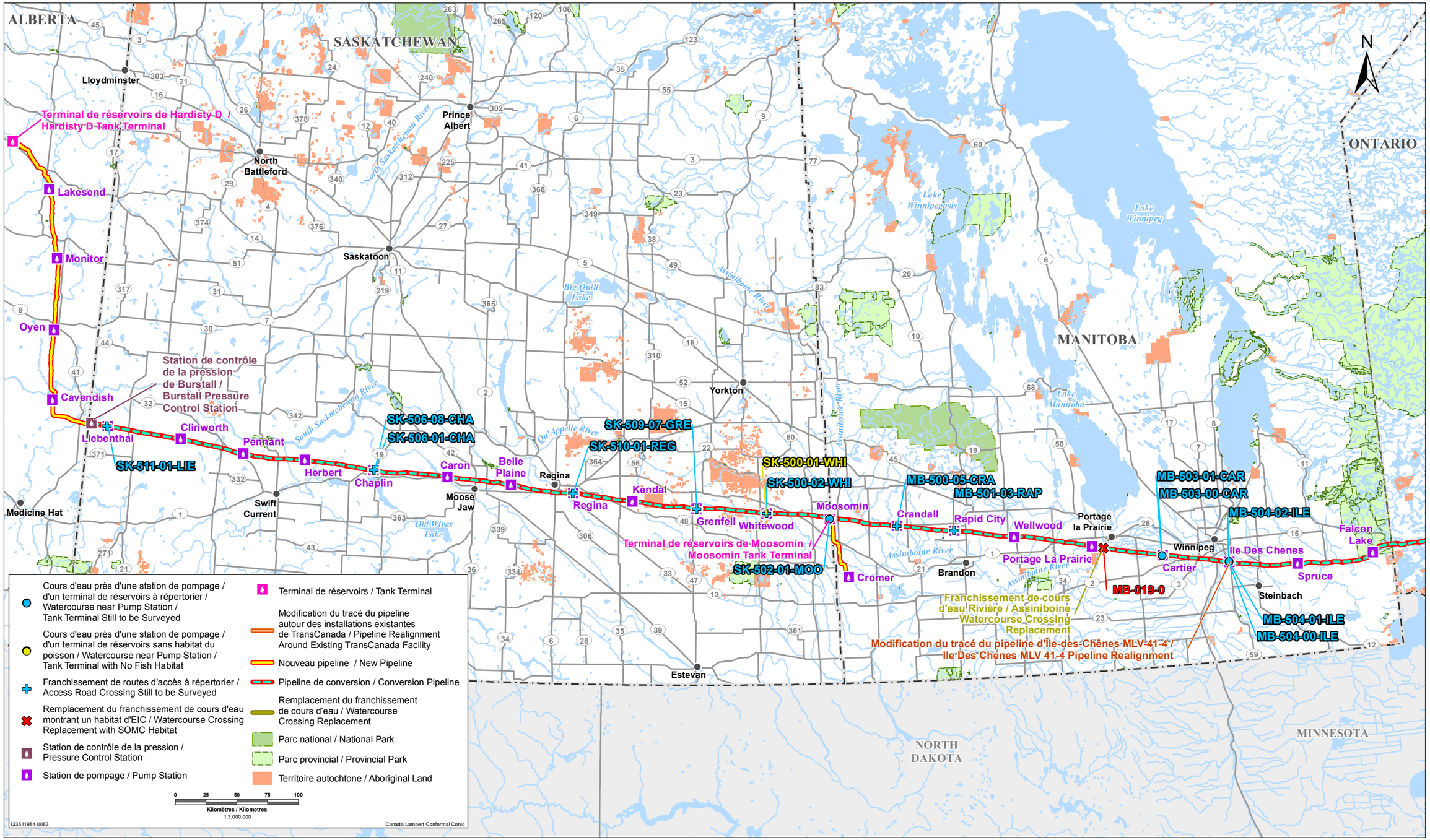
A thorough review of existing information was conducted using fish and fish habitat data from various sources. For the replacement of the watercourse crossing in the Assiniboine River (Figure 6-1), digital imagery was examined for information on existing fish habitat at the crossing location. This imagery included satellite and aerial photographs [1:10,000 scale], National Hydro Network maps [1:50,000 scale] and mapped watercourses delineated by the Water Security Agency [formerly the Saskatchewan Watershed Authority] and the Manitoba Water Stewardship Division.

Available fish and fish habitat data were reviewed for the Assiniboine River. Where possible, provincial (e.g., Manitoba Conservation Data Centre) and federal (DFO – Species at Risk biologist) agencies were asked for existing data and species records within the RAA.

CROMER LATERAL PIPELINE CROSSINGS

For the Cromer lateral, potential watercourses crossed by the pipeline (Figure 6-2) were initially identified through a review of National Hydro Network maps (1:50,000 scale) and mapped watercourses delineated by the Water Security Agency and the Manitoba Water Stewardship Division. Based on existing data, 35 potential watercourse crossing locations were identified. Each potential watercourse crossing location was compared with digital imagery, including satellite and aerial photographs (1:10,000 scale), to determine if a watercourse was, or might be, present along the pipeline route. Of the 35 potential watercourses examined during the review of existing information, four were determined to lack evidence of a defined channel, and were classified as having no visible channel (NVC) and no potential for fish habitat. This reduced the number of potential watercourse crossings to 31 along the Cromer lateral.

Available fish and fish habitat data were reviewed for all watercourses identified in the RAA. A recent technical publication from DFO provided key information, including descriptions of fish and fish habitat in the southern part of Manitoba (Milani 2013).



PROJET OLÉODUC ÉNERGIE EST / ENERGY EAST PIPELINE PROJECT

Tronçon de la Saskatchewan et du Manitoba – Composantes du projet pouvant avoir une incidence sur les poissons ou leur habitat / Saskatchewan and Manitoba Segment - Project Components with Potential to Affect Fish or Fish Habitat

Sources : données sur le projet fournies par TransCanada Pipelines Limited. Données de base fournies par les gouvernements du Canada, de l'Alberta, de la Saskatchewan, du Manitoba et de l'Ontario. /
Sources: Project data provided by TransCanada Pipelines Limited. Base data provided by the Governments of Canada, Alberta, Saskatchewan, Manitoba, and Ontario.

PRÉPARÉ PAR / PREPARED BY: Stantec

PRÉPARÉ POUR / PREPARED FOR: TransCanada

FIGURE NO / FIGURE NO.: **6-1**

Dernière modification: 4/6/2016 par: kmichiels / Last Modified: 4/6/2016 By: kmichiels

Moosomin
SK-502-01-MOO
Terminal de réservoirs de Moosomin / Moosomin Tank Terminal
SK-002-0
SK-001-0
MB-001-0
MB-002-0
MB-020-0
MB-021-0
MB-022-0
MB-023-0
MB-024-0
MB-025-0
MB-026-0
MB-027-0
MB-028-0
MB-029-0
MB-003-0
MB-030-0
MB-031-0
MB-004-0
MB-005-0
MB-006-0
MB-032-0
MB-007-0
MB-033-0
MB-008-0
MB-034-0
MB-009-0
MB-010-0
MB-011-0
MB-035-0
MB-012-0
MB-013-0
MB-014-0
MB-015-0
MB-016-0
MB-017-0
Cromer
Brennand Creek
Wythes Creek
Nisso Creek
Bosshill Creek
Pipestone Creek
Stony Creek
Gopher Creek
Fleming
Kirkella
Reeder
Elkhorn
Kola
SASKATCHEWAN
MANITOBA
1
41
256
467
542
48
257
N

Cours d'eau près d'une station de pompage / d'un terminal de réservoirs à répertorier / Watercourse near Pump Station / Tank Terminal Still to be Surveyed
Franchissement du pipeline à répertorier / Pipeline Crossing Still to be Surveyed
Franchissement du pipeline avec habitat du poisson / Pipeline Crossing with Fish Habitat
Franchissement du pipeline sans habitat du poisson / Pipeline Crossing with No Fish Habitat
Station de pompage / Pump Station
Terminal de réservoirs / Tank Terminal
Nouveau pipeline / New Pipeline
Pipeline de conversion / Conversion Pipeline
Territoire autochtone / Aboriginal Land

0 2.5 5
Kilomètres / Kilometres

123511954-0060 1:150,000 NAD 1983 UTM Zone 14N

NT NU MB SK ON MT ND MN
Zone d'intérêt / Area of Interest

PROJET OLÉODUC ÉNERGIE EST / ENERGY EAST PIPELINE PROJECT

Pipeline latéral de Cromer – Composantes du projet pouvant avoir une incidence sur les poissons ou leur habitat / Cromer Lateral - Project Components with Potential to Affect Fish or Fish Habitat

Sources: Données sur le projet fournies par TransCanada Pipelines Limited. Données de base fournies par les gouvernements du Canada, de la Saskatchewan et du Manitoba. / Sources: Project data provided by TransCanada Pipelines Limited. Base data provided by the Governments of Canada, Saskatchewan and Manitoba.

PRÉPARÉ PAR / PREPARED BY: Stantec
PRÉPARÉ POUR / PREPARED FOR: TransCanada
FIGURE NO / FIGURE NO. 6-2

Dernière modification: 4/14/2016 par: bcurry / Last Modified: 4/14/2016 By: bcurry

PIPELINE REALIGNMENTS AROUND EXISTING TRANSCANADA FACILITIES

Potential watercourses crossed by Iles des Chenes MLV 41-4 pipeline realignment were examined and screened based on the same methodology used to identify and analyze the watercourses crossed by the Cromer lateral. No watercourses crossed by pipeline realignments were identified.

FACILITIES

The LAA of each pump station and tank terminal was examined and screened for proximity to nearby watercourses (including watercourses and ponds) using the same methodology used to identify and analyze the watercourses crossed by the Cromer lateral. All watercourses identified within the LAA of a pump station or tank terminal were documented. A thorough review of existing fish and fish habitat data was conducted for each of these watercourses.

Eight potential water bodies were identified in the LAA of the following facilities based on review of existing data:

- Moosomin tank terminal
- Whitewood pump station
- Chaplin pump station
- Cartier pump station (two potential watercourses)
- Iles des Chenes pump station (three potential watercourses)

Assessment of these eight watercourses was carried through to the field program.

PERMANENT ACCESS ROAD CROSSINGS

A review of local fish and fish habitat data was also conducted for watercourses potentially crossed by permanent access roads to each pump station and tank terminal based on the same methodology used for pipeline crossings.

Seven potential watercourses or water bodies were determined to be crossed by permanent access roads to the following facilities based on review of existing data:

- Liebenthal pump station
- Grenfell pump station
- Whitewood pump station
- Chaplin pump station
- Regina pump station
- Crandall pump station
- Rapid City pump station

Assessment of these seven watercourses was carried through to the field program.

6.2.1.2 Field Methods

Field assessments were completed between May and October in 2013 and 2015 by a team of qualified aquatic environment specialists (as defined in the Guidelines to the Code of Practice [AENV 2001]) and technicians. The objective was to confirm the presence of a watercourse, document its biophysical characteristics and in situ water quality, and determine fisheries potential.

Results from the 2013 and 2014 field assessments are provided in the Saskatchewan and Manitoba Fish and Fish Habitat TDR in Volume 22. Results from field assessments completed after 2014 are provided in the EPPs and alignment sheets in Volume 21.

WATERCOURSE CROSSING REPLACEMENTS

The field assessment of the Assiniboine River was completed on May 9, 2013.Photographs were taken for documentation, and field data, described below, were collected.

FISH HABITAT

Habitat near the pipeline crossing were identified and recorded. Guidelines for aquatic assessment were adapted from Alberta's Code of Practice for Pipelines and Telecommunication Lines Crossing a Water Body under the Alberta *Water Act* (ESRD 2013a). The Alberta *Fish Habitat Manual* (Alberta Transportation 2009) was used as a guideline to classify fish habitat. These guidelines were implemented in all provinces across the Project to assess and classify fish habitat in a consistent way.

The Assiniboine River was assessed using a boat 500 m upstream and 1,000 m downstream of the crossing location. The following data were recorded at the centerline of the crossing, and at several transects along the assessed reach:

- channel width
- wetted width
- water depth
- water velocity/discharge
- substrate composition
- bank description, including height, slope and stability
- functional cover type and abundance
- habitat units within the survey area (e.g. riffle, run, pool)

Field data were used to develop an overview of functional habitat features and general channel morphology. Habitat requirements of species suspected to occur in the RAA and presence of potential fish migration barriers were considered when assessing habitat quality at each site.

WATER QUALITY

The objective of the sampling program was to document baseline conditions at the time of the assessment. In situ water quality parameters measured in the field included:

- dissolved oxygen
- specific conductivity
- pH
- temperature
- turbidity

FISH COMMUNITY SAMPLING

A qualitative determination of fish presence and community structure was completed at the Assiniboine River by boat electrofishing. Fish sampling data were combined with historical data to determine the characteristics of the local fish community and potential windows for RAPs.

SUBSTRATE SURVEY

The fish community sampling was not designed to assess the presence of mussels or mussel habitat at the PDA or within the LAA. DFO recommended that a baseline survey to determine the presence of mussels within the PDA would not be required. In the absence of field confirmation of mussel presence, a substrate survey was conducted to provide more information on the likelihood of mussel habitat within the PDA and downstream of the crossing location. Details and results of the substrate survey are provided in the Assiniboine River Sediment Dispersion Modelling and Substrate Survey TDR (see Volume 22).

A substrate survey was conducted in April and May 2015 to document the variation in substrate type in the PDA and at pre-defined transects downstream of the crossing location to determine the likelihood of mussel habitat at the PDA and downstream of the crossing location.

Substrate observations were collected at the crossing location and at transects located downstream of the crossing location. Along each transect, GPS coordinates, depths and substrate observations were documented across the wetted width of the river. In the PDA, observations were taken at the transect at the crossing location and at transects 30 m upstream and 30 m downstream of the crossing location. Transects were accessed by boat. Observations were collected by inserting a long metal pole with a blunt tip into the substrate. Based on the feel, sound and difficulty of pushing the pole into the substrate, the observer documented the substrate type.

CROMER LATERAL PIPELINE CROSSINGS

Field assessments of the Cromer lateral watercourse crossings were completed between May and November in 2013 and 2015.

WATERCOURSE CLASSIFICATION

Each watercourse was categorized as one of the following types (adapted from ESRD 2013b):

- NVC – typically a low-lying depression, often cultivated, that does not provide direct or indirect habitat values for fish
- ephemeral – a seasonal flowing unnamed watercourse with poor to well-defined bed and banks
- intermittent/spring – an intermittently flowing (i.e., sub-surface and surface flows) unnamed or named watercourse with defined bed and banks, sometimes fed by a groundwater source
- small permanent – an unnamed or named watercourse that flows throughout the year and has a channel width less than 5 m
- large permanent – an unnamed or named watercourse that flows throughout the year and has a channel width greater than 5 m

Where a watercourse was present, photographs were taken for documentation and field data, described below, were collected. Channels defined as NVC were photographed, but limited data were collected at these watercourses.

FISH HABITAT

For each watercourse confirmed in the field (i.e., presence of defined bed and banks), habitat near the pipeline crossing were identified and recorded.

Guidelines for aquatic assessment were adapted from Alberta's Code of Practice for Pipelines and Telecommunication Lines Crossing a Water Body under the Alberta *Water Act* (ESRD 2013a). The Alberta *Fish Habitat Manual* (Alberta Transportation 2009) was used as a guideline to classify fish habitat. These guidelines were implemented in all provinces across the Project to assess and classify fish habitat in a consistent way.

Watercourses along the Cromer lateral were assessed 100 m upstream and 300 m downstream of the proposed pipeline crossing locations. Ephemeral watercourses were assessed approximately 100 m upstream to 100 m downstream of the proposed crossing location.

The following data were recorded at the centerline of the crossing, and at several transects along the assessed reach:

- channel width
- wetted width
- water depth
- water velocity/discharge
- substrate composition
- bank description, including height, slope and stability
- functional cover type and abundance
- habitat units within the survey area (e.g. riffle, run, pool)

Field data were used to develop an overview of functional habitat features and general channel morphology. Habitat requirements of species suspected to occur in the RAA and presence of potential fish migration barriers were considered when assessing habitat quality at each site.

WATER QUALITY

In situ surface water quality data were collected at each watercourse where water depth at the time of the habitat assessment was sufficient to submerge the probe of the water quality meter. The objective of the sampling program was to document baseline conditions at the time of the assessment. Water quality parameters measured in the field included:

- dissolved oxygen
- specific conductivity
- pH
- temperature
- turbidity

FISH COMMUNITY SAMPLING

A qualitative determination of fish presence and community structure was completed at each confirmed watercourse crossing. In smaller watercourses located along the Cromer lateral, backpack electrofishing was primarily used to sample fish communities. Where water depth permitted, minnow traps were also used. In watercourses where substrates or water depths precluded safe electrofishing operation, Gee-style minnow traps were primarily used to sample fish.

Fish sampling data were combined with historical data to determine the characteristics of the local fish community and potential windows for RAPs.

FACILITIES

Field assessment of the potential watercourse identified within the LAA of Whitewood pump station was completed during the 2015 field assessment program. This watercourse was assessed following similar methods as described for pipeline crossings. Field assessments of the seven remaining potential watercourses could not be conducted due to land access constraints.

PERMANENT ACCESS ROAD CROSSINGS

Field assessments of the seven potential watercourses crossed by permanent access roads could not be conducted due to land access constraints.

6.2.1.3 Data Analysis

HABITAT SENSITIVITY RANKINGS

The *Practitioners Guide to the Risk Management Framework for DFO Habitat Management Staff* (DFO 2006) provides guidelines for assessing risk to fish and fish habitat based on the sensitivity of the watercourse and the scale of negative effect of the activity.

Following review of existing information and field surveys, the *sensitivity of fish and fish habitat* in each watercourse or water body was ranked using criteria adapted from DFO's Risk Management Framework (DFO 2006). To meet a habitat sensitivity ranking listed below, the watercourses must possess at least one of the following criteria:

HIGH SENSITIVITY

- species present are highly sensitive to perturbations and are not resilient to change
- presence of spawning or other habitat critical to the survival of a species
- supports habitat for SOMC
- habitat essential to sustaining a commercial, recreational, or Aboriginal fishery
- permanent flowing, cold and cool water systems that cannot easily buffer temperature changes or are not resilient to disturbance especially where unique or limited within an ecozone

MODERATE SENSITIVITY

- species present are moderately resilient to change and perturbation
- diverse fish community
- habitat used by one or more species of a fishery for feeding, growth and migration
- typical of the fish habitat in the region. Large amount of similar habitat readily available

LOW SENSITIVITY

- habitat with low productive capacity
- no suitable spawning habitat for sport fish and low or nil rearing potential for sport fish
- habitat has substantial limitations to contribute to a fishery (e.g., sparse in-water and overhead cover, low flows, poor fish passage, no overwintering capacity)
- typically supports only forage fish species which are not limiting to a fishery
- contributes only indirectly to a commercial, recreational, or Aboriginal fishery
- ephemeral watercourses that might not provide habitat for fish to complete one or more of their life processes, but might provide occasional habitat in high flows as well as flow and nutrients to downstream areas. These watercourses may also affect downstream areas through the transport of sediment and other deleterious substances.

NOT FISH HABITAT

- No direct or indirect contribution to downstream habitat

The *scale of negative effect* (DFO 2006) will be determined on a watercourse-specific basis once construction methods are finalized and will be based on the expected risks associated with each construction activity.

Based on the available background and field data, construction methods were recommended by a qualified aquatic biologist based on physical (e.g., watercourse size and discharge) and biological (e.g., fish species composition and the habitat sensitivity ranking) factors for each watercourse crossing location. See Volume 14, Section 2 for a description of watercourse crossing methods as well as the selection process for determining the appropriate crossing method for each watercourse. The final crossing methods used will be determined by a qualified engineering team, which will consider engineering, and constructability requirements, fisheries values and protection of riparian habitats.

RESTRICTED ACTIVITY PERIODS

For a description of the methods used to determine watercourse RAPs in Saskatchewan and Manitoba, see Sections 6.1.2 and 6.1.3. For RAPs specific to each watercourse, see Appendix 6B.

6.2.2 Overview of Baseline Conditions

6.2.2.1 Regional Setting

The Saskatchewan and Manitoba segment is located in the Southern Fish Management Zone in both Saskatchewan (Government of Saskatchewan 2013) and in Manitoba (Government of Manitoba 2013).

The Assiniboine River drains an area of 182,000 km^2 and traverses a distance of 1,070 km (NRCAN 2004) from its source in eastern Saskatchewan to its confluence with the Red River in the City of Winnipeg. The Assiniboine River and its tributaries support recreational fisheries. In the RAA, the Assiniboine River supports a range of sport fish (see Table 6-1).

Recreational fishing is not known to occur in the RAA of the watercourses along the Cromer lateral; however, fish that support recreational fisheries are known to occur in the RAA (see Table 6-1).

6.2.2.2 Project Setting

WATERCOURSE CROSSING REPLACEMENTS

The proposed watercourse crossing replacement at the Assiniboine River is located approximately 9 km upstream of the Portage Diversion, a water control structure that diverts flow from the Assiniboine River into Lake Manitoba. The Assiniboine River watercourse crossing replacement is planned to be constructed by open-cut methods in flowing conditions (see Consolidated Application Volume 5, the appendix for HDD Crossing Feasibility Study – Assiniboine River). The Assiniboine River was confirmed as fish habitat that supports several fish species. For a summary of biophysical data, see Appendix 6B, Table 6B-1.

Sport, coarse and forage fish were captured during the field assessment and have historically been documented in the Assiniboine River throughout the RAA (Milani 2013). Although the Assiniboine River is historically known to support four SAR (COSEWIC 2003, 2006a, 2009, 2010; Conservation and Water Stewardship Fisheries Branch 2012) and one SOMC (COSEWIC 2006b), no SAR or SOMC were captured during the field investigations. For a summary of historical and field fish records, see Appendix 6B, Table 6B-1.

A substrate survey was also conducted to provide more information about mussel habitat in the PDA. Details of the substrate survey are provided in the Assiniboine River Sediment Dispersion Modelling and Substrate Survey TDR (see Volume 22). Within the PDA and downstream of the crossing location, mussel habitat is generally poor quality because of deep water, abundant silt and sand, unstable substrate and lack of hard-packed coarse substrate. Within the PDA, poor to moderate habitat was documented along the right side of the channel. Some areas of poor to moderate mussel habitat were documented 100 m, 300 m and 600 m downstream of the crossing location.

COMER LATERAL PIPELINE CROSSINGS

The Cromer lateral crossings are recommended to be constructed by trenched methods (i.e., open-cut if dry or frozen, or isolation if flowing).

Of the 31 potential watercourse crossing locations identified along the Cromer lateral during the review of existing information, fish habitat was confirmed in nine of the watercourses. In addition, 15 potential watercourses that may have fish and fish habitat could not be surveyed due to land access constraints; however, based on the review of existing data, familiarity with the area and professional expertise, these 15 watercourses are expected to have low sensitivity fish habitat or no fish habitat. Fish habitat potential will be confirmed following field surveys at a later date. For a summary of biophysical data for the confirmed watercourses, see Appendix 6B, Table 6B-2. Field assessment information is provided in the New Pipeline EPP.

The remaining seven sites assessed were dry swales, terrestrial gullies or field drainages that do not meet the definition of a water body under the Alberta *Code of Practice for Pipelines and Telecommunication Lines Crossing a Water Body* (ESRD 2013a) or of fish habitat under the *Fisheries Act*. These were classified as ephemeral or NVC and added to the list of NVC crossings identified during the review of existing information. In total, 11 ephemeral watercourse and NVCs with no fish habitat potential are crossed by the Cromer lateral (see Appendix 6B, Table 6B-3).

Forage fish were the only species captured and were documented in only eight of the watercourses along the Cromer lateral. SOMC were not captured or observed during the fish and fish habitat assessments.

PIPELINE REALIGNMENTS AROUND EXISTING TRANSCANADA FACILITIES

No watercourses crossed by the Iles des Chenes MLV 41-4 pipeline realignment were identified.

FACILITIES

The watercourse located within the LAA of the Whitewood pump station was determined to be an NVC with no fish habitat (see Appendix 6B, Table 6B-5). The remaining seven potential watercourses within the LAA of the Chaplin A, Cartier, Iles des Chenes pump stations and the Moosomin tank terminal could not be surveyed due to land access constraints. However, based on the review of existing data, familiarity with the area and professional expertise, these watercourses are expected to have low sensitivity fish habitat or no fish habitat. Fish habitat potential will be confirmed following field surveys at a later date. For a summary of biophysical data for each of the confirmed watercourses, see Appendix 6B, Table 6B-4. Field assessment information is provided in the Pump Station and Tank Terminal EPPs.

PERMANENT ACCESS ROAD CROSSINGS

Seven potential watercourses crossed by permanent access roads could not be surveyed due to land access constraints. However, based on the review of existing data, familiarity with the area and professional expertise, these watercourses are expected to have low sensitivity fish habitat or no fish habitat. Fish habitat potential will be confirmed following field surveys at a later date. For a summary of biophysical data for each of the confirmed watercourses, see Appendix 6B, Table 6B-6. Field assessment information is provided in the Pump Station and Tank Terminal EPPs.

6.2.2.3 Saskatchewan and Manitoba Key Indicators

COMMERCIAL, RECREATIONAL AND ABORIGINAL FISHERIES

No commercial fisheries are present in the RAA of the Saskatchewan and Manitoba segment (MCWS 2012, 2013; North/South Consultants 2010).

For a list of recreational fisheries in the RAA, as well as species that support recreational fisheries, see Table 6-1.

Table 6-1 Recreational Fisheries and Supporting Species in the RAA

Recreational Fisheries and Supporting Species[1]	Fish Species	
	Conversion (Assiniboine River)	**New Pipeline (Cromer Lateral)**
Sport fish	lake sturgeon* (*Acipenser fulvescens*) mooneye (*Hiodon tergisus*) goldeye (*Hiodon alosoides*) northern pike *(*Esox lucius*)* channel catfish (*Ictalurus punctatus*) burbot (*Lota lota*) rock bass (*Ambloplites rupestris*) sauger (*Sander canadensis*) walleye (*Sander vitreus*) yellow perch (Perca flavescens)	None

Table 6-1 Recreational Fisheries and Supporting Species in the RAA

Recreational Fisheries and Supporting Species[1]	Fish Species	
	Conversion (Assiniboine River)	**New Pipeline (Cromer Lateral)**
Coarse fish	chestnut lamprey* (*Ichthyomyzon castaneus*) bigmouth buffalo* (*Ictiobus cyprinellus*) golden redhorse (*Moxostoma erythrurum*) shorthead redhorse (*Moxostoma macrolepidotum*) quillback (*Carpiodes cyprinus*) white sucker (*Catostomus commersonii*) carp spp. black bullhead *(Ameiurus melas)* stonecat (*Noturus flavus*)	white sucker (*Catostomus commersonii*)
Forage fish	bigmouth shiner* (*Notropis dorsalis)* emerald shiner (*Notropis atherinoides*) sand shiner (*Notropis stramineus*) spottail shiner (*Notropis hudsonius*) silver chub (*Notropis photogenis*) creek chub (*Semotilus atromaculatus*) flathead chub (*Platygobio gracilis*) fathead minnow (*Pimephales promelas*) longnose dace (*Rhinichthys cataractae*) trout-perch (*Percopsis omiscomaycus*) johnny darter (*Etheostoma nigrum*)	brook stickleback (*Culaea inconstans*) common shiner (*Luxilus cornutus*) creek chub (*Semotilus atromaculatus*) fathead minnow (*Pimephales promelas*) northern redbelly dace (*Phoxinus eos)* trout-perch (*Percopsis omiscomaycus*) johnny darter (*Etheostoma nigrum*)
Other species[2]	mapleleaf mussel* (*Quadrula quadrula*)	

NOTES:

* Species of management concern and species at risk

[1] Sport fish, coarse fish and forage fish are defined as follows:

Sport fish: Fish species that are targeted by recreational anglers and desired in commercial and Aboriginal fisheries. These species are typically desired for their taste or ability to fight. There are often specific regulations in each jurisdiction regarding the recreational harvest and pursuit of these species (e.g., trout, pike, bass).

Coarse fish: Fish species often not sought after for recreational angling, but valuable for subsistence fisheries. Coarse fish typically include large-bodied fish, such as suckers and carp. These fish are often caught during netting and used to support commercial and subsistence fisheries where they are present.

Forage fish: Fish species that are generally small-bodied fish and typically not harvested for subsistence. These fish may be harvested as bait, so they might support a commercial fishery. Additionally, they can constitute a significant portion of the diet for sport fish, so they might support recreational fisheries.

[2] Mussels are defined as fish under the federal *Fisheries Act*:

"fish" includes (a) parts of fish, (b) shellfish, crustaceans, marine animals and any parts of shellfish, crustaceans or marine animals, and (c) the eggs, sperm, spawn, larvae, spat and juvenile stages of fish, shellfish, crustaceans and marine animals.

SPECIES OF MANAGEMENT CONCERN

No SOMC or SAR were identified in the RAA in Saskatchewan. In Manitoba, five fish SOMC were identified in the RAA of the Assiniboine River including four fish SAR (see Appendix 6A, Table 6A-1). Their status is described below. No SOMC or SAR were identified in the watercourses crossed by the Cromer lateral pipeline.

SPECIES AT RISK

mapleleaf mussel

- The Saskatchewan-Nelson River population of mapleleaf mussel is considered *endangered* by COSEWIC and under Schedule 1 of SARA, and is therefore protected by federal legislation. The mapleleaf mussel is also listed as *endangered* under the Manitoba *Endangered Species Act,* and is thus protected by provincial legislation.
- The mapleleaf mussel is known to occur in the Assiniboine River (COSEWIC 2006a). Known occurrences have been documented within the RAA approximately 9.5 and 13.5 km downstream of the PDA (Friesen 2013, Manitoba Conservation Data Centre, pers. comm.). These mussel records are located 0.5 km and 4.5 km downstream of the Portage Diversion.
- Good quality mussel habitat is lacking in the PDA and downstream to the Portage Diversion; therefore, it is unlikely that large numbers of mussels will be present. However, because poor to moderate habitat was documented in the PDA and 100 m, 300 m and 600 m downstream of the crossing location, the presence of individual mussels cannot be ruled out.
- Key issues affecting this species include habitat loss and degradation of habitat due to agricultural land use and urban runoff (DFO 2013c).

bigmouth buffalo

- The Saskatchewan-Nelson River population of bigmouth buffalo is listed as *special concern* under both COSEWIC and Schedule 1 of SARA (2011). Because this species is listed as *special concern* under SARA, it is not legally protected under federal legislation. The bigmouth buffalo is not listed under the Manitoba *Endangered Species Act* and is therefore not legally protected by provincial legislation. The bigmouth buffalo is known to occur in the Assiniboine River (COSEWIC 2009). Key issues affecting this species include habitat alteration due to channelization and flood control (Johnson 1963; Edwards 1983 and Becker 1983).

bigmouth shiner

- The bigmouth shiner is listed as *special concern* on Schedule 3 of SARA and is therefore not legally protected under federal legislation. The bigmouth shiner is not listed under the Manitoba *Endangered Species Act* and is therefore not legally protected by provincial legislation. The bigmouth shiner is known to occur in the Assiniboine River (COSEWIC 2003). Key issues affecting this species include habitat alteration and degradation due to agricultural land use (COSEWIC 2003).

chestnut lamprey

- The chestnut lamprey is listed as *special concern* on Schedule 3 of SARA and is therefore not legally protected under federal legislation. The chestnut lamprey is not listed under the Manitoba *Endangered Species Act* and is therefore not legally protected by provincial legislation. The chestnut lamprey is known to occur in the Assiniboine River (COSEWIC 2010). Key issues affecting this species include increased siltation and eutrophication due to agricultural land use (Lanteigne 1991).

OTHER SPECIES OF MANAGEMENT CONCERN

lake sturgeon

- The Red-Assiniboine Rivers-Lake Winnipeg population of lake sturgeon is designated as *endangered* by COSEWIC. Although consultations are underway to have this species listed under SARA, it is not legally protected by federal legislation. Lake sturgeon is not listed under the Manitoba *Endangered Species Act* and is therefore not legally protected by provincial legislation. The lake sturgeon is known to occur in the Assiniboine River (COSEWIC 2006b; Conservation and Water Stewardship Fisheries Branch 2012). Key issues affecting this species include habitat loss or alteration due to due to agricultural land use and urban development, as well as fragmentation caused by migration barriers (Auer 1996, Alberta Lake Sturgeon Recovery Team 2011, Wallace 1999; Auer and Baker 2002, DFO 2010a, Breining 2003, Lehmkuhl 1972, Chiasson et al. 1997, LaHaye et al. 1992, Auer and Baker 2002, Bruch and Binkowski 2002, Bruch 2004, Harkness and Dymond 1961, Wang et al. 1985).

6.3 Potential Effects

6.3.1 Potential Effects, Key Indicators and Measurable Parameters

Potential project effects are related to construction and operation of the pipeline (including watercourse crossings), pump stations, the tank terminal and permanent access roads. The construction and operation phases of the Project will interact with fish and fish habitat in different ways. As such, these two phases are discussed separately.

Table 6-2 summarizes the potential effects, key indicators, measureable parameters and rationale for each selection for the fish and fish habitat VC. See province-specific sections (Volumes 15 and 17, Section 6) for the list of SOMC identified as key indicators.

Table 6-2 Potential Effects, Key Indicators and Measurable Parameters for Fish and Fish Habitat

Potential Project Effect	Rationale for Inclusion of the Potential Project Effect in the Assessment	Key Indicator(s)	Measurable Parameter(s) for the Effect	Rationale for Selection of the Measurable Parameter
Change in fish and fish habitat (including critical habitat of species at risk)	Pipeline construction near or through a fish-bearing water body could affect: • Fish and fish habitat (including critical habitat of species at risk) • Fish movement, migration and fish passage • Fish mortality • Introduction of deleterious substances could affect fish habitat (including critical habitat of species at risk) and fish mortality	Commercial, recreational and Aboriginal fisheries fish species of management concern (including species at risk)	Change in riparian and in-water habitat availability (including critical habitat of species at risk)	• The availability of habitat will be assessed in the baseline survey prior to construction. • The baseline information is used to determine the extent of the harm to fish habitat and the requirements for compensation to offset the harm to achieve no net loss of fish habitat.
Change in fish movement, migration and fish passage			Change in flow rates or obstructions	• The accessibility of upstream and downstream habitat will be assessed in the baseline survey prior to construction. • Change in flow rates or obstructions can affect fish movement and migration to critical habitats for spawning, rearing, overwintering, etc.).
Change in fish mortality			Change in direct mortality risk	• Understanding of baseline fish community is required to assess sensitivity to construction and therefore, mortality risk. • Water quality measurements will be compared to the CCME guidelines for the protection of aquatic life (CCME 2002).

Table 6-2 Potential Effects, Key Indicators and Measurable Parameters for Fish and Fish Habitat

Potential Project Effect	Rationale for Inclusion of the Potential Project Effect in the Assessment	Key Indicator(s)	Measurable Parameter(s) for the Effect	Rationale for Selection of the Measurable Parameter
Introduction of deleterious substances on fish habitat (including critical habitat of species at risk) and fish mortality			Change in water quality parameters Change in sediment load and quality	• Water quality measurements will be compared to provincial water quality guidelines and the CCME guidelines for the protection of aquatic life (CCME 2002).
				• Introduction of sediment and other deleterious substances could cause harm to fish • Deposition of sediment could cause harm to fish habitat. • Introduction of sediment and other deleterious substances could potentially change water chemistry in a manner that is harmful to fish.

6.3.2 Effects Assessment

The following potential project effects on fish and fish habitat were assessed (see Table 6-3):

- change in fish habitat (including critical habitat of SAR)
- change in fish movement, migration and fish passage
- change in fish mortalityintroduction of deleterious substances on fish habitat (including critical habitat of species at risk) and fish mortality

Table 6-3 Potential Effects on Fish and Fish Habitat

Project Activities and Physical Works[1]	Potential Effects			
	Change in fish habitat	**Change in fish movement, migration, and fish passage**	**Change in fish mortality**	**Introduction of deleterious substances**
Construction (Conversion)				
Watercourse crossing replacement	✓	✓	✓	✓
Pipeline realignment	N/A	N/A	N/A	N/A
Construction (New Facilities)				
Cromer lateral[2]	✓	✓	✓	✓
Pump stations	✓	✓	✓	✓
Moosomin tank terminal (including temporary workspace)	✓	✓	✓	✓
Permanent access roads	✓	✓	✓	✓
Operation				
Cromer lateral[2], watercourse crossing replacement, and pipeline realignment	✓	✓	✓	✓
Pump stations	✓	✓	✓	✓
Moosomin tank terminal (including temporary workspace)	✓	✓	✓	✓
Permanent access roads	✓	✓	✓	✓
Decommissioning and abandonment[3]				

NOTES:

✓ Indicates that an activity is likely to contribute to the environmental effect

N/A indicates not applicable.

[1] For accidents and malfunctions, see Volume 19.

[2] Construction includes development and use of temporary ancillary facilities (e.g., stockpile sites, laydown areas, storage yards).

[3] For effects of decommissioning and abandonment, see Volume 14, Section 8.

6.3.2.1 Construction of Watercourse Crossing Replacement

The Assiniboine River watercourse crossing replacement will be constructed using an open-cut method during flowing conditions along the RoW of the existing pipeline (see Consolidated Application Volume 5, the appendix for HDD Crossing Feasibility Study – Assiniboine River). The relative risk to fish and fish habitat from pipeline crossings is described in Pipeline Associated Watercourse Crossings (CAPP 2005). Project-specific effects are addressed below.

CHANGE IN FISH HABITAT

COMMERCIAL, RECREATIONAL AND ABORIGINAL FISHERIES

Trenched construction methods through watercourses might alter the riparian vegetation, stability of watercourse bed and banks, channel and shoreline morphology, and in-water habitat. Excavation or trenching through a watercourse disrupts the existing bed and banks in the RoW and might result in temporary or longer term degradation of habitat quality in the affected area. The extent of this effect is determined by physical factors (e.g., channel width, flow characteristics, substrate types) and construction timing. The magnitude of the effect depends on the sensitivity of the aquatic habitats relative to their importance in sustaining the resident aquatic biota. Sensitive habitat generally includes areas that are important for completing essential life processes such as spawning, rearing, migrating and overwintering.

Trenched construction methods might cause suspension of sediment and changes to channel and shoreline morphology, which might alter substrate composition, resulting in changes in the food supply and habitat structure available to fish.

Riparian vegetation and bank stability are important watercourse characteristics because they influence the rate of riparian soil erosion, provide filtration of overland flow from the surrounding land and provide cover, cooling shade and food (e.g., terrestrial invertebrates) for fish. Loss of riparian habitat resulting from construction activities might reduce cover, increase water temperature and affect invertebrate populations.

Recreational fish species in the Assiniboine River RAA tend to prefer large, slow-moving rivers and shallow lakes, and feed on small fish, aquatic insects and larvae (Scott and Crossman 1998). Although relatively tolerant of silty waters, many species in the RAA require clear water with gravel, pebble or rock substrate in which to spawn. Pipeline construction might result in increased sediment input and mobilization of sediment that might cover spawning substrate. Loss of riparian habitat as a result of construction activities might reduce cover, increase water temperature, and affect invertebrate populations.

SPECIES OF MANAGEMENT CONCERN

Habitat changes may have a greater effect on fish SOMC than on common species because of specialized habitat or biological requirements and narrow tolerances to habitat alterations. The general effects on fish habitat described for recreational fisheries apply to SOMC.

Pipeline construction activities that might alter riparian areas, substrate, in-water vegetation and watercourse morphology have the potential to affect SOMC in the RAA. Although these construction activities tend to have a small footprint and do not typically affect large reaches of a watercourse, the habitat specificity and biological characteristics (e.g., longevity, delayed maturity and infrequent spawning) of SOMC, especially those that migrate long distances (such as lake sturgeon) or those that

have limited mobility (such as mapleleaf mussel) make SOMC in the RAA highly susceptible to changes in their habitat.

Species-specific effects are summarized below.

Mapleleaf mussel

Pipeline construction activities that might alter riparian vegetation, bed and banks, and substrate, or cause changes in flow have the potential to affect mapleleaf mussel habitat in the Assiniboine River. Pipeline construction might also result in temporary suspended sediment spikes that have the potential to cover and possibly starve mussels in affected areas (DFO 2013c). Mapleleaf mussels are sensitive to siltation and to deteriorating water quality (SARA 2013).

Bigmouth buffalo

Bigmouth buffalo requires shallow, vegetated water or non-channelized watercourses during high water events for spawning (Stewart and Watkinson 2004). Bigmouth buffalo spawning habitat might therefore be affected by pipeline construction activities that change channel and shoreline morphology.

Bigmouth shiner

Bigmouth shiner favour small watercourses with medium to high streamflow velocities and coarse substrates (Stewart and Watkinson 2004). Open-cut construction activities might cause changes in hydraulics and substrates, and affect bigmouth shiner habitat. Little is known about the spawning habitat requirements of the bigmouth shiner, so potential effects of construction on bigmouth shiner habitat are not known.

Chestnut lamprey

Chestnut lamprey spend the larval stage buried in silt or sand substrate of watercourses with high streamflow velocities (Stewart and Watkinson 2004). Chestnut lamprey spawn in gravel beds (Stewart and Watkinson 2004). Open-cut construction activities might cause siltation and changes in substrate, and affect chestnut lamprey rearing and spawning habitat.

Lake sturgeon

Lake sturgeon require different habitat types for spawning, rearing, feeding and overwintering. Large river systems provide diverse habitat to meet the habitat requirements of lake sturgeon, including deep water areas for feeding, rearing and overwintering, as well as shallow, fast-flowing, rocky areas for spawning (Wallace 1999; Auer and Baker 2002). Open-cut construction activities at the Assiniboine River that might alter substrate, riparian areas, rapids, other high-gradient areas, and deep water habitats of large rivers have the potential to affect lake sturgeon habitat in the RAA. Although these construction activities tend to have a small footprint and do not typically affect large reaches of river, the biological characteristics of lake sturgeon (i.e., longevity, delayed maturity and infrequent spawning) make this species highly susceptible to changes in its habitat and slow to rebound from low population levels (ASRD 2002).

CHANGE IN FISH MOVEMENT, MIGRATION AND FISH PASSAGE

COMMERCIAL, RECREATIONAL AND ABORIGINAL FISHERIES

Trenched construction methods and temporary crossings might result in a temporary blockage or diversion of flow, resulting in the partial or complete blockage of fish passage. Open-cut crossings, particularly of larger watercourses with wide channels, might alter flow patterns and disrupt fish behaviour (Alberta Transportation 2009). The degree of alteration or restriction might depend on the timing of construction and the mitigation measures applied.

Fish movement and migration are important to local fish populations and assemblages to access habitat for lifecycle requirements. Many recreational fish species in the RAA spawn in spring in smaller watercourses and require open migratory pathways to reach their spawning grounds (Scott and Crossman 1998; Stewart and Watkinson 2004).

SPECIES OF MANAGEMENT CONCERN

Impediments to fish movement, migration and fish passage might have a greater effect on fish SOMC than common species because of migration requirements of these species. The general effects on movement, migration and passage of fish described for recreational fisheries apply to SOMC.

Species-specific effects are presented as follows.

Mapleleaf mussel

Adult mapleleaf mussels are sessile and are therefore unaffected by temporary blockages caused by construction. However, the larval stage is mobile and attaches to a host fish species (channel catfish) (DFO 2013c). Channel catfish migrate to spawn in small tributaries during late June and early July (Stewart and Watkinson 2004). Temporary blockages might interfere with host species migration and movement; therefore, larval mussel dispersal might also be disrupted by temporary blockages caused by construction activities.

Bigmouth buffalo

In spring, bigmouth buffalo move out of lakes and large rivers into tributaries and wetlands with shallow vegetated water to spawn (Scott and Crossman 1998). In-water pipeline construction activities that impede or discourage movement might prevent seasonal fish movement.

Bigmouth shiner

Bigmouth shiner movement might be impeded by in-water pipeline construction activities. Key migration periods (e.g., spawning) are not known for this species (COSEWIC 2003).

Chestnut lamprey

Chestnut lamprey emerge from silt or sand substrates in the spring and migrate to coarser substrate to spawn (COSEWIC 2010). Chestnut lamprey movement might be impeded by in-water pipeline construction activities.

Lake sturgeon

Lake sturgeon might undergo upstream or downstream migrations to move to spawning grounds (Stewart and Watkinson 2004). In-water pipeline construction activities might cause temporary blockage of the watercourse, preventing seasonal fish movement or disruption of migration.

CHANGE IN FISH MORTALITY

COMMERCIAL, RECREATIONAL AND ABORIGINAL FISHERIES

Fish are subject to two sources of increased mortality risk during pipeline construction: through the direct risk of mortality during in-water construction activities (e.g., contact with machinery, entrapment on pump intakes, accidental removal from watercourse via construction equipment or asphyxiation as a result of dewatering activities), or through the introduction of a deleterious substance during construction (described below).

SPECIES OF MANAGEMENT CONCERN

Increased fish mortality might have a greater effect on fish SOMC than common fish species because SOMC populations are already approaching critical levels for sustainability as a result of threats to their environment. For many SOMC, biological characteristics make these populations slow to recover from increased mortality. The general effects on mortality of fish described for recreational fisheries apply to SOMC.

Species-specific effects are as follows:

Mapleleaf mussel

Sediment mobilized during in-water construction during the Assiniboine River watercourse crossing replacement may affect mortality of adult mussels within the LAA. Adult mapleleaf mussels are sessile and not capable of leaving a disturbed area. Furthermore, they are filter feeders and have the potential to be affected (buried and effectively starved) by settling sediment from construction activities (DFO 2013c). In-water crossing techniques without mitigation measures have potential to increase the risk of mortality for mapleleaf mussel in the Assiniboine River.

Mapleleaf mussels are documented 9.5 and 13.5 km downstream of the watercourse crossing replacement. Sediment mobilized during in-water construction of the watercourse crossing replacement is expected to settle out of the water column in the large pool formed upstream of the diversion, and is unlikely to affect mussels located downstream of the diversion.

River sediment dispersion modelling of sediment transport was conducted to investigate the dispersion of sediments suspended in the water column during proposed fall and spring trenching activities, and to estimate the extent, duration and concentration of sediment transported in the Assiniboine River during construction. Sediments mobilized and transported during trenching activities in fall and spring are predicted to move downstream to the Portage Diversion within 7–9 hours, and sediment concentration is expected to return to background levels within 24 hours. Details of the river sediment dispersion modelling are provided in the Assiniboine River Sediment Dispersion Modelling and Substrate Survey TDR (see Volume 22).

Bigmouth buffalo

Biological characteristics of bigmouth buffalo (e.g., delayed maturity) (COSEWIC 2009) make this species highly susceptible to changes in its habitat and slow to rebound from low population levels. In-water crossing techniques without mitigation measures have the potential to increase the risk of mortality for bigmouth buffalo in the Assiniboine River.

Bigmouth shiner

The general effects on mortality of fish described for recreational fisheries apply to bigmouth shiner.

Chestnut lamprey

Biological characteristics of chestnut lamprey (i.e., delayed maturity) (COSEWIC 2010) make this species highly susceptible to changes to their habitat and slow to rebound from low population levels. During their parasitic adult stage, the general effects on mortality of fish described for recreational fisheries apply to chestnut lamprey.

Lake sturgeon

Biological characteristics of lake sturgeon (i.e., longevity, delayed maturity and infrequent spawning) make this species highly susceptible to changes to their habitat and slow to rebound from low population levels (ASRD 2002). In-water crossing techniques without mitigation measures have the potential increase the risk of mortality for lake sturgeon in the Assiniboine River.

INTRODUCTION OF DELETERIOUS SUBSTANCES

COMMERCIAL, RECREATIONAL AND ABORIGINAL FISHERIES

Deleterious substances introduced during construction of watercourse crossings might affect fish and fish habitat. Deleterious substances introduced at watercourse crossings during construction might include sediment and hydrocarbons (e.g., spills from construction equipment).

Introduction of sediment into a watercourse might induce a wide range of biological effects. At lower suspended sediment concentrations, the effects might include subtle behavioural changes in fish, such as avoidance reactions. These reactions might lead to higher energy expenditures by individual fish and changes in territorial responses in some species (Newcombe and Jensen 1996; DFO 2013d). At higher concentrations, the introduction of fine suspended sediment, such as silts and clays, might induce sublethal effects, such as reduced feeding efficiency, decreased predator avoidance and lower growth rates (Newcombe and Jensen 1996). Fish mortality might also occur as a result of heavy gill abrasion at high sediment concentrations (Herbert and Merkins 1961; DFO 2013d). Continuous elevated sediment levels might decrease overall fish production in a watercourse because of turbidity-related reductions in algae and in benthic and aquatic insect production.

When water velocities slow, the suspended sediment might settle out and smother benthic invertebrate communities or fish eggs and larvae if they are present in a watercourse, and degrade water quality (Alberta Transportation 2009; DFO 2013c). If high volumes of fines (i.e., silt, clay, and sand) are deposited, pool and run habitat might be infilled or the voids in gravel and cobble bed materials might become embedded. This alteration of downstream streambed conditions might affect the abundance and

diversity of benthic invertebrate communities and availability of feeding and spawning areas (Reid and Anderson 2002; DFO 2013d).

Although relatively tolerant to silty waters, several recreational species in the RAA of the Assiniboine River require clear water with gravel, pebble or rock substrate in which to spawn (Scott and Crossman 1998). In-water work might result in increased sediment input and mobilization of sediment downstream of a crossing that might cover spawning substrate. Coarse and forage fish species that are prey species for recreational fisheries in the RAA are highly tolerant of sediment influxes into their environment (Scott and Crossman 1998).

DFO's pathways of effects models identify the use of heavy equipment in or adjacent to fish habitats as a potential source of contaminants (DFO 2010d). Hydrocarbons such as oil, gasoline, lubricants and hydraulic fluids might enter surface water from machinery used for in-water construction or from maintenance and fuelling activities carried out near a watercourse. Ecological effects might range from direct mortality of fish or other aquatic biota, to persistent and progressive accumulation in sediment or biological tissues, which could impair health, vigour or productive capacity (Alberta Transportation 2009). The extent of the effect is determined by the amount of the release, the type of hydrocarbon (that might determine the residence time in the aquatic system) and the flow rate in the watercourse (that determines the extent of downstream transport). A hydrocarbon spill is considered an accident, malfunction, or unplanned event and will be assessed separately in Volume 19.

Species of Management Concern

SOMC species may have specialized habitat or biological requirements that have narrow tolerances to turbid waters, sedimentation or deleterious substances, including drilling fluid and hydrocarbons. Introduction of deleterious substances might have a greater effect on fish SOMC populations than on common fish populations, as individual species or habitats are critical to the population and persistence of the species. The general effects of deleterious substances on fish described for recreational fisheries apply to SOMC.

Species-specific effects are presented as follows.

Mapleleaf mussel

Adult mapleleaf mussels are highly susceptible to settling suspended sediments and changes in water quality (SARA 2013). Sedimentation of substrates and the introduction of hydrocarbons have the potential to adversely affect mapleleaf mussel populations in the LAA.

Bigmouth buffalo

Bigmouth buffalo are adapted to turbid conditions (Stewart and Watkinson 2004); however, an increase in silt or sediment into the watercourse might increase water turbidity and smother eggs (DFO 2013d).

Bigmouth shiner

Bigmouth shiner are adapted to turbid conditions (Stewart and Watkinson 2004); however, an increase in silt or sediment into the watercourse might increase water turbidity and smother eggs (DFO 2013d).

Chestnut lamprey

Chestnut lamprey require coarse substrates in which to spawn and build nests (Stewart and Watkinson 2004). An increase in silt or sediment into the watercourse might change substrate and smother eggs (DFO 2013d).

Lake sturgeon

Lake sturgeon might be negatively affected by increased sedimentation on coarse substrates especially during spawning and early life stages. An increase in silt or sediment deposition might smother lake sturgeon eggs (DFO 2013d). Hydrocarbons introduced to the watercourse might kill lake sturgeon or impair health, vigour or productive capacity (Alberta Transportation 2009).

6.3.2.2 Construction of Pipeline Crossings

Crossing methods used for the Cromer lateral will likely be trenched methods (i.e., open-cut or isolation [dam and pump or flume]. See Volume 14, Section 2 for a description of watercourse crossing methods as well as the selection process for determining the appropriate crossing method for each watercourse. The final crossing methods used will be determined by a qualified engineering team, which will consider engineering and constructability requirements, fisheries values and protection of riparian habitats. No trenchless methods are currently proposed for the Saskatchewan and Manitoba segment. Construction equipment access might require temporary watercourse crossings. Various methods might be used for the Project, including temporary clear-span bridges, fords and snowfills.

The relative risk to fish and fish habitat from pipeline crossings is described in Pipeline Associated Watercourse Crossings (CAPP 2005). Project-specific effects are the same as those described for construction of watercourse crossing replacement (see Section 6.3.2.1). No SOMC were identified in the RAA of watercourses crossed by the Cromer lateral pipeline.

6.3.2.3 Construction of Facilities

A 30 m setback from a water body is recommended as an acceptable distance to protect the riparian area and buffer the overland effects that construction may have on fish and fish habitat in several best management practices (e.g., Stepping Back from the Water [ESRD 2012] and Ontario Natural Heritage Reference Manual [MNR 2010]). This distance is standard in industry regulations across Canada (e.g., BC Riparian Areas Regulation [BCMWLAP 2004], New Brunswick Watercourse and Wetland Alteration Regulation [NBDELG 2012]). Project-specific effects related to facility construction within 30 m of a water body are addressed below.

CHANGE IN FISH HABITAT

COMMERCIAL, RECREATIONAL AND ABORIGINAL FISHERIES

Construction of facilities might alter riparian vegetation, stability of watercourse bed and banks, and in-water habitat. Habitat might be lost or altered during removal or alteration of fish habitat during watercourse realignment, channelization or infilling.

Work in or near water involving excavation and soil disturbance could increase the rate of sediment input (particularly of fines) to the watercourse, and temporarily increase the sediment load (Alberta Transportation 2009). Excavation near or in a watercourse channel disrupts the existing bed and banks in the RoW and might result in temporary or longer-term degradation of habitat quality in the affected area. The extent of this effect is determined by physical factors, such as channel width, flow characteristics, substrate types and construction timing. The level of the effect depends on the sensitivity of the aquatic habitats relative to their importance in sustaining the resident aquatic biota. Sensitive habitat generally includes areas that are important for completing essential life processes, such as spawning, rearing, migrating and overwintering.

Riparian vegetation and bank stability are important watercourse characteristics because they influence the rate of riparian soil erosion, provide filtration of overland flow from the surrounding land, and provide cover, cooling shade and food (e.g., terrestrial invertebrates) for fish. Loss of riparian habitat as a result of construction activities could reduce cover, increase water temperature, and negatively affect invertebrate populations.

Many fish species found in the RAA have specialized habitat requirements for certain life stages (e.g., specific substrate requirements for spawning); therefore, changes in fish habitat might negatively affect fish populations by reducing success of spawning, rearing, foraging or other important life processes.

SPECIES OF MANAGEMENT CONCERN

No SOMC were identified in the RAA of the Chaplin A, Cartier, Iles des Chenes pump stations or the Moosomin tank terminal.

CHANGE IN FISH MOVEMENT, MIGRATION AND FISH PASSAGE

COMMERCIAL, RECREATIONAL AND ABORIGINAL FISHERIES

Construction of facilities might result in a temporary blockage or diversion of flow resulting in the partial or complete blockage of fish passage. Construction of facilities might require isolation of a watercourse or water body that might prevent the movement, migration or passage of fish. Construction of facilities might require a diversion of a watercourse that might prevent upstream or downstream fish migration if the diversion occurs during the migratory period of fish species in the RAA. The degree of alteration or restriction might depend on the timing of construction and the mitigation measures applied.

Several fish species in the RAA spawn in spring or early summer in smaller watercourses and require open migratory pathways to reach their spawning grounds (Scott and Crossman 1998). During construction of facilities, fish might avoid the vicinity of the work area if water quality is impaired by high suspended sediment concentrations.

SPECIES OF MANAGEMENT CONCERN

No SOMC were identified in the RAA of the Chaplin A, Cartier, Iles des Chenes pump stations or the Moosomin tank terminal.

CHANGE IN FISH MORTALITY

COMMERCIAL, RECREATIONAL AND ABORIGINAL FISHERIES

Fish are subject to two sources of increased mortality risk during facility construction: through the direct risk of mortality during in-water construction activities (e.g., contact with machinery, entrapment on pump intakes, accidental removal from watercourses via construction equipment or asphyxiation as a result of dewatering activities), or through the introduction of a deleterious substance during construction (described below).

SPECIES OF MANAGEMENT CONCERN

No SOMC were identified in the RAA of the Chaplin A, Cartier, Iles des Chenes pump stations or the Moosomin tank terminal.

INTRODUCTION OF DELETERIOUS SUBSTANCES

COMMERCIAL, RECREATIONAL AND ABORIGINAL FISHERIES

The introduction of deleterious substances might affect fish and fish habitat. Deleterious substances introduced into watercourses during in-water work might include sediment and hydrocarbons (e.g., spills from construction equipment).

In-water work might result in increased sediment input and mobilization of sediment downstream of a crossing that might cover spawning substrate. Coarse and forage fish species that are prey species for the recreational fishery in the RAA are highly tolerant of sediment influxes into their environment (Scott and Crossman 1998).

Operation or fueling of machinery adjacent to a watercourse has the potential to result in the introduction of hydrocarbons.

See Section 6.3.2.1 for a description of the potential effects on fish and fish habitat from the introduction of sediment and hydrocarbons into a watercourse.

SPECIES OF MANAGEMENT CONCERN

No SOMC were identified in the RAA of the Chaplin A, Cartier, Iles des Chenes pump stations or the Moosomin tank terminal.

6.3.2.4 Construction of Permanent Access Road Crossings

Construction of new facilities might require the installation of permanent access roads that may cross watercourses along the route. Where possible, access roads will be upgrades of existing roads or trails. Several watercourse crossing methods may be used for the Project, including but not limited to culverts and clear-span bridges (see Volume 14, Section 2). Project-specific effects are similar to those described for pipeline crossings (see Section 6.3.2.1). Seven potential watercourses crossed by permanent access roads were assessed.

Construction equipment access may require temporary watercourse crossings. Various methods might be used for the Project, including temporary clear-span bridges, fords and snowfills.

6.3.2.5 Operation

During the operation phase, maintenance activities along the pipeline ROW and within facility footprints can have potential effects on fish and fish habitat. Potential effects related to operation are predicted to be essentially the same for commercial, recreational and Aboriginal fisheries as they are for SOMC; therefore, these key indicators are assessed together. The operation phase is anticipated to present a low risk to fish and fish habitat as operation activities do not directly interact with or affect watercourses. However, routine maintenance along the pipeline ROW and within facility footprints may involve temporary watercourse crossings or fording of watercourses, as well as riparian vegetation management and potential use of herbicides to control noxious or invasive riparian vegetation species. The operation and use of permanent access road crossings may involve bridge and culvert maintenance activities (e.g., bridge deck cleaning).

CHANGE IN FISH HABITAT

Temporary watercourse crossings or fording of watercourses, riparian vegetation management and potential use of herbicides to control noxious or invasive riparian vegetation could lead to changes in fish habitat.

CHANGE IN FISH MOVEMENT, MIGRATION AND FISH PASSAGE

Temporary watercourse crossings or fording activities could interact with fish movement when vehicles are in a watercourse, temporarily blocking passage or causing fish to temporarily move out of the immediate area of the activity.

CHANGE IN FISH MORTALITY

Temporary watercourse crossings or fording required during operation and maintenance activities could result in direct or indirect fish mortality if fish are present at the time and location of in-water work.

INTRODUCTION OF DELETERIOUS SUBSTANCES

Temporary watercourse crossings or fording could result in the introduction of a deleterious substance if sediment is released at the crossing location. Riparian vegetation management involving herbicide use (i.e., to control noxious or invasive riparian vegetation species) could introduce herbicides into watercourses. Reduced riparian vegetation (as a result of riparian vegetation management) might also increase sediment loads because of erosion and runoff. Bridge and culvert maintenance activities (e.g., bridge deck cleaning) could introduce sediment into watercourses.

6.4 Mitigation

Siting and design considerations and mitigation measures (Table 6-4) are recommended to avoid or minimize potential effects on fish and fish habitat during construction and operation of the Project. These siting and design considerations and mitigation measures are included in the EPPs.

6.4.1 Siting and Design Considerations

During detailed design, the following siting and design considerations should be applied:

- For pipeline crossings
  - Route the pipeline to avoid sensitive areas.
  - Select the appropriate watercourse crossing method following Energy East's Watercourse Crossing Selection Process (see Volume 14, Section 2).
- For construction of new facilities, the following mitigation measures are recommended based on an assessment that likely overestimates the effect of a facility on a watercourse or water body:
  - Relocate or redesign the facility to avoid construction within the bed and banks of a watercourse or water body is the first measure recommended (DFO 2013e). Where practicable, site facilities 30 m away from a watercourse or water body.
  - Where it is not possible to site facilities 30 m away from a watercourse or water body, site them above the high water mark such that they do not disturb the bed or bank of a watercourse or water body. See Volume 14, Section 4.10, Table 4-1 for siting criteria for facilities.
  - For facilities where disturbance to the bed or bank or watercourse realignments may occur, obtain necessary approvals from federal and provincial regulators.
- For permanent access road crossings:
  - Locate permanent access roads on existing roads, where practicable
  - Select appropriate access road crossing structures to provide sufficient water depth and velocity for fish passage.

6.4.2 Constructing within the Restricted Activity Period

Due to the scope and scale of the Project, construction outside the restricted activity period (RAP) may not be possible for all construction near and in watercourses. Where construction within the RAP is required, the following mitigation measures are recommended to reduce potential effects on fish and fish habitat:

- Schedule construction for when watercourses are dry or frozen to the bottom during low-flow periods, or outside of CRA spawning or migration periods, unless otherwise approved by the appropriate regulatory agency.
- Consult appropriate regulatory agencies to determine whether permits or approvals are necessary, and apply for and obtain approvals in advance of in-water construction.

- Where in-water work is required, install site isolation measures or measures to contain suspended sediment (e.g., silt boom or silt curtain), where possible.
- Conduct water quality monitoring during construction to avoid turbidity levels that exceed Canadian Council of Ministers of the Environment (CCME) guidelines (i.e., 8 NTU above background over a 24 hour period or 2 NTU over background over a greater than 30 day period [CCME 2002]).

6.4.3 Mitigation Measures

The mitigation measures recommended to avoid or minimize potential effects on fish and fish habitat during construction are shown in Table 6-4. The EPPs include all recommended mitigation measures and contingency plans (see Volume 21).

In addition to the recommended measures shown in Table 6-4, activities near water should be carried out following standard guidance (e.g., DFO *Measures to Avoid Causing Harm to Fish and Fish Habitat* [DFO 2013e], *Pipeline-Associated Watercourse Crossings* [CAPP et al. 2005]) that reduce effects on fish and fish habitat and on SOMC.

Table 6-4 Recommended Mitigation Measures for Fish and Fish Habitat

Effect	Recommended Mitigation Measures

Change in Fish Habitat	**For pipeline crossings and the Assiniboine River watercourse crossing replacement:**
	• Abide by all applicable provincial and federal permits and authorization conditions.
	• Establish and clearly identify a riparian buffer or minimal disturbance zone (MDZ) for all watercourses and water bodies before the start of clearing activities. RoWs should be narrowed in these areas to the extent practical. Disturbance in the MDZ should be restricted to allow access crossing construction (if required), excavation of the trench, and installation of the pipeline.
	• Limit clearing at watercourse and water body crossings to the removal of trees and shrubs to the ditch line and work side areas required for vehicle crossings.
	• Fell trees away from watercourses and water bodies. Immediately remove trees, debris or soil inadvertently deposited below the high watermark of a watercourse.
	• Reduce grubbing near watercourses and water bodies, muskeg, and other wet areas to facilitate the restoration of shrub communities.
	• Monitor weather reports and watercourse flow before beginning construction to determine if no risk of heavy precipitation exists for the expected duration of the work. The construction schedule should be modified in accordance with local weather and site conditions to the extent practicable.
	• Where poor weather conditions and project activities have the potential to cause increased sedimentation, modify or suspend the construction stage until weather conditions abate or effective mitigation procedures have been implemented. This response should be outlined in an Adverse Weather Contingency Plan.
	• No construction activity will occur within the RAP for any watercourse or water body unless:
	  • it is dry or frozen to the bottom at the time of construction; or
	  • trenchless techniques are employed; or
	  • the appropriate regulatory agency is consulted to determine whether permits or approvals are necessary

Table 6-4 Recommended Mitigation Measures for Fish and Fish Habitat

Effect	Recommended Mitigation Measures
Change in Fish Habitat (cont'd)	• Obtain all applicable regulatory permits and authorizations before the start of watercourse and water body crossing construction. • The Contractor will develop a detailed site-specific pipeline crossing plan that meets provincial and federal requirements and submit the plan to the Company prior to initiating any watercourse or water body crossing activities. • Before the installation of the pipeline crossing and the commencement of in-water activity, the Contractor will make sure that all necessary equipment and materials are available and are on-site. • The Contractor will weld, coat, and weight the water crossing portion of pipe prior to starting in-water ditching activities. To reduce the length of time of in-water activity, the Contractor will make every effort to ditch, lower-in, and backfill water crossings during the same working day. • When implementing a trenched (i.e., open cut or isolated) pipeline installation method, and where practicable, salvage the upper 0.5 m (minimum) of granular material if present. Stockpile separately from the remainder of the trench spoil so that the salvaged, native granular material can be used to cap the upper portion of the trench. • Postpone watercourse or water body crossing construction if excessive flows or flood conditions exist or are anticipated, and construction methods cannot be modified to cope with the increased flow, follow the Flood and Excessive Flow Contingency Plan. • Return the bed and banks of each watercourse or water body as close as possible to original preconstruction contours. Do not realign or straighten watercourses or change hydraulic characteristics. • Place only imported clean coarse material (gravel or rock), or native material removed from the trench, as the final 0.5 m of backfill. Any imported material must be obtained from an approved off-site facility. • Implement permanent bank reclamation measures to re-establish riparian vegetation and fish habitat as a part of backfill operations. • Seed disturbed banks and riparian areas with an approved native seed mixture. The Environmental Inspector(s) will determine onsite whether other restoration methods need to be applied to stabilize banks (e.g., soil wraps, brush layers and matting). • Do not permit fording of watercourses or water bodies unless approved by the applicable regulatory authority. • Consider alternative methods of vehicle crossings on a site-specific basis. The decision-making process will include the Contractor, Construction Manager and the Environmental Inspector(s). Decision criteria will include protection of the riparian vegetation and fisheries values associated with the crossing, and applicable legislation. • Construct or install temporary vehicle access across watercourses and water bodies, shorelines, and riverbanks in a manner that protects the banks from erosion and maintains the streamflows. • Construct all bridges (single-span or ice and snow fill) beyond the ends of the banks and with a minimum depth of 0.5 m of snowfill or fill material at each bank. Do not place fill within primary banks for bridge abutment construction, unless approved by the appropriate regulatory agency. • During winter construction, where conditions permit, employ ice and snowfill bridges as temporary crossing structures. Install ice and snowfill bridges using water drawn from an approved source and/or clean snow plowed in from surrounding areas or made.

Table 6-4 Recommended Mitigation Measures for Fish and Fish Habitat

Effect	Recommended Mitigation Measures
Change in Fish Habitat (cont'd)	• If conditions will not support the construction of ice/snowfill bridges, then employ other temporary crossing structures approved by regulatory agencies. • Remove all temporary vehicle crossing structures, prior to spring break-up. Remove or breach snow or ice bridges to make sure they do not impede flow. • If hauling in of fill material is required during the construction of bridge abutments with wings, place geotextile fabric between the fill material and the surface layer. • Line single-span bridges with impervious geotextile. All crossing structures must have a minimum of 30 cm high side boards. Side containment for single span bridges must be constructed of plywood. Snow bridges can use watered snow. • Use only clean ice/snow for construction of an ice/snowfill or ice bridge. Approaches to the bridge should be constructed with compacted snow and ice of sufficient thickness to protect the stream channel and banks. Sand, gravel and soils are not to be used for ice bridge approaches. **For watercourses within 30 m of facilities:** • Where practical, maintain natural watercourse conditions (e.g., widths, slopes, substrate, cover, habitat unit). • Do not realign the watercourse, alter the watercourse bed or banks or infill the channel, unless otherwise approved. • Where work in-channel requires channel realignment or infill, and is authorized by regulatory authorities, design and construct works to maintain or enhance the quality and productivity of fish habitat. • Where work in a watercourse or water body is required, restore bed and banks to pre-construction condition or better. **For permanent access road crossings:** • Align culverts or bridges parallel to the existing natural channel and locate them on a straight watercourse section of uniform gradient. • Where practical, maintain natural substrate and hydraulic capacity of watercourses using open bottom/bottomless arch culverts. Install footings for open bottom culverts or bridge outside the normal wetted perimeter of the watercourse, and tie into the bedrock or sufficiently stabilize to prevent erosion or undermining around footings. • Do not locate culverts or bridges on meander bends, braided watercourses, alluvial fans, active flood plains or areas that are inherently unstable.
Change in Fish Movement, Migration and/or Fish Passage	**For pipeline crossings and the Assiniboine River watercourse crossing replacement:** • Maintain downstream flow at all times when conducting in-water construction activities. • Make sure water and pump intakes reduce or avoid disturbance of the streambed and are screened with a maximum mesh size of 2.54 mm and approach velocity of 0.038 m/s. To accomplish this, where pumps larger than 15 cm diameter are used, place the intakes in a mesh cage (2.54 mm) to reduce the approach velocity that fish are exposed to and prevent them from being impinged on the intakes. Maintain the screens free of debris. • Construct or install temporary vehicle access across watercourses and water bodies, shorelines, and riverbanks in a manner that does not obstruct or impede fish movement, migration or fish passage.

Table 6-4 Recommended Mitigation Measures for Fish and Fish Habitat

Effect	Recommended Mitigation Measures
Change in Fish Movement, Migration and/or Fish Passage (cont'd)	• If water withdrawal is necessary for the construction of a temporary crossing or hydrostatic testing, make sure that necessary regulatory approvals are in place and follow DFO conditions, if applicable. • If used as a temporary vehicle crossing structure, make sure ice bridges or snowfills do not interfere with or impede winter flows. • Do not withdraw more than 10% of the instantaneous stream flow at any given time. • The Company must authorize the water withdrawal sources for hydrostatic testing purposes (i.e., must have sufficient quantity and quality of water) as well as the Contractor's test plan, including discharge locations, no less than 30 days prior to testing. • Prior to discharge of hydrostatic test water, make sure appropriate testing and treatment measures are implemented in accordance with local regulatory requirements. **For watercourses within 30 m of facilities:** • Where in-channel work requires channel realignment or infill, and is authorized by regulatory authorities, design and construct channel or infill such that fish movement, migration and fish passage is maintained or enhanced. **For permanent access road crossings:** • Select culvert size to provide sufficient depth of flow and appropriate water velocities for fish passage. • Select culvert size based on the capacity required to handle peak flows. • If used, install cylindrical culverts to simulate open bottom or pipe arch culverts. Set the culvert bottom at least 0.15 m (or 10–20% of culvert diameter, whichever is greater) below the streambed elevation to allow for fish passage and reduce the risk of undermining the culvert. Adjust the diameter of the culvert to avoid countersinking, which reduces the hydraulic capacity of the culvert. • Size and install culverts so that scouring of the outlet streambed does not occur as a result of increased water velocities in the culvert. • Provide a minimum water depth of 0.20 m throughout the culvert length. To maintain water depth at low flow periods, construct an outlet pool and an inlet pool if necessary. • Construct the invert of the pool outlet at culverts at an elevation that maintains a minimum of 0.20 m of water depth up to the inlet or upstream end of the culvert. • Where practical, the culvert slope should follow the existing streambed slope. Consider excessive culvert slope, reduced culvert capacity from countersinking and maintenance of the 0.20 m minimum depth of flow, and back watering for creation of an outlet pool when selecting the required culvert diameter to allow fish passage and pass peak flows. • Within constricted watercourses with high water velocities, or wide watercourses, install baffles or weirs in the culvert to provide an adequate depth of flow and reduce the water velocity in order to facilitate fish passage.

Table 6-4 Recommended Mitigation Measures for Fish and Fish Habitat

Effect	Recommended Mitigation Measures
Change in Fish Mortality	**For all Project components:** • Project personnel are not permitted to hunt or fish recreationally on the work site. • The Contractor will notify the Company 72 hours before construction of any watercourse or water body crossing or diversions to make sure fish salvage operations are conducted, where required. • Where recommended by an aquatics specialist (i.e., Qualified Aquatic Environmental Specialist or provincial equivalent), conduct a fish salvage led by an aquatic specialist. • Conduct fish salvage, in accordance with permit conditions, using appropriate methods and equipment. Release all captured fish to areas outside of the work area that provide suitable habitat. • To reduce or prevent mortality of mussel SAR, mussels should be relocated prior to in-water works using the steps outlined in DFO's *Protocol for the Detection and Relocation of Freshwater Mussel Species at Risk in Ontario-Great Lakes Area (OGLA)* (Mackie et al. 2008).
Introduction of Deleterious Substances	**For all Project components:** • Where practical, install site isolation measures (e.g., silt boom or silt curtain) for containing suspended sediment where in-water work is required (e.g., non-isolated in-water activities). **For pipeline crossings and the Assiniboine River watercourse crossing replacement:** • Establish and clearly identify a riparian buffer or MDZ for all watercourses and water bodies before the start of clearing activities. RoWs should be narrowed in these areas to the extent practical. Disturbance in the MDZ should be restricted to allow access crossing construction (if required), excavation of the trench, and installation of the pipeline. • Install erosion and sediment control at all watercourses and/or water bodies as directed by the Environmental Inspector(s). • When soil conditions become such that implementing erosion and sediment control mitigation is not practical (e.g. due to weather conditions), reduce the number of vehicles on access roads or pipeline RoW to limit erosion risks. This response should be outlined in a Wet Soils Contingency Plan. • Make sure that grubbing, stripping and grading on approach slopes to watercourses and water bodies is restricted to an amount required to allow the safe passage of equipment, excavation of the trench, and installation of the pipeline. • Where practical, delay grading of the primary banks of watercourses and water bodies until immediately before construction of the crossing. If required, appropriate temporary erosion and sediment control structures will be installed at the discretion of the Environmental Inspector(s), upon initial disturbance of the vegetative mat and strippings. • If spoil is likely to be highly saturated, excavate a pit or construct berms of packed earth to prevent spoil from flowing into a watercourse or water body. Locate containment berms and spoil outside of the MDZ and install temporary erosion and sediment controls. • Store excavation material outside the MDZ during open cut construction.

Table 6-4 Recommended Mitigation Measures for Fish and Fish Habitat

Effect	Recommended Mitigation Measures

Introduction of Deleterious Substances (cont'd)	• Develop water quality monitoring plans to monitor for sediment release events during in-water construction activities where required by regulatory approvals. If monitoring reveals sediment values are approaching threshold values, the water quality monitors will alert the Environmental Inspector(s) and work with them to develop corrective actions. If corrective actions are not successful, construction activities will be temporarily suspended until effective solutions are identified.
	• If trenchless methods are used, develop a water quality monitoring plan with input from an aquatics specialist that includes monitoring for TSS and/or turbidity.
	• Develop an emergency response plan that will be implemented in the event of inadvertent releases of drilling mud or spills of deleterious substances during the construction of the trenchless crossings.
	• In the event of inadvertent releases of drilling mud or spills of deleterious substances during the construction of the trenchless crossings, implement the Directional Drilling Procedures and Instream Drilling Mud Release Contingency Plan.
	• Make sure water from flumes, dam and pumps, diversion or other methods does not cause erosion or introduce sediment into the channel.
	• If the trench requires dewatering, pump water onto stable, well vegetated areas, tarpaulins, sheeting, rocks, sand bags, or into settling ponds, filter bags, or other appropriate sediment filtering devices, as determined by the Environmental Inspector(s). Complete dewatering in a manner that does not cause erosion or allow sediment to re-enter a watercourse or water body.
	• Where water erosion is evident, and there is potential for runoff from the right-of-way to flow into a watercourse or water body, refer to the Soil Erosion Contingency Plan.
	• Collect all storm water and surface runoff within facility site and release back to the watershed free from contamination, as outlined in a Storm Water Management Plan.
	• The Contractor will make sure equipment is well maintained and free of fluid leaks.
	• Do not allow fuel, oil, or hazardous material storage within 100 m of a watercourse or water body except where secondary containment is provided.
	• Make sure pumps, generators and light towers used within 100 m of a watercourse or water body crossing have secondary containment that can hold a capacity of 125% of the fuel tank.
	• Conduct refuelling at least 100 m away from any watercourse or water body, where practicable.
	• Employ the following measures to reduce the risk of fuel spills in water. Where equipment refuelling is required within 100 m of a watercourse or water body, make sure that:
	  • all containers, hoses, nozzles are free of leaks;
	  • all fuel nozzles are equipped with automatic shut-offs; and
	  • always have operators stationed at both ends of the hose during fuelling
	• Equipment to be used in or adjacent to a watercourse or water body will be clean or otherwise free of external grease, oil or other fluids, mud, soil and vegetation, prior to entering the water body.
	• Make sure no vehicles or equipment that contain petroleum, oil, or lubricants are parked or stationed in a watercourse or water body at any time except for equipment that is required for that immediate phase of construction.

Table 6-4 Recommended Mitigation Measures for Fish and Fish Habitat

Effect	Recommended Mitigation Measures
Introduction of Deleterious Substances (cont'd)	• Do not wash equipment or machinery in, or within 100 m of, watercourses or water bodies. • In the event of a spill, refer to the Spill Contingency Plan.Dispose of all waste drilling fluid and drilling solids according to and in conformance with pertinent regulatory requirements. • Excavate entry and exit sites back from the ordinary high water mark and far enough from the watercourse or water body to provide for containment of sediments and other deleterious substances above the high water mark. • Vegetation removal for the entry and exit sites is only to occur within the approved construction right-of-way and temporary workspace. • Make sure that water from dewatering entry and exit sites with a high sediment load is not discharged or allowed to flow into any watercourse or water body. Remove the sediment load (e.g., filter or discharge into a vegetated area, as approved by the Environmental Inspector(s)) before discharge water is allowed to enter any watercourse. • The Company must authorize the water withdrawal sources for testing purposes (i.e., must have sufficient quantity and quality of water) as well as the Contractor's test plan, including discharge locations, no less than 30 days prior to testing. • Shunt test water ahead from test section to test section to the extent possible to minimize water hauling, water usage and number of dewatering points. • Prior to discharge of hydrostatic test water, make sure appropriate testing and treatment measures are implemented in accordance with local regulatory requirements. • Discharge hydrostatic test water into the same drainage basin from which it was withdrawn, unless otherwise approved by the appropriate authority. • Preserve water quality, including preventing the introduction of foreign material (debris, sediment, etc.) into the receiving watercourse or water body. • Prohibit the use of herbicides within 30 m from a watercourse or water body, unless the herbicide application is conducted by ground application equipment, or otherwise approved by the relevant regulatory agency. **For permanent access road crossings:** • During bridge and culvert maintenance activities (e.g., bridge deck cleaning), implement appropriate silt and sediment controls to prevent silt or sediment from entering the watercourse or water body.

6.5 Residual Effects and Determination of Significance

This assessment considers residual effects on fish and fish habitat after general mitigation is implemented. Residual effects are characterized based on several criteria (see Table 6-5) and on the expected effectiveness of mitigation measures (see Section 6.4).

6.5.1 Residual Effects Description Criteria

Table 6-5 provides the effects classification criteria that are applied to make a determination with respect to Project residual effects on fish and fish habitat.

Table 6-5 Effects Classification Criteria – Fish and Fish Habitat

Criteria		Criteria Definitions	
Direction	The expected long-term trend of the effects	Positive	Effect is an increase in the productive capacity of fish habitat compared with baseline conditions and trends
		Negative	Effect is a decrease in the productive capacity of fish habitat compared with baseline conditions and trends
		Neutral	Effect is no change from baseline conditions and trends
Magnitude	The expected change in a measurable parameter or variable relative to baseline case	Low	No change or negligible change in fish and fish habitat
		Moderate	Measurable change to fish and fish habitat that is within applicable guidelines, legislated requirements, and/or federal and provincial management objectives, or that does not affect the sustainability of fish populations.
		High	Measurable change to fish and fish habitat that is not within applicable guidelines, legislated requirements, and/or federal and provincial management objectives, or that results in a change in the sustainability of fish populations
Geographic Extent	The geographic area within which an effect of a defined magnitude is expected to occurs	PDA	Effect restricted to the PDA (i.e., construction RoW and footprints associated with constructing the pipeline, temporary or permanent access roads and associated facilities)
		LAA	Effect extends to the LAA
		RAA	Effect extends to the RAA

Table 6-5 Effects Classification Criteria – Fish and Fish Habitat

Criteria		Criteria Definitions	
Duration	The period of time that is required until the fish and fish habitat VC returns to its baseline condition or the effect can no longer be measured or otherwise perceived	Short-term	Effect is restricted to construction
		Medium-term	Effect occurs throughout construction and operation
		Long-term	Effects continues after decommissioning
		Permanent	Effect unlikely to recover to baseline condition
Frequency	The number of times during a project or a specific project phase that an effect could occur	Single event	Effect (or event) occurs once
		Multiple irregular event	Effect occurs sporadically (and intermittently) throughout assessment period
		Multiple regular event	Effect occurs repeatedly and regularly throughout assessment period
		Continuous	Effect occurs continually over assessment period
Reversibility	The likelihood that a measurable parameter will recover from an effect	Reversible	Recovery from an environmental effect is likely, through active management and mitigation
		Irreversible	Recovery is unlikely
Ecological and Socio-economic Context	The general characteristics of the area in which the project is located	Negligible or limited disturbance	Largely undeveloped land and limited motorized access
		Low disturbance levels	Low levels of recreation use and resources exploration
		Moderate disturbance levels	Forestry, conventional oil/gas extraction activities; isolated permanent facilities and all weather roads
		High disturbance levels	Extensive land modification from industrial complexes, mines, and agriculture

6.5.2 Significance Thresholds for Residual Effects

A significant adverse residual environmental effect on fish and fish habitat is defined as one that results in the serious harm to fish that are part of or support a commercial, recreational or Aboriginal fisheries and where the effect cannot be avoided, mitigated or offset. Significant adverse effects may include:

- effects that will displace fish otherwise occurring in that habitat;
- effects that prevent fish from carrying out one or more of its life processes thereby affecting the sustainability or productivity of a fish population or stock;
- effects that cause the habitat to become unusable or marginalized; and
- effects on fish or fish habitat of high importance (e.g., SOMC, spawning, or other critical habitat required for sustaining fish populations).

All applicable legislation and regulations (i.e., *Fisheries Act*, *SARA, Saskatchewan's Wildlife Act* and *Manitoba Endangered Species Act*) were also considered to be an essential part of the framework for the assessment of residual effects on fish and fish habitat.

6.5.3 Assessment of Residual Effects

6.5.3.1 Construction of Watercourse Crossing Replacement

The watercourse crossing replacement at the Assiniboine River will be crossed using an open-cut method during flowing conditions (see Consolidated Application Volume 5, the appendix for HDD Crossing Feasibility Study – Assiniboine River). Crossing construction will occur outside the RAP, and will be carried out following the conditions and mitigation measures outlined in Section 6.4. The characterization of residual effects on fish and fish habitat due to construction of the Assiniboine River watercourse crossing replacement is as follows, and is presented in Table 6-6.

CHANGE IN FISH HABITAT

For this residual effect, the:

- direction is negative because open-cut crossings within flowing watercourses can result in harm to fish and fish habitat.
- magnitude is moderate. Although construction outside the RAP would reduce disturbance to fish habitat and avoid disruption of sensitive fish species during spawning and rearing, effects on fish and fish habitat are expected to be outside the normal variability of baseline conditions.
- geographic extent is the LAA. Direct habitat disturbance will be limited to the bed and banks of the PDA. Habitat disturbance as a result of sedimentation will occur in the LAA (i.e., the zone of influence [ZOI] where 90% of the sediment potentially generated during construction would be expected to be deposited).
- duration is short term (recovery of the in-water and riparian habitats is expected to be fully achieved following construction). No permanent reduction of fish habitat is expected.

- frequency is single event/multiple irregular events. Disturbances may occur several times throughout the construction process as activity progresses, but the likelihood of multiple disturbances is low.
- effect is reversible. Post-construction bank stabilization techniques are expected to restore the bed and banks to preconstruction condition, and revegetation methods would encourage riparian vegetation to grow and stabilize the banks before spring flows.
- ecological and socio-economic context is a high level of disturbance. Construction occurs in a developed area with high agricultural use. The pipeline PDA follows an existing pipeline RoW that has been previously disturbed and is subject to regular maintenance.

With the application of the guidance in DFO's Fisheries Protection Policy Statement, which includes recommended mitigation measures, residual effects on fish habitat are predicted to be not significant. Prediction confidence is high because proposed mitigation measures reflect accepted industry best practices and have been vetted by regulatory agencies.

CHANGE IN FISH MOVEMENT, MIGRATION AND FISH PASSAGE

For this residual effect, the:

- direction is negative because open-cut crossings in flowing watercourses have the potential to obstruct fish movement, migration and fish passage.
- magnitude is low because mitigation measures, such as reducing duration of in-water work and construction outside the RAP, are expected to reduce obstruction of fish passage and would reduce disturbance to fish migration
- geographic extent is limited to the construction area in the PDA only
- duration is short term. Obstructions to fish movement are expected to be fully removed immediately following construction. No permanent obstruction of fish movement is expected.
- frequency is single event/multiple irregular events. Disturbances may occur several times throughout the construction process as activity progresses, but the likelihood of multiple disturbances is low.
- effect is reversible. Once obstructions have been removed from the watercourse following construction, fish movement, migration and fish passage are expected to return to preconstruction conditions.
- ecological and socio-economic context is a high level of disturbance. Construction occurs in a developed area with high agricultural use. The pipeline PDA follows an existing pipeline RoW that has been previously disturbed and is subject to regular maintenance.

With the application of the guidance in DFO's Fisheries Protection Policy Statement, which includes recommended mitigation measures, residual effects on fish movement, migration and fish passage are predicted to be not significant. Prediction confidence is high because proposed mitigation measures reflect accepted industry best practices and have been vetted by regulatory agencies.

CHANGE IN FISH MORTALITY

Because the potential effects on fish and mussel mortality due to the watercourse crossing replacement at the Assiniboine River differ, and due to the designation of mapleleaf mussel as an endangered species under Schedule 1 of SARA, the residual effects on these two elements were characterized separately.

CHANGE IN FISH MORTALITY

For this residual effect, the:

- direction is negative because open-cut crossings in flowing watercourses have potential to result in mortality to fish.
- magnitude is moderate. Although mitigation measures such as conducting fish rescues prior to in-water work, as well as, construction outside the RAP would limit fish mortality and avoid disruption of sensitive fish species during spawning and rearing, risk of fish mortality are expected to be outside the normal variability of baseline conditions.
- geographic extent is the LAA. Risk of direct fish mortality is expected to be limited to the construction area in the PDA only. Risk of indirect fish mortality (i.e., resulting from sedimentation) might occur in the LAA.
- duration is short term. Risk of direct and indirect mortality of fish is not expected continue following construction. No permanent reduction of recreational fisheries is expected.
- frequency is single event/multiple irregular events. Disturbances may occur several times throughout the construction process as activity progresses, but the likelihood of multiple disturbances is low.
- effect is reversible and not expected to continue following construction. Risk of direct fish mortality is expected to occur only during in-water construction activities. Bank slopes and riparian areas will be contoured and revegetated immediately following construction to limit continued sediment influx into the river.
- ecological and socio-economic context is a high level of disturbance. Construction occurs in a developed area with high agricultural use. The pipeline PDA follows an existing pipeline RoW that has been previously disturbed and is subject to regular maintenance.

With the application of the guidance in DFO's Fisheries Protection Policy Statement, which includes recommended mitigation measures, residual effects on fish mortality are predicted to be not significant. Prediction confidence is high based on the quantity and quality of available baseline data and the mitigation measures in the EPP, which reflect accepted best industry practice and have been vetted by regulatory agencies.

CHANGE IN MUSSEL MORTALITY

Because of the temporary nature of the increased sediment concentrations and the low likelihood of mussels being present within the PDA and downstream of the crossings location, it is unlikely that mapleleaf mussels will be negatively affected by the trenching activities at the Assiniboine River watercourse crossing replacement. Measures to reduce sedimentation, such as conducting trenching activities during periods of lower flow, reducing the duration of instream work and applying in-water

sediment control measures (i.e., sediment curtains), are recommended to prevent sediment disturbance to individual mussels that may be present in the LAA.

Because the presence of mussels in the PDA cannot be ruled out, it is recommended that DFO be consulted before the construction period begins. A mussel survey will be conducted within the PDA prior to the commencement of trenching activities. If mussels are found within the PDA, mussel relocation efforts (conducted under a SARA Section 73 permit) will be implemented following the steps outlined in DFO's *Protocol for the Detection and Relocation of Freshwater Mussel Species at Risk in Ontario-Great Lakes Area* (OGLA) (Mackie et al. 2008).

For this residual effect, the:

- direction is negative because open-cut crossings in flowing watercourses have potential to result in mortality to mussels.
- magnitude is moderate. Although mitigation measures such as conducting mussel relocations prior to in-water work would limit mussel mortality, risk of mussel mortality is expected to be outside the normal variability of baseline conditions.
- geographic extent is the LAA. Risk of direct mussel mortality is expected to be limited to the construction area in the PDA only. Risk of indirect mussel mortality (i.e., resulting from sedimentation) might occur in the LAA.
- duration is short term. Risk of direct and indirect mortality of mussels is not expected to continue following construction.
- frequency is single event/multiple irregular events. Risk of direct mussel mortality will occur only during construction; however, risk of indirect mussel mortality may occur several times throughout the construction process as activity progresses, but the likelihood of multiple disturbances is low.
- effect is reversible and not expected to continue following construction. Risk of direct mussel mortality is expected to occur only during in-water construction activities. Bank slopes and riparian areas will be contoured and revegetated immediately following construction to limit continued sediment influx into the river.
- ecological and socio-economic context is a high level of disturbance. Construction occurs in a developed area with high agricultural use. The pipeline PDA follows an existing pipeline RoW that has been previously disturbed and is subject to regular maintenance.

With the application of the guidance in DFO's Fisheries Protection Policy Statement, which includes recommended mitigation measures, residual effects on mussel mortality are predicted to be not significant. Prediction confidence is high because the likelihood of mussel presence within the PDA is low, based on the results of the substrate survey conducted in the Assiniboine River (see Assiniboine River Sediment Dispersion Modelling and Substrate Survey TDR in Volume 22). Also, the mitigation measures described in the EPPs reflect accepted best industry practice and have been vetted by regulatory agencies.

INTRODUCTION OF DELETERIOUS SUBSTANCES

For this residual effect, the:

- direction is negative because open-cuts within flowing watercourses can introduce deleterious substances to these waterways
- magnitude is moderate. Although implementation of mitigation measures, such as proper erosion and sediment control, and overland water management, will limit sediment from being introduced into the watercourse, mobilization of sediment is expected to be outside the normal variability of baseline conditions. Application of DFO's *Measures to Avoid Causing Harm to Fish and Fish Habitat* during operation of machinery (DFO 2013e) will limit hydrocarbons and other deleterious substances related to equipment use from being introduced into the watercourse.
- geographic extent is the LAA. Introduction of deleterious substances is expected to be confined to the LAA.
- duration is short term (i.e., during construction)
- frequency is single event/multiple irregular events. Disturbances may occur several times throughout the construction process as activity progresses, but the likelihood of multiple disturbances is low.
- effect is reversible. The potential introduction of deleterious substances will only occur during in-water and upland construction activities within 30 m of a watercourse. Introduction of deleterious substances is not expected to continue following construction.
- ecological and socio-economic context is a high level of disturbance. Construction occurs in a developed area with high agricultural use. The pipeline PDA follows an existing pipeline RoW that has been previously disturbed and is subject to regular maintenance.

With the application of the guidance in DFO's Fisheries Protection Policy Statement, which includes recommended mitigation measures, residual effects from the introduction of deleterious substances are predicted to be not significant. Prediction confidence is high because proposed mitigation measures reflect accepted industry best practices and have been vetted by regulatory agencies.

6.5.3.2 Construction of Pipeline Crossings

The Cromer lateral will cross several watercourses that have the potential to support fish or fish habitat (Appendix 6B, Table 6B-2). Crossing construction will occur outside the RAP, and will be carried out following the conditions and mitigation measures outlined in Section 6.4. The characterization of residual effects on fish and fish habitat due to construction of pipeline crossings along the Cromer lateral is as follows, and is presented in Table 6-6.

CHANGE IN FISH HABITAT

The Cromer lateral will cross nine watercourses that have potential fish or fish habitat.

For this residual effect, the:

- direction is negative because isolated and open-cut crossings within flowing watercourses can result in harm to fish and fish habitat

- magnitude is low because mitigation measures, such as proper isolation and sediment control, will minimize disturbance. Construction outside the RAP will reduce disturbance to fish habitat and avoid disruption of sensitive fish species or habitat (e.g., spawning and rearing).
- geographic extent is the LAA. Direct habitat disturbance will be limited to the bed and banks of the PDA. Habitat disturbance resulting from sedimentation may extend through the LAA (i.e., the ZOI where 90% of the sediment potentially generated during construction would be expected to be deposited).
- duration is short-term because recovery of the in-water and riparian habitats is expected to be achieved following construction. No permanent reduction of fish habitat is expected.
- frequency is single event/multiple irregular events. In some cases, disturbances may occur several times throughout the construction process as activity progresses, but the likelihood of multiple disturbances at most watercourses is low.
- effect is reversible because post-construction bank stabilization techniques are expected to restore the bed and banks to preconstruction condition, and revegetation methods will encourage the riparian vegetation to grow and stabilize the banks before spring flows.
- environmental context is a high level of disturbance. Construction occurs in a developed area with high agricultural use.

With the application of the guidance in DFO's Fisheries Protection Policy Statement, which includes recommended mitigation measures, residual effects on fish habitat are predicted to be not significant. Prediction confidence is high because proposed mitigation measures reflect accepted industry best practices and have been vetted by regulatory agencies.

CHANGE IN FISH MOVEMENT, MIGRATION, AND FISH PASSAGE

For this residual effect, the:

- direction is negative because isolated crossings and open-cuts within flowing watercourses have the potential to obstruct fish movement, migration, and fish passage.
- magnitude is low because mitigation measures, such as reducing duration of in-water work, will minimize the potential for obstruction of fish passage. Construction outside the RAP will reduce potential disturbance to fish migration.
- geographic extent is limited to the construction area in the PDA only
- duration is short-term. Obstructions to fish movement are expected to be fully removed immediately following construction. No permanent obstruction of fish movement is expected.
- frequency is single event/multiple irregular events. In some cases, obstructions to fish movement may occur several times at a watercourse throughout the construction process, but the likelihood of multiple disturbances at most watercourses is low.
- effect is reversible because all obstructions will be removed from the watercourse following construction and fish movement, migration and fish passage will be restored to pre-construction conditions.

- environmental context is a high level of disturbance. Construction occurs in a developed area with high agricultural use.

With the application of DFO's Fisheries Protection Policy Statement, which includes recommended mitigation measures, residual effects on fish movement, migration, and fish passage are predicted to be not significant. Prediction confidence is high because proposed mitigation measures reflect accepted industry best practices and have been vetted by regulatory agencies.

CHANGE IN FISH MORTALITY

For this residual effect, the:

- direction is negative because isolated crossings and open-cuts within flowing watercourses have the potential to result in mortality to fish.
- magnitude is low because mitigation measures, such as conducting fish rescues prior to in-water work, as well as, isolation and sediment control to minimize sediment influx into the watercourse, and bank contouring and revegetation immediately following construction, will minimize potential mortality of fish. Construction outside the RAP will reduce mortality to sensitive fish species during spawning and rearing.
- geographic extent is the LAA. Risk of direct fish mortality will be limited to the construction area within the PDA only. Risk of indirect fish mortality as a result of sedimentation may occur within the LAA.
- duration is short-term. Risk of direct and indirect mortality to fish is not expected to continue following construction. No reductions in the productivity or sustainability of recreational fisheries are expected.
- frequency is single event/multiple irregular events. In some cases, risk of direct and indirect mortality to fish may occur several times at a watercourse throughout the construction process, but the likelihood of multiple disturbances at most watercourses is low. No permanent reduction of recreational fisheries is expected.
- effect is reversible and not expected to continue following construction. Risk of direct fish mortality will only occur during in-water construction activities.
- environmental context is a high level of disturbance. Construction occurs in a developed area with high agricultural use.

With the application of the guidance in DFO's Fisheries Protection Policy Statement, which includes recommended mitigation measures, residual effects on fish mortality are predicted to be not significant. Prediction confidence is high because proposed mitigation measures reflect accepted industry best practices and have been vetted by regulatory agencies.

INTRODUCTION OF DELETERIOUS SUBSTANCES

For this environmental effect, the:

- direction is negative because isolated crossings and open-cuts within flowing watercourses have the potential to introduce deleterious substances.
- magnitude is low because mitigation measures, such as proper isolation, sediment control and overland water management, are expected to limit introduction of deleterious substances. Following DFO's *Measures to Avoid Causing Harm to Fish and Fish Habitat* during operation of machinery (DFO 2013e) is expected to limit the introduction of hydrocarbons or other deleterious substances related to equipment use from being introduced into the watercourse.
- geographic extent is the LAA. Introduction of deleterious substances will be confined to the LAA.
- duration is short-term. The potential for introduction of deleterious substance expected to occur only during construction.
- frequency is single event/multiple irregular events. In some cases, the introduction of deleterious substances may occur several times in a watercourse throughout the construction process, but the likelihood of multiple disturbances at most watercourses is low.
- effect is reversible. The potential for the introduction of deleterious substances would only occur during in-water and upland construction activities within 30 m of a watercourse. Introduction of deleterious substances is not expected to continue following construction.
- environmental context is a high level of disturbance. Construction occurs in a developed area with high agricultural use.
- With the application of the guidance in DFO's Fisheries Protection Policy Statement, which includes recommended mitigation measures, residual effects from the introduction of deleterious substances are predicted to be not significant. Prediction confidence is high because proposed mitigation measures reflect accepted industry best practices and have been vetted by regulatory agencies.

6.5.3.3 Construction of Facilities

No residual effects are anticipated for the construction of facilities along the Saskatchewan and Manitoba segment (see Table 6-6). Within the LAA of the facilities, the watercourse that was field surveyed was determined to have no fish habitat (Appendix 6B, Tables 6B-5). Watercourses that have not yet been field surveyed are expected to have low sensitivity fish habitat or no fish habitat, based on a review of baseline information (Appendix 6B, Tables 6B-4).

Where practicable, facilities will be sited so that construction occurs more than 30 m away from a watercourse or water body (see Volume 14, Section 4.10, Table 4-1). However, in the unlikely event that facility construction activities occur within 30 m of a watercourse, a physical disturbance of the bed and banks of the watercourse is unlikely.

Short-term effects caused by facility construction activities will be reduced or eliminated by implementing mitigation measures including sediment and erosion control, and site grading to direct surface water runoff away from the watercourse. With the application of recommended mitigation measures, residual effects on fish and fish habitat are not anticipated.

6.5.3.4 Construction of Permanent Access Road Crossings

Residual effects are anticipated for the construction of seven permanent access road crossings. The characterization of residual effects on fish and fish habitat due to the construction of permanent access road crossings is as follows, and is presented in Table 66.

CHANGE IN FISH HABITAT

For this residual effect, the:

- direction is negative because in-water work and work within 30 m of a watercourse or water body could result in harm to fish and fish habitat.
- magnitude is low because mitigation measures such as proper isolation and sediment control are expected to limit disturbance. Selecting access road crossing structures (e.g., bridges or culverts) and conducting construction outside the RAP, where possible, will reduce disturbance to fish habitat and avoid disruption of sensitive fish species or habitat (e.g., spawning and rearing).
- geographic extent is the LAA because direct habitat disturbance will be limited to the bed and banks of the PDA. Habitat disturbance due to sedimentation might extend throughout the LAA (i.e., the zone of influence [ZOI], where 90% of the sediment potentially generated during construction would be expected to be deposited).
- duration is short-term because recovery of the in-water and riparian habitats is expected following construction. No permanent reduction of fish habitat is expected.
- frequency is single event/multiple irregular events. Disturbance will occur only once at most watercourses during construction. In some cases, disturbances might occur several times throughout the construction process as activity progresses.
- effect is reversible because post-construction bank stabilization techniques are expected to restore the bed and banks to preconstruction condition, and revegetation methods will encourage the riparian vegetation to grow and stabilize the banks.
- ecological and socio-economic context is that the level of disturbance is high. Construction will occur in a developed area with high agricultural use.

With the application of the guidance in DFO's Fisheries Protection Policy Statement, which includes recommended mitigation measures, residual effects on fish habitat are predicted to be not significant. Prediction confidence is high because the residual effects characterization is based on the familiarity of the Project team with the area. The recommended mitigation measures reflect accepted industry best practices and have been vetted by regulatory agencies.

CHANGE IN FISH MOVEMENT, MIGRATION AND FISH PASSAGE

For this residual effect, the:

- direction is negative because in-water work or work within 30 m of a watercourse or water body could temporarily obstruct fish movement, migration and fish passage.
- magnitude is low because mitigation measures, such as reducing the duration of in-water work and conducting construction outside the RAP, where possible, are expected to limit obstruction of fish passage and reduce disturbance to fish migration.
- geographic extent is limited to the construction area in the PDA only because mitigation measures, such as reducing the duration of in-water work and conducting construction outside the RAP, where possible, are expected to limit obstruction of fish passage and reduce disturbance to fish migration.
- duration is short-term because obstructions to fish movement are expected to be fully removed immediately following construction. No permanent obstruction of fish movement is expected with the implementation of mitigation measures such as the selection of appropriate access road crossing structures that provide sufficient water depths and velocities for fish passage.
- frequency is single event/multiple irregular events. Obstruction to fish movement will occur only once at most trenched watercourse crossings during construction. In some cases, obstructions to fish movement might occur several times at a watercourse throughout the construction process.
- effect is reversible because once obstructions are removed from the watercourse or water body following construction, fish movement, migration and fish passage are expected to be restored to preconstruction conditions.
- ecological and socio-economic context is that the level of disturbance is high. Construction will occur in a developed area with high agricultural use.

With the application of the guidance in DFO's Fisheries Protection Policy Statement, which includes recommended mitigation measures, residual effects on fish movement, migration and fish passage are predicted to be not significant. Prediction confidence is high because the residual effects characterization is based on the familiarity of the Project team with the area. The proposed mitigation measures reflect accepted industry best practices and have been vetted by regulatory agencies.

CHANGE IN FISH MORTALITY

For this residual effect, the:

- direction is negative because in-water work or work within 30 m of a watercourse or water body could result in mortality of fish.
- magnitude is low because mitigation measures, such as conducting construction outside the RAP, where possible, and conducting fish salvages prior to construction, are expected to limit fish mortality. Construction outside the RAP, where possible, would reduce mortality of sensitive fish species during spawning and rearing.
- geographic extent is the LAA. The risk of direct fish mortality is expected to be limited to the construction area in the PDA only. Risk of indirect fish mortality due to sedimentation might occur within the LAA.

- duration is short-term. The risk of direct and indirect mortality of fish is not expected to continue following construction. No permanent reduction of recreational fisheries is expected.
- frequency is single event/multiple irregular events. The risk of direct and indirect mortality of fish will occur only once at most watercourse crossings during construction. In some cases, the risk of direct and indirect mortality of fish might occur several times at a watercourse throughout the construction process.
- effect is reversible because the risk of direct fish mortality will occur only during in-water construction activities.
- ecological and socio-economic context is that the level of disturbance is high. Construction will occur in a developed area with high agricultural use.

With the application of the guidance in DFO's Fisheries Protection Policy Statement, which includes recommended mitigation measures, residual effects on fish mortality are predicted to be not significant. Prediction confidence is high because the residual effects characterization is based on the familiarity of the Project team with the area. The proposed mitigation measures reflect accepted industry best practices and have been vetted by regulatory agencies.

INTRODUCTION OF DELETERIOUS SUBSTANCES

For this residual effect, the:

- direction is negative because in-water work or work within 30 m of a watercourse or water body could introduce deleterious substances to these watercourses.
- magnitude is low because mitigation measures, such as proper isolation, sediment control and overland water management, are expected to limit the introduction of deleterious substances. Following DFO's *Measures to Avoid Causing Harm to Fish and Fish Habitat* during operation of machinery (DFO 2013e) is expected to limit the introduction of hydrocarbons or other deleterious substances related to equipment use.
- geographic extent is the LAA. The introduction of deleterious substances will be confined to the LAA.
- duration is short-term (i.e., during construction) because the potential for the introduction of deleterious substances is expected to occur only during construction.
- frequency is single event/multiple irregular events. The introduction of deleterious substances will occur only once at most watercourses during construction. In some cases, the introduction of deleterious substances might occur several times at a watercourse throughout the construction process.
- effect is reversible because the potential introduction of deleterious substances is expected to occur only during in-water and upland construction activities within 30 m of a watercourse or water body. The introduction of deleterious substances is not expected to continue following construction.
- ecological and socio-economic context is that the level of disturbance is high. Construction will occur in a developed area with high agricultural use.

With the application of the guidance in DFO's Fisheries Protection Policy Statement, which includes recommended mitigation measures, residual effects from the introduction of deleterious substances are predicted to be not significant. Prediction confidence is high because the residual effects characterization is based on the familiarity of the Project team with the area. The proposed mitigation measures reflect accepted industry best practices and have been vetted by regulatory agencies.

6.5.3.5 Operation

Temporary watercourse crossings or fording activities, riparian vegetation management and potential use of herbicides during operation might result in a disturbance to riparian vegetation and the bed and banks of watercourses. Short-term effects caused by maintenance activities conducted during pipeline and facility operation will be reduced or eliminated by implementing mitigation measures that reduce the duration of in-water activities and manage the application of herbicide, and scheduling in-water activities outside the RAP. With the application of recommended mitigation measures, no residual effects on fish and fish habitat are anticipated (see Table 6-6).

Potential effects of the operation and use of permanent access road crossings will be reduced or eliminated by applying the recommended mitigation measures in Section 6.4, such as selecting the appropriate access road crossing structure size to provide sufficient water depth and velocities for fish passage. During bridge and culvert maintenance activities (e.g., bridge deck cleaning), the implementation of appropriate silt and sediment controls will reduce or eliminate potential effects on watercourses and water bodies. With the application of recommended mitigation measures, no residual effects on fish and fish habitat due to the operation of permanent access road crossings are anticipated (see Table 6-6).

6.5.3.6 Summary of Residual Effects

See Table 6-6 for a summary of the residual effects on fish and fish habitat.

Table 6-6 Residual Effects on Fish and Fish Habitat - Saskatchewan and Manitoba Segment

Project Phase	Mitigation	Residual Effects Characteristics							Significance	Prediction Confidence	Likelihood of Significant Effects[1]	Monitoring and Follow-up
		Direction	Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Ecological and Socio-economic Context				
WATERCOURSE CROSSING REPLACEMENT												
Change in Fish Habitat												
Construction	See Section 6.4	N	M	LAA	S	S/MI	R	H	N	H	N/A	See Section 6.7
Operation	See Section 6.4	With the application of mitigation measures, no residual effects are anticipated										See Section 6.7
Decommissioning and abandonment[3]												
Change in Fish Movement, Migration and Passage												
Construction	See Section 6.4	N	L	PDA	S	S/MI	R	H	N	H	N/A	See Section 6.7
Operation	See Section 6.4	With the application of mitigation measures, no residual effects are anticipated										See Section 6.7
Decommissioning and abandonment[2]												
Change in Fish Mortality[3]												
Construction	See Section 6.4	N	M	LAA	S	S/MI	R	H	N	H	N/A	See Section 6.7
Operation	See Section 6.4	With the application of mitigation measures, no residual effects are anticipated										See Section 6.7
Decommissioning and abandonment[2]												
Change in Mussel Mortality[3]												
Construction	See Section 6.4	N	M	LAA	S	S/MI	R	H	N	H	N/A	See Section 6.7
Operation	See Section 6.4	With the application of mitigation measures, no residual effects are anticipated										See Section 6.7
Decommissioning and abandonment[3]												

Table 6-6 Residual Effects on Fish and Fish Habitat - Saskatchewan and Manitoba Segment

Project Phase	Mitigation	Residual Effects Characteristics							Significance	Prediction Confidence	Likelihood of Significant Effects[1]	Monitoring and Follow-up
		Direction	Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Ecological and Socio-economic Context				
Introduction of Deleterious Substances												
Construction	See Section 6.4	N	M	LAA	S	S/MI	R	H	N	H	N/A	See Section 6.7
Operation	See Section 6.4	With the application of mitigation measures, no residual effects are anticipated										See Section 6.7
Decommissioning and abandonment[2]												
CROMER LATERAL												
Change in Fish Habitat												
Construction	See Section 6.4	N	L	LAA	S	S/MI	R	H	N	H	N/A	See Section 6.7
Operation	See Section 6.4	With the application of mitigation measures, no residual effects are anticipated										See Section 6.7
Decommissioning and abandonment[2]												
Change in Fish Movement, Migration and Passage												
Construction	See Section 6.4	N	L	PDA	S	S/MI	R	H	N	H	N/A	See Section 6.7
Operation	See Section 6.4	With the application of mitigation measures, no residual effects are anticipated										See Section 6.7
Decommissioning and abandonment[2]												
Change in Fish Mortality												
Construction	See Section 6.4	N	L	LAA	S	S/MI	R	H	N	H	N/A	See Section 6.7
Operation	See Section 6.4	With the application of mitigation measures, no residual effects are anticipated										See Section 6.7
Decommissioning and abandonment[2]												

Table 6-6 Residual Effects on Fish and Fish Habitat - Saskatchewan and Manitoba Segment

Project Phase	Mitigation	Residual Effects Characteristics							Significance	Prediction Confidence	Likelihood of Significant Effects[1]	Monitoring and Follow-up
		Direction	Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Ecological and Socio-economic Context				
Introduction of Deleterious Substances												
Construction	See Section 6.4	N	L	LAA	S	S/MI	R	H	N	H	N/A	See Section 6.7
Operation	See Section 6.4	With the application of mitigation measures, no residual effects are anticipated										See Section 6.7
Decommissioning and abandonment[2]												
PIPELINE REALIGNMENT												
Change in Fish Habitat; Change in Fish Movement, Migration and Fish Passage; Change in Fish Mortality; Introduction of Deleterious Substances												
Construction	Not applicable	Not applicable – an interaction is notexpected										Not applicable
Operation	Not applicable	Not applicable – an interaction is not expected										Not applicable
Decommissioning and abandonment[2]												
PUMP STATIONS												
Change in Fish Habitat; Change in Fish Movement, Migration and Fish Passage; Change in Fish Mortality; Introduction of Deleterious Substances												
Construction	See Section 6.4	With the application of mitigation measures, no residual effects are anticipated										See Section 6.7
Operation	See Section 6.4	With the application of mitigation measures, no residual effects are anticipated										See Section 6.7
Decommissioning and abandonment[2]												
MOOSOMIN TANK TERMINAL (including temporary workspace)												
Change in Fish Habitat; Change in Fish Movement, Migration and Fish Passage; Change in Fish Mortality; Introduction of Deleterious Substances												
Construction	See Section 6.4	With the application of mitigation measures, no residual effects are anticipated										See Section 6.7
Operation	See Section 6.4	With the application of mitigation measures, no residual effects are anticipated										See Section 6.7

Table 6-6 Residual Effects on Fish and Fish Habitat - Saskatchewan and Manitoba Segment

Project Phase	Mitigation	Residual Effects Characteristics							Significance	Prediction Confidence	Likelihood of Significant Effects[1]	Monitoring and Follow-up
		Direction	Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Ecological and Socio-economic Context				
Decommissioning and abandonment[2]												
PERMANENT ACCESS ROAD WATERCOURSE CROSSINGS												
Change in Fish Habitat												
Construction	See Section 6.4	N	L	LAA	S	S/MI	R	H	N	H	N/A	See Section 6.7
Operation	See Section 6.4	With the application of mitigation measures, no residual effects are anticipated										See Section 6.7
Change in Fish Movement, Migration and Passage												
Construction	See Section 6.4	N	L	PDA	S	S/MI	R	H	N	H	N/A	See Section 6.7
Operation	See Section 6.4	With the application of mitigation measures, no residual effects are anticipated										See Section 6.7
Change in Fish Mortality[3]												
Construction	See Section 6.4	N	L	LAA	S	S/MI	R	H	N	H	N/A	See Section 6.7
Operation	See Section 6.4	With the application of mitigation measures, no residual effects are anticipated										See Section 6.7
Introduction of Deleterious Substances												
Construction	See Section 6.4	N	L	LAA	S	S/MI	R	H	N	H	N/A	See Section 6.7
Operation	See Section 6.4	With the application of mitigation measures, no residual effects are anticipated										See Section 6.7
Decommissioning and abandonment[2]												

Table 6-6 Residual Effects on Fish and Fish Habitat

NOTES:

[1] Likelihood is characterized only if there is a significant adverse effect.

[2] Decommissioning and abandonment – see Volume 14 Section 8 for the assessment of residual effects.

[3] The characterization of fish mortality and mussel mortality is done separately for watercourse crossing replacement along the Saskatchewan and Manitoba segment.

KEY

Direction

P	Positive
N	Negative
Nt	Neutral

Geographic Extent

PDA	Project Development Area
LAA	Local Assessment Area
RAA	Regional Assessment Area

Frequency

S	Single event
MI	Multiple irregular event
MR	Multiple regular event
C	Continuous

Ecological and Socio-economic Context

N	Negligible or limited
L	Low
M	Moderate
H	High

Magnitude

L	Low
M	Moderate
H	High

Duration

S	Short term
M	Medium term
L	Long term

Significance

S	Significant
N	Not significant

Prediction Confidence

L	Low
M	Moderate
H	High

Reversibility

R	Reversible
I	Irreversible

N/A	Not applicable

6.6 Cumulative Effects

A cumulative effect occurs if a residual effect of the Project acts cumulatively with the effects of other physical activities that have been or will be carried out. For cumulative effects assessment methods, see Volume 14, Section 6. The potential for cumulative effects on fish and fish habitat is evaluated in Table 6-7. The assessment of cumulative effects considers residual effects from the construction phase of the Project only, because no residual effects associated with the operation phase were identified (see Section 6.5).

Past and existing physical activities that have been or are being carried out have influenced the baseline conditions for the assessment of Project effects (refer to Section 6.2). The effects of other physical activities that have been or are being carried out in combination with the effects of the Project are therefore considered in the assessment of the residual environmental effects of the Project (see Section 6.5).

Certain and reasonably foreseeable physical activities with the potential to interact cumulatively with the Project within the RAA were identified, although as shown in Table 6.7. Certain and reasonably foreseeable physical activities with the potential to interact cumulatively with the Project within the RAA were identified, although as shown in Table 6-7, no cumulative effects were identified with these activities for fish and fish habitat. Accordingly, no further cumulative effects assessment was undertaken.

Table 6-7 Potential Cumulative Effects on Fish and Fish Habitat

Other Physical Activities with Potential for Cumulative Effects	Potential Effects				Rationale
	Change in fish habitat	Change in fish movement, migration and fish passage	Change in fish mortality	Introduction of deleterious substances	
SASKATCHEWAN					
Past or Existing Physical Activities					
Agricultural Conversion	✓	✓	✓	✓	Existing and past agricultural conversion practices exist in the LAA and RAA and have residual effects that could interact with residual effects of Project construction.
Residential Developments	✓	✓	✓	✓	Residential and urban developments exist in the RAA and have residual effects that could interact with residual effects of Project construction.
Existing Linear Infrastructure	✓	✓	✓	✓	Existing linear features (e.g., roads) exist in the RA and have residual effects that could interact with residual effects of Project construction.
Other Resource Activities	✓	✓	✓	✓	Other resource activities occur in the RAA and have residual effects that could interact with residual effects of Project construction.
Certain and Reasonably Foreseeable Physical Activities					
Kinder Morgan Pipeline – Flow Reversal on Cochlin Pipeline Project	N/A	N/A	N/A	N/A	This project crosses the RoW between the Belle Plaine and Regina pump stations; however, no effects on fish and fish habitat were identified along the RoW or within the footprints of these pump stations. There is no potential for the residual effects of the Energy East Project to act cumulatively with the residual effects of the Kinder Morgan Pipeline project.

Table 6-7 Potential Cumulative Effects on Fish and Fish Habitat

Other Physical Activities with Potential for Cumulative Effects	Potential Effects				Rationale
	Change in fish habitat	Change in fish movement, migration and fish passage	Change in fish mortality	Introduction of deleterious substances	
Vale Potash Canada – Kronau Project	N/A	N/A	N/A	N/A	This project occurs near the Regina pump station; however, no effects on fish and fish habitat were identified within the footprint of the Regina pump station. There is no potential for the residual effects of the Energy East Project to act cumulatively with the residual effects of the Vale Potash Canada project.
EOG Resources Canada – Liebenthal Shallow Gas Development Project	N/A	N/A	N/A	N/A	This project is outside of the fish and fish habitat LAA and RAA of the Energy East Project. There is no potential for the residual effects of the Energy East Project to act cumulatively with the residual effects of the EOG Resources Canada project.
Windlectric Inc.- The Chaplin Wind Energy Project	N/A	N/A	N/A	N/A	This project occurs near the Chaplin pump station; however, no effects on fish and fish habitat were identified within the footprint of the Chaplin pump station. There is no potential for the residual effects of the Energy East Project to act cumulatively with the residual effects of the Windlectric Inc project.
MANITOBA					
Past or Existing Physical Activities					
Agricultural Conversion	✓	✓	✓	✓	Existing and past agricultural conversion practices exist in the LAA and RAA and have residual effects that could interact with residual effects of Project construction.

Table 6-7 Potential Cumulative Effects on Fish and Fish Habitat

Other Physical Activities with Potential for Cumulative Effects	Potential Effects				Rationale
	Change in fish habitat	Change in fish movement, migration and fish passage	Change in fish mortality	Introduction of deleterious substances	
Residential Developments	✓	✓	✓	✓	Residential and urban developments exist in the RAA and have residual effects that could interact with residual effects of Project construction.
Existing Linear Infrastructure	✓	✓	✓	✓	Existing linear features (e.g., roads) exist in the RAA and have residual effects that could interact with residual effects of Project construction.
Other Resource Activities	✓	✓	✓	✓	Other resource activities occur in the RAA and have residual effects that could interact with residual effects of Project construction.
Certain and Reasonably Foreseeable Physical Activities					
City of Winnipeg – Brady Road Resources Recycling Facility	N/A	N/A	N/A	N/A	This project is outside of the fish and fish habitat LAA and RAA of the Energy East Project. There is no potential for the residual effects of the Energy East Project to act cumulatively with the residual effects of the City of Winnipeg project.
GFL Environmental West Corp. (formerly Mid-Canada Environmental Services Ltd.) – Soil Treatment Facility	N/A	N/A	N/A	N/A	This project crosses the RoW in the vicinity of the Iles des Chenes pump station; however, no effects on fish and fish habitat were identified within the footprint of this pump station. There is no potential for the residual effects of the Energy East Project to act cumulatively with the residual effects of GFL Environmental West Corp. project.

Table 6-7 Potential Cumulative Effects on Fish and Fish Habitat

Other Physical Activities with Potential for Cumulative Effects	Potential Effects				Rationale
	Change in fish habitat	Change in fish movement, migration and fish passage	Change in fish mortality	Introduction of deleterious substances	
Agrico Canada – Continued Operation of Liquid/Granular Fertilizer Storage and Handling Facility	N/A	N/A	N/A	N/A	This project is outside of the fish and fish habitat LAA and RAA of the Energy East Project. There is no potential for the residual effects of the Energy East Project to act cumulatively with the residual effects of the Agrico Canada project
Focus Agronomics Ltd. – Crop Protection Products Warehouse	N/A	N/A	N/A	N/A	This project occurs near the Oakville pump station; however, no effects on fish and fish habitat were identified within the footprint of this pump station. There is no potential for the residual effects of the Energy East Project to act cumulatively with the residual effects of Focus Agronomics Ltd. project.
Tundra Oil and Gas – Cromer Crude Oil Rail Car Loading Terminal	N/A	N/A	N/A	N/A	This project is outside of the fish and fish habitat LAA and RAA of the Energy East Project. There is no potential for the residual effects of the Energy East Project to act cumulatively with the residual effects of the Tundra Oil and Gas project.
Cartier Regional Water Co-operative Water Treatment Plant Expansion	N/A	N/A	N/A	N/A	This project is outside of the fish and fish habitat LAA and RAA of the Energy East Project. There is no potential for the residual effects of the Energy East Project to act cumulatively with the residual effects of the Cartier Regional Water Co-operative project.
Manitoba Hydro - Bipole III Transmission Reliability Project	N/A	N/A	N/A	N/A	This project crosses the RoW in the vicinity of the Portage La Prairie pump station; however, no effects on fish and fish habitat were identified within the footprint of this pump station. There is no potential for the residual effects of the Energy East Project to act cumulatively with the residual effects of the Manitoba Hydro - Bipole III project.

Table 6-7 Potential Cumulative Effects on Fish and Fish Habitat

Other Physical Activities with Potential for Cumulative Effects	Potential Effects				Rationale
	Change in fish habitat	Change in fish movement, migration and fish passage	Change in fish mortality	Introduction of deleterious substances	
Manitoba–Minnesota Transmission Project - Southern Loop transmission corridor	N/A	N/A	N/A	N/A	This project crosses the RoW between the Oakville and Iles des Chenes pump stations; however, no effects on fish and fish habitat were identified along the RoW or within the footprints of these pump stations. There is no potential for the residual effects of the Energy East Project to act cumulatively with the residual effects of the Manitoba–Minnesota Transmission Project.
St. Vital Transmission Complex	N/A	N/A	N/A	N/A	This project crosses the RoW in the vicinity of the Iles des Chenes pump station; however, no effects on fish and fish habitat were identified within the footprint of this pump station. There is no potential for the residual effects of the Energy East Project to act cumulatively with the residual effects of the St. Vital Transmission Complex project.

NOTES:

✓ Indicates that project effects are likely to act cumulatively with those of other physical activities

N/A Indicates that project effects do not act cumulatively with those of other physical activities

6.7 Monitoring and Follow-Up

Construction monitoring will be accomplished through Energy East's environmental inspection program. Environmental inspectors will be onsite during pipeline and facility construction to monitor activities for compliance with regulatory commitments and mitigation measures as outlined in the Project-Specific EPPs (see Volume 21). Resource specialists (e.g., fisheries biologists) might be required by Energy East to monitor some aspects of pipeline and facility construction.

Energy East will follow TransCanada's standard post-construction monitoring program. This program:

- evaluates the success of mitigation implemented during construction
- documents opportunities for procedural learning and improvement
- reviews the success of re-establishing equivalent land capability
- compares predicted effects (including cumulative effects) and mitigation measures with actual documented effects

The monitoring program evaluates land reclamation success against adjacent representative site conditions, recommends corrective actions and allows for adaptive management where deficiencies are identified. A fish and fish habitat monitoring program will occur as part of construction monitoring and will verify the effectiveness of the mitigation strategies used during construction and identify any additional remedial action required. Energy East will follow its fish and fish habitat monitoring program and post-construction monitoring plan (as outlined in the EPPs) (see Volume 21).

No follow-up programs are anticipated. All proposed mitigation has been previously approved by regulators for use on other large-diameter pipeline projects.

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APPENDIX 6A Fish Species of Management Concern in the RAA

Table 6A-1 SOMC and SAR in the RAA – Saskatchewan and Manitoba Segment

Species	Species of Management Concern (SOMC) Status		Species at Risk (SAR) Designation (If applicable)		
common name (Scientific name)	**COSEWIC designation**	**Conservation Data Centre ranking**	**SARA listing**	**Legal Protection under the *Manitoba Endangered Species Act***	**Potential Occurrence in RAA**
SASKATCHEWAN					
No SOMC were identified in the RAA in Saskatchewan.					
MANITOBA					
Species at Risk:					
Chestnut lamprey (*Ichthyomyzon castaneus*)	Data deficient	SU (MBCDC 2015)	*Special Concern* Schedule 3	No status	Chestnut lamprey are known to occur in the Assiniboine River.
Bigmouth buffalo (*Ictiobus cyprinellus*)	*Special Concern*	S5 (MBCDC 2015)	*Special Concern* Schedule 1	No status	Bigmouth buffalo are known to occur in the Assiniboine River.
Bigmouth shiner (*Notropis dorsalis*)	Not at Risk	S4 (MBCDC 2015)	*Special Concern* Schedule 3	No status	Bigmouth shiner is known to occur in the Assiniboine River.
Mapleleaf mussel (*Quadrula quadrula*)	*Endangered*	S2 (MBCDC 2014) Not listed in MBCDC 2015	*Endangered* Schedule 1	*Endangered* Manitoba Endangered Species Act	Mapleleaf mussel is known to occur in the Assiniboine River.
Other species of management concern :					
Lake sturgeon (*Acipenser fulvescens*)	*Endangered*	S2 (MBCDC 2015)	No status	No status	Lake sturgeon are known to occur in the Assiniboine River.

Table 6A-1 SOMC and SAR in the RAA – Saskatchewan and Manitoba Segment

Definitions

COSEWIC (2014) and SARA (2002)

Fish Species: species, subspecies, variety, or geographically or genetically distinct population of animal, plant or other organism, other than a bacterium or virus, that is wild by nature and is either native to Canada or has extended its range into Canada without human intervention and has been present in Canada for at least 50 years.

Extinct: A fish species that no longer exists.

Extirpated: A fish species no longer existing in the wild in Canada, but occurring elsewhere.

Endangered: A fish species facing imminent extirpation or extinction.

Threatened: A fish species likely to become endangered if limiting factors are not reversed.

Special Concern: A fish species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.

Not at Risk: A fish species that has been evaluated and found to be not at risk of extinction given the current circumstances.

Data Deficient: A category that applies when the available information is insufficient (a) to resolve a species' eligibility for assessment or (b) to permit an assessment of the species' risk of extinction.

Manitoba CDC rankings

S = Subnational (province-wide status)

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.

Table 6A-1 SOMC and SAR in the RAA – Saskatchewan and Manitoba Segment

Manitoba Endangered Species Act

Species of Special Concern: A species indigenous to Manitoba, which is at risk of becoming threatened or endangered because of a combination of biological characteristics and identified threats to the species.

Threatened: A species indigenous to Manitoba, which 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.

Endangered: A species indigenous to Manitoba, which is threatened with imminent extinction or with extirpation throughout all or a significant portion of its Manitoba range.

Extirpated: A species formerly indigenous to Manitoba, which no longer exists in the wild in Manitoba but exists elsewhere.

APPENDIX 6B Watercourses Assessed in the Saskatchewan and Manitoba Segment

Table 6B-1 Watercourse Crossing Replacements with Potential for Fish and Fish Habitat – Saskatchewan and Manitoba Segment

Crossing ID	Watercourse Name	Location (UTM 14)		Watercourse Type (ESRD 2013b)	Channel Width (m)[a]	Documented Fish Species	DFO Habitat Sensitivity Ranking (DFO 2006)	Restricted Activity Period	Recommended Pipeline Crossing Method	Contingency Pipeline Crossing Method	Navigability[b]
		Easting	Northing								
MB-019-0	Assiniboine River	543478	5527150	Large Permanent	140	*Present Study* – quillback, white sucker, silver redhorse, black bullhead, sauger, walleye, *Historical Data* – lake sturgeon[c], northern pike, emerald shiner, fathead minnow, flathead chub, sand shiner, spotfin shiner, spottail shiner, creek chub, silver chub, longnose dace, carp, bigmouth buffalo, golden redhorse, shorthead redhorse, black bullhead, channel catfish, stonecat, burbot, trout-perch, rock bass, Johnny darter, yellow perch mapleleaf mussel[c],	High	April 1 to June 30	Open-cut in flowing conditions	Open-cut in flowing conditions	Scheduled Water

NOTES:

[a] Larger rivers were measured to the nearest 1 m, whereas smaller watercourses were measured to the nearest 0.1 m.

[b] Navigability criteria were developed with consideration of the Minor Waters User Guide (2010) to determine physical parameters that could be available to recreational watercraft users.

Not navigable indicates that a recreational watercraft could not be accommodated in the watercourse.

Potential recreational use indicates that the physical parameters of the watercourse can accommodate a watercraft, but public use is unknown.

Recreational use indicates that the watercourse is publicly used.

Scheduled waterway indicates navigable water that is regulated by Transport Canada due to the volume of users that navigate the water body.

[c] Federally Endangered and Provincially Threatened (COSEWIC 2007)

*****TBD indicates To Be Determined following field survey at a later date. Information is based on review of existing information.

Table 6B-2 Pipeline Crossings with Potential for Fish and Fish Habitat – Cromer Lateral

Crossing ID	Watercourse Name	Location (UTM 13/14)		Watercourse Type (ESRD 2013b)	Channel Width (m)[a]	Documented Fish Species	DFO Habitat Sensitivity Ranking (DFO 2006)	Restricted Activity Period	Recommended Pipeline Crossing Method	Contingency Pipeline Crossing Method[b]	Navigability[b]
		Easting	Northing								
SK-002-0	Brennand Creek, Tributary	323390	5563926	Small permanent	3.5	*Present Study* – none *Historical Data* – none	Low	No RAP	Trenched (non-isolated)	Trenched (non-isolated)	Non-navigable
MB-002-0	Niso Creek, Tributary	325333	5559976	Large permanent	16.7	*Present Study* – none *Historical Data* – trout-perch	Low	No RAP	Trenched (non-isolated)	Trenched (non-isolated)	Non-navigable
MB-003-0	Niso Creek	325233	5553104	Large permanent	75	*Present Study* – none *Historical Data* – trout-perch	Low	No RAP	Trenched (isolate if flowing)	Trenched (non-isolated)	Recreational Use
MB-006-0	Niso Creek, Tributary	325129	5546827	Large permanent	5.7	*Present Study* – brook stickleback *Historical Data* – trout-perch	Low	No RAP	Trenched (isolate if flowing)	Trenched (non-isolated)	Non-navigable
MB-007-0	Bosshill Creek	329353	5540458	Large permanent	70	*Present Study* – none *Historical Data* – creek chub, fathead minnow, white sucker, brook stickleback, Johnny darter	Low	April 1 - June 15	Trenched (isolate if flowing)	Trenched (non-isolated)	Recreational Use
MB-008-0	Bosshill Creek, Tributary	329247	5538656	Intermittent	2.5	*Present Study* – none *Historical Data* – creek chub, fathead minnow, white sucker, brook stickleback, Johnny darter	Low	April 1 - June 15	Trenched (non-isolated)	Trenched (non-isolated)	Non-navigable
MB-009-0	Gopher Creek, Tributary	329105	5536713	Large permanent	25	*Present Study* – none *Historical Data* – common shiner, creek chub, fathead minnow, northern redbelly dace, white sucker, brook stickleback, Johnny darter	Low	April 1 - June 15	Trenched (isolate if flowing)	Trenched (non-isolated)	Non-navigable
MB-011-0	Gopher Creek	329617	5533525	Large permanent	9.0	*Present Study* – fathead minnow, brook stickleback *Historical Data* – common shiner, creek chub, fathead minnow, northern redbelly dace, white sucker, brook stickleback, Johnny darter	Low	April 1 - June 15	Trenched (isolate if flowing)	Trenched (non-isolated)	Non-navigable
MB-016-0	Oak Lake, Tributary	333430	5521200	Large permanent	7.0	*Present Study* – fathead minnow, brook stickleback *Historical Data* – none	Low	No RAP	Trenched (non-isolated)	Trenched (non-isolated)	Non-navigable
MB-020-0	Localized Drainage	325370	5559587	TBD*	TBD*	*Present Study* - TBD* *Historical Data* – none	Low*	No RAP*	Trenched (non-isolated)	Trenched (non-isolated)	Non-navigable
MB-021-0	Localized Drainage	325358	5559042	TBD*	TBD*	*Present Study* - TBD* *Historical Data* – none	Low*	No RAP*	Trenched (non-isolated)	Trenched (non-isolated)	Non-navigable
MB-022-0	Localized Drainage	325380	5558690	TBD*	TBD*	*Present Study* - TBD* *Historical Data* – none	Low*	No RAP*	Trenched (non-isolated)	Trenched (non-isolated)	Non-navigable

Table 6B-2 Pipeline Crossings with Potential for Fish and Fish Habitat – Cromer Lateral

Crossing ID	Watercourse Name	Location (UTM 13/14)		Watercourse Type (ESRD 2013b)	Channel Width (m)[a]	Documented Fish Species	DFO Habitat Sensitivity Ranking (DFO 2006)	Restricted Activity Period	Recommended Pipeline Crossing Method	Contingency Pipeline Crossing Method[b]	Navigability[b]
		Easting	Northing								
MB-023-0	Localized Drainage	325409	5557895	TBD*	TBD*	*Present Study* - TBD* *Historical Data* – none	Low*	No RAP*	Trenched (non-isolated)	Trenched (non-isolated)	Non-navigable
MB-024-0	Localized Drainage	325418	5557625	TBD*	TBD*	*Present Study* - TBD* *Historical Data* – none	Low*	No RAP*	Trenched (non-isolated)	Trenched (non-isolated)	Non-navigable
MB-025-0	Localized Drainage	325429	5557263	TBD*	TBD*	*Present Study* - TBD* *Historical Data* – none	Low*	No RAP*	Trenched (non-isolated)	Trenched (non-isolated)	Non-navigable
MB-026-0	Localized Drainage	325437	5556624	TBD*	TBD*	*Present Study* - TBD* *Historical Data* – none	Low*	No RAP*	Trenched (non-isolated)	Trenched (non-isolated)	Non-navigable
MB-027-0	Localized Drainage	325416	5556222	TBD*	TBD*	*Present Study* - TBD* *Historical Data* – none	Low*	No RAP*	Trenched (non-isolated)	Trenched (non-isolated)	Non-navigable
MB-028-0	Localized Drainage	325409	5556071	TBD*	TBD*	*Present Study* - TBD* *Historical Data* – none	Low*	No RAP*	Trenched (non-isolated)	Trenched (non-isolated)	Non-navigable
MB-029-0	Localized Drainage	325347	5553783	TBD*	TBD*	*Present Study* - TBD* *Historical Data* – none	Low*	No RAP*	Trenched (non-isolated)	Trenched (non-isolated)	Non-navigable
MB-030-0	Localized Drainage	325427	5551944	TBD*	TBD*	*Present Study* - TBD* *Historical Data* – none	Low*	No RAP*	Trenched (non-isolated)	Trenched (non-isolated)	Non-navigable
MB-031-0	Localized Drainage	325237	5550588	TBD*	TBD*	*Present Study* - TBD* *Historical Data* – none	Low*	No RAP*	Trenched (non-isolated)	Trenched (non-isolated)	Non-navigable
MB-032-0	Localized Drainage	329337	5540648	TBD*	TBD*	*Present Study* - TBD* *Historical Data* – none	Low*	No RAP*	Trenched (non-isolated)	Trenched (non-isolated)	Non-navigable
MB-033-0	Localized Drainage	329371	5540061	TBD*	TBD*	*Present Study* - TBD* *Historical Data* – none	Low*	No RAP*	Trenched (non-isolated)	Trenched (non-isolated)	Non-navigable
MB-034-0	Localized Drainage	329215	5538375	TBD*	TBD*	*Present Study* - TBD* *Historical Data* – none	Low*	No RAP*	Trenched (non-isolated)	Trenched (non-isolated)	Non-navigable

NOTES:

[a] Larger rivers were measured to the nearest 1 m, whereas smaller watercourses were measured to the nearest 0.1 m.

[b] Navigability criteria were developed with consideration of the Minor Waters User Guide (2010) to determine physical parameters that could be available to recreational watercraft users.

Not navigable indicates that a recreational watercraft could not be accommodated in the watercourse.

Potential recreational use indicates that the physical parameters of the watercourse can accommodate a watercraft, but public use is unknown.

Recreational use indicates that the watercourse is publicly used.

Scheduled waterway indicates navigable water that is regulated by Transport Canada due to the volume of users that navigate the water body.

***** TBD indicates To Be Determined following field survey at a later date. Information is based on review of existing information.

Table 6B-3 Pipeline Crossings with No Fish Habitat – Cromer Lateral

Crossing ID	Channel Name	Location (UTM 13/14)		Category	Rationale
		Easting	Northing		
SK-001-0	Brennand Creek	325004	5563532	Ephemeral	Field verification
MB-001-0	Niso Creek, Tributary	325534	5561322	NVC	Field verification
MB-004-0	Niso Creek, Tributary	325241	5549930	Intermittent	Field verification
MB-005-0	Niso Creek, Tributary	325301	5548693	NVC	Field verification
MB-010-0	Localized Drainage	329592	5535021	NVC	Desktop verification – field survey not required
MB-012-0	Gopher Creek, Tributary	329530	5531781	Ephemeral	Field verification
MB-013-0	Localized Drainage	329589	5530006	NVC	Desktop verification – field survey not required
MB-014-0	Oak Lake, Tributary	333367	5524778	Ephemeral	Field verification
MB-015-0	Oak Lake, Tributary	333472	5523328	Ephemeral	Field verification
MB-017-0	Localized Drainage	335070	5516482	NVC	Desktop verification – field survey not required
MB-035-0	Localized Drainage	329605	5532946	NVC	Desktop verification – field survey not required

Table 6B-4 Watercourses within the LAA of Facilities with Potential for Fish and Fish Habitat – Saskatchewan and Manitoba Segment

Crossing ID	Watercourse Name	Location (UTM 13/14)		Interacting Project Component	Watercourse Type (ESRD 2013b)	Channel Width (m)[a]	Documented Fish Species	DFO Habitat Sensitivity Ranking (DFO 2006)	Restricted Activity Period	Navigability[b]
		Easting	Northing							
SK-506-01-CHA	Unnamed Wetland	379711	5595837	Chaplin A Pump Station	TBD*	TBD*	*Present Study* - TBD* *Historical Data* – none	Low*	No RAP*	Non-navigable
SK-502-01-MOO	Brennand Creek, Tributary	323053	5564035	Moosomin Tank Terminal	TBD*	TBD*	*Present Study* - TBD* *Historical Data* – none	Low*	No RAP*	Non-navigable
MB-503-00-CAR	Unnamed Tributary	591080	5518466	Cartier Pump Station	TBD*	TBD*	*Present Study* - TBD* *Historical Data* – none	Low*	No RAP*	Non-navigable
MB-503-01-CAR	Unnamed Tributary	590812	5518159	Cartier Pump Station	TBD*	TBD*	*Present Study* - TBD* *Historical Data* – none	Low*	No RAP*	Non-navigable
MB-504-00-ILE	Unnamed Tributary	645005	5509621	Iles des Chenes Pump Station	TBD*	TBD*	*Present Study* - TBD* *Historical Data* – none	Low*	No RAP*	Non-navigable
MB-504-01-ILE	Unnamed Tributary	644923	5509610	Iles des Chenes Pump Station	TBD*	TBD*	*Present Study* - TBD* *Historical Data* – none	Low*	No RAP*	Non-navigable
MB-504-02-ILE	Unnamed Tributary	644733	5509575	Iles des Chenes Pump Station	TBD*	TBD*	*Present Study* - TBD* *Historical Data* – none	Low*	No RAP*	Non-navigable

NOTES:

[a] Larger rivers were measured to the nearest 1 m, whereas smaller watercourses were measured to the nearest 0.1 m.

[b] Navigability criteria were developed with consideration of the Minor Waters User Guide (2010) to determine physical parameters that could be available to recreational watercraft users.

Not navigable indicates that a recreational watercraft could not be accommodated in the watercourse.

Potential recreational use indicates that the physical parameters of the watercourse can accommodate a watercraft, but public use is unknown.

Recreational use indicates that the watercourse is publicly used.

Scheduled waterway indicates navigable water that is regulated by Transport Canada due to the volume of users that navigate the water body.

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Table 6B-5 Watercourses within the LAA of Facilities with No Potential for Fish and Fish Habitat – Saskatchewan and Manitoba Segment

Crossing ID	Channel Name	Interacting Project Component	Location (UTM 13)		Category	Rationale
			Easting	Northing		
SK-500-01-WHI	Pipestone Creek, Tributary	Whitewood Pump Station	699680	5570017	NVC	Field verification

Table 6B-6 Permanent Access Road Crossings with Potential for Fish and Fish Habitat – Saskatchewan and Manitoba Segment

Crossing ID	Watercourse Name	Location (UTM 12/13/14)		Interacting Project Component	Watercourse Type (ESRD 2013b)	Channel Width (m)[a]	Documented Fish Species	DFO Habitat Sensitivity Ranking (DFO 2006)	Restricted Activity Period	Navigability[b]
		Easting	Northing							
SK-511-01-LIE	Unnamed Wetland	585690	5613719	Permanent Access Road to Liebenthal Pump Station	TBD*	TBD*	*Present Study* - TBD* *Historical Data* – none	Low*	No RAP*	Non-navigable
SK-506-08-CHA	Unnamed Wetland	379978	5595895	Permanent Access Road to Chaplin Pump Station	TBD*	TBD*	*Present Study* - TBD* *Historical Data* – none	Low*	No RAP*	Non-navigable
SK-510-01-REG	Unnamed Wetland	542003	5582117	Permanent Access Road to Regina Pump Station	TBD*	TBD*	*Present Study* - TBD* *Historical Data* – none	Low*	No RAP*	Non-navigable
SK-509-07-GRE	Unnamed Wetland	643024	5572191	Permanent Access Road to Grenfell Pump Station	TBD*	TBD*	*Present Study* - TBD* *Historical Data* – none	Low*	No RAP*	Non-navigable
SK-500-02-WHI	Unnamed Wetland	699925	5570286	Permanent Access Road to Whitewood Pump Station	TBD*	TBD*	*Present Study* - TBD* *Historical Data* – none	Low*	No RAP*	Non-navigable
MB-500-05-CRA	Unnamed Wetland	377417	5554913	Permanent Access Road to Crandal Pump Station	TBD*	TBD*	*Present Study* - TBD* *Historical Data* – none	Low*	No RAP*	Non-navigable
MB-501-03-RAP	Unnamed Wetland	423281	5548831	Permanent Access road to Rapid City Pump Station	TBD*	TBD*	*Present Study* - TBD* *Historical Data* – none	Low*	No RAP*	Non-navigable

NOTES:

[a] Larger rivers were measured to the nearest 1 m, whereas smaller watercourses were measured to the nearest 0.1 m.

[b] Navigability criteria were developed with consideration of the Minor Waters User Guide (2010) to determine physical parameters that could be available to recreational watercraft users.

Not navigable indicates that a recreational watercraft could not be accommodated in the watercourse.

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