

**WATERCOURSE CROSSING REPORT  
FOR THE  
CANADIAN NATURAL  
KIRBY IN SITU OIL SANDS EXPANSION PROJECT**

**Prepared for:  
Canadian Natural Resources Limited**

**Prepared by:  
Golder Associates Ltd.**

**December 2011**

**10-1346-0052**

## TABLE OF CONTENTS

<b><u>SECTION</u></b>	<b><u>PAGE</u></b>
1 INTRODUCTION.....	1
2 REGULATORY REQUIREMENT INFORMATION.....	5
2.1 TRANSPORT CANADA.....	5
2.2 FISHERIES AND OCEANS CANADA.....	5
2.3 ALBERTA ENVIRONMENT AND WATER.....	6
3 METHODS.....	7
3.1 FIELD METHODS.....	7
3.1.1 Watercourse Habitat Mapping.....	8
3.1.2 Fish Inventory.....	8
3.1.3 Stream Discharge Measurement.....	9
3.1.4 Field Water Quality Measurement.....	9
3.2 ASSESSMENT METHODS.....	10
3.2.1 Pipeline Crossing Habitat Evaluation Parameters.....	10
3.2.2 Minor Works Determination.....	14
3.2.3 Minor Waters Determination.....	15
4 RESULTS.....	17
4.1.1 Field Results.....	17
4.1.2 Watercourse Sensitivity to Construction Evaluation Results.....	18
4.1.3 Fish Habitat Suitability.....	19
4.1.4 Minor Works Determination.....	21
4.1.5 Minor Water Determination.....	21
4.1.6 Transport Canada Site Overflight and Feedback.....	22
5 SUMMARY.....	23
5.1 TRANSPORT CANADA.....	23
5.2 FISHERIES AND OCEANS CANADA.....	23
5.3 ALBERTA ENVIRONMENT AND WATER.....	24
6 CLOSURE.....	25
7 REFERENCES.....	26
8 ABBREVIATIONS.....	28
9 GLOSSARY.....	30

## LIST OF TABLES

Table 1	Watercourse Crossing Terms of Reference.....	3
Table 2	Kirby Expansion Project Watercourse Crossing Locations.....	3
Table 3	Summary of Electrofishing and Minnow Trapping Effort at Watercourse Crossing Locations.....	9
Table 4	Summary of Activities Conducted at Watercourse Crossing Locations.....	18

Table 5	Summary of Watercourse Sensitivity to Construction at Crossing Locations.....	19
Table 6	Summary of Fish Habitat Suitability and Culvert Candidacy at Crossing Locations.....	20
Table 7	Summary of Proposed Activities/Developments and the Minor Works Determination at Crossing Locations.....	21
Table 8	Summary of Minor Waters Determinations at Crossing Locations.....	22

### LIST OF FIGURES

Figure 1	Watercourse Crossing Locations.....	4
----------	-------------------------------------	---

### LIST OF ATTACHMENTS

- Attachment A - KS003
- Attachment B - KS004
- Attachment C - KS005
- Attachment D - KS006
- Attachment E - KS007
- Attachment F - KN001
- Attachment G - KN002
- Attachment H - KN003
- Attachment I - KN004
- Attachment J - KN005
- Attachment K - KN006
- Attachment L - KN007
- Attachment M - KN008
- Attachment N – Transport Canada Determination

# 1 INTRODUCTION

Canadian Natural Resources Limited (Canadian Natural) is applying for approval of the Kirby In Situ Oil Sands Expansion Project (the Project). The applications to the Energy Resources Conservation Board (ERCB) under the *Oil Sands Conservation Act*, and Alberta Environment and Water (AEW) under the *Environmental Protection and Enhancement Act* (EPEA) and *Water Act* as well as the Environmental Impact Assessment (EIA) are herein collectively referred to as the Application.

The proposed Project will involve bitumen production from oil sands formations within a Lease Area located in Townships 73, 74 and 75, Ranges 7, 8 and 9, West of the Fourth Meridian (W4M) and within the Regional Municipality of Wood Buffalo (RMWB). Minor portions of the proposed Project facilities will extend beyond the Lease Area boundary. The footprint includes water source and disposal wells and pipelines that extend west of the Lease Area, and water source wells and a pipeline that extend east of the Lease Area. The footprint west of the Lease Area extends into Lac La Biche County.

The Lease Area consists of 110.75 sections (29,143 ha) of land on which Canadian Natural fully or partially holds the oil sands exploration and development rights. To facilitate description of the expansion plans and facility locations, the Lease Area has been divided into two geographic areas, referred to as the North Expansion Area and the South Expansion Area, which are generally divided by provincial Highway 881. The Project will be accessed via an all-weather gravel road which intersects with Highway 881, at a location approximately 35 km by road south of Conklin and 110 km by road northeast of Lac La Biche.

Canadian Natural currently has ERCB commercial scheme approvals for the following two projects:

- The Canadian Natural Kirby In Situ Oil Sands Project, hereafter referred to as Kirby South 2010 (or KS1), was approved in 2010 for bitumen production of 45,000 bbl/d (7,150 m<sup>3</sup>/d) using Steam Assisted Gravity Drainage (SAGD) technology.
- The Enerplus Resources Fund (Enerplus) Kirby Oil Sands Project Phase 1, hereafter referred to as Kirby North 2010, was approved in 2010 for bitumen production of 10,000 bbl/d (1,590 m<sup>3</sup>/d), also using SAGD technology. The Kirby North 2010 oil sands leases and nearby Enerplus oil sands leases were acquired by Canadian Natural in 2010.

The Kirby Expansion Project will occur in three phases, as described below:

- Kirby North Phase 1 (KN1) will involve the expansion of the approved Kirby North Central Processing Facility (CPF) and development of facilities to increase bitumen production and processing capacity in the North Expansion Area from the approved 10,000 bbl/d (1,590 m<sup>3</sup>/d) to 50,000 bbl/d (7,950 m<sup>3</sup>/d);
- Kirby North Phase 2 (KN2) will further expand the Kirby North CPF, facilities, and bitumen production and processing capacity within the North Expansion Area from 50,000 bbl/d (7,950 m<sup>3</sup>/d) to 80,000 bbl/d (12,720 m<sup>3</sup>/d); and
- Kirby South Phase 2 (KS2) will involve expansion of the approved Kirby South CPF and development of facilities to allow an increase in South Expansion Area bitumen production and processing capacity by 15,000 bbl/d (2,384 m<sup>3</sup>/d) from the approved 45,000 bbl/d (7,150 m<sup>3</sup>/d) to a total of 60,000 bbl/d (9,540 m<sup>3</sup>/d).

As a result of the expansion, the Kirby North CPF will have a design capacity of 80,000 bbl/d (12,720 m<sup>3</sup>/d) and the Kirby South CPF will have a design capacity of 60,000 bbl/d (9,540 m<sup>3</sup>/d), for a total bitumen production capacity within the Lease Area of 140,000 bbl/d (22,260 m<sup>3</sup>/d). In addition, the Project will increase the combined life of Kirby lease developments from 20 years to approximately 30 years. The layout of proposed surface facilities and watercourse crossings associated with the Project is shown in [Figure 1](#).

The purpose for the watercourse crossing assessments are to provide information to Transport Canada (TC) and Fisheries and Oceans Canada (DFO) to make determinations if the Project will require authorizations that in turn may result in a [Section 5](#) trigger under the *Canadian Environmental Assessment Act* (CEAA). The information collected at the crossing sites also meets the Terms of Reference requirement to describe and map crossings of watercourses or waterbodies (including bridge, culverts and pipelines) ([Table 1](#)). This information includes the identification and details of all watercourse crossings related to the Project and an evaluation of the fish, fish habitat and aquatic resources in the proposed Project Area.

**Table 1 Watercourse Crossing Terms of Reference**

	<b>Surface Water</b>	<b>Concordance</b>
2.6.2	[B] Describe and map crossings of watercourses or waterbodies (including bridges, culverts and pipelines) required.	Watercourse Crossing Summary Report
3.5	<b>Aquatic Ecology</b>	
	<b>Impact Assessment</b>	
3.5.2	[A] Describe and assess the potential impacts of the Project on fish, fish habitat and other aquatic resources, including: a) potential habitat loss and alteration;	[A] a) Aquatic Ecology Assessment, Volume 4, Sections 4.3 and 4.4.1, Watercourse Crossing Summary Report

Source: AEW (2011).

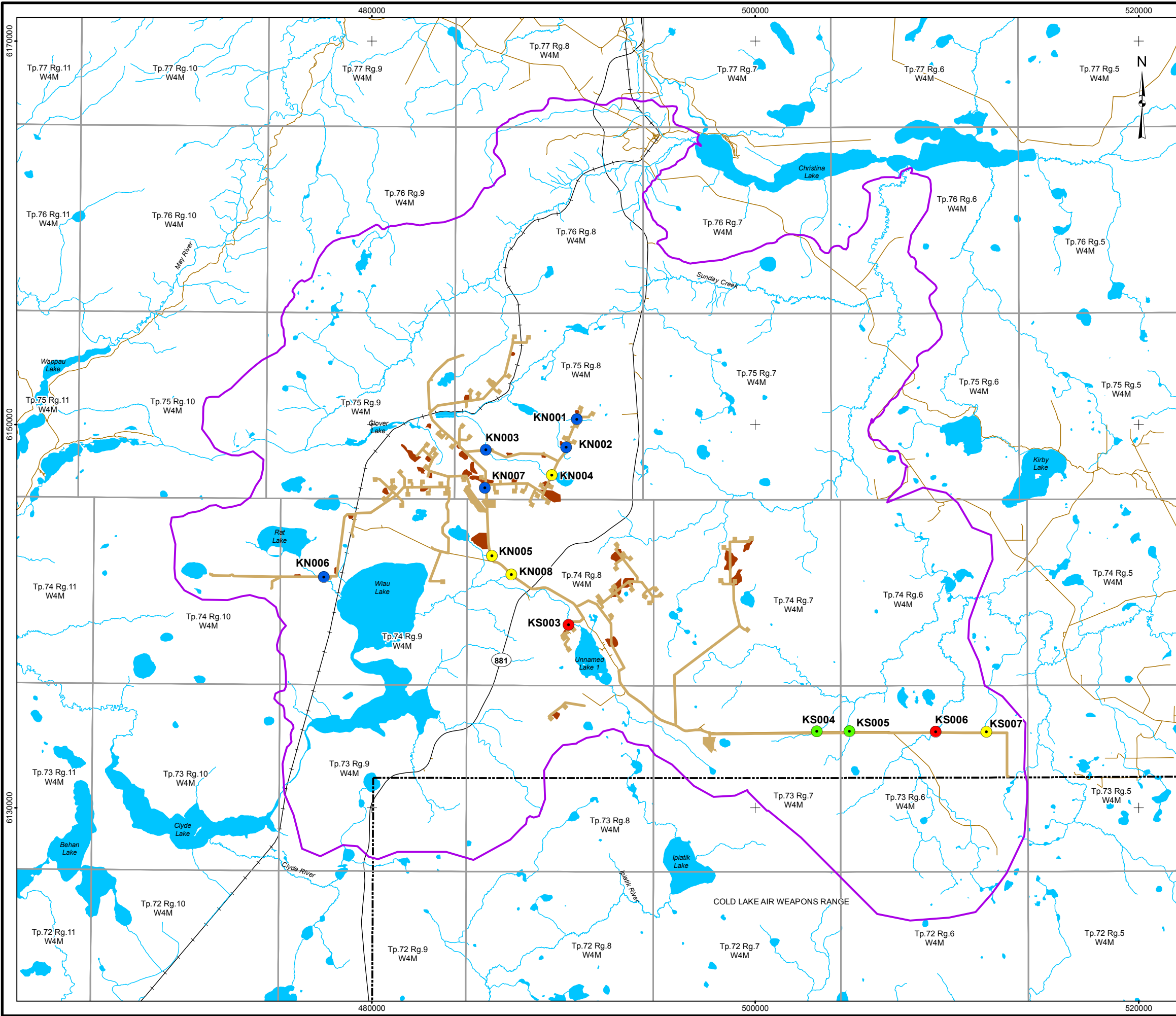
The proposed Project will require 13 crossings of watercourses, involving roads, power lines, buried pipelines and/or above-ground pipelines. The overall layout of the project was optimized with consideration of minimizing the footprint of the site to reduce the effect on watercourses and by using existing disturbance where possible. The planned crossing locations were identified from the watercourses identified on maps using the AltaLis database. The locations of the watercourse crossings are identified in [Table 2](#) and shown in [Figure 1](#). Assessments of 11 of the 13 crossing locations were completed by a Qualified Aquatic Environmental Specialist (QAES) between August 31 and September 10, 2011. A detailed crossing assessment of KS003 was completed in March 2010. The survey completed at KN007 was reconnaissance level.

**Table 2 Kirby Expansion Project Watercourse Crossing Locations**

Watercourse Crossing ID	UTM Coordinates (NAD 83 Zone 12U)	
	Easting	Northing
KS003	490241	6139580
KS004	503203	6133982
KS005	504894	6133989
KS006	509394	6133971
KS007	512057	6133945
KN001	490722	6150338
KN002	490066	6148810
KN003	485946	6148655
KN004	489390	6147367
KN005	486287	6143146
KN006	477548	6142028
KN007	485900	6146694
KN008	487278	6142187

Note: KS = South Expansion Area; KN = North Expansion Area.

I:\CLIENTS\CNRL\10-1346-0052\mapping\mxds\Crossing\_Assessment\FIGURES\FINAL\1013460052\_CA\_001\_GIS.mxd



**LEGEND**

**WATERCOURSE CROSSINGS**

- MINOR WATERS
- MINOR WORKS
- NO DEFINED CHANNEL
- NON-MINOR WATERS
- PAVED ROAD
- UNPAVED ROAD
- RAILROAD
- AQUATIC RESOURCES LOCAL STUDY AREA
- BORROW AREA
- FOOTPRINT
- OPEN WATER

**REFERENCE**  
 ALBERTA DIGITAL BASE DATA OBTAINED FROM ALTALIS LTD. © GOVERNMENT OF ALBERTA 2004-2011 (ALL RIGHTS RESERVED) AND FROM IHS ENERGY INC. DATUM: NAD 83 PROJECTION: UTM ZONE 12



PROJECT		KIRBY IN SITU OIL SANDS EXPANSION PROJECT	
TITLE			
<b>WATERCOURSE CROSSING LOCATIONS</b>			
	PROJECT	10-1346-0052	FILE No.
	DESIGN	TC 25 July 2011	SCALE AS SHOWN
	GIS	SS 07 Dec. 2011	REV. 3
	CHECK	MD 10 Dec. 2011	
	REVIEW	SM 10 Dec. 2011	
			<b>FIGURE: 1</b>

## **2 REGULATORY REQUIREMENT INFORMATION**

Regulatory agencies, including TC, DFO and AEW, require information regarding any proposed watercourse (i.e., creeks, brooks, streams and rivers) crossing. The following sections outline the regulatory requirements of these agencies.

### **2.1 TRANSPORT CANADA**

Transport Canada (TC) requires information necessary to determine if the Project will have any impact on navigability of watercourses. To make this determination, proposed watercourse crossings must be identified and applicable information must be provided including the crossing locations, design, crossing type and method. All crossings must be identified including those that potentially require approval under the *Navigable Waters Protection Act* (NWPA) (Government of Canada 1985) and those for which the NWPA does not apply as determined via guidelines under the *Minor Works and Waters (NWPA) Order (TC 2009a)*. Crossing(s) that require NWPA approval will then be constructed to meet the guidelines and specifications required under the Act.

### **2.2 FISHERIES AND OCEANS CANADA**

DFO requires the information collected from the watercourse crossing assessment to determine if the Project will potentially impact fish habitat. Impacts could include changes to fish habitat based on the construction methods and crossing design or changes to fish movement as a result of the crossing installation. Proposed mitigation to address any impacts to fish and/or fish habitat are also required as part of the review process.

Watercourse crossing (i.e. clear span bridge) construction will follow methods and mitigation outlined in the DFO Alberta Operational Statements (OS) (DFO 2008a,b,c); specifically to avoid harm or damage to fish and fish habitat, including consideration of the construction timing, preferred crossing methods, sediment and erosion control plans, and best management practices. Prior to construction, Canadian Natural will independently assess each crossing location based on fish habitat and stream channel characteristics, and will work with DFO to ensure crossing designs are best suited to each site's characteristics while meeting regulatory requirements such that a *Fisheries Act* authorization is not required. For watercourse crossings that might involve culvert installation, Canadian Natural intends to meet with DFO to review the habitat conditions at the proposed culvert crossing locations and review proposed mitigation measure commitments that will be necessary to avoid the Harmful Alteration, Disruption or Destruction (HADD) of fish habitat.



## **2.3 ALBERTA ENVIRONMENT AND WATER**

The Alberta *Code of Practice (COP) for Pipelines and Telecommunication Lines Crossing a Waterbody* (AENV 2007a) and *COP for Watercourse Crossings* (AENV 2007b) outline the potential crossing methods, structure types and mitigation related to watercourse crossings. Canadian Natural will meet or exceed the mitigation stipulated in the COP and, if required, will provide written specifications or recommendations from a QAES regarding watercourse crossings. Approval under the *Water Act* is only required if instream work that is proposed is not stipulated under a COP. All of the watercourse crossing activities identified for the Project will fall under a COP and will not require approvals under the *Water Act*.

## **3 METHODS**

### **3.1 FIELD METHODS**

An initial screening assessment was conducted at each of the watercourse crossing locations to determine the appropriate assessment method for each location. The initial screening assessment was to determine if a defined channel was present at the crossing location. If no defined channel was identified, then a photo survey was completed to document conditions of the location at the time of the survey. If a defined channel was identified, then a complete crossing assessment was conducted according to the methods outlined in the following sections. The field methods determined fish species presence and measured fish habitat parameters relevant to the information requirements of the regulatory agencies. The assessments were conducted by a QAES.

Four of the watercourses did not have a defined channel. These included KS007, KN004, KN005 and KN008. A photo survey was conducted at these locations.

The assessment of KN007 was a reconnaissance survey that involved a visual assessment of the channel on the ground and from a helicopter. The channel width and depth were visually estimated and basic habitat parameters (i.e., bank stability, substrate composition, fish habitat suitability) were noted. No fish sampling was conducted, as a fish collection permit was not available at the time of the survey. The crossing location was identified after the other assessments were completed, and based on the visual assessment, a more detailed assessment was determined to be unnecessary.

The KS003 assessment was a reconnaissance survey that involved a visual assessment of the crossing location. A detailed crossing assessment was previously conducted at KS003 in March 2010 for Kirby South 2010 project baseline studies. The 2011 survey was to confirm site conditions were similar to the previous assessment.

### 3.1.1 Watercourse Habitat Mapping

Watercourse habitat mapping was conducted in accordance with Golder Associates Ltd.'s (Golder's) *Technical Procedure 8.5-1: Stream Habitat Mapping and Classification System* (Golder 1997a). The stream habitat mapping system records the presence and location of the individual channel units (i.e., riffle/run/pool) in combination with depth, velocity, substrate characteristics, and instream and overhead cover. This habitat information is used to provide a qualitative rating for the channel unit in relation to the habitat requirements of fish at their various life stages (i.e., spawning, rearing, feeding, and overwintering). The study area extends a minimum of 100 m upstream of the crossing location and a minimum of 40 times the channel width or 300 m downstream, whichever is less. The assessment also includes the collection of photograph records throughout the reach, at the crossing location, and at each location where channel measurements were collected.

### 3.1.2 Fish Inventory

Sampling was conducted in accordance with Golder's *Technical Procedure 8.1-3: Fish Inventory Methods* (Golder 1997b). Backpack electrofishing using a Smith-Root® LR24 electrofisher was conducted within the study area for each crossing location. Electrofishing effort for each crossing location is presented in [Table 3](#).

Standard Gee minnow traps were also set during the crossing assessments. Four minnow traps were set both upstream and downstream of the proposed crossing in water with sufficient depth for full immersion of the trap. The traps were used as a supplemental sampling method to determine the presence of fish species not encountered during the electrofishing efforts, or as the primary sampling method at sites where electrofishing could not be conducted. Traps had a minimum of a two-hour set time. Minnow trapping effort at each crossing location is presented in [Table 3](#). Four additional traps were set upstream at KS004 because the beaver impoundment could not be sampled with an electrofisher.

**Table 3 Summary of Electrofishing and Minnow Trapping Effort at Watercourse Crossing Locations**

Watercourse Crossing Location	Electrofishing Effort [seconds]	Minnow Trapping			
		Set Location	Number of Traps	Trap Duration Set [hr]	Total Trap Effort [trap-hr]
KS003	n/a	n/a	0	0	0
KS004	n/a	upstream	8	21.4	171.3
		downstream	4	22.5	90
KS005	520	upstream	4	24.3	97
		downstream	4	22.9	91.4
KS006	975	upstream	4	4.7	18.8
		downstream	4	3.3	13.2
KS007	n/c	n/c	0	0	0
KN001	708	upstream	4	2	8
		downstream	4	2.2	8.7
KN002	494	upstream	4	3.2	12.7
		downstream	4	2.8	11.3
KN003	564	upstream	4	2.1	8.3
		downstream	4	3	12
KN004	n/c	n/c	0	0	0
KN005	n/c	n/c	0	0	0
KN006	638	upstream	4	3	12
		downstream	4	3.1	12.4
KN007	n/a	n/a	0	0	0
KN008	n/a	n/c	0	0	0

Note: KS = South Expansion Area; KN = North Expansion Area.

n/a =Not applicable as no fishing effort was conducted at the site.

n/c = No channel present for fishing effort.

### 3.1.3 Stream Discharge Measurement

Stream discharge measurements were collected as outlined in Golder's *Technical Procedure 8.24-0: Stream Discharge Measurement Methods* (Golder 1997c). Stream flow data used to calculate the discharge volume were collected using a Marsh-McBirney digital velocity meter at or near the proposed crossing locations.

### 3.1.4 Field Water Quality Measurement

In situ water quality characteristics were measured at the proposed watercourse crossings in accordance with Golder's *Technical Procedure 8.3-1: Surface Water Sampling Methods* (Golder 1997d). Data collected included pH, conductivity, temperature and dissolved oxygen using a YSI 556 multimeter.

## **3.2 ASSESSMENT METHODS**

### **3.2.1 Pipeline Crossing Habitat Evaluation Parameters**

A Pipeline Crossing Habitat Evaluation Parameters (PCHEP) assessment was completed at the potential crossing locations where a defined channel was identified. This assessment outlines protocols to determine the physical characteristics of the stream and to evaluate fish habitat parameters that are required for consideration by TC, DFO and AEW. To ensure consistent evaluations, the protocols used to complete the PCHEP followed Golder's *Technical Procedure 8.14-1: Pipeline Crossing Habitat Evaluation Parameters* (Golder 1997e). The PCHEP assessment results are determined from the fish and fish habitat information collected from the field methods, including:

- general watercourse characteristics (e.g., stream pattern, confinement, gradient);
- photographs of the proposed crossing site;
- channel characteristics (e.g., channel width, cross-sectional depth, velocity profile, depth of pools/riffle/runs);
- field water quality;
- fish presence and species composition in the area of the proposed crossing using backpack electrofishing and minnow trapping;
- stream bed and bank material;
- bed and bank erosion potential;
- other pertinent habitat features (e.g., fish habitat potential, barriers to fish movement, macrophyte growth); and
- a qualitative rating of the suitability of the habitat for the various life history functions of sportfish, non-sportfish and forage fish species.

#### **3.2.1.1 Watercourse Sensitivity to Construction Activities**

Observations made in the field were then used to assess the sensitivity of the watercourse to crossing activities and structure. The sensitivity to crossing construction is influenced by several factors:

- the suitability of the habitat provided by the watercourse for use by the fish species and life stages likely present in the watercourse;
- the fish species likely to be present in the vicinity of the proposed watercourse crossing;

- the expected effects of construction on the habitats within the area affected and their use by fish; and
- the sensitivity of the habitats in the area affected by the crossing sites to sedimentation and other disturbances from construction activities.

Sensitivity to the effects of construction was rated according to the following four levels: nil, low, moderate, or high. Criteria used to assign a level of sensitivity for the watercourse crossed is provided below.

#### **Nil**

- Dry and/or undefined channel.
- No suitable habitat for overwintering, spawning, or rearing.
- Not suitable for use as a migratory corridor.
- Likely to be dry or frozen to the substrate during crossing construction.

#### **Low**

- Stable banks.
- Low scour potential.
- Deep pools, evidence of groundwater seepage, and suitable flows for overwintering totally absent.
- Substrate or macrophytes and flows or water depths suitable for spawning totally absent.
- Water depths, flows, size of substrate, and instream/overhead cover suitable for rearing totally absent.
- Presence of barriers to upstream movement such as seasonal flow, beaver dams, waterfalls and perched culverts in the immediate vicinity of the crossing.

#### **Moderate**

- Unstable banks present, but not abundant.
- Moderate scour potential.
- Deep pools, evidence of groundwater seepage for overwintering present but not abundant. Flows and depths suitable for overwintering.
- Substrate or macrophytes suitable for spawning present but not abundant. Flow or water depths suitable for spawning.
- Size of substrate and instream/overhead cover suitable for rearing present but not abundant. Flows and depths suitable for rearing.

- Flows, water depths and instream/overhead cover suitable for adult holding or feeding.
- Barriers to upstream movement such as seasonal flow, beaver dams, waterfalls and perched culverts more than 5 km from the crossing.

#### **High**

- Unstable banks abundant.
- High scour potential.
- Deep pools, evidence of groundwater seepage for overwintering abundant. Flows and depths suitable for overwintering.
- Size of substrate or macrophytes suitable for spawning abundant. Flows or water depths suitable for spawning.
- Size of substrate and instream/overhead cover suitable for rearing abundant. Flows and depths suitable for rearing.
- Flows, water depths and instream/overhead cover suitable for adult holding or feeding.
- No barriers to upstream movement such as seasonal flow, beaver dams, waterfalls and perched culverts.

### **3.2.1.2 Bank Stability**

Bank stability was evaluated at three levels: low, moderate, or high. Criteria used to assign a level of bank stability are provided below.

- **Low:** evidence of undercutting or slumping abundant.
- **Moderate:** evidence of undercutting or slumping present, but not abundant.
- **High:** no evidence of undercutting or slumping.

### **3.2.1.3 Fish Habitat Suitability**

The potential suitability of the available habitats for use by fish was determined by assessing habitat use potential, which evaluates how well the habitat can provide the physical environment indigenous fish species require throughout their life history (Nelson and Paetz 1992; Scott and Crossman 1973). The habitat types evaluated include: spawning, rearing, feeding and overwintering. The potential suitability of available habitats is ranked as nil, low, moderate and high. These rankings are based on the following criteria:

### **Nil**

- Dry and/or undefined channel.
- No suitable habitat for overwintering (frozen to bottom, anoxic conditions).
- Water quality beyond threshold limits for species in all seasons.
- No suitable habitat for spawning, or rearing.
- Not suitable for use as a migratory corridor.

### **Low**

- Deep pools, evidence of groundwater seepage, and suitable flows/depths for overwintering are limited.
- Water quality (dissolved oxygen/temperature) routinely at or near tolerance levels for species in the region.
- Substrate or macrophytes, flows or water depth suitable for spawning is limited.
- Water depths, flows, size of substrate, and instream/overhead cover suitable for rearing is limited.
- Presence of barriers to upstream movement such as low seasonal flow, beaver dams, waterfalls, and perched culverts present.

### **Moderate**

- Deep pools, evidence of groundwater seepage for overwintering present but not abundant. Flow and depths suitable for overwintering.
- Water quality (dissolved oxygen/temperature) infrequently near tolerance levels for species in region under some conditions.
- Substrate or macrophytes suitable for spawning present, but not abundant. Flows or water depth suitable for spawning.
- Size of substrate and instream/overhead cover suitable for rearing present, but not abundant. Flow and depths suitable for rearing.
- Flows, water depth, and instream/overhead cover suitable for adult holding or feeding.
- Barriers to upstream movement such as seasonal flow, beaver dams, waterfalls, and perched culverts more than 5 km from the survey location.



### High

- Deep pools, evidence of groundwater seepage for overwintering abundant. Flow and depths suitable for overwintering.
- No water quality limitations for species in the region.
- Size of substrate or macrophytes suitable for spawning abundant. Flows or water depth suitable for spawning.
- Size of substrate and instream/overhead cover suitable for rearing abundant. Flows and depths suitable for rearing.
- Flows, water depth, and instream/overhead cover suitable for adult holding or feeding.
- No barriers to upstream movement such as seasonal flow, beaver dams, waterfalls, and perched culverts.

Habitat use potential is not necessarily based on whether a particular fish species or life stage was found using the habitat during sampling, but on how well that habitat would potentially meet the requirements of the species or life stage. At times, this evaluation is conducted for fish guilds, which are groupings of fish species based on similar characteristics or habitat requirements. This evaluation includes three guilds:

- sport fish – large-bodied fish species targeted by subsistence and sport fisherman;
- non-sport fish – large-bodied sucker species; and
- forage fish – small-bodied species that provide food for larger fish.

## 3.2.2 Minor Works Determination

The crossing locations were assessed to determine if they met the criteria of a minor work, depending on the proposed activity/development occurring at each location. The criteria for a minor work are based on the terms and conditions outlined in Section 7 of the Minor Works and Waters (NWPA) Order (TC 2009a).

The Pipeline Crossings – Transport Publication 14593 (NWPA) (TC 2009b) was used to determine whether a pipeline crossing requires an application under the NWPA. A pipeline crossing is considered a minor work and thus does not require an application under the NWPA if it is buried beneath the bed of the watercourse and none of the following criteria apply:

- requires approval under the *National Energy Board Act*;
- is located on a charted navigable water;

- installation requires the use of cables that are not lying on the bed of the watercourse; or
- the width of the waters at the crossing exceeds 50 m.

For the purposes of this Project, if a proposed crossing location only has a buried pipeline then the site was identified as a minor work if it met the specified criteria. This also applies to a pipeline crossing that parallels an existing road where upgrades to the road are not proposed as part of the Project. If the crossings included activities such as construction of a new road or above-ground pipeline, then the minor work criteria would not apply.

### 3.2.3 Minor Waters Determination

Crossing locations were assessed to determine if they met the criteria for minor waters under the Minor Works and Waters (NWPA) Order (TC 2009a). The process for identifying a watercourse as a minor navigable water is summarized in the *Minor Waters User Guide – TP 14838* (TC 2010). This process was used to identify which crossing locations could be identified as a minor water and would not require an application under the NWPA.

The self assessment process of determining a minor waters is a two-stage review process including an Initial and Secondary Review. The initial review consists of measuring only average high-water depth and width. At a minimum, these measurements are collected at three locations including 100 m upstream, 100 m downstream and at the crossing location. If either of the following conditions is met, the watercourse may be considered a minor water and an approval under the NWPA is not required:

- average depth of the watercourse measured at the high-water level is less than 0.30 m; or
- average width of the watercourse measured at the high-water level is less than 1.20 m.

The Secondary Review is the subsequent review method that consists of analyzing the remaining water characteristics in combination with the average width of the watercourse. This review is conducted if the watercourse does not meet the conditions of the initial review. If the average width is 1.2 m or more but no more than 3.0 m and one of the following four conditions are also true, the watercourse may be considered a minor water and an application for approval under the NWPA is not required. The four conditions include:

- average depth of the watercourse measured at the high-water level is 0.6 m or less;
- the slope is greater than 4%;
- the sinuosity ratio is greater than 2; or
- there are 3 or more natural obstacles (i.e. beaver dams, deadfalls, large steep drops or thick vegetation growing in the channel).

If the average high-water width is greater than 3.0 m, the watercourse cannot be considered a minor water and an approval under the NWPA is required.

## 4 RESULTS

A summary of the fish community, fish habitat and regulatory assessment results for each of the 13 watercourse crossing assessments is presented in the following sections. Detailed site information, including photographs, site characteristics and assessment results of each of the crossing locations are provided in [Attachments A](#) through [M](#).

### 4.1.1 Field Results

The activities completed at each of the 13 watercourse crossing locations are summarized in [Table 4](#). A preliminary assessment concluded four of the locations did not have a defined channel; therefore only a reconnaissance photo survey of each was conducted. The sites that did not have a defined channel (KS007, KN004, KN005 and KN008) do not require further evaluation as there are no regulatory requirements associated with AEW, DFO or TC.

The remaining 9 crossing sites were assessed further. Two of the crossing assessments, KS003 and KN007, were reconnaissance surveys which only involved visual observations of habitat. Crossing location KN007 did not require a detailed crossing assessment as the reconnaissance survey concluded it would be a minor water. Crossing location KS003 had a previous crossing assessment conducted by Golder on March 23, 2010. A navigability determination for this crossing indicated the proposed/ existing works at the site are subject to the provisions of the NWPA (File No: 8200-10-10238, Dated August 18, 2010). This determination was also confirmed by TC following a helicopter survey of the crossing on November 2, 2011.

Fish species captured during the fish inventory of the crossings included: northern pike, white sucker, brook stickleback, finescale dace, lake chub and pearl dace. Northern pike were only captured at KN006 and white sucker were only captured at KS006. Fish capture results are detailed for each of the crossing locations in [Attachments A](#) through [M](#).

**Table 4 Summary of Activities Conducted at Watercourse Crossing Locations**

Watercourse Crossing Location	Date	EF	MT	H	D	WQ	P	PC	V	Comments
KS003	30-Aug-11	-	-	-	-	-	-	-		Crossing assessment previously conducted
KS004	1-Sep-11	-							-	None
KS005	1-Sep-11								-	None
KS006	4-Sep-11								-	None
KS007	4-Sep-11	-	-	-	-	-	-	-		No defined channel
KN001	9-Sep-11								-	None
KN002	10-Sep-11								-	None
KN003	10-Sep-11								-	None
KN004	10-Sep-11	-	-	-	-	-	-	-		No defined channel
KN005	2-Sep-11	-	-	-	-	-	-	-		No defined channel
KN006	9-Sep-11								-	None
KN007	2-Jun-11	-	-	-	-	-	-	-		None
KN008	10-Sep-11	-	-	-	-	-	-	-		No defined channel

Note: Circle (●) indicates sampling activity completed. Dash (-) indicates sampling activity not completed.

Field Sampling Activities:

EF – Electrofishing.

MT – Minnow Trapping.

H - Habitat Parameters.

D - Discharge Measurement.

WQ - Water Quality Field Parameters.

P – Photos.

PC – Pipeline Crossing Habitat Evaluation Parameters Assessment.

V – Visual Inspection Only.

KS = South Expansion Area; KN = North Expansion Area.

## 4.1.2 Watercourse Sensitivity to Construction Evaluation Results

Of the crossing locations with defined channels, KS006 was the only site determined to have moderate sensitivity to construction. KS006 is incised with unstable, fine-textured banks in sections which result in a higher potential for slumping and erosion. Sensitivity to construction is low for all the remaining sites as they have stable banks and limited erosion potential. Sensitivity to construction for each of the crossing locations is summarized in [Table 5](#).

Under the Alberta COP for Pipelines and Telecommunication Lines Crossing a Water Body and the COP for Watercourse Crossings, the watercourse crossings are all Class C with a Restricted Activity Period of April 16 to July 15. Construction activities conducted within the restricted period require the written

recommendations of a QAES, although it is Canadian Natural's intent to construct the crossings outside the Restricted Activity Period.

**Table 5 Summary of Watercourse Sensitivity to Construction at Crossing Locations**

Watercourse Crossing Location	Sensitivity to Construction
KS003	Low
KS004	Low
KS005	Low
KS006	Moderate
KN001	Low
KN002	Low
KN003	Low
KN006	Low
KN007	Low

Note: KS = South Expansion Area; KN = North Expansion Area.

### 4.1.3 Fish Habitat Suitability

The fish habitat suitability for each of the watercourse crossing locations is summarized in [Table 6](#). Habitat suitability ranges from nil to high for forage fish, and nil to moderate for sport and non-sport fish species.

The habitat suitability for the KS crossings was between moderate and high for forage fish and low to moderate for sport and non-sport fish species. The habitat suitability for the KN crossings was nil to low for sport and non-sport fish species.

The habitat suitability for KS crossings were characterized by larger watercourses that provided a wider range of habitat types for forage fish, non-sport and sport fish species. In addition, more fish species were captured at the KS crossings as compared to the limited fish community observed at the KN crossing locations. The KN crossings were watercourses that offered low to moderate habitat potential for fish species. KN007 fish habitat suitability is based on a visual assessment. The fish community is unknown within this watercourse as fishing effort was not conducted at this location.

**Table 6 Summary of Fish Habitat Suitability and Culvert Candidacy at Crossing Locations**

Watercourse Crossing Location	Habitat Type								Potential Culvert Candidate
	Forage Fish				Sport/Non-Sport Fish				
	Spawning	Rearing	Feeding	Overwintering	Spawning	Rearing	Feeding	Overwintering	
KS003	Moderate	Moderate	Moderate	Moderate	Low	Moderate	Moderate	Low	No
KS004	Moderate	High	High	Moderate	Low	Moderate	Low	Low	Existing
KS005	Moderate	Moderate	Moderate	Moderate	Low	Low	Low	Low	Existing
KS006	Moderate	High	High	Moderate	Low	Moderate	Moderate	Low	No
KN001	Low	Low	Low	Low	Low	Low	Low	Low	Yes
KN002	Low	Low	Low	Low	Low	Low	Low	Low	Yes
KN003	Low	Low	Low	Low	Low	Low	Low	Low	Yes
KN006	Moderate	Low	Low	Low	Moderate	Low	Low	Low	No
KN007	Moderate	Moderate	Moderate	Nil	Low	Low	Low	Nil	Yes

Note: KS = South Expansion Area; KN = North Expansion Area.

A number of crossing locations are potentially suitable candidate sites for installation of culverts without resulting in an impact on the productive capacity of the fish habitat or fish population or interference with potential navigability (Table 7). Two of the crossing locations (KS004 and KS005) have existing culverts and no work is planned to upgrade the road or the crossing structures at these locations. Four of the crossing locations, including KN001, KN002, KN003 and KN007 are candidates for use of a culvert as the crossing structure. These sites are minor waters that have nil to low habitat suitability for sport fish and non-sport fish, and nil to moderate forage fish habitat potential. Crossings will be designed to maintain fish passage and may include additional mitigation developed in consultation with DFO to avoid the requirement of an Authorization under the *Fisheries Act*. Culvert crossings can be installed within Class C streams under the COP with the written specification of a QAES. Culvert crossings are also proposed for watercourse crossing locations KS007, KN004, KN005 and KN008, which have no defined channels.

Crossing location KS003 is located on a navigable watercourse and a clear-span bridge is proposed at this location. Clear-span bridges are also proposed at KS006 and KN006. Crossing location KS006 has moderate rearing and feeding habitat for sport and non-sport. Crossing location KN006 has moderate spawning suitability for northern pike. Several rearing juvenile northern pike were observed in the watercourse channel at KN006 but low dissolved oxygen concentrations would limit the potential for other species to utilize this habitat. Northern pike juveniles are tolerant to very low dissolved oxygen concentrations.

#### 4.1.4 Minor Works Determination

Of the nine crossings evaluated under the minor works criteria, two (KS004 and KS005) were determined to be minor works and therefore do not require an application under the NWPA. KS004 and KS005 both will have buried pipelines and overhead power lines associated with the Project. Each crossing meets the criteria of a minor work. There is an existing road at these locations but no upgrades or additional work to the road is proposed. The remaining seven crossing locations will include a proposed road crossing and above-ground pipeline; therefore, they cannot be classified as minor works.

**Table 7 Summary of Proposed Activities/Developments and the Minor Works Determination at Crossing Locations**

Watercourse Crossing ID	Proposed Activity/Development					Minor Works Determination (yes or no)
	Rights-of-Way Type	Road	Above-Ground Pipelines	Buried Pipelines	Power Line	
KS003	Production	Yes	Yes	No	Yes	No
KS004	Water Source	Existing	No	Yes	Yes	Yes
KS005	Water Source	Existing	No	Yes	Yes	Yes
KS006	Water Source	Yes	No	Yes	Yes	No
KN001	Production	Yes	Yes	No	Yes	No
KN002	Production	Yes	Yes	Yes	Yes	No
KN003	Water Source	Yes	No	Yes	Yes	No
KN006	Disposal	Yes	No	Yes	No	No
KN007	Production and Water Source	Yes	Yes	Yes	Yes	No

Note: KS = South Expansion Area; KN = North Expansion Area.

#### 4.1.5 Minor Water Determination

The results of the minor waters assessment indicated that six of the crossing locations (KS004, KS005, KN001, KN002, KN003, KN006 and KN007) meet the criteria to be classified as a minor water and, therefore, do not require an application under the NWPA (Table 8). KS005 is determined to be a minor water but is an existing crossing, and was also previously identified as a minor work. The remaining three crossing locations; KS004, KS003 and KS006, are greater than 3.0 m wide and cannot be self assessed as minor waters. KS004 does not meet the criteria for a minor water but is a crossing previously identified as a minor work and therefore does not require an application under the NWPA.



**Table 8 Summary of Minor Waters Determinations at Crossing Locations**

Watercourse Crossing ID	Average Channel Dimensions		Initial Review		Secondary Review			Minor Waters (Yes or No)
	High Water Width	High Water Depth	High Water Width	High Water Depth	High Water Width	High Water Depth	3 or more Natural Obstacles	
	[m]	[m]	<1.2 m	<0.3 m	<3.0 m	<0.6 m		
KS003	5.0	0.59	No	No	No	Yes	Yes	No
KS004	3.4	1	No	No	No	No	Yes	n/a
KS005	1.6	0.68	No	No	Yes	No	Yes	Yes
KS006	4.5	1.6	No	No	No	No	No	No
KN001	2	0.9	No	No	Yes	No	Yes	Yes
KN002	1.1	0.76	Yes	No	n/a	n/a	n/a	Yes
KN003	1.8	1.1	No	No	Yes	No	Yes	Yes
KN006	2.9	0.9	No	No	Yes	No	Yes	Yes
KN007	<1.0 m	<0.3 m	Yes	Yes	n/a	n/a	n/a	Yes

Note: KS = South Expansion Area; KN = North Expansion Area.

n/a = Not applicable.

#### 4.1.6 Transport Canada Site Overflight and Feedback

On November 2, 2011, Canadian Natural, Golder, and TC representatives conducted a flyover of specific crossing locations (NWPP File No: 2011-600195). The purpose of the flyover was to familiarize TC staff with the overall landscape of the Project and to allow for a first-hand visual assessment of the crossing locations to aid in the determination if the NWPA was applicable at any of the sites.

After the initial self assessment utilizing the data collected for each crossing, crossings KS003 and KS006 did not meet the minor waters definition. After review of the site characteristics and completion of the flight of the two crossing locations, TC determined that the only crossing that was subject to the provisions of the NWPA for the Project was site KS003 (Attachment N). As a result, the works proposed at KS003 will require an application and approval under the NWPA. However, Canadian Natural will construct the proposed clear-span bridge, above-ground pipeline and power line crossing at KS003 such they meet the criteria identified under Section 50 of the Exemption List Regulation (NWPA) and a federal environmental assessment under CEAA will not be required.

## **5 SUMMARY**

The Project involves the crossing of watercourses by roads, above-ground pipelines and buried pipelines and power lines in various combinations. In total, 13 crossing assessments were conducted. Four crossings were at sites that had no defined channel; therefore, no approval requirements are associated with TC, DFO or AEW. The remaining nine crossings were assessed to collect the information necessary to support future regulatory approvals or notifications and to determine if federal involvement under the CEAA is required.

### **5.1 TRANSPORT CANADA**

Of the nine locations for watercourse crossings with defined channels, two were identified as minor works and five of the remaining sites were determined to be Minor Waters; therefore, an application for approval under the NWPA is not required. The results of the TC helicopter site tour indicated that only KS003 will require an application under the NWPA (NWPP File No: 2011-600195). The KS003 crossing will be constructed in accordance with the guidelines and specifications required under the Act and will meet the criteria identified under Section 50 of the Exemption List Regulation (NWPA) such that a federal environmental assessment under the CEAA will not be required.

### **5.2 FISHERIES AND OCEANS CANADA**

Fisheries habitat at the stream crossings varies from nil to high suitability for various fish species. Crossing locations KS003, KS004, KS006 and KN006 have moderate habitat suitability for sport and non-sport fish. KS003 is a navigable watercourse and a clear-span bridge is proposed. Clear-span bridges are also proposed at KS006 and KN006 because their habitat potential and the site conditions at each site. Crossing locations KN001, KN002, KN003 and KN007 are potential culvert candidates as they are minor waters, contain low habitat suitability for sport and non-sport fish species, and can be built in a manner that will avoid the HADD of fish habitat.

Watercourse crossing construction will follow methods and mitigation measures outlined in the DFO Alberta Operational Statements (DFO 2008a,b,c) specifically to avoid harm or damage to fish and fish habitat, including consideration of the construction timing, preferred crossing methods, sediment and erosion control plans, and best management practices. Canadian Natural will work with DFO to independently assess each culvert crossing location with a defined channel based on fish habitat and stream channel characteristics. An appropriate crossing will be designed that is best suited to the individual site characteristics,

while meeting regulatory requirements such that a *Fisheries Act* Authorization is not required.

### **5.3 ALBERTA ENVIRONMENT AND WATER**

The Alberta *COP for Pipelines and Telecommunication Lines Crossing a Waterbody* (AENV 2007a) and *COP for Watercourse Crossings* (AENV 2007b) outline the potential crossing methods, structure types and mitigation related to watercourse crossings. Canadian Natural will meet or exceed the mitigation stipulated in the COP's and, if required, will provide written specifications or recommendations of a QAES regarding watercourse crossings. Approval under the *Water Act* is only required if instream work is proposed that is not stipulated under a COP. All of the watercourse crossing activities identified for the Project will fall under a COP and will not require approvals under the *Water Act*.

## 6 CLOSURE

We trust the above meets your present requirements. If you have any questions or require additional details, please contact the undersigned.

### **GOLDER ASSOCIATES LTD.**

Report prepared by:

Report reviewed by:



Michael Day, B.Sc.  
Fisheries Biologist



Kasey Clipperton, B.Sc., M.E.Des.  
Associate, Senior Fisheries Biologist

## 7 REFERENCES

- AENV (Alberta Environment). 2007a. *Code of Practice for Pipelines and Telecommunication Lines Crossing a Water Body. Water Act - Water (Ministerial) Regulation*. Alberta Queen's Printer. February 2007. Edmonton, AB. 37 pp.
- AENV (Alberta Environment). 2007b. *Code of Practice for Watercourse Crossings. Water Act - Water (Ministerial) Regulation*. Alberta Queen's Printer. February 2007. Edmonton, AB. 26 pp.
- AEW (Alberta Environment and Water). 2011. *Final Terms of Reference Environmental Impact Assessment (EIA) Report for the Canadian Natural Kirby In-Situ Oil Sands Expansion*. Edmonton AB.
- DFO (Fisheries and Oceans Canada). 2008a. Alberta Operational Statement (OS), Punch and Bore Crossings (Version 3.0). 3pp.
- DFO. 2008b. Alberta Operational Statement (OS), Isolated or Dry Open-Cut Stream Crossings (Version 3.0). 4pp.
- DFO. 2008c. Alberta Operational Statement (OS), Clear-Span (Version 3.0). 3pp.
- Golder (Golder Associates Ltd.). 1997a. *Technical Procedure (TP) 8.3-1: Surface Water Sampling Methods*. Calgary, AB.
- Golder. 1997b. *Technical Procedure (TP) 8.1-3: Fish Inventory Methods*. Calgary, AB.
- Golder. 1997c. *Technical Procedure 8.5-1: Watercourse Habitat Mapping System*. Calgary, AB.
- Golder. 1997d. *Technical Procedure 8.24-0: Stream Discharge Measurement Methods*. Calgary, AB.
- Golder. 1997e. *Technical Procedure 8.14-1: Pipeline Crossing Habitat Evaluation Parameters*. Calgary, AB.
- Government of Canada. 1985. *Navigable Waters Protection Act. (R.S., 1985, c. N-22)*. Department of Justice. Act current to March 9, 2011.

Nelson, J.S. and M.J. Paetz. 1992. *The Fishes of Alberta*. 2nd Edition. University of Calgary Press. Calgary, AB.

Scott, W.B. and E.J. Crossman. 1973. *Freshwater Fishes of Canada*. Fisheries Research Board of Canada Bulletin. No. 184. 966 pp.

TC (Transport Canada). 2009a. *Minor Works and Waters (Navigable Waters Protection Act) Order*. Transport Canada. Order current to April 22, 2009.

TC (Transport Canada). 2009b. *Pipeline Crossings – Transport Publication 14593 (NWPA)*. Transport Canada.

TC (Transport Canada). 2010. *Minor Waters User Guide – TP 14838*. Transport Canada.

## 8 ABBREVIATIONS

°C	Temperature in degrees Celsius
%	Percent
<	Less than
AEW	Alberta Environment and Water, formerly Alberta Environment (AENV)
bb/d	barrels per day
Canadian Natural	Canadian Natural Resources Limited
CEAA	<i>Canadian Environmental Assessment Act</i>
CPF	Central Processing Facility
COP	Code of Practice
CPUE	Catch per unit of effort
DFO	Fisheries and Oceans Canada (Note: formerly Department of Fisheries and Oceans Canada)
DO	Dissolved Oxygen
e.g.	For example
EIA	Environmental Impact Assessment
Enerplus	Enerplus Resources Fund
EPEA	<i>Alberta Environmental Protection and Enhancement Act</i>
ERCB	Energy Resources Conservation Board
Golder	Golder Associates Ltd.
ha	hectare
HADD	Harmful Alteration, Disruption or Destruction
hr or h	hour
ID	Interim Directive
i.e.	That is
km	kilometre
KN	North Expansion Area
KN1	Kirby North Phase 1
KN2	Kirby North Phase 2
KS	South Expansion Area
KS1	Kirby South 2010
KS2	Kirby South Phase 2
m	metre
m <sup>3</sup>	cubic metre
m <sup>3</sup> /d	cubic metre per day
mg/L	Milligrams per litre
m/s	Metres per second
n/a	Not applicable
NAD	North American Datum
NWPA	<i>Navigable Waters Protection Act</i>

OS	Operational Statements
PCHEP	Pipeline Crossing Habitat Evaluation Parameters
QAES	Qualified Aquatics Environmental Specialist
RAP	Restricted Activity Period
RMWB	Regional Municipality of Wood Buffalo
s	Second
SAGD	Steam Assisted Gravity Drainage
The Project	Kirby In Situ Oil Sands Expansion Project
TC	Transport Canada
UTM	Universal Transverse Mercator
W4M	West of the Fourth Meridian
µS/cm	Microsiemens per centimetre



## 9 GLOSSARY

<b>Anoxia</b>	Little to no dissolved oxygen in the water sample. Waters with less than 2 mg/L of dissolved oxygen experience anoxia.
<b>Bankfull Width</b>	The width of the stream, measured at the water surface elevation corresponding to the bankfull discharge. For undisturbed streams with a wide floodplain, this is equivalent to channel width.
<b>Bedrock</b>	The body of rock that underlies gravel, soil or other subregion material.
<b>Bitumen</b>	A highly viscous, tarry, black hydrocarbon material having an API gravity of about 9 (specific gravity about 1.0). It is a complex mixture of organic compounds. Carbon accounts for 80 to 85% of the elemental composition of bitumen, hydrogen 10%, sulphur 5%, and nitrogen, oxygen and trace elements form the remainder.
<b>Channel</b>	The bed of a stream or river.
<b>Channel Unit</b>	Distinct channel sections with specific characteristics of water depth, velocity and cover for fish.
<b>Channel Width</b>	The horizontal distance along a transect line from stream bank to stream bank (rooted vegetation to rooted vegetation) at the normal high water marks measured at right angles to the direction of flow.
<b>Conductivity</b>	A measure of the capacity of water to conduct an electrical current. It is the reciprocal of resistance. This measurement provides an estimate of the total concentration of dissolved ions in the water.
<b>Dissolved Oxygen (DO)</b>	Measurement of the concentration of dissolved (gaseous) oxygen in the water, usually expressed in milligrams per litre (mg/L).
<b>Drainage Basin</b>	A region of land that eventually contributes water to a river or lake.
<b>Electrofishing</b>	A 'live' fish capture technique in which negative (anode) and positive (cathode) electrodes are placed in the water and an electrical current is passed between the electrodes. Fish are attracted (galvano-taxis) to the anode and become stunned (galvano-narcosis) by the current, allowing fish to be collected, measured and released.
<b>Emergent Vegetation</b>	Aquatic plants which root in shallow water but grow primarily above the water e.g., cattails and bulrushes.
<b>Environmental Impact Assessment (EIA)</b>	A review of the effects that a proposed development will have on the local and regional environment.
<b>Erosion</b>	The process by which material, such as rock or soil, is worn away or removed by wind or water.

<b>Fish</b>	Fish as defined in the <i>Fisheries Act</i> , includes parts of fish, shellfish, crustaceans, marine animals and any parts of shellfish, crustaceans or marine animals and the eggs, sperm, spawn, larvae, spat and juvenile stages of fish, shellfish, crustaceans and marine animals.
<b>Fish Habitat</b>	Fish habitat, as defined in the <i>Fisheries Act</i> , includes the spawning grounds and nursery, rearing, food supply and migration areas on which fish depend directly or indirectly to carry out their life processes.
<b>Footprint</b>	The proposed development area that directly affects the soil and vegetation components of the landscape.
<b>Forage Fish</b>	Small fish that provide food for larger fish (e.g., longnose sucker, fathead minnow).
<b>Groundwater</b>	That part of the subsurface water that occurs beneath the water table, in soils and geologic formations that are fully saturated.
<b>Guilds</b>	A set of co-existing species that share a common resource.
<b>Habitat</b>	The place or environment where a plant or animal naturally or normally lives or occurs.
<b>In Situ</b>	Also known as “in place”. Refers to methods of extracting deep deposits of oil sands without removing the groundcover. The in situ technology in oil sands uses underground wells to recover the resources with less impact to the land, air and water than for oil sands mining.
<b>Local Study Area (LSA)</b>	Defines the spatial extent directly or indirectly affected by the project.
<b>Macrophytes</b>	Plants large enough to be seen by the unaided eye. Aquatic macrophytes are plants that live in or in close proximity to water.
<b>Morphology</b>	Morphology or fluvial geomorphology is the term used in the description of closure drainage designs that replicate natural analogues. It describes the process and the structure of natural systems that are to be replicated in constructed drainage channels, including regime relationships for various channel parameters such as width, depth, width/depth ratio, meander wavelength, sinuosity, bed material, gradient and bank slope.
<b>Muskeg</b>	A soil type comprised primarily of organic matter. Also known as bog peat.
<b>Non-Sport Fish</b>	Large fish that is not caught for food or sport (e.g., longnose sucker, white sucker).
<b>Oil Sands</b>	A sand deposit containing a heavy hydrocarbon (bitumen) in the intergranular pore space of sands and fine grained particles. Typical oil sands comprise approximately 10 wt% bitumen, 85% coarse sand (>44 µm) and a fines (<44 µm) fraction, consisting of silts and clays.

<b>Overwintering Habitat</b>	Habitat used during the winter as a refuge and for feeding.
<b>pH</b>	The degree of acidity (or alkalinity) of soil or solution. The pH scale is generally presented from 1 (most acidic) to 14 (most alkaline). A difference of one pH unit represents a ten-fold change in hydrogen ion concentration.
<b>Reach</b>	A comparatively short length of river, stream channel or shore. The length of the reach is defined by the purpose of the study.
<b>Riffle-Run-Pool</b>	A mixture of flows and depth and providing a variety of habitats. Pools are deep with slow water. Riffles are shallow with fast, turbulent water running over rocks. Runs are deep with fast water and little or no turbulence.
<b>Sediment</b>	Solid material that is transported by, suspended in, or deposited from water. It originates mostly from disintegrated rocks; it also includes chemical and biochemical precipitates and decomposed organic material, such as humus. The quantity, characteristics and cause of the occurrence of sediment in streams are influenced by environmental factors. Some major factors are degree of slope, length of slope soil characteristics, land usage and quantity and intensity of precipitation.
<b>Seepage</b>	Slow water movement in subsurface. Flow of water from constructed retaining structures. A spot or zone, where water oozes from the ground, often forming the source of a small spring.
<b>Sinuosity</b>	The ratio of the thalweg length (i.e., the line connecting the deepest points along a stream) to valley length, for a specific reach of a river or stream system. This is, in essence, a ratio of the stream's actual "running" length to its down-gradient length.
<b>Spawning</b>	The reproductive stage of adult fish that includes fertilization and deposition of eggs.
<b>Species</b>	A group of organisms that actually or potentially interbreed and are reproductively isolated from all other such groups; a taxonomic grouping of genetically and morphologically similar individuals; the category below genus.
<b>Sport/Game Fish</b>	Large fish caught for food or sport (e.g., northern pike, Arctic grayling).
<b>Steam Assisted Gravity Drainage (SAGD)</b>	An in situ oil sands recovery technique that involves the use of two horizontal wells, one to inject steam and a second to produce the bitumen.

<b>Substrate</b>	<p>Material in the stream bed. The assemblage of material sizes include:</p> <ul style="list-style-type: none"><li>• Organic/Silt: organic material or fine material less than 0.006 mm diameter;</li><li>• Sand: material 0.06 to 2.0 mm diameter;</li><li>• Small Gravel: material 2 to 8 mm diameter;</li><li>• Large Gravel: material 8 to 32 mm diameter;</li><li>• Pebble: material 32 to 64 mm diameter;</li><li>• Cobble: material 64 to 256 mm diameter; and</li><li>• Boulder: material &gt;256 mm diameter.</li></ul>
<b>Waterbody</b>	<p>A general term that refers to ponds, bays, lakes, estuaries and marine areas.</p>
<b>Watercourse</b>	<p>A general term that refers to riverine systems such as creeks, brooks, streams and rivers.</p>
<b>Wetted Width</b>	<p>The width of the water surface measured at right angles to the direction of flow. Multiple channel widths are summed to obtain total wetted width.</p>

**ATTACHMENT A**

**KS003**

## KS003

Crossing location KS003 is on an unnamed tributary of Wiau Lake and is downstream of the outlet of Unnamed Lake 1 (Figure 1, Figure A). The proposed activity/development at this site includes the construction of a clear-span bridge, an above-ground pipeline and a power line.

A previous crossing assessment was conducted March 23, 2010 by Golder Associates Ltd. and a navigability determination indicated the proposed/existing works at the site are subject to the provisions of the *Navigable Water Protection Act* (NWPA) (File No: 8200-10-10238, Dated August 18, 2010). In March 2010, the watercourse channel width was 5.0 m wide and the channel depth was 0.59 m. The substrate consisted of fines with abundant macrophyte growth and there were four beaver dams upstream and downstream of the crossing location. An existing road is located adjacent to the crossing site but the previous crossing structure was removed. On August 30, 2011 a reconnaissance survey was conducted at the site, which confirmed that site conditions were similar to the previous assessment.

Transport Canada determined this watercourse is navigable and requires the submission of an application for approval under the NWPA.



Photo 1: Upstream view at crossing location of upstream impoundment (September 2011).



Photo 2: Downstream view from crossing location (September 2011).



Photo 3: Downstream view from 100 m downstream of the crossing location (September 2011).



Photo 4: Downstream aerial view of crossing location, looking northeast (November 2011).

Site	
Location (Legal)	S16 T74 R8 M4 SE
Location (UTM)	490241E 6139580N
Survey Date	17-Mar-2010
Watercourse	Unnamed Tributary

Channel Morphology at Crossing			
Pattern:	Impoundment	Channel Width [m]:	n/a
Confinement:	Un-confined	Channel Depth [m]:	n/a
Bank Stability:	Moderate	Wetted Width [m]:	n/a
Channel Profile:	Irregular	Wetted Depth [m]:	n/a
Bank Texture:	Fines	Discharge [m <sup>3</sup> /s]:	n/a

Substrate [%]		Water Quality Field Parameters	
Fines:	100	pH:	-
Small Gravel:		Temp. [°C]:	-
Gravel:		Cond. [µS/cm]:	-
Cobble:		D.O. [mg/L]:	-
Boulder:			
Bedrock:			

Fish Collection Data			
Minnow Trap		Electrofishing	
Fish Captured	Effort [h]	Fish Captured	Effort [s]
-	-	-	-

Habitat Suitability		
Fish Life Stage	Forage Fish	Sport/Non-Sport Fish
Spawning	Moderate	Low
Rearing	Moderate	Moderate
Feeding	Moderate	Moderate
Overwintering	Moderate	Low

Stream Classification	
AENV COP	Class C
Restricted Activity Period	Apr 16 – Jul 15
Sensitivity to Construction	Low

Minor Works and Minor Navigable Waters Determination	
Minor Works	
Proposed Activity/Development	Road, Below Ground Pipeline, Powerline
Minor Work Determination	No
Minor Waters	
Average Channel Depth (m)	0.59
Average Channel Width (m)	5.0
Channel Slope	-
Sinuosity Ratio	-
Frequency of Natural Obstacles	4 Beaver Dams, Vegetated channel
Minor Waters Determination	No – previously assessed



Photo 5: Aerial view of crossing location, looking upstream and northeast (September 2011).

L:\2010\1346\10-1346-0052\6100\Report A (6110)\FigA\_10134600526100A012 CrossingLoc-KS003.dwg Dec 08, 2011 - 12:22pm

		<b>KIRBY IN SITU OIL SANDS EXPANSION PROJECT</b>	
<b>KS003 - KIRBY CROSSING SUMMARY SHEET</b>			
PROJECT	10.1346.0052.6100	FILE No.	10134600526100A012
DESIGN	DA 12/10/11	SCALE	AS SHOWN REV. 0
CADD	BTM 08/12/11		
CHECK	MD 07/12/11		
REVIEW	KC 08/12/11		
		<b>FIGURE: A</b>	

SCHEMATIC ONLY, NOT TO SCALE

**ATTACHMENT B**

**KS004**



## KS004

Crossing location KS004 is on an unnamed tributary of Winefred Lake (Figure 1, Figure B). The watercourse is already crossed by an existing road with two culverts at the proposed crossing location. The proposed activity/development at the site includes the installation of a buried pipeline and a power line. The existing road will be used to access areas of the Project but no upgrades or changes are planned.

### Habitat Assessment

The pertinent parameters related to the PCHEP assessment at each of the transect locations on crossing KS004 are shown in Table B-1. The transects were located where the creek was confined upstream and downstream of the beaver impounded areas. An aerial assessment of the watercourse confirmed that the watercourse was narrower at distances greater than 100 m upstream and downstream of the crossing location.

**Table B-1 Crossing KS004 Transect Habitat Parameters**

Parameter	125 m Upstream	At Crossing	170 m Downstream
Bankful Width [m]	1.55	5.9	2.6
Wetted Width [m]	1.55	4.6	2.6
Avg. Channel Depth [m]	0.68	1.16	0.9
Average Water Velocity [m/s]	0.01	0.01	0.01
Substrate [% composition]	F (100)	F (100)	F (100)
Bank Stability	High	Moderate	High

Note: Substrate: F=finest, G=gravel, C=cobble, B=boulder.

The watercourse adjacent to the existing road provides slow moving, impounded, pool habitat. Upstream and downstream of beaver impounded sections, the watercourse was confined within a meandering channel with stable banks. The substrate consisted of fines and organics. Instream cover for fish was provided primarily by vegetation and depth of water. Overhead cover consisted mostly of overhanging vegetation including trees, shrubs and grasses. Three beaver dams were identified within the surveyed reach.

### Fish Inventory

In total, 214 brook stickleback (*Culaea inconstans*), and 361 finescale dace (*Phoxinus neogaeus*) were captured from minnow trapping. Backpack electrofishing was not conducted as site conditions were not suitable for successful electrofishing effort. Catch results for minnow trapping including catch-per-unit effort (CPUE) for each species caught, are listed in Table B-2. No sport or non-sport fish were captured during the fish inventory.

**Table B-2 Minnow Trapping Catch and Catch-Per-Unit-Effort for Species Captured At KS004**

Set Location	# of Traps	Total Effort [trap-hr]	Species <sup>(a)</sup>			
			BRST		FNDC	
			Catch	CPUE	Catch	CPUE
Upstream	8	171.3	148	86.4	199	116.2
Downstream	4	90	66	73.3	162	180.0

<sup>(a)</sup> BRST = brook stickleback, FNDC = finescale dace.  
CPUE= Number of fish/Effort (trap-hours).

### ***Water Quality***

Water quality data were collected at KS004. Water temperature was 10.9°C, pH was 7.5, dissolved oxygen concentration was 7.4 mg/L and conductivity was 156 µS/cm.

### ***Discharge***

A stream discharge of 0.009 m<sup>3</sup>/s was measured at KS004 at the time of survey.

### ***PCHP Assessment***

The watercourse was poorly confined due to extensive beaver activity at the crossing location. The location of the proposed crossing has an irregular meandering, unconfined, open channel with class 1 and 2 impounded habitat. Spawning and overwintering habitat potential was rated moderate for forage fish and low for large-bodied species. Rearing habitat was rated high for forage species. Sensitivity to construction activities was considered low because the channel had stable banks and a low scour potential due to the slow-moving flow. The fish community consisted entirely of forage fish species.

### ***Minor Works and Minor Navigable Waters Determination***

As the proposed activity/development includes a buried pipeline, a power line and use of the existing road, the determination for this crossing is a minor work that is not subject to the provisions of the NWPA.



Photo 1: Upstream view from crossing location to upstream beaver impoundment (September 2011).



Photo 2: Downstream view from crossing location (September 2011).



Photo 3: Downstream view of beaver dam located 74 m downstream of crossing location (September 2011).



Photo 4: Downstream aerial view looking northeast with small channel upstream (September 2011).

Site	
Location (Legal)	S26 T73 R7 M4 NE
Location (UTM)	503203E 6133982N
Survey Date	01-Sep-2011
Watercourse	Unnamed Tributary

Channel Morphology at Crossing			
Pattern:	Irregular Meander	Channel Width [m]:	5.9
Confinement:	Un-confined	Channel Depth [m]:	1.2
Bank Stability:	Moderate	Wetted Width [m]:	4.6
Channel Profile:	Irregular	Wetted Depth [m]:	0.54
Bank Texture:	Fines	Discharge [m <sup>3</sup> /s]:	0.0096

Substrate [%]		Water Quality Field Parameters	
Fines:	100	pH:	7.5
Small Gravel:	-	Temp. [°C]:	10.9
Gravel:	-	Cond. [µS/cm]:	156
Cobble:	-	D.O. [mg/L]:	7.4
Boulder:	-		
Bedrock:	-		

Fish Collection Data			
Minnow Trap		Electrofishing	
Fish Captured	Effort [h]	Fish Captured	Effort [s]
575	261:20	-	-

Habitat Suitability		
Fish Life Stage	Forage Fish	Sport/Non-Sport Fish
Spawning	Moderate	Low
Rearing	High	Moderate
Feeding	High	Low
Overwintering	Moderate	Low



Stream Classification	
AENV COP	Class C
Restricted Activity Period	Apr 16 – Jul 15
Sensitivity to Construction	Low

Minor Works and Minor Navigable Waters Determination	
Minor Works	
Proposed Activity/Development	Existing Road, Below Ground Pipeline, Powerline
Minor Work Determination	Yes
Minor Waters	
Average Channel Depth (m)	1.0
Average Channel Width (m)	3.4
Channel Slope	-
Sinuosity Ratio	-
Frequency of Natural Obstacles	3 beaver dams
Minor Waters Determination	No



Photo 5: Downstream aerial view of crossing location, looking northeast (November 2011).

L:\2010\1346\10-1346-0052\6100\Report A (6110)\FigB\_10134600526100A013 CrossingLoc-KS004.dwg Dec 08, 2011 - 12:22pm

PROJECT		 <b>KIRBY IN SITU OIL SANDS EXPANSION PROJECT</b>	
TITLE		<b>KS004 - KIRBY CROSSING SUMMARY SHEET</b>	
PROJECT	10.1346.0052.6100	FILE No.	10134600526100A013
DESIGN	DA 12/10/11	SCALE	AS SHOWN REV. 0
CADD	BTM 08/12/11	 <b>FIGURE: B</b>	
CHECK	MD 07/12/11		
REVIEW	KC 08/12/11		

SCHEMATIC ONLY, NOT TO SCALE

**ATTACHMENT C**

**KS005**

## KS005

Crossing location KS005 is on an unnamed tributary of Winefred Lake (Figure 1, Figure C). The watercourse is already crossed by an existing road with a single culvert at the proposed crossing. The proposed activity/development at the site includes the installation of a buried pipeline and a power line. The existing road will be used to access areas of the Project but no upgrades or changes are planned.

### **Habitat Assessment**

The pertinent parameters related to the PCHEP assessment at each of the transect locations on crossing KS005 are shown in Table C-1. Downstream of the crossing there was no confined channel with some pools, with water flowing throughout vegetation; therefore, no stream channel measurements were taken downstream. Upstream of the existing road, the watercourse provided slow moving, Class 3 run habitat. The watercourse's morphology was meandering, with both banks appearing stable with limited undercutting and no slumping observed. The substrate consisted of fines and organics. Instream cover for fish was provided by vegetation. Overhead cover consisted mostly of overhanging vegetation including shrubs and grasses.

**Table C-1 Crossing KS005 Transect Habitat Parameters**

Parameter	100 m Upstream	50 m Upstream	At Crossing
Bankful Width [m]	1.6	1.5	1.6
Wetted Width [m]	1.6	1.5	1.6
Avg. Channel Depth [m]	0.6	0.69	0.63
Average Water Velocity [m/s]	0.02	0.00	0.00
Substrate [% composition]	F (100)	F (100)	F (100)
Bank Stability	High	High	Moderate

Note: Substrate: F=fines, G=gravel, C=cobble, B=boulder.

### **Fish Inventory**

In total, 69 brook stickleback and 22 lake chub (*Couesius plumbeus*) were captured from both backpack electrofishing and minnow trapping. Backpack electrofishing captured a single lake chub and CPUE was 0.19 fish per 100 seconds of effort. Catch results for minnow trapping including CPUE for each species caught are shown in Table C-2. No sport fish were captured during the fish inventory.

**Table C-2 Minnow trapping catch and catch-per-unit-effort for species captured at KS005**

Set Location	# of Traps	Total Effort (trap-hr)	Species <sup>(a)</sup>			
			BRST		LKCH	
			Catch	CPUE	Catch	CPUE
Upstream	4	97	7	7.2	9	9.3
Downstream	4	91.4	62	67.8	12	13.1

<sup>(a)</sup> BRST = brook stickleback, LKCH = lake chub.  
CPUE= Number of fish / Effort (trap-hours).

### ***Water Quality***

Water quality data were collected at KS005. Water temperature was 9.7°C, pH was 7.2, dissolved oxygen concentration was 6.1 mg/L and conductivity was 138 µS/cm.

### ***Discharge***

A stream discharge of 0.008 m<sup>3</sup>/s was calculated at KS005 at the time of survey.

### ***PCHEP Assessment***

The bed and banks of the stream are well defined upstream of the crossing, but downstream, the stream is primarily unconfined with pooled water in locations. The watercourse at the crossing has an irregular meandering, un-confined, irregular channel with shallow class 3 run habitat. Spawning and overwintering habitat potential was rated moderate for forage fish and low for large-bodied species. Rearing habitat was rated moderate for forage species. Sensitivity to construction activities was considered low because the channel had stable banks and a low scour potential due to the slow-moving flow, and the fish community consisted entirely of forage fish species.

### ***Minor Works and Minor Navigable Waters Determination***

As the proposed activity/development includes a buried pipeline, a power line and use of the existing road, the determination for this crossing is a minor work that is not subject to the provisions of the NWPA.



Photo 1: Upstream view from crossing location (September 2011).



Photo 2: Downstream view from crossing location (September 2011).



Photo 3: Downstream view of unconfined watercourse downstream of crossing location (September 2011).



Photo 4: Upstream view of watercourse upstream of crossing location (September 2011).

Site	
Location (Legal)	S25 T73 R7 M4 NE
Location (UTM)	504894E 6133989N
Survey Date	01-Sep-2011
Watercourse	Unnamed Tributary

Channel Morphology at Crossing			
Pattern:	Irregular Meander	Channel Width [m]:	1.6
Confinement:	Un-confined	Channel Depth [m]:	0.7
Bank Stability:	Moderate	Wetted Width [m]:	1.6
Channel Profile:	Irregular	Wetted Depth [m]:	0.38
Bank Texture:	Fines	Discharge [m <sup>3</sup> /s]:	0.0083

Substrate [%]		Water Quality Field Parameters	
Fines:	100	pH:	7.2
Small Gravel:	-	Temp. [°C]:	9.7
Gravel:	-	Cond. [µS/cm]:	138
Cobble:	-	D.O. [mg/L]:	6.1
Boulder:	-		
Bedrock:	-		

Fish Collection Data			
Minnow Trap		Electrofishing	
Fish Captured	Effort [h]	Fish Captured	Effort [s]
90	192	1	520

Habitat Suitability		
Fish Life Stage	Forage Fish	Sport/Non-Sport Fish
Spawning	Moderate	Low
Rearing	Moderate	Low
Feeding	Moderate	Low
Overwintering	Moderate	Low

Stream Classification	
AENV COP	Class C
Restricted Activity Period	Apr 16 – Jul 15
Sensitivity to Construction	Low

Minor Works and Minor Navigable Waters Determination	
Minor Works	
Proposed Activity/Development	Existing Road, Below Ground Pipeline
Minor Work Determination	Yes
Minor Waters	
Average Channel Depth (m)	0.68
Average Channel Width (m)	1.6
Channel Slope	-
Sinuosity Ratio	-
Frequency of Natural Obstacles	1 beaver dam and abundant instream vegetation
Minor Waters Determination	Yes



Photo 5: Upstream aerial view of crossing location, looking south (September 2011).

L:\2010\1346\10-1346-0052\6100\Report A (6110)\FigC\_10134600526100A014 CrossingLoc-KS005.dwg Dec 08, 2011 - 12:27pm

		<b>KIRBY IN SITU OIL SANDS EXPANSION PROJECT</b>	
<b>KS005 - KIRBY CROSSING SUMMARY SHEET</b>			
PROJECT	10.1346.0052.6100	FILE No.	10134600526100A014
DESIGN	DA 12/10/11	SCALE	AS SHOWN REV. 0
CADD	BTM 08/12/11		
CHECK	MD 07/12/11		
REVIEW	KC 08/12/11		
		<b>FIGURE: C</b>	

SCHEMATIC ONLY, NOT TO SCALE

**ATTACHMENT D**

**KS006**



## KS006

Crossing location KS006 is on an unnamed tributary of Winefred Lake (Figure 1, Figure D). The proposed activity/development at the site includes the construction of a road and the installation of a buried pipeline and a power line. The crossing is within an existing rights-of-way.

### Habitat Assessment

The pertinent parameters related to the PCHEP assessment at each of the transect locations on crossing KS006 are shown in Table D-1.

The watercourse provides slow moving, class 1 and 3 impounded habitat with some class 1 and 3 run habitat. The watercourse's morphology was meandering with both banks appearing unstable some bank undercutting and slumping observed. Oxbows (i.e., cut-off channels) were present adjacent to the crossing location, indicating the channel has migrated. The substrate consisted of fines. Instream cover for fish was provided primarily by depth of water. Overhead cover consisted mostly of undercut banks with overhanging vegetation including shrubs and grasses.

**Table D-1 Crossing KS006 Transect Habitat Parameters**

Parameter	100 m Upstream	At Crossing	130 m Downstream
Bankful Width [m]	4.3	5.7	3.6
Wetted Width [m]	4.3	4.3	3.5
Avg. Channel Depth [m]	1.48	1.62	1.24
Average Water Velocity [m/s]	0.01	0.01	0.02
Substrate [% composition]	F (100)	F (100)	F (100)
Bank Stability	Low	Low	Low

Note: Substrate: F=fines, G=gravel, C=cobble, B=boulder.

### Fish Inventory

In total, 75 brook stickleback, 47 finescale dace, 41 lake chub, 2 pearl dace (*Margariscus margarita*) and 21 juvenile white sucker (*Catostomus commersoni*) were captured from both backpack electrofishing and minnow trapping. Catch results for backpack electrofishing and minnow trapping including CPUE for each species caught are listed in Tables D-2 and D-3. No sport fish were captured during the fish inventory.

**Table D-2 Backpack electrofishing catch and catch-per-unit-effort for species captured at KS006**

Effort (sec)	Species <sup>(a)</sup>									
	BRST		LKCH		FNDC		PRDC		WHSC	
	Catch	CPUE	Catch	CPUE	Catch	CPUE	Catch	CPUE	Catch	CPUE
975	15	1.5	15	1.5	5	0.5	1	0.1	7	0.7

<sup>(a)</sup> BRST = brook stickleback, LKCH = lake chub, FNDC = finescale dace, PRDC = pearl dace, WHSC = white sucker.  
CPUE= Number of fish/Effort (100 seconds).

**Table D-3 Minnow trapping catch and catch-per-unit-effort for species captured at KS006**

Set Location	# of Traps	Total Effort [trap-hr]	Species <sup>(a)</sup>									
			BRST		LKCH		FNDC		PRDC		WHSC	
			Catch	CPUE	Catch	CPUE	Catch	CPUE	Catch	CPUE	Catch	CPUE
Upstream	4	18.8	18.7	28	1.5	0	5	0.3	0	0	1	0.1
Downstream	4	13.2	13.3	32	2.4	26	37	2.8	1	0.1	13	1

<sup>(a)</sup> BRST = brook stickleback, LKCH = lake chub, FNDC = finescale dace, PRDC = pearl dace, WHSC = white sucker.  
CPUE= Number of fish/Effort (100 seconds).

## Water Quality

Water quality data were collected at KS006. Water temperature was 14.3°C, pH was 8.0, dissolved oxygen concentration was 9.3 mg/L and conductivity was 218 µS/cm.

## Discharge

A stream discharge of 0.033 m<sup>3</sup>/s was calculated at KS006 at the time of survey.

## PCHEP Assessment

The bed and banks of the stream were well defined at the proposed crossing location. The watercourse at the crossing has a tortuous meandering, incised channel in an unconfined valley with Class 1 and 3 run habitat and large sections of the creek comprised of deep and shallow impoundments related to beaver activity. Spawning and overwintering habitat potential was rated moderate for forage fish and low for large-bodied species. Rearing habitat was rated high for forage species and moderate for large-bodied species. Sensitivity to construction activities was considered moderate because the channel had unstable banks with evidence of slumping and channel migration, but there is low scour potential due to the slow-moving flow. The fish community consisted largely of forage fish species but white sucker were also captured, indicating spawning and rearing habitat is present.

### ***Minor Works and Minor Navigable Waters Determination***

The proposed activity/development includes the construction of a road and installation of a buried pipeline and a power line. Transport Canada determined this watercourse will not require an NWPA application.



Photo 1: Downstream view from crossing location (September 2011).



Photo 2: Upstream view from 100 m upstream of the crossing location (September 2011).



Photo 3: Downstream view from beaver dam at 50 m downstream of crossing location (September 2011).



Photo 4: Upstream aerial view of crossing location, looking northeast (November 2011).

Site	
Location (Legal)	S28 T73 R6 M4 NE
Location (UTM)	509394E 6133971N
Survey Date	04-Sep-2011
Watercourse	Unnamed Tributary

Channel Morphology at Crossing			
Pattern:	Tortuous Meander	Channel Width [m]:	5.7
Confinement:	Un-confined	Channel Depth [m]:	1.9
Bank Stability:	Low	Wetted Width [m]:	4.3
Channel Profile:	Deeply Incised	Wetted Depth [m]:	1.1
Bank Texture:	Fines	Discharge [m <sup>3</sup> /s]:	0.0329

Substrate [%]		Water Quality Field Parameters	
Fines:	100	pH:	8.0
Small Gravel:		Temp. [°C]:	14.3
Gravel:		Cond. [µS/cm]:	218
Cobble:		D.O. [mg/L]:	9.3
Boulder:			
Bedrock:			

Fish Collection Data			
Minnow Trap		Electrofishing	
Fish Captured	Effort [h]	Fish Captured	Effort [s]
144	32	43	975

Habitat Suitability		
Fish Life Stage	Forage Fish	Sport/Non-Sport Fish
Spawning	Moderate	Low
Rearing	High	Moderate
Feeding	High	Moderate
Overwintering	Moderate	Low



Stream Classification	
AENV COP	Class C
Restricted Activity Period	Apr 16 – Jul 15
Sensitivity to Construction	Moderate

Minor Works and Minor Navigable Waters Determination	
Minor Works	
Proposed Activity/Development	Road, Below Ground Pipeline, Power Line
Minor Work Determination	No
Minor Waters	
Average Channel Depth (m)	1.6
Average Channel Width (m)	4.5
Channel Slope	-
Sinuosity Ratio	-
Frequency of Natural Obstacles	2 beaver dams and lots of beaver activity noted
Minor Waters Determination	Yes



Photo 5: Downstream aerial view of crossing location, looking southwest (November 2011).

L:\2010\1346\10-1346-0052\6100\Report A (6110)\FigD\_10134600526100A015 CrossingLoc-KS006.dwg Dec 08, 2011 - 12:27pm

PROJECT		 <b>KIRBY IN SITU OIL SANDS EXPANSION PROJECT</b>	
TITLE		<b>KS006 - KIRBY CROSSING SUMMARY SHEET</b>	
PROJECT		10.1346.0052.6100	FILE No. 10134600526100A015
DESIGN	DA	12/10/11	SCALE AS SHOWN REV. 0
CADD	BTM	08/12/11	
CHECK	MD	07/12/11	
REVIEW	KC	08/12/11	
 <b>Golder Associates</b> Calgary, Alberta		<b>FIGURE: D</b>	

SCHEMATIC ONLY, NOT TO SCALE

**ATTACHMENT E**

**KS007**

## KS007

Crossing location KS007 is within the Winefred Lake watershed ([Figure 1](#)). The proposed activity/development at the site includes the construction of a road and the installation of a buried pipeline and a power line. The proposed crossing is within an existing rights-of-way.

The crossing assessment conducted at the location did not identify a defined watercourse ([Figure E](#)). Although no standing water was identified, wet areas were observed that contained semi-aquatic vegetation, indicating water may pool in these areas seasonally or during high precipitation events.

Since no defined channel was identified at this location, there are no approval requirements associated with AEW under the *Water Act*, DFO or TC.



Photo 1: View of depression with wet muskeg at crossing location (September 2011).



Photo 2: View of proposed crossing location through the tree line (September 2011).



Photo 3: View of bog area lacking a defined watercourse at crossing location (September 2011).



Photo 4: View of bog area plants at crossing location (September 2011).

Site	
Location (Legal)	S4 T75 R8 M4 NE
Location (UTM)	512057E 6133945N
Survey Date	04-Sep-2011
Watercourse	Unnamed Tributary

Channel Morphology at Crossing			
Pattern:	n/a	Channel Width [m]:	n/a
Confinement:	n/a	Channel Depth [m]:	n/a
Bank Stability:	n/a	Wetted Width [m]:	n/a
Channel Profile:	n/a	Wetted Depth [m]:	n/a
Bank Texture:	n/a	Discharge [m <sup>3</sup> /s]:	n/a

Substrate [%]		Water Quality Field Parameters	
Fines:	-	pH:	-
Small Gravel:	-	Temp. [°C]:	-
Gravel:	-	Cond. [µS/cm]:	-
Cobble:	-	D.O. [mg/L]:	-
Boulder:	-		
Bedrock:	-		

Fish Collection Data			
Minnow Trap		Electrofishing	
Fish Captured	Effort [h]	Fish Captured	Effort [s]
-	-	-	-

Habitat Suitability		
Fish Life Stage	Forage Fish	Sport/Non-Sport Fish
Spawning	Nil	Nil
Rearing	Nil	Nil
Feeding	Nil	Nil
Overwintering	Nil	Nil

Stream Classification	
AENV COP	Class C
Restricted Activity Period	Apr 16 – Jul 15
Sensitivity to Construction	Low

Minor Works and Minor Navigable Waters Determination	
Minor Works	
Proposed Activity/Development	Road, Below Ground Pipeline, Power Line
Minor Work Determination	n/a
Minor Waters	
Average Channel Depth (m)	No Defined Channel
Average Channel Width (m)	-
Channel Slope	-
Sinuosity Ratio	-
Frequency of Natural Obstacles	n/a
Minor Waters Determination	n/a



Photo 5: Aerial view of proposed crossing location, looking west (September 2011).

L:\2010\1346\10-1346-0052\6100\Report A (6110)\FigE\_10134600526100A016 CrossingLoc-KS007.dwg Dec 08, 2011 - 12:27pm

		<b>KIRBY IN SITU OIL SANDS EXPANSION PROJECT</b>	
<b>KS007 - KIRBY CROSSING SUMMARY SHEET</b>			
PROJECT	10.1346.0052.6100	FILE No.	10134600526100A016
DESIGN	DA 12/10/11	SCALE	AS SHOWN REV. 0
CADD	BTM 08/12/11		
CHECK	MD 07/12/11		
REVIEW	KC 08/12/11		
		<b>FIGURE: E</b>	

SCHEMATIC ONLY, NOT TO SCALE

**ATTACHMENT F**

**KN001**



# KN001

Crossing location KN001 is on an unnamed tributary of Sunday Creek (Figure 1, Figure F). The proposed activity/development at the site includes the construction of a road and the installation of an above-ground pipeline and a power line.

## **Habitat Assessment**

The pertinent parameters related to the PCHEP assessment at each of the transect locations on crossing KN001 are shown in Table F-1.

The watercourse provides a small, slow moving, class 2 impounded habitat. Three beaver dams were identified in the surveyed reach and several impoundments were identified upstream and downstream of the crossing location. The watercourse's morphology is meandering with both banks appearing stable and no slumping observed. The substrate consisted of fines with some cobble and gravel present. Instream cover for fish was provided primarily by depth of water and vegetation. Overhead cover consisted primarily of overhanging vegetation including shrubs and grasses.

**Table F-1 Crossing KN001 Transect Habitat Parameters**

Parameter	100 m Upstream	At Crossing	100 m Downstream
Bankful Width [m]	1.8	2.3	1.9
Wetted Width [m]	1.6	2.3	1.9
Avg. Channel Depth [m]	0.70	0.96	0.80
Average Water Velocity [m/s]	0.01	0.01	0.01
Substrate [% composition]	C (100)	F (100)	F (80)/ G (20)
Bank Stability	High	High	High

Note: Substrate: F=fines, G=gravel, C=cobble, B=boulder.

## **Fish Inventory**

In total, 64 brook stickleback were captured from both backpack electrofishing and minnow trapping. Catch results for backpack electrofishing and minnow trapping including CPUE for each species caught are listed in Tables F-2 and F-3. No sport fish were captured during the fish inventory.

**Table F-2 Backpack Electrofishing Catch and Catch-Per-Unit-Effort for Species Captured at KN001**

Effort (sec)	Species <sup>(a)</sup>	
	BRST	
	Catch	CPUE
708	45	6.4

<sup>(a)</sup> BRST = brook stickleback.

CPUE= Number of fish/Effort (100 seconds).

**Table F-3 Minnow Trapping Catch and Catch-Per-Unit-Effort for Species Captured at KN001**

Set Location	# of Traps	Total Effort (trap hr)	Species <sup>(a)</sup>	
			BRST	
			Catch	CPUE
Upstream	4	8	0	0
Downstream	4	8.7	19	2.2

<sup>(a)</sup> BRST = brook stickleback.

CPUE= Number of fish/Effort (100 seconds).

## **Water Quality**

Water quality data were collected at KN001. Water temperature was 15.8°C, pH was 7.1, dissolved oxygen concentration was 2.91 mg/L and conductivity was 272 µS/cm.

## **Discharge**

A stream discharge of 0.013 m<sup>3</sup>/s was calculated at KN001 at the time of survey.

## **PCHEP Assessment**

The bed and banks of the stream were poorly defined at the proposed crossing location due to the beaver impoundments. The watercourse at the crossing has an irregular meandering pattern, irregular channel with class 2 impounded habitat within an unconfined valley. Spawning and overwintering habitat potential was rated low for forage fish and low for large-bodied species. Rearing habitat was rated low for forage species and low for large-bodied species. Sensitivity to construction activities was considered low because the channel had stable banks and a low scour potential due to the slow-moving flow, and the fish community consisted entirely of forage fish species.

## **Minor Works and Minor Navigable Waters Determination**

The proposed activity/development includes the construction of a road and installation of an above-ground pipeline and a power line. The average channel width is 2.0 m and there are three beaver dams with abundant vegetation throughout. Due to these

characteristics, the determination is that it is a Minor Waters and is not subject to the provisions of the NWPA.



Photo 1: Upstream aerial view of impounded habitat upstream of crossing location (September 2011).



Photo 2: Downstream view from 100 m downstream of the crossing location (September 2011).



Photo 3: Downstream view from crossing location (September 2011).



Photo 4: Upstream view from 50 m upstream of the crossing location (September 2011).

Site	
Location (Legal)	S15 T75 R8 M4 NE
Location (UTM)	490722E 6150338 N
Survey Date	09-Sep-2011
Watercourse	Unnamed Tributary

Channel Morphology at Crossing			
Pattern:	Irregular Meander	Channel Width [m]:	2.3
Confinement:	Un-confined	Channel Depth [m]:	1.02
Bank Stability:	High	Wetted Width [m]:	2.3
Channel Profile:	Irregular	Wetted Depth [m]:	0.92
Bank Texture:	Fines	Discharge [m <sup>3</sup> /s]:	0.013

Substrate [%]		Water Quality Field Parameters	
Fines:	100	pH:	7.1
Small Gravel:		Temp. [°C]:	15.8
Gravel:		Cond. [µS/cm]:	272
Cobble:		D.O. [mg/L]:	2.91
Boulder:			
Bedrock:			

Fish Collection Data			
Minnow Trap		Electrofishing	
Fish Captured	Effort [h]	Fish Captured	Effort [s]
19	16.4	45	708

Habitat Suitability		
Fish Life Stage	Forage Fish	Sport/Non-Sport Fish
Spawning	Low	Low
Rearing	Low	Low
Feeding	Low	Low
Overwintering	Low	Low



Stream Classification	
AENV COP	Class C
Restricted Activity Period	Apr 16 – Jul 15
Sensitivity to Construction	Low

Minor Works and Minor Navigable Waters Determination	
Minor Works	
Proposed Activity/Development	Road, Above Ground Pipeline, Power Line
Minor Work Determination	No
Minor Waters	
Average Channel Depth (m)	0.9
Average Channel Width (m)	2.0
Channel Slope	-
Sinuosity Ratio	-
Frequency of Natural Obstacles	3 beaver dams
Minor Waters Determination	Yes



Photo 5: Downstream aerial view of crossing location, looking west (September 2011).

L:\2010\1346\10-1346-0052\6100\Report A (6110)\FigF\_10134600526100A017 CrossingLoc-KN001.dwg Dec 08, 2011 - 12:27pm

PROJECT		 <b>KIRBY IN SITU OIL SANDS EXPANSION PROJECT</b>	
TITLE		<b>KN001 - KIRBY CROSSING SUMMARY SHEET</b>	
PROJECT		10.1346.0052.6100	FILE No.10134600526100A017
DESIGN	DA	12/10/11	SCALE AS SHOWN REV. 0
CADD	BTM	08/12/11	
CHECK	MD	07/12/11	
REVIEW	KC	08/12/11	
 <b>Golder Associates</b> Calgary, Alberta		<b>FIGURE: F</b>	

SCHEMATIC ONLY, NOT TO SCALE

**ATTACHMENT G**

**KN002**

# KN002

Crossing location KN002 is on the headwaters of Sunday Creek (Figure 1, Figure G). The proposed activity/development at the site includes the construction of a road and the installation of an above-ground pipeline, a buried pipeline and a power line.

## Habitat Assessment

The pertinent parameters related to the PCHEP assessment at each of the transect locations on crossing KN002 are shown in Table G-1.

The watercourse provides slow moving, shallow, class 3 run habitat. Two beaver dams were identified in the surveyed reach and several impoundments were identified downstream of the crossing location. The watercourse's morphology is meandering with both banks appearing stable with no slumping observed. The substrate consisted of fines. Instream cover for fish was provided by depth of water, turbidity and vegetation. Overhead cover consisted of overhanging vegetation including shrubs and grasses.

**Table G-1 Crossing KN002 Transect Habitat Parameters**

Parameter	100 m Upstream	At Crossing	100 m Downstream
Bankful Width [m]	0.45	1.0	1.8
Wetted Width [m]	0.45	1.0	1.8
Avg. Channel Depth [m]	0.47	0.63	0.57
Average Water Velocity [m/s]	0.10	0.03	0.01
Substrate [% composition]	F (100)	F (100)	F (100)
Bank Stability	High	High	High

Note: Substrate: F=fines, G=gravel, C=cobble, B=boulder.

## Fish Inventory

In total, 76 brook stickleback were captured from both backpack electrofishing and minnow trapping. Catch results for backpack electrofishing and minnow trapping including CPUE for each species caught are listed in Tables G-2 and G-3. No sport fish were captured during the fish inventory.

**Table G-2 Backpack Electrofishing Catch and Catch-Per-Unit-Effort for Species Captured at KN002**

Effort (sec)	Species <sup>(a)</sup>	
	BRST	
	Catch	CPUE
494	20	4.0

<sup>(a)</sup> BRST = brook stickleback.

CPUE= Number of fish/Effort (100 seconds).

**Table G-3 Minnow Trapping Catch and Catch-Per-Unit-Effort for Species Captured at KN002**

Set Location	# of Traps	Total Effort (trap hr)	Species <sup>(a)</sup>	
			BRST	
			Catch	CPUE
Upstream	4	12.7	2	0.2
Downstream	4	11.3	54	4.8

<sup>(a)</sup> BRST = brook stickleback.

CPUE= Number of fish/Effort (100 seconds).

## **Water Quality**

Water quality data were collected at KN002. Water temperature was 13.8°C, pH was 7.2, dissolved oxygen concentration was 2.0 mg/L and conductivity was 463 µS/cm.

## **Discharge**

A stream discharge of 0.012 m<sup>3</sup>/s was calculated at KN002 at the time of survey.

## **PCHEP Assessment**

The bed and banks of the stream were poorly defined at the proposed crossing location due to the beaver impoundments. The watercourse at the crossing has an irregular meandering, incised channel with class 2 run habitat within and unconfined valley. Spawning and overwintering habitat potential was rated low for forage fish and low for large-bodied species. Rearing habitat was rated low for forage species and low for large-bodied species. Sensitivity to construction activities was considered low because the channel had stable banks and a low scour potential due to the slow-moving flow and the fish community consisted entirely of forage fish species.

## **Minor Works and Minor Navigable Waters Determination**

The proposed activity/development includes the construction of a road and installation of an above-ground pipeline, a buried pipeline and a power line. The average channel width is 1.1 m and there are two beaver dams with abundant vegetation throughout. As

the watercourse is less than 1.2 m in width the determination is that it is a Minor Waters and is not subject to the provisions of the NWPA.





Photo 1: Upstream view of watercourse at crossing location (September 2011).



Photo 2: Downstream view of watercourse at crossing location (September 2011).

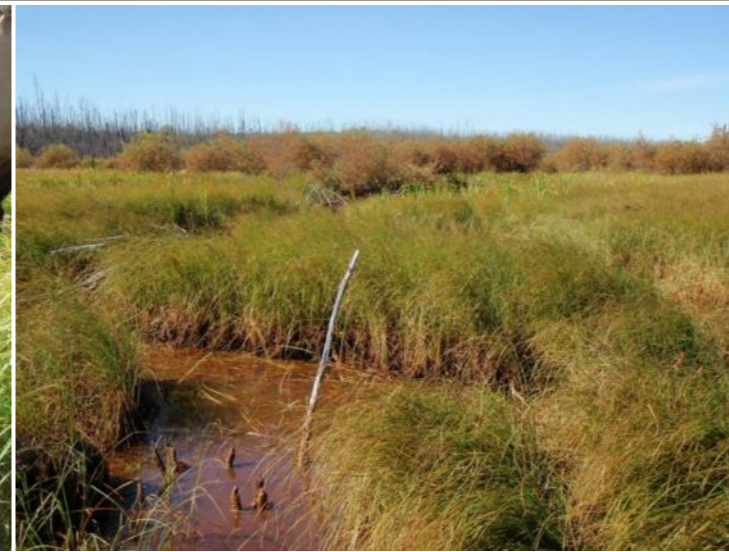


Photo 3: Downstream view of watercourse at 100 m downstream of crossing site (September 2011).



Photo 4: Upstream overhead view of watercourse at the crossing site (September 2011).

Site	
Location (Legal)	S10 T75 R8 M4 NW
Location (UTM)	490066E 6148810N
Survey Date	10-Sep-2011
Watercourse	Sunday Creek

Channel Morphology at Crossing			
Pattern:	Irregular Meander	Channel Width [m]:	1.0
Confinement:	Un-confined	Channel Depth [m]:	0.7
Bank Stability:	High	Wetted Width [m]:	1.0
Channel Profile:	Incised	Wetted Depth [m]:	0.4
Bank Texture:	Fines	Discharge [m <sup>3</sup> /s]:	0.0118

Substrate [%]		Water Quality Field Parameters	
Fines:	100	pH:	7.2
Small Gravel:		Temp. [°C]:	13.8
Gravel:		Cond. [µS/cm]:	463
Cobble:		D.O. [mg/L]:	2.0
Boulder:			
Bedrock:			

Fish Collection Data			
Minnow Trap		Electrofishing	
Fish Captured	Effort [h]	Fish Captured	Effort [s]
56	24	20	494

Habitat Suitability		
Fish Life Stage	Forage Fish	Sport/Non-Sport Fish
Spawning	Low	Low
Rearing	Low	Low
Feeding	Low	Low
Overwintering	Low	Low

Stream Classification	
AENV COP	Class C
Restricted Activity Period	Apr 16 – Jul 15
Sensitivity to Construction	Low

Minor Works and Minor Navigable Waters Determination	
Minor Works	
Proposed Activity/Development	Road, Above Ground Pipeline, Power Line
Minor Work Determination	No
Minor Waters	
Average Channel Depth (m)	0.66
Average Channel Width (m)	1.1
Channel Slope	-
Sinuosity Ratio	-
Frequency of Natural Obstacles	1 Beaver Dam
Minor Waters Determination	Yes



Photo 5: Downstream aerial view of crossing location and downstream beaver impoundments, looking southwest (September 2011).

L:\2010\1346\10-1346-0052\6100\Report A (6110)\Fig\_10134600526100A018 CrossingLoc-KN002.dwg Dec 08, 2011 - 12:28pm

		<b>KIRBY IN SITU OIL SANDS EXPANSION PROJECT</b>	
<b>KN002 - KIRBY CROSSING SUMMARY SHEET</b>			
PROJECT	10.1346.0052.6100	FILE No.	10134600526100A018
DESIGN	DA 12/10/11	SCALE	AS SHOWN REV. 0
CADD	BTM 08/12/11	<b>FIGURE: G</b>	
CHECK	KC 07/12/11		
REVIEW	KC 08/12/11		

SCHEMATIC ONLY, NOT TO SCALE

**ATTACHMENT H**

**KN003**

# KN003

Crossing location KN003 is on a tributary of Sunday Creek (Figure 1, Figure H). The proposed activity/development at the site includes the construction of a road and the installation of a buried pipeline and a power line.

## Habitat Assessment

The pertinent parameters related to the PCHEP assessment at each of the transect locations on crossing KN003 are shown in Table H-1.

The watercourse provides slow moving, flat habitat. The channel contained abundant in-stream vegetation. The watercourse's morphology was meandering with both banks appearing stable with no slumping observed. The substrate consisted of fines. Instream cover for fish was provided by vegetation and depth of water. Overhead cover consisted primarily of overhanging vegetation including shrubs and grasses.

**Table H-1 Crossing KN003 Transect Habitat Parameters**

Parameter	100 m Upstream	At Crossing	100 m Downstream
Bankful Width [m]	0.55	2.8	1.9
Wetted Width [m]	0.55	2.8	1.8
Avg. Channel Depth [m]	0.76	1.3	1.0
Average Water Velocity [m/s]	0.03	0.01	0.02
Substrate [% composition]	F (100)	F (100)	F (100)
Bank Stability	High	High	High

Note: Substrate: F=fines, G=gravel, C=cobble, B=boulder.

## Fish Inventory

In total, 74 brook stickleback were captured from both backpack electrofishing and minnow trapping. Catch results for backpack electrofishing and minnow trapping including CPUE for each species caught are listed in Tables H-2 and H-3. No sport fish were captured during the fish inventory.

**Table H-2 Backpack Electrofishing Catch and Catch-Per-Unit-Effort for Species Captured at KN003**

Effort (sec)	Species <sup>(a)</sup>	
	BRST	
	Catch	CPUE
564	47	8.3

<sup>(a)</sup> BRST = brook stickleback.

CPUE= Number of fish/Effort (100 seconds).

**Table H-3 Minnow Trapping Catch and Catch-Per-Unit-Effort for Species Captured at KN003**

Set Location	# of Traps	Total Effort (trap hr)	Species <sup>(a)</sup>	
			BRST	
			Catch	CPUE
Upstream	4	8.3	13	1.6
Downstream	4	12	14	1.2

<sup>(a)</sup> BRST = brook stickleback.

CPUE= Number of fish/Effort (100 seconds).

### ***Water Quality***

Water quality data were collected at KN003. Water temperature was 13.6°C, pH was 7.0, dissolved oxygen concentration was 3.8 mg/L and conductivity was 278 µS/cm.

### ***Discharge***

A stream discharge of 0.009 m<sup>3</sup>/s was calculated at KN003 at the time of survey.

### ***PCHEP Assessment***

The bed and banks of the stream were defined at the proposed crossing location. The watercourse at the crossing had an irregular meandering, incised channel with flat habitat within an unconfined valley. Spawning and overwintering habitat potential was rated low for forage fish and low for large-bodied species. Rearing habitat was rated low for forage species and low for large-bodied species. Sensitivity to construction activities was considered low because the channel had stable banks and a low scour potential due to the slow-moving flow, and the fish community consisted entirely of forage fish species.

### ***Minor Works and Minor Navigable Waters Determination***

The proposed activity/development includes the construction of a road and installation of a buried pipeline and a power line. The average channel width is 1.8 m with abundant vegetation throughout. Considering the watercourse is less than 3.0 m wide and inundated with aquatic vegetation; therefore, the determination is that crossing location KN003 is a Minor Waters and is not subject to the provisions of the NWPA.



Photo 1: View of watercourse at the crossing location (September 2011).



Photo 2: Downstream view from the crossing location (September 2011).



Photo 3: Downstream view from 100 m downstream of the crossing location (September 2011).



Photo 4: Downstream view from 50 m upstream of the crossing location (September 2011).

Site	
Location (Legal)	S7 T75 R8 M4 NE
Location (UTM)	485946E 6148655N
Survey Date	10-Sep-2011
Watercourse	Unnamed Tributary

Channel Morphology at Crossing			
Pattern:	Irregular Meander	Channel Width [m]:	2.8
Confinement:	Un-confined	Channel Depth [m]:	1.48
Bank Stability:	High	Wetted Width [m]:	2.8
Channel Profile:	Deeply Incised	Wetted Depth [m]:	0.58
Bank Texture:	Fines	Discharge [m <sup>3</sup> /s]:	0.0099

Substrate [%]		Water Quality Field Parameters	
Fines:	100	pH:	7.0
Small Gravel:		Temp. [°C]:	13.6
Gravel:		Cond. [µS/cm]:	278
Cobble:		D.O. [mg/L]:	3.8
Boulder:			
Bedrock:			

Fish Collection Data			
Minnow Trap		Electrofishing	
Fish Captured	Effort [h]	Fish Captured	Effort [s]
27	16:20	47	564

Habitat Suitability		
Fish Life Stage	Forage Fish	Sport/Non-Sport Fish
Spawning	Low	Low
Rearing	Low	Low
Feeding	Low	Low
Overwintering	Low	Low

Stream Classification	
AENV COP	Class C
Restricted Activity Period	Apr 16 – Jul 15
Sensitivity to Construction	Low

Minor Works and Minor Navigable Waters Determination	
Minor Works	
Proposed Activity/Development	Road, Below Ground Pipeline
Minor Work Determination	No
Minor Waters	
Average Channel Depth (m)	1.1
Average Channel Width (m)	1.8
Channel Slope	-
Sinuosity Ratio	-
Frequency of Natural Obstacles	1 Debris Pile, abundant instream vegetation
Minor Waters Determination	Yes



Photo 5: Downstream aerial view of crossing site, looking northwest (September 2011).

L:\2010\1346\10-1346-0052\6100\Report A (6110)\FigH\_10134600526100A019 CrossingLoc-KN003.dwg Dec 08, 2011 - 12:28pm

		<b>KIRBY IN SITU OIL SANDS EXPANSION PROJECT</b>	
<b>KN003 - KIRBY CROSSING SUMMARY SHEET</b>			
PROJECT	10.1346.0052.6100	FILE No.	10134600526100A019
DESIGN	DA 12/10/11	SCALE	AS SHOWN REV. 0
CADD	BTM 08/12/11		
CHECK	MD 07/12/11		
REVIEW	KC 08/12/11		
<b>FIGURE: H</b>			

SCHEMATIC ONLY, NOT TO SCALE

**ATTACHMENT I**

**KN004**

## KN004

Crossing location KN004 is within the Sunday Creek watershed ([Figure 1](#)). The proposed activity/development at the site includes the construction of a road and the installation of an above-ground pipeline and a power line. The crossing is within an existing rights-of-way.

The crossing assessment conducted at the location did not identify a defined watercourse ([Figure I](#)). No standing water was identified but wet areas were observed that contained semi-aquatic vegetation indicating water may pool in these areas seasonally or during high precipitation events.

As no defined channel was identified there are no approval requirements associated with AEW, DFO or TC.



Photo 1: View of cutline where crossing location was identified (September 2011).



Photo 2: View of wet depression at crossing location lacking a defined channel (September 2011).



Photo 3: View of vegetation at proposed crossing location indicating seasonal flooding (September 2011).



Photo 4: Aerial view of crossing location, looking northeast (September 2011).

Site	
Location (Legal)	S4 T75 R8 M4 NE
Location (UTM)	489390E 6147367N
Survey Date	10-Sep-2011
Watercourse	Unnamed Tributary

Channel Morphology at Crossing			
Pattern:	n/a	Channel Width [m]:	n/a
Confinement:	n/a	Channel Depth [m]:	n/a
Bank Stability:	n/a	Wetted Width [m]:	n/a
Channel Profile:	n/a	Wetted Depth [m]:	n/a
Bank Texture:	n/a	Discharge [m <sup>3</sup> /s]:	n/a

Substrate [%]		Water Quality Field Parameters	
Fines:	-	pH:	-
Small Gravel:	-	Temp. [°C]:	-
Gravel:	-	Cond. [µS/cm]:	-
Cobble:	-	D.O. [mg/L]:	-
Boulder:	-		
Bedrock:	-		

Fish Collection Data			
Minnow Trap		Electrofishing	
Fish Captured	Effort [h]	Fish Captured	Effort [s]
-	-	-	-

Habitat Suitability		
Fish Life Stage	Forage Fish	Sport/Non-Sport Fish
Spawning	Nil	Nil
Rearing	Nil	Nil
Feeding	Nil	Nil
Overwintering	Nil	Nil



Stream Classification	
AENV COP	Class C
Restricted Activity Period	Apr 16 – Jul 15
Sensitivity to Construction	Low

Minor Works and Minor Navigable Waters Determination	
Minor Works	
Proposed Activity/Development	Road, Above Ground Pipeline, Power Line
Minor Work Determination	n/a
Minor Waters	
Average Channel Depth (m)	-
Average Channel Width (m)	No Defined Channel
Channel Slope	-
Sinuosity Ratio	-
Frequency of Natural Obstacles	-
Minor Waters Determination	n/a



Photo 5: Aerial view of crossing location, looking east (September 2011).

L:\2010\1346\10-1346-0052\6100\Report A (6110)\Fig\_10134600526100A020 CrossingLoc-KN004.dwg Dec 08, 2011 - 12:28pm

PROJECT		 <b>KIRBY IN SITU OIL SANDS EXPANSION PROJECT</b>	
TITLE		<b>KN004 - KIRBY CROSSING SUMMARY SHEET</b>	
PROJECT	10.1346.0052.6100	FILE No.	10134600526100A020
DESIGN	DA 12/10/11	SCALE	AS SHOWN REV. 0
CADD	BTM 08/12/11	 <b>FIGURE: I</b>	
CHECK	MD 07/12/11		
REVIEW	KC 08/12/11		

SCHEMATIC ONLY, NOT TO SCALE



**ATTACHMENT J**

**KN005**

## KN005

Crossing location KN005 is within the Wiau Lake watershed ([Figure 1](#)). The proposed activity/development at the site includes the installation of a buried pipeline.

The crossing assessment conducted at the location did not identify a defined watercourse ([Figure J](#)). No standing water was identified but wet areas were observed indicating water may pool in these areas seasonally or during high precipitation events.

As no defined channel was identified there are no requirements associated with AEW under the *Water Act*, DFO or TC.

L:\2010\1346\10-1346-0052\6100\Report A (6110)\Fig\_10134600526100A021 CrossingLoc-KN005.dwg Dec 08, 2011 - 12:29pm



Photo 1: Isolated depressions with water but no defined channel at crossing location (September 2011).



Photo 2: View of wetted bog area at crossing location (September 2011).



Photo 3: View of wetted bog area at crossing location (September 2011).



Photo 4: Aerial view of crossing location, looking southeast (September 2011).

Site	
Location (Legal)	S30 T74 R8 M4 SW
Location (UTM)	486287E 6143146N
Survey Date	02-Sep-2011
Watercourse	Unnamed Tributary

Channel Morphology at Crossing			
Pattern:	n/a	Channel Width [m]:	n/a
Confinement:	n/a	Channel Depth [m]:	n/a
Bank Stability:	n/a	Wetted Width [m]:	n/a
Channel Profile:	n/a	Wetted Depth [m]:	n/a
Bank Texture:	n/a	Discharge [m <sup>3</sup> /s]:	n/a

Substrate [%]		Water Quality Field Parameters	
Fines:	-	pH:	-
Small Gravel:	-	Temp. [°C]:	-
Gravel:	-	Cond. [µS/cm]:	-
Cobble:	-	D.O. [mg/L]:	-
Boulder:	-		
Bedrock:	-		

Fish Collection Data			
Minnow Trap		Electrofishing	
Fish Captured	Effort [h]	Fish Captured	Effort [s]
-	-	-	-



Habitat Suitability		
Fish Life Stage	Forage Fish	Sport/Non-Sport Fish
Spawning	Nil	Nil
Rearing	Nil	Nil
Feeding	Nil	Nil
Overwintering	Nil	Nil

Stream Classification	
AENV COP	Class C
Restricted Activity Period	Apr 16 – Jul 15
Sensitivity to Construction	Low

Minor Works and Minor Navigable Waters Determination	
Minor Works	
Proposed Activity/Development	Below Ground Pipeline
Minor Work Determination	n/a
Minor Waters	
Average Channel Depth (m)	-
Average Channel Width (m)	No Defined Channel
Channel Slope	-
Sinuosity Ratio	-
Frequency of Natural Obstacles	-
Minor Waters Determination	n/a



Photo 5: Aerial view for crossing location, looking northeast (September 2011).

		<b>KIRBY IN SITU OIL SANDS EXPANSION PROJECT</b>	
<b>KN005 - KIRBY CROSSING SUMMARY SHEET</b>			
PROJECT	10.1346.0052.6100	FILE No.	10134600526100A021
DESIGN	DA 12/10/11	SCALE	AS SHOWN REV. 0
CADD	BTM 08/12/11		
CHECK	MD 07/12/11		
REVIEW	KC 08/12/11		
<b>FIGURE: J</b>			

SCHEMATIC ONLY, NOT TO SCALE

**ATTACHMENT K**

**KN006**

## KN006

Crossing location KN006 is on a tributary of Wiau Lake (Figure 1, Figure K). The proposed activity/development at the site includes the construction of a road and the installation of a buried pipeline.

### **Habitat Assessment**

The pertinent parameters related to the PCHEP assessment at each of the transect locations on crossing KN006 are shown in Table K-1.

The watercourse provides slow-moving, flat habitat. The channel contained abundant in-stream vegetation. The watercourse's morphology was meandering with both banks appearing stable with no slumping observed. The substrate was predominantly fines and organics. Instream cover for fish was provided by vegetation and depth of water. Overhead cover consisted primarily of overhanging vegetation including shrubs and grasses.

**Table K-1 Crossing KN006 Transect Habitat Parameters**

Parameter	100 m Upstream	At Crossing	100 m Downstream
Bankful Width (m)	2.1	3.1	3.6
Wetted Width (m)	1.8	3.1	3.1
Avg. Channel Depth (m)	1.03	0.8	0.8
Average Water Velocity (m/s)	0.01	0.01	0.01
Substrate (% composition)	F (100)	F (100)	F (100)
Bank Stability	High	High	High

Note: Substrate: F=fines, G=gravel, C=cobble, B=boulder.

### **Fish Inventory**

In total, one northern pike was captured and four were observed during backpack electrofishing. Catch results for backpack electrofishing including catch-per-unit effort (CPUE) for each species caught are listed in Table K-2. No fish were captured in the minnow traps.

**Table K-2 Backpack Electrofishing Catch and Catch-Per-Unit-Effort for Species Captured at KN006**

Effort (sec)	Species <sup>(a)</sup>	
	NRPK	
	Catch	CPUE
638	1	0.2

<sup>(a)</sup> NRPK = northern pike.

CPUE= Number of fish/Effort (100 seconds).

### ***Water Quality***

Water quality data were collected at KN006. Water temperature was 12.1°C, pH was 7.0, dissolved oxygen concentration was 1.3 mg/L and conductivity was 242 µS/cm.

### ***Discharge***

A stream discharge of 0.014 m<sup>3</sup>/s was calculated at KN006 at the time of survey.

### ***PCHEP Assessment***

The bed and banks of the stream were defined at the proposed crossing location. The watercourse at the crossing has an irregular meandering, open channel with flat habitat within an unconfined valley. Spawning habitat potential was rated moderate for forage fish and large-bodied species, particularly northern pike. Rearing habitat was rated low for forage species and low for large-bodied species due to the low dissolved oxygen concentrations. Overwintering habitat potential is low for both forage fish species and large-bodied species. Sensitivity to construction activities was considered low because the channel had stable banks and a low scour potential due to the slow-moving flow.

### ***Minor Works and Minor Navigable Waters Determination***

The proposed activity/development includes the construction of a road and a buried pipeline. The average channel width is 2.9 m with abundant vegetation throughout. The watercourse is less than 3.0 m wide and abundant aquatic vegetation; therefore, the determination is that crossing location KN006 is a Minor Waters and is not subject to the provisions of the NWPA.



Photo 1: Downstream view from crossing location (September 2011).



Photo 2: Downstream view from 100 m upstream of the crossing location (September 2011).



Photo 3: Downstream view from 100 m downstream of the crossing location (September 2011).



Photo 4: Aerial view of watercourse downstream of the crossing location, looking northeast (September 2011).

Site	
Location (Legal)	S19 T74 R9 M4 SE
Location (UTM)	477548E 6142028N
Survey Date	09-Sep-2011
Watercourse	Unnamed Tributary

Channel Morphology at Crossing			
Pattern:	Irregular Meander	Channel Width [m]:	3.1
Confinement:	Un-confined	Channel Depth [m]:	0.84
Bank Stability:	High	Wetted Width [m]:	3.1
Channel Profile:	Open	Wetted Depth [m]:	0.64
Bank Texture:	Organics/Fines	Discharge [m <sup>3</sup> /s]:	0.01582

Substrate [%]		Water Quality Field Parameters	
Fines:	100	pH:	7.0
Small Gravel:	-	Temp. [°C]:	12.1
Gravel:	-	Cond. [µS/cm]:	242
Cobble:	-	D.O. [mg/L]:	1.26
Boulder:	-		
Bedrock:	-		

Fish Collection Data			
Minnow Trap		Electrofishing	
Fish Captured	Effort [h]	Fish Captured	Effort [s]
0	24:20	1	638

Habitat Suitability		
Fish Life Stage	Forage Fish	Sport/Non-Sport Fish
Spawning	Moderate	Moderate
Rearing	Low	Low
Feeding	Low	Low
Overwintering	Low	Low

Stream Classification	
AENV COP	Class C
Restricted Activity Period	Apr 16 – Jul 15
Sensitivity to Construction	Low

Minor Works and Minor Navigable Waters Determination	
Minor Works	
Proposed Activity/Development	Road, Below Ground Pipeline
Minor Work Determination	No
Minor Waters	
Average Channel Depth (m)	0.9
Average Channel Width (m)	2.9
Channel Slope	-
Sinuosity Ratio	-
Frequency of Natural Obstacles	Channel full of vegetation throughout
Minor Waters Determination	Yes



Photo 5: Upstream aerial view of crossing location, looking northwest (September 2011).

L:\2010\1346\10-1346-0052\6100\Report A (6110)\FigK\_10134600526100A022 CrossingLoc-KN006.dwg Dec 08, 2011 - 12:29pm

		<b>KIRBY IN SITU OIL SANDS EXPANSION PROJECT</b>	
<b>KN006 - KIRBY CROSSING SUMMARY SHEET</b>			
PROJECT	10.1346.0052.6100	FILE No.	10134600526100A022
DESIGN	DA 12/10/11	SCALE	AS SHOWN REV. 0
CADD	BTM 08/12/11		
CHECK	MD 07/12/11		
REVIEW	KC 08/12/11		
		<b>FIGURE: K</b>	

SCHEMATIC ONLY, NOT TO SCALE

**ATTACHMENT L**

**KN007**



## KN007

Crossing location KN007 is on a tributary of Birch Creek ([Figure 1](#), [Figure L](#)). The proposed activity/development at the site includes the construction of a road and the installation of an above-ground pipeline and a power line.

### ***Habitat Assessment***

A complete PCHEP assessment was not conducted at this location. A site reconnaissance was conducted to determine width of the creek at the crossing location and a visual habitat assessment was conducted. The connectivity to fish habitat downstream was also evaluated.

The watercourse is less than 1 m wide with shallow, class 3 run habitat. The watercourse's morphology was meandering with both banks appearing stable with no slumping observed. The substrate at the crossing location was predominantly fines and organics with some gravel. Instream cover for fish was provided by vegetation and woody debris. Overhead cover consisted primarily of overhanging vegetation including trees, shrubs and grasses. Several hundred metres downstream a series of three beaver impoundments were identified. The watercourse is isolated upstream of the crossing and downstream of the beaver impoundments, flowing from and into a wet muskeg.

### ***Fish Inventory***

A fish inventory was not conducted at this location.

### ***Water Quality***

Water quality parameters were not measured at this location.

### ***Discharge***

A discharge measurement was not calculated at this location.

### ***PCHEP Assessment***

A complete PCHEP assessment was not conducted at the site but the visual assessment can be used to determine some of the criteria used for the assessment. The bed and banks of the stream were defined at the proposed crossing location. The watercourse at the crossing had an irregular meandering, neutral channel with run habitat within an unconfined valley. Spawning habitat potential was rated moderate for forage fish and low for large-bodied species. Rearing habitat was rated moderate for forage species and low for large-bodied species due to the small size of the watercourse. Overwintering habitat

potential is nil at the crossing location for both forage fish species and large-bodied species as it would freeze to the substrate in the winter, but fish may be able to utilize the downstream beaver impoundments as overwintering habitat. Sensitivity to construction activities was considered low because the channel had stable banks and a low scour potential due to the slow-moving flow.

### ***Minor Works and Minor Navigable Waters Determination***

The proposed activity/development includes the construction of a road and installation of an above-ground pipeline and a power line. The average channel width is less than 1.0 m wide. Since the watercourse is less than 1.2 m wide, crossing location KN007 was determined to be a Minor Waters and is not subject to the provisions of the NWPA.



Photo 1: Upstream view at crossing location (June 2011).



Photo 2: Downstream view at crossing location (June 2011).



Photo 3: Upstream view from upstream of crossing location (June 2011).



Photo 4: Upstream aerial view of beaver impoundment downstream of crossing, looking southeast (June 2011).

Site	
Location (Legal)	S6 T75 R8 M4 SE
Location (UTM)	485900E 6146694N
Survey Date	09-Sep-2011
Watercourse	Unnamed Tributary

Channel Morphology at Crossing			
Pattern:	Irregular Meander	Channel Width [m]:	< 1.0
Confinement:	Un-confined	Channel Depth [m]:	0.4
Bank Stability:	Low	Wetted Width [m]:	<1.0
Channel Profile:	Neutral	Wetted Depth [m]:	0.3
Bank Texture:	Organics/Fines	Discharge [m <sup>3</sup> /s]:	-

Substrate [%]		Water Quality Field Parameters	
Fines:	100	pH:	-
Small Gravel:	-	Temp. [°C]:	-
Gravel:	-	Cond. [µS/cm]:	-
Cobble:	-	D.O. [mg/L]:	-
Boulder:	-		
Bedrock:	-		

Fish Collection Data			
Minnow Trap		Electrofishing	
Fish Captured	Effort [h]	Fish Captured	Effort [s]
-	-	-	-

Habitat Suitability		
Fish Life Stage	Forage Fish	Sport/Non-Sport Fish
Spawning	Moderate	Low
Rearing	Moderate	Low
Feeding	Moderate	Low
Overwintering	Nil	Nil



Stream Classification	
AENV COP	Class C
Restricted Activity Period	Apr 16 – Jul 15
Sensitivity to Construction	Low

Minor Works and Minor Navigable Waters Determination	
Minor Works	
Proposed Activity/Development	Road, Above Ground Pipeline, Power Line
Minor Work Determination	No
Minor Waters	
Average Channel Depth (m)	0.3
Average Channel Width (m)	< 1.0
Channel Slope	-
Sinuosity Ratio	-
Frequency of Natural Obstacles	-
Minor Waters Determination	Yes



Photo 5: Downstream of crossing location, looking northwest (June 2011).

L:\2010\1346\10-1346-0052\6100\Report A (6110)\Fig\_10134600526100A023 CrossingLoc-KN007.dwg Dec 08, 2011 - 12:29pm

PROJECT		 <b>KIRBY IN SITU OIL SANDS EXPANSION PROJECT</b>	
TITLE		<b>KN007 - KIRBY CROSSING SUMMARY SHEET</b>	
PROJECT	10.1346.0052.6100	FILE No.	10134600526100A023
DESIGN	DA 12/10/11	SCALE	AS SHOWN REV. 0
CADD	BTM 08/12/11	 <b>FIGURE: L</b>	
CHECK	MD 07/12/11		
REVIEW	KC 08/12/11		

SCHEMATIC ONLY, NOT TO SCALE

**ATTACHMENT M**

**KN008**

## KN008

Crossing location KN008 is within the Wiau Lake watershed ([Figure 1](#)). The proposed activity/development at the site includes the installation of a buried pipeline and a power line. An existing road will be utilized at this crossing location.

The crossing assessment conducted at the location did not identify a defined watercourse channel upstream or downstream of the existing road ([Figure M](#)). An existing culvert is in place at the crossing location. No standing water was identified but wet areas were observed upstream and downstream of the road indicating water pools in these areas seasonally or during high precipitation events. Downstream of road there is evidence of seasonal flow but no defined channel was identified.

As no defined channel was identified there are no approval requirements associated with AEW under the *Water Act*, DFO or TC.



Photo 1: View of forest floor downstream of existing culvert (September 2011).



Photo 2: View of forest floor with lack of defined channel downstream of the crossing location (September 2011).



Photo 3: View of water pooled upstream of culvert (September 2011).



Photo 4: View of ditchline upstream of culvert (September 2011).

Site	
Location (Legal)	S19 T74 R8 M4 NE
Location (UTM)	487278E 6142187N
Survey Date	10-Sep-2011
Watercourse	Unnamed Tributary

Channel Morphology at Crossing			
Pattern:	n/a	Channel Width [m]:	n/a
Confinement:	n/a	Channel Depth [m]:	n/a
Bank Stability:	n/a	Wetted Width [m]:	n/a
Channel Profile:	n/a	Wetted Depth [m]:	n/a
Bank Texture:	n/a	Discharge [m <sup>3</sup> /s]:	n/a

Substrate [%]		Water Quality Field Parameters	
Fines:	-	pH:	-
Small Gravel:	-	Temp. [°C]:	-
Gravel:	-	Cond. [µS/cm]:	-
Cobble:	-	D.O. [mg/L]:	-
Boulder:	-		
Bedrock:	-		

Fish Collection Data			
Minnow Trap		Electrofishing	
Fish Captured	Effort [h]	Fish Captured	Effort [s]
-	-	-	-

Habitat Suitability		
Fish Life Stage	Forage Fish	Sport/Non-Sport Fish
Spawning	Nil	Nil
Rearing	Nil	Nil
Feeding	Nil	Nil
Overwintering	Nil	Nil

Stream Classification	
AENV COP	Class C
Restricted Activity Period	Apr 16 – Jul 15
Sensitivity to Construction	Low

Minor Works and Minor Navigable Waters Determination	
Minor Works	
Proposed Activity/Development	Existing Road, Below Ground Pipeline, Power Line
Minor Work Determination	n/a
Minor Waters	
Average Channel Depth (m)	-
Average Channel Width (m)	No Defined Channel
Channel Slope	-
Sinuosity Ratio	-
Frequency of Natural Obstacles	-
Minor Waters Determination	n/a



Photo 5: Aerial view of crossing location, looking northwest (September 2011).

L:\2010\1346\10-1346-0052\6100\Report A (6110)\FigM\_10134600526100A024\_CrossingLoc-KN008.dwg Dec 08, 2011 - 12:30pm

		<b>KIRBY IN SITU OIL SANDS EXPANSION PROJECT</b>	
<b>KN008 - KIRBY CROSSING SUMMARY SHEET</b>			
PROJECT	10.1346.0052.6100	FILE No.	10134600526100A024
DESIGN	DA 12/10/11	SCALE	AS SHOWN REV. 0
CADD	BTM 08/12/11		
CHECK	MD 07/12/11		
REVIEW	KC 08/12/11		
		<b>FIGURE: M</b>	

SCHEMATIC ONLY, NOT TO SCALE

**ATTACHMENT N**

**TRANSPORT CANADA DETERMINATION**

**From:** Camilleri,Michelle [CEAA] [mailto:Michelle.Camilleri@ceaa-acee.gc.ca]  
**Sent:** Monday, November 21, 2011 2:54 PM  
**To:** Anita Sartori; Marc Scrimshaw; Jon Gareau  
**Cc:** Poklitar, Holly  
**Subject:** CNRL Kirby and Grouse - Transport Canada Response Re: Proposed Crossings

Hello,

Transport Canada's Navigable Waters Protection Program (NWPP) has reviewed the results of the CNRL Kirby and Grouse site fly-over which took place on November 2, 2011. CNRL **must** submit an application for approval under the Navigable Waters Protection Act (NWP) for Crossing KS003, associated with the Kirby project. None of the other crossings associated with the Kirby (NWPP#2011-600195) and Grouse (NWPP#2010-600655) projects discussed on November 2, 2011 will require NWP applications.

For more information on the NWP application process, please contact the NWPP directly:

NWPP

Transport Canada Marine – Prairies and Northern Region

1100 9700 Jasper Avenue, Edmonton, AB T5J4E6

NWP-PEN.PN@tc.gc.ca

780-495-8215

**The requirement for an NWP approval for crossing KS003 will trigger Transport Canada's requirement for a federal environmental assessment (EA), unless CNRL confirms in writing (email is fine) that the crossing can and will be constructed per section 50 of the Exclusions List Regulations (<http://laws-lois.justice.gc.ca/PDF/SOR-2007-108.pdf>), as follows:**

**50.** The proposed construction, installation, operation, expansion, modification, decommissioning, removal or abandonment of a singlespan bridge and any supporting structures if the project

- (a) results in a bridge that is no more than 30 m long and 20 m wide;
- (b) does not involve the installation of any supporting structures in a water body;
- (c) is not to be carried out in a water body; and
- (d) does not involve the likely release of a polluting substance into a water body



CNRL should note that the NWPA approval for crossing KS003 will still require aboriginal consultation, regardless of whether a federal EA is required. This will likely be coordinated between the NWPP and TC's Aboriginal Consultation Unit via Transport Canada, Programs, Environmental Affairs (Holly Poklitar).

In terms of next steps, if CNRL can let me know when we can expect to see the additional information about crossing KS003 (i.e., if it can and will be constructed to meet the exclusion identified above) that would be great.

If you have any questions or concerns please do not hesitate to contact me.

Thanks,

Michelle Camilleri

Environmental Assessment Officer/Agente d'évaluation environnementale

Canadian Environmental Assessment Agency | Agence canadienne d'évaluation environnementale  
61 Airport Road, Edmonton AB T5G 0W6 | 61, chemin Airport, Edmonton, AB T5G 0W6  
michelle.camilleri@ceaa-acee.gc.ca  
Telephone | Téléphone 780-495-2580  
Facsimile | Télécopieur 780-495-2876  
Government of Canada | Gouvernement du Canada