FINAL REPORT

Review of Previous Pipeline Abandonment Program – TransCanada Peace River Mainline

Prepared for

Pipeline Abandonment Research Steering Committee

February 2018

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Contents

Acronyms and Abbreviations

CEPA	Canadian Energy Pipeline Association
CH2M	CH2M HILL Energy Canada, Ltd.
DNV	Det Norske Veritas
ESA	Environmental and Socio-economic Assessment
km	kilometre(s)
NEB	National Energy Board
NGTL	NOVA Gas Transmission Ltd.
NPS	nominal pipe size
PRML	Peace River Mainline
Project	Review of Previous Pipeline Abandonment Program - TransCanada Peace River Mainline Pipeline
ROW	right-of-way
UTM	universal transverse Mercator

SECTION 1

Project Description

The Pipeline Abandonment Research Steering Committee of the Petroleum Technology Alliance of Canada commissioned CH2M HILL Energy Canada, Ltd. (CH2M) to undertake a review of a previous pipeline abandonment program, which involves a surface assessment of three 20-inch-diameter (508-millimetre outside diameter) pipeline segments of the TransCanada Peace River Mainline (PRML) Pipeline (the Project), abandoned between 1972 and 1979. Based on historical information, CH2M assumes that these segments were abandoned due to integrity concerns, given that each segment was looped with new pipeline. A total of approximately 12 kilometres (km) of previously abandoned pipeline right-of-way (ROW) were included in the surface assessment. Figure A-1 in Appendix A shows the nominal pipe size (NPS) 20 PRML Retirement Program previously abandoned sections identified as 1379404, 1379405, and 1379406.

The Project objective is to review the condition of a medium diameter pipeline that was abandoned more than 10 years ago, and includes the following.

- Review the abandonment methodologies implemented at the time of pipeline abandonment
- Conduct a field surface assessment, to determine if there was evidence of environmental effects or potential environmental effects of pipeline abandonment in-place as currently understood by industry
- Identify if any environmental effects of pipeline abandonment were in evidence, which were outside of the current industry understanding of the risks of abandonment
- Identify areas along the abandoned segments, where subsurface testing could be conducted to further confirm the presence or absence of those potential effects

Upon investigation, it was determined that formal abandonment plans or details of the abandonment methodologies for the abandoned segments of the PRML proposed for assessment were not available and, as such, this scope of work was removed from the Project. The following objectives were removed from the Project:

- Evaluate the outcomes achieved by the abandonment program
- Develop suggestions for additional testing of the abandoned pipeline to further assess the abandonment program

The potential effects of abandonment in-place include:

- Ground subsidence and frost heave
- Soil and groundwater contamination
- Subsidence at road, railway, and utility crossings
- Watercourse and wetland crossings
- Erosion
- Creation of water conduits

The abandoned pipeline segments were assessed both from the air, using a helicopter, and by ground-truthing, to determine if there was surficial evidence of the potential environmental effects of pipeline abandonment in-place and to suggest locations where further assessment (that is, subsurface investigation) is recommended to visualize the pipe and surrounding soil for the potential environmental effects described in this report.

1.1 Project Location

The Project is located within Clear Hills County and the County of Northern Lights within the Green Area in the province of Alberta (Figure A-1).

The start and end points of three pipeline segments assessed for the Project are provided in Table 1-1. The pipeline segments are in predominantly forested areas, and cross multiple wetlands and two watercourses.

Table 1-1. Pipeline Segments Assessed

Segment	Legal Location (Approximate UTM 11U)	Approximate Length (m)
Section 1379405 – Segment 1	SE 19-91-1 W6M (430191E 6307062N) to SE 18-91-9 W6M (430427E 6305759N)	991
Section 1379404 – Segment 2	SE 6-91-1 W6M (430788E 6302325N) to SW 8-90-1 W6M (431496E 6294484N)	7,630
Section 1379406 – Segment 3	NE 32-89-1 W6M (431725E 6292057N) to NW 16-89-1 W6M (432404E 6287437N)	4,264

Note:

UTM = universal transverse Mercator

SECTION 2

Methods

The abandoned segments of the PRML assessed as part of the Project are colocated in a ROW with the NOVA Gas Transmission Ltd. (NGTL) PRML Pipeline. In the absence of a formal abandonment plan for the PRML segments abandoned in the 1970s, CH2M reviewed existing information about the PRML. The records review was used to determine specific locations to focus on during the field surface assessment along the abandoned pipeline segments. Areas of focus included locations where the potential environmental effects of abandonment of a pipeline in-place were most likely to be observed. Areas of focus are listed in Table 2-1. The records review is described in Section 2.1.

2.1 Records Review

CH2M reviewed historical information provided to TERA Environmental Consultants (TERA) by NGTL as part of the 2012 PRML Decommissioning Project, and publicly available information filed with the National Energy Board (NEB) as part of the 2016 PRML Abandonment application. Abandonment plans or details of the abandonment methodologies from the 1970s were limited for the Project. Information reviewed includes:

- As-built alignment sheets for the abandoned pipeline dated 1972 and revised in 1979, 1987, and 1993
- Environmental and Socio-economic Assessment (ESA) (TERA, 2012) (NEB Filing ID A5E5Z4) and supporting information prepared in support of the NGTL PRML Decommissioning Project
- ESA prepared in support of the NGTL PRML Abandonment Project (Stantec, 2016) (NEB Filing ID A5E573)
- PRML Abandonment Application (NEB Filing ID A79036)
- PRML Abandonment Schematics (NEB Filing ID A79036)
- Phase I Environmental Site Assessment for the Peace River Mainline NPS 20, Alberta (Golder Associates Ltd., 2011) (NEB Filing ID A5I3D6)
- Historical aerial photographs

From this information, the most informative records were three as-built alignment sheets for the abandoned pipeline from 1972. The as-builts indicated the location of the start and end point for each of the abandoned segments, the valve locations, and the location of screw anchors installed to prevent pipeline buoyancy (Appendix B). Additional information was available from the as-built alignment sheets, such as the location of river weights, swamp weights, casing pipe, cathodic protection test leads, air relief valves, and potential farm tap tees. However, none of these features were located on the abandoned segments assessed as part of the Project.

The ESA and supporting information prepared in support of the NGTL PRML Decommissioning Project (TERA, 2012), and the ESA and supporting information prepared in support of the NGTL PRML Abandonment Project (Stantec, 2016), were reviewed for any concerns identified on the previously abandoned segments of pipe. The PRML parallels the abandoned pipeline segments being assessed and, as such, was also a source of information for the pipeline configuration within the PRML Corridor and the environmental conditions on the ROW. The review of environmental conditions focused on identifying any areas where the potential effects of pipeline abandonment were evident and could potentially be targeted for surface-level assessment. No concerns were noted during the desktop environmental assessment of the PRML Corridor.

The Phase I Environmental Site Assessment conducted by Golder Associates Ltd. (2011) in support of the ESA provided information regarding the possible constituents of the pipeline coating and the contaminants that may result from the degradation of the pipeline coating. No concerns were noted during review of the Phase I Environmental Site Assessment.

Historical aerial photographs from various years prior to, and following, construction and abandonment of the pipeline segments were reviewed to determine pipeline abandonment-caused changes to surficial cover or local hydrology. The historical aerial photographs reviewed are provided in Appendix C.

There were no regulatory requirements associated with pipeline abandonment in the 1970s, and as such, it is unlikely that abandonment plans for the segments assessed as part of the Project were prepared. Any pipeline segmentation measures or measures designed to prevent buoyancy (such as swamp weights) are assumed to have been installed to isolate the abandoned segments from the operational segments or prior to pipeline segment abandonment.

Areas of focus described in Section 2.2 were informed by the records review and the information provided by CEPA (2007) and Det Norske Veritas (DNV) (2010).

2.2 Field Assessment

A helicopter-supported field survey was conducted on July 17, 2017, to investigate the surficial conditions along the Project. A total of approximately 12 km of pipeline ROW was surveyed.

Focus was concentrated on the locations listed in Table 2-1 during the overflight. In addition to observations made along the abandoned pipeline segments, observations were made along the adjacent PRML ROW (which parallels the abandoned pipeline segments to the east), as well as the undisturbed areas to the west and east of the existing pipeline rights-of way. The abandoned segments are located approximately 10 to 12 m from the western edge of the pipeline corridor, and 6 m east of the active PRML.

Much of the pipeline rights-of-way are overgrown, so landing in the helicopter was not possible at all areas of focus. Where landing was not possible, locations were surveyed from the air. Locations where ground-based surveys were conducted are included in Table 2-1.

Table 2-1. Locations of Focus During Field Survey

Segment	Location of Focus	Ground-based Survey Conducted	Unique ID	Photo Reference (Appendix D)
Segment 1	Start and end points of the abandoned pipeline, where the abandoned pipeline was isolated from the existing pipeline at SE 19-91-1 W6M and SE 18-91-9 W6M	Yes - Abandoned segment start at SE 19-91-1 W6M	1-1	Plate D-1 (end point) Plate D-2 (start point)
	Heavy-wall carrier pipe at 18-91-1 W6M	--	1-2	Plates D-3 and D-4
Segment 2	Start and end points of the abandoned pipeline, where the abandoned pipeline was isolated from the existing pipeline at SE 6-91-1 W6M and SW 8-90-1 W6M	--	2-1	Plate D-5 (start point)
	Single screw anchors on the pipeline at approximately SE 6-91-1 W6M	--	2-2	Plate D-6

Table 2-1. Locations of Focus During Field Survey

Segment	Location of Focus	Ground-based Survey Conducted	Unique ID	Photo Reference (Appendix D)
Segment 2 (cont'd)	Single screw anchors on the pipeline at approximately SW 17-90-1 W6M	--	2-3	Plate D-7
	Valve assembly at NW 8-90-1 W6M	Yes	2-4	Plate D-8
	Watercourse crossing at NE 31-90-1 W6M	--	2-5	Plate D-9
	Watercourse crossings at SW 17-90-1 W6M	--	2-6	Plate D-10
Segment 3	Start and end points of the abandoned pipeline, where the abandoned pipeline was isolated from the existing pipeline at NE 32-89-1 W6M and NW 16-89-1 W6M	Yes - Abandoned segment start at NE 32-89-1 W6M and abandoned segment end at NW 16-89-1 W6M	3-1	Plate D-11 (end point) Plates D-12 and D-13 (along Segment 3)
	Single screw anchors on the pipeline at approximately NE 29-89-1 W6M	--	3-2	Plate D-14
	Single screw anchors on the pipeline at approximately SW 21-89-1 W6M	--	3-3	Plate D-15
	Access road that crosses the pipeline ROW at SW 21-89-1 W6M (at the time of the field assessment, an approximate location where a bell hole was noted on the as-builts for the abandoned sections was observed)	Yes	3-4	Plate D-16

The following characteristics were assessed during the fieldwork, which may indicate the potential environmental effects of pipelines abandoned in-place:

- Evidence of subsidence, which may indicate the formation of a water conduit, corrosion, or pipeline collapse
- Evidence of soil or water contamination, which may indicate the disintegration of a pipe wall, the formation of a water conduit, corrosion, or that the pipe was not well-cleaned (or was cleaned to applicable standards at the time of abandonment)
- Evidence of disruption to drainage, which may indicate the formation of a water conduit
- Change in depth of cover, such as pipeline exposure, which may indicate erosion, frost heaving, or buoyancy
- Evidence of issues at watercourse and wetland crossings, such as disruption in hydrology
- Evidence of special concerns at road crossings, such as trench subsidence
- Evidence of erosion, which may indicate pipeline collapse, formation of water conduits, or issues at watercourse crossings

The habitat and hydrologic functions of the abandoned pipeline ROW and surrounding area were also evaluated during the fieldwork to compare where appropriate (native) functions have returned to the abandoned pipeline segments. The evaluation noted the:

- Presence and abundance of native vegetation, as well as dominant vegetation
- Hydrology, including the presence or absence of ponded water at watercourse and wetland crossings (beaver activity was also noted as a naturally occurring alteration)
- Habitat suitability for wildlife, including wildlife sign along/adjacent to the abandoned pipeline segment

Each of the previously mentioned criteria noted along the abandoned pipeline segments was compared to the parallel PRML ROW and undisturbed areas adjacent to the rights-of-way.

Photographs from the July 2017 fieldwork are provided in Appendix D.

SECTION 3

Findings

The results of the field assessment grouped according to the areas of focus in Section 2.2 are provided in the following subsections.

3.1 Evidence of Subsidence

There was no evidence of subsidence, which may indicate water conduit effect, corrosion, or pipeline collapse observed along the abandoned pipeline sections. Unnatural ponded water or sunken areas along the abandoned pipeline segments were not apparent during the field survey. Plates D-2 and D-11 in Appendix D show appropriate vegetation cover of native vegetation (such as, trembling aspen and white spruce) along the abandoned pipeline segments. No concerns were noted at 18-91-1 W6M (Unique ID 1-2) in relation to the heavy-wall carrier pipe.

3.2 Evidence of Soil or Water Contamination

There were no obvious signs that would indicate soil or water contamination along the abandoned pipeline segments, such as a change in vegetation colour or a visible sheen on water or soil, including at the valve assembly at NW 8-90-1 W6M (Unique ID 2-4) (Plate D-8, Appendix D).

3.3 Evidence of Disruption to Drainage

Changes in vegetation and ponding at watercourses and wetlands may indicate changes in drainage over the years. This could indicate changes in subsidence or water conduits. Based on the review of historic aerial photography (Appendix C) and field assessment, it was determined that there was no disruption to drainage due to the abandonment of the pipeline segments, including at the start and end points at SE 19-91-1 W6M and SE 18-91-9 W6M (Unique ID 1-1), SE 6-91-1 W6M and SW 8-90-1 W6M (Unique ID 2-1), and NE 32-89-1 W6M and NW 16-89-1 W6M (Unique ID 3-1).

Beaver dams were observed to have altered the hydrology in numerous locations along the abandoned pipeline segments, the PRML ROW, and the surrounding area (Plate D -13, Appendix D). Active beaver dams were noted on and off the pipeline rights-of-way; however, the beavers did not appear to be preferentially attracted to the specific abandoned pipeline segments when compared to the adjacent pipeline ROW.

The historical aerial photograph review showed that hydrology was not significantly impacted due to the pipeline abandonment, but that it has changed over time mainly due to beaver dams or anthropogenic disturbances, such as clear cutting. The historical aerial photograph review also showed that land use type (such as, forest and wetland) have remained similar during pre- and post pipeline segment abandonment along the ROW. Examples of some of the historical aerial photographs used in the review are provided in Appendix C.

3.4 Change in Depth of Cover

There was no evidence of pipeline exposure at the surface along the abandoned pipeline segments. Approximate screw anchor locations, typically within wetland complexes at SE 6-91-1 W6M (Unique ID 2-2), SW 17-90-1 W6M (Unique ID 2-3), NE 29-89-1 W6M (Unique ID 3-2), and SW 21-89-1 W6M (Unique ID 3-3), were observed as well-vegetated with appropriate hydrology (such as, open water or floating vegetation mats within wetlands). Based on these observations, it is anticipated that subsurface testing would demonstrate that the screw anchors are providing appropriate pipeline weighting at these locations (Plates D-7 and D-14, Appendix D).

3.5 Evidence of Issues at Watercourse Crossings

No signs of soil erosion or preferential weathering were observed during the field survey, and the riparian areas and wetland habitat surrounding watercourses were well-vegetated with native vegetation. No evidence of the above-mentioned issues were observed at watercourse crossings at NE 31-90-1 W6M (Unique ID 2-5) and SW 17-90-1 W6M (Unique ID 2-6). The watercourse at NE 31-91-1 W6M is surrounded by upland habitat (Plate D-9, Appendix D). The watercourse at SW 17-90-1 W6M is associated with wetland habitat (Plate D-10, Appendix D).

3.6 Evidence of Special Concerns at Road Crossings

No special concerns were observed at the access road and bell hole location at SW 21-89-1 W6M (Unique ID 3-4). The area surrounding the access road was well-vegetated with appropriate woody vegetation and a graminoid understory. No impounded water was observed along the road crossing (Plate D-16, Appendix D). There are no county regulated or maintained road crossings along any of the abandoned segments, and as such, there are no available records of additional maintenance related to subsidence at road crossings.

3.7 Habitat and Hydrological Characteristics

Habitat conditions along the abandoned pipeline segments were determined to be functional as native vegetation was well-established on the ROW. When comparing the abandoned pipeline segments to the parallel PRML ROW, notable differences were anticipated. For example, woody vegetation was taller on the abandoned pipeline segments when compared to the PRML ROW, where vegetation was more recently cleared. Dominant tree species in undisturbed upland areas were mature trembling aspen, balsam poplar, and black and white spruce (Plate D-4, Appendix D), while on the abandoned pipeline segments, those trees species were present in a successional stage, and shrub species, such as alder, were more dominant.

In wetland areas along the abandoned pipeline segments, the dominant tree species were small black spruce, with willow species dominating shrubby areas and emergent vegetation, such as sedge species and common cattail abundant in marsh-type areas. Weed concerns were generally not noted along the abandoned pipeline segments. However, trace amounts of Canada thistle were observed to be growing in equal amounts across all the rights-of-way in upland areas. Successional species, such as fireweed, were also present in upland areas in equal amounts across all the rights-of-way where woody vegetation was cleared. There was some excess water over the pipeline crown on the PRML ROW; however, this was not apparent on the abandoned pipeline segments. Open water areas existing along the abandoned pipeline segments are enhanced due to beaver activity (Plate D-12, Appendix D). The historical aerial photograph review confirmed that pipeline abandonment did not substantially alter the habitat and hydrology characteristics along the abandoned pipeline segments. In areas of the beginning and end points on the abandoned pipeline segments, there were no notable differences between the ROW and the parallel PRML ROW with regards to vegetation indicators, aside from different successional stages depending on where the ROW was last cleared. Plate D-15 in Appendix D is a view across the PRML, the abandoned pipeline segment, and surrounding undisturbed forest.

SECTION 4

Recommendations for Future Work

Dense and healthy native vegetation appropriate for the region is well-established along the abandoned pipeline segments, and wetland and watercourse hydrology is not impeded. Therefore, further field surveys of surface conditions are not recommended at this time. However, one of the objectives of the Project is to identify areas for further subsurface investigation. Table 4-1 includes sites where additional testing could be considered, as well as suggestions for subsurface assessment activities.

Table 4-1. Recommendations for Future Work

Site Description	Legal Location (Approximate UTM 11U)	Additional Testing
Segment 1 start and end point (Unique ID 1-1)	SE 19-91-1 W6M (430191E 6307062N) SE 18-91-9 W6M (430427E 6305759N)	• Excavate in the vicinity of the start and end points of the abandoned pipeline segment. • Assess the isolation measures installed at the time of abandonment for function. • Characterize coating and confirm further appropriate testing based on those results. • Collect soil samples from the area immediately surrounding the pipeline and submit for contamination screening from pipe coating degradation or contents leakage. Test for evidence of compounds described in NOVA Chemicals Corporation's Fate and Decomposition of Pipe Coating Materials in Abandoned Pipelines (2015) and Thorne et al.'s Trace Contaminants in Oil and Gas Pipelines (1996). • Collect soil samples for the area immediately surrounding the pipeline and submit for microbial culture to gain an understanding of whether the metabolic by-products of the bacterial population could contribute to corrosion of the pipe as discussed in Microbially Influenced Corrosion of Pipelines in the Oil and Gas Industry (Alabbas and Mishra, 2013). • Collect pipe coating samples and submit for characterization (for example, coal tar enamel, polyvinyl chloride, or asphalt enamel) screening (for example, plasticizers). • Assess the condition of the pipeline by measuring the wall thickness and soil resistivity. • Open the abandoned pipeline and collect samples to determine the composition, the concentration, and the volume of any residue left remaining in the pipe (as informed by Alberta Innovates – Technology Futures' Cleaning of Pipelines for Abandonment [2015]). Determining the volume of residue will confirm if there is enough material to cause contamination outside of the pipe, or if the residue is voluminous enough to be mobile and cause contamination in other areas along the pipe.
Segment 2 start and end point (Unique ID 2-1)	SE 6-91-1 W6M (430788E 6302325N) SW 8-90-1 W6M (431496E 6294484N)	
Segment 3 start and end point (Unique ID 3-1)	NE 32-89-1 W6M (431725E 6292057N) NW 16-89-1 W6M (432404E 6287437N)	

Table 4-1. Recommendations for Future Work

Site Description	Legal Location (Approximate UTM 11U)	Additional Testing
Valve assembly (Unique ID 2-4)	NW 8-90-1 W6M (431383E 6295615N)	• Collect soils samples from the area immediately adjacent to the valve assembly and submit for contamination screening (for example, hydrocarbons and benzene, toluene, ethylbenzene, and xylenes). • If the valve is associated with the segment of pipe being assessed as part of the Project, then assess it to determine if it has been deactivated/disabled in the closed position and if it is acting as a means of segmenting the pipe. A definitive determination of the state of this valve (that is, is the valve functioning or permanently disabled) was not possible since the site is fenced.
Screw anchors (Unique IDs 2-2, 2-3, 3-2, and 3-3)	SE 6-91-1 W6M (430767E 6302378N) SW 17-90-1 W6M (431346E 6296251N) NE 29-89-1 W6M (431900E 6290383N) SW 21-89-1 W6M (432335E 6287822N)	• Excavate select screw anchor sites and assess whether the screw anchors are still in place on the pipeline. • Assess the condition of the pipeline and the pipeline coating (if the pipeline is coated). • If through-wall corrosion is noted on the pipeline, assess the surrounding area for evidence of preferential flow of water through the pipe (that is, evidence of the formation of water conduits). • Assess the area surrounding the pipe for evidence of erosion or preferential flow of water along the outside of the pipe (that is, erosion).
Heavy-wall pipe (Unique ID 1-2)	18-91-1 W6M (430379E 6306148N)	• Excavate and assess the condition of the heavy-wall pipe and compare it to the condition of nonheavy-wall pipe.
Access road (Unique ID 3-4)	SW 21-89-1 W6M (432364E 6287593N)	• Excavate abandoned pipe under a small portion of the road and assess it for evidence of corrosion, to determine if access over the abandoned pipe has caused it to deaerate and become anodic, as described in DNV's Understanding the Mechanisms of Corrosion and their Effects on Abandoned Pipelines (2015).
Watercourse crossings (Unique IDs 2-5 and 2-6)	NE 31-90-1 W6M (430801E 6302058N) SW 17-90-1 W6M (431330E 6296436N)	• Excavate the pipe outside of the riparian area of the watercourse and assess it for through-wall corrosion. • If through-wall corrosion is noted on the pipeline, assess the surrounding area for evidence of preferential flow of water through the pipe. • Assess the area surrounding the pipe for evidence of erosion or preferential flow of water along the outside of the pipe.
Cathodic Protection Test Leads (not assessed during PARSC 010)	NE 7-91-1 W6M NW 4-89-1 W6M SE 5-90-1 W6M	• Excavate the pipe and determine presence or absence of cathodic protection test leads. • Assess the condition of the excavated pipe in relation to the presence or absence of cathodic protection.

SECTION 5

Summary

The objectives of the Project were to undertake a surface-level assessment for the potential environmental effects of pipelines abandoned in-place along three previously abandoned segments of the NGTL PRML Pipeline, and to identify areas where further subsurface assessment could be performed to provide additional information pertaining to a pipeline abandoned in-place. The surface level assessment did not reveal any evidence of the potential environmental effects of abandoning a pipeline in-place. Areas where additional assessment may be considered were determined using the most recent pipeline abandonment research and applying it to the locations identified during the literature review and field assessment.

SECTION 6

References

6.1 Literature Cited

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Appendix A
Abandoned Sections Overview

Notikewin River

Section 1379405
Chainage: 230+827 to 231+818
Length: 991m

ACCESS ALONG PIPELINE R/W
PLA 2832, NGTL
+/- 3.81 km

LIC# 38055-005
PLA 030446
SURGE ENERGY

WATER CROSSING

LIC# 80373-042, NGTL
LIC# 80162-467, NGTL
LIC# 80280215-004, TCPL
LINES FROM EAST TO WEST.

WATER CROSSING

Section 1379404
Chainage: 219+375 to 227+005
Length: 7630 m

ACCESS ALONG PIPELINE R/W
PLA 2825, NGTL
+/- 2.82 km

Section 1379406
Chainage: 212+352 to 216+616
Length: 4264m

WATER CROSSING

ACCESS ALONG PIPELINE R/W
PLA 2825, NGTL
C OF T: 208Z251
OWNER(S): CROWN
+/- 5.02 km

SEE PAGE 1 OF 2
FOR DETAIL

LAT: 56.679074
LONG: -118.087776

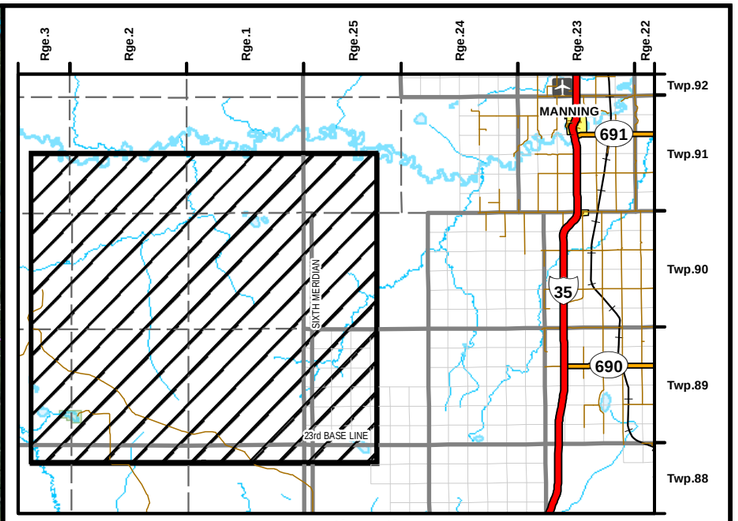
ACCESS ALONG PIPELINE R/W
PLA 2824, NGTL
C OF T: 207Z251
OWNER(S): CROWN
+/- 0.45 km

DLO 900131
DAISHOWA-MARUBENI
INTERNATIONAL LTD.
+/- 7.17 km

Sulphur Lake

Silver Creek

91-2-6 | 91-1-6 | 91-25-5
90-2-6 | 90-1-6 | 90-26-5 | 90-25-5
89-2-6 | 89-1-6 | 89-26-5 | 89-25-5



Location Plan
1:500,000

Legend

- Primary Highway
- Secondary Highway
- Minor Roads
- Temporary Access / Trail
- Railways
- Airfields
- Lake / Water Body / Irrigation Canal
- River / Creek
- City / Town
- First Nations
- Metis Settlement
- Parks / Protected Areas
- Telus Trenches
- Power Transmission Line
- Gas Co-Op
- Licensed Pipeline
- Licensed Pipeline (Foreign)
- Site
- AGM
- Access Route
- Access Route Start / End Point
- Foreign Crossing Location
- Water Crossing

TransCanada
In business to deliver

NPS 20 PEACE RIVER MAINLINE
RETIREMENT PROGRAM (WINTER ACCESS)
PREVIOUSLY ABANDONED SECTIONS 1379404, 1379405, 1379406

WITHIN Twp. 88-91 Rge. 1 W.6M

0 2,500 5,000 10,000 Meters

1:100,000

MIDWEST SURVEYS INC.
2827 Sunridge Blvd. N.E. Calgary, Alberta
Phone: 403.244.7471 Fax: 403.244.2466
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Date: September 30, 2016
Drawn By: LJC
Midwest Job No.: IA-0086-15-J1-R1
Checked By: JJ
Midwest Plan: IA-0086-15-J1_R1_TCPL_PRML_Retirement_Section_Accessmap_Pg2

REVISION 0

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Appendix B
1972 As-builts

TRACT Nº	802-296	802-297		802-298	802-299	802-300	802-301	802-302		802-303	802-304	802-305		802-306	802-307		802-308	802-309
OWNERSHIP	CROWN VACANT	CROWN VACANT	R/A	CROWN VACANT	CROWN VACANT	CROWN VACANT	CROWN VACANT	CROWN VACANT	R/A	CROWN VACANT	CROWN VACANT	CROWN VACANT	R/A	CROWN VACANT	CROWN VACANT	R/A	CROWN VACANT	CROWN VACANT
ACREAGE																		
VEGETATION																		

PIPE TOTALS					
NET	O.D.	W.T.	WT./FT.	MFG.	CODE
22031.2'	20"	0.219"			A.P.I. 5LX52
205.8'	20"	0.281"			A.P.I. 5LX52.
8613'	20"	0.255"			CSA Z245.2 GR 60

CASING TOTALS					
NET	O.D.	W.T.	WT./FT.	MFG.	CODE

MISCELLANEOUS		
NET	DESCRIPTION	REQ'N. Nº.
5	2 WIRE TEST LEAD SK-614	66208
2	WARNING SIGN	66208

REFERENCE DRAWINGS	DRG. Nº.
STAGE II PIPELINE PROFILE	D-802-108
STAGE II ROUTE MAP	D-802-2006
TYPICAL P/L, X'ING 66' R/A. WITH HVY. WALL PIPE	B-1000-706
*53 SULPHURLAKE CATHODIC PROTECTION AT 6852+16	B-802-423
30" PEACE R. LOOP ALIGNMENT	E-9051-30 8 31 832
*53 SULPHUR LK. CATH PROT FUEL SUPPLY	B-802-424

LEGEND
- SCREW ANCHORS / RIVER WEIGHTS
- SWAMP WEIGHTS
- CARRIER PIPE
- HEAVY WALL CARRIER PIPE
- CASING PIPE
- WARNING SIGN ON VENT
- WARNING SIGN ON POST
- (CHAINAGE HERE INDICATES TEST HEAD LOCATION) TEST LEAD & DIRECTION OF WIRES
- TEE FOR POTENTIAL FARM TAP
- 1" AIR RELIEF VALVE

LIMITS OF THIS SHEET

	QTR.	SEC.	TWP.	RG.	MER.
UPSTREAM	NE	29	89	1	6
DOWNSTREAM	SE	33	88	1	6

WORK ORDER Nº 1730

OPERATING LICENCE Nº.
CONSTRUCTION PERMIT Nº.
DESIGN PRESSURE. 820 P.S.I.G.
MIN. TEST PRESSURE. 1138 P.S.I.G.
MAX. OPERATING PRESSURE. 820 P.S.I.G.

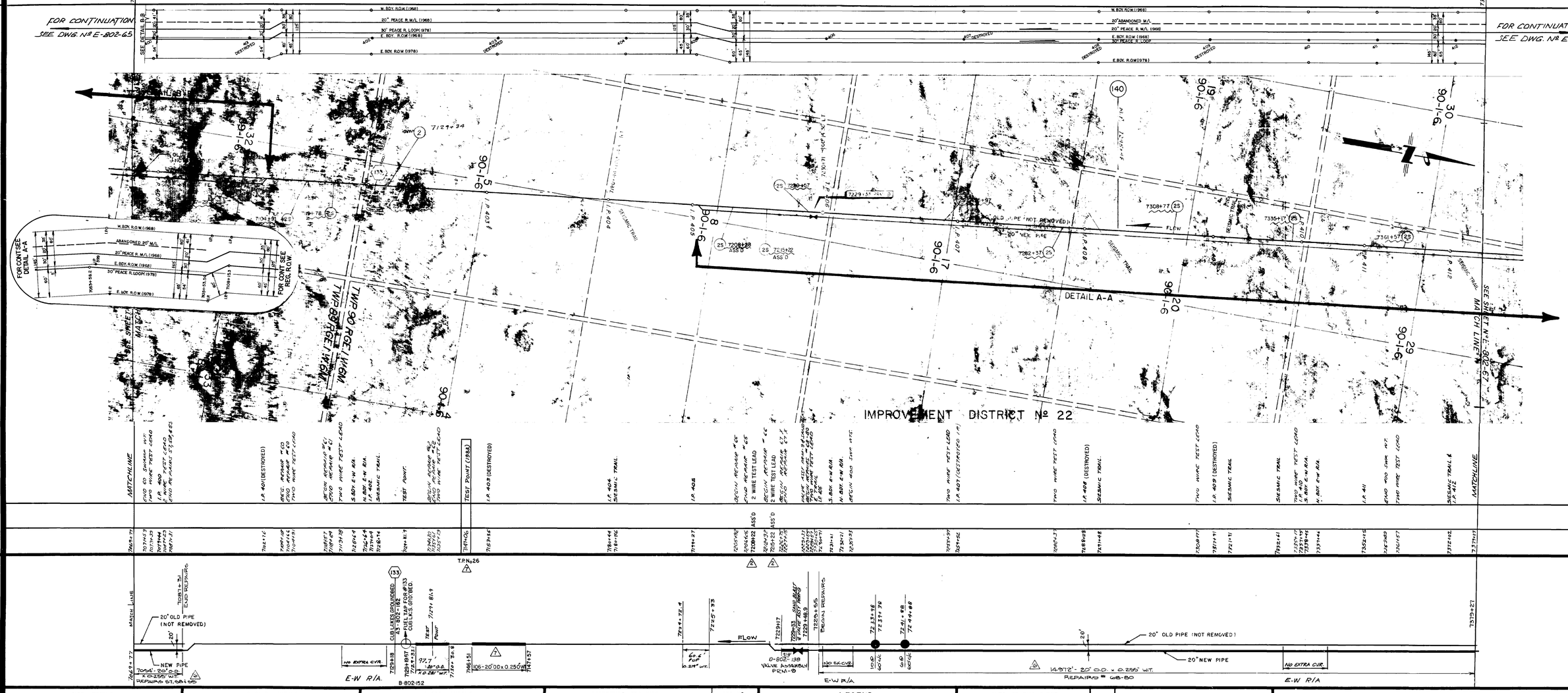
The Alberta Gas Trunk Line Company Limited
CALGARY ALBERTA
7705084

REV.	REMARKS	DATE
1	DRAWING "AS-BUILT" by A.D.	JUNE 21/73
2	#53 CATHODIC PROT (B-802-423	OCT 17/77
3	ADDED WIRE TEST LEADS INFO FROM 30" PEACE R. LOOP AS-BUILT (J.NESS MAR/79)	79-03-21
4	ADDED PEACE R. LOOP & UP-DATED R.O.W.	79/05
5	ADDED REPAIRED SECTIONS ON PIPE DATA & CHANGED PIPE TOTALS	83/05/20
6	GRD. BED. NO. & TITLE CHANGED 153 SULPHUR LAKE GRD. BED., CO-ORD. L.McGILLIVRAY, A.F.E. 186275	1987-03-26
7	AS-BUILT ACCESS ROAD @ 6785+16.7	1993-10-29

TITLE
20" PEACE RIVER MAINLINE AS-BUILT ALIGNMENT

APPROVED L. M. [signature] Sept 22/72 — SUPERVISING ENGINEER
DATE JULY 24 1972. APP'D SCALE 1"=1000'
DRN. G. JUNGLE
CHKD. N.E.N.
DWG. NO. E-802-65

TRACT Nº		802-310	802-311		802-312	802-313	802-314	802-315	802-316		802-317	802-318	802-319	802-320		802-321	802-322	
OWNERSHIP	MATCHLINE	CROWN VACANT	CROWN VACANT	R/A	CROWN VACANT	CROWN VACANT	CROWN VACANT	CROWN VACANT	CROWN VACANT	R/A	CROWN VACANT	CROWN VACANT	CROWN VACANT	CROWN VACANT	R/A	CROWN VACANT	CROWN VACANT	MATCHLINE
ACREAGE																		
VEGETATION																		



PIPE TOTALS

NET	O.D.	W.T.	WT./FT.	MFG.	CODE
8794.4'	20"	0.219"			API 5LX52
77.7'	20"	0.281"			API 5LX52
22026'	20"	0.255"			CAN.Z245.2 GR.GOB
⚠ 106'	20"	0.250"		CSA Z245.2	GR.414
31.9	VALVE ASSEMBLY PRM-9				

CASING TOTALS

NET	O.D.	W.T.	WT./FT.	MFG.	CODE

MISCELLANEOUS

NET	DESCRIPTION	REQ'N. Nº.
14	2-WIRE TEST LEAD (SK-614)	66208

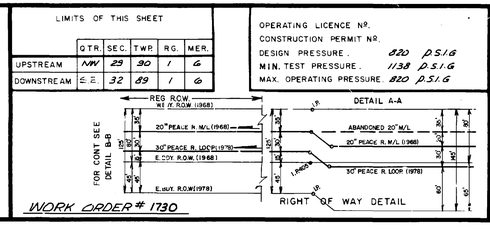
REFERENCE DRAWINGS

	DRG. Nº.
STAGE II PIPELINE PROFILE	D-802-108/09
STAGE II ROUTE MAP	D-802-200/6
VALVE ASSEMBLY PRM-9	D-802-138
133 CUB LAKES GROUNDBED AT 7129+18	AS-802-162
30" PEACE RIVER LOOP ALIGNMENT	E-9051-32 & 91
FUEL TAP FOR 133 CUB LAKES GRD'BED. AT 7129+19.67	B-802-152

LIMITS OF THIS SHEET

	QTR.	SEC.	TWP.	RG.	MER.
UPSTREAM	NW	29	90	1	6
DOWNSTREAM	S.E.	32	89	1	6

OPERATING LICENCE Nº.
CONSTRUCTION PERMIT Nº.
DESIGN PRESSURE. 820 P.S.I.G
MIN. TEST PRESSURE. 1138 P.S.I.G
MAX. OPERATING PRESSURE. 820 P.S.I.G



WORK ORDER # 1730

The Alberta Gas Trunk Line Company Limited
CALGARY ALBERTA 770502 5

REV.	REMARKS	DATE
1	DRAWING "AS-BUILT" by A.D.	JUNE 21/73
⚠2	ADDED WIRE TEST LEADS INFO FROM 30" PEACE R. LOOP AS. BUILT (JNESS MAR 78)	MAR 79 RH
3	ADDED PEACE R LOOP & UP-DATED ROW &	79/05
⚠4	ADDED TEST POINT FOR 1983/07/05	DEC. 83
5	ADD I.D. 22 JGS	83-03-14
6	ADDED REPAIRED SECTIONS ON PIPE JOINTS AND REVISED PIPE TABLE	83/05/25
7	AS-BUILT, 1983 TEST POINT, D.JOHNSON B.K. 106	83/08
8	GRD'BED. NO. 8 TITLE CHANGED # 133 CUB LKS. GRD' BED. AT 7129+18, CO-ORD. TEMPLE, AFE 86275 rbk	1987-03-11

TITLE
20" PEACE RIVER PIPELINE AS - BUILT ALIGNMENT

APPROVED [signature] SUPERVISING ENGINEER DATE
DATE JULY 26 1972 APP'D
SCALE 1" = 1000'
DRN. G.JUNGLE
CHKD. N.E.N.
DWG. NO. E-802-66

TRACT Nº	802-322	802-323		802-324	802-325		802-326	802-327	802-328	802-329		802-330	802-331	802-332	802-333	802-334		802-335
OWNERSHIP	CROWN VACANT	CROWN VACANT	R/A	CROWN VACANT	CROWN VACANT	R/A	CROWN VACANT	CROWN VACANT	CROWN VACANT	CROWN VACANT	R/A	CROWN VACANT	CROWN VACANT	CROWN VACANT	CROWN VACANT	CROWN VACANT	R/A	CROWN (COLLINS-FISHER LUMBER LTD)
ACREAGE																		
VEGETATION																		

PIPE TOTALS					
NET	O.D.	W.T.	WT./FT.	MFG.	CODE
944'	20"	0.219"			A.P.I. 5LX52
15110'	20"	0.281"			A.P.I. 5LX52
10596'	20"	0.255"			CSA Z245.2 GR.60
⚠10 8'	20"	0.250"		CSA 245.2	GR.414

CASING TOTALS					
NET	O.D.	W.T.	WT./FT.	MFG.	CODE

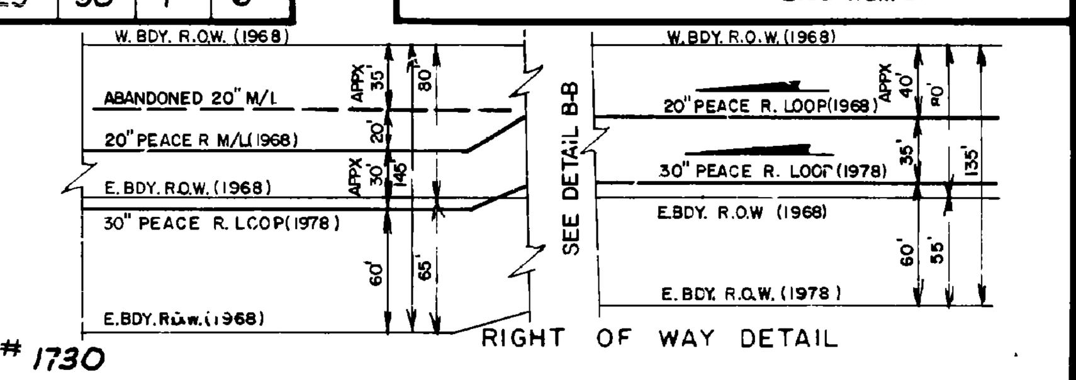
MISCELLANEOUS		
NET	DESCRIPTION	REQ'N. Nº
12	2-WIRE TEST LEAD (SK-614)	66208

REFERENCE DRAWINGS	DRG. Nº
NOTIKEWIN RIVER CROSSING.	
STAGE II PIPELINE PROFILE	D-802-109
" ROUTE MAP	D-802-200/6
#142 NOTIKEWIN GROUNDBED AT 7548+15	B-802-466
30" PEACE R. LOOP ALIGNMENT	E-9051-32833

LEGEND

- SCREW ANCHORS
- RIVER WEIGHTS
- SWAMP WEIGHTS
- CARRIER PIPE
- HEAVY WALL CARRIER PIPE
- CASING PIPE
- WARNING SIGN ON VENT
- WARNING SIGN ON POST
- (CHAINAGE HERE INDICATES TEST HEAD LOCATION) TEST LEAD & DIRECTION OF WIRES
- TEE FOR POTENTIAL FARM TAP
- 1" AIR RELIEF VALVE

LIMITS OF THIS SHEET	QTR.	SEC.	TWP.	RG.	MER.
UPSTREAM	S.W.	30	91	1	6
DOWNSTREAM	N.W.	29	90	1	6



RIGHT OF WAY DETAIL

WORK ORDER # 1730

OPERATING LICENCE Nº.
CONSTRUCTION PERMIT Nº.
DESIGN PRESSURE. 820 P.S.I.G.
MIN. TEST PRESSURE. 1138 P.S.I.G.
MAX. OPERATING PRESSURE. 820 P.S.I.G.

The Alberta Gas Trunk Line Company Limited
CALGARY ALBERTA

REV.	REMARKS	DATE
10	AS-BUILT, 1983 TEST POINT, D JOHNSON B.K.	83/08
11	ADDED RAMBLING CR. LAT. X-ING NLC	84 01 16
12	GRD.'BED. NO. & TITLE CHANGED 142 NOTIKEWIN GRD.'BED., CO OR L.McGILLIVRAY, A.F.E. 186275 RKK	1987-03-27
4	ADDED WIRE TEST LEADS INFO. FROM 30" PEACE R. LOOP AS BUILT (J. NESS MAR/78) RK	79/04/27
5	ADDED PEACE R. LOOP & UP-DATED R.O.W. RK	79/05
⚠6	TEST POINT FOR 1983 (07/83)	DEC. 82
7	ADD I.D. Nº 22 JGS	83-03-14
8	ADD TEST POINT 1983 REMOVE TEST PT. 7674+50 J.G.S.	83-04-29
9	ADDED REPAIRED SECTIONS ON PIPE DATA AND REVISED PIPE TOTALS	83/06/20

TITLE
20" PEACE RIVER PIPELINE AS-BUILT ALIGNMENT

APPROVED ____ SUPERVISING ENGINEER ____ DATE

DATE Aug 1 1972 | APP'D | SCALE 1"=1000'

DRN. | CHKD. A.J.A. | DWG. NO. E-802-67

Appendix C
Historic Aerial Photographs

APPENDIX C

Historic Aerial Photographs

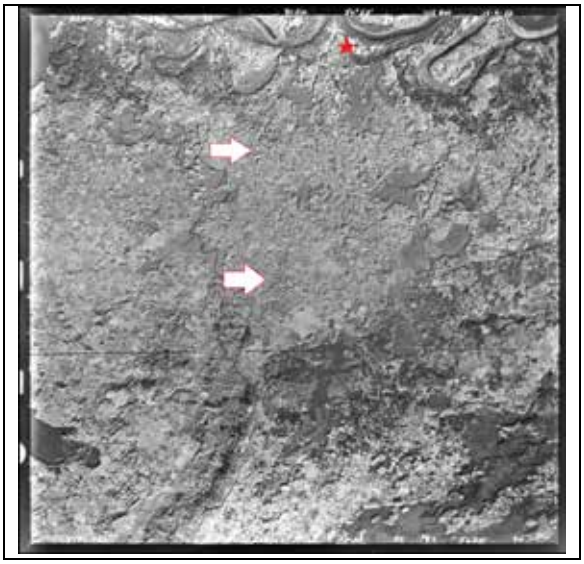


Plate C-1. White arrows show approximate beginning/end point locations on Segment 1 prior to pipeline construction at SE 19 and SE 18-91-1 W6M (September 1952). Red star provides landscape reference point.

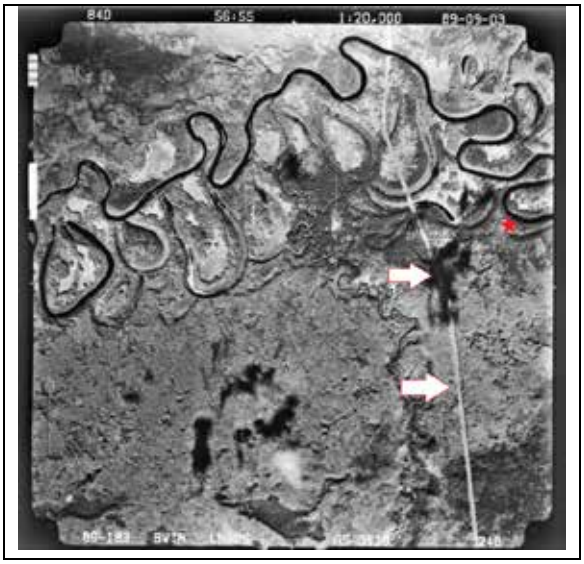


Plate C-2. White arrows show approximate beginning/end point locations on Segment 1 after abandonment at SE 19 and SE 18-91-1 W6M; forest type and hydrology are similar (September 1989). Red star provides landscape reference point.

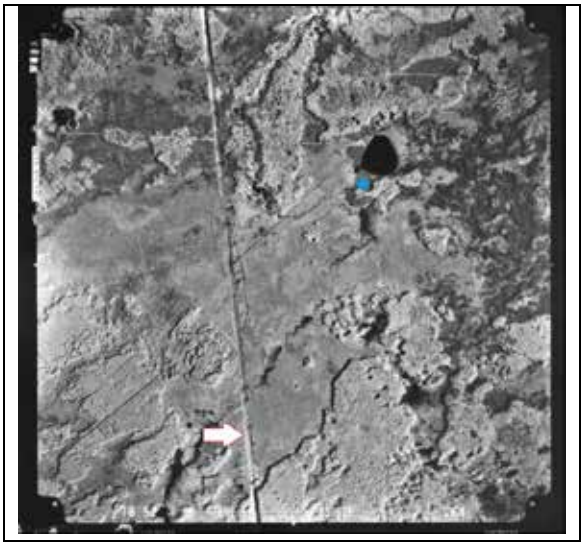


Plate C-3. White arrow shows the approximate screw anchor weight location on Segment 2 at SW 17-90-1 W6M, immediately following pipeline abandonment (June 1978). Blue star provides landscape reference point.

Plate C-4. White arrow shows the approximate screw anchor weight location on Segment 2 at SW 17-90-1 W6M, decades following pipeline abandonment; hydrology is similar in this location (August 2012). Blue star provides landscape reference point.

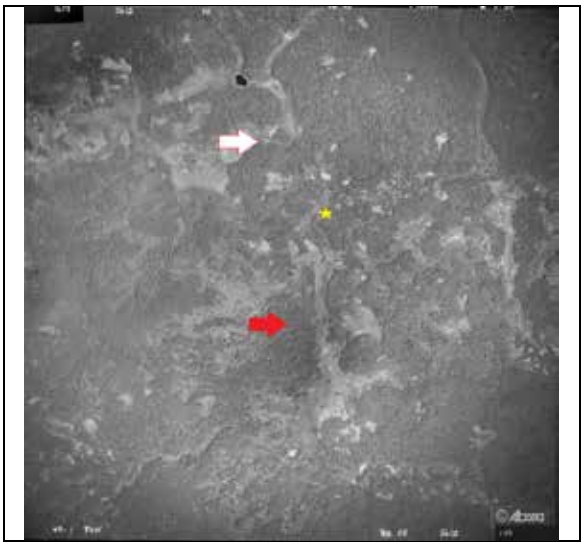


Plate C-5. White arrow shows the approximate screw anchor weight location on Segment 3 at NE 29-89-1 W6M, and yellow arrow shows the approximate beginning/end point at NW 16-89-1 W6M, prepipeline construction (September 1950). Yellow star provides landscape reference point.

Plate C-6. A white arrow shows the approximate screw anchor weight location on Segment 3 at NE 29-89-1 W6M, and red arrow shows the approximate beginning/end point at NW 16-89-1 W6M; hydrology is similar before and after pipeline abandonment; forest is cleared in the approximate area of beginning/end point in 2001 (June 2001). Yellow star provides landscape reference point.

Appendix D
Field Photographs

APPENDIX D

Field Photographs

Plate D-1. View south along the abandoned pipeline Segment 1 showing the well-vegetated right-of-way (ROW) near the end point of the segment at SE 18-91-1 W6M (Unique ID 1-1).

Plate D-2. View south along the abandoned pipeline Segment 1 showing the well-vegetated ROW near the start point of the segment at SE 19-91-1 W6M (Unique ID 1-1).

Plate D-3. View south at the approximate heavy-wall carry site along the abandoned pipeline Segment 1 at NW 18-91-1 W6M (Unique ID 1-2).

Plate D-4. View south along the abandoned pipeline Segment 1 showing upland forest at SW 18-91-1 W6M (Unique ID 1-2).

Plate D-5. View west across the abandoned pipeline Segment 2 showing beaver impoundment at SE 6-91-1 W6M, near the start point (Unique ID 2-1).

Plate D-6. View south along the abandoned pipeline Segment 2 showing beaver activity and an area with a screw anchor; no issues with pipe buoyancy at SE 6-91-1 W6M (Unique ID 2-2).

Plate D-7. View south along the abandoned pipeline Segment 2 showing an area with a screw anchor and no issues with pipe buoyancy at SW 17-90-1 W6M (Unique ID 2-3).

Plate D-8. View west at the valve site showing healthy, woody vegetation growing on the abandoned pipeline Segment 2 ROW at NW 8-90-1 W6M (Unique ID 2-4).

Plate D-9. View west across the abandoned pipeline Segment 2 showing a watercourse crossing at NE 31-90-1 W6M (Unique ID 2-5).

Plate D-10. View east across the abandoned pipeline Segment 2 showing a watercourse crossing at SW 17-90-1 W6M (Unique ID 2-6).

Plate D-11. View north along the abandoned pipeline Segment 3 showing the well-vegetated ROW near the end point of the segment at NW 16-89-1 W6M (Unique ID 3-1).

Plate D-12. View west across the abandoned pipeline Segment 3 showing a beaver impoundment at NE 29-89-1 W6M (Unique ID 3-1).

Plate D-13. View east across the abandoned pipeline Segment 3 showing a beaver-altered wetland with healthy, emergent vegetation at SE 29-89-1 W6M (Unique ID 3-1).

Plate D-14. View east across the abandoned pipeline Segment 3 showing beaver dams and an area with a screw anchor; no issues with pipe buoyancy at NE 29-89-1 W6M (Unique ID 3-2).

Plate D-15. View west across the abandoned pipeline Segment 3 showing Peace River Mainline, the abandoned pipeline segment rights-of-way, and the approximate screw anchor location to the south at SW 21-89-1 W6M (Unique ID 3-3).

Plate D-16. View west at a road crossing showing vegetation growth at the abandoned pipeline Segment 3 at SW 21-89-1 W4M (Unique ID 3-4).