



June 2017

BOW AND ELBOW RIVER HAZARD STUDY

Survey and Base Data Collection Report

Submitted to:

Alberta Environment and Parks
Peter Onyshko
11th Floor, Oxbridge Place
9820 - 106 Street NW
Edmonton, AB T5K 2J6



Report Number: 1536673_R0001 Rev. 0

Distribution:

5 Paper Copies: Alberta Environment and Parks
1 E-Copy: Alberta Environment and Parks

REPORT





Executive Summary

Alberta Environment and Parks (AEP) commissioned Golder Associates Ltd. (Golder) in September 2015 to undertake the Bow and Elbow River Hazard Study. The primary purpose of the study is to identify and assess river and flood hazards along the Bow River (from Bearspaw Dam to the Highwood River confluence) and the Elbow River (from Bragg Creek to the Bow River confluence), including lengths of Bragg and Lott Creeks.

The study is conducted under the provincial Flood Hazard Identification Program (FHIP), the goals of which include enhancement of public safety and reduction of future flood damages through the identification of river and flood hazards. Project stakeholders include the Government of Alberta, local authorities, and the public. Key municipal stakeholders include the City of Calgary, Municipal District of Foothills, and Rocky View County. The project includes working with Tsuut'ina Nation.

The Bow and Elbow River Hazard Study includes multiple components and deliverables. This report documents the methodology and results of the survey and base data collection component of the study, which supports the hydraulic modelling, flood mapping, flood risk assessment, and channel stability investigation components. The tasks associated with this component include a river cross section survey, hydraulic and flood control structure data collection, digital terrain model (DTM) data integration, and aerial imagery acquisition. Additional base data collected by Golder in support of the study includes administrative, cadastral, and transportation data, structural design drawings, and other relevant data.

Topographic and shallow-water surveys were conducted using Real Time Kinematic (RTK) GPS units. Bathymetric surveys were conducted using an Acoustic Doppler Profiler (ADP) in combination with a boat-mounted RTK unit. A total station was used to collect supplementary bridge data. The majority of cross sections on the Bow and Elbow Rivers in Calgary were surveyed by Golder in the fall of 2013 as part of a joint project funded by the City of Calgary and AEP. Supplementary data and new cross sections on the Bow River downstream of Calgary, the Elbow River upstream of Calgary, and Lott and Bragg Creeks were surveyed by Golder in the fall of 2015 and spring of 2016.

The total length of the Bow River study reach is approximately 72 km. The total length of the Elbow River study reach is approximately 65 km. The total study reach lengths of Bragg and Lott Creeks are 1 km and 7 km, respectively. The features surveyed to date are summarized in Table i.

Table i: Summary of Survey Features

Features	Total Number for Each Study Reach			
	Bow River	Elbow River	Bragg Creek	Lott Creek
Cross Sections - Main Channel (Side Channels)	533 (188)	812	14	109
Bridges and Culverts	44	27	2	17
Weirs	2	-	-	1
Dams	-	1	-	-
Flood Control Structures	14	6	-	-
Other Features	1	-	-	1



Acknowledgements

This component of the Bow and Elbow River Hazard Study was managed by Dr. Wolf Ploeger. Overall direction and senior review for this component was provided by Dr. Dejiang Long and Mark Chiarandini. The field survey was conducted by Kevin Belanger, Carmen Orosz, Karlen Lowes, Jason Fregoe, Mark Piciacchia, Gene Chu, Ken Allen, Hossein Kheirkhah Gildeh, Ekikere Elijah, Beth Jim, and Nancy Guo.

The authors express their special thanks to Peter Onyshko and Abdullah Mamun, Project Managers for Alberta Environment and Parks, who provided overall study management, background data, and technical guidance.

The authors express their thanks to Cole Nelson of Rocky View County for providing additional background information and for guiding a site reconnaissance of the Bragg Creek area and to Rocky Bond of Redwood Meadows for guiding a site reconnaissance of the Redwood Meadows area.

The authors express their thanks to Irene Crowchild, Hollice Crowchild, and Trent Heavenfire from Tsuut'ina First Nation for guiding the survey crew on the Nation lands and for providing UXO safety for our survey crew along the Elbow River upstream of Glenmore Reservoir in the former Harvey Baracks area.

The authors express their thanks to Deighen Blakely and Frank Frigo of the City of Calgary for their support and for providing background information and survey data.

DRAFT



Table of Contents

1.0 INTRODUCTION	1
1.1 Study Objectives	1
1.2 Study Area and Reaches	1
1.3 Scope of Work	1
1.3.1 Survey Program	1
1.3.2 Aerial Imagery Acquisition	3
1.3.3 Additional Base Data Collection	3
2.0 SURVEY DATA	4
2.1 Procedures and Methodology	4
2.1.1 Topographic, Bathymetric, and Structure Surveys	4
2.1.2 Discharge Measurements	9
2.2 Cross Sections	12
2.3 Hydraulic Structures	14
2.3.1 Bridges	14
2.3.2 Culverts	18
2.3.3 Weirs and Dams	19
2.3.4 Other Features	20
2.4 Flood Control Structures	20
2.5 Accuracy	22
2.6 LiDAR-derived DTM	22
3.0 AERIAL IMAGERY	23
4.0 OTHER BASE DATA	24
5.0 CONCLUSIONS	24
6.0 CLOSURE	25
THIRD PARTY DISCLAIMER	26
7.0 REFERENCES	27



BOW AND ELBOW RIVER HAZARD STUDY - SURVEY AND BASE DATA COLLECTION REPORT

TABLES

Table 1: River Survey Coverage and Timeline.....	3
Table 2: RTK Survey Data Codes	5
Table 3: Comparison of Elbow River Flows Measured below Glenmore Dam and Mean Daily Flows Recorded at WSC Gauge 05BJ001	10
Table 4: Comparison of Elbow River Flows Measured above Glenmore Reservoir and Preliminary Mean Daily Flows Recorded at WSC Gauge 05BJ004.....	10
Table 5: Comparison of Bow River Flows Measured upstream of the Elbow River Confluence and Mean Daily Flows Recorded at WSC Gauge 05BH004.....	11
Table 6: Comparison of Bow River Flows Measured downstream of the Elbow River Confluence and Mean Daily Flows Recorded at WSC Gauges 05BH004 and 05BJ001.....	11
Table 7: Lott Creek Flows Measured at Misty Morning Drive	12
Table 8: Lott Creek Flows Measured at Allen's Trout Farm	12
Table 9: Bragg Creek Flows Measured 100 m upstream of Bracken Road Bridge	12
Table 10: Surveyed Cross Sections within the Study Area	13
Table 11: Bow River Bridges within the Study Area	14
Table 12: Elbow River Bridges within the Study Area	17
Table 13: Lott Creek Bridges within the Study Area.....	18
Table 14: Bragg Creek Bridges within the Study Area	18
Table 15: Elbow River Culverts within the Study Area.....	18
Table 16: Lott Creek Culverts within the Study Area.....	19
Table 17: Weirs and Dams within the Study Area.....	19
Table 18: Other Features within the Study Area	20
Table 19: Flood Control Structures within the Study Area.....	21
Table 20: Summary of Elevation Differences between Surveyed Control Points and LiDAR DTM	23

FIGURES

Figure 1: Study Area	2
Figure 2: Schematic of Survey Point Locations.....	5



BOW AND ELBOW RIVER HAZARD STUDY - SURVEY AND BASE DATA COLLECTION REPORT

APPENDICES

APPENDIX A

Surveyed Thalweg and Water Level Profiles

APPENDIX B

Cross Section, Hydraulic Structure, and Flood Control Structure Locations

APPENDIX C

Hydraulic Structures Datasheets

APPENDIX D

Flood Control Structure Datasheets

APPENDIX E

LiDAR DTM Ground Control Points

APPENDIX F

Aerial Imagery Acquisition Memorandum

DRAFT



1.0 INTRODUCTION

1.1 Study Objectives

Alberta Environment and Parks (AEP) commissioned Golder Associates Ltd. (Golder) in September 2015 to undertake the Bow and Elbow River Hazard Study. The primary purpose of the study is to identify and assess river and flood hazards along the Bow River (from Bearspaw Dam to the Highwood River confluence) and the Elbow River (from Bragg Creek to the Bow River confluence), including lengths of Bragg and Lott Creeks.

The study is conducted under the provincial Flood Hazard Identification Program (FHIP), the goals of which include enhancement of public safety and reduction of future flood damages through the identification of river and flood hazards. Project stakeholders include the Government of Alberta, local authorities, and the public. Key municipal stakeholders include the City of Calgary, Municipal District of Foothills, and Rocky View County. The project includes working with Tsuut'ina Nation.

The Bow and Elbow River Hazard Study includes multiple components and deliverables. This report documents the methodology and results of the survey and base data collection component, which supports the hydraulic modelling, flood mapping, flood risk assessment, and channel stability investigation components. The tasks associated with this component include a river cross section survey, hydraulic and flood control structure data collection, digital terrain model (DTM) data integration, and aerial imagery acquisition. Additional base data collected by Golder in support of the study includes administrative, cadastral, and transportation data, structural design drawings, and other relevant data.

1.2 Study Area and Reaches

The study area includes approximately 72 km of the Bow River between Bearspaw Dam and the Highwood River confluence, approximately 65 km of the Elbow River from Bragg Creek to the Bow River confluence in Calgary, approximately 1 km of Bragg Creek upstream of the Elbow River confluence, and approximately 7 km of Lott Creek upstream of the Elbow River confluence (see Figure 1).

The study area includes the following local authorities and communities: Bragg Creek, Calgary, Elbow Valley Residents Club, Municipal District of Foothills, Redwood Meadows, Rocky View County, and Tsuut'ina Nation.

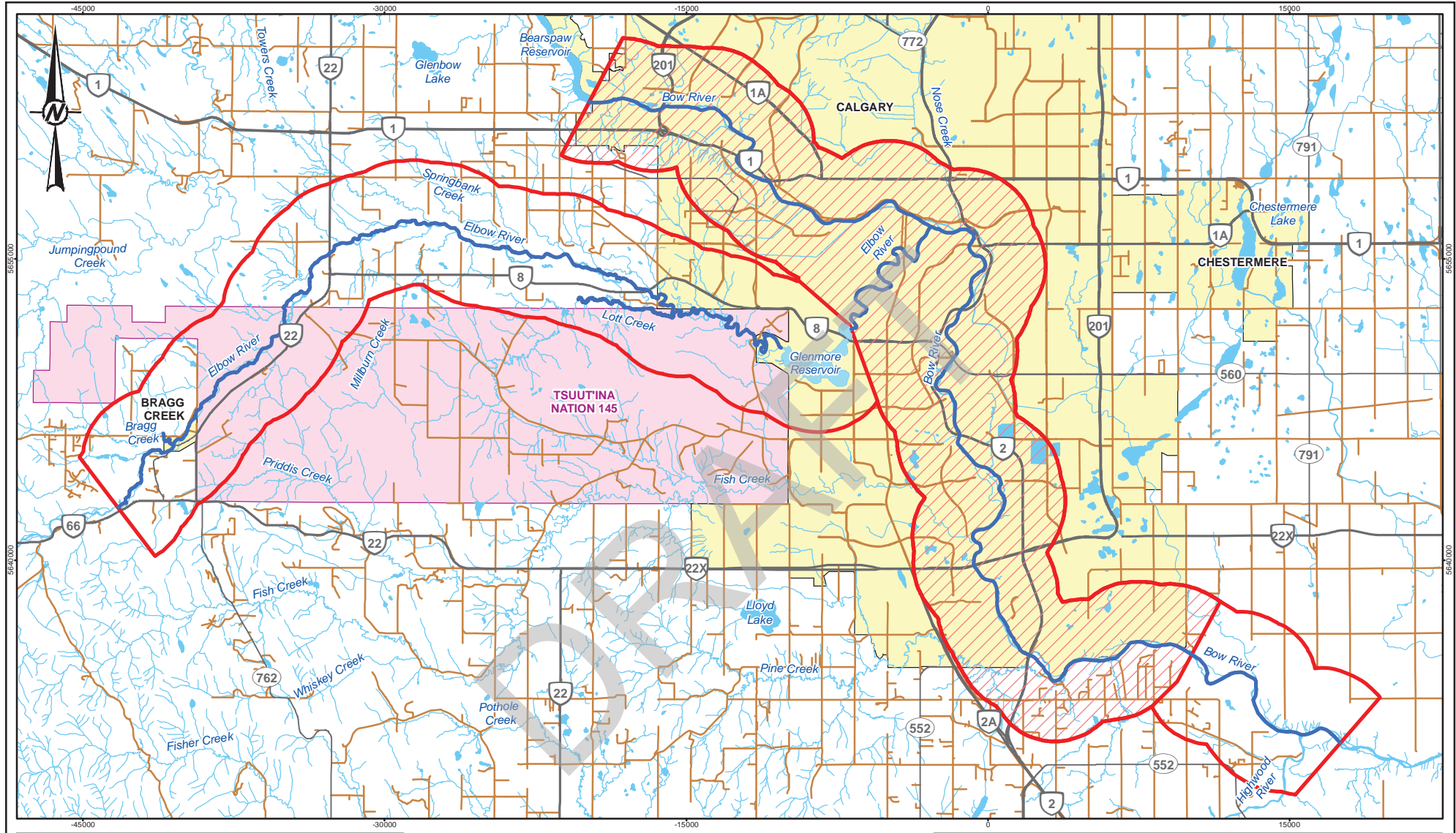
1.3 Scope of Work

1.3.1 Survey Program

The program includes survey of river cross sections, hydraulic structures, flood control structures, and other features. Table 1 describes the surveyed river reaches and identifies when each reach was surveyed.

Golder surveyed the Bow and Elbow Rivers within Calgary in September to November 2013 and April 2014, following the June 2013 flood event (Golder 2015). These survey data were collected by Golder on behalf of the City of Calgary in support of a joint Calgary-AEP project, and were used with permission for this study.

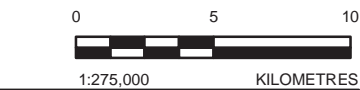
An approximately 2 km length of the Bow River below the Highwood River confluence was surveyed in October 2015, as part of this study. Supplementary data on the Bow River within Calgary and new cross sections on the Elbow River through Rocky View County were also surveyed in the fall of 2015. Survey work along the Elbow River through Tsuut'ina Nation, within Weaselhead Natural Area, through Glenmore Reservoir, along Lott Creek, and along Bragg Creek was conducted from April to August 2016.



- LEGEND**
- PRIMARY HIGHWAY
 - SECONDARY HIGHWAY
 - LOCAL ROAD
 - WATERCOURSE
 - POPULATED PLACE
 - WATERBODY
 - FIRST NATION
 - STUDY REACHES
 - 2015 BOW AND ELBOW RIVER HYDRAULIC MODEL
 - RIVER HAZARD STUDY AREA

CLIENT
ALBERTA ENVIRONMENT AND PARKS

CONSULTANT



YYYY-MM-DD	2016-07-07
DESIGNED	W.PLOEGER
PREPARED	P.THIEDE
REVIEWED	W. PLOEGER
APPROVED	D. LONG

REFERENCE(S)
 POPULATED PLACES AND HYDROGRAPHY OBTAINED FROM ALTALIS, © GOVERNMENT OF ALBERTA 2015. ALL RIGHTS RESERVED.
 ROADS OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
 DATUM: NAD 83 CSRS PROJECTION: 3TM 114

PROJECT
BOW AND ELBOW RIVER HAZARD STUDY

TITLE
LOCATION MAP

PROJECT NO. 1536673	CONTROL	REV. 0	FIGURE 1
------------------------	---------	-----------	--------------------



Table 1: River Survey Coverage and Timeline

River	Reach Description	Survey Period
Bow River	Bears paw Dam to southeast Calgary city limit	September to November 2013 (Golder 2015a), with supplementary survey in October 2015
	Southeast Calgary city limit to Highwood River confluence	September to November 2013 (Golder 2015a), with additional survey in October 2015
	Downstream of Highwood River confluence	October 2015
Elbow River	Upstream of Bragg Creek to western Tsuut'ina Nation limit	October and November 2015
	Northwest Tsuut'ina Nation, including Redwood Meadows	June and July 2016
	Rocky View County, north of Tsuut'ina Nation	October and November 2015
	Northeast Tsuut'ina Nation, opposite Discovery Ridge	June 2016
	Weaselhead Natural Area and Glenmore Reservoir	June and August 2016
	Glenmore Dam to Bow River confluence	September to November 2013 (Golder 2015a)
Lott Creek	Elbow Valley and Tsuut'ina Nation to Elbow River confluence	June 2016
Bragg Creek	Centre Avenue to Elbow River confluence	July 2016

1.3.2 Aerial Imagery Acquisition

The scope of work includes the acquisition of new aerial imagery of the study area. The aerial imagery was acquired on May 6, 2016.

1.3.3 Additional Base Data Collection

The additional base data acquired or assembled for this study include the following:

- administrative, cadastral, transportation, and other provincially available data sets;
- supplementary survey data;
- infrastructure datasets;
- design drawings and as-built information or drawings; and
- other relevant data.



2.0 SURVEY DATA

2.1 Procedures and Methodology

2.1.1 Topographic, Bathymetric, and Structure Surveys

The following survey techniques were used to collect all new survey data for this study:

- Real Time Kinematic (RTK) GPS units (Trimble R8 and R10) for ground features and where river flows were shallow enough to wade.
- Acoustic Doppler Profiler (ADP) (Sontek M9) in combination with a boat-mounted RTK unit where river flows were too deep to wade.
- Total station (Nikon Nivo) to collect bridge data.

The RTK data were referenced to geodetic positions using one of the following methods:

- The Cansel Can-net Virtual Reference Station (VRS) System (Can-net) was used where available. This system uses correctional data calculated at multiple fixed base units positioned across Canada and broadcast via cellular network to generate an accurate position (with an accuracy of ± 0.02 m). When using Can-net, each rover was calibrated daily to an Alberta Survey Control Marker (ASCM) or a Golder-established temporary benchmark that had been tied to an ASCM.
- Where cellular coverage was not available, the RTK base station was set up over a temporary benchmark (TBM) and calibrated to an ASCM that was close to each survey reach. The resulting accuracy of the RTK unit was ± 0.02 m.
- The RTK data were acquired by RTK rovers with geoid files loaded and applied. The RTK data output is in Orthometric Elevation with correct northing and easting values. All survey data were converted from UTM to the 3TM 114° projection in the NAD83 CSRS datum.

Can-net was used for all Elbow River survey work. The RTK base was used for portions of the lower Bow River where cell coverage (and thus Can-net coverage) was not available.

Each RTK survey point was attributed with a specific code value in the field. A complete list of RTK codes is listed in Table 2. A schematic of survey point locations is shown in Figure 2.



BOW AND ELBOW RIVER HAZARD STUDY - SURVEY AND BASE DATA COLLECTION REPORT

Table 2: RTK Survey Data Codes

Primary Code	Description
b	Bank (a surveyed point on the river bank)
g	Ground (a survey point above the top of bank)
sb	Stream Bottom (a survey point below the water line)
tb	Top of Bank (locations where bank slope transitions to ground)
toe	Toe of Bank (locations where steep bank slope transitions to stream bottom slope)
wl	Water Level (a survey point where water meets the bank)
wl long	Water Level (as part of longitudinal profile to be used for model calibration)
Secondary Code	Description
1	Sediment Description – Mud/Silt
2	Sediment Description – Gravel
3	Sediment Description – Cobble
4	Sediment Description – Boulder
5	Sediment Description – Bedrock
G	Grass – Grasses and Fescues
Rip	Riprap
T	Trees (larger mature trees with tree trunk greater than 20 cm in diameter)
W	Willows (shrubs, willow plants, and smaller trees less than 3 m in height and or less than 20 cm in diameter)

For example: “sb 3” denotes stream bottom – cobble substrate, and “tb w” denotes top of bank – willow cover.

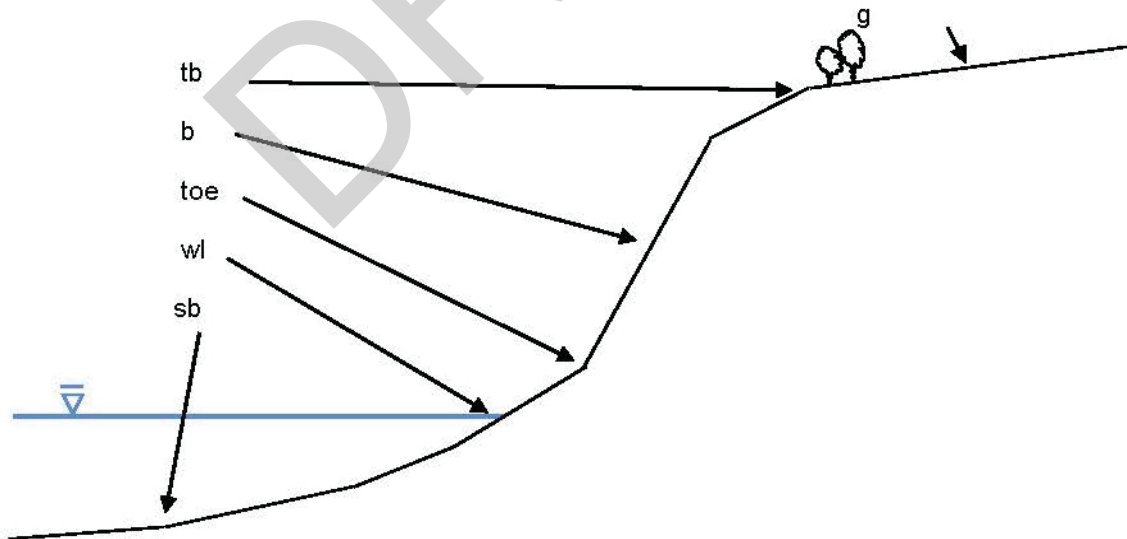


Figure 2: Schematic of Survey Point Locations



Elbow River below Glenmore Dam and above Weaselhead Natural Area, Lott Creek, and Bragg Creek

The Elbow River upstream of the Weaselhead Natural Area is relatively steep (slope of 0.008 m/m near Bragg Creek to 0.006 m/m at Weaselhead Natural Area) and flows were relatively shallow at the time of the survey. Therefore, the cross sections in this reach were surveyed on foot (by wading) as follows:

- the field data were collected by surveying river cross sections perpendicular to the river flow;
- cross-sectional information was collected from a location beyond top of one bank to another location beyond top of the other bank;
- special attention was paid to surveying topographic slope breaks;
- topographic survey points were attributed in the field with codes that described substrate and vegetation types;
- water surface elevations were surveyed using the RTK rover at each bank and each channel if the section is braided; and
- discharge measurements were taken daily by wading at suitable locations.

The Elbow River below Glenmore Dam was also surveyed by wading during low flow conditions in September to November 2013 (Golder 2015a). Both Bragg and Lott Creeks were surveyed in 2016 by wading.

Bow River, Glenmore Reservoir, and Elbow River within Weaselhead Natural Area

The Bow River, Glenmore Reservoir, and the Elbow River within Weaselhead Natural Area upstream of Glenmore Reservoir were surveyed using a combination of boat and on-the-foot survey methods. The on-the-foot method described above for the Elbow River apply to the Bow River survey, where only the bank portions of the cross sections were surveyed using on-the-foot method.

The boat survey method is described below:

- A Sontek M9 Acoustic Doppler Profiler (ADP) was mounted onto a frame, which was fastened on top of an inflatable Zodiac boat. Once the ADP was securely mounted on the boat, it was deployed in the water and the distance from the sensor to the water surface was measured.
- The RTK unit was placed on top of the ADP mount at a measured offset from the water surface which was recorded daily.
- The ADP and RTK units were connected to a laptop for data storage. The system was checked to make sure that both units were communicating properly.
- A brief calibration file was run to verify the recorded equipment offset values.
- The bathymetric data were collected along the select cross sections (perpendicular to the river flow) and Glenmore Reservoir. In shallow water areas (<0.5 m of depth), survey points were collected by wading.
- Bank topographic data were obtained using RTK rover units as described above.
- Water surface elevations were surveyed using the RTK rover at points where the water met the bank.



- Water Survey of Canada (WSC) discharge protocols were followed when conducting discharge measurements using the ADP (i.e., an even number of transects, an equal number of transects moving each direction across the channel, and all transects within a 5% standard deviation).

Hydraulic Structures

Hydraulic structures (i.e., bridges, culverts, etc.) on the streams within the study area were surveyed following current study and FHIP specifications. The required survey features of bridges include:

- length of span (corner points, abutment to abutment);
- width of bridge (corner points, outside to outside);
- top of curb or solid guard rail elevations (upstream and downstream sides);
- low chord elevations (upstream and downstream sides);
- number and width of piers;
- location of piers and the distance of each pier from the abutment;
- type of piers (i.e., concrete, pile bent);
- shape of pier (i.e., round nose, wedge shape); and
- top of roadway profile.

The following features of culverts were surveyed:

- culvert type (i.e., concrete, CMP, etc.);
- culvert shape (i.e., round, arch, rectangular, etc.);
- entrance condition (i.e., projecting from fill, mitered to conform to slope, head wall properties, etc.);
- culvert dimensions and barrel length;
- upstream and downstream inverts; and
- top of roadway profile.

The structures were surveyed using RTK or total station units, or a combination of both. The RTK unit was used to collect data on structure points with a clear view of the sky (i.e., bridge decks, railings, etc.). The total station was used in reflector-less mode to collect survey points underneath the main bridge structure. In reflector-less mode the user aligns the unit cross hairs on the point that is to be surveyed and a laser beam is transmitted to the structure and reflected from the structure without using a traditional total station prism or reflector target. Geo-located photos of all hydraulic structures were taken.



Flood Control Structures

Permanent flood control structures (i.e., berms, floodwalls, etc.) identified by AEP and local authorities as being present within the study area as late as Fall 2016 were surveyed using RTK methods. Survey data were used to verify as-built drawing dimensions, and new surveys were undertaken even if previous survey data for some structures were available to ensure a consistent dataset. All identified structures present within the survey and base data collection period were surveyed in either Fall 2015 or between Spring and Fall 2016. Some of the structures were surveyed in conjunction with the river survey work and others were surveyed independently, as required.

The survey of flood control structures included collection of the following information:

- crest elevation and cross-sectional dimensions in regular intervals (approximately 50 m); and
- culverts, gates, and other openings, if present.

Geo-located photos of all flood control structures were taken.

Survey Data Processing and Quality Control

Primary quality assurance and quality control (QA/QC) of RTK data were conducted in the field by calibrating to a known point and surveying this point at the beginning and end of each day. In the office, the accuracy of the RTK daily open and close data was verified before being considered final. Following the field program, the RTK data were inspected for quality and points with poor positional data were removed from the data. Poor positional data are defined as those where a RTK lock was not acquired (typically under vegetation cover where the number of satellites available to the RTK rover is decreased). The attribute codes assigned to each RTK survey point were reviewed and standardized for consistency.

The ADP-collected bathymetric and flow velocity data were exported using with the Sontek RiverSurveyorLive software (version 2.50.0.00). The exported data were processed in a spreadsheet application as follows:

- Data were sorted using the UTM easting values and any points with UTM coordinates of zero were removed (<1% of the points had that issue).
- Data were sorted by altitude¹, and values where RTK coverage was lost were removed (these cannot be corrected as the Altitude values drift out of lock when RTK coverage is lost, <1%).
- Data were sorted by combined depth and those points with a zero depth or depths well outside of the possible range were removed (<1%).
- Data were sorted by difference in depth. This column is the difference between the vertical beam (VB) depth and the averaged bottom track (BT) depth². If in shallow water the VB beam occasionally returns an inaccurate value, the BT depth was used.

¹ The Altitude is the elevation value supplied to the ADP from the RTK via a GGA NMEA data string. Golder's Trimble RTK unit returns a value equal to the head of the unit only, no offset can be entered. Therefore an offset must be applied to the data after the field work.

² The ADP unit returns both a VB (vertical beam- single downward viewing beam) and BT (Bottom track – average of 4 slanted velocity beams) depth in its data file. The vertical beam data is the more accurate in all but a few cases. The MATLAB program returns a VB value when both were present and a BT value when no BT values were available. Manual sorting was then required to select cases where the VB data was erroneous and then BT was inserted. This scenario appeared in less than 5 percent of the data points and only in shallow water.



- Data were sorted by mean velocity. The ADP returns a value of zero when it cannot compute a velocity and direction. These values were removed (<5%), and the rest of the point's values were retained.

In total, less than 5% of the collected data were removed during the above-mentioned processes.

All survey data collected were imported into a Geographic Information System (GIS) (Esri ArcMap, version 10.X) to allow for validation and further processing. In addition to the field data QA/QC procedures, the survey data were checked in ArcMap against outliers and through visual inspection of created triangulated irregular network surfaces. Similar steps were undertaken to ensure accurate matches between all datasets collected on different dates and with different survey equipment.

2.1.2 Discharge Measurements

Elbow River below Glenmore Dam and above Weaselhead Natural Area

Daily discharges of the Elbow River in wadeable reaches below Glenmore Dam and above Weaselhead Natural Area were measured using the handheld Sontek Flowtracker, and processed using Flowtracker software (version 2.20), adhering to WSC protocols (WSC 1999). This measurement method is considered to result in accuracies within $\pm 5\%$ of actual flow.

Bow River, Glenmore Reservoir, and Elbow River within Weaselhead Natural Area

Discharge measurements in the Bow River, within Glenmore Reservoir, and in the Elbow River within Weaselhead Natural Area were taken using the Sontek M9 ADP. The crew adhered to WSC protocols for ADP flow measurement, resulting in accuracies within $\pm 5\%$ of actual flow.

Discharge Data Processing and Quality Control

The measured flows were compared to the available WSC gauging data at the Elbow River below Glenmore Dam (WSC 05BJ001) and Bow River at Calgary (WSC 05BH004) stations (Tables 3 to 6). The 2015 WSC gauge data for WSC 05BJ001 is preliminary and only mean daily flows were available at the time of the comparison of flow values.

In general, the Bow River flow measurements are in good agreement with the mean daily gauging data, with the exception of the flow measured near the Inglewood neighbourhood of Calgary on September 12, 2013. On average, Golder's Elbow River flow measurements are 5% lower than WSC-reported values.

Potential reasons for differences between the gauge data and the flow measurements are as follows:

- 2015 gauge data at WSC 05BJ001 has not yet been verified by WSC and may not represent actual flows.
- Gauge data were reported as mean daily data but there may have been hourly variations during each day.
- WSC gauge data for the Bow River reach downstream of the Elbow River only includes the Elbow River inflow data. There are additional inflows from tributaries (i.e., Nose Creek, Pine Creek, Fish Creek, the two wastewater treatment plants within Calgary) and storm water outlets downstream of the gauge, but the data for these inflows were not available.
- Accuracy of flow measurements vary within $\pm 5\%$ accuracy, depending on the flow measurement location.



BOW AND ELBOW RIVER HAZARD STUDY - SURVEY AND BASE DATA COLLECTION REPORT

Flows were measured in Bragg and Lott Creeks each day during the survey using the same protocols used for the Bow and Elbow Rivers. There is no gauge available at Bragg or Lott Creeks for comparison. The measured flows are listed in Table 7, Table 8, and Table 9.

Table 3: Comparison of Elbow River Flows Measured below Glenmore Dam and Mean Daily Flows Recorded at WSC Gauge 05BJ001

Date	Time	Flow at WSC 05BJ001 (Elbow River below Glenmore Dam) [m ³ /s]	Measured Flow During Survey (Elbow River) [m ³ /s]	Difference	
				[m ³ /s]	[%]
9/3/2013	09:40	2.9	2.6	-0.3	-9.1%
9/4/2013	09:05	2.9	2.7	-0.2	-6.6%
9/5/2013	09:12	2.9	2.6	-0.3	-9.4%
9/6/2013	09:00	3.0	3.7	0.7	23.4%
9/8/2013	n.a.	9.2	Flow not measured due to rising water levels caused by a rain event	n.a.	n.a.
9/10/2013	10:25	2.9	2.8	-0.1	-5.3%
9/11/2013	09:11	2.7	2.3	-0.4	-15.7%
9/12/2013	09:07	4.0	2.6	n.a. ^(a)	n.a. ^(a)
Average				-0.1	-3.8%

^(a) Flow started to increase at approximately 11:00 am on September 12, 2013, and reached a maximum of 6.3 m³/s on September 13, 2013. Because the manual flow measurement was completed before the flow increase began, a flow difference was not computed for this day and it was not included in the summary statistics.

Table 4: Comparison of Elbow River Flows Measured above Glenmore Reservoir and Preliminary Mean Daily Flows Recorded at WSC Gauge 05BJ004

Date	Time	Flow at WSC 05BJ004 (Elbow River at Bragg Creek) ^(a) [m ³ /s]	Measured Flow During Survey (Elbow River) [m ³ /s]	Difference	
				[m ³ /s]	[%]
10/15/2015	14:33	n.a.	6.1	n.a.	n.a.
10/16/2015	11:35	n.a.	8.1	n.a.	n.a.
10/19/2015	15:54	n.a.	7.8	n.a.	n.a.
10/20/2015	09:13	n.a.	7.5	n.a.	n.a.
10/21/2015	09:54	n.a.	6.9	n.a.	n.a.
10/22/2015	09:59	n.a.	6.8	n.a.	n.a.
10/26/2015	09:24	n.a.	6.0	n.a.	n.a.
10/27/2015	13:48	n.a.	6.4	n.a.	n.a.
10/28/2015	13:48	n.a.	6.5	n.a.	n.a.
10/29/2015	13:43	n.a.	4.7	n.a.	n.a.
11/3/2015	17:17	n.a.	5.9	n.a.	n.a.
11/5/2015	13:37	n.a.	6.1	n.a.	n.a.
11/6/2015	13:55	n.a.	5.2	n.a.	n.a.
11/7/2015	14:15	n.a.	5.3	n.a.	n.a.
Average				n.a.	n.a.

^(a) Preliminary flow data were requested from Water Survey of Canada but not yet available to date.



BOW AND ELBOW RIVER HAZARD STUDY - SURVEY AND BASE DATA COLLECTION REPORT

Table 5: Comparison of Bow River Flows Measured upstream of the Elbow River Confluence and Mean Daily Flows Recorded at WSC Gauge 05BH004

Date	Time	Flow at WSC 05BH004 (Bow River at Calgary) [m ³ /s]	Measured Flow During Survey (Bow River upstream of Elbow River) [m ³ /s]	Difference	
				[m ³ /s]	[%]
9/8/2013	12:36	112.0	107.0	-5.0	-5%
9/9/2013	11:45	103.0	94.9	-8.1	-9%
9/10/2013	10:08	113.0	106.0	-7.0	-7%
9/11/2013	09:57	119.0	114.6	-4.4	-4%
10/1/2013	13:04	82.1	94.7	12.6	13%
10/2/2013	10:51	71.6	66.2	-5.4	-8%
10/7/2013	13:53	65.9	57.5	-8.4	-15%
10/8/2013	10:35	63.7	59.6	-4.1	-7%
Average				-3.7	-5%

Table 6: Comparison of Bow River Flows Measured downstream of the Elbow River Confluence and Mean Daily Flows Recorded at WSC Gauges 05BH004 and 05BJ001

Date	Time	Combined Flow from WSC 05BH004 (Bow River at Calgary) and WSC 05BJ001 (Elbow River below Glenmore Dam) [m ³ /s]	Measured Flow During Survey (Bow River downstream of Elbow River) [m ³ /s]	Difference	
				[m ³ /s]	[%]
9/12/2013	14:28	128.0	92.4	-35.6	-39% ^(a)
9/13/2013	10:20	130.3	114.6	-15.7	-14%
9/14/2013	12:34	146.0	130.8	-15.2	-12%
9/17/2013	12:44	129.3	122.1	-7.2	-6%
9/19/2013	13:46	135.4	129.7	-5.7	-4%
9/21/2013	12:18	125.8	121.0	-4.8	-4%
9/23/2013	13:50	96.4	94.4	-2.0	-2%
9/24/2013	12:17	94.9	87.7	-7.2	-8%
9/26/2013	16:06	97.3	92.6	-4.6	-5%
9/27/2013	13:56	97.6	94.1	-3.5	-4%
9/30/2013	15:00	94.8	93.6	-1.3	-1%
10/9/2013	13:37	73.6	76.4	2.8	4%
10/18/2013	12:51	75.5	82.3	6.8	8%
10/30/2013	16:02	60.0	65.9	5.9	9%
10/7/2015	18:13	n.a. ^(b)	95.2	n.a.	n.a.
10/8/2015	15:01	n.a. ^(b)	n.a. ^(c)	n.a.	n.a.
Average				-4.0	3%

^(a) This outlier was excluded from the statistical average calculation.

^(b) Preliminary flow data were requested from Water Survey of Canada but not yet available to date.

^(c) No satisfactory flow measurement was obtained.



Table 7: Lott Creek Flows Measured at Misty Morning Drive

Date	Time	Measured Flow During Survey [m ³ /s]
6/1/2016	16:12	0.08
6/2/2016	09:24	0.06

Table 8: Lott Creek Flows Measured at Allen's Trout Farm

Date	Time	Measured Flow During Survey [m ³ /s]
6/24/2016	07:38	0.24

Table 9: Bragg Creek Flows Measured 100 m upstream of Bracken Road Bridge

Date	Time	Measured Flow During Survey [m ³ /s]
08/07/2016	10:23	0.065

2.2 Cross Sections

The total length of the Bow River study reach is approximately 72 km. A total number of 721 cross sections were surveyed in either 2013 (Golder 2015a) or 2015, including 533 cross sections in the channel main stem and 188 cross sections in the side channels.

The river channels in the immediate vicinity of the Western Headworks Weir and Harvie Passage were unsafe to survey, and either design drawing or as-built survey information was used to define bathymetry in these areas.

Select reaches of the Bow River were surveyed using relatively dense cross-sectional spacing to allow for supplementary two-dimensional hydraulic modelling if required. The reaches of the Bow River surveyed using the small cross-sectional spacing are listed below:

- the reach adjacent to Bowness Park (Stoney Trail Bridge to the downstream end of Bowness Park);
- the reach adjacent to Shouldice Park (Bowmount Park to Shouldice Park);
- the reach through Downtown Calgary (Crowchild Trail Bridge to the Western Headworks Weir);
- the reach from Harvie Passage to Ogden Road; and
- an approximately 1.2 km long reach below the Glenmore Trail Bridge.

The total length of the Elbow River study reach is approximately 65 km. A total of 748 cross sections were surveyed in either 2013 (Golder 2015a) or 2015. The cross-sectional spacing varies throughout the study reach.

The length of the Lott Creek study reach is approximately 7 km. A total of 109 cross sections were surveyed in 2016. The cross section spacing is on average 63 m.

The length of the Bragg Creek study reach is approximately 1 km. A total of 14 cross sections were surveyed in 2016. The cross section spacing is on average 84 m.



BOW AND ELBOW RIVER HAZARD STUDY - SURVEY AND BASE DATA COLLECTION REPORT

A summary of the surveyed river cross sections is provided in Table 10. The surveyed main channel thalwegs are provided in Appendix A. An overview of the surveyed cross sections is provided in Appendix B.

Table 10: Surveyed Cross Sections within the Study Area

River	Reach Description	Number of Cross Sections	Average Spacing of Cross Sections [m]	Year of Survey
Bow River	Bearspaw Dam to southeast Calgary city limit	451	120	2013
	Southeast Calgary city limit to Highwood River confluence	75	240	2013 & 2015
	Downstream of Highwood River confluence	7	290	2015
	Bowness Park Side Channel	27	82	2013
	Bowness Island Side Channel	5	149	2013
	Prince's Island Side Channel	27	38	2013
	Zoo Island Side Channel	41	43	2013
	Harvie Passage Bypass Channel	6	31	2013
	Inglewood Bird Sanctuary Side Channel	16	40	2013
	Millican Estates Side Channel	16	45	2013
	Heritage Meadows Side Channel	29	48	2013
	Sue Higgins Park Side Channel	4	135	2013
	Deer Run Side Channel	17	160	2013
Elbow River	Upstream of Bragg Creek	26	133	2015
	Bragg Creek to western Tsuut'ina Nation limit	63	52	2015
	Northwest Tsuut'ina Nation, including Redwood Meadows	136	57	2016
	Rocky View County, north of Tsuut'ina Nation	252	97	2015
	Northeast Tsuut'ina Nation, opposite Discovery Ridge	76	131	2016
	Weaselhead Natural Area and Glenmore Reservoir	16	344	2016
	Glenmore Dam to Bow River confluence	387	29	2013
	Mission Side Channel	20	28	2013
Lott Creek	Elbow Valley and Tsuut'ina Nation to Elbow River confluence	109	63	2016
Bragg Creek	Centre Avenue to Elbow River confluence	14	84	2016
Total		1,820	-	

The initial river-wide 2013 survey of cross sections in Calgary was supplemented by further detailed river surveys along the six main river bank repair construction sites at Home Road, Memorial Drive and 19th Street, Memorial Drive at Sunnyside, Inglewood, Enmax at Douglasdale, and Diamond Cove (Golder 2015a).



2.3 Hydraulic Structures

2.3.1 Bridges

There are 44 bridges along the Bow River (Table 11) and 26 bridges along the Elbow River within the study area (Table 12). There are four bridges on Lott Creek (Table 13) and two bridges on Bragg Creek (Table 14) within the study area. The locations of the bridges are shown in the map sheets provided in Appendix B. Summary data sheets were prepared for each bridge, and are provided in Appendix C.

During the 2013 flood, four bridges on the Elbow River downstream of Glenmore Dam were damaged: three pedestrian bridges (Sandy Beach Bridge, Riverdale Avenue Bridge, and Rideau Park Bridge) and Stampede Park South Saddledome Access Bridge. These four bridges were rehabilitated in 2014 (Stampede Park South Saddledome Access Bridge was rebuilt as Weadick Crossing). A new bridge, the Elbow River Traverse, was constructed near the Bow River confluence in 2015.

The bridges within Calgary were first surveyed in 2010 as part of the joint Calgary-AEP Bow and Elbow River Updated Hydraulic Model Project (Golder 2011). Only new bridges and bridges that were replaced since the 2010 survey were surveyed as part of this study.

Four small pedestrian bridges (i.e., timber beam bridges without piers) cross Lott Creek. These bridges are not permanently fixed and are expected to be easily dislocated during a flood event, resulting in no or negligible effects on flood flow hydraulics.

Table 11: Bow River Bridges within the Study Area

No.	River	River Station [m]	Name	Description	Type
1	Bow River	65,773	Stoney Trail Bridge		5-Span
2	Bow River	64,207	85 th Street NW Bridge		4-Span
3	Bow River	63,565	Bowmont Bridge	Pedestrian bridge, includes bridge over side channel	2-Span
4	Bow River	63,474	CP Rail Twin Bridges	Includes bridge over side channel	Clear-Span
5	Bow River	59,604	Hextall Bridge	Pedestrian bridge upstream of Bowness Road	3-Span
6	Bow River	59,583	Shouldice Bridge	Bowness Road	3-Span
7	Bow River	59,182	Trans-Canada Highway Bridge	16 th Avenue NW	5-Span
8	Bow River	56,728	Harry Boothman Bridge	Edworthy Park pedestrian bridge	4-Span
9	Bow River	53,167	Crowchild Trail Bridge		5-Span
10	Bow River	51,706	Mewata Bridge	14 th Street SW	3-Span
11	Bow River	50,929	Louise Bridge	9 th , 10 th Street SW	5-Span



BOW AND ELBOW RIVER HAZARD STUDY - SURVEY AND BASE DATA COLLECTION REPORT

Table 11: Bow River Bridges within the Study Area

No.	River	River Station [m]	Name	Description	Type
12	Bow River	50,814	North West LRT Bridge		4-Span
13	Bow River	50,411	Peace Bridge	Pedestrian bridge	Clear-Span
14	Bow River	49,625	Prince's Island Bridge	Pedestrian bridge	7-Span, Suspension
15	Bow River	48,932	Centre Street Bridge		4-Span
16	Bow River	48,167	4 th Avenue Flyover Bridge		4-Span
17	Bow River	48,132	Old Langevin Bridge	4 th Street NE	2-Span
18	Bow River	48,023	New Langevin (Edmonton Trail) Bridge	Edmonton Trail	6-Span
19	Bow River	47,988	Harry Kroeger Bridge	LRT bridge	5-Span
20	Bow River	47,705	St. Patrick's Island Pedestrian Bridge	Pedestrian bridge	Clear-Span
21	Bow River	46,540	St. George's Island Bridge	12 th Street SE	6-Span
22	Bow River	45,573	CP Rail Bridge	Rail bridge near Nose Creek confluence	5-Span
23	Bow River	44,288	Cushing Bridge	Blackfoot Trail, 17 th Avenue SE bridge	3-Span
24	Bow River	41,011	CN Rail Bridge (Bonnybrook)	Rail bridge	3-Span
25	Bow River	40,949	CP Rail Bridge (Bonnybrook)	Rail bridge	5-Span
26	Bow River	40,815	Bonnybrook Bridge	Ogden Road	5-Span
27	Bow River	40,141	Calf Robe Bridge	Deerfoot Trail	5-Span
28	Bow River	39,626	CN Rail Bridge	Rail bridge	6-Span
29	Bow River	37,158	Graves Bridge (Upstream)	Glenmore Trail	6-Span
30	Bow River	37,138	Graves Bridge (Downstream)	Glenmore Trail	6-Span
31	Bow River	34,433	Eric Harvie Bridge	Pedestrian bridge	3-Span
32	Bow River	32,424	Ivor Strong Bridge	Deerfoot Trail near Douglasdale	5-Span
33	Bow River	30,868	Sue Higgins Bridge	Pedestrian bridge	5-Span, Suspension
34	Bow River	26,388	McKenzie Bridge	Pedestrian bridge	5-Span



BOW AND ELBOW RIVER HAZARD STUDY - SURVEY AND BASE DATA COLLECTION REPORT

Table 11: Bow River Bridges within the Study Area

No.	River	River Station [m]	Name	Description	Type
35	Bow River	23,614	Marquis of Lorne Bridge (Upstream)	Highway 22X	5-Span
36	Bow River	23,573	Marquis of Lorne Bridge (Downstream)	Highway 22X	6-Span
37	Bow River	18,031	Dunbow Road Bridge (Upstream)	Highway 2, Deerfoot Extension	4-Span
38	Bow River	17,998	Dunbow Road Bridge (Downstream)	Highway 2, Deerfoot Extension	4-Span
39	Prince's Island Side Channel	476	Jaipur Bridge	Prince's Island pedestrian bridge	3-Span
40	Prince's Island Side Channel	308	Prince's Island Bridge on Side Channel	Downstream of Prince's Island Lagoon Weirs	Clear-Span
41	Zoo Side Channel	1,868	St. Patrick's Island Pedestrian Bridge on Zoo Side Channel		Clear-Span
42	Zoo Side Channel	1,119	Baines Bridge	Zoo Road NE, 12 th Street NE	3-Span
44	Zoo Side Channel	434	Zoo Service Bridge	Zoo side channel	3-Span

DRAFT



BOW AND ELBOW RIVER HAZARD STUDY - SURVEY AND BASE DATA COLLECTION REPORT

Table 12: Elbow River Bridges within the Study Area

No.	River	River Station [m]	Name	Description	Type
1	Elbow River	59,132	Balsam Avenue Bridge	In Bragg Creek	2-Span
2	Elbow River	46,778	Highway 22 Bridge	Between Bragg Creek and Cochrane	2-Span
3	Elbow River	27,842	Highway 8 Bridge		3-Span
4	Elbow River	19,086	Grey Eagle Drive Bridge	Tsuut'ina Nation	3-Span
5	Elbow River	16,815	Weaselhead Glenmore Pathway	Pedestrian bridge	3-Span
6	Elbow River	12,054	Glenmore Trail Bridge		3-Span
7	Elbow River	8,851	Sandy Beach Bridge	Pedestrian bridge	Clear-Span, Suspension
8	Elbow River	7,601	Riverdale Avenue Bridge	Pedestrian bridge	Clear-Span, Suspension
9	Elbow River	7,206	Elboya Bridge	Elbow Drive bridge	3-Span
10	Elbow River	5,506	Rideau Park Bridge	32 nd Avenue pedestrian bridge	Clear-Span, Suspension
11	Elbow River	4,783	Mission Bridge	Mission Road, 4 th Street SW	4-Span
12	Elbow River	4,043	25 th Avenue SW Bridge		4-Span
13	Elbow River	3,483	Lindsay Park Bridge	21 st Avenue SW pedestrian bridge	Clear-Span
14	Elbow River	3,243	Lindsay Park CN Rail Bridge	19 th Avenue SW, near St. Mary's High School	3-Span
15	Elbow River	2,954	Pattison Bridge	McLeod Trail South	2-Span
16	Elbow River	2,720	Victoria Bridge	McLeod Trail North	3-Span
17	Elbow River	2,677	LRT Bridge		3-Span
18	Elbow River	2,455	Stampede Park Access Bridge	3 rd Street SE	3-Span
19	Elbow River	1,902	Horse Barn Bridge (New)		Clear-Span, Suspension
20	Elbow River	1,855	Horse Barn Bridge (Old)		3-Span
21	Elbow River	1,244	Weadick Crossing	Stampede Park South Saddledome Access Bridge	Clear-Span
22	Elbow River	991	Stampede Park North Saddledome Access Bridge	Saddledome Access Bridge	2-Span
23	Elbow River	576	MacDonald Bridge	MacDonald Avenue	Clear-Span
24	Elbow River	334	CP Rail Bridge	9 th Avenue SE, rail bridge	2-Span
25	Elbow River	287	9 th Avenue SE Bridge	Inglewood	Clear-Span
26	Elbow River	165	Elbow River Traverse	Near Elbow River confluence	Clear-Span



Table 13: Lott Creek Bridges within the Study Area

No.	River	River Station [m]	Name	Description	Type
1	Lott Creek	7,000	Small Pedestrian Bridge 1	Small timber beam bridge with no piers or abutments	Clear-Span
2	Lott Creek	6,824	Small Pedestrian Bridge 2	Small timber beam bridge with no piers or abutments	Clear-Span
3	Lott Creek	6,045	Small Pedestrian Bridge 3	Small timber beam bridge with no piers or abutments	Clear-Span
4	Lott Creek	4,878	Small Pedestrian Bridge 4	Small timber beam bridge with no piers or abutments	Clear-Span
5	Lott Creek	4,093	Fisherman's Lake Pedestrian Bridge	Between Owl Haven and Coulee Ridge	Clear-Span
6	Lott Creek	3,530	Golf Course Bridge 1	Elbow Springs Golf Club	Clear-Span
7	Lott Creek	3,431	Golf Course Bridge 2	Elbow Springs Golf Club	Clear-Span
8	Lott Creek	3,390	Golf Course Bridge 3	Elbow Springs Golf Club	Clear-Span
9	Lott Creek Lakes	395	Fisherman's Lake Inlet Pedestrian Bridge	At Inlet of Fisherman's Lake	

Table 14: Bragg Creek Bridges within the Study Area

No.	River	River Station [m]	Name	Description	Type
1	Bragg Creek	1,065	Centre Avenue Bridge	In Bragg Creek	Clear-Span
2	Bragg Creek	117	Bracken Road Bridge	In Bragg Creek	Clear-Span

2.3.2 Culverts

There is one culvert on the Elbow River (Table 15) and seven culverts on Lott Creek within the study area (Table 16). The locations of the culverts are included in the map sheets in Appendix B, and culvert summary sheets are provided in Appendix C.

Table 15: Elbow River Culverts within the Study Area

No.	River	River Station [m]	Name	Description
1	Elbow River	27,842	Highway 8 Culvert	Conveys flows of small, unnamed tributary creek during normal flow and Elbow River flows during flood conditions



Table 16: Lott Creek Culverts within the Study Area

No.	River	River Station [m]	Name	Description
1	Lott Creek	5,239	Misty Morning Drive Culvert	Lott Creek Drive and Misty Morning Drive
2	Lott Creek	5,015	Elbow Valley Lake Culvert	Between Lott Creek Hollow and Misty Morning Drive
3	Lott Creek	4,581	Lott Creek Hollow Culvert	Lott Creek Drive and Lott Creek Hollow
4	Lott Creek	4,482	Wolfwillow Lane Culvert	Lott Creek Drive and Wolfwillow Lane
5	Lott Creek	4,273	Coulee Ridge Culvert	Lott Creek Drive and Coulee Ridge
6	Lott Creek	3,933	Owl Haven Culvert	North of Lott Creek Drive and Owl Haven
7	Lott Creek	3,860	Lott Creek Drive Bridge	Lott Creek Drive near Crooked Pond Green
8	Lott Creek Lakes	605	Elbow Valley Lake Outlet Culvert	North of Fisherman's Bend

2.3.3 Weirs and Dams

There are three weir or dam structures within the study reaches of the Bow and Elbow Rivers and one weir at the Lott Creek Lakes (Table 17). The locations of the weirs and dams are included in the map sheets in Appendix B.

Table 17: Weirs and Dams within the Study Area

No.	River	River Station [m]	Name	Description
1	Prince's Island Side Channel	362	Prince's Lagoon Weirs	Two Obermeyer gates
2	Bow River	45,212	Western Headworks Weir	Includes the weir and Harvie Passage
3	Elbow River	11,417	Glenmore Dam	Dam for water supply reservoir
4	Lott Creek Lakes	49	Fisherman's Lake Weir	Weir at outlet of Fisherman's Lake

The weir at the downstream end of Prince's Island Lagoon (Prince's Island side channel of the Bow River) is comprised of two Obermeyer Gates, each with 5.5 m widths.

The Western Headworks Weir is located on the Bow River downstream of the Nose Creek confluence. The structure was initially built in 1974 to divert water to the Western Irrigation District. It includes three sluice gates at the north bank of the Bow River. The weir has a crest elevation of 1034.57 m and a width of about 150 m.

Harvie Passage was constructed immediately downstream of the Western Headworks Weir in 2012. Harvie Passage was damaged during the June 2013 flood event, but it is being rebuilt to near pre-flood specifications.

Glenmore Dam impounds the primary-purposed water supply Glenmore Reservoir, which has limited operational capacity to provide Elbow River flood control. The dam was constructed in 1932. The dam structure itself was not surveyed in this study, but relevant data were obtained from the City of Calgary.



Summary sheets for the weirs and dams are provided in Appendix C.

2.3.4 Other Features

At the upstream end of the Prince’s Island side channel in Calgary there is a hydraulic structure comprised of a causeway and three box culverts (Prince’s Island Causeway, see Table 18). The causeway consists of an earth embankment with a top elevation that decreases from south to north, with a minimum elevation of 1045.50 m. The box culverts have a width of 2.40 m and a height of 1.20 m each. The inlet invert of the culverts is 1042.00 m. Both the upstream and downstream side slopes are protected with riprap and concrete.

The causeway was overtopped and damaged during the 2013 flood. It was rehabilitated after the flood. A summary sheet was prepared for this feature (Appendix C).

There is a drop-inlet structure and culvert to divert high Lott Creek flows into the artificial lakes in the Elbow Valley Residents Club and manage water levels in these lakes.

Table 18: Other Features within the Study Area

No.	River	River Station [m]	Name	Description
1	Bow River (Prince’s Island Side Channel)	949	Prince’s Island Causeway	Causeway with three box culverts
2	Lott Creek Lakes	1,027	Elbow Valley Lake Drop-Inlet Structure and culvert	Lott Creek Drive by Elbow Valley Lake

2.4 Flood Control Structures

At the time of survey program, 14 permanent flood control structures were present along the Bow River and six along the Elbow River (Table 19). The existence and ownership or maintenance responsibility status of each structure was confirmed through consultation with AEP and local authorities. Flood control structures locations are included in the map sheets in Appendix B, and summary data sheets are included in Appendix D.

Most of the flood control structures within the study area are earthfill barriers (i.e., berms) that are integrated into the City of Calgary transportation or pathway system, including sections of roadway that formally serve as flood barriers. However, the Calgary flood control structures also include engineered floodwalls at Stampede Park and Inglewood, as well as a floodwall along Deanne House at the Elbow River confluence.

The Erlton Flood Control Weir is a lateral hydraulic structure located on the right bank of the Elbow River near Erlton at 22nd Avenue SW, The weir was designed to divert excess flow from the Elbow River along 22nd Avenue SW during high flow events. The weir has a crest elevation of 1048.00 m and a width of about 30 m.

Three permanent flood control structures were identified on the Elbow River upstream of Calgary, all earthfill barriers (i.e., berms): two at Redwood Meadows within Tsuut’ina Nation, and one at Bragg Creek.



BOW AND ELBOW RIVER HAZARD STUDY - SURVEY AND BASE DATA COLLECTION REPORT

Table 19: Flood Control Structures within the Study Area

River	No.	Side of River ^(a)	Length [m]	Name	Description	Type	Survey Date
Bow River	1	Left	384	Montgomery Berm	Montgomery Boulevard, Bow View Manor Nursing Home	Earthfill Barrier	11/24/2015
	2	Left	929	West Hillhurst Berm	20 th Street NW to 14 th Street NW	Earthfill Barrier	11/28/2015
	3	Left	590	Kensington Berm	14 th Street NW to Poppy Plaza	Earthfill Barrier	11/28/2015
	4	Left	1,950	Sunnyside Berm	Poppy Plaza to Centre Street	Earthfill Barrier	11/27/2015 to 11/28/2015
	5	Left	462	Memorial Drive Berm	Memorial Drive downstream of Centre Street Bridge	Earthfill Barrier	11/27/2015
	6	Left	236	Langevin Bridge Berm	Memorial Drive at 4 th Avenue Flyover Bridge	Earthfill Barrier	11/27/2015
	7	Left	1,786	Riverwalk Berm	Centre Street Bridge to Elbow River	Pathway	11/27/2015
	8	Right	1,240	Bridgeland Berm	New Langevin Bridge to 12 th Street NE	Earthfill Barrier	11/27/2015 to 11/28/2015
	9	Right	835	West Inglewood Berm	Elbow River to 13 th Street SE	Earthfill Barrier	11/27/2015
	10	Right	460	Inglewood Flood Barrier	13 th Street SE to 15 th Street SE	Concrete Wall	11/27/2015
	11	Right	385	Pearce Estate Park Berm	Pearce Estate Park	Pathway on Top of Earthfill Barrier	10/20/2016
	12	Right	465	South Inglewood Berm	End of 8 th Avenue SE	Pathway on top of Riprap Embankment	11/24/2015
	13	Right	372	Glenmore Trail Berm	Along the La Farge access road	Earthfill Barrier	11/24/2015
	14	Left	977	Quarry Park Berm	Elevated ground along new development at Quarry Park	Earthfill Barrier	11/24/2015
Elbow River	15	Left	380	Bracken Road Berm	Along Bracken Road	Earthfill Barrier	11/23/2016
	16	Right	1,139	Redwood Meadows Golf & Country Club Berm	Intermittent barrier that partly ties into higher ground on the upstream end of the barrier	Earthfill Barrier	7/11/2016
	17	Right	3,050	Redwood Meadows Berm	Covers the full length along the Redwood Meadows community	Earthfill Barrier	7/11/2016
	18	Right	77	Erlton Flood Control Weir	Buried weir to control flood flows into 22 nd Avenue SW	Reinforced Below Grade Weir	11/24/2015
	19	Left	676	Stampede Floodwall	Along the south end of Stampede race track	Earthfill Barrier and Concrete Wall	11/24/2015
	20	Right	188	Deane House Flood Barrier	From 9 th Avenue SE to the Bow and Elbow River confluence	Earthfill Barrier and Concrete Wall	11/27/2015

^(a) Right and left side of the river are relative to an observer looking downstream.



2.5 Accuracy

As per current study and FHIP specifications, topographic and infrastructure survey data collected using ground-based technologies (i.e., RTK GPS and total stations) must have an absolute positional accuracy of ± 0.05 m, at 95% confidence. Final accuracy of bathymetric data collected using a combination of ground and acoustic-based technologies (i.e. ADP) must be accurate to ± 0.15 m, but it is expected that much of the final data may maintain the ± 0.05 m accuracy obtained from ground-based technologies.

The survey accuracy for all topographic points collected using the RTK GPS system with either the Can-net Virtual Reference Station (VRS) System or using a base station, is considered to be within ± 0.02 m in horizontal and vertical direction. The RTK unit was calibrated daily to an ASCM benchmark. The daily survey was opened and closed on a common point (preferably the ASCM used to calibrate) to maintain a ± 0.02 m level of accuracy.

The bridge surveys were conducted using a reflectorless total station that was set up over a temporary benchmark that was established using RTK GPS. The temporary benchmark setup and total station accuracy combined result in a slightly greater than ± 0.02 m but less than ± 0.05 m accuracy. The exact accuracy for each point varies subject to the distance between the target and the total station.

The river survey conducted using an ADP and RTK combination using a boat resulted in bathymetric survey data with an overall accuracy less than the RTK alone due to the following:

- While the RTK signal accuracy is considered to be within ± 0.02 m in horizontal and vertical direction, the constant movement of the boat on the water surface creates roll, pitch and yaw rotation that influences the angle of the ADP beam. Depending on the water depth and the angle deviation from vertical, the accuracy can be reduced by a few centimetres.
- Bow and Elbow River bed material sizes typically ranged from gravels to cobbles. In comparison to finer bed materials like sand, the ADP will return a depth-averaged signal when reflected on these coarse bed materials, such that smaller variations in the river bed may not be fully captured.

Overall, the bathymetric survey data collected using a boat and a RTK/ADP combination is considered to have a final accuracy within ± 0.10 m in the horizontal and vertical directions.

2.6 LiDAR-derived DTM

As per current study and FHIP specifications, a digital terrain model (DTM) used to describe floodplain topography has a ± 0.15 m minimum vertical accuracy requirement, at 95% confidence.

Within Calgary, a LiDAR-derived DTM exceeding current study and FHIP specifications was provided by the City of Calgary (Calgary 2016). The LiDAR data was first acquired from September 28, 2012, to June 14, 2013, and updated along the Bow and Elbow Rivers from September 09, 2013, to October 07, 2013. Select areas with elevation changes were re-acquired in May 2015. A one-mile buffer outside of Calgary city limits was captured September 28 to October 19, 2015. The DTM was provided in a 0.20 m resolution raster format, and processed by Golder into a 0.50 m resolution for some uses. The vertical accuracy of the DTM is approximately ± 0.05 m, at 95% confidence, and the horizontal accuracy is approximately ± 0.10 m on hard surfaces.



A LiDAR-derived DTM was provided by AEP for the study area outside Calgary. The LiDAR data was acquired by Airborne Imaging (Airborne) in October 2015 and processed into a raster DTM with a resolution of 0.50 m (Airborne 2016a,b,c). An independent ground truth survey was completed by All-Can Engineering & Surveys (All-Can) to confirm that the DTM met current study and FHIP specifications (All-Can 2016). No anomalies were found and the accuracy of the DTM was determined to be within ± 0.15 m, at 95% confidence.

As part of the study, Golder performed an additional quality check on the newly-acquired DTM for the study area outside Calgary. Ground control points were surveyed by Golder at least every kilometre and within a distance of less than 100 m from the river. These ground control points were used as an additional quality check for the LiDAR-derived DTM provided by AEP. The differences between the ground control points and the LiDAR-derived DTM are summarized in Table 20. The supplementary quality check confirmed that the vertical accuracy of the newly-acquired DTM is better than ± 0.15 m at all surveyed control points. A complete list of the control points and the elevation difference to the DTM is provided in Appendix E.

Table 20: Summary of Elevation Differences between Surveyed Control Points and LiDAR DTM

River	Reach	Number of Control Points	Average Difference between Ground Survey and LiDAR (m)	Mean Absolute Difference Between Ground Survey and LiDAR (m)	Maximum Positive Difference Between Ground Survey and LiDAR (m)	Maximum Negative Difference Between Ground Survey and LiDAR (m)
Elbow River ^(a)	Bragg Creek to Glenmore Reservoir	86	0.02	0.05	0.12	-0.15
Bow River	Calgary City Limit to Downstream Study Area Boundary	29	0.03	0.06	0.13	-0.07
Bragg Creek	Full Study Area	2	0.06	0.06	0.07	0.05
Lott Creek	Full Study Area	8	0.01	0.05	0.09	-0.06

^(a) The area between the upstream end of Glenmore Reservoir and the Weaselhead Pedestrian Bridge was inundated during the LiDAR data acquisition in the fall of 2015 due to seasonally high reservoir levels. The ground control points collected in this area in the spring of 2016 were under water during the LiDAR survey and excluded from this quality check.

3.0 AERIAL IMAGERY

Aerial imagery for the entire study area was collected by GeodesyGroup Inc. (GeodesyGroup) on May 6, 2016. The imagery has a 0.30 m Ground Sampling Distance (GSD) resolution and was delivered as 4-band orthophotos and stereo images, as per current study specifications (Golder 2016). The deliverables include aerial triangulation data, metadata, camera calibration reports, flight report, and an index of the aerial imagery tiles. A technical memorandum describing the aerial imagery acquisition is provided in Appendix F.



4.0 OTHER BASE DATA

Additional base data acquired or collected in this study includes the following:

- LiDAR data provided by AEP and the City of Calgary;
- Design drawings and as-built survey data or drawings provided by the City of Calgary, the Elbow Valley Residents Club, and Alberta Transportation for bridges, flood control structures, and other infrastructure; and
- GIS data provided by the Government of Alberta, Rocky View County, and the City of Calgary, including administrative, cadastral, transportation, water resources, land use, and building footprint data.

5.0 CONCLUSIONS

The river survey and base data required to support the Bow and Elbow River Hazard Study were collected in accordance with AEP requirements. The following conclusions are made by Golder:

- **River Cross Section Survey**
The river survey data collected for this study in 2015 and 2016, combined with survey data from previous studies collected in 2010 and 2015, comprise a topographic and bathymetric survey dataset that meets current study and FHIP specifications, and is sufficient for hydraulic modelling.
- **Hydraulic and Flood Control Structure Survey**
The hydraulic and flood control structure survey data collected for this study in 2015 and 2016, combined with survey data from previous studies collected in 2010 and 2015, comprise a survey dataset that meets current study and FHIP specifications, and is sufficient for hydraulic modelling.
- **Digital Terrain Model**
The digital terrain models provided by AEP and the City of Calgary meet current study and FHIP specifications, and are sufficient for hydraulic modelling and mapping.
- **Aerial Imagery**
The aerial imagery procured by Golder in May 2016 meets current study and FHIP specifications.



6.0 CLOSURE

This report is prepared and reviewed by the undersigned.

GOLDER ASSOCIATES LTD.

Prepared by:

Reviewed by:

ORIGINAL DOCUMENT SIGNED

ORIGINAL DOCUMENT SIGNED

Wolf Ploeger, Dr.-Ing.
Senior River Specialist, Project Manager

Dejiang Long, Ph.D., P.Eng.
Principal, Project Director

WP/DL/ak

Golder, Golder Associates and the GA globe design are trademarks of Golder Associates Corporation.

\\golder.gds\calgary\active\2015\3 proj\1536673 aep bow and elbow river hazard study\05_ph 1000_survey\reporting\final\1536673_r0001_0_survey_report_20170615.docx

DRAFT



THIRD PARTY DISCLAIMER

This report has been prepared by Golder Associates Ltd. (Golder) for the benefit of the client to whom it is addressed. The information and data contained herein represent Golder's best professional judgment in light of the knowledge and information available to Golder at the time of preparation. Except as required by law, this report and the information and data contained herein are to be treated as confidential and may be used and relied upon only by the client, its officers and employees. Golder denies any liability whatsoever to other parties who may obtain access to this report for any injury, loss or damage suffered by such parties arising from their use of, or reliance upon, this report or any of its contents without the express written consent of Golder and the client.

DRAFT



7.0 REFERENCES

- Airborne Imaging Inc. (Airborne). 2016a. *QC Report – 13215_BowPeace 2015*. March 24, 2016
- Airborne. 2016b. *Data Processing QA/QC Report – 13215_BowPeace*. March 24, 2016
- Airborne. 2016c. *DTM Creation Report – 13215_BowPeace 2015*. March 24, 2016
- All-Can Engineering & Surveys Ltd. 2016. *LiDAR Verification Report and Certification of Bow, Elbow, Peace and Sheep Rivers*. March 23, 2016
- Golder Associates Ltd. (Golder). 2011. *Bow and Elbow River Updated Hydraulic Model Project – Survey Data Collection and DEM Creation*. Prepared for the City of Calgary. December 2011
- Golder. 2015a. *Bow and Elbow River Updated Hydraulic Model Project – Survey Data Collection and Digital Elevation Model Creation*. Prepared for the City of Calgary. February 2015
- Golder. 2015b. *Bow and Elbow River – Hydraulic Model and Flood Inundation Mapping Update*. Prepared for the City of Calgary and Alberta Environment and Parks. July 2015.
- Golder. 2016. *Bow and Elbow River Hazard Study: 2016 Aerial Imagery Acquisition Memorandum*. July 2016
- City of Calgary (Calgary). 2016. *Metadata Record, Digital Elevation Model (DEM) from LiDAR, DEM_2012_2013_2015_20cm, DEM_2012_2013_2015_1m, DEM_2012_2013_2015_2m*. April 2016

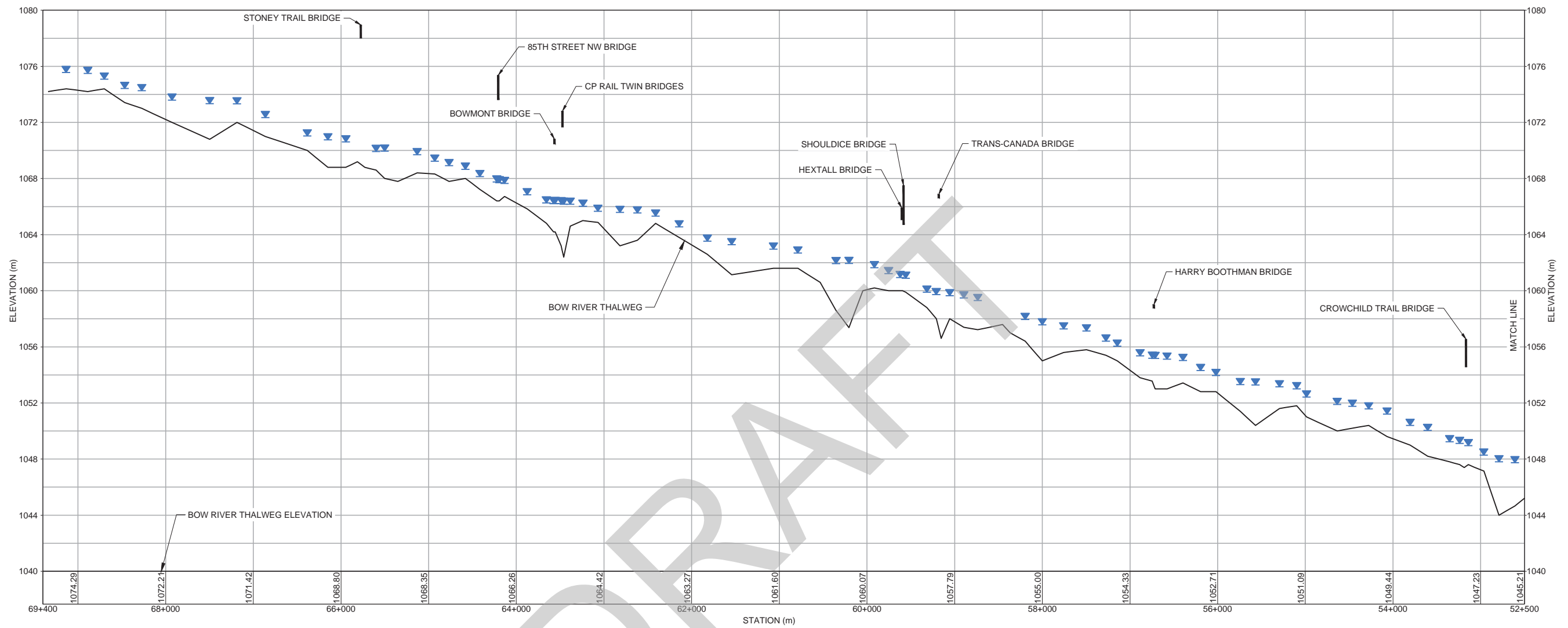
DRAFT



APPENDIX A

Surveyed Thalweg and Water Level Profiles

DRAFT



LEGEND

MEASURED WATER LEVELS DURING SURVEY

REFERENCE

SURVEY DATA COLLECTED BY GOLDER IN SEPTEMBER TO OCTOBER 2015 (UPPER ELBOW RIVER), IN SEPTEMBER TO NOVEMBER (LOWER ELBOW RIVER AND BOW RIVER) AND APRIL 2014 (BOW RIVER).

0 1,000 2,000
 HORIZONTAL SCALE 1:50,000 METRES
 VERTICAL EXAGGERATION = 160X

CLIENT
 ALBERTA ENVIRONMENT AND PARKS

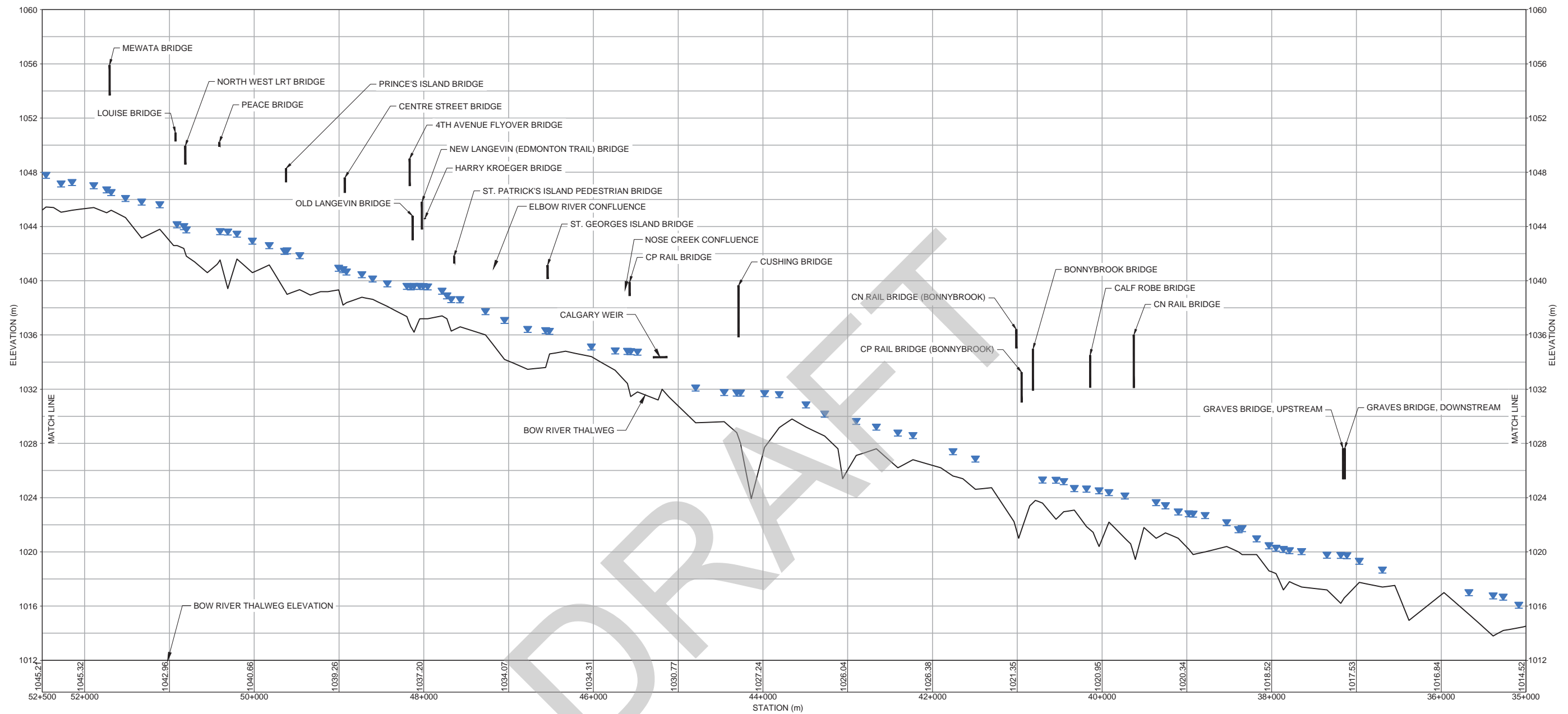
PROJECT
 BOW AND ELBOW RIVER HAZARD STUDY

TITLE
 BOW RIVER THALWEG PROFILE

CONSULTANT	YYYY-MM-DD	2017-06-12
	PREPARED	M. HOUGHAM
	DESIGN	W. PLOEGER
	REVIEW	W. PLOEGER
	APPROVED	D. LONG



PROJECT No. 1536673 CONTROL 1000 Rev. 0 FIGURE A-1



LEGEND
 MEASURED WATER LEVELS DURING SURVEY

REFERENCE
 SURVEY DATA COLLECTED BY GOLDER IN SEPTEMBER TO OCTOBER 2015 (UPPER ELBOW RIVER), IN SEPTEMBER TO NOVEMBER (LOWER ELBOW RIVER AND BOW RIVER) AND APRIL 2014 (BOW RIVER).

0 1,000 2,000
 HORIZONTAL SCALE 1:50,000 METRES
 VERTICAL EXAGGERATION = 160X

CLIENT
 ALBERTA ENVIRONMENT AND PARKS

PROJECT
 BOW AND ELBOW RIVER HAZARD STUDY

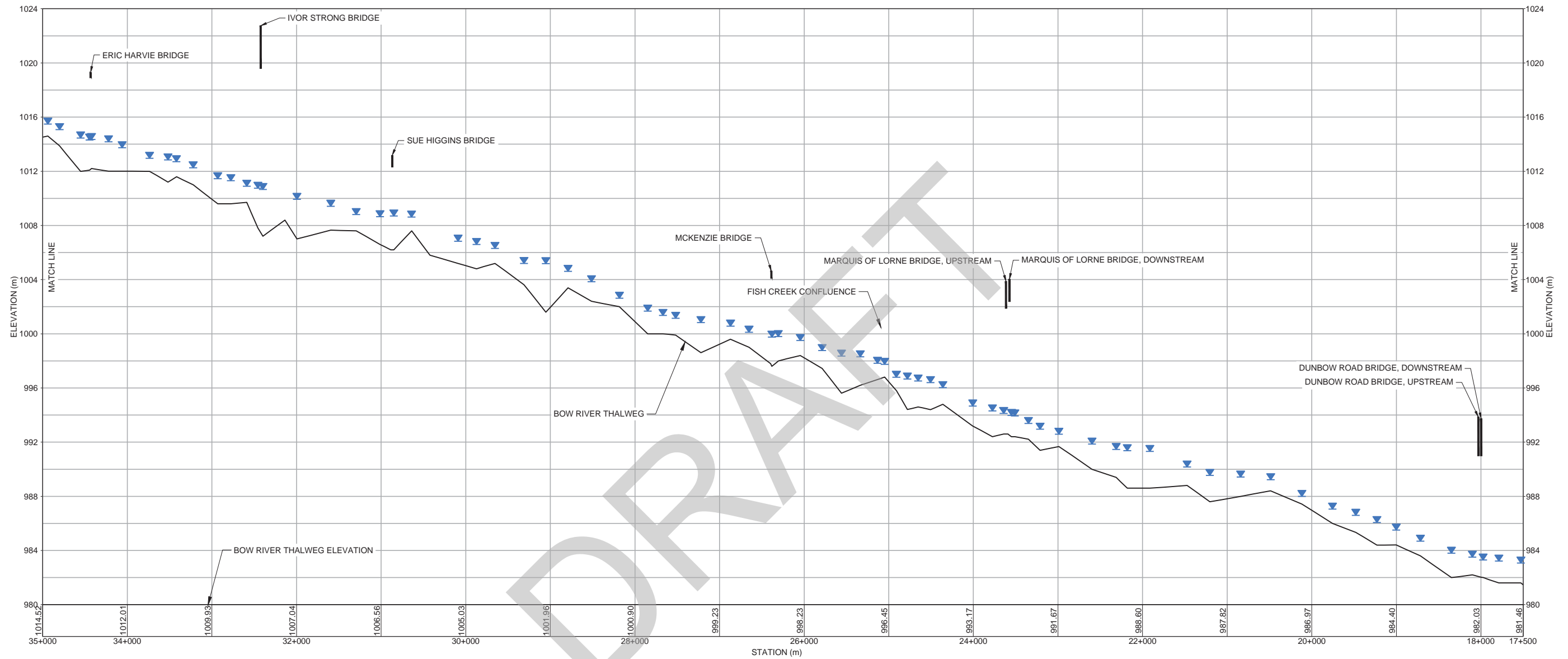
TITLE
 BOW RIVER THALWEG PROFILE

CONSULTANT	YYYY-MM-DD	2017-06-12
	PREPARED	M. HOUGHAM
	DESIGN	W. PLOEGER
	REVIEW	W. PLOEGER
	APPROVED	D. LONG



PROJECT No. 1536673 CONTROL 1000 Rev. 0

FIGURE A-2



LEGEND
 MEASURED WATER LEVELS DURING SURVEY

REFERENCE
 SURVEY DATA COLLECTED BY GOLDER IN SEPTEMBER TO OCTOBER 2015 (UPPER ELBOW RIVER), IN SEPTEMBER TO NOVEMBER (LOWER ELBOW RIVER AND BOW RIVER) AND APRIL 2014 (BOW RIVER).

0 1,000 2,000
 HORIZONTAL SCALE 1:50,000 METRES
 VERTICAL EXAGGERATION = 160X

CLIENT
 ALBERTA ENVIRONMENT AND PARKS

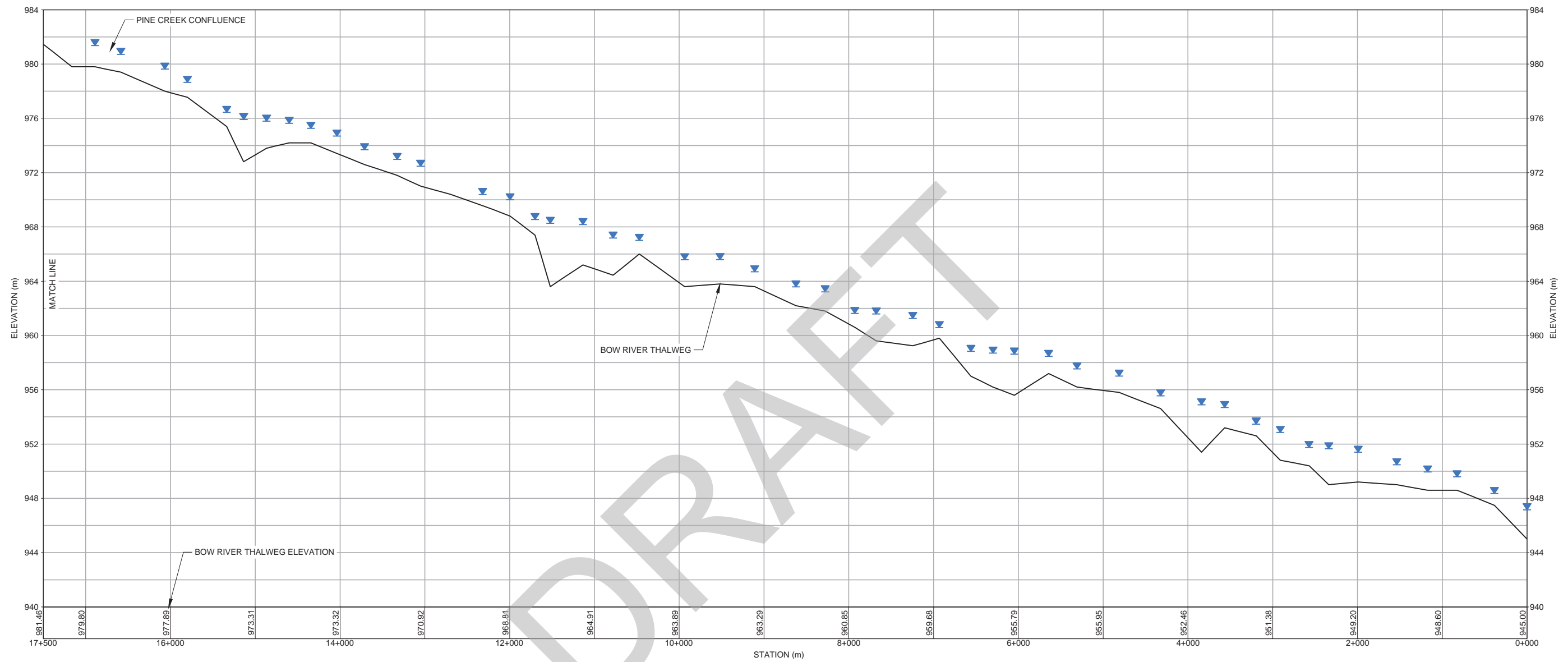
PROJECT
 BOW AND ELBOW RIVER HAZARD STUDY

TITLE
 BOW RIVER THALWEG PROFILE

CONSULTANT	YYYY-MM-DD	2017-06-12
	PREPARED	M. HOUGHAM
	DESIGN	W. PLOEGER
	REVIEW	W. PLOEGER
	APPROVED	D. LONG



PROJECT No. 1536673 CONTROL 1000 Rev. 0 FIGURE A-3



LEGEND

▼ MEASURED WATER LEVELS DURING SURVEY

REFERENCE

SURVEY DATA COLLECTED BY GOLDER IN SEPTEMBER TO OCTOBER 2015 (UPPER ELBOW RIVER), IN SEPTEMBER TO NOVEMBER (LOWER ELBOW RIVER AND BOW RIVER) AND APRIL 2014 (BOW RIVER).

CLIENT
ALBERTA ENVIRONMENT AND PARKS

PROJECT
BOW AND ELBOW RIVER HAZARD STUDY

TITLE
BOW RIVER THALWEG PROFILE

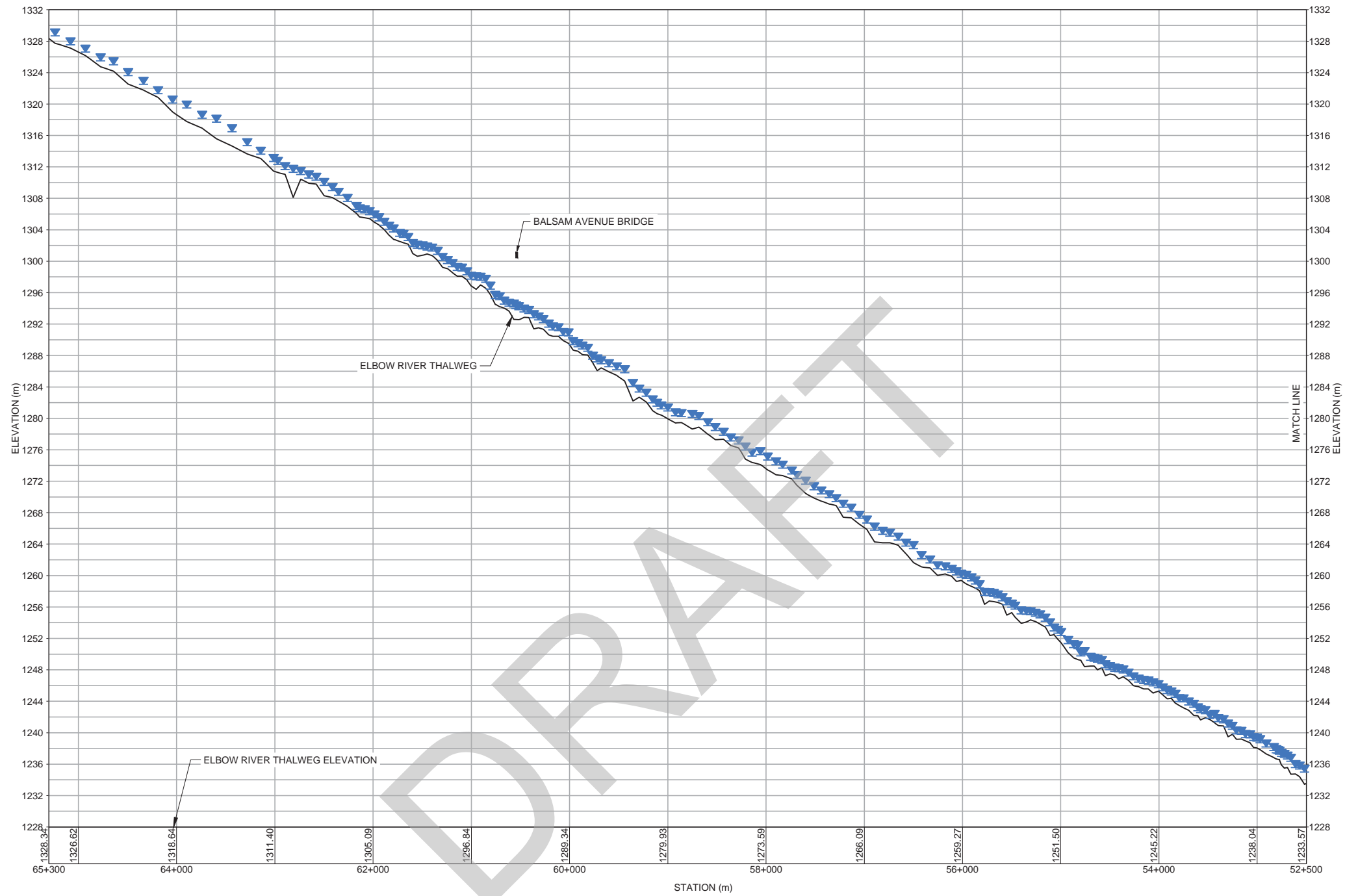
CONSULTANT	YYYY-MM-DD	2017-06-12
PREPARED	M. HOUGHAM	
DESIGN	W. PLOEGER	
REVIEW	W. PLOEGER	
APPROVED	D. LONG	



0 1,000 2,000
HORIZONTAL SCALE 1:50,000 METRES
VERTICAL EXAGGERATION = 160X

PROJECT No. 1536673 CONTROL 1000 Rev. 0 FIGURE A-4

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM A3/B

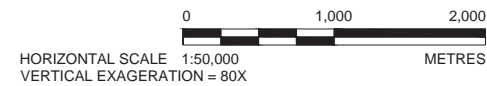


LEGEND

 MEASURED WATER LEVELS DURING SURVEY

REFERENCE


SURVEY DATA COLLECTED BY GOLDER IN SEPTEMBER 2013, OCTOBER 2015, NOVEMBER 2015, MAY 2016, JUNE 2016, AND JULY 2016 FOR THE ELBOW RIVER. SURVEY DATA COLLECTED BY GOLDER IN JUNE 2016 FOR LOTT CREEK. SURVEY DATA COLLECTED BY GOLDER IN JULY 2016 FOR BRAGG CREEK.



CLIENT
ALBERTA ENVIRONMENT AND PARKS

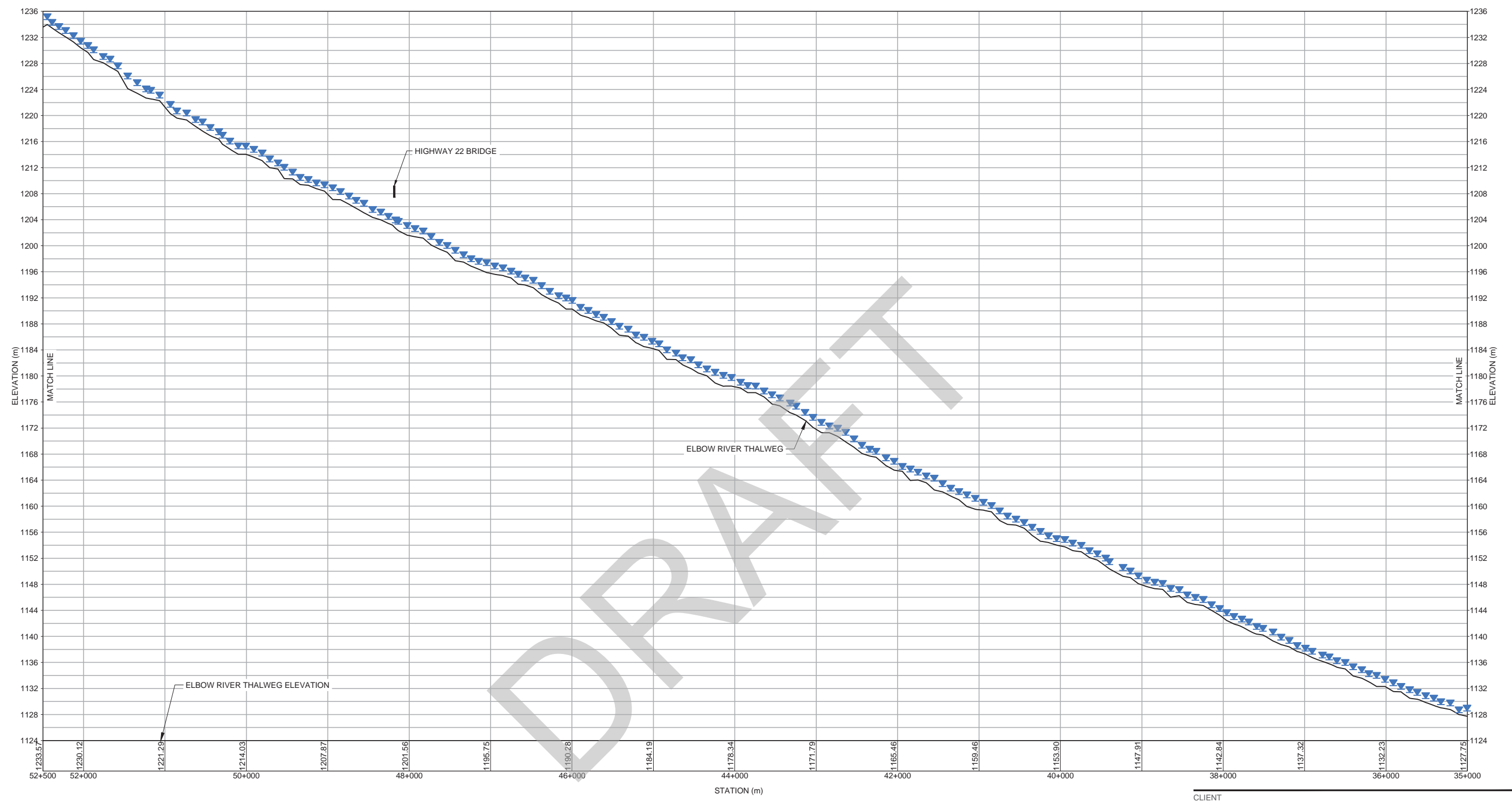
PROJECT
BOW AND ELBOW RIVER HAZARD STUDY

TITLE
ELBOW RIVER PROFILE

CONSULTANT	YYYY-MM-DD	2017-06-12
	PREPARED	M. HOUGHAM
	DESIGN	W. PLOEGER
	REVIEW	W. PLOEGER
	APPROVED	D. LONG

PROJECT No. 1536673 CONTROL 1000 Rev. 0 FIGURE A-5

\\golder\apps\gis\asst\cor\log\2015\1536673\figures\Elbow River, Lott Creek, Bragg Creek | File Name: 1536673 Elbow River.dwg



LEGEND

▼ MEASURED WATER LEVELS DURING SURVEY

REFERENCE
 SURVEY DATA COLLECTED BY GOLDER IN SEPTEMBER 2013, OCTOBER 2015, NOVEMBER 2015, MAY 2016, JUNE 2016, AND JULY 2016 FOR THE ELBOW RIVER. SURVEY DATA COLLECTED BY GOLDER IN JUNE 2016 FOR LOTT CREEK. SURVEY DATA COLLECTED BY GOLDER IN JULY 2016 FOR BRAGG CREEK.

0 1,000 2,000
 METRES
 HORIZONTAL SCALE 1:50,000
 VERTICAL EXAGGERATION = 80X

CLIENT
 ALBERTA ENVIRONMENT AND PARKS

PROJECT
 BOW AND ELBOW RIVER HAZARD STUDY

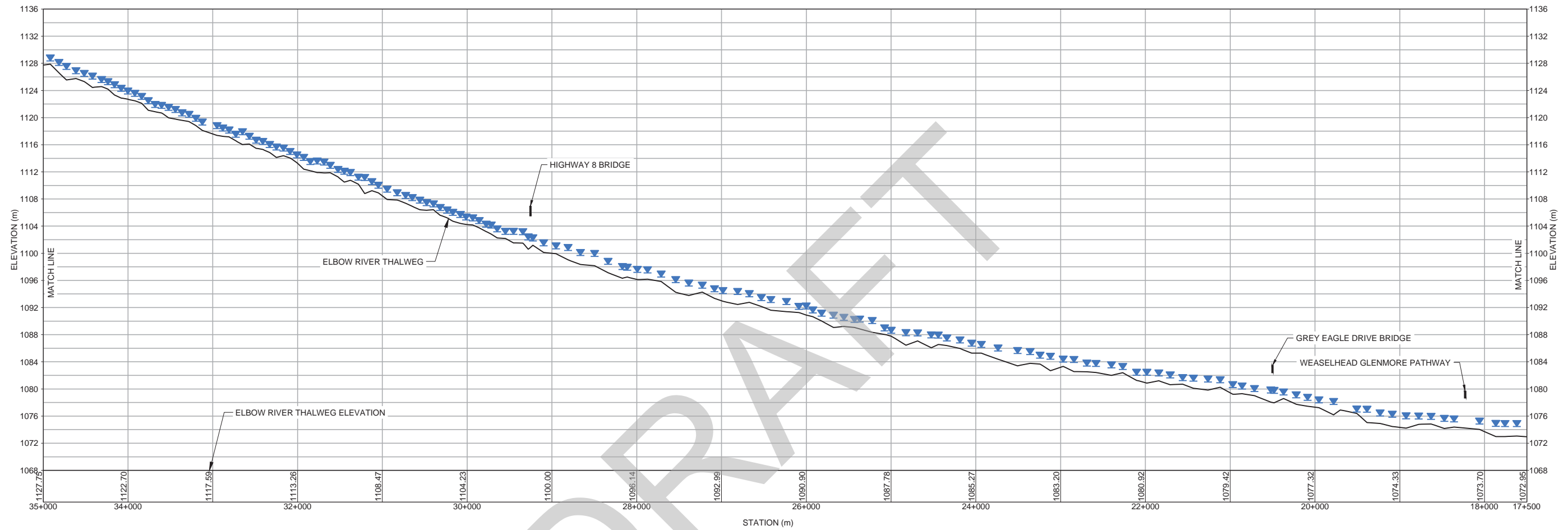
TITLE
 ELBOW RIVER PROFILE

CONSULTANT	YYYY-MM-DD	2017-06-12
	PREPARED	M. HOUGHAM
	DESIGN	W. PLOEGER
	REVIEW	W. PLOEGER
	APPROVED	D. LONG

PROJECT No. 1536673 CONTROL 1000 Rev. 0

FIGURE
 A-6

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANS B 28 mm

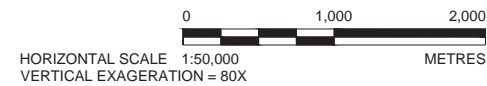


LEGEND

MEASURED WATER LEVELS DURING SURVEY

REFERENCE

SURVEY DATA COLLECTED BY GOLDER IN SEPTEMBER 2013, OCTOBER 2015, NOVEMBER 2015, MAY 2016, JUNE 2016, AND JULY 2016 FOR THE ELBOW RIVER. SURVEY DATA COLLECTED BY GOLDER IN JUNE 2016 FOR LOTT CREEK. SURVEY DATA COLLECTED BY GOLDER IN JULY 2016 FOR BRAGG CREEK.



CLIENT
ALBERTA ENVIRONMENT AND PARKS

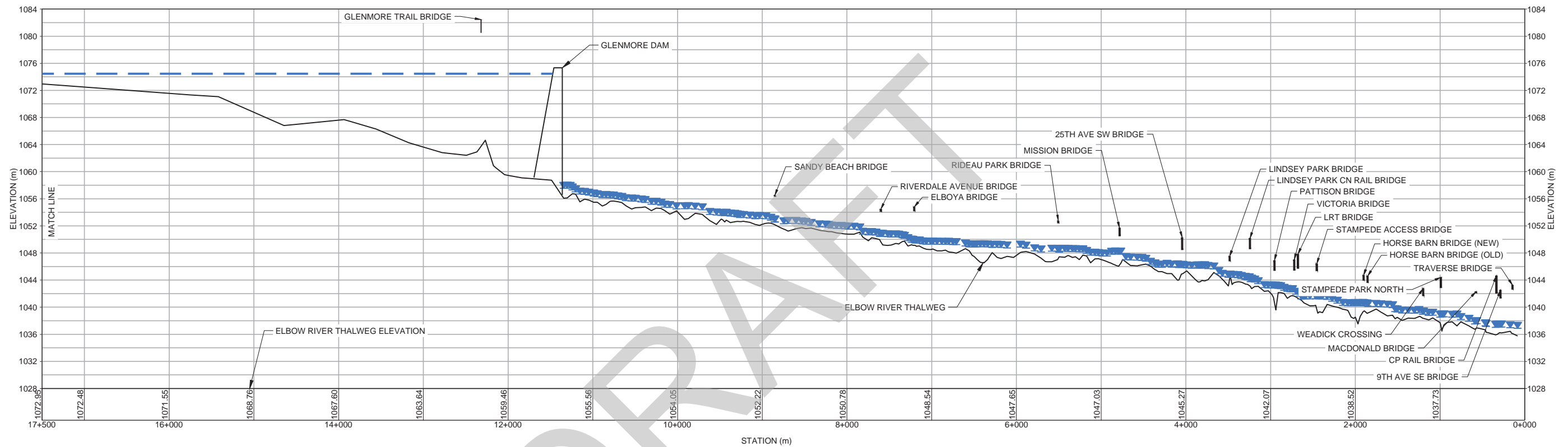
PROJECT
BOW AND ELBOW RIVER HAZARD STUDY

TITLE
ELBOW RIVER PROFILE

CONSULTANT	YYYY-MM-DD	2017-06-12
	PREPARED	M. HOUGHAM
	DESIGN	W. PLOEGER
	REVIEW	W. PLOEGER
	APPROVED	D. LONG



PROJECT No. 1536673 CONTROL 1000 Rev. 0 FIGURE A-7

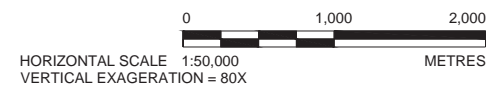


LEGEND

 MEASURED WATER LEVELS DURING SURVEY

REFERENCE


SURVEY DATA COLLECTED BY GOLDER IN SEPTEMBER 2013, OCTOBER 2015, NOVEMBER 2015, MAY 2016, JUNE 2016, AND JULY 2016 FOR THE ELBOW RIVER. SURVEY DATA COLLECTED BY GOLDER IN JUNE 2016 FOR LOTT CREEK. SURVEY DATA COLLECTED BY GOLDER IN JULY 2016 FOR BRAGG CREEK.



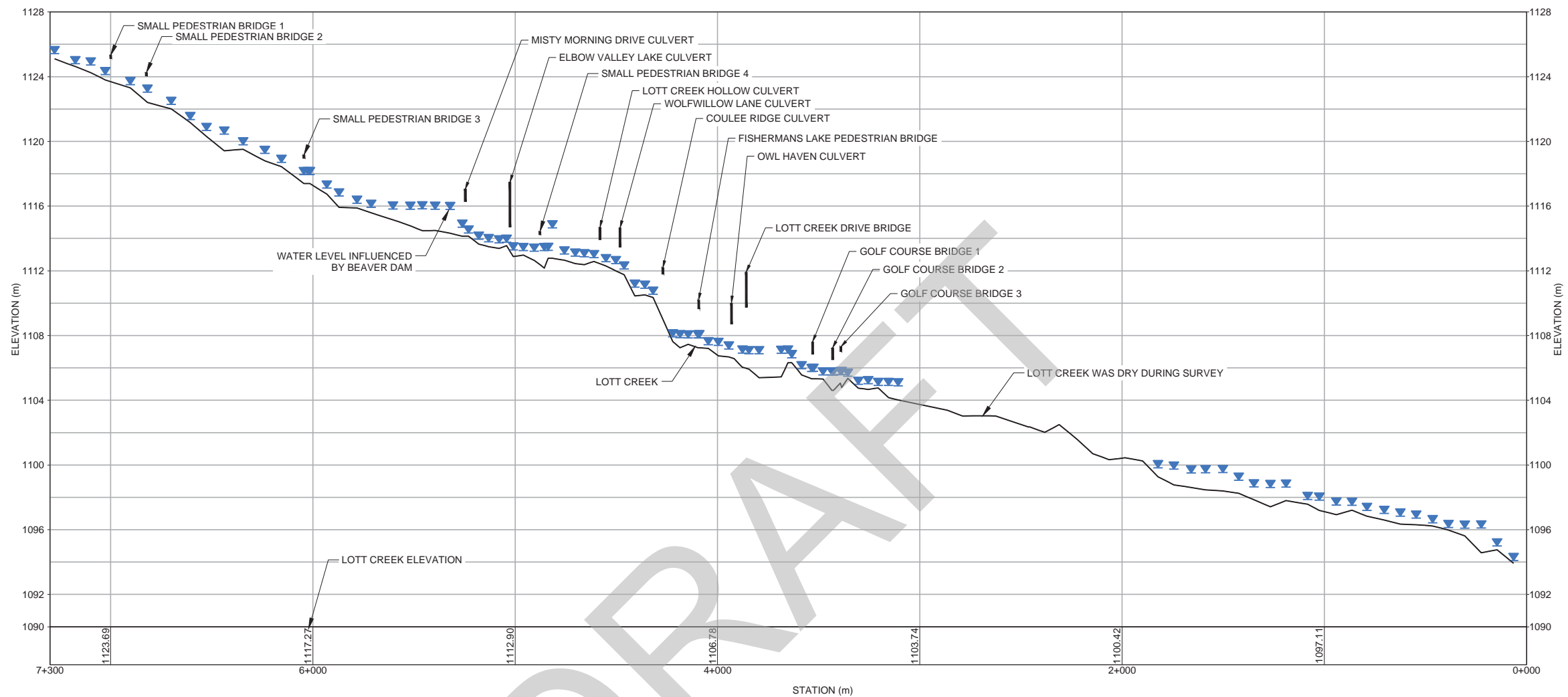
CLIENT
ALBERTA ENVIRONMENT AND PARKS

PROJECT
BOW AND ELBOW RIVER HAZARD STUDY

TITLE
ELBOW RIVER PROFILE

CONSULTANT	YYYY-MM-DD	2017-06-12
	PREPARED	M. HOUGHAM
	DESIGN	W. PLOEGER
	REVIEW	W. PLOEGER
	APPROVED	D. LONG

PROJECT No. 1536673 CONTROL 1000 Rev. 0 FIGURE A-8

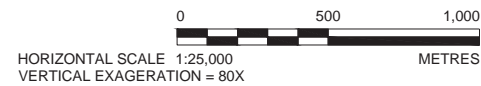


LEGEND

▼ MEASURED WATER LEVELS DURING SURVEY

REFERENCE

SURVEY DATA COLLECTED BY GOLDER IN SEPTEMBER 2013, OCTOBER 2015, NOVEMBER 2015, MAY 2016, JUNE 2016, AND JULY 2016 FOR THE ELBOW RIVER. SURVEY DATA COLLECTED BY GOLDER IN JUNE 2016 FOR LOTT CREEK. SURVEY DATA COLLECTED BY GOLDER IN JULY 2016 FOR BRAGG CREEK.



CLIENT
ALBERTA ENVIRONMENT AND PARKS

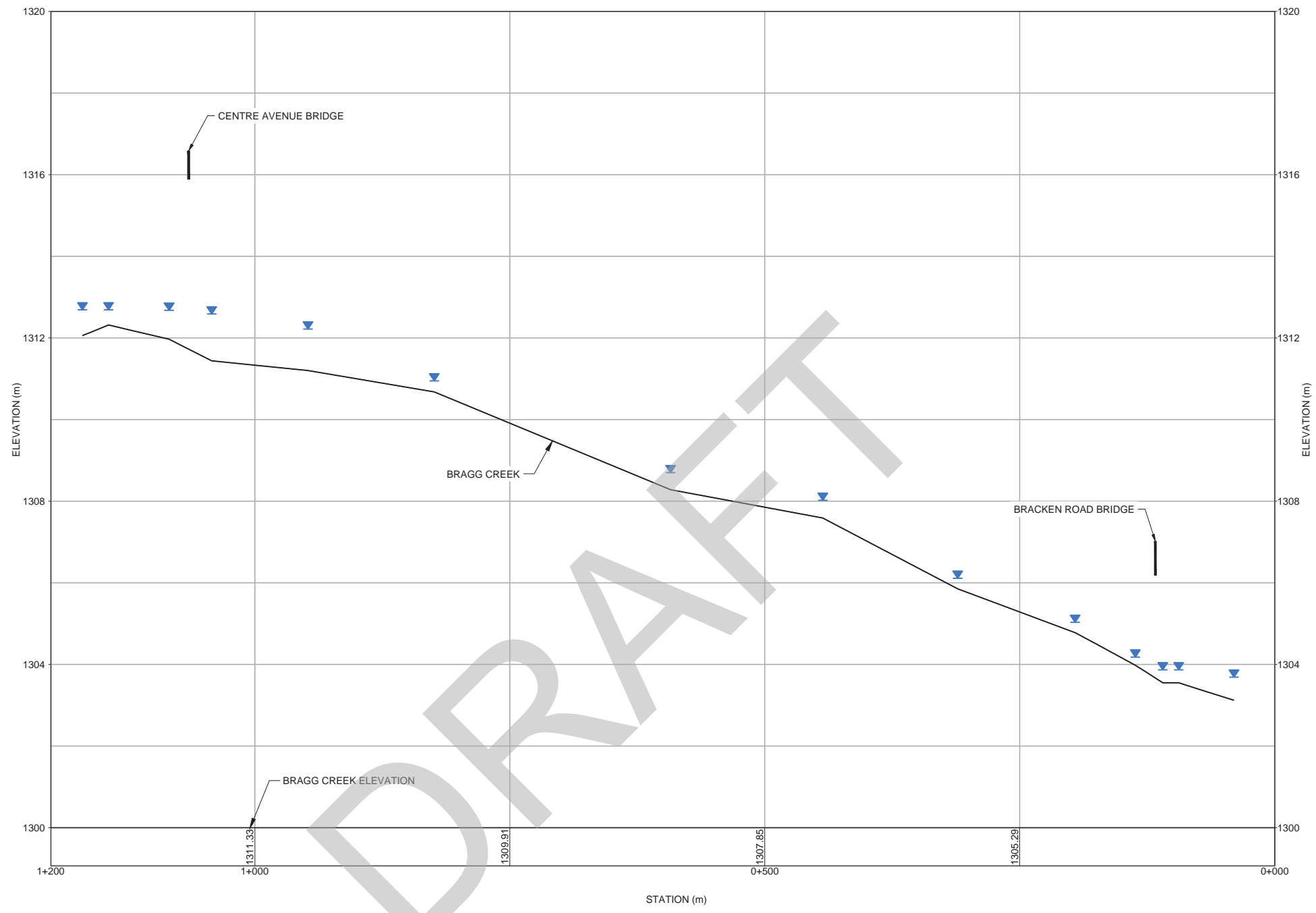
PROJECT
BOW AND ELBOW RIVER HAZARD STUDY

TITLE
LOTT CREEK PROFILE

CONSULTANT	YYYY-MM-DD	2017-06-12
PREPARED	M. HOUGHAM	
DESIGN	W. PLOEGER	
REVIEW	W. PLOEGER	
APPROVED	D. LONG	



PROJECT No. 1536673 CONTROL 1000 Rev. 0 FIGURE A-9



LEGEND
 MEASURED WATER LEVELS DURING SURVEY

REFERENCE
 SURVEY DATA COLLECTED BY GOLDER IN SEPTEMBER 2013, OCTOBER 2015, NOVEMBER 2015, MAY 2016, JUNE 2016, AND JULY 2016 FOR THE ELBOW RIVER. SURVEY DATA COLLECTED BY GOLDER IN JUNE 2016 FOR LOTT CREEK. SURVEY DATA COLLECTED BY GOLDER IN JULY 2016 FOR BRAGG CREEK.

0 100 200
 HORIZONTAL SCALE 1:5,000 METRES
 VERTICAL EXAGGERATION = 40X

CLIENT
 ALBERTA ENVIRONMENT AND PARKS

PROJECT
 BOW AND ELBOW RIVER HAZARD STUDY

TITLE
 BRAGG CREEK PROFILE

CONSULTANT	YYYY-MM-DD	2017-06-12
PREPARED	M. HOUGHAM	
DESIGN	W. PLOEGER	
REVIEW	W. PLOEGER	
APPROVED	D. LONG	

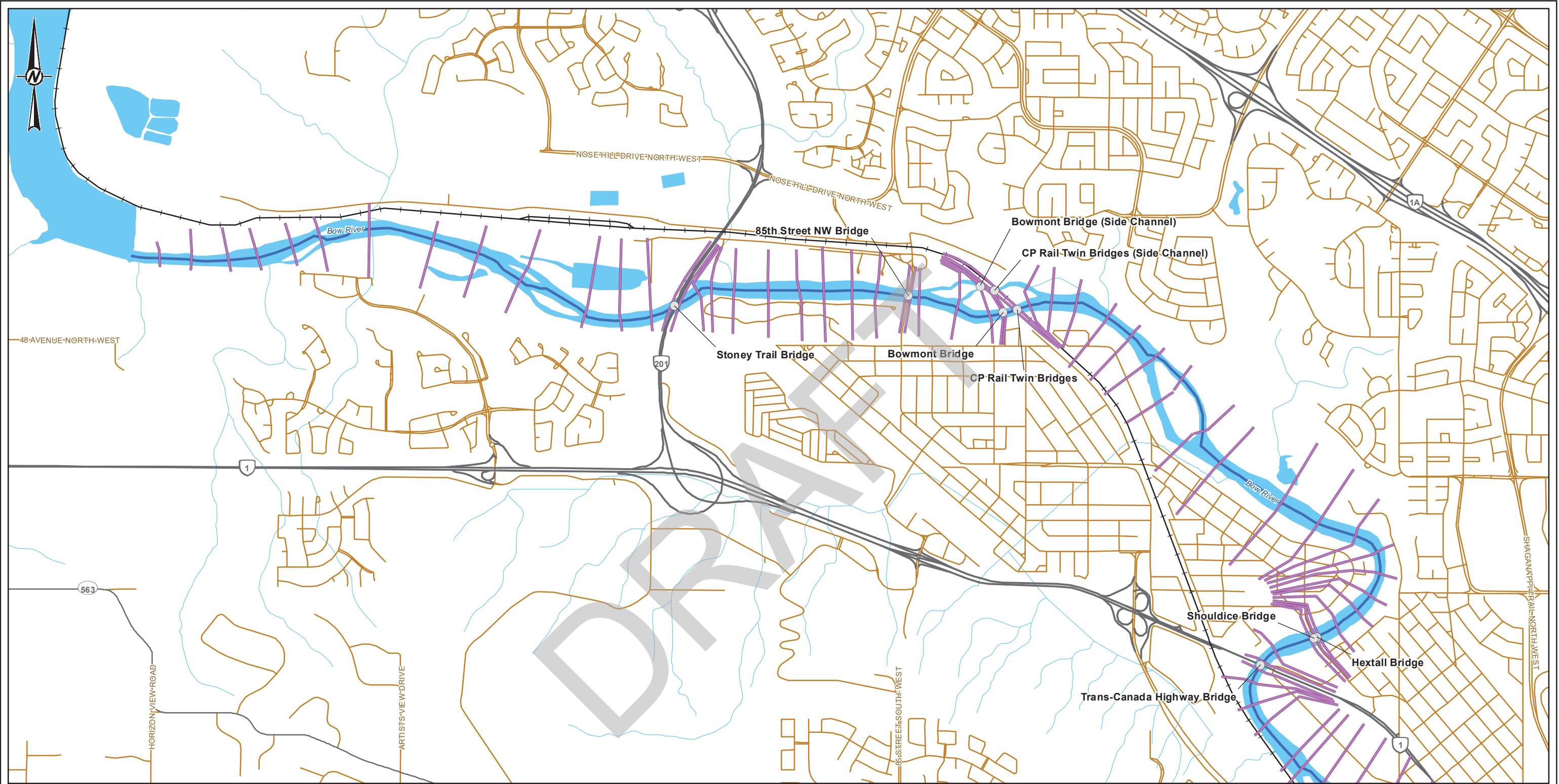
PROJECT No. 1536673 CONTROL 1000 Rev. 0 FIGURE A-10



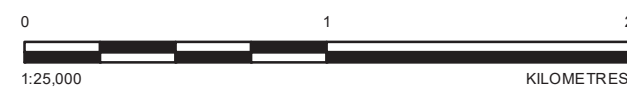
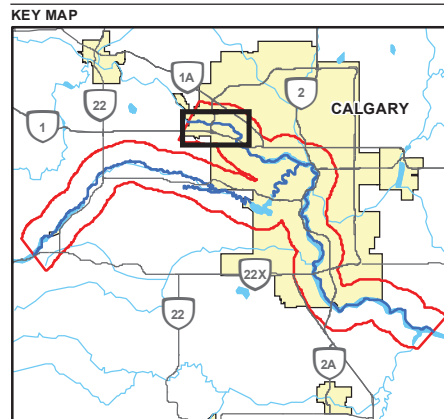
APPENDIX B

Cross Section, Hydraulic Structure, and Flood Control Structure Locations

DRAFT



LEGEND	
	PRIMARY HIGHWAY
	SECONDARY HIGHWAY
	LOCAL ROAD
	RAILROAD
	WATERCOURSE
	WATERBODY
	POPULATED PLACE
	FIRST NATION
	BRIDGE
	CULVERT
	DAM
	WEIR
	OTHER
	FLOOD CONTROL STRUCTURE
	SURVEY REACH
	2015 BOW AND ELBOW RIVER HYDRAULIC MODEL CROSS SECTION
	SURVEYED CROSS SECTION



CLIENT
ALBERTA ENVIRONMENT AND PARKS

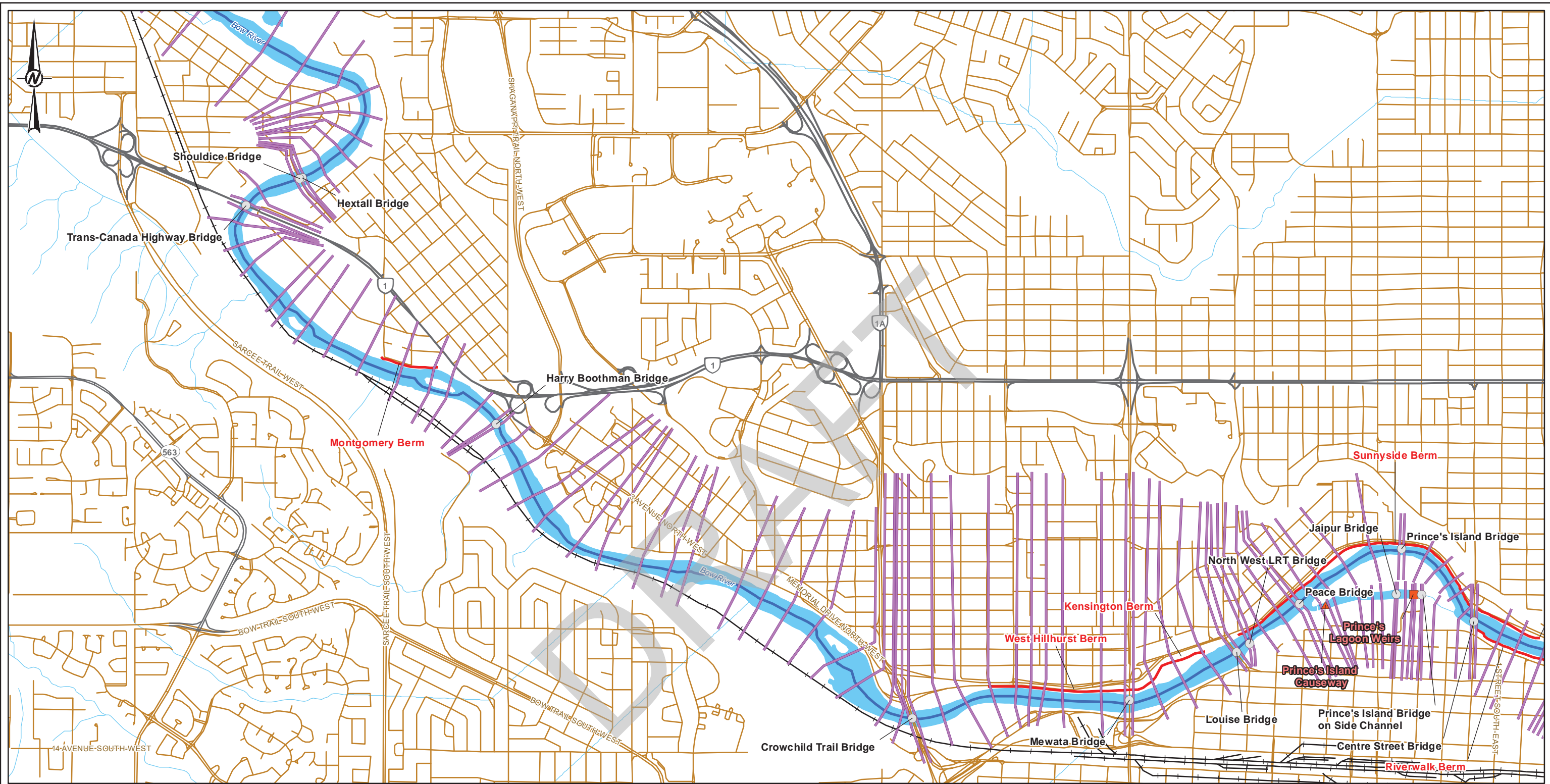
CONSULTANT	DATE	DESCRIPTION
	2017-06-09	DESIGNED
		PREPARED
		REVIEWED
		APPROVED

REFERENCE(S)
POPULATED PLACES AND HYDROGRAPHY OBTAINED FROM ALTALIS, © GOVERNMENT OF ALBERTA 2015. ALL RIGHTS RESERVED.
ROADS AND RAILWAYS OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

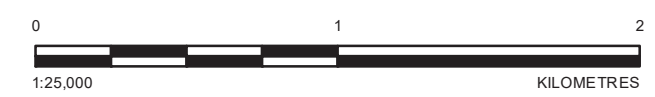
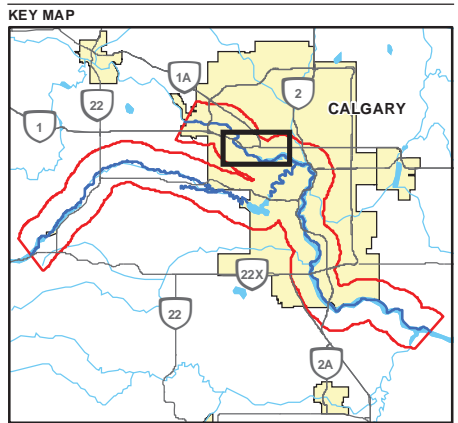
PROJECT
BOW AND ELBOW RIVER HAZARD STUDY

TITLE
CROSS SECTIONS, HYDRAULIC STRUCTURES AND FLOOD CONTROL STRUCTURES

PROJECT NO.	CONTROL	REV.	FIGURE
1536673		0	B-1



LEGEND	
	PRIMARY HIGHWAY
	SECONDARY HIGHWAY
	LOCAL ROAD
	RAILROAD
	WATERCOURSE
	WATERBODY
	POPULATED PLACE
	FIRST NATION
HYDRAULIC STRUCTURES	
	BRIDGE
	CULVERT
	DAM
	WEIR
	OTHER
	FLOOD CONTROL STRUCTURE
	SURVEY REACH
	2015 BOW AND ELBOW RIVER HYDRAULIC MODEL CROSS SECTION
	SURVEYED CROSS SECTION

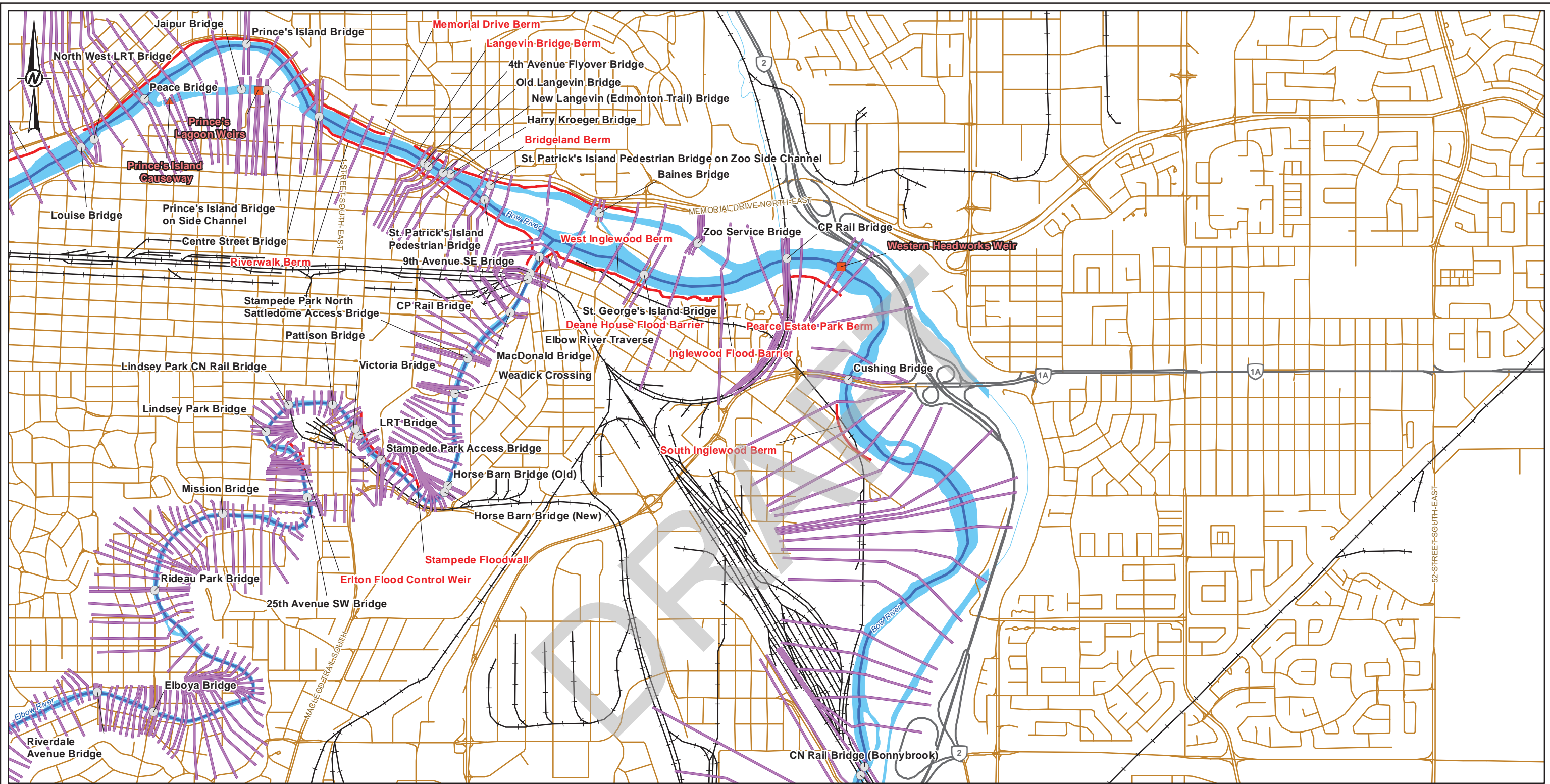


CLIENT
ALBERTA ENVIRONMENT AND PARKS

CONSULTANT	
YYYY-MM-DD	2017-06-09
DESIGNED	W.PLOEGER
PREPARED	P.THIEDE
REVIEWED	W.PLOEGER
APPROVED	D.LONG

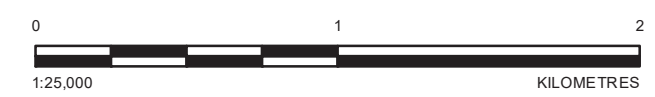
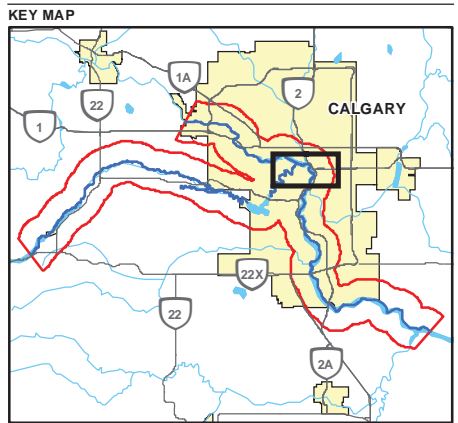
REFERENCE(S)
POPULATED PLACES AND HYDROGRAPHY OBTAINED FROM ALTALIS, © GOVERNMENT OF ALBERTA 2015. ALL RIGHTS RESERVED.
ROADS AND RAILWAYS OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

PROJECT	
BOW AND ELBOW RIVER HAZARD STUDY	
TITLE	
CROSS SECTIONS, HYDRAULIC STRUCTURES AND FLOOD CONTROL STRUCTURES	
PROJECT NO.	CONTROL
1536673	
REV.	0



LEGEND

— PRIMARY HIGHWAY	HYDRAULIC STRUCTURES
— SECONDARY HIGHWAY	○ BRIDGE
— LOCAL ROAD	◊ CULVERT
— RAILROAD	● DAM
— WATERCOURSE	■ WEIR
— WATERBODY	▲ OTHER
— POPULATED PLACE	— FLOOD CONTROL STRUCTURE
— FIRST NATION	— SURVEY REACH
	— 2015 BOW AND ELBOW RIVER HYDRAULIC MODEL CROSS SECTION
	— SURVYED CROSS SECTION



CLIENT
ALBERTA ENVIRONMENT AND PARKS

CONSULTANT

YYYY-MM-DD	2017-06-09
DESIGNED	W.PLOEGER
PREPARED	P.THIEDE
REVIEWED	W.PLOEGER
APPROVED	D.LONG



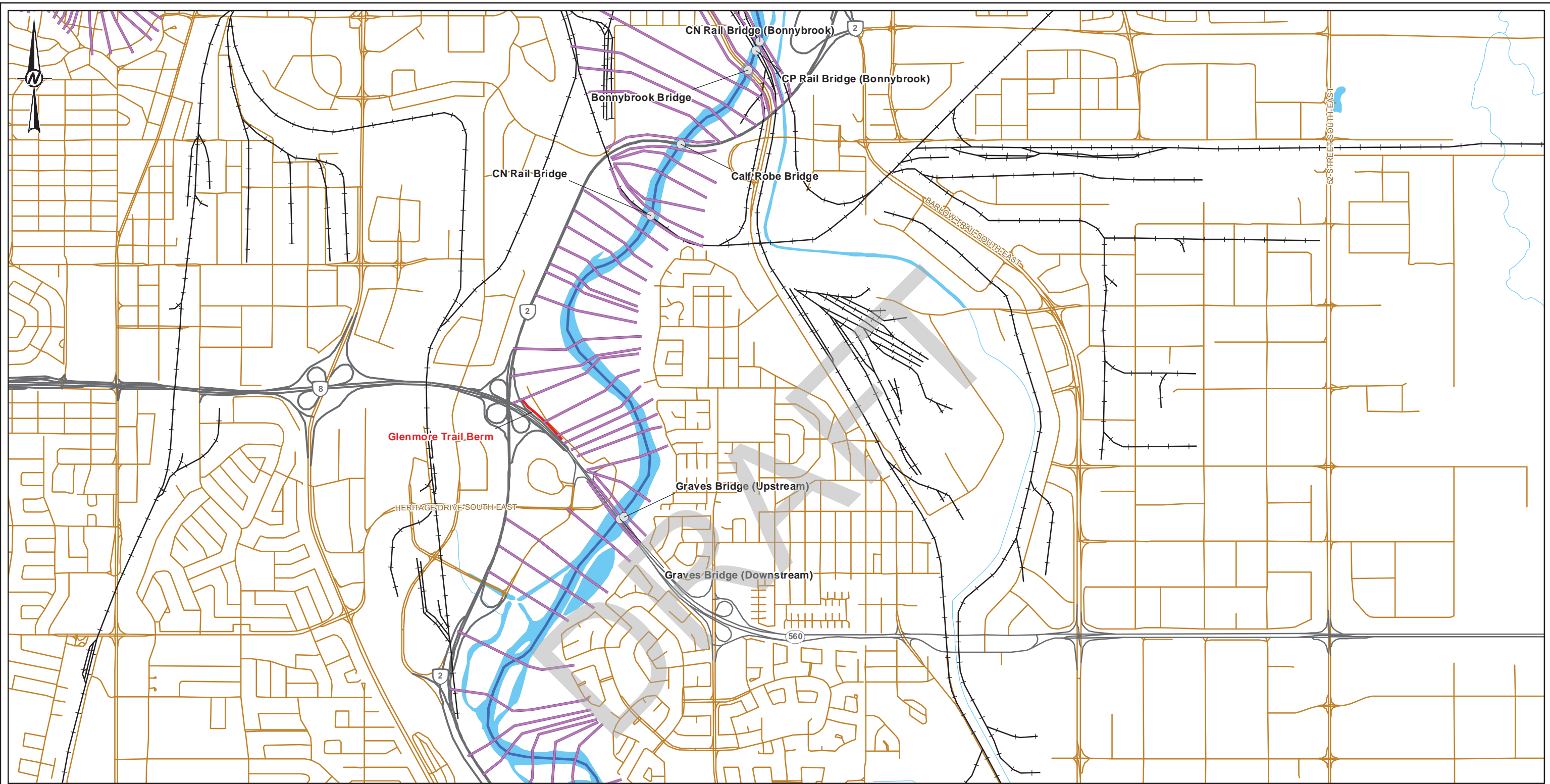
REFERENCE(S)
POPULATED PLACES AND HYDROGRAPHY OBTAINED FROM ALTALIS, © GOVERNMENT OF ALBERTA 2015. ALL RIGHTS RESERVED.
ROADS AND RAILWAYS OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

PROJECT
BOW AND ELBOW RIVER HAZARD STUDY

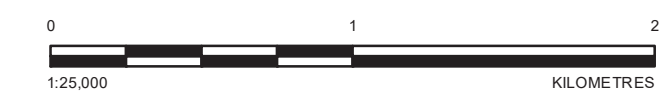
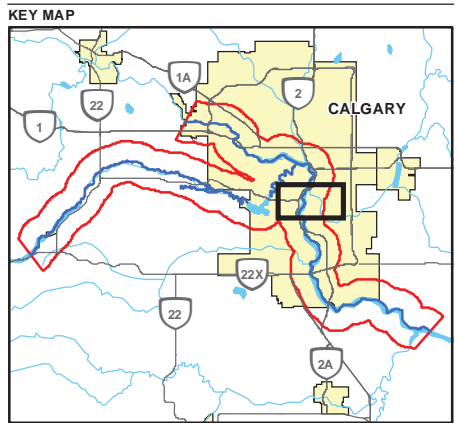
TITLE
CROSS SECTIONS, HYDRAULIC STRUCTURES AND FLOOD CONTROL STRUCTURES

PROJECT NO.	CONTROL	REV.	FIGURE
1536673		0	B-3

T:\1\1301515066723Mapping\MCH\Hydrology\River Survey\1506673_Apendix_B_Structures_Rev0.mxd PRINTED ON: 2017-06-09 AT: 1:24:31 PM
 IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B



LEGEND	
	PRIMARY HIGHWAY
	SECONDARY HIGHWAY
	LOCAL ROAD
	RAILROAD
	WATERCOURSE
	WATERBODY
	POPULATED PLACE
	FIRST NATION
HYDRAULIC STRUCTURES	
	BRIDGE
	CULVERT
	DAM
	WEIR
	OTHER
	FLOOD CONTROL STRUCTURE
	SURVEY REACH
	2015 BOW AND ELBOW RIVER HYDRAULIC MODEL CROSS SECTION
	SURVYED CROSS SECTION



CLIENT
ALBERTA ENVIRONMENT AND PARKS

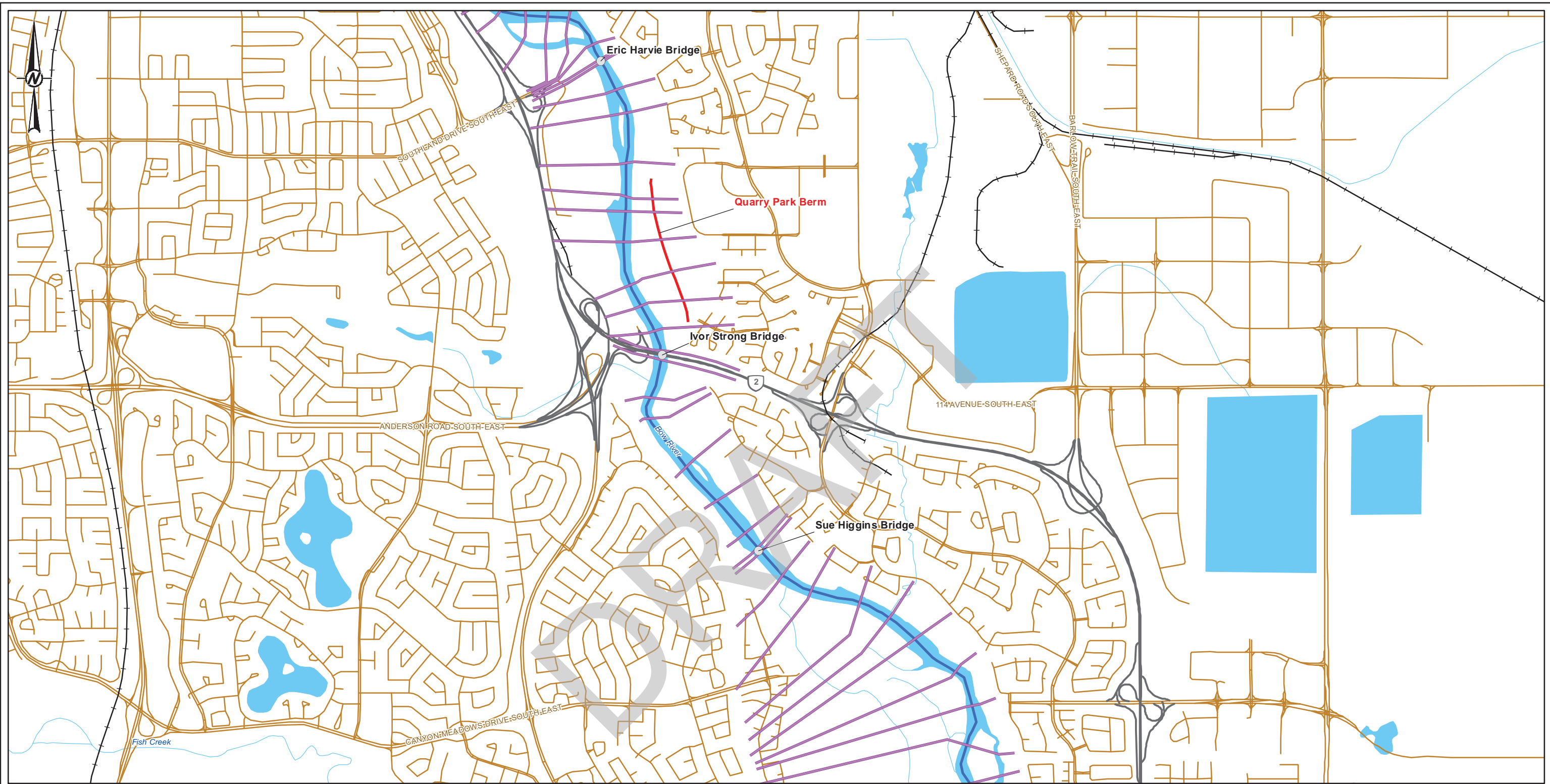
CONSULTANT	DATE	DESCRIPTION
	YYYY-MM-DD	2017-06-09
	DESIGNED	W.PLOEGER
	PREPARED	P.THIEDE
	REVIEWED	W.PLOEGER
	APPROVED	D.LONG

REFERENCE(S)
 POPULATED PLACES AND HYDROGRAPHY OBTAINED FROM ALTALIS, © GOVERNMENT OF ALBERTA 2015. ALL RIGHTS RESERVED.
 ROADS AND RAILWAYS OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
 DATUM: NAD 83 CSRS PROJECTION: 3TM 114

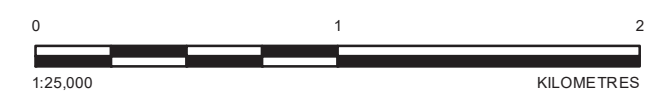
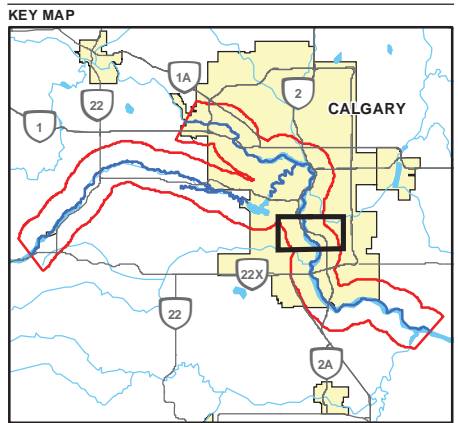
PROJECT		TITLE	
BOW AND ELBOW RIVER HAZARD STUDY		CROSS SECTIONS, HYDRAULIC STRUCTURES AND FLOOD CONTROL STRUCTURES	
PROJECT NO.	CONTROL	REV.	FIGURE
1536673		0	B-4

I:\130151\506672\Maping\KCH\Hydrology\River Survey\1506673_Apennix B_Structures_Rev0.mxd PRINTED ON: 2017-06-09 AT: 1:24:42 PM

25mm IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B



LEGEND	
	PRIMARY HIGHWAY
	SECONDARY HIGHWAY
	LOCAL ROAD
	RAILROAD
	WATERCOURSE
	WATERBODY
	POPULATED PLACE
	FIRST NATION
HYDRAULIC STRUCTURES	
	BRIDGE
	CULVERT
	DAM
	WEIR
	OTHER
	FLOOD CONTROL STRUCTURE
	SURVEY REACH
	2015 BOW AND ELBOW RIVER HYDRAULIC MODEL CROSS SECTION
	SURVYED CROSS SECTION

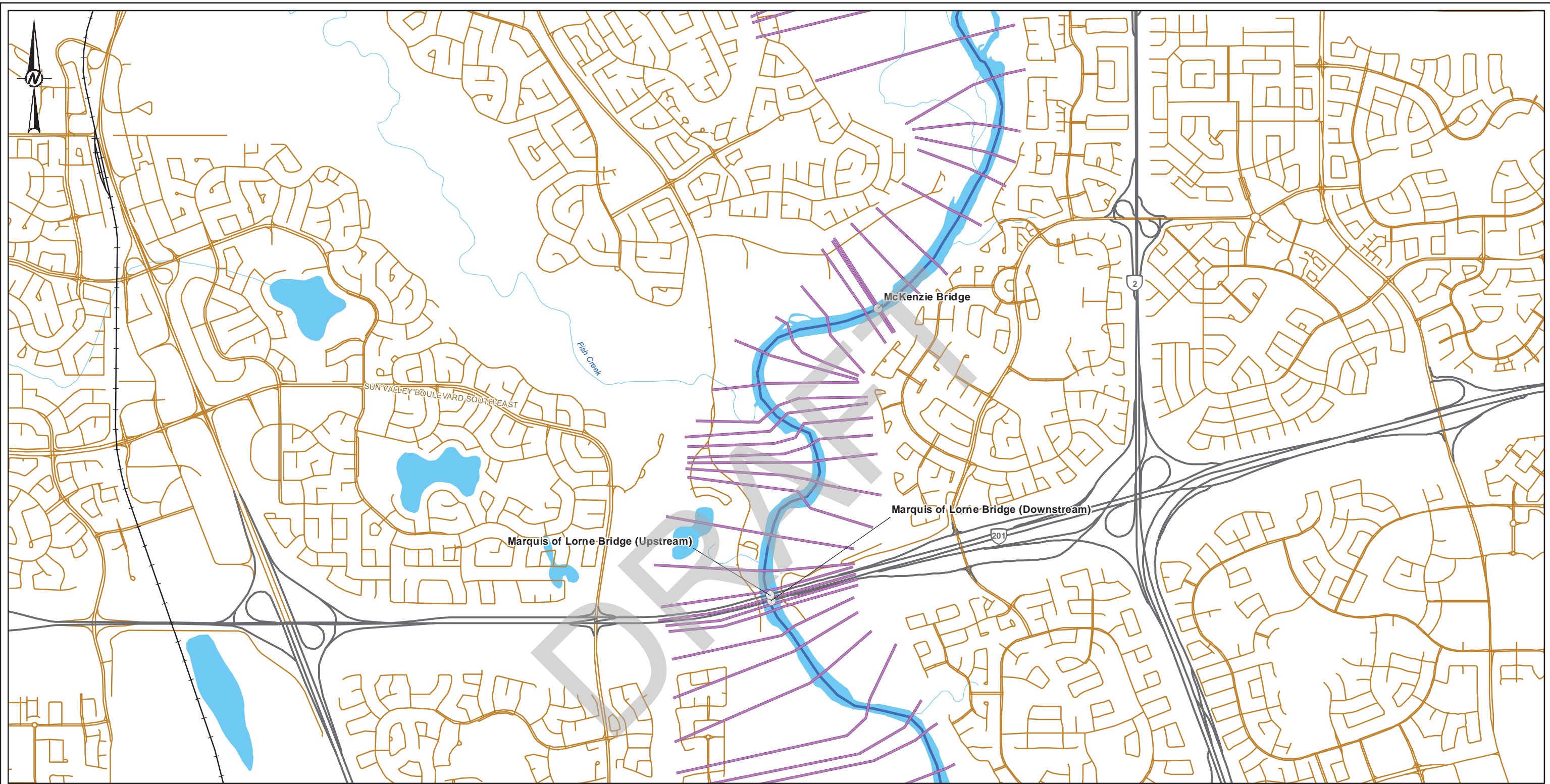


CLIENT
ALBERTA ENVIRONMENT AND PARKS

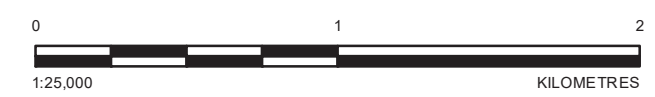
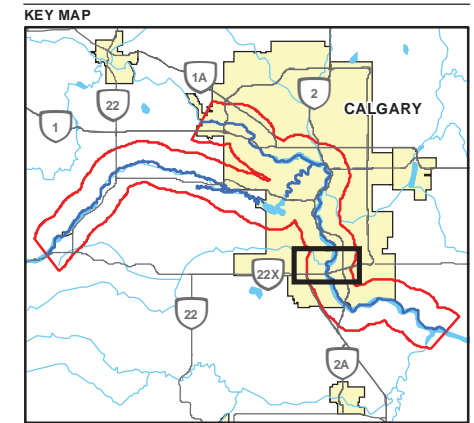
CONSULTANT	DATE	REVISION
	YYYY-MM-DD	2017-06-09
	DESIGNED	W.PLOEGER
	PREPARED	P.THIEDE
	REVIEWED	W.PLOEGER
	APPROVED	D.LONG

REFERENCE(S)
POPULATED PLACES AND HYDROGRAPHY OBTAINED FROM ALTALIS, © GOVERNMENT OF ALBERTA 2015. ALL RIGHTS RESERVED.
ROADS AND RAILWAYS OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

PROJECT		
BOW AND ELBOW RIVER HAZARD STUDY		
TITLE		
CROSS SECTIONS, HYDRAULIC STRUCTURES AND FLOOD CONTROL STRUCTURES		
PROJECT NO.	CONTROL	REV.
1536673		0
		FIGURE
		B-5



LEGEND	
	PRIMARY HIGHWAY
	SECONDARY HIGHWAY
	LOCAL ROAD
	RAILROAD
	WATERCOURSE
	WATERBODY
	POPULATED PLACE
	FIRST NATION
HYDRAULIC STRUCTURES	
	BRIDGE
	CULVERT
	DAM
	WEIR
	OTHER
	FLOOD CONTROL STRUCTURE
	SURVEY REACH
	2015 BOW AND ELBOW RIVER HYDRAULIC MODEL CROSS SECTION
	SURVYED CROSS SECTION

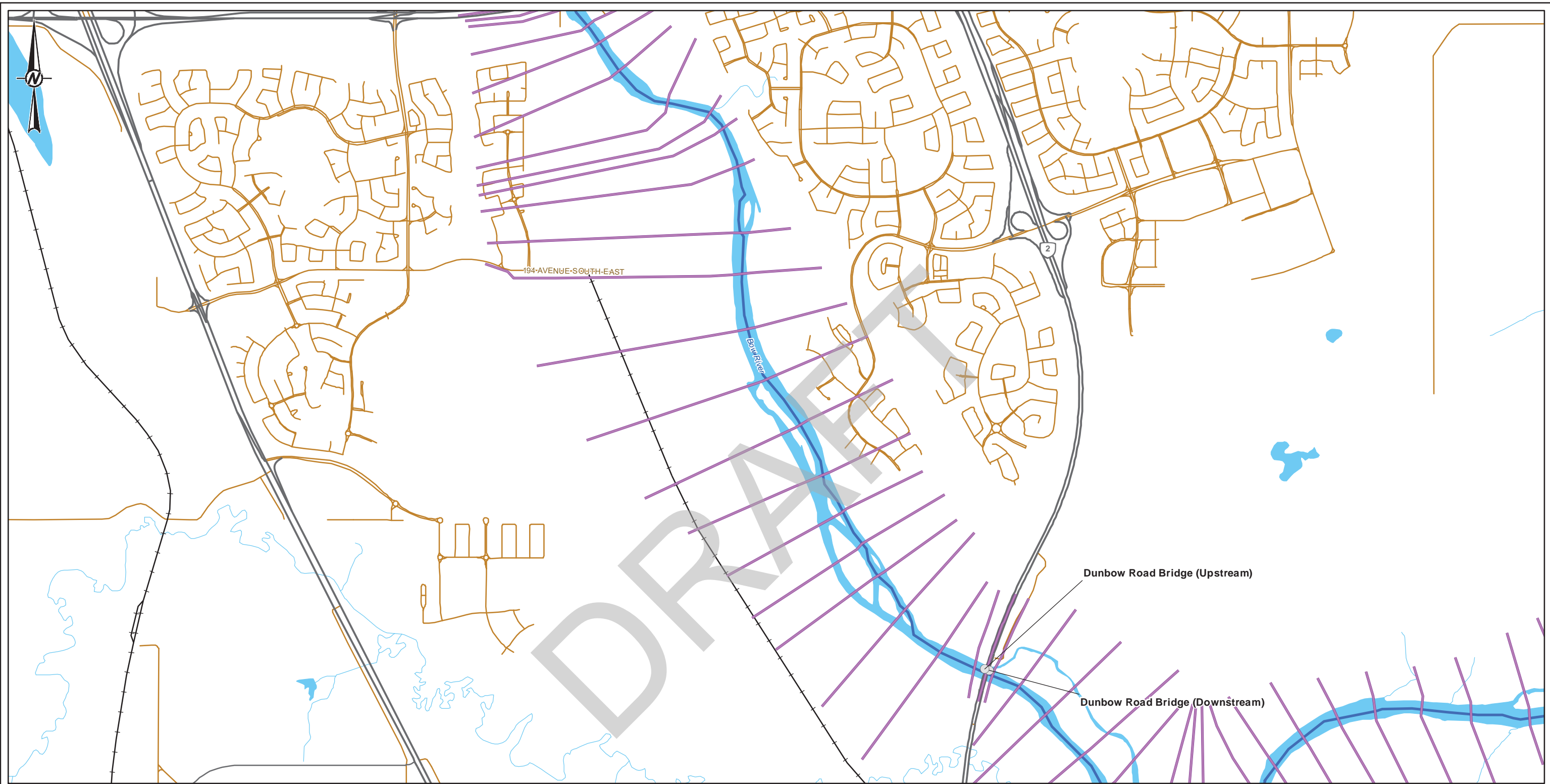


CLIENT
ALBERTA ENVIRONMENT AND PARKS

CONSULTANT	DATE	DESCRIPTION
	YYYY-MM-DD	2017-06-09
	DESIGNED	W.PLOEGER
	PREPARED	P.THIEDE
	REVIEWED	W.PLOEGER
	APPROVED	D.LONG

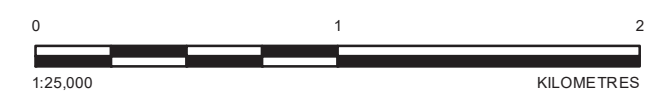
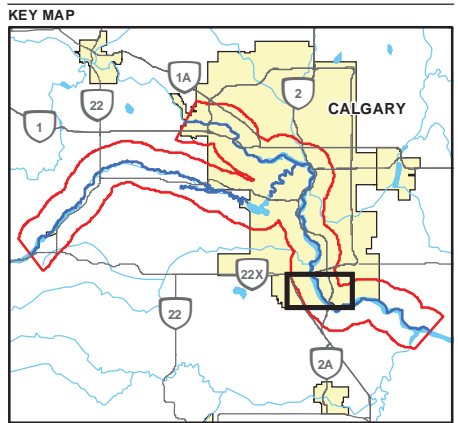
REFERENCE(S)
 POPULATED PLACES AND HYDROGRAPHY OBTAINED FROM ALTALIS, © GOVERNMENT OF ALBERTA 2015. ALL RIGHTS RESERVED.
 ROADS AND RAILWAYS OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
 DATUM: NAD 83 CSRS PROJECTION: 3TM 114

PROJECT		TITLE	
BOW AND ELBOW RIVER HAZARD STUDY		CROSS SECTIONS, HYDRAULIC STRUCTURES AND FLOOD CONTROL STRUCTURES	
PROJECT NO.	CONTROL	REV.	FIGURE
1536673		0	B-6



LEGEND

	PRIMARY HIGHWAY		BRIDGE
	SECONDARY HIGHWAY		CULVERT
	LOCAL ROAD		DAM
	RAILROAD		WEIR
	WATERCOURSE		OTHER
	WATERBODY		FLOOD CONTROL STRUCTURE
	POPULATED PLACE		SURVEY REACH
	FIRST NATION		2015 BOW AND ELBOW RIVER HYDRAULIC MODEL CROSS SECTION
			SURVEYED CROSS SECTION



CLIENT
ALBERTA ENVIRONMENT AND PARKS

CONSULTANT

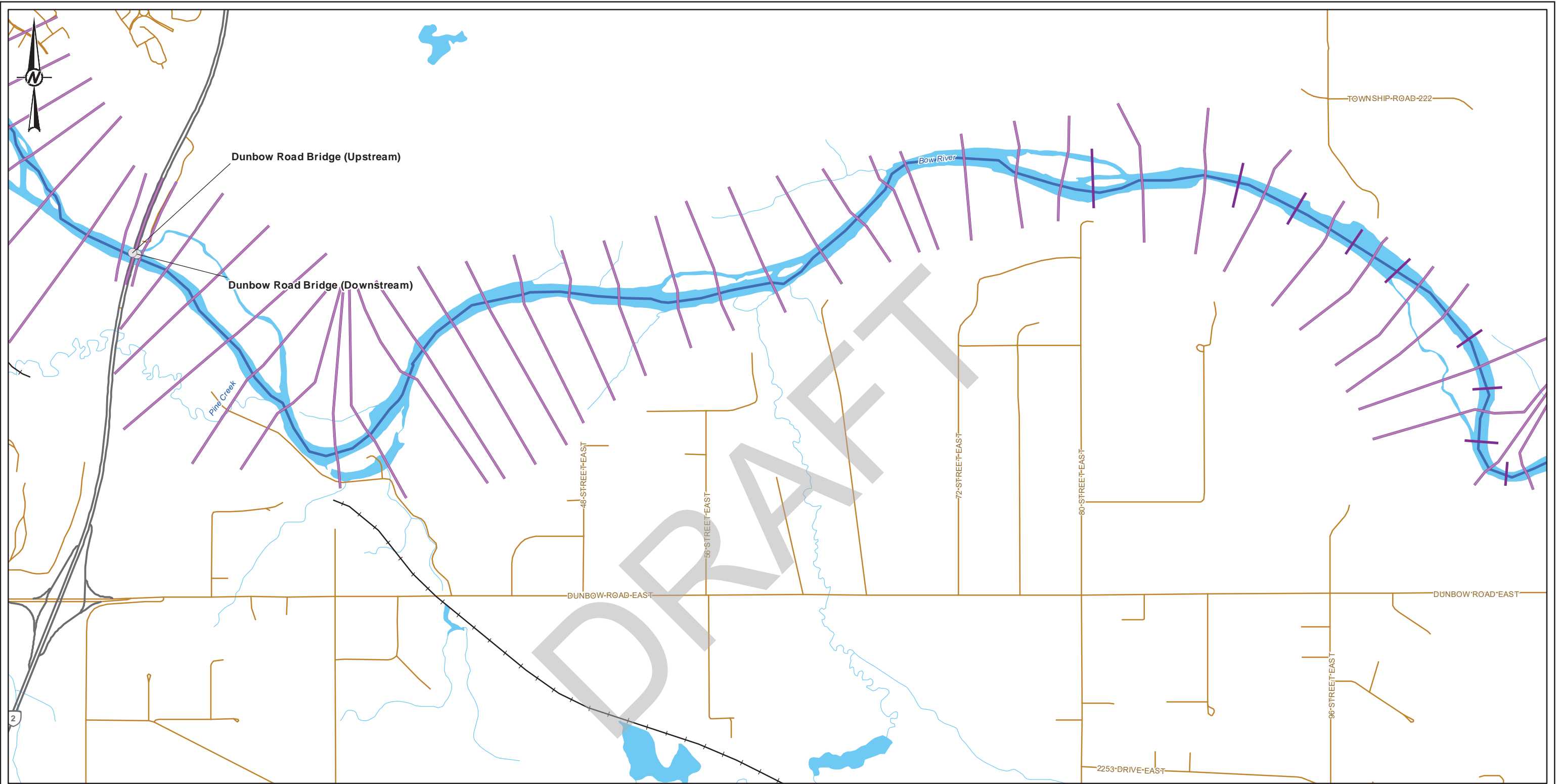
	YYYY-MM-DD	2017-06-09
	DESIGNED	W.PLOEGER
	PREPARED	P.THIEDE
	REVIEWED	W.PLOEGER
	APPROVED	D.LONG

REFERENCE(S)
POPULATED PLACES AND HYDROGRAPHY OBTAINED FROM ALTALIS, © GOVERNMENT OF ALBERTA 2015. ALL RIGHTS RESERVED.
ROADS AND RAILWAYS OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

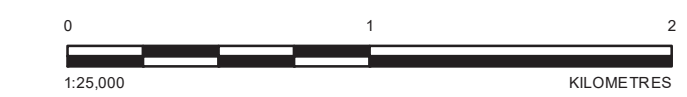
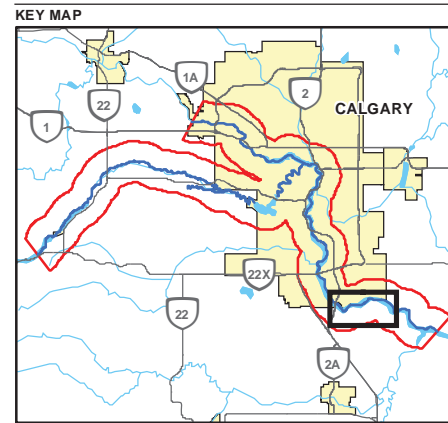
PROJECT
BOW AND ELBOW RIVER HAZARD STUDY

TITLE
CROSS SECTIONS, HYDRAULIC STRUCTURES AND FLOOD CONTROL STRUCTURES

PROJECT NO. 1536673	CONTROL	REV. 0	FIGURE B-7
------------------------	---------	-----------	----------------------



LEGEND	
	PRIMARY HIGHWAY
	SECONDARY HIGHWAY
	LOCAL ROAD
	RAILROAD
	WATERCOURSE
	WATERBODY
	POPULATED PLACE
	FIRST NATION
	BRIDGE
	CULVERT
	DAM
	WEIR
	OTHER
	FLOOD CONTROL STRUCTURE
	SURVEY REACH
	2015 BOW AND ELBOW RIVER HYDRAULIC MODEL CROSS SECTION
	SURVEYED CROSS SECTION



CLIENT
ALBERTA ENVIRONMENT AND PARKS

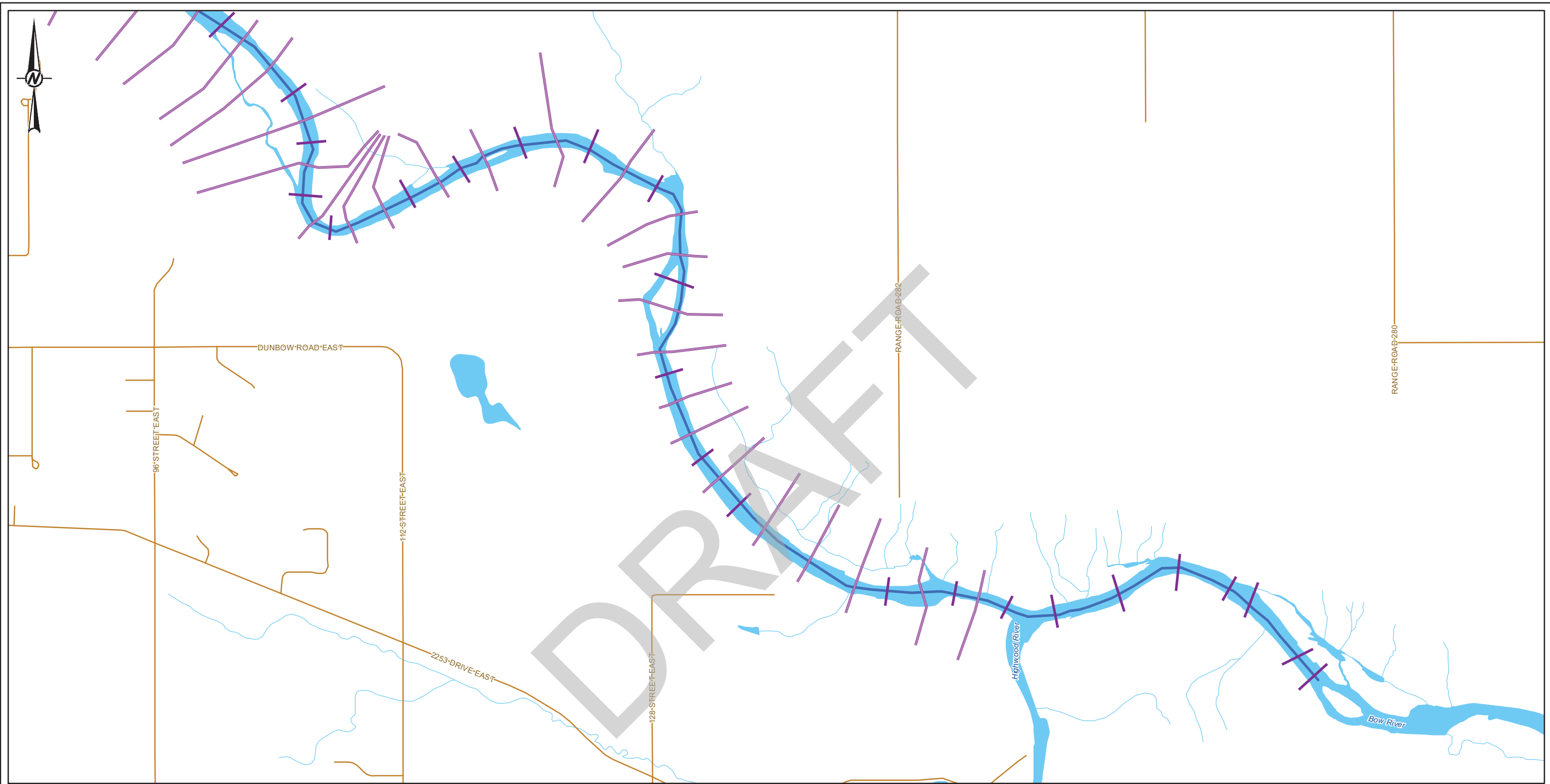
CONSULTANT	DATE	DESCRIPTION
	2017-06-09	DESIGNED
		PREPARED
		REVIEWED
		APPROVED

REFERENCE(S)
 POPULATED PLACES AND HYDROGRAPHY OBTAINED FROM ALTALIS, © GOVERNMENT OF ALBERTA 2015. ALL RIGHTS RESERVED.
 ROADS AND RAILWAYS OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
 DATUM: NAD 83 CSRS PROJECTION: 3TM 114

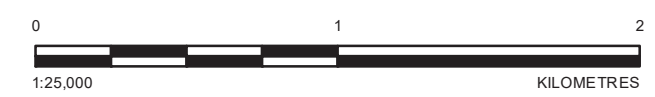
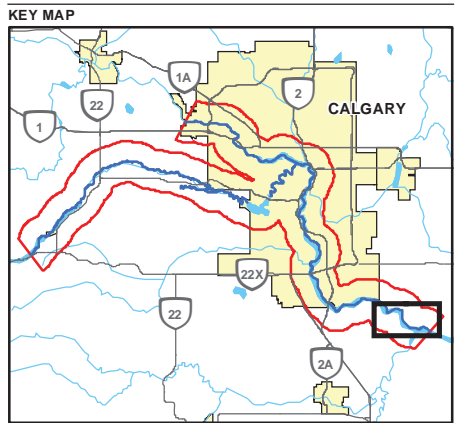
PROJECT	TITLE	PROJECT NO.	CONTROL	REV.	FIGURE
BOW AND ELBOW RIVER HAZARD STUDY	CROSS SECTIONS, HYDRAULIC STRUCTURES AND FLOOD CONTROL STRUCTURES	1536673	CONTROL	0	B-8

I:\1310151\1536673\Maping\KCH\Hydrology\River_Survey\1536673_Apendix_B_Structures_Rev0.mxd PRINTED ON: 2017-06-09 AT: 1:25:34 PM

25mm IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B



LEGEND	
	PRIMARY HIGHWAY
	SECONDARY HIGHWAY
	LOCAL ROAD
	RAILROAD
	WATERCOURSE
	WATERBODY
	POPULATED PLACE
	FIRST NATION
HYDRAULIC STRUCTURES	
	BRIDGE
	CULVERT
	DAM
	WEIR
	OTHER
	FLOOD CONTROL STRUCTURE
	SURVEY REACH
	2015 BOW AND ELBOW RIVER HYDRAULIC MODEL CROSS SECTION
	SURVYED CROSS SECTION

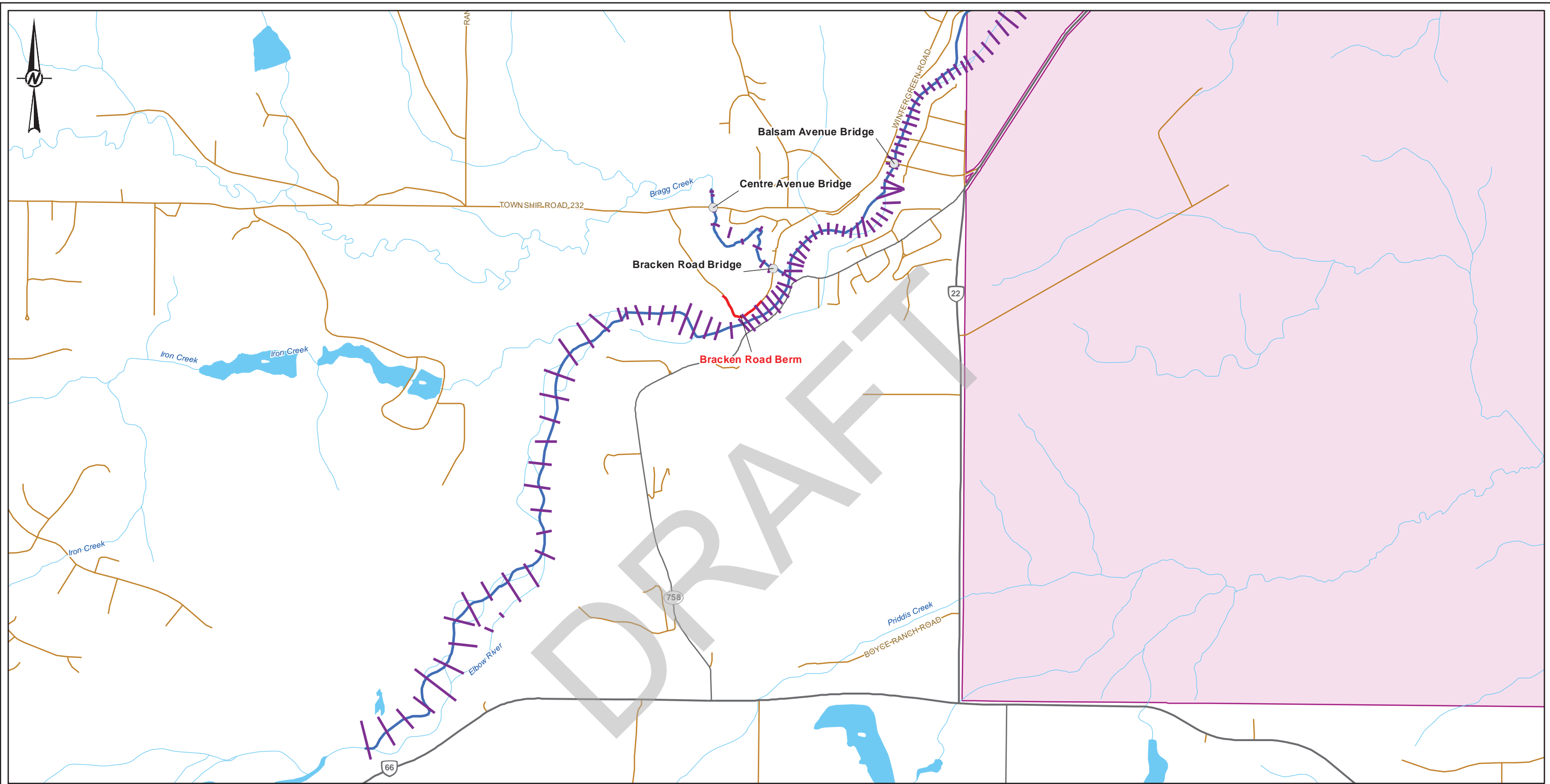


CLIENT
ALBERTA ENVIRONMENT AND PARKS

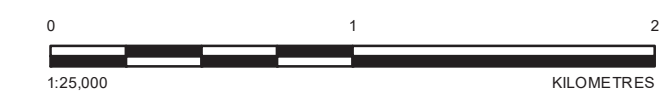
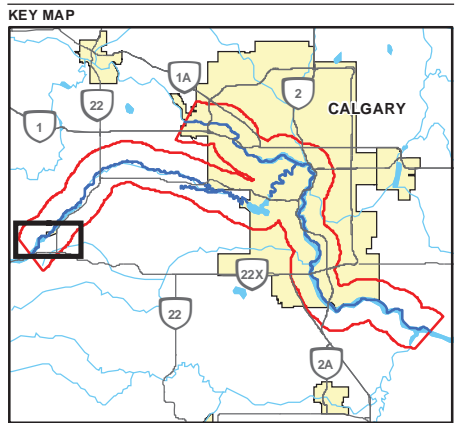
CONSULTANT	DATE	DESCRIPTION
	2017-06-09	DESIGNED
		PREPARED
		REVIEWED
		APPROVED

REFERENCE(S)
 POPULATED PLACES AND HYDROGRAPHY OBTAINED FROM ALTALIS, © GOVERNMENT OF ALBERTA 2015. ALL RIGHTS RESERVED.
 ROADS AND RAILWAYS OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
 DATUM: NAD 83 CSRS PROJECTION: 3TM 114

PROJECT		TITLE	
BOW AND ELBOW RIVER HAZARD STUDY		CROSS SECTIONS, HYDRAULIC STRUCTURES AND FLOOD CONTROL STRUCTURES	
PROJECT NO.	CONTROL	REV.	FIGURE
1536673		0	B-9



LEGEND	
	PRIMARY HIGHWAY
	SECONDARY HIGHWAY
	LOCAL ROAD
	RAILROAD
	WATERCOURSE
	WATERBODY
	POPULATED PLACE
	FIRST NATION
HYDRAULIC STRUCTURES	
	BRIDGE
	CULVERT
	DAM
	WEIR
	OTHER
	FLOOD CONTROL STRUCTURE
	SURVEY REACH
	2015 BOW AND ELBOW RIVER HYDRAULIC MODEL CROSS SECTION
	SURVYED CROSS SECTION



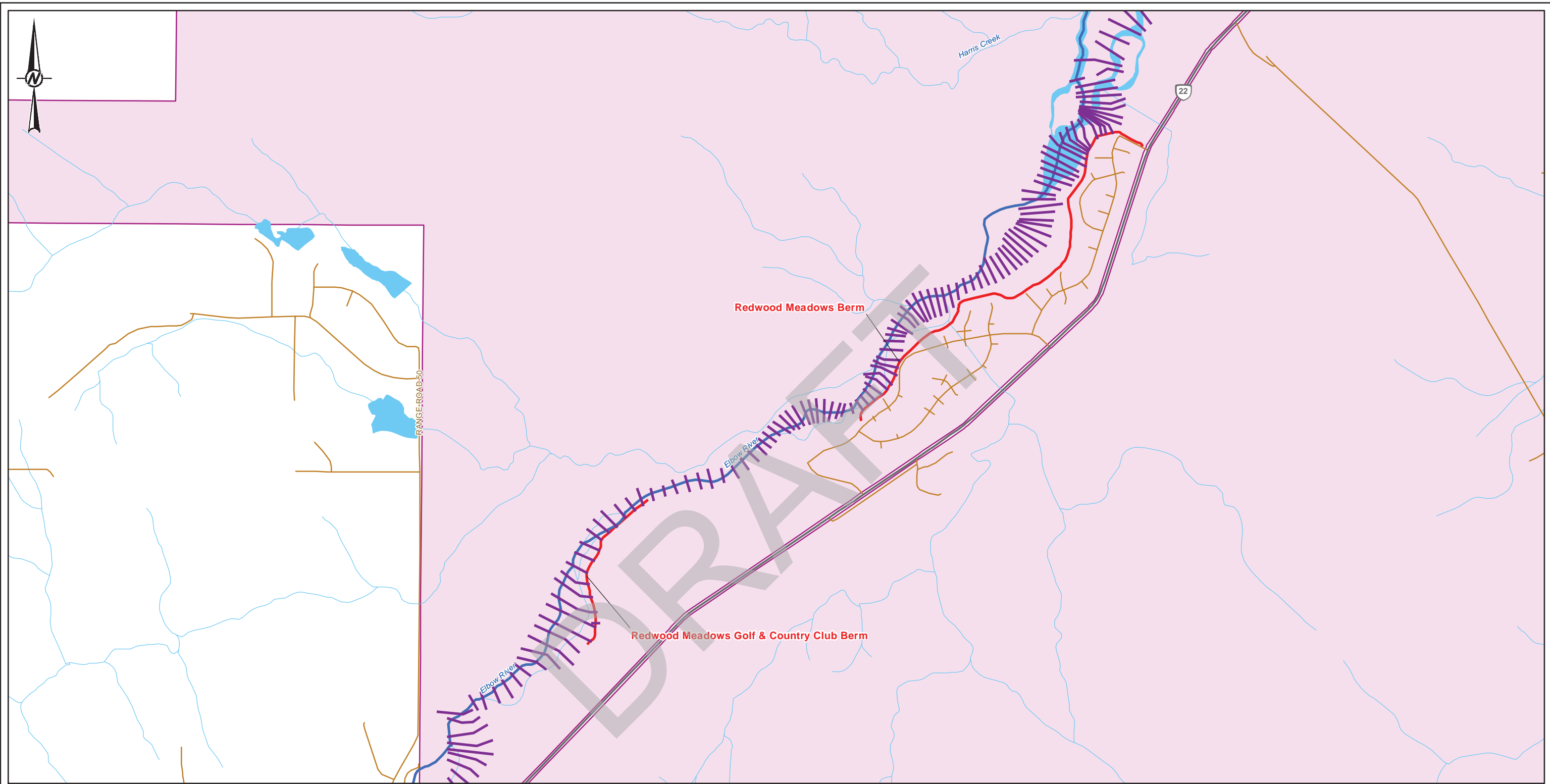
CLIENT
ALBERTA ENVIRONMENT AND PARKS

CONSULTANT	DATE	REVISION
	YYYY-MM-DD	2017-06-09
	DESIGNED	W.PLOEGER
	PREPARED	P.THIEDE
	REVIEWED	W.PLOEGER
	APPROVED	D.LONG

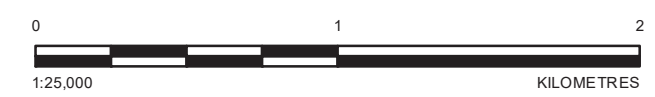
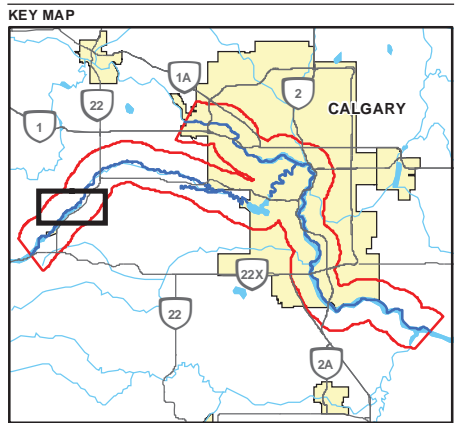
REFERENCE(S)
POPULATED PLACES AND HYDROGRAPHY OBTAINED FROM ALTALIS, © GOVERNMENT OF ALBERTA 2015. ALL RIGHTS RESERVED.
ROADS AND RAILWAYS OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

PROJECT		TITLE	
BOW AND ELBOW RIVER HAZARD STUDY		CROSS SECTIONS, HYDRAULIC STRUCTURES AND FLOOD CONTROL STRUCTURES	
PROJECT NO.	CONTROL	REV.	FIGURE
1536673		0	B-10

I:\13101515066723\Maping\Hydrology\River Survey\1506673_Apendix_B_Structures_Rev0.mxd PRINTED ON: 2017-06-09 AT: 1:26:01 PM
 IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B



LEGEND	
	PRIMARY HIGHWAY
	SECONDARY HIGHWAY
	LOCAL ROAD
	RAILROAD
	WATERCOURSE
	WATERBODY
	POPULATED PLACE
	FIRST NATION
HYDRAULIC STRUCTURES	
	BRIDGE
	CULVERT
	DAM
	WEIR
	OTHER
	FLOOD CONTROL STRUCTURE
	SURVEY REACH
	2015 BOW AND ELBOW RIVER HYDRAULIC MODEL CROSS SECTION
	SURVYED CROSS SECTION



CLIENT
ALBERTA ENVIRONMENT AND PARKS

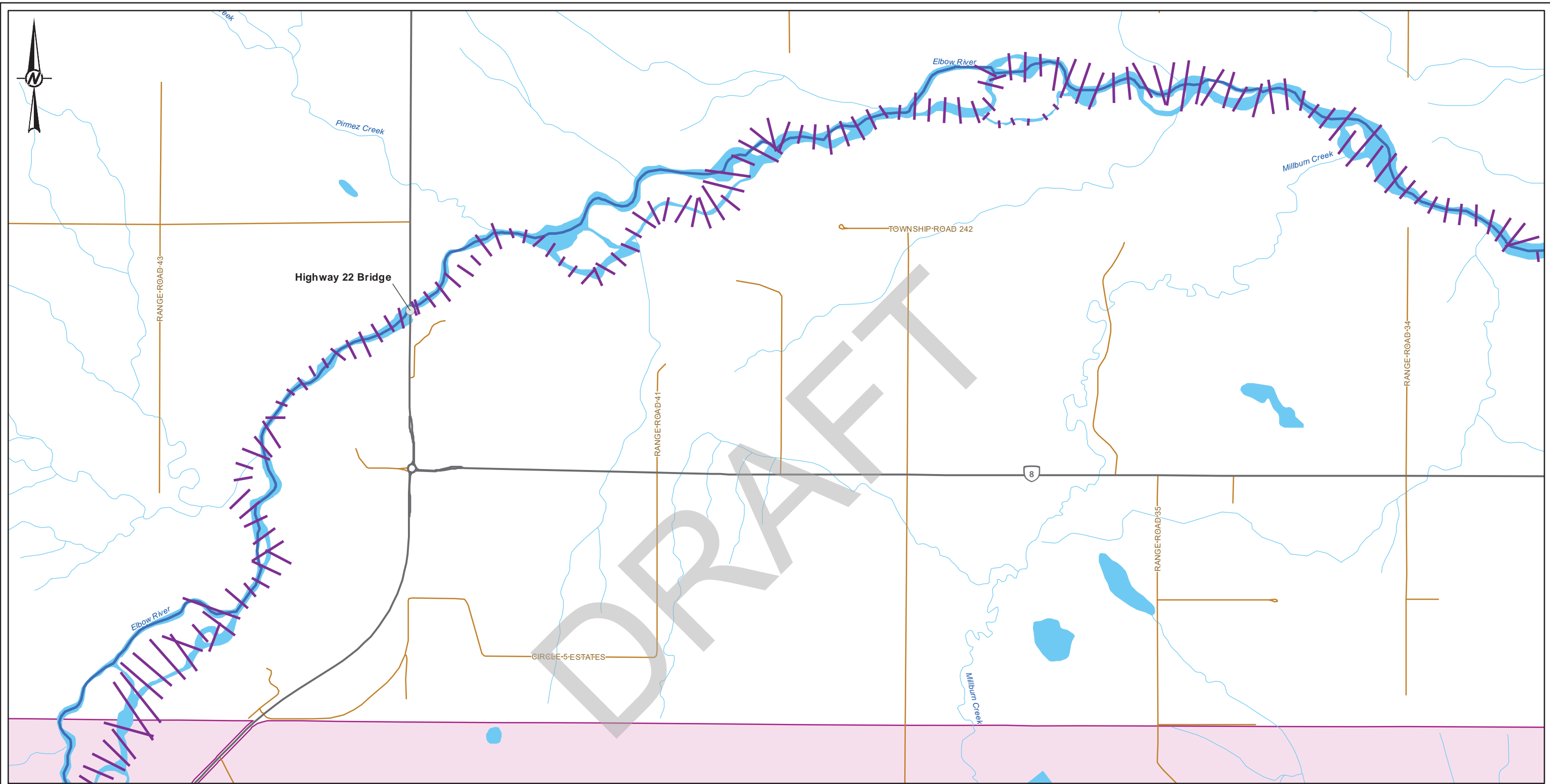
CONSULTANT	DATE	REVISION
	2017-06-09	DESIGNED
		PREPARED
		REVIEWED
		APPROVED

REFERENCE(S)
 POPULATED PLACES AND HYDROGRAPHY OBTAINED FROM ALTALIS, © GOVERNMENT OF ALBERTA 2015. ALL RIGHTS RESERVED.
 ROADS AND RAILWAYS OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
 DATUM: NAD 83 CSRS PROJECTION: 3TM 114

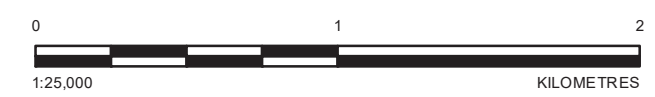
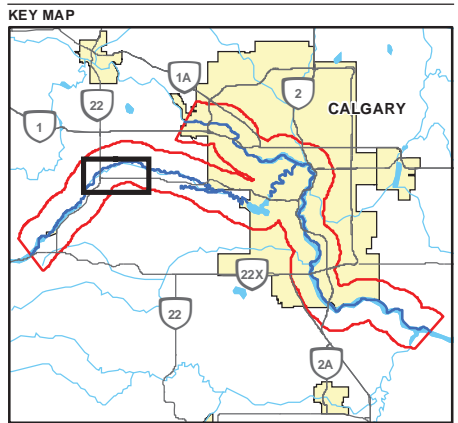
PROJECT
BOW AND ELBOW RIVER HAZARD STUDY

TITLE
CROSS SECTIONS, HYDRAULIC STRUCTURES AND FLOOD CONTROL STRUCTURES

PROJECT NO.	CONTROL	REV.	FIGURE
1536673		0	B-11



LEGEND	
	PRIMARY HIGHWAY
	SECONDARY HIGHWAY
	LOCAL ROAD
	RAILROAD
	WATERCOURSE
	WATERBODY
	POPULATED PLACE
	FIRST NATION
HYDRAULIC STRUCTURES	
	BRIDGE
	CULVERT
	DAM
	WEIR
	OTHER
	FLOOD CONTROL STRUCTURE
	SURVEY REACH
	2015 BOW AND ELBOW RIVER HYDRAULIC MODEL CROSS SECTION
	SURVYED CROSS SECTION



CLIENT
ALBERTA ENVIRONMENT AND PARKS

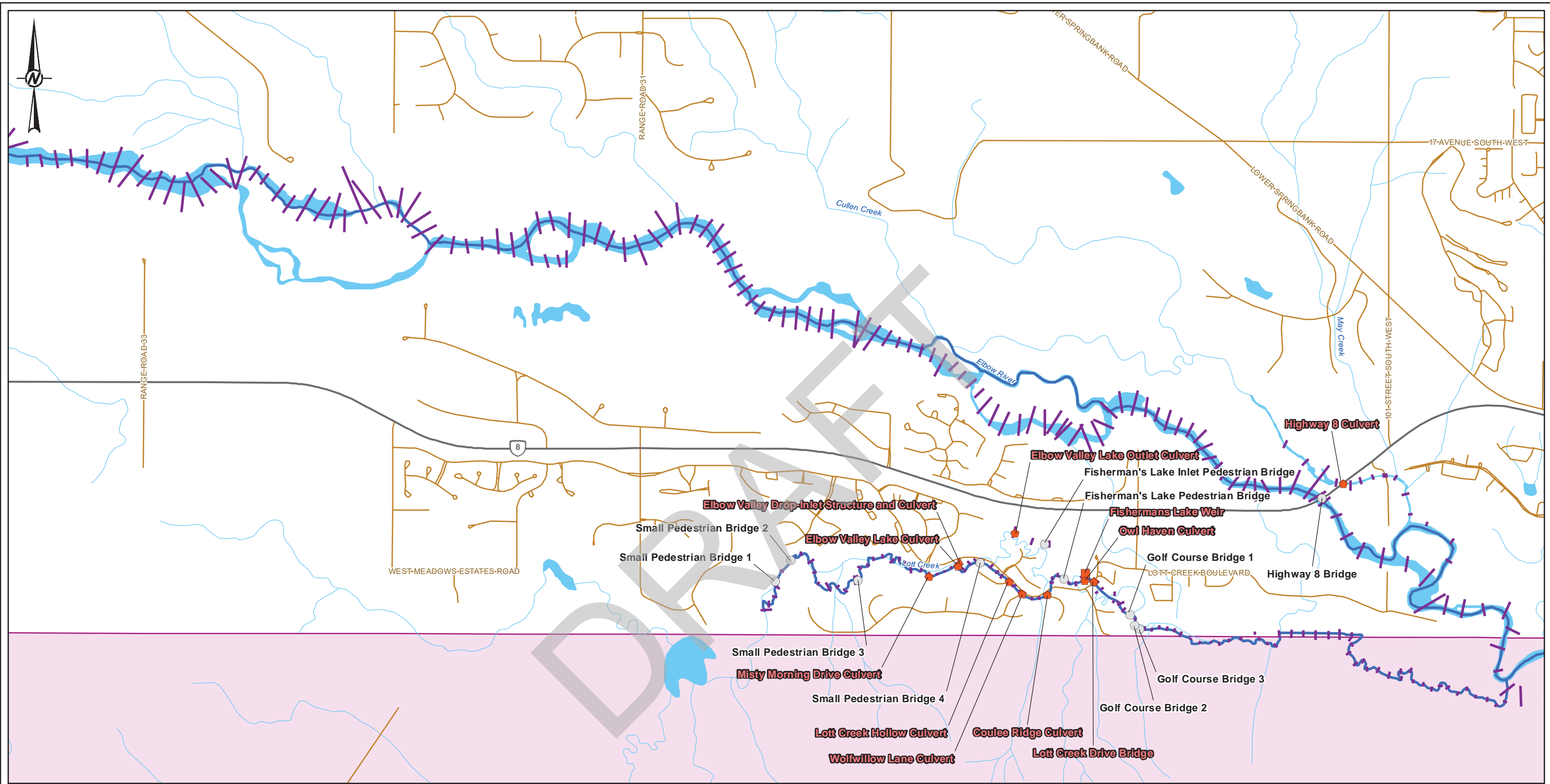
CONSULTANT	DATE	DESCRIPTION
	2017-06-09	DESIGNED
		PREPARED
		REVIEWED
		APPROVED

REFERENCE(S)
 POPULATED PLACES AND HYDROGRAPHY OBTAINED FROM ALTALIS, © GOVERNMENT OF ALBERTA 2015. ALL RIGHTS RESERVED.
 ROADS AND RAILWAYS OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
 DATUM: NAD 83 CSRS PROJECTION: 3TM 114

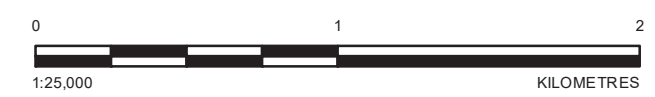
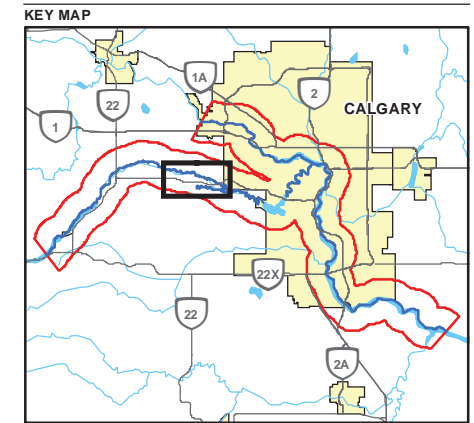
PROJECT
BOW AND ELBOW RIVER HAZARD STUDY

TITLE
CROSS SECTIONS, HYDRAULIC STRUCTURES AND FLOOD CONTROL STRUCTURES

PROJECT NO.	CONTROL	REV.	FIGURE
1536673		0	B-12



LEGEND	
	PRIMARY HIGHWAY
	SECONDARY HIGHWAY
	LOCAL ROAD
	RAILROAD
	WATERCOURSE
	WATERBODY
	POPULATED PLACE
	FIRST NATION
	BRIDGE
	CULVERT
	DAM
	WEIR
	OTHER
	FLOOD CONTROL STRUCTURE
	SURVEY REACH
	2015 BOW AND ELBOW RIVER HYDRAULIC MODEL CROSS SECTION
	SURVEYED CROSS SECTION

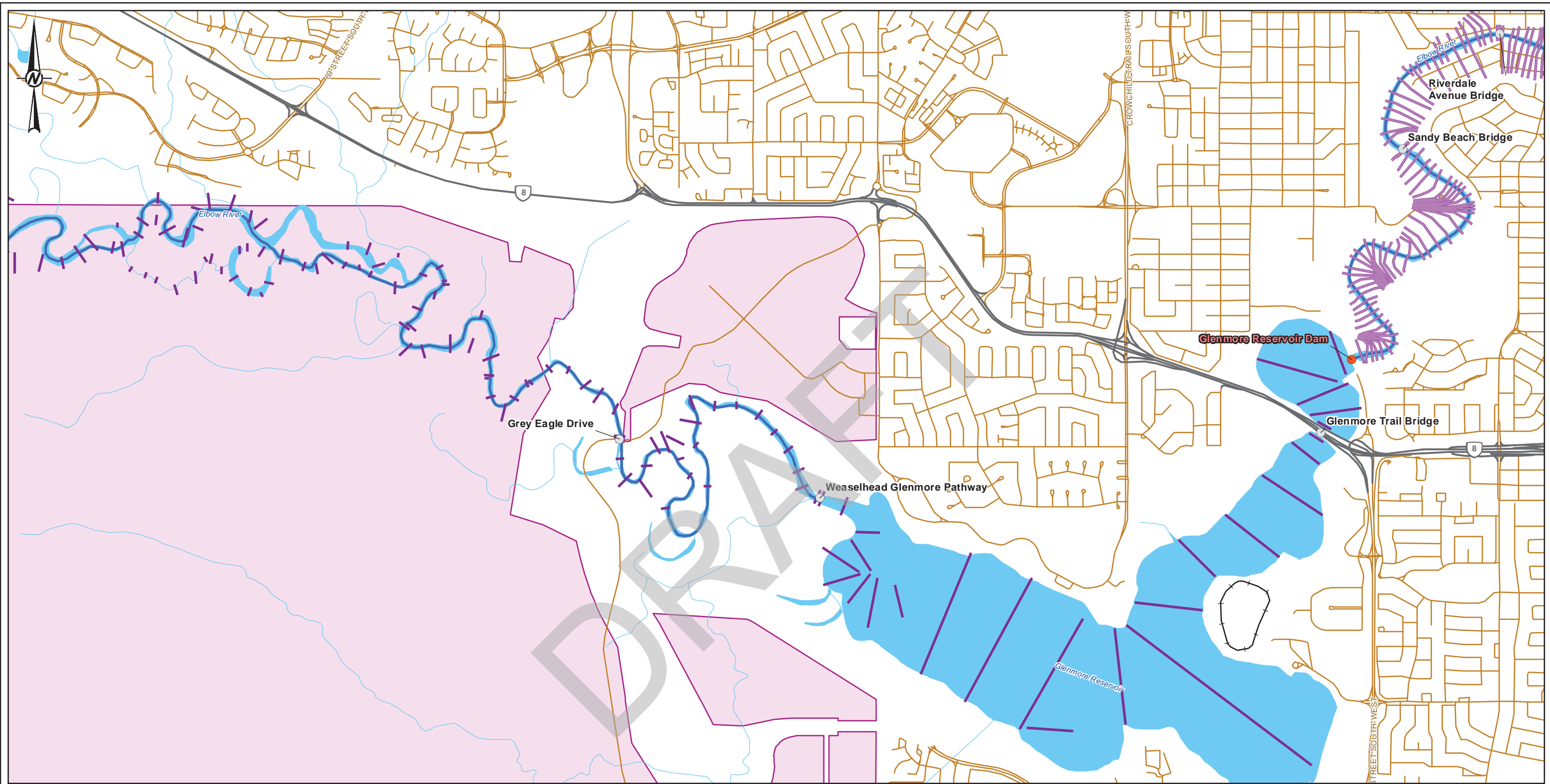


CLIENT
ALBERTA ENVIRONMENT AND PARKS

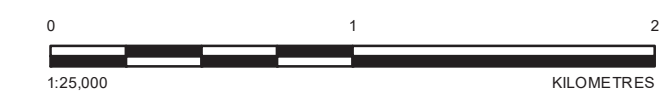
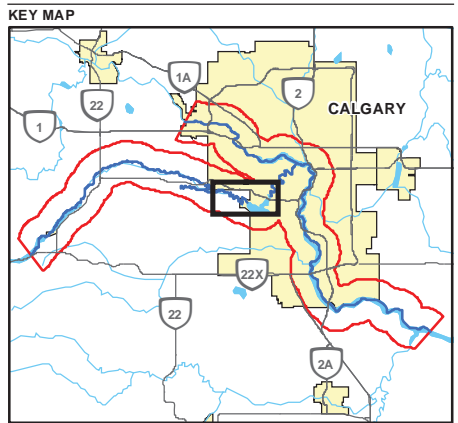
CONSULTANT	DATE	DESCRIPTION
	YYYY-MM-DD	2017-06-09
	DESIGNED	W.PLOEGER
	PREPARED	P.THIEDE
	REVIEWED	W.PLOEGER
	APPROVED	D.LONG

REFERENCE(S)
POPULATED PLACES AND HYDROGRAPHY OBTAINED FROM ALTALIS, © GOVERNMENT OF ALBERTA 2015. ALL RIGHTS RESERVED.
ROADS AND RAILWAYS OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

PROJECT		TITLE	
BOW AND ELBOW RIVER HAZARD STUDY		CROSS SECTIONS, HYDRAULIC STRUCTURES AND FLOOD CONTROL STRUCTURES	
PROJECT NO.	CONTROL	REV.	FIGURE
1536673		0	B-13



LEGEND	
	PRIMARY HIGHWAY
	SECONDARY HIGHWAY
	LOCAL ROAD
	RAILROAD
	WATERCOURSE
	WATERBODY
	POPULATED PLACE
	FIRST NATION
	BRIDGE
	CULVERT
	DAM
	WEIR
	OTHER
	FLOOD CONTROL STRUCTURE
	SURVEY REACH
	2015 BOW AND ELBOW RIVER HYDRAULIC MODEL CROSS SECTION
	SURVEYED CROSS SECTION



CLIENT
ALBERTA ENVIRONMENT AND PARKS

CONSULTANT	DATE	DESCRIPTION
	YYYY-MM-DD	2017-06-09
	DESIGNED	W.PLOEGER
	PREPARED	P.THIEDE
	REVIEWED	W.PLOEGER
	APPROVED	D.LONG

REFERENCE(S)
POPULATED PLACES AND HYDROGRAPHY OBTAINED FROM ALTALIS, © GOVERNMENT OF ALBERTA 2015. ALL RIGHTS RESERVED.
ROADS AND RAILWAYS OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

PROJECT		TITLE	
BOW AND ELBOW RIVER HAZARD STUDY		CROSS SECTIONS, HYDRAULIC STRUCTURES AND FLOOD CONTROL STRUCTURES	
PROJECT NO.	CONTROL	REV.	FIGURE
1536673		0	B-14



APPENDIX C

Hydraulic Structures Datasheets

DRAFT

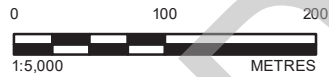


PHOTO 1 LEFT BANK, LOOKING DOWNSTREAM



PHOTO 2 LEFT BANK, LOOKING UPSTREAM



TITLE
STONEY TRAIL BRIDGE

LOCATION	BOW RIVER
DESCRIPTION	-
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	78812
YEAR BUILT	1998
TOTAL LENGTH OF SPAN (m)	476
DECK WIDTH OF BRIDGE (m)	21.5
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1078.95
AVERAGE LOW CHORD ELEVATION (m)	1078.00
AVERAGE DECK HEIGHT	0.95
NUMBER OF PIERS	4

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	312.00	2.75	CONCRETE	TRAPEZOIDAL NOSE AND TAIL
2	414.00	2.75	CONCRETE	TRAPEZOIDAL NOSE AND TAIL
3	516.00	2.75	CONCRETE	TRAPEZOIDAL NOSE AND TAIL
4	618.00	2.75	CONCRETE	TRAPEZOIDAL NOSE AND TAIL
5	-	-	-	-
6	-	-	-	-

LEGEND

- BRIDGE SURVEY POINT
- ROAD
- PATHWAY

NOTE(S)

ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.

REFERENCE(S)

BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT

ALBERTA ENVIRONMENT AND PARKS

PROJECT

BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT



YYYY-MM-DD	2017-06-09
DESIGNED	W.PLOEGER
PREPARED	V.VALLIS
REVIEWED	W.PLOEGER
APPROVED	D.LONG

PROJECT NO.
1536673

CONTROL

REV.
0

FIGURE
C-1



TITLE
85TH STREET NW BRIDGE

LOCATION	BOW RIVER
DESCRIPTION	-
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	9795
YEAR BUILT	1963
TOTAL LENGTH OF SPAN (m)	130.6
DECK WIDTH OF BRIDGE (m)	12
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1076.26
AVERAGE LOW CHORD ELEVATION (m)	1074.35
AVERAGE DECK HEIGHT	1.91
NUMBER OF PIERS	3

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	168.88	1.2	CONCRETE	SEMI-CIRCULAR NOSE AND TAIL
2	202.41	1.2	CONCRETE	SEMI-CIRCULAR NOSE AND TAIL
3	235.95	1.2	CONCRETE	SEMI-CIRCULAR NOSE AND TAIL
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

LEGEND

- BRIDGE SURVEY POINT
- ROAD
- PATHWAY

NOTE(S)

ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH. ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.

REFERENCE(S)

BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT

ALBERTA ENVIRONMENT AND PARKS

PROJECT

BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT



YYYY-MM-DD	2017-06-09
DESIGNED	W.PLOEGER
PREPARED	V.VALLIS
REVIEWED	W.PLOEGER
APPROVED	D.LONG

PROJECT NO.
1536673

CONTROL

REV.
0

FIGURE
C-2

PHOTO 1 LEFT BANK, LOOKING DOWNSTREAM



PHOTO 2 LEFT BANK, ABUTMENT





TITLE
BOWMONT BRIDGE

LOCATION	BOW RIVER
DESCRIPTION	PEDESTRIAN BRIDGE
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	-
YEAR BUILT	1989
TOTAL LENGTH OF SPAN (m)	76.859
DECK WIDTH OF BRIDGE (m)	3
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1072.00
AVERAGE LOW CHORD ELEVATION (m)	1071.65
AVERAGE DECK HEIGHT	0.35
NUMBER OF PIERS	1

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	523.00	1.0	CONCRETE	RECTANGULAR
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

LEGEND

- BRIDGE SURVEY POINT
- ROAD
- PATHWAY

NOTE(S)

ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.

REFERENCE(S)

BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT

ALBERTA ENVIRONMENT AND PARKS

PROJECT

BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT



YYYY-MM-DD	2017-06-09
DESIGNED	W.PLOEGER
PREPARED	V.VALLIS
REVIEWED	W.PLOEGER
APPROVED	D.LONG

PROJECT NO.
1536673

CONTROL

REV.
0

FIGURE
C-3

PHOTO 1 RIGHT BANK, LOOKING UPSTREAM



PHOTO 2 LEFT BANK, ABUTMENT



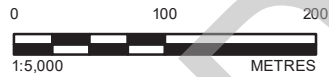
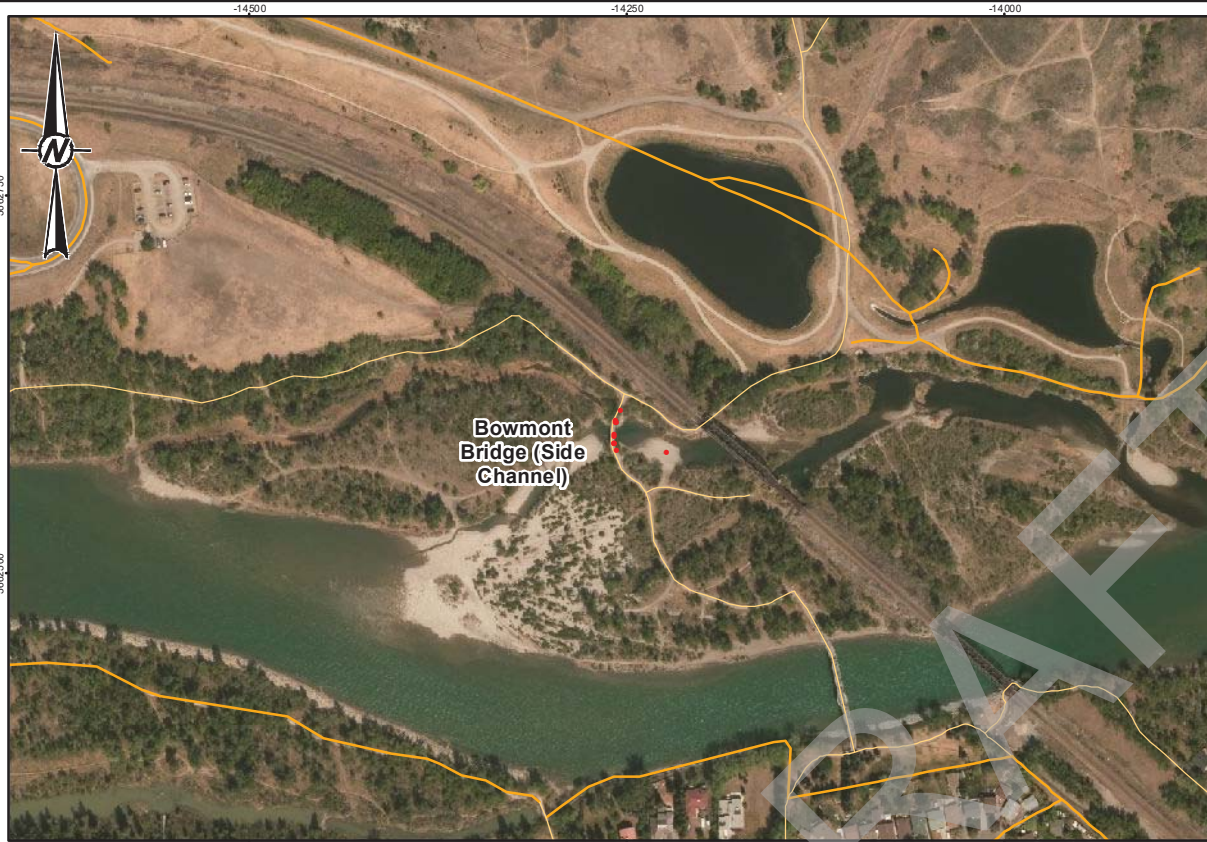


PHOTO 1 IN CHANNEL, LOOKING UPSTREAM



PHOTO 2 RIGHT BANK, LOOKING DOWNSTREAM



TITLE
BOWMONT BRIDGE (SIDE CHANNEL)

LOCATION	BOW RIVER
DESCRIPTION	PEDESTRIAN BRIDGE, SIDE CHANNEL PART OF BOWMONT BRIDGE
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	-
YEAR BUILT	1989
TOTAL LENGTH OF SPAN (m)	15
DECK WIDTH OF BRIDGE (m)	3
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1069.38
AVERAGE LOW CHORD ELEVATION (m)	1069.03
AVERAGE DECK HEIGHT	0.35
NUMBER OF PIERS	0

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	-	-	-	-
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

LEGEND

- BRIDGE SURVEY POINT
- ROAD
- PATHWAY

NOTE(S)

ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.

REFERENCE(S)

BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT

ALBERTA ENVIRONMENT AND PARKS

PROJECT

BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT



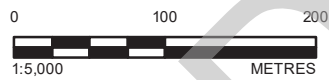
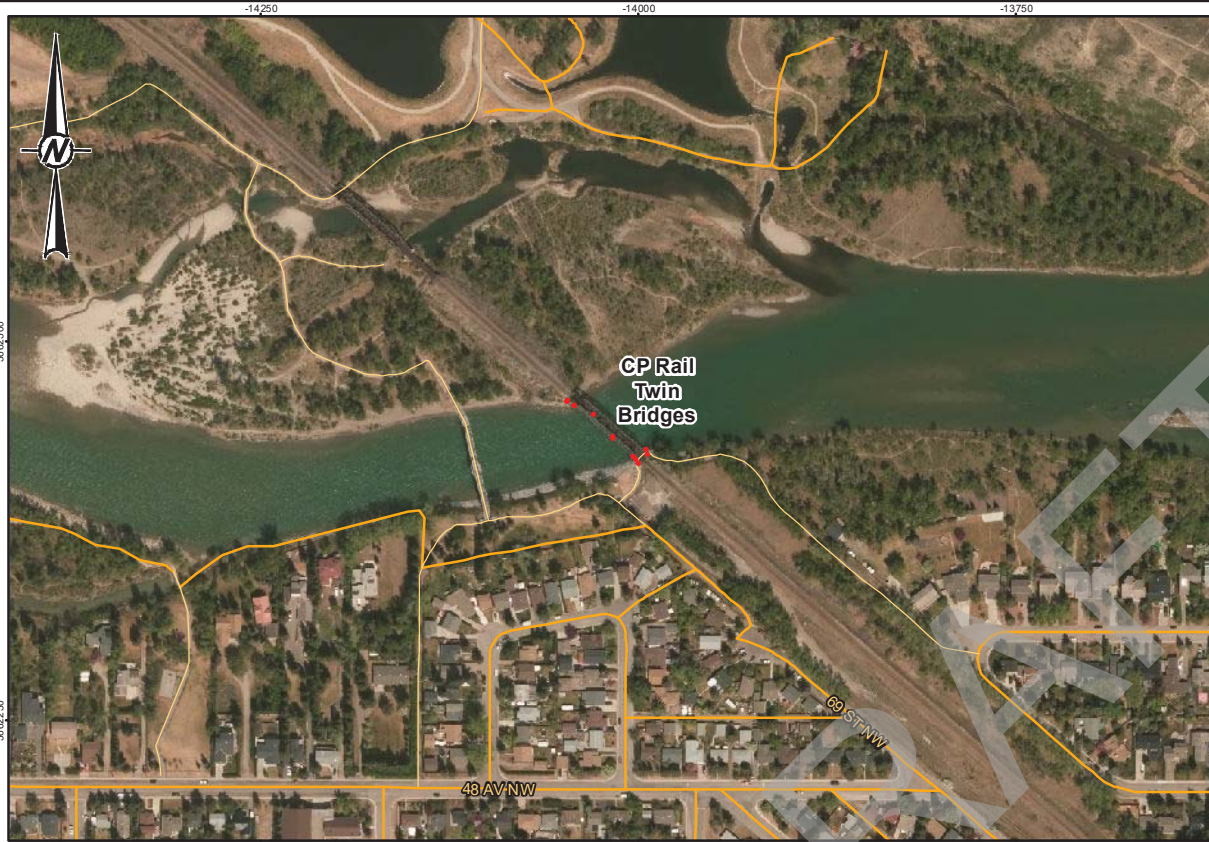
YYYY-MM-DD	2017-06-09
DESIGNED	W.PLOEGER
PREPARED	V.VALLIS
REVIEWED	W.PLOEGER
APPROVED	D.LONG

PROJECT NO.
1536673

CONTROL

REV.
0

FIGURE
C-4



TITLE
CP RAIL TWIN BRIDGES

LOCATION	BOW RIVER
DESCRIPTION	RAIL BRIDGE
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	-
YEAR BUILT	-
TOTAL LENGTH OF SPAN (m)	63
DECK WIDTH OF BRIDGE (m)	6.2
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1073.52
AVERAGE LOW CHORD ELEVATION (m)	1072.40
AVERAGE DECK HEIGHT	1.30
NUMBER OF PIERS	0

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	-	-	-	-
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

LEGEND

- BRIDGE SURVEY POINT
- ROAD
- PATHWAY

NOTE(S)

ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.

REFERENCE(S)

BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT

ALBERTA ENVIRONMENT AND PARKS

PROJECT

BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT



YYYY-MM-DD	2017-06-09
DESIGNED	W.PLOEGER
PREPARED	V.VALLIS
REVIEWED	W.PLOEGER
APPROVED	D.LONG

PROJECT NO.
1536673

CONTROL

REV.
0

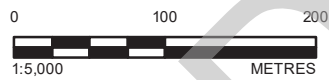
FIGURE
C-5

PHOTO 1 RIGHT BANK, LOOKING DOWNSTREAM



PHOTO 2 RIGHT BANK, LOOKING DOWNSTREAM





TITLE
CP RAIL TWIN BRIDGES (SIDE CHANNEL)

LOCATION	BOW RIVER
DESCRIPTION	RAIL BRIDGE, SIDE CHANNEL PART OF CP RAIL TWIN BRIDGES
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	-
YEAR BUILT	-
TOTAL LENGTH OF SPAN (m)	69
DECK WIDTH OF BRIDGE (m)	6.2
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1073.02
AVERAGE LOW CHORD ELEVATION (m)	1071.73
AVERAGE DECK HEIGHT	1.30
NUMBER OF PIERS	0

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	-	-	-	-
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

- LEGEND**
- BRIDGE SURVEY POINT
 - ROAD
 - PATHWAY

NOTE(S)
ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.
REFERENCE(S)
BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT
ALBERTA ENVIRONMENT AND PARKS

PROJECT
BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT	YYYY-MM-DD	2017-06-09
	DESIGNED	W.PLOEGER
	PREPARED	V.VALLIS
	REVIEWED	W.PLOEGER
	APPROVED	D.LONG



PHOTO 1 RIGHT BANK, LOOKING AT LEFT BANK ABUTMENT

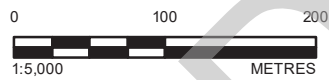


PHOTO 2 RIGHT BANK, LOOKING DOWNSTREAM



IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM ANS/A

25mm



TITLE
HEXTALL BRIDGE

LOCATION	BOW RIVER
DESCRIPTION	PEDESTRIAN BRIDGE UPSTREAM OF BOWNESS ROAD
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	6686
YEAR BUILT	1911
TOTAL LENGTH OF SPAN (m)	118.64
DECK WIDTH OF BRIDGE (m)	8
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1065.90
AVERAGE LOW CHORD ELEVATION (m)	1065.06
AVERAGE DECK HEIGHT	0.84
NUMBER OF PIERS	2

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	328.82	1.6	CONCRETE	TRIANGULAR NOSE
2	368.32	1.6	CONCRETE	TRIANGULAR NOSE
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

- LEGEND**
- BRIDGE SURVEY POINT
 - ROAD
 - PATHWAY

NOTE(S)
ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.
REFERENCE(S)
BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT
ALBERTA ENVIRONMENT AND PARKS

PROJECT
BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT	YYYY-MM-DD	2017-06-09
	DESIGNED	W.PLOEGER
	PREPARED	V.VALLIS
	REVIEWED	W.PLOEGER
	APPROVED	D.LONG



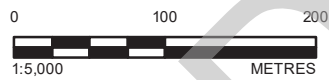
PHOTO 1 RIGHT BANK, ABUTMENT



PHOTO 2 RIGHT BANK, LOOKING DOWNSTREAM



IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM ANSA



TITLE
SHOULDICE BRIDGE

LOCATION	BOW RIVER
DESCRIPTION	BOWNESS ROAD
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	-
YEAR BUILT	1986
TOTAL LENGTH OF SPAN (m)	130.5
DECK WIDTH OF BRIDGE (m)	10.8
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1067.60
AVERAGE LOW CHORD ELEVATION (m)	1064.81
AVERAGE DECK HEIGHT	2.80
NUMBER OF PIERS	2

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	328.14	1.6	CONCRETE	TRIANGULAR NOSE
2	375.64	1.6	CONCRETE	TRIANGULAR NOSE
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

LEGEND

- BRIDGE SURVEY POINT
- ROAD
- PATHWAY

NOTE(S)

ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.

REFERENCE(S)

BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT

ALBERTA ENVIRONMENT AND PARKS

PROJECT

BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT



YYYY-MM-DD	2017-06-09
DESIGNED	W.PLOEGER
PREPARED	V.VALLIS
REVIEWED	W.PLOEGER
APPROVED	D.LONG

PROJECT NO.
1536673

CONTROL

REV.
0

FIGURE
C-8

PHOTO 1 RIGHT BANK, LOOKING UPSTREAM



PHOTO 2 RIGHT BANK, ABUTMENT



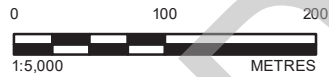


PHOTO 1 RIGHT BANK, LOOKING UPSTREAM



PHOTO 2 RIGHT BANK, ABUTMENT



TITLE
TRANS-CANADA HIGHWAY BRIDGE

LOCATION	BOW RIVER
DESCRIPTION	16TH AVENUE NW
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	74360
YEAR BUILT	1958
TOTAL LENGTH OF SPAN (m)	168.293
DECK WIDTH OF BRIDGE (m)	19
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1067.20
AVERAGE LOW CHORD ELEVATION (m)	1065.51
AVERAGE DECK HEIGHT	1.69
NUMBER OF PIERS	4

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	435.20	1.0	CONCRETE	SEMI-CIRCULAR NOSE AND TAIL
2	473.00	1.0	CONCRETE	SEMI-CIRCULAR NOSE AND TAIL
3	510.80	1.0	CONCRETE	SEMI-CIRCULAR NOSE AND TAIL
4	548.61	1.0	CONCRETE	SEMI-CIRCULAR NOSE AND TAIL
5	-	-	-	-
6	-	-	-	-

- LEGEND**
- BRIDGE SURVEY POINT
 - ROAD
 - PATHWAY

NOTE(S)
ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.
REFERENCE(S)
BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

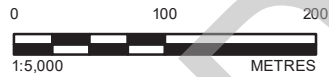
CLIENT
ALBERTA ENVIRONMENT AND PARKS

PROJECT
BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT	YYYY-MM-DD	2017-06-09
	DESIGNED	W.PLOEGER
	PREPARED	V.VALLIS
	REVIEWED	W.PLOEGER
	APPROVED	D.LONG



IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM ANSA



TITLE
HARRY BOOTHMAN BRIDGE

LOCATION	BOW RIVER
DESCRIPTION	EDWORTHY PARK PEDESTRIAN BRIDGE
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	-
YEAR BUILT	1977
TOTAL LENGTH OF SPAN (m)	131.408
DECK WIDTH OF BRIDGE (m)	4
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1061.33
AVERAGE LOW CHORD ELEVATION (m)	1059.97
AVERAGE DECK HEIGHT	1.35
NUMBER OF PIERS	4

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	88.57	0.56	CONCRETE	RECTANGULAR
2	124.49	0.56	CONCRETE	RECTANGULAR
3	160.49	0.56	CONCRETE	RECTANGULAR
4	195.99	0.56	CONCRETE	RECTANGULAR
5	-	-	-	-
6	-	-	-	-

LEGEND

- BRIDGE SURVEY POINT
- ROAD
- PATHWAY

NOTE(S)

ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.

REFERENCE(S)

BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT

ALBERTA ENVIRONMENT AND PARKS

PROJECT

BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT



YYYY-MM-DD	2017-06-09
DESIGNED	W.PLOEGER
PREPARED	V.VALLIS
REVIEWED	W.PLOEGER
APPROVED	D.LONG

PROJECT NO.
1536673

CONTROL

REV.
0

FIGURE
C-10

PHOTO 1

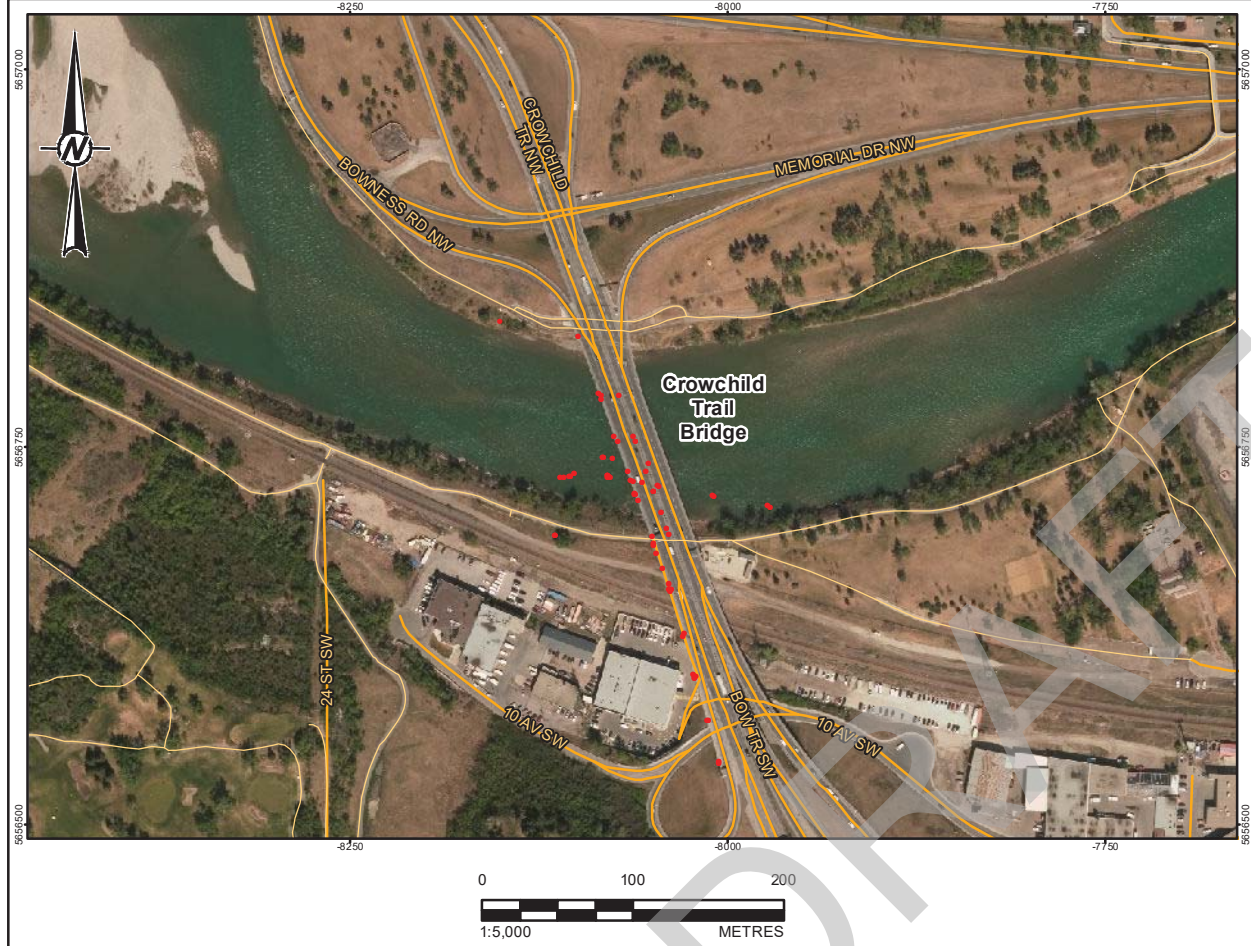
LEFT BANK, LOOKING DOWNSTREAM



PHOTO 2

RIGHT BANK, ABUTMENT





TITLE
CROWCHILD TRAIL BRIDGE

LOCATION	BOW RIVER
DESCRIPTION	-
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	75188
YEAR BUILT	1967
TOTAL LENGTH OF SPAN (m)	171.646
DECK WIDTH OF BRIDGE (m)	4
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1056.54
AVERAGE LOW CHORD ELEVATION (m)	1054.57
AVERAGE DECK HEIGHT	1.98
NUMBER OF PIERS	4

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	1553.61	1.5	CONCRETE	RECTANGULAR
2	1587.15	1.5	CONCRETE	RECTANGULAR
3	1624.65	1.5	CONCRETE	RECTANGULAR
4	1662.146	1.5	CONCRETE	RECTANGULAR
5	-	-	-	-
6	-	-	-	-

- LEGEND**
- BRIDGE SURVEY POINT
 - ROAD
 - PATHWAY

NOTE(S)
ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.
REFERENCE(S)
BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT
ALBERTA ENVIRONMENT AND PARKS

PROJECT
BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT	YYYY-MM-DD	2017-06-09
	DESIGNED	W.PLOEGER
	PREPARED	V.VALLIS
	REVIEWED	W.PLOEGER
	APPROVED	D.LONG



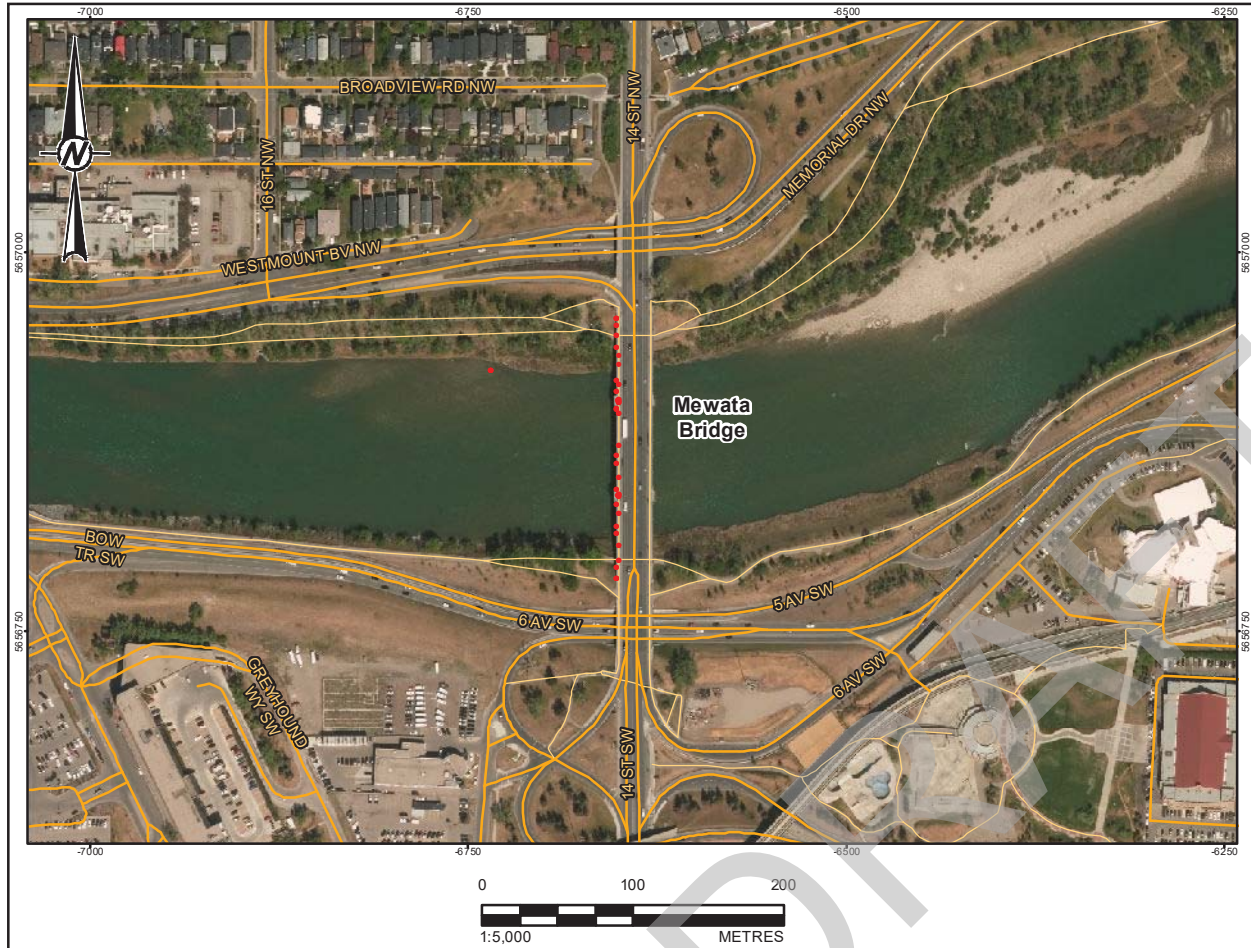
PHOTO 1 LEFT BANK, LOOKING DOWNSTREAM



PHOTO 2 LEFT BANK, ABUTMENT



IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM ANS/A 25mm



TITLE
MEWATA BRIDGE

LOCATION	BOW RIVER
DESCRIPTION	14TH STREET SW
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	74214
YEAR BUILT	1962
TOTAL LENGTH OF SPAN (m)	150
DECK WIDTH OF BRIDGE (m)	24.5
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1055.90
AVERAGE LOW CHORD ELEVATION (m)	1053.88
AVERAGE DECK HEIGHT	2.02
NUMBER OF PIERS	2

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	1468.61	1.0	CONCRETE	TRIANGULAR NOSE
2	1530.14	1.0	CONCRETE	TRIANGULAR NOSE
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

- LEGEND**
- BRIDGE SURVEY POINT
 - ROAD
 - PATHWAY

NOTE(S)
ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.
REFERENCE(S)
BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT
ALBERTA ENVIRONMENT AND PARKS

PROJECT
BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT	YYYY-MM-DD	2017-06-09
	DESIGNED	W.PLOEGER
	PREPARED	V.VALLIS
	REVIEWED	W.PLOEGER
	APPROVED	D.LONG



PHOTO 1 LEFT BANK, LOOKING UPSTREAM



PHOTO 2 LEFT BANK, LOOKING UPSTREAM



IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM ANSA



TITLE
LOUISE BRIDGE

LOCATION	BOW RIVER
DESCRIPTION	9TH, 10TH STREET SW
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	554
YEAR BUILT	1921
TOTAL LENGTH OF SPAN (m)	172.256
DECK WIDTH OF BRIDGE (m)	20.5
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1051.31
AVERAGE LOW CHORD ELEVATION (m)	1047.40
AVERAGE DECK HEIGHT	3.91
NUMBER OF PIERS	4

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	973.95	3.2	CONCRETE	TRIANGULAR NOSE
2	1009.01	3.2	CONCRETE	TRIANGULAR NOSE
3	1044.07	3.2	CONCRETE	TRIANGULAR NOSE
4	1079.13	3.2	CONCRETE	TRIANGULAR NOSE
5	-	-	-	-
6	-	-	-	-

- LEGEND**
- BRIDGE SURVEY POINT
 - ROAD
 - PATHWAY

NOTE(S)
ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.
REFERENCE(S)
BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT
ALBERTA ENVIRONMENT AND PARKS

PROJECT
BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT	YYYY-MM-DD	2017-06-09
	DESIGNED	W.PLOEGER
	PREPARED	V.VALLIS
	REVIEWED	W.PLOEGER
	APPROVED	D.LONG



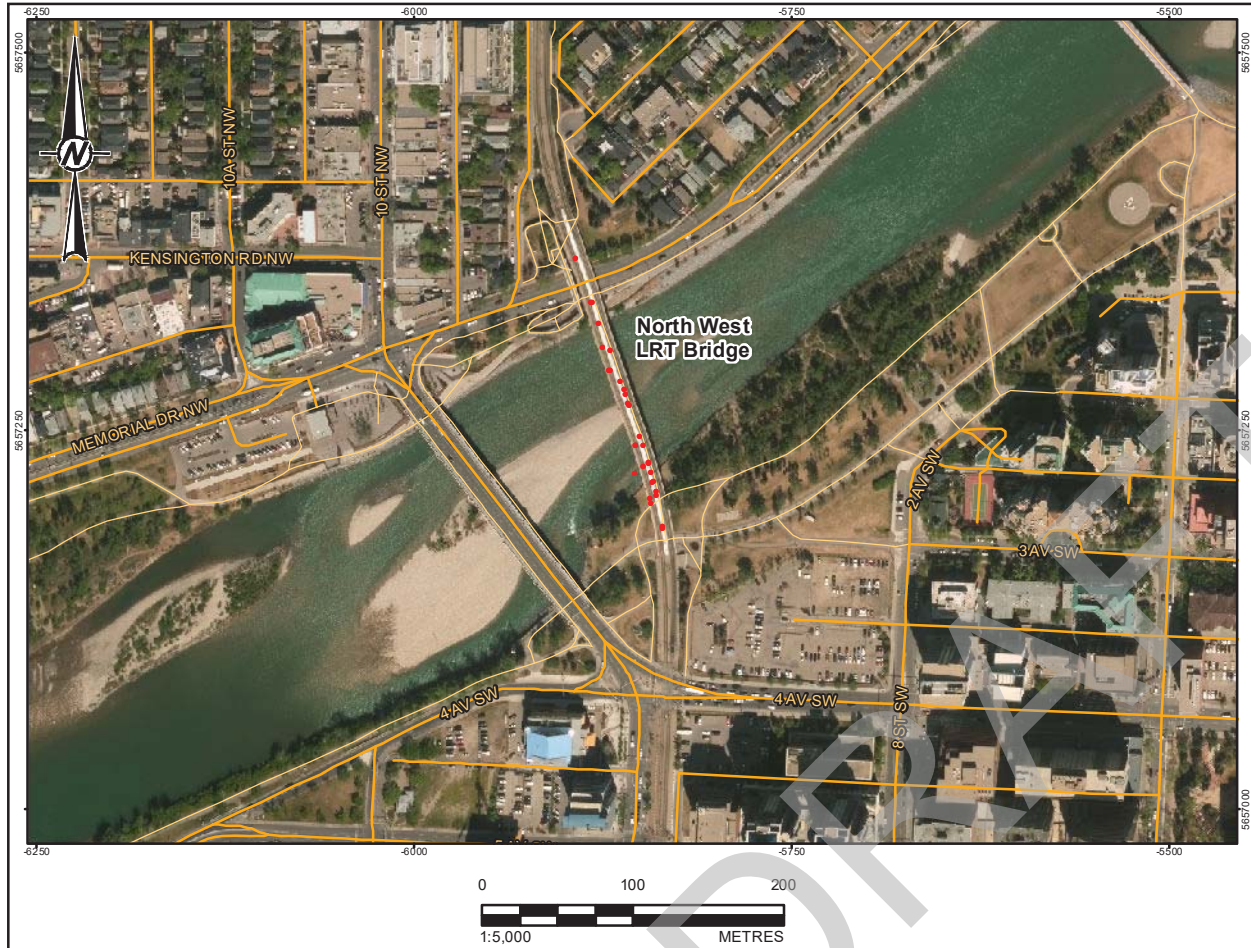
PHOTO 1 RIGHT BANK, LOOKING UPSTREAM



PHOTO 2 RIGHT BANK, LOOKING DOWNSTREAM



IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM ANSA



TITLE
NORTH WEST LRT BRIDGE

LOCATION	BOW RIVER
DESCRIPTION	-
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	-
YEAR BUILT	1986
TOTAL LENGTH OF SPAN (m)	171.9
DECK WIDTH OF BRIDGE (m)	12
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1050.06
AVERAGE LOW CHORD ELEVATION (m)	1048.71
AVERAGE DECK HEIGHT	1.35
NUMBER OF PIERS	3

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	896.37	1.0	CONCRETE	ROUNDED NOSE
2	952.37	1.0	CONCRETE	ROUNDED NOSE
3	1008.37	1.0	CONCRETE	ROUNDED NOSE
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

- LEGEND**
- BRIDGE SURVEY POINT
 - ROAD
 - PATHWAY

NOTE(S)
ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.
REFERENCE(S)
BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT
ALBERTA ENVIRONMENT AND PARKS

PROJECT
BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT	YYYY-MM-DD	2017-06-09
	DESIGNED	W.PLOEGER
	PREPARED	V.VALLIS
	REVIEWED	W.PLOEGER
	APPROVED	D.LONG



PHOTO 1 RIGHT BANK, ABUTMENT



PHOTO 2 RIGHT BANK, LOOKING DOWNSTREAM



IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM ANSA 25mm



TITLE
PEACE BRIDGE

LOCATION	BOW RIVER
DESCRIPTION	PEDESTRIAN BRIDGE
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	-
YEAR BUILT	2012
TOTAL LENGTH OF SPAN (m)	126
DECK WIDTH OF BRIDGE (m)	8.02
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1050.00
AVERAGE LOW CHORD ELEVATION (m)	1049.00
AVERAGE DECK HEIGHT	1.00
NUMBER OF PIERS	0

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	-	-	-	-
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

- LEGEND**
- BRIDGE SURVEY POINT
 - ROAD
 - PATHWAY

NOTE(S)
ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.
REFERENCE(S)
BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT
ALBERTA ENVIRONMENT AND PARKS

PROJECT
BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT	YYYY-MM-DD	2017-06-09
	DESIGNED	W.PLOEGER
	PREPARED	V.VALLIS
	REVIEWED	W.PLOEGER
	APPROVED	D.LONG



PHOTO 1 RIGHT BANK, ABUTMENT



PHOTO 2 RIGHT BANK, LOOKING DOWNSTREAM



IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM ANSA



TITLE
PRINCE'S ISLAND BRIDGE

LOCATION	BOW RIVER
DESCRIPTION	PEDESTRIAN BRIDGE
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	-
YEAR BUILT	1968
TOTAL LENGTH OF SPAN (m)	190.285
DECK WIDTH OF BRIDGE (m)	3.5
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1050.45
AVERAGE LOW CHORD ELEVATION (m)	1050.11
AVERAGE DECK HEIGHT	0.33
NUMBER OF PIERS	6

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	167.00	1.2	CONCRETE	RECTANGULAR
2	195.00	1.2	CONCRETE	ROUNDED NOSE
3	267.00	1.2	CONCRETE	RECTANGULAR
4	289.00	1.2	CONCRETE	RECTANGULAR
5	311.00	1.2	CONCRETE	RECTANGULAR
6	333.00	1.2	CONCRETE	RECTANGULAR

- LEGEND**
- BRIDGE SURVEY POINT
 - ROAD
 - PATHWAY

NOTE(S)
ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.
REFERENCE(S)
BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT
ALBERTA ENVIRONMENT AND PARKS

PROJECT
BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT	YYYY-MM-DD	2017-06-09
	DESIGNED	W.PLOEGER
	PREPARED	V.VALLIS
	REVIEWED	W.PLOEGER
	APPROVED	D.LONG



PHOTO 1 LEFT BANK, MEMORIAL DRIVE



PHOTO 2 LEFT BANK, LOOKING DOWNSTREAM



IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM ANSA



TITLE
JAIPUR BRIDGE

LOCATION	PRINCE'S ISLAND SIDE CHANNEL
DESCRIPTION	PRINCE'S ISLAND PEDESTRIAN BRIDGE
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	-
YEAR BUILT	1968
TOTAL LENGTH OF SPAN (m)	59.29
DECK WIDTH OF BRIDGE (m)	4
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1047.71
AVERAGE LOW CHORD ELEVATION (m)	1046.22
AVERAGE DECK HEIGHT	1.49
NUMBER OF PIERS	2

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	18.38	0.95	CONCRETE	TRAPEZOIDAL NOSE AND TAIL
2	39.72	0.95	CONCRETE	TRAPEZOIDAL NOSE AND TAIL
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

LEGEND

- BRIDGE SURVEY POINT
- ROAD
- PATHWAY

NOTE(S)

ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.

REFERENCE(S)

BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT

ALBERTA ENVIRONMENT AND PARKS

PROJECT

BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT



YYYY-MM-DD	2017-06-09
DESIGNED	W.PLOEGER
PREPARED	V.VALLIS
REVIEWED	W.PLOEGER
APPROVED	D.LONG

PROJECT NO.
1536673

CONTROL

REV.
0

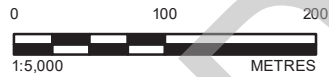
FIGURE
C-17

PHOTO 1 RIGHT BANK, LOOKING UPSTREAM



PHOTO 2 RIGHT BANK, ABUTMENT





TITLE
PRINCE'S ISLAND BRIDGE ON SIDE CHANNEL

LOCATION	PRINCE'S ISLAND SIDE CHANNEL
DESCRIPTION	DOWNSTREAM OF PRINCE'S LAGOON WEIRS
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	-
YEAR BUILT	-
TOTAL LENGTH OF SPAN (m)	40
DECK WIDTH OF BRIDGE (m)	3
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1045.50
AVERAGE LOW CHORD ELEVATION (m)	1045.10
AVERAGE DECK HEIGHT	0.40
NUMBER OF PIERS	0

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	-	-	-	-
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

- LEGEND**
- BRIDGE SURVEY POINT
 - ROAD
 - PATHWAY

NOTE(S)
ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.
REFERENCE(S)
BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT
ALBERTA ENVIRONMENT AND PARKS

PROJECT
BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT	YYYY-MM-DD	2017-06-09
	DESIGNED	W.PLOEGER
	PREPARED	V.VALLIS
	REVIEWED	W.PLOEGER
	APPROVED	D.LONG



PHOTO 1 RIGHT BANK, LOOKING DOWNSTREAM



PHOTO 2 RIGHT BANK, ABUTMENT



25mm IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM ANSA



TITLE
CENTRE STREET BRIDGE

LOCATION	BOW RIVER
DESCRIPTION	-
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	7438
YEAR BUILT	1916
TOTAL LENGTH OF SPAN (m)	198.945
DECK WIDTH OF BRIDGE (m)	21.5
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1052.12
AVERAGE LOW CHORD ELEVATION (m)	1045.63
AVERAGE DECK HEIGHT	6.49
NUMBER OF PIERS	3

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	131.31	3.5	CONCRETE	RECTANGULAR
2	173.92	3.5	CONCRETE	RECTANGULAR
3	216.53	3.5	CONCRETE	RECTANGULAR
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

- LEGEND**
- BRIDGE SURVEY POINT
 - ROAD
 - PATHWAY

NOTE(S)
ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.
REFERENCE(S)
BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT
ALBERTA ENVIRONMENT AND PARKS

PROJECT
BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT	YYYY-MM-DD	2017-06-09
	DESIGNED	W.PLOEGER
	PREPARED	V.VALLIS
	REVIEWED	W.PLOEGER
	APPROVED	D.LONG



PHOTO 1 RIGHT BANK, ABUTMENT



PHOTO 2 RIGHT BANK, LOOKING UPSTREAM



IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM ANSA

25mm

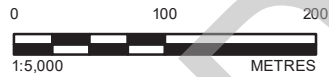


PHOTO 1 RIGHT BANK, LOOKING UPSTREAM



PHOTO 2 RIGHT BANK, ABUTMENT



TITLE
4TH AVENUE FLYOVER BRIDGE

LOCATION	BOW RIVER
DESCRIPTION	-
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	-
YEAR BUILT	1972
TOTAL LENGTH OF SPAN (m)	208
DECK WIDTH OF BRIDGE (m)	12.5
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1050.00
AVERAGE LOW CHORD ELEVATION (m)	1048.00
AVERAGE DECK HEIGHT	2.00
NUMBER OF PIERS	3

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	68.57	1.0	CONCRETE	SEMI-CIRCULAR NOSE AND TAIL
2	118.55	1.0	CONCRETE	SEMI-CIRCULAR NOSE AND TAIL
3	168.42	1.0	CONCRETE	SEMI-CIRCULAR NOSE AND TAIL
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

- LEGEND**
- BRIDGE SURVEY POINT
 - ROAD
 - PATHWAY

NOTE(S)
ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.
REFERENCE(S)
BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

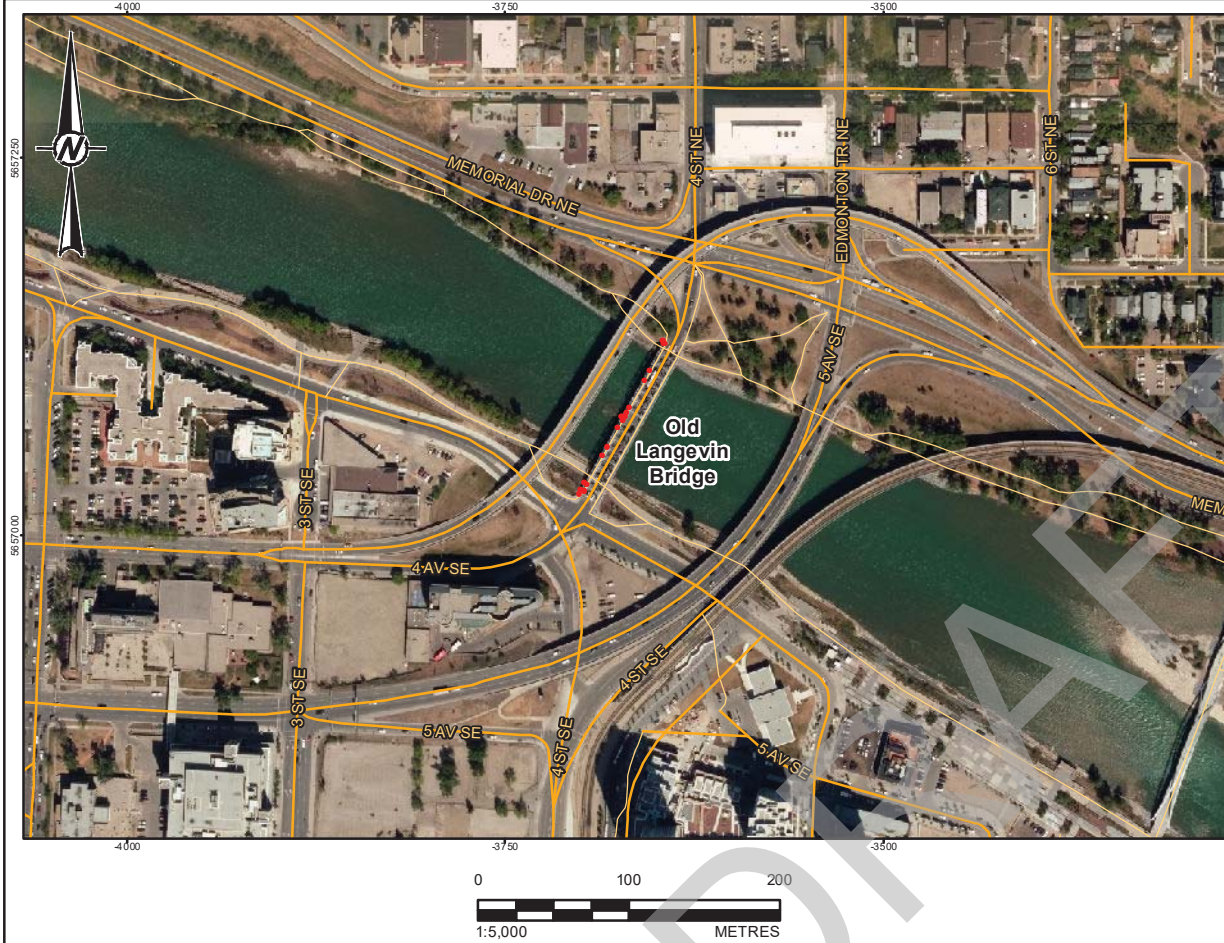
CLIENT
ALBERTA ENVIRONMENT AND PARKS

PROJECT
BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT	YYYY-MM-DD	2017-06-09
	DESIGNED	W.PLOEGER
	PREPARED	V.VALLIS
	REVIEWED	W.PLOEGER
	APPROVED	D.LONG



IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM ANSA



TITLE
OLD LANGEVIN BRIDGE

LOCATION	BOW RIVER
DESCRIPTION	4TH STREET NE
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	-
YEAR BUILT	1910
TOTAL LENGTH OF SPAN (m)	113.8
DECK WIDTH OF BRIDGE (m)	14.5
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1044.77
AVERAGE LOW CHORD ELEVATION (m)	1043.00
AVERAGE DECK HEIGHT	1.77
NUMBER OF PIERS	1

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	107.88	2.5	CONCRETE	TRIANGULAR NOSE
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

LEGEND

- BRIDGE SURVEY POINT
- ROAD
- PATHWAY

NOTE(S)

ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.

REFERENCE(S)

BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT

ALBERTA ENVIRONMENT AND PARKS

PROJECT

BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT



YYYY-MM-DD	2017-06-09
DESIGNED	W.PLOEGER
PREPARED	V.VALLIS
REVIEWED	W.PLOEGER
APPROVED	D.LONG

PROJECT NO.
1536673

CONTROL

REV.
0

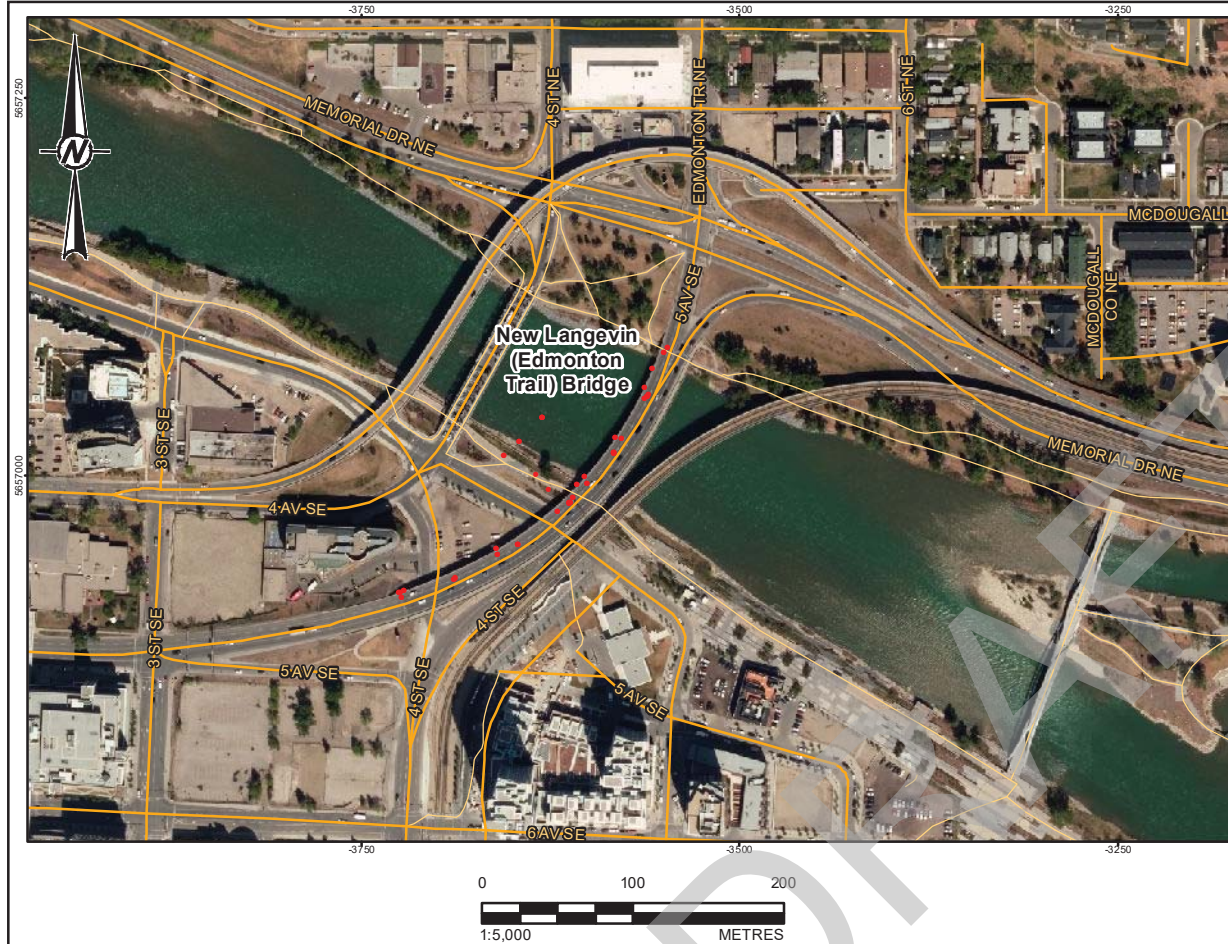
FIGURE
C-21

PHOTO 1 RIGHT BANK, LOOKING UPSTREAM



PHOTO 2 RIGHT BANK, LOOKING UPSTREAM





TITLE
NEW LANGEVIN (EDMONTON TRAIL) BRIDGE

LOCATION	BOW RIVER
DESCRIPTION	EDMONTON TRAIL
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	555
YEAR BUILT	1980
TOTAL LENGTH OF SPAN (m)	257.824
DECK WIDTH OF BRIDGE (m)	20.5
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1047.81
AVERAGE LOW CHORD ELEVATION (m)	1045.96
AVERAGE DECK HEIGHT	1.85
NUMBER OF PIERS	5

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	84.54	0.91	CONCRETE	TRIANGULAR NOSE
2	127.76	0.91	CONCRETE	TRIANGULAR NOSE
3	170.81	0.91	CONCRETE	TRIANGULAR NOSE
4	208.30	0.91	CONCRETE	TRIANGULAR NOSE
5	250.00	0.91	CONCRETE	TRIANGULAR NOSE
6	-	-	-	-

LEGEND

- BRIDGE SURVEY POINT
- ROAD
- PATHWAY

NOTE(S)

ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.

REFERENCE(S)

BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
 ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
 DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT

ALBERTA ENVIRONMENT AND PARKS

PROJECT

BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT



YYYY-MM-DD	2017-06-09
DESIGNED	W.PLOEGER
PREPARED	V.VALLIS
REVIEWED	W.PLOEGER
APPROVED	D.LONG

PROJECT NO.
1536673

CONTROL

REV.
0

FIGURE
C-22

PHOTO 1

RIGHT BANK, ABUTMENT

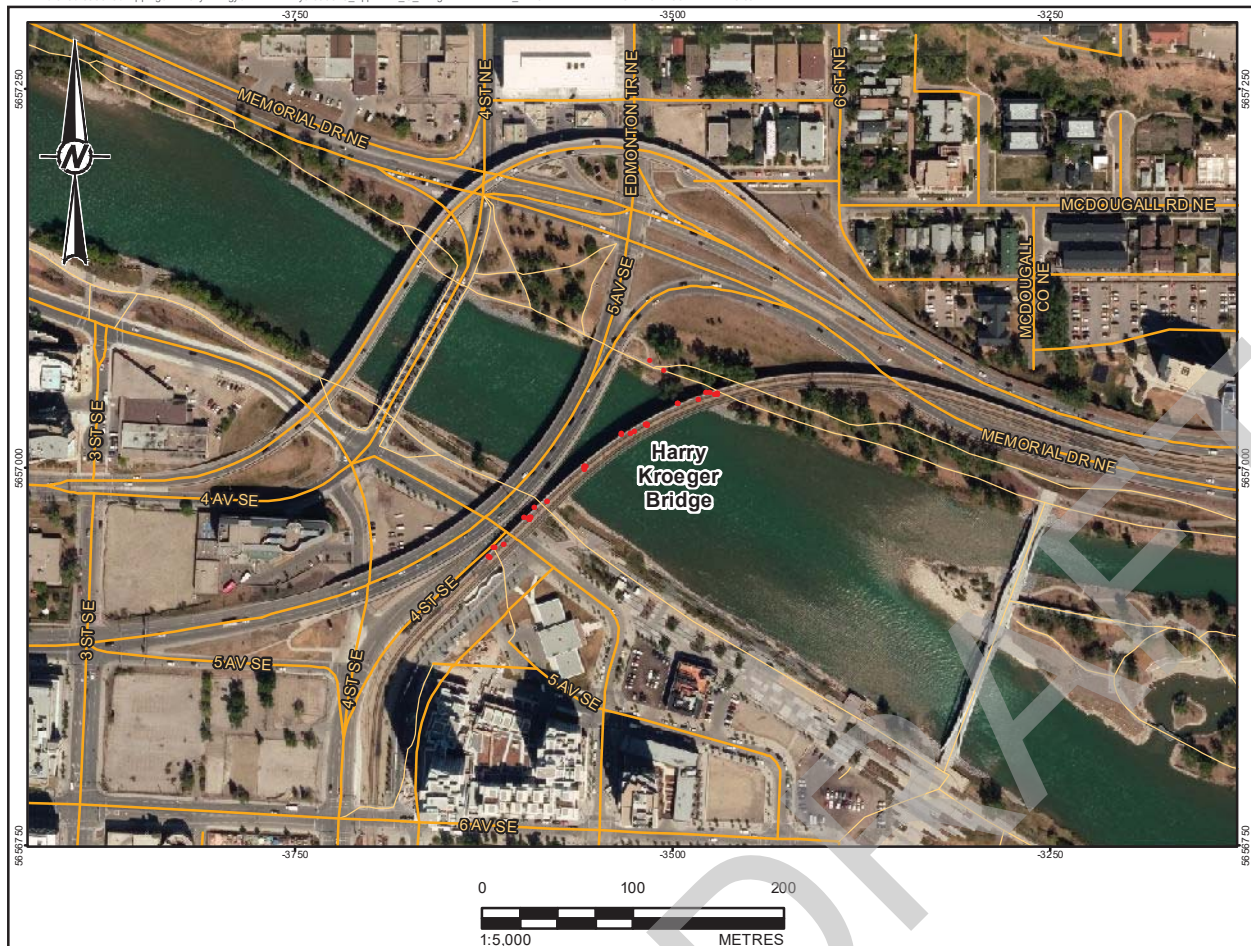


PHOTO 2

RIGHT BANK, LOOKING DOWNSTREAM



IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM ANSA 25mm



TITLE
HARRY KROEGER BRIDGE

LOCATION	BOW RIVER
DESCRIPTION	LRT BRIDGE
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	-
YEAR BUILT	1982
TOTAL LENGTH OF SPAN (m)	284.102
DECK WIDTH OF BRIDGE (m)	10.5
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1049.93
AVERAGE LOW CHORD ELEVATION (m)	1046.58
AVERAGE DECK HEIGHT	3.35
NUMBER OF PIERS	4

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	54.97	1.2	CONCRETE	SEMI-CIRCULAR NOSE AND TAIL
2	105.32	1.2	CONCRETE	SEMI-CIRCULAR NOSE AND TAIL
3	154.66	1.2	CONCRETE	SEMI-CIRCULAR NOSE AND TAIL
4	203.23	1.2	CONCRETE	SEMI-CIRCULAR NOSE AND TAIL
5	-	-	-	-
6	-	-	-	-

- LEGEND**
- BRIDGE SURVEY POINT
 - ROAD
 - PATHWAY

NOTE(S)
ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.
REFERENCE(S)
BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT
ALBERTA ENVIRONMENT AND PARKS

PROJECT
BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT	YYYY-MM-DD	2017-06-09
	DESIGNED	W.PLOEGER
	PREPARED	V.VALLIS
	REVIEWED	W.PLOEGER
	APPROVED	D.LONG



PHOTO 1 RIGHT BANK, ABUTMENT



PHOTO 2 RIGHT BANK, LOOKING DOWNSTREAM



IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM ANS/A

25mm



TITLE
ST. PATRICK'S ISLAND PEDESTRIAN BRIDGE

LOCATION	BOW RIVER
DESCRIPTION	PEDESTRIAN BRIDGE
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	-
YEAR BUILT	2015
TOTAL LENGTH OF SPAN (m)	101.571
DECK WIDTH OF BRIDGE (m)	8
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1044.38
AVERAGE LOW CHORD ELEVATION (m)	1044.08
AVERAGE DECK HEIGHT	0.50
NUMBER OF PIERS	0

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	-	-	-	-
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

- LEGEND**
- BRIDGE SURVEY POINT
 - ROAD
 - PATHWAY

NOTE(S)
ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.

REFERENCE(S)
BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT
ALBERTA ENVIRONMENT AND PARKS

PROJECT
BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT	YYYY-MM-DD	2017-06-09
	DESIGNED	W.PLOEGER
	PREPARED	V.VALLIS
	REVIEWED	W.PLOEGER
	APPROVED	D.LONG



PROJECT NO. 1536673	CONTROL	REV. 0	FIGURE C-24
-------------------------------	----------------	------------------	-----------------------

PHOTO 1 RIGHT BANK, LOOKING UPSTREAM



PHOTO 2 RIGHT BANK, LOOKING DOWNSTREAM



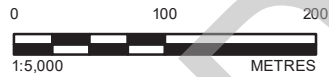
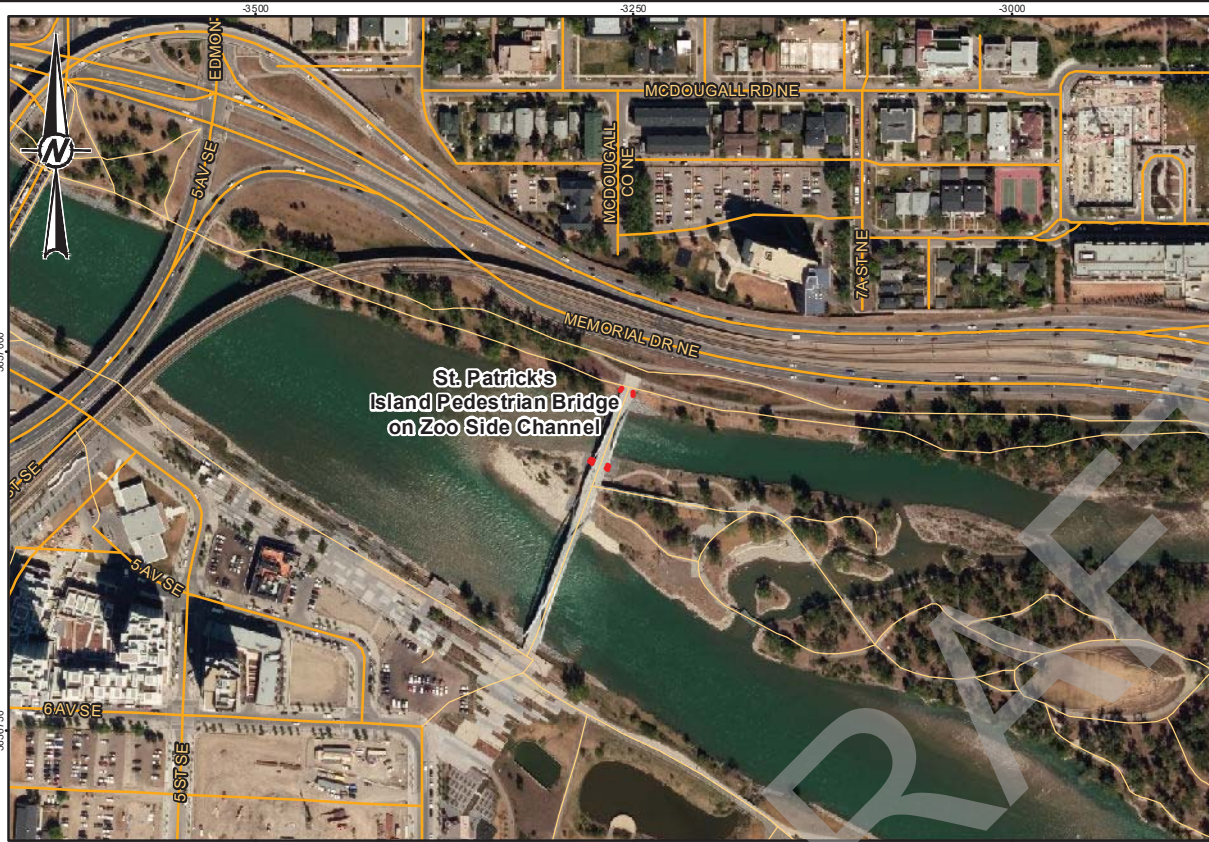


PHOTO 1 LEFT BANK, LOOKING UPSTREAM



PHOTO 2 LEFT BANK, ABUTMENT



TITLE
ST. PATRICK'S ISLAND PEDESTRIAN BRIDGE ON ZOO SIDE CHANNEL

LOCATION	ZOO SIDE CHANNEL
DESCRIPTION	PEDESTRIAN BRIDGE
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	-
YEAR BUILT	2015
TOTAL LENGTH OF SPAN (m)	46
DECK WIDTH OF BRIDGE (m)	8
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1044.40
AVERAGE LOW CHORD ELEVATION (m)	1044.10
AVERAGE DECK HEIGHT	0.50
NUMBER OF PIERS	0

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	-	-	-	-
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

- LEGEND**
- BRIDGE SURVEY POINT
 - ROAD
 - PATHWAY

NOTE(S)
ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.
REFERENCE(S)
BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

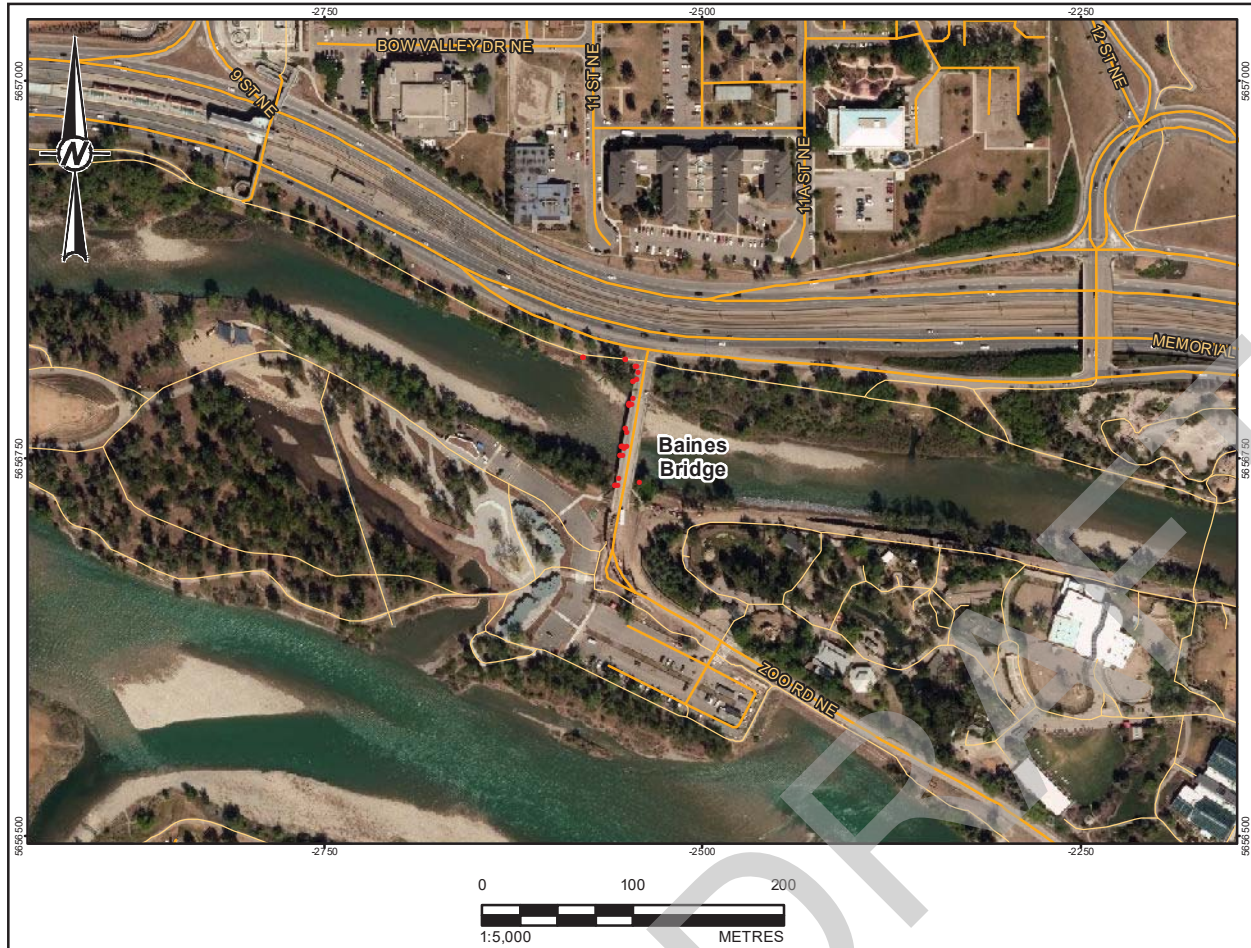
CLIENT
ALBERTA ENVIRONMENT AND PARKS

PROJECT
BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT	YYYY-MM-DD	2017-06-09
	DESIGNED	W.PLOEGER
	PREPARED	V.VALLIS
	REVIEWED	W.PLOEGER
	APPROVED	D.LONG



25mm IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM ANS/A



TITLE
BAINES BRIDGE

LOCATION ZOO SIDE CHANNEL

DESCRIPTION ZOO ROAD, 12TH STREET NE

ALBERTA TRANSPORTATION BRIDGE FILE NUMBER -

YEAR BUILT 1964

TOTAL LENGTH OF SPAN (m) 79.11

DECK WIDTH OF BRIDGE (m) 11.2

AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m) 1043.85

AVERAGE LOW CHORD ELEVATION (m) 1041.96

AVERAGE DECK HEIGHT 1.89

NUMBER OF PIERS 2

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	25.87	1.88	CONCRETE	TRIANGULAR NOSE
2	54.16	1.88	CONCRETE	TRIANGULAR NOSE
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

LEGEND

- BRIDGE SURVEY POINT
- ROAD
- PATHWAY

NOTE(S)

ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.

REFERENCE(S)

BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
 ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
 DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT
 ALBERTA ENVIRONMENT AND PARKS

PROJECT
 BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT	YYYY-MM-DD	2017-06-09
DESIGNED	W.PLOEGER	
PREPARED	V.VALLIS	
REVIEWED	W.PLOEGER	
APPROVED	D.LONG	



PROJECT NO. 1536673 CONTROL REV. 0 FIGURE C-26

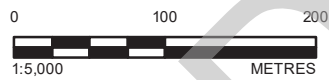
PHOTO 1 LEFT BANK, LOOKING DOWNSTREAM



PHOTO 2 LEFT BANK, ABUTMENT



IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM ANSA



TITLE
ST. GEORGE'S ISLAND BRIDGE

LOCATION	BOW RIVER
DESCRIPTION	12TH STREET SE
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	-
YEAR BUILT	1964
TOTAL LENGTH OF SPAN (m)	155.854
DECK WIDTH OF BRIDGE (m)	8.5
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1041.25
AVERAGE LOW CHORD ELEVATION (m)	1040.15
AVERAGE DECK HEIGHT	1.09
NUMBER OF PIERS	5

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	173.91	0.9	CONCRETE	ROUNDED NOSE
2	250.71	0.9	CONCRETE	ROUNDED NOSE
3	252.54	0.25	STEEL	RECTANGULAR
4	270.94	0.25	STEEL	RECTANGULAR
5	289.54	0.25	STEEL	RECTANGULAR
6	-	-	-	-

LEGEND

- BRIDGE SURVEY POINT
- ROAD
- PATHWAY

NOTE(S)

ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.

REFERENCE(S)

BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT

ALBERTA ENVIRONMENT AND PARKS

PROJECT

BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT



YYYY-MM-DD	2017-06-09
DESIGNED	W.PLOEGER
PREPARED	V.VALLIS
REVIEWED	W.PLOEGER
APPROVED	D.LONG

PROJECT NO.
1536673

CONTROL

REV.
0

FIGURE
C-27

PHOTO 1 RIGHT BANK, LOOKING UPSTREAM



PHOTO 2 RIGHT BANK, ABUTMENT



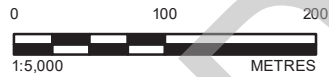
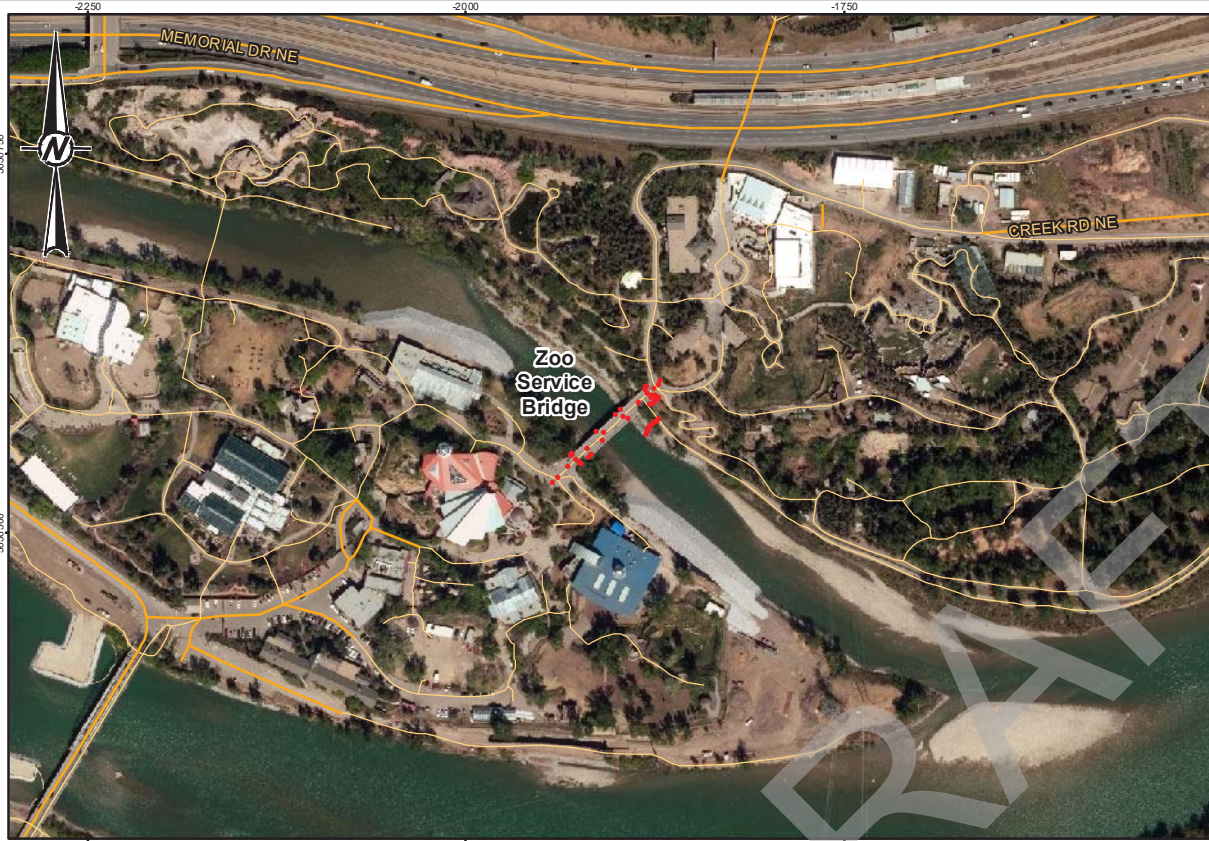
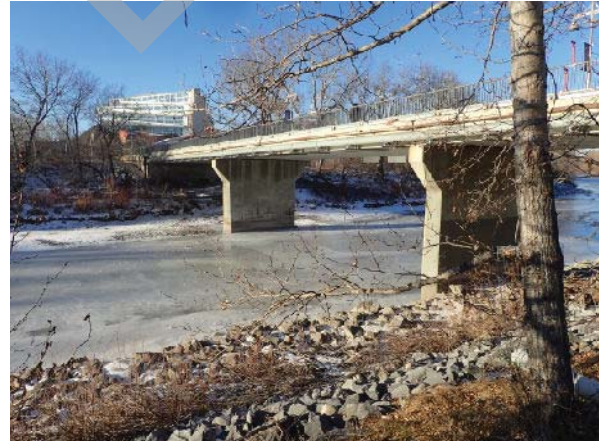


PHOTO 1 LEFT BANK, LOOKING UPSTREAM



PHOTO 2 LEFT BANK, LOOKING UPSTREAM



TITLE
ZOO SERVICE BRIDGE

LOCATION	ZOO SIDE CHANNEL
DESCRIPTION	ZOO SIDE CHANNEL
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	-
YEAR BUILT	1977
TOTAL LENGTH OF SPAN (m)	64.6
DECK WIDTH OF BRIDGE (m)	8.8
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1042.20
AVERAGE LOW CHORD ELEVATION (m)	1041.30
AVERAGE DECK HEIGHT	0.90
NUMBER OF PIERS	2

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	200.49	0.9	CONCRETE	TRIANGULAR NOSE
2	222.17	0.9	CONCRETE	TRIANGULAR NOSE
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

LEGEND

- BRIDGE SURVEY POINT
- ROAD
- PATHWAY

NOTE(S)

ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.

REFERENCE(S)

BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT

ALBERTA ENVIRONMENT AND PARKS

PROJECT

BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT



YYYY-MM-DD	2017-06-09
DESIGNED	W.PLOEGER
PREPARED	V.VALLIS
REVIEWED	W.PLOEGER
APPROVED	D.LONG

PROJECT NO.
1536673

CONTROL

REV.
0

FIGURE
C-28

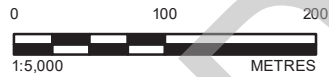


PHOTO 1 RIGHT BANK, LOOKING DOWNSTREAM



PHOTO 2 RIGHT BANK, LOOKING ACROSS THE RIVER



TITLE
CP RAIL BRIDGE

LOCATION	BOW RIVER
DESCRIPTION	RAIL BRIDGE NEAR NOSE CREEK CONFLUENCE
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	-
YEAR BUILT	-
TOTAL LENGTH OF SPAN (m)	162.9
DECK WIDTH OF BRIDGE (m)	6.3
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1039.90
AVERAGE LOW CHORD ELEVATION (m)	1038.90
AVERAGE DECK HEIGHT	1.00
NUMBER OF PIERS	4

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	55.43	2.8	CONCRETE	TRIANGULAR NOSE
2	97.86	2.8	CONCRETE	TRIANGULAR NOSE
3	138.56	2.8	CONCRETE	TRIANGULAR NOSE
4	179.27	2.8	CONCRETE	TRIANGULAR NOSE
5	-	-	-	-
6	-	-	-	-

LEGEND

- BRIDGE SURVEY POINT
- ROAD
- PATHWAY

NOTE(S)

ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.

REFERENCE(S)

BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT

ALBERTA ENVIRONMENT AND PARKS

PROJECT

BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT



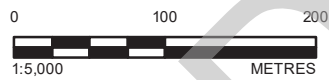
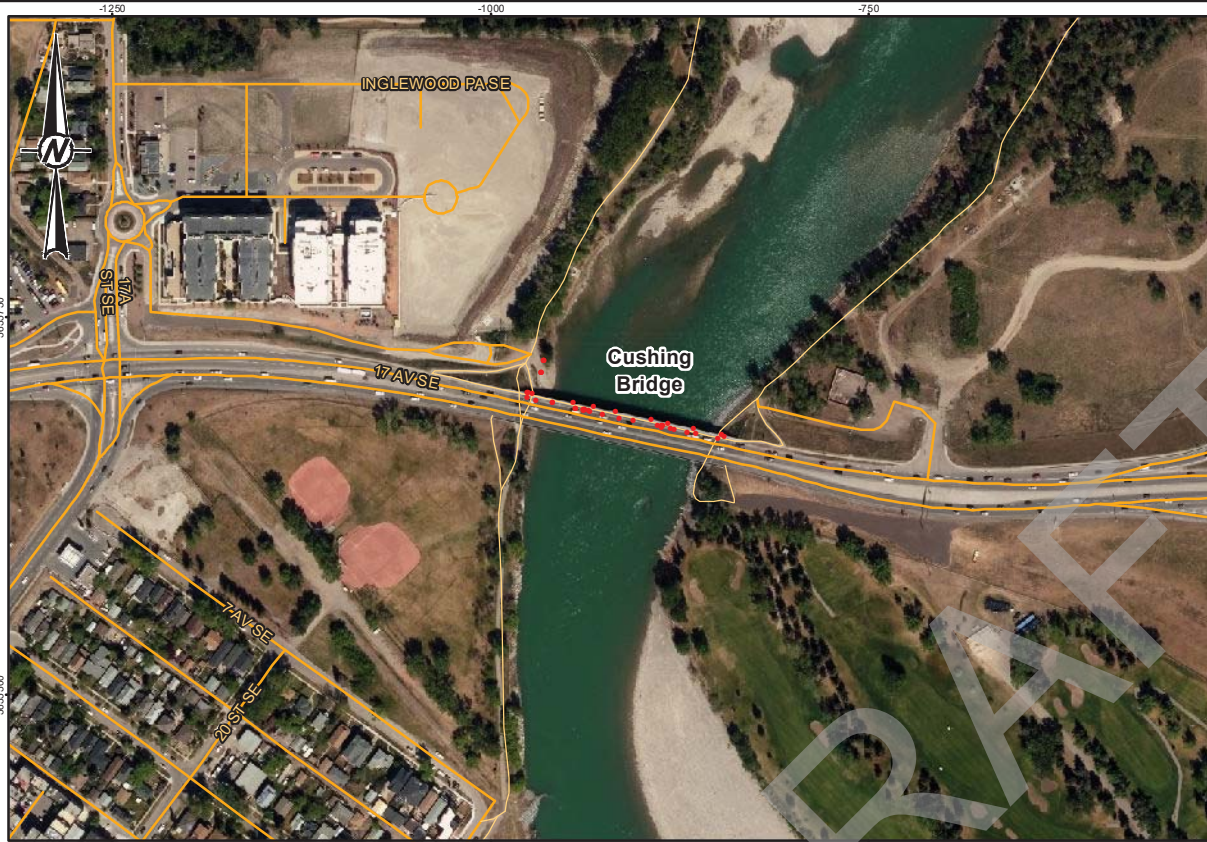
YYYY-MM-DD	2017-06-09
DESIGNED	W.PLOEGER
PREPARED	V.VALLIS
REVIEWED	W.PLOEGER
APPROVED	D.LONG

PROJECT NO.
1536673

CONTROL

REV.
0

FIGURE
C-29



TITLE
CUSHING BRIDGE

LOCATION	BOW RIVER
DESCRIPTION	BLACKFOOT TRAIL, 17TH AVENUE SE BRIDGE
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	2436
YEAR BUILT	1956
TOTAL LENGTH OF SPAN (m)	132.317
DECK WIDTH OF BRIDGE (m)	22.3
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1039.64
AVERAGE LOW CHORD ELEVATION (m)	1035.85
AVERAGE DECK HEIGHT	3.80
NUMBER OF PIERS	2

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	338.79	1.0	CONCRETE	TRIANGULAR NOSE
2	391.23	1.0	CONCRETE	TRIANGULAR NOSE
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

LEGEND

- BRIDGE SURVEY POINT
- ROAD
- PATHWAY

NOTE(S)

ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.

REFERENCE(S)

BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT

ALBERTA ENVIRONMENT AND PARKS

PROJECT

BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT



YYYY-MM-DD	2017-06-09
DESIGNED	W.PLOEGER
PREPARED	V.VALLIS
REVIEWED	W.PLOEGER
APPROVED	D.LONG

PROJECT NO.
1536673

CONTROL

REV.
0

FIGURE
C-30

PHOTO 1 LEFT BANK, LOOKING UPSTREAM



PHOTO 2 LEFT BANK, LOOKING UPSTREAM





TITLE
CN RAIL BRIDGE (BONNYBROOK)

LOCATION	BOW RIVER
DESCRIPTION	RAIL BRIDGE
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	-
YEAR BUILT	-
TOTAL LENGTH OF SPAN (m)	152.636
DECK WIDTH OF BRIDGE (m)	6
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1037.01
AVERAGE LOW CHORD ELEVATION (m)	1035.44
AVERAGE DECK HEIGHT	1.56
NUMBER OF PIERS	2

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	374.92	6.3	CONCRETE	RECTANGULAR
2	447.73	6.3	CONCRETE	RECTANGULAR
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

LEGEND

- BRIDGE SURVEY POINT
- ROAD
- PATHWAY

NOTE(S)

ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.

REFERENCE(S)

BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
 ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
 DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT

ALBERTA ENVIRONMENT AND PARKS

PROJECT

BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT



YYYY-MM-DD	2017-06-09
DESIGNED	W.PLOEGER
PREPARED	V.VALLIS
REVIEWED	W.PLOEGER
APPROVED	D.LONG

PROJECT NO.
1536673

CONTROL

REV.
0

FIGURE
C-31

PHOTO 1 LEFT BANK, LOOKING UPSTREAM



PHOTO 2 LEFT BANK, ABUTMENT





TITLE
CP RAIL BRIDGE (BONNYBROOK)

LOCATION	BOW RIVER
DESCRIPTION	RAIL BRIDGE
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	-
YEAR BUILT	1897
TOTAL LENGTH OF SPAN (m)	142.307
DECK WIDTH OF BRIDGE (m)	21
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1033.41
AVERAGE LOW CHORD ELEVATION (m)	1031.18
AVERAGE DECK HEIGHT	2.23
NUMBER OF PIERS	4

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	390.00	1.25	CONCRETE	TRIANGULAR NOSE
2	423.67	1.25	CONCRETE	TRIANGULAR NOSE
3	452.72	1.25	CONCRETE	TRIANGULAR NOSE
4	483.50	1.25	CONCRETE	TRIANGULAR NOSE
5	-	-	-	-
6	-	-	-	-

LEGEND

- BRIDGE SURVEY POINT
- ROAD
- PATHWAY

NOTE(S)

ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.

REFERENCE(S)

BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT

ALBERTA ENVIRONMENT AND PARKS

PROJECT

BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT



YYYY-MM-DD	2017-06-09
DESIGNED	W.PLOEGER
PREPARED	V.VALLIS
REVIEWED	W.PLOEGER
APPROVED	D.LONG

PROJECT NO.
1536673

CONTROL

REV.
0

FIGURE
C-32

PHOTO 1 LEFT BANK, LOOKING UPSTREAM



PHOTO 2 LEFT BANK, LOOKING DOWNSTREAM





TITLE
BONNYBROOK BRIDGE

LOCATION	BOW RIVER
DESCRIPTION	OGDEN ROAD
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	-
YEAR BUILT	1980
TOTAL LENGTH OF SPAN (m)	212.4
DECK WIDTH OF BRIDGE (m)	26.5
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1035.81
AVERAGE LOW CHORD ELEVATION (m)	1032.83
AVERAGE DECK HEIGHT	2.99
NUMBER OF PIERS	4

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	309.73	1.2	CONCRETE	SEMI-CIRCULAR NOSE AND TAIL
2	355.03	1.2	CONCRETE	SEMI-CIRCULAR NOSE AND TAIL
3	400.33	1.2	CONCRETE	SEMI-CIRCULAR NOSE AND TAIL
4	445.63	1.2	CONCRETE	SEMI-CIRCULAR NOSE AND TAIL
5	-	-	-	-
6	-	-	-	-

- LEGEND**
- BRIDGE SURVEY POINT
 - ROAD
 - PATHWAY

NOTE(S)
ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.
REFERENCE(S)
BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT
ALBERTA ENVIRONMENT AND PARKS

PROJECT
BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT	YYYY-MM-DD	2017-06-09
	DESIGNED	W.PLOEGER
	PREPARED	V.VALLIS
	REVIEWED	W.PLOEGER
	APPROVED	D.LONG



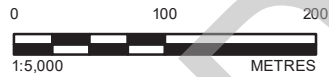
PHOTO 1 LEFT BANK, LOOKING UPSTREAM



PHOTO 2 LEFT BANK, LOOKING DOWNSTREAM



IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM ANS/A 25mm



TITLE
CALF ROBE BRIDGE

LOCATION	BOW RIVER
DESCRIPTION	DEERFOOT TRAIL
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	78880
YEAR BUILT	1987
TOTAL LENGTH OF SPAN (m)	224
DECK WIDTH OF BRIDGE (m)	31.6
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1035.56
AVERAGE LOW CHORD ELEVATION (m)	1032.90
AVERAGE DECK HEIGHT	2.66
NUMBER OF PIERS	4

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	149.57	1.2	CONCRETE	RECTANGULAR
2	201.07	1.2	CONCRETE	RECTANGULAR
3	262.07	1.2	CONCRETE	RECTANGULAR
4	313.57	1.2	CONCRETE	RECTANGULAR
5	-	-	-	-
6	-	-	-	-

LEGEND

- BRIDGE SURVEY POINT
- ROAD
- PATHWAY

NOTE(S)

ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.

REFERENCE(S)

BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT

ALBERTA ENVIRONMENT AND PARKS

PROJECT

BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT



YYYY-MM-DD	2017-06-09
DESIGNED	W.PLOEGER
PREPARED	V.VALLIS
REVIEWED	W.PLOEGER
APPROVED	D.LONG

PROJECT NO.
1536673

CONTROL

REV.
0

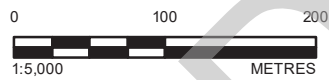
FIGURE
C-34

PHOTO 1 LEFT BANK, ABUTMENT



PHOTO 2 LEFT BANK, LOOKING UPSTREAM





TITLE
CN RAIL BRIDGE

LOCATION	BOW RIVER
DESCRIPTION	RAIL BRIDGE
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	-
YEAR BUILT	-
TOTAL LENGTH OF SPAN (m)	162.7
DECK WIDTH OF BRIDGE (m)	8.5
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1036.00
AVERAGE LOW CHORD ELEVATION (m)	1032.10
AVERAGE DECK HEIGHT	3.90
NUMBER OF PIERS	5

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	335.04	2.0	CONCRETE	RECTANGULAR
2	362.47	2.0	CONCRETE	SEMI-CIRCULAR NOSE AND TAIL
3	389.90	2.0	CONCRETE	SEMI-CIRCULAR NOSE AND TAIL
4	417.33	2.0	CONCRETE	SEMI-CIRCULAR NOSE AND TAIL
5	444.76	2.0	CONCRETE	RECTANGULAR
6	-	-	-	-

LEGEND

- BRIDGE SURVEY POINT
- ROAD
- PATHWAY

NOTE(S)

ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.

REFERENCE(S)

BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT

ALBERTA ENVIRONMENT AND PARKS

PROJECT

BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT



YYYY-MM-DD	2017-06-09
DESIGNED	W.PLOEGER
PREPARED	V.VALLIS
REVIEWED	W.PLOEGER
APPROVED	D.LONG

PROJECT NO.
1536673

CONTROL

REV.
0

FIGURE
C-35

PHOTO 1

LEFT BANK, LOOKING UPSTREAM



PHOTO 2

LEFT BANK, ABUTMENT





TITLE
GRAVES BRIDGE (UPSTREAM)

LOCATION	BOW RIVER
DESCRIPTION	GLENMORE TRAIL
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	77002
YEAR BUILT	1965
TOTAL LENGTH OF SPAN (m)	243.902
DECK WIDTH OF BRIDGE (m)	19
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1028.24
AVERAGE LOW CHORD ELEVATION (m)	1025.93
AVERAGE DECK HEIGHT	2.31
NUMBER OF PIERS	5

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	170.83	1.2	CONCRETE	SEMI-CIRCULAR NOSE AND TAIL
2	212.30	1.2	CONCRETE	SEMI-CIRCULAR NOSE AND TAIL
3	253.76	1.2	CONCRETE	SEMI-CIRCULAR NOSE AND TAIL
4	295.22	1.2	CONCRETE	SEMI-CIRCULAR NOSE AND TAIL
5	336.69	1.2	CONCRETE	SEMI-CIRCULAR NOSE AND TAIL
6	-	-	-	-

- LEGEND**
- BRIDGE SURVEY POINT
 - ROAD
 - PATHWAY

NOTE(S)
ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.
REFERENCE(S)
BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT
ALBERTA ENVIRONMENT AND PARKS

PROJECT
BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT	YYYY-MM-DD	2017-06-09
	DESIGNED	W.PLOEGER
	PREPARED	V.VALLIS
	REVIEWED	W.PLOEGER
	APPROVED	D.LONG



PHOTO 1 LEFT BANK, LOOKING DOWNSTREAM



PHOTO 2 LEFT BANK, LOOKING DOWNSTREAM



IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM ANSA



TITLE
GRAVES BRIDGE (DOWNSTREAM)

LOCATION	BOW RIVER
DESCRIPTION	GLENMORE TRAIL
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	77002
YEAR BUILT	1965
TOTAL LENGTH OF SPAN (m)	243.902
DECK WIDTH OF BRIDGE (m)	19
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1028.24
AVERAGE LOW CHORD ELEVATION (m)	1025.93
AVERAGE DECK HEIGHT	2.31
NUMBER OF PIERS	5

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	175.28	1.2	CONCRETE	SEMI-CIRCULAR NOSE AND TAIL
2	216.75	1.2	CONCRETE	SEMI-CIRCULAR NOSE AND TAIL
3	258.21	1.2	CONCRETE	SEMI-CIRCULAR NOSE AND TAIL
4	299.68	1.2	CONCRETE	SEMI-CIRCULAR NOSE AND TAIL
5	341.14	1.2	CONCRETE	SEMI-CIRCULAR NOSE AND TAIL
6	-	-	-	-

- LEGEND**
- BRIDGE SURVEY POINT
 - ROAD
 - PATHWAY

NOTE(S)
ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.
REFERENCE(S)
BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT
ALBERTA ENVIRONMENT AND PARKS

PROJECT
BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT	YYYY-MM-DD	2017-06-09
	DESIGNED	W.PLOEGER
	PREPARED	V.VALLIS
	REVIEWED	W.PLOEGER
	APPROVED	D.LONG



PHOTO 1 LEFT BANK, LOOKING UPSTREAM



PHOTO 2 LEFT BANK, LOOKING UPSTREAM



IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM ANSA



TITLE
ERIC HARVIE BRIDGE

LOCATION	BOW RIVER
DESCRIPTION	PEDESTRIAN BRIDGE
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	-
YEAR BUILT	-
TOTAL LENGTH OF SPAN (m)	121.071
DECK WIDTH OF BRIDGE (m)	4
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1020.11
AVERAGE LOW CHORD ELEVATION (m)	1019.71
AVERAGE DECK HEIGHT	0.40
NUMBER OF PIERS	2

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	76.31	3.6	CONCRETE	RECTANGULAR
2	154.63	3.6	CONCRETE	RECTANGULAR
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

LEGEND

- BRIDGE SURVEY POINT
- ROAD
- PATHWAY

NOTE(S)

ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.

REFERENCE(S)

BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT

ALBERTA ENVIRONMENT AND PARKS

PROJECT

BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT



YYYY-MM-DD	2017-06-09
DESIGNED	W.PLOEGER
PREPARED	V.VALLIS
REVIEWED	W.PLOEGER
APPROVED	D.LONG

PROJECT NO.
1536673

CONTROL

REV.
0

FIGURE
C-38

PHOTO 1 LEFT BANK, LOOKING DOWNSTREAM



PHOTO 2 LEFT BANK, LOOKING UPSTREAM



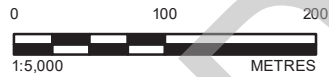


PHOTO 1 LEFT BANK, LOOKING DOWNSTREAM



PHOTO 2 LEFT BANK, LOOKING UPSTREAM



TITLE
IVOR STRONG BRIDGE

LOCATION	BOW RIVER
DESCRIPTION	DEERFOOT TRAIL NEAR DOUGLASDALE
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	79210
YEAR BUILT	1983
TOTAL LENGTH OF SPAN (m)	214
DECK WIDTH OF BRIDGE (m)	28
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1023.50
AVERAGE LOW CHORD ELEVATION (m)	1020.33
AVERAGE DECK HEIGHT	3.17
NUMBER OF PIERS	4

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	454.84	1.3	CONCRETE	TRAPEZOIDAL NOSE AND TAIL
2	502.84	1.3	CONCRETE	TRAPEZOIDAL NOSE AND TAIL
3	550.84	1.3	CONCRETE	TRAPEZOIDAL NOSE AND TAIL
4	598.84	1.3	CONCRETE	TRAPEZOIDAL NOSE AND TAIL
5	-	-	-	-
6	-	-	-	-

LEGEND

- BRIDGE SURVEY POINT
- ROAD
- PATHWAY

NOTE(S)

ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.

REFERENCE(S)

BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT

ALBERTA ENVIRONMENT AND PARKS

PROJECT

BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT



YYYY-MM-DD	2017-06-09
DESIGNED	W.PLOEGER
PREPARED	V.VALLIS
REVIEWED	W.PLOEGER
APPROVED	D.LONG

PROJECT NO.
1536673

CONTROL

REV.
0

FIGURE
C-39

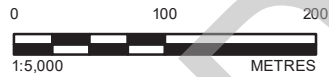
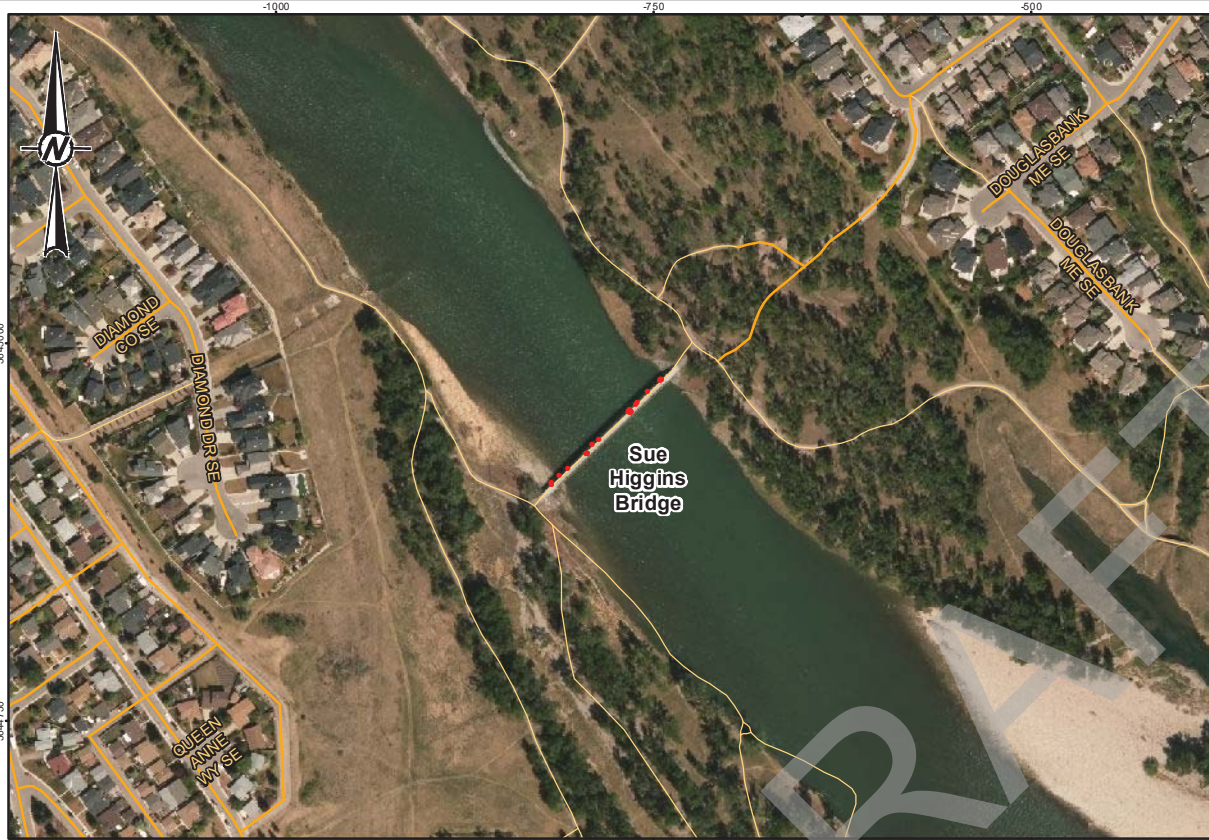


PHOTO 1 LEFT BANK, LOOKING DOWNSTREAM



PHOTO 2 LEFT BANK, LOOKING UPSTREAM



TITLE
SUE HIGGINS BRIDGE

LOCATION	BOW RIVER
DESCRIPTION	PEDESTRIAN BRIDGE
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	-
YEAR BUILT	1996
TOTAL LENGTH OF SPAN (m)	99.781
DECK WIDTH OF BRIDGE (m)	4.5
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1013.55
AVERAGE LOW CHORD ELEVATION (m)	1012.67
AVERAGE DECK HEIGHT	0.88
NUMBER OF PIERS	4

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	259	1.0	CONCRETE	CYLINDER
2	287.3	1.0	CONCRETE	CYLINDER
3	326.7	1.0	CONCRETE	CYLINDER
4	360.4	1.0	CONCRETE	CYLINDER
5	-	-	-	-
6	-	-	-	-

LEGEND

- BRIDGE SURVEY POINT
- ROAD
- PATHWAY

NOTE(S)

ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.

REFERENCE(S)

BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT

ALBERTA ENVIRONMENT AND PARKS

PROJECT

BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT



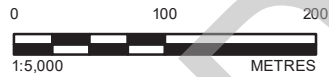
YYYY-MM-DD	2017-06-09
DESIGNED	W.PLOEGER
PREPARED	V.VALLIS
REVIEWED	W.PLOEGER
APPROVED	D.LONG

PROJECT NO.
1536673

CONTROL

REV.
0

FIGURE
C-40



TITLE
MCKENZIE BRIDGE

LOCATION	BOW RIVER
DESCRIPTION	PEDESTRIAN BRIDGE
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	-
YEAR BUILT	1994
TOTAL LENGTH OF SPAN (m)	108.829
DECK WIDTH OF BRIDGE (m)	6.1
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1005.55
AVERAGE LOW CHORD ELEVATION (m)	1004.96
AVERAGE DECK HEIGHT	0.60
NUMBER OF PIERS	4

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	149.57	1.0	CONCRETE	TRIANGULAR NOSE
2	180.63	1.0	CONCRETE	TRIANGULAR NOSE
3	219.58	1.0	CONCRETE	TRIANGULAR NOSE
4	254	1.0	CONCRETE	TRIANGULAR NOSE
5	-	-	-	-
6	-	-	-	-

LEGEND

- BRIDGE SURVEY POINT
- ROAD
- PATHWAY

NOTE(S)

ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.

REFERENCE(S)

BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT

ALBERTA ENVIRONMENT AND PARKS

PROJECT

BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT



YYYY-MM-DD	2017-06-09
DESIGNED	W.PLOEGER
PREPARED	V.VALLIS
REVIEWED	W.PLOEGER
APPROVED	D.LONG

PROJECT NO.
1536673

CONTROL

REV.
0

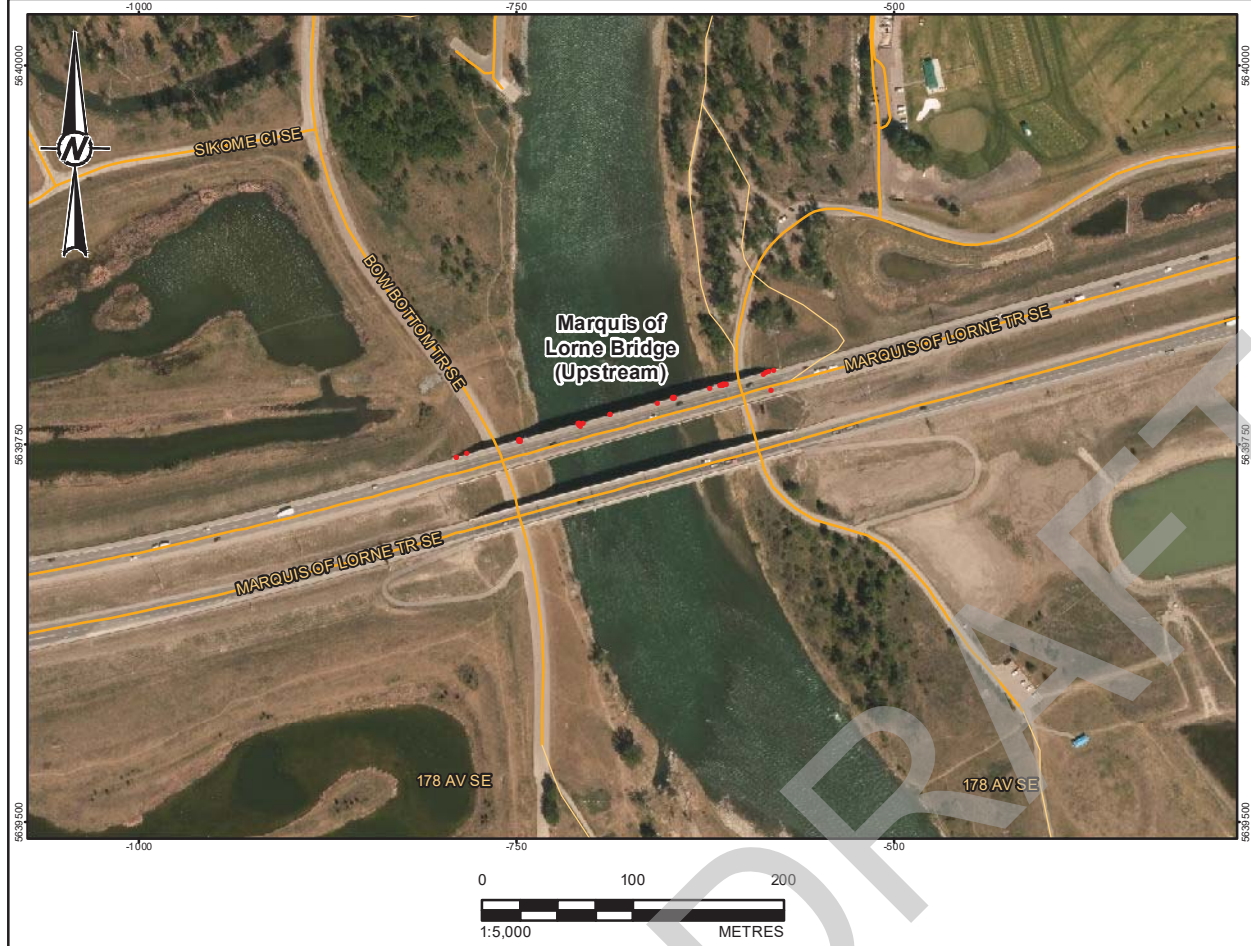
FIGURE
C-41

PHOTO 1 LEFT BANK, LOOKING DOWNSTREAM



PHOTO 2 LEFT BANK, LOOKING UPSTREAM





TITLE
MARQUIS OF LORNE BRIDGE (UPSTREAM)

LOCATION	BOW RIVER
DESCRIPTION	HIGHWAY 22X
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	77547
YEAR BUILT	2007
TOTAL LENGTH OF SPAN (m)	203.984
DECK WIDTH OF BRIDGE (m)	18.5
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1004.98
AVERAGE LOW CHORD ELEVATION (m)	1002.58
AVERAGE DECK HEIGHT	2.41
NUMBER OF PIERS	4

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	521.39	1.3	CONCRETE	SEMI-CIRCULAR NOSE AND TAIL
2	554.51	1.3	CONCRETE	SEMI-CIRCULAR NOSE AND TAIL
3	618.44	1.3	CONCRETE	SEMI-CIRCULAR NOSE AND TAIL
4	658.39	1.3	CONCRETE	SEMI-CIRCULAR NOSE AND TAIL
5	-	-	-	-
6	-	-	-	-

LEGEND

- BRIDGE SURVEY POINT
- ROAD
- PATHWAY

NOTE(S)

ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.

REFERENCE(S)

BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT

ALBERTA ENVIRONMENT AND PARKS

PROJECT

BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT



YYYY-MM-DD	2017-06-09
DESIGNED	W.PLOEGER
PREPARED	V.VALLIS
REVIEWED	W.PLOEGER
APPROVED	D.LONG

PROJECT NO.
1536673

CONTROL

REV.
0

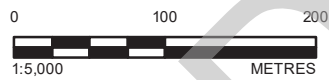
FIGURE
C-42

PHOTO 1 LEFT BANK, LOOKING DOWNSTREAM



PHOTO 2 LEFT BANK, LOOKING UPSTREAM





TITLE
MARQUIS OF LORNE BRIDGE (DOWNSTREAM)

LOCATION	BOW RIVER
DESCRIPTION	HIGHWAY 22X
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	77547
YEAR BUILT	1975
TOTAL LENGTH OF SPAN (m)	207.317
DECK WIDTH OF BRIDGE (m)	15.5
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1004.58
AVERAGE LOW CHORD ELEVATION (m)	1002.85
AVERAGE DECK HEIGHT	1.72
NUMBER OF PIERS	5

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	517.49	1.3	CONCRETE	SEMI-CIRCULAR NOSE AND TAIL
2	547.98	1.3	CONCRETE	SEMI-CIRCULAR NOSE AND TAIL
3	584.56	1.3	CONCRETE	SEMI-CIRCULAR NOSE AND TAIL
4	621.15	1.3	CONCRETE	SEMI-CIRCULAR NOSE AND TAIL
5	657.73	1.3	CONCRETE	SEMI-CIRCULAR NOSE AND TAIL
6	-	-	-	-

LEGEND

- BRIDGE SURVEY POINT
- ROAD
- PATHWAY

NOTE(S)

ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.

REFERENCE(S)

BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT

ALBERTA ENVIRONMENT AND PARKS

PROJECT

BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT



YYYY-MM-DD	2017-06-09
DESIGNED	W.PLOEGER
PREPARED	V.VALLIS
REVIEWED	W.PLOEGER
APPROVED	D.LONG

PROJECT NO.
1536673

CONTROL

REV.
0

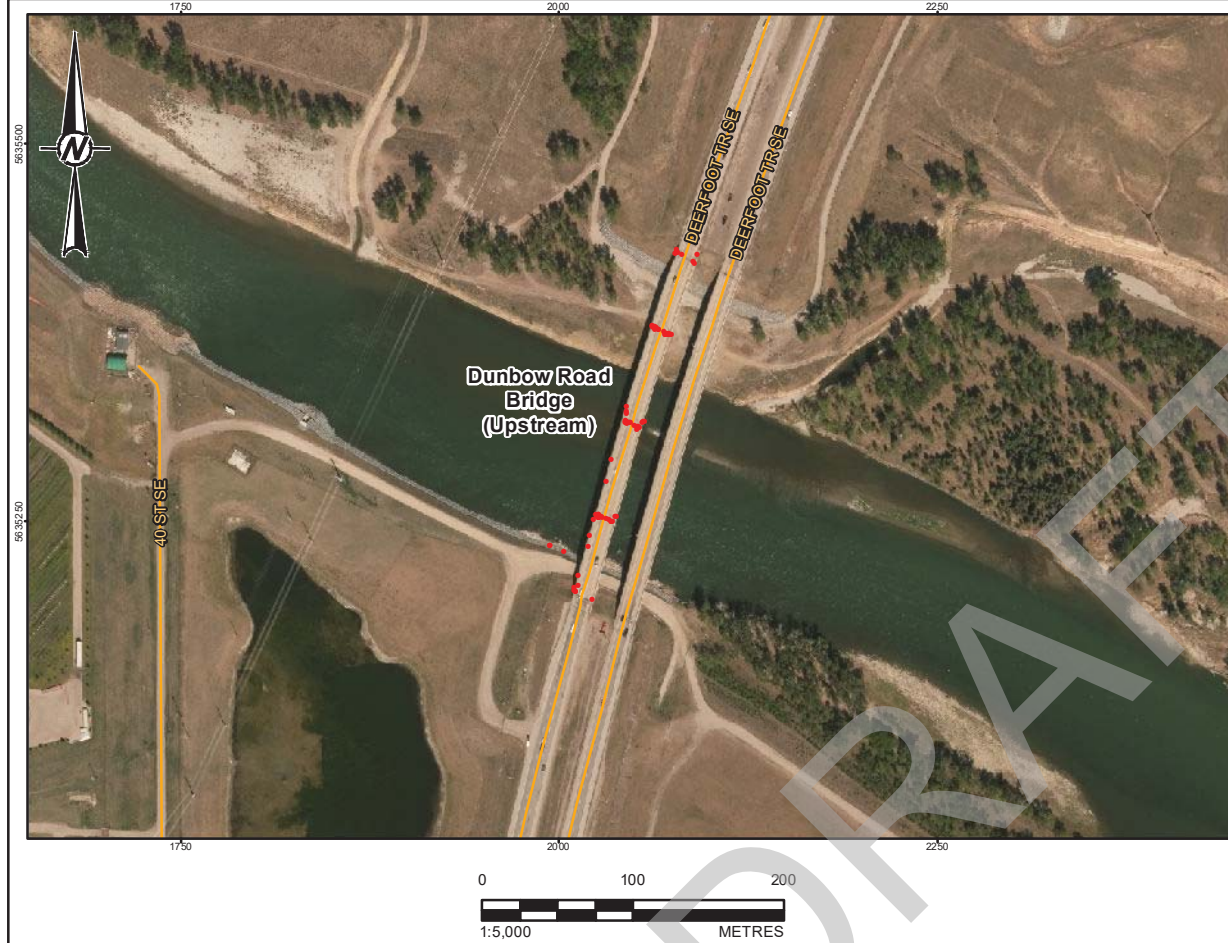
FIGURE
C-43

PHOTO 1 LEFT BANK, ABUTMENT



PHOTO 2 LEFT BANK, LOOKING UPSTREAM





TITLE
DUNBOW ROAD BRIDGE (UPSTREAM)

LOCATION	BOW RIVER
DESCRIPTION	HIGHWAY 2, DEERFOOT EXTENSION
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	81802
YEAR BUILT	1981
TOTAL LENGTH OF SPAN (m)	250.923
DECK WIDTH OF BRIDGE (m)	14.5
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	995.04
AVERAGE LOW CHORD ELEVATION (m)	991.63
AVERAGE DECK HEIGHT	3.40
NUMBER OF PIERS	3

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	459.00	0.7	CONCRETE	SEMI-CIRCULAR NOSE AND TAIL
2	523.00	0.7	CONCRETE	SEMI-CIRCULAR NOSE AND TAIL
3	588.00	0.7	CONCRETE	SEMI-CIRCULAR NOSE AND TAIL
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

- LEGEND**
- BRIDGE SURVEY POINT
 - ROAD
 - PATHWAY

NOTE(S)
ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.
REFERENCE(S)
BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT
ALBERTA ENVIRONMENT AND PARKS

PROJECT
BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT	YYYY-MM-DD	2017-06-09
DESIGNED	W.PLOEGER	
PREPARED	V.VALLIS	
REVIEWED	W.PLOEGER	
APPROVED	D.LONG	



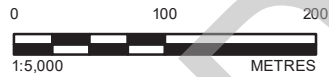
PHOTO 1 LEFT BANK, LOOKING DOWNSTREAM



PHOTO 2 LEFT BANK, LOOKING DOWNSTREAM



IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM ANSA



TITLE
DUNBOW ROAD BRIDGE (DOWNSTREAM)

LOCATION	BOW RIVER
DESCRIPTION	HIGHWAY 2, DEERFOOT EXTENSION
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	81802
YEAR BUILT	1981
TOTAL LENGTH OF SPAN (m)	250.158
DECK WIDTH OF BRIDGE (m)	14.5
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	994.99
AVERAGE LOW CHORD ELEVATION (m)	991.63
AVERAGE DECK HEIGHT	3.35
NUMBER OF PIERS	3

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	462.00	0.7	CONCRETE	SEMI-CIRCULAR NOSE AND TAIL
2	526.00	0.7	CONCRETE	SEMI-CIRCULAR NOSE AND TAIL
3	591.00	0.7	CONCRETE	SEMI-CIRCULAR NOSE AND TAIL
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

- LEGEND**
- BRIDGE SURVEY POINT
 - ROAD
 - PATHWAY

NOTE(S)
ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.
REFERENCE(S)
BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT
ALBERTA ENVIRONMENT AND PARKS

PROJECT
BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT	YYYY-MM-DD	2017-06-09
DESIGNED	W.PLOEGER	
PREPARED	V.VALLIS	
REVIEWED	W.PLOEGER	
APPROVED	D.LONG	



PHOTO 1 LEFT BANK, LOOKING UPSTREAM

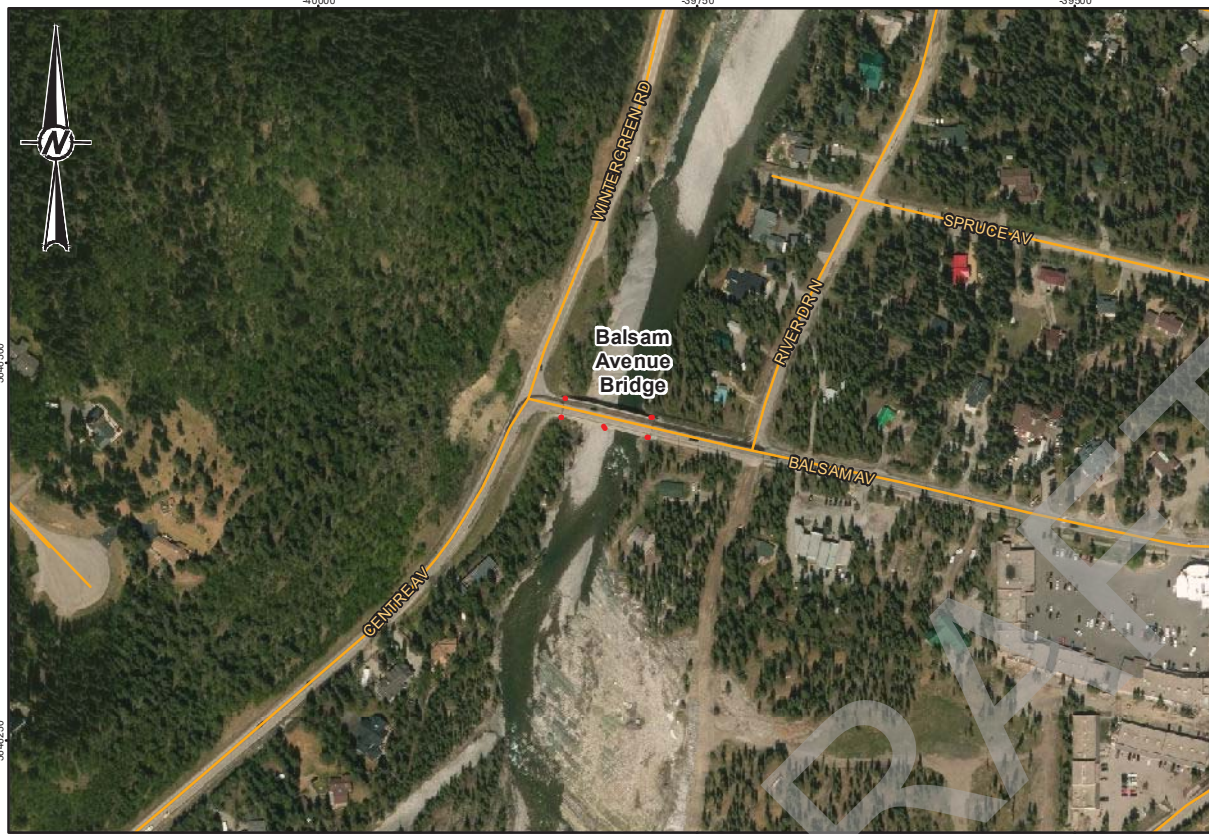


PHOTO 2 LEFT BANK, LOOKING UPSTREAM



IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM ANS/A

25mm



TITLE
BALSAM AVENUE BRIDGE

LOCATION	ELBOW RIVER
DESCRIPTION	IN BRAGG CREEK
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	7425
YEAR BUILT	1983
TOTAL LENGTH OF SPAN (m)	60
DECK WIDTH OF BRIDGE (m)	10.1
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1300.93
AVERAGE LOW CHORD ELEVATION (m)	1300.43
AVERAGE DECK HEIGHT	0.50
NUMBER OF PIERS	1

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	30	1.0	CONCRETE	SEMI-CIRCULAR NOSE AND TAIL
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

LEGEND

- BRIDGE SURVEY POINT
- ROAD
- PATHWAY

NOTE(S)

ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.

REFERENCE(S)

BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT

ALBERTA ENVIRONMENT AND PARKS

PROJECT

BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT



YYYY-MM-DD	2017-06-09
DESIGNED	W.PLOEGER
PREPARED	V.VALLIS
REVIEWED	W.PLOEGER
APPROVED	D.LONG

PROJECT NO.
1536673

CONTROL

REV.
0

FIGURE
C-46

PHOTO 1 LEFT BANK, LOOKING DOWNSTREAM



PHOTO 2 IN CHANNEL, LOOKING DOWNSTREAM





TITLE
HIGHWAY 22 BRIDGE

LOCATION	ELBOW RIVER
DESCRIPTION	BETWEEN BRAGG CREEK AND COCHRANE
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	13545
YEAR BUILT	1987
TOTAL LENGTH OF SPAN (m)	80
DECK WIDTH OF BRIDGE (m)	13
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1209.25
AVERAGE LOW CHORD ELEVATION (m)	1207.40
AVERAGE DECK HEIGHT	1.85
NUMBER OF PIERS	1

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	40	1.34	CONCRETE	SEMI-CIRCULAR NOSE AND TAIL
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

LEGEND

- BRIDGE SURVEY POINT
- ROAD
- PATHWAY

NOTE(S)

ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.

REFERENCE(S)

BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT

ALBERTA ENVIRONMENT AND PARKS

PROJECT

BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT



YYYY-MM-DD	2017-06-09
DESIGNED	W.PLOEGER
PREPARED	V.VALLIS
REVIEWED	W.PLOEGER
APPROVED	D.LONG

PROJECT NO.
1536673

CONTROL

REV.
0

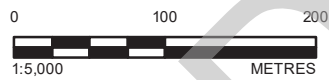
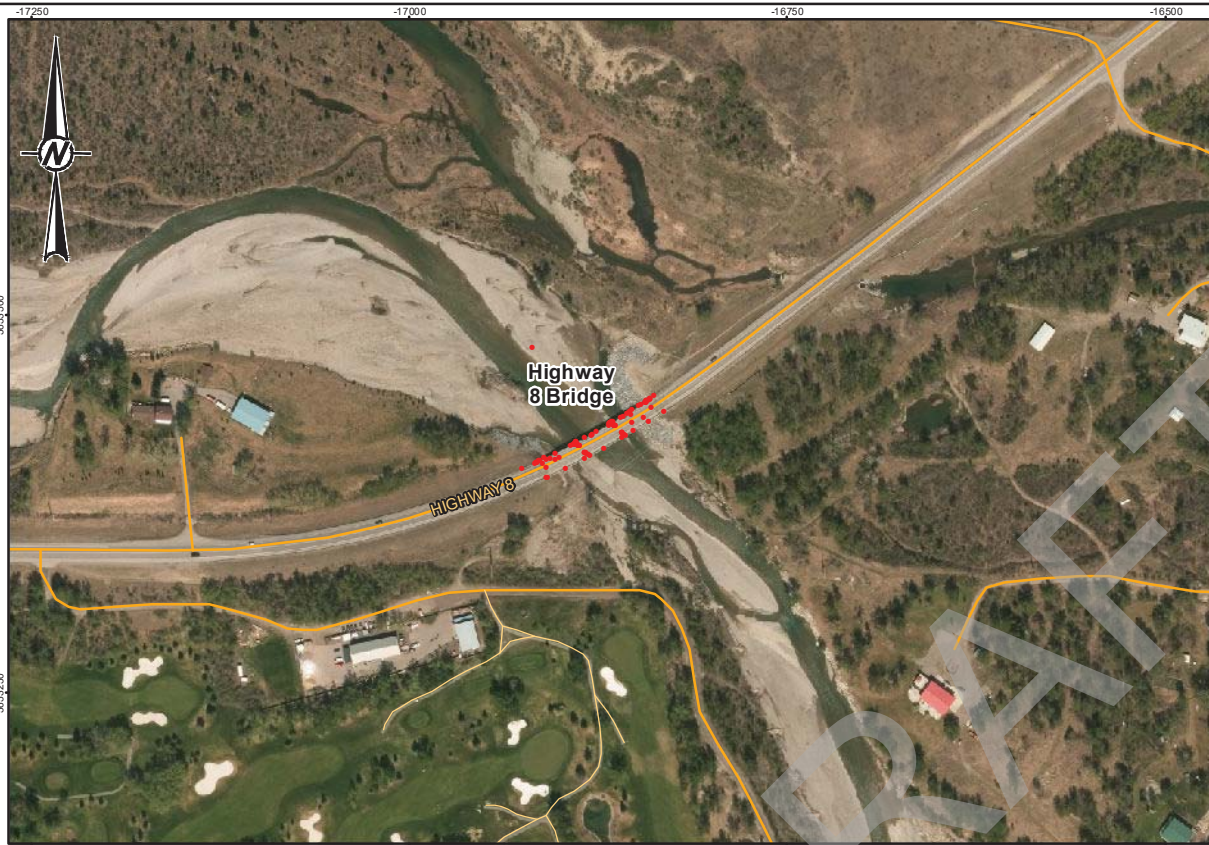
FIGURE
C-47

PHOTO 1 RIGHT BANK, LOOKING DOWNSTREAM



PHOTO 2 LEFT BANK, ABUTMENT





TITLE
HIGHWAY 8 BRIDGE

LOCATION	ELBOW RIVER
DESCRIPTION	-
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	2143
YEAR BUILT	1970
TOTAL LENGTH OF SPAN (m)	82.2
DECK WIDTH OF BRIDGE (m)	10.7
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1106.94
AVERAGE LOW CHORD ELEVATION (m)	1105.52
AVERAGE DECK HEIGHT	1.42
NUMBER OF PIERS	2

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	27.4	1.16	CONCRETE	CYLINDER
2	54.8	1.18	CONCRETE	CYLINDER
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

LEGEND

- BRIDGE SURVEY POINT
- ROAD
- PATHWAY

NOTE(S)

ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.

REFERENCE(S)

BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT

ALBERTA ENVIRONMENT AND PARKS

PROJECT

BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT



YYYY-MM-DD	2017-06-09
DESIGNED	W.PLOEGER
PREPARED	V.VALLIS
REVIEWED	W.PLOEGER
APPROVED	D.LONG

PROJECT NO.
1536673

CONTROL

REV.
0

FIGURE
C-48

PHOTO 1 LEFT BANK, ABUTMENT



PHOTO 2 IN CHANNEL, LOOKING DOWNSTREAM





TITLE
HIGHWAY 8 CULVERT

DESCRIPTION	CONVEYS FLOWS OF SMALL, UNNAMED TRIBUTARY CREEK
NUMBER OF CULVERTS	1
TOTAL LENGTH OF CULVERT (m)	52.20
RISE OF CULVERT (m)	4.82
SPAN OF CULVERT (m)	3.11
DIAMETER OF CULVERT	-
CULVERT TYPE	CORRUGATED STEEL ELLIPSE
CULVERT INVERT ELEVATION - UPSTREAM END (m)	1101.10
CULVERT INVERT ELEVATION - DOWNSTREAM END (m)	1100.89

LEGEND

- SURVEY POINT
- ROAD
- PATHWAY

NOTE(S)
SEE REPORT SECTION 2.3 FOR MORE INFORMATION.
WHERE THERE ARE MULTIPLE CULVERTS, SUBSEQUENT INFORMATION IS APPLICABLE FOR ALL CULVERTS.

REFERENCE(S)
HYDRAULIC STRUCTURE SURVEY AND STRUCTURE PHOTOS BY GOLDER ASSOCIATES LTD. 2016.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT
ALBERTA ENVIRONMENT AND PARKS

PROJECT
BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT	YYYY-MM-DD	2017-06-09
	DESIGNED	W.PLOEGER
	PREPARED	V.VALLIS
	REVIEWED	W.PLOEGER
	APPROVED	D.LONG



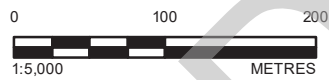
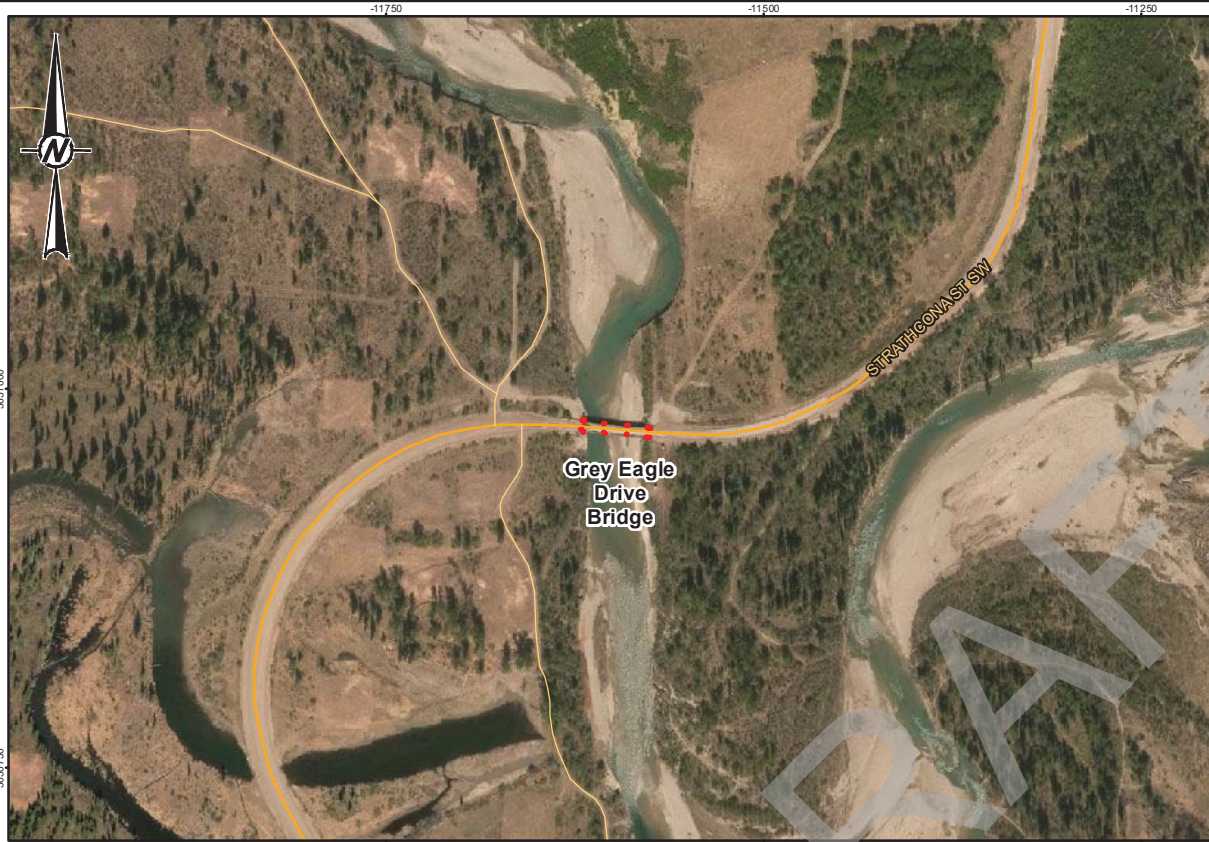
PHOTO 1 LEFT BANK, LOOKING UPSTREAM



PHOTO 2 RIGHT BANK, LOOKING DOWNSTREAM



IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM ANS/A



TITLE
GREY EAGLE DRIVE BRIDGE

LOCATION	ELBOW RIVER
DESCRIPTION	TSUUT'INA NATION
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	80775
YEAR BUILT	-
TOTAL LENGTH OF SPAN (m)	41.6
DECK WIDTH OF BRIDGE (m)	6.4
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1083.50
AVERAGE LOW CHORD ELEVATION (m)	1082.37
AVERAGE DECK HEIGHT	1.13
NUMBER OF PIERS	2

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	13.5	1.0	CONCRETE	TRAPEZOIDAL
2	29	1.0	CONCRETE	TRAPEZOIDAL
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

LEGEND

- BRIDGE SURVEY POINT
- ROAD
- PATHWAY

NOTE(S)

ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.

REFERENCE(S)

BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT

ALBERTA ENVIRONMENT AND PARKS

PROJECT

BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT



YYYY-MM-DD	2017-06-09
DESIGNED	W.PLOEGER
PREPARED	V.VALLIS
REVIEWED	W.PLOEGER
APPROVED	D.LONG

PROJECT NO.
1536673

CONTROL

REV.
0

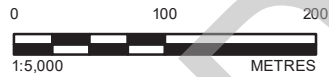
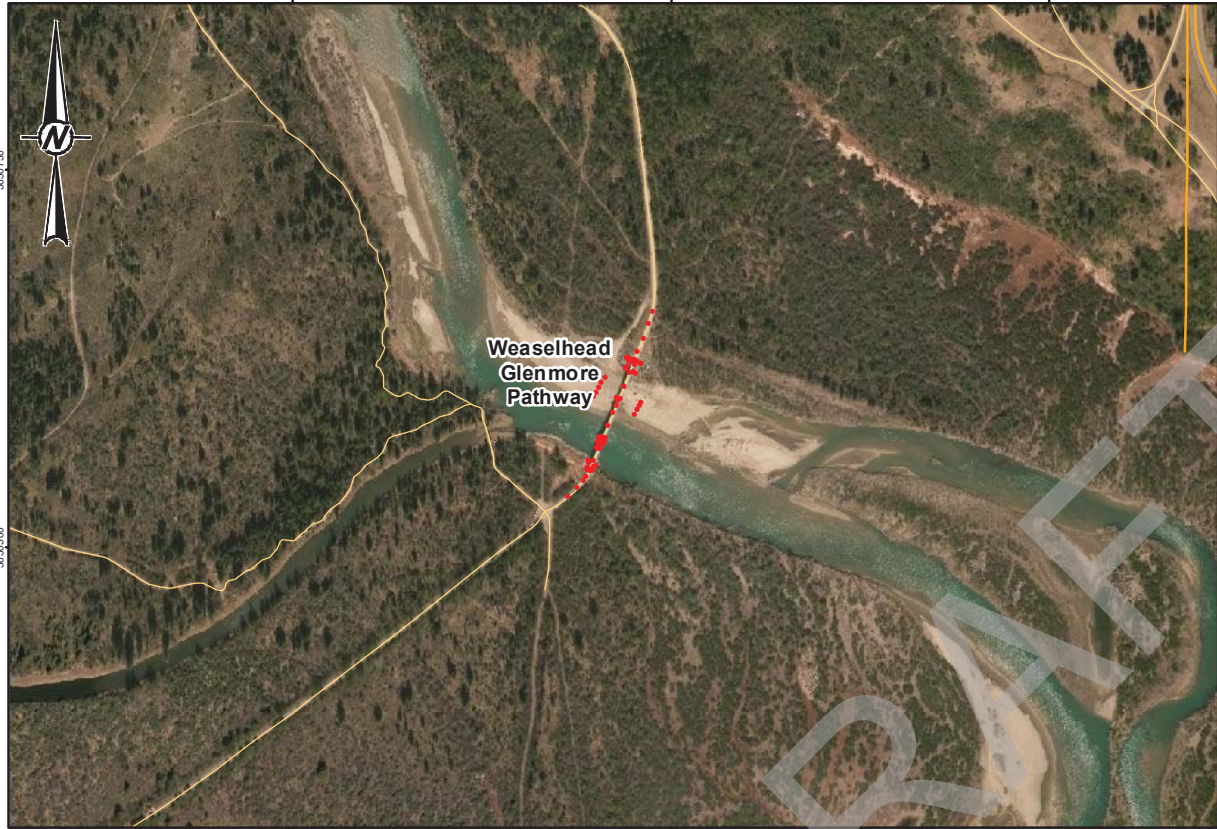
FIGURE
C-50

PHOTO 1 RIGHT BANK, LOOKING UPSTREAM



PHOTO 2 LEFT BANK, ABUTMENT





TITLE
WEASELHEAD GLENMORE PATHWAY

LOCATION	ELBOW RIVER
DESCRIPTION	PEDESTRIAN BRIDGE
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	-
YEAR BUILT	-
TOTAL LENGTH OF SPAN (m)	78.1
DECK WIDTH OF BRIDGE (m)	2.1
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1079.70
AVERAGE LOW CHORD ELEVATION (m)	1078.64
AVERAGE DECK HEIGHT	1.06
NUMBER OF PIERS	2

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	31.5	0.36	STEEL	TRIANGULAR NOSE
2	63	0.36	STEEL	TRIANGULAR NOSE
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

- LEGEND**
- BRIDGE SURVEY POINT
 - ROAD
 - PATHWAY

NOTE(S)
ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH. ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.
REFERENCE(S)
BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT
ALBERTA ENVIRONMENT AND PARKS

PROJECT
BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT	YYYY-MM-DD	2017-06-09
	DESIGNED	W.PLOEGER
	PREPARED	V.VALLIS
	REVIEWED	W.PLOEGER
	APPROVED	D.LONG



PHOTO 1 LEFT BANK, LOOKING DOWNSTREAM



PHOTO 2 LEFT BANK, ABUTMENT



IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM ANSA



TITLE
GLENMORE TRAIL BRIDGE

LOCATION	ELBOW RIVER
DESCRIPTION	-
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	75407
YEAR BUILT	-
TOTAL LENGTH OF SPAN (m)	92
DECK WIDTH OF BRIDGE (m)	58.5
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1082.45
AVERAGE LOW CHORD ELEVATION (m)	1080.50
AVERAGE DECK HEIGHT	1.95
NUMBER OF PIERS	2

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	25.5	2	CONCRETE	CYLINDER
2	61.5	2	CONCRETE	CYLINDER
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

LEGEND

- BRIDGE SURVEY POINT
- ROAD
- PATHWAY

NOTE(S)

ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.

REFERENCE(S)

BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT

ALBERTA ENVIRONMENT AND PARKS

PROJECT

BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT



YYYY-MM-DD	2017-06-09
DESIGNED	W.PLOEGER
PREPARED	V.VALLIS
REVIEWED	W.PLOEGER
APPROVED	D.LONG

PROJECT NO.
1536673

CONTROL

REV.
0

FIGURE
C-52

PHOTO 1 ON RESERVOIR, LOOKING DOWNSTREAM



PHOTO 2 LEFT BANK, ABUTMENT



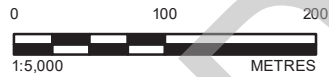


PHOTO 1 RIGHT BANK, LOOKING DOWNSTREAM

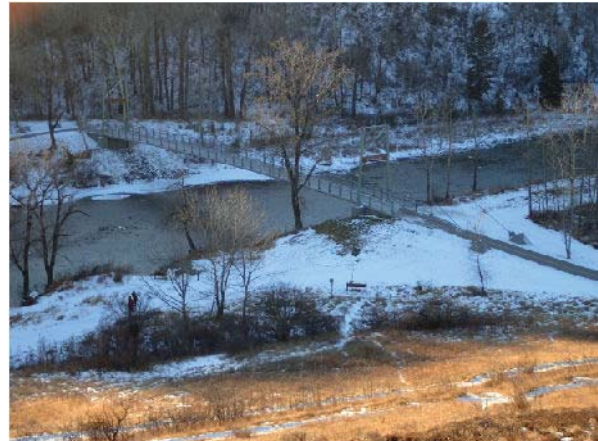


PHOTO 2 RIGHT BANK, LOOKING DOWNSTREAM



TITLE
SANDY BEACH BRIDGE

LOCATION	ELBOW RIVER
DESCRIPTION	PEDESTRIAN BRIDGE
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	-
YEAR BUILT	2014
TOTAL LENGTH OF SPAN (m)	56.6
DECK WIDTH OF BRIDGE (m)	1.7
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1056.53
AVERAGE LOW CHORD ELEVATION (m)	1056.37
AVERAGE DECK HEIGHT	0.16
NUMBER OF PIERS	0

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	-	-	-	-
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

- LEGEND**
- BRIDGE SURVEY POINT
 - ROAD
 - PATHWAY

NOTE(S)
ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.
REFERENCE(S)
BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT
ALBERTA ENVIRONMENT AND PARKS
PROJECT
BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT	YYYY-MM-DD	2017-06-09
	DESIGNED	W.PLOEGER
	PREPARED	V.VALLIS
	REVIEWED	W.PLOEGER
	APPROVED	D.LONG



IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM ANS/A



TITLE
RIVERDALE AVENUE BRIDGE

LOCATION	ELBOW RIVER
DESCRIPTION	PEDESTRIAN BRIDGE
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	-
YEAR BUILT	2014
TOTAL LENGTH OF SPAN (m)	55
DECK WIDTH OF BRIDGE (m)	1.7
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1054.49
AVERAGE LOW CHORD ELEVATION (m)	1054.11
AVERAGE DECK HEIGHT	0.38
NUMBER OF PIERS	0

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	-	-	-	-
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

- LEGEND**
- BRIDGE SURVEY POINT
 - ROAD
 - PATHWAY

NOTE(S)
ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.
REFERENCE(S)
BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT
ALBERTA ENVIRONMENT AND PARKS

PROJECT
BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT	YYYY-MM-DD	2017-06-09
	DESIGNED	W.PLOEGER
	PREPARED	V.VALLIS
	REVIEWED	W.PLOEGER
	APPROVED	D.LONG



PHOTO 1 RIGHT BANK, LOOKING DOWNSTREAM



PHOTO 2 RIGHT BANK, LOOKING DOWNSTREAM



IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM ANSA



TITLE	
ELBOYA BRIDGE	
LOCATION	ELBOW RIVER
DESCRIPTION	ELBOW DRIVE BRIDGE
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	6895
YEAR BUILT	1955
TOTAL LENGTH OF SPAN (m)	66.35
DECK WIDTH OF BRIDGE (m)	1.7
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1054.79
AVERAGE LOW CHORD ELEVATION (m)	1053.47
AVERAGE DECK HEIGHT	1.33
NUMBER OF PIERS	2

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	158.29	0.31	9999	RECTANGULAR
2	185.59	0.38	9999	RECTANGULAR
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

LEGEND	
•	BRIDGE SURVEY POINT
—	ROAD
—	PATHWAY

NOTE(S)
 ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.
REFERENCE(S)
 BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
 ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
 DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT		
ALBERTA ENVIRONMENT AND PARKS		
PROJECT		
BOW AND ELBOW RIVER HAZARD STUDY		
CONSULTANT		
	YYYY-MM-DD	2017-06-09
	DESIGNED	W.PLOEGER
	PREPARED	V.VALLIS
	REVIEWED	W.PLOEGER
	APPROVED	D.LONG



PROJECT NO. 1536673	CONTROL	REV. 0	FIGURE C-55
------------------------	---------	-----------	-----------------------

PHOTO 1 RIGHT BANK, LOOKING DOWNSTREAM



PHOTO 2 RIGHT BANK, ABUTMENT



IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM ANSA

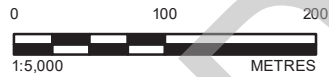
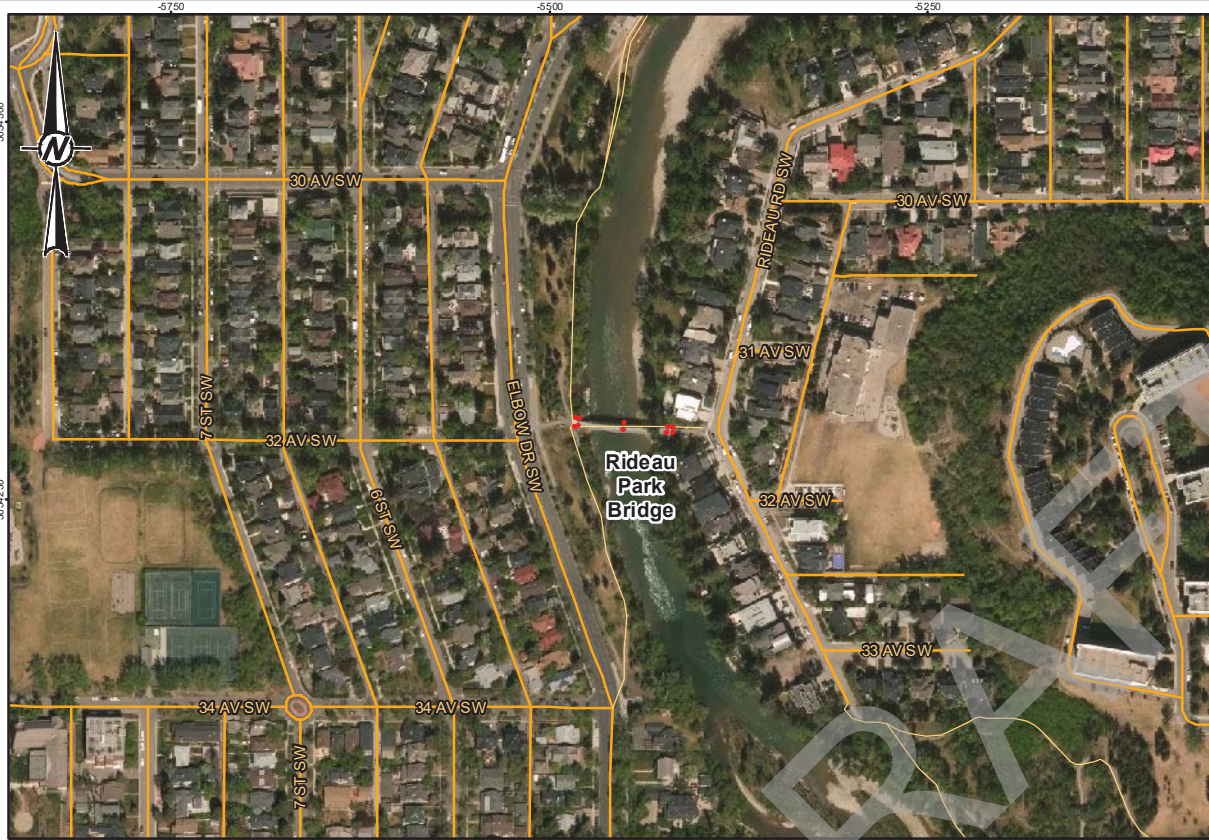


PHOTO 1 RIGHT BANK, LOOKING DOWNSTREAM



PHOTO 2 RIGHT BANK, ABUTMENT



TITLE
RIDEAU PARK BRIDGE

LOCATION	ELBOW RIVER
DESCRIPTION	32ND AVENUE PEDESTRIAN BRIDGE
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	-
YEAR BUILT	2014
TOTAL LENGTH OF SPAN (m)	51.4
DECK WIDTH OF BRIDGE (m)	2
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1052.72
AVERAGE LOW CHORD ELEVATION (m)	1052.42
AVERAGE DECK HEIGHT	0.30
NUMBER OF PIERS	0

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	-	-	-	-
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

LEGEND

- BRIDGE SURVEY POINT
- ROAD
- PATHWAY

NOTE(S)

ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.

REFERENCE(S)

BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

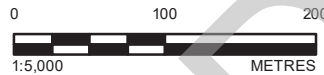
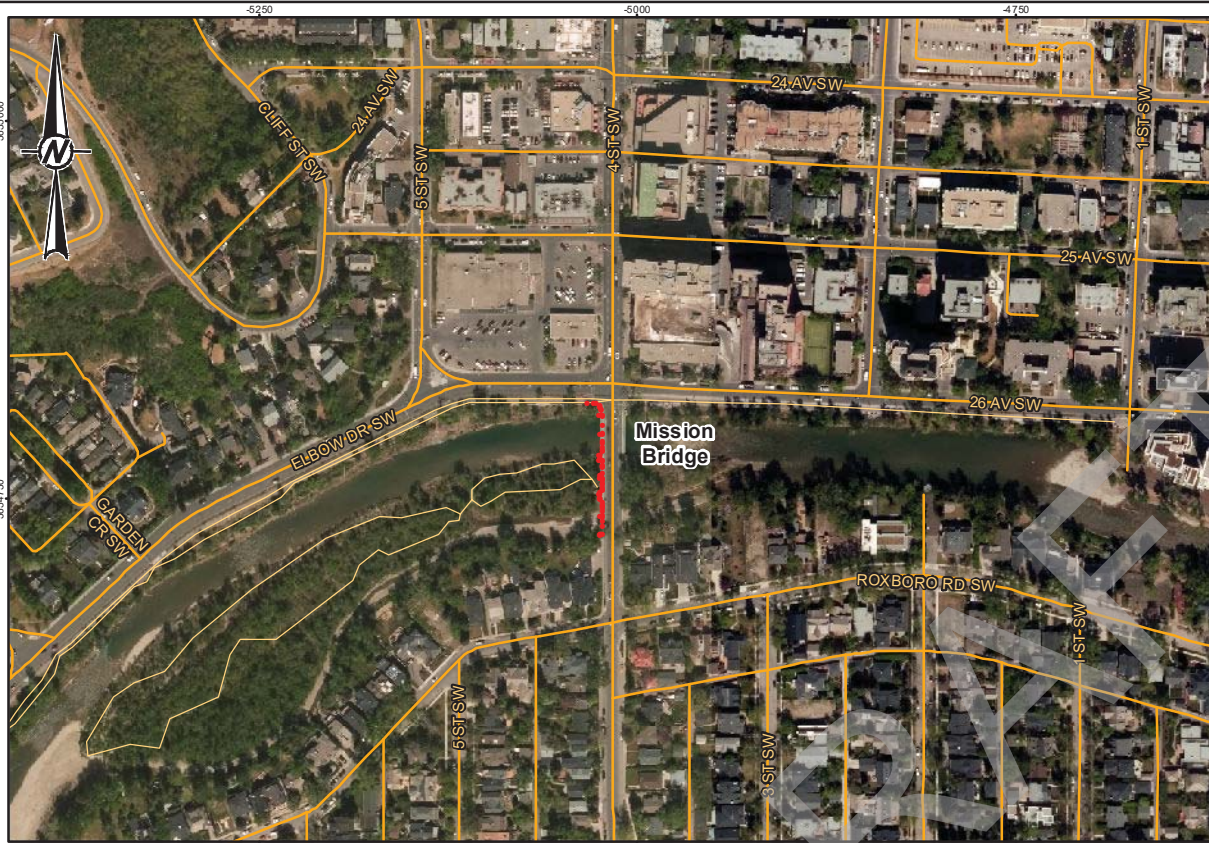
CLIENT
ALBERTA ENVIRONMENT AND PARKS

PROJECT
BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT	YYYY-MM-DD	2017-06-09
	DESIGNED	W.PLOEGER
	PREPARED	V.VALLIS
	REVIEWED	W.PLOEGER
	APPROVED	D.LONG



PROJECT NO. 1536673	CONTROL	REV. 0	FIGURE C-56
------------------------	---------	-----------	-----------------------



TITLE
MISSION BRIDGE

LOCATION	ELBOW RIVER
DESCRIPTION	MISSION ROAD, 4TH STREET SW
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	547
YEAR BUILT	1915
TOTAL LENGTH OF SPAN (m)	80
DECK WIDTH OF BRIDGE (m)	16.5
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1051.70
AVERAGE LOW CHORD ELEVATION (m)	1048.26
AVERAGE DECK HEIGHT	3.44
NUMBER OF PIERS	3

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	103.99	3.66	CONCRETE	RECTANGULAR
2	117.20	2.01	CONCRETE	RECTANGULAR
3	130.40	3.66	CONCRETE	RECTANGULAR
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

LEGEND

- BRIDGE SURVEY POINT
- ROAD
- PATHWAY

NOTE(S)

ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.

REFERENCE(S)

BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT

ALBERTA ENVIRONMENT AND PARKS

PROJECT

BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT



YYYY-MM-DD	2017-06-09
DESIGNED	W.PLOEGER
PREPARED	V.VALLIS
REVIEWED	W.PLOEGER
APPROVED	D.LONG

PROJECT NO.
1536673

CONTROL

REV.
0

FIGURE
C-57

PHOTO 1

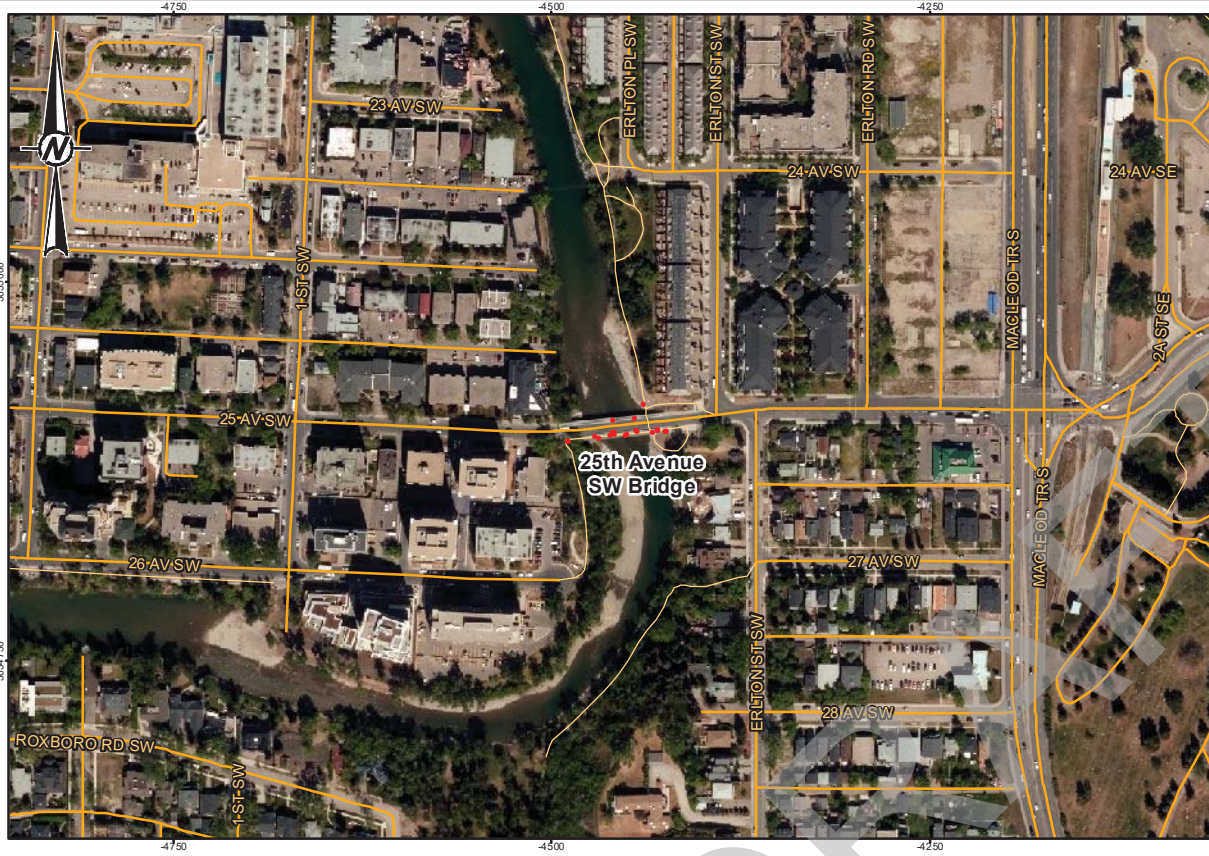
RIGHT BANK, ABUTMENT



PHOTO 2

LEFT BANK, LOOKING DOWNSTREAM





TITLE
25TH AVENUE SW BRIDGE

LOCATION	ELBOW RIVER
DESCRIPTION	-
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	-
YEAR BUILT	-
TOTAL LENGTH OF SPAN (m)	69.747
DECK WIDTH OF BRIDGE (m)	11.7
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1050.33
AVERAGE LOW CHORD ELEVATION (m)	1048.47
AVERAGE DECK HEIGHT	1.86
NUMBER OF PIERS	3

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	248.15	0.66	CONCRETE	T-SHAPED
2	263.35	0.66	CONCRETE	T-SHAPED
3	278.55	0.66	CONCRETE	T-SHAPED
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

LEGEND

- BRIDGE SURVEY POINT
- ROAD
- PATHWAY

NOTE(S)

ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.

REFERENCE(S)

BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT

ALBERTA ENVIRONMENT AND PARKS

PROJECT

BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT



YYYY-MM-DD	2017-06-09
DESIGNED	W.PLOEGER
PREPARED	V.VALLIS
REVIEWED	W.PLOEGER
APPROVED	D.LONG

PROJECT NO.
1536673

CONTROL

REV.
0

FIGURE
C-58

PHOTO 1 RIGHT BANK, LOOKING DOWNSTREAM



PHOTO 2 LEFT BANK, ABUTMENT





TITLE
LINDSAY PARK BRIDGE

LOCATION	ELBOW RIVER
DESCRIPTION	21ST AVENUE SW, PEDESTRIAN BRIDGE
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	-
YEAR BUILT	1960
TOTAL LENGTH OF SPAN (m)	33.2
DECK WIDTH OF BRIDGE (m)	2.5
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1049.07
AVERAGE LOW CHORD ELEVATION (m)	1047.25
AVERAGE DECK HEIGHT	1.82
NUMBER OF PIERS	0

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	-	-	-	-
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

LEGEND

- BRIDGE SURVEY POINT
- ROAD
- PATHWAY

NOTE(S)

ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.

REFERENCE(S)

BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT

ALBERTA ENVIRONMENT AND PARKS

PROJECT

BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT



YYYY-MM-DD	2017-06-09
DESIGNED	W.PLOEGER
PREPARED	V.VALLIS
REVIEWED	W.PLOEGER
APPROVED	D.LONG

PROJECT NO.
1536673

CONTROL

REV.
0

FIGURE
C-59

PHOTO 1 LEFT BANK, LOOKING DOWNSTREAM



PHOTO 2 LEFT BANK, ABUTMENT





TITLE
LINDSAY PARK CN RAIL BRIDGE

LOCATION ELBOW RIVER

DESCRIPTION 19TH AVENUE SW, NEAR ST. MARY'S HIGH SCHOOL

ALBERTA TRANSPORTATION BRIDGE FILE NUMBER -

YEAR BUILT 1983

TOTAL LENGTH OF SPAN (m) 60

DECK WIDTH OF BRIDGE (m) 7.3

AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m) 1050.18

AVERAGE LOW CHORD ELEVATION (m) 1048.62

AVERAGE DECK HEIGHT 1.56

NUMBER OF PIERS 2

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	93.75	1.8	CONCRETE	TRIANGULAR NOSE
2	114.35	1.8	CONCRETE	TRIANGULAR NOSE
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

LEGEND

- BRIDGE SURVEY POINT
- ROAD
- PATHWAY

NOTE(S)

ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.

REFERENCE(S)

BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT

ALBERTA ENVIRONMENT AND PARKS

PROJECT

BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT	YYYY-MM-DD	2017-06-09
DESIGNED	W.PLOEGER	
PREPARED	V.VALLIS	
REVIEWED	W.PLOEGER	
APPROVED	D.LONG	



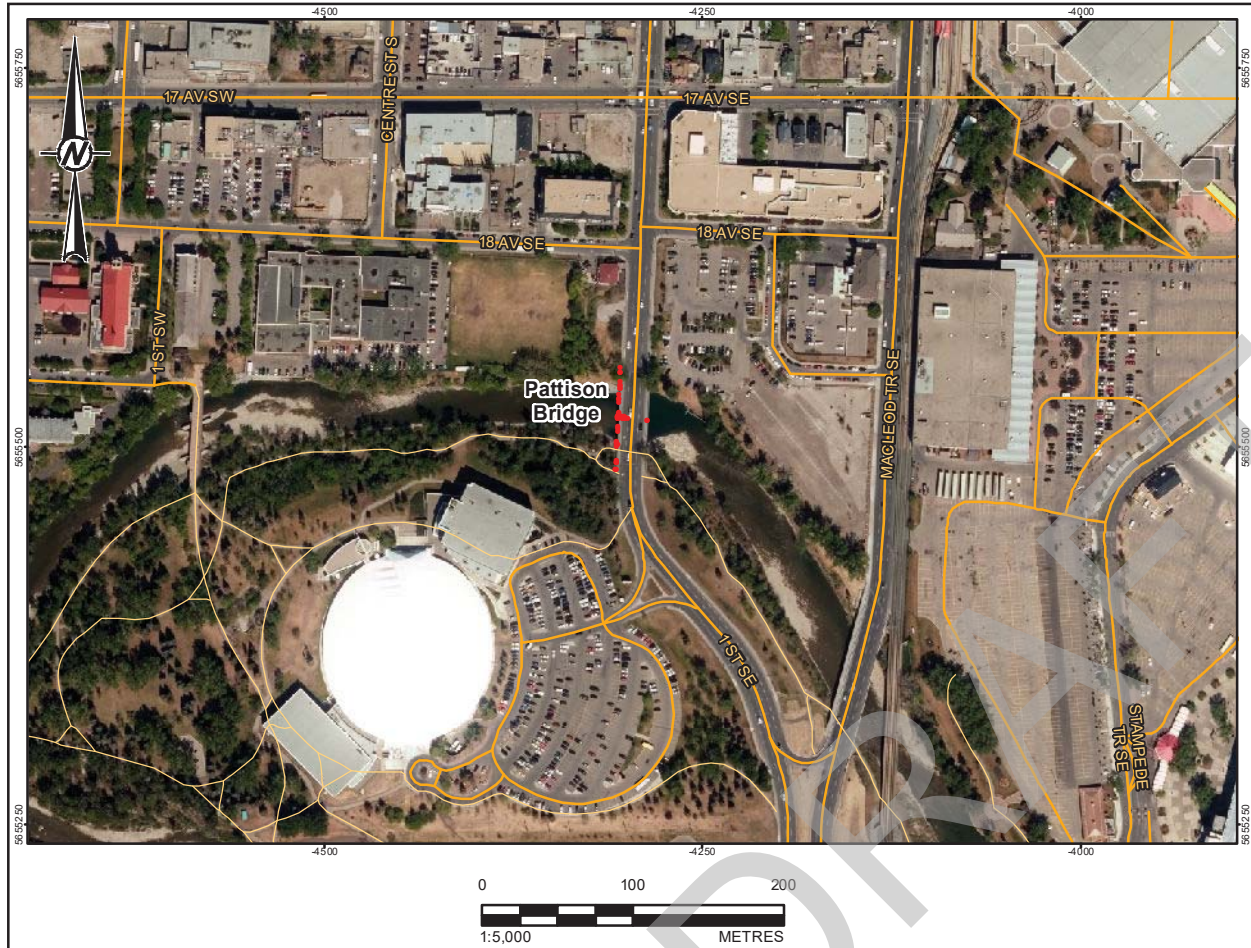
PHOTO 1 RIGHT BANK, LOOKING DOWNSTREAM



PHOTO 2 RIGHT BANK, ABUTMENT



IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM ANSA



TITLE
PATTISON BRIDGE

LOCATION	ELBOW RIVER
DESCRIPTION	MCLEOD TRAIL SOUTH
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	76622
YEAR BUILT	1999
TOTAL LENGTH OF SPAN (m)	51
DECK WIDTH OF BRIDGE (m)	19.7
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1047.09
AVERAGE LOW CHORD ELEVATION (m)	1045.55
AVERAGE DECK HEIGHT	1.53
NUMBER OF PIERS	1

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	92.71	1.17	CONCRETE	ROUNDED NOSE
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

LEGEND

- BRIDGE SURVEY POINT
- ROAD
- PATHWAY

NOTE(S)

ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.

REFERENCE(S)

BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT

ALBERTA ENVIRONMENT AND PARKS

PROJECT

BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT



YYYY-MM-DD	2017-06-09
DESIGNED	W.PLOEGER
PREPARED	V.VALLIS
REVIEWED	W.PLOEGER
APPROVED	D.LONG

PROJECT NO.
1536673

CONTROL

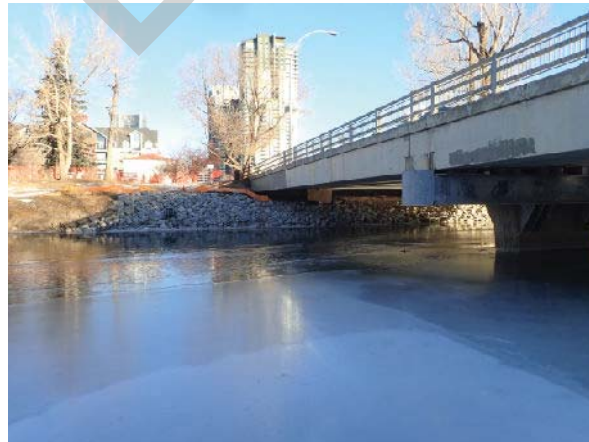
REV.
0

FIGURE
C-61

PHOTO 1 RIGHT BANK, LOOKING DOWNSTREAM



PHOTO 2 LEFT BANK, ABUTMENT





TITLE
VICTORIA BRIDGE

LOCATION	ELBOW RIVER
DESCRIPTION	MCLEOD TRAIL NORTH
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	-
YEAR BUILT	1966
TOTAL LENGTH OF SPAN (m)	65
DECK WIDTH OF BRIDGE (m)	20.5
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1047.18
AVERAGE LOW CHORD ELEVATION (m)	1045.57
AVERAGE DECK HEIGHT	1.61
NUMBER OF PIERS	2

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	43.11	2.1	CONCRETE	ROUNDED NOSE
2	64.48	2.1	CONCRETE	ROUNDED NOSE
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

LEGEND

- BRIDGE SURVEY POINT
- ROAD
- PATHWAY

NOTE(S)

ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.

REFERENCE(S)

BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT

ALBERTA ENVIRONMENT AND PARKS

PROJECT

BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT



YYYY-MM-DD	2017-06-09
DESIGNED	W.PLOEGER
PREPARED	V.VALLIS
REVIEWED	W.PLOEGER
APPROVED	D.LONG

PROJECT NO.
1536673

CONTROL

REV.
0

FIGURE
C-62

PHOTO 1

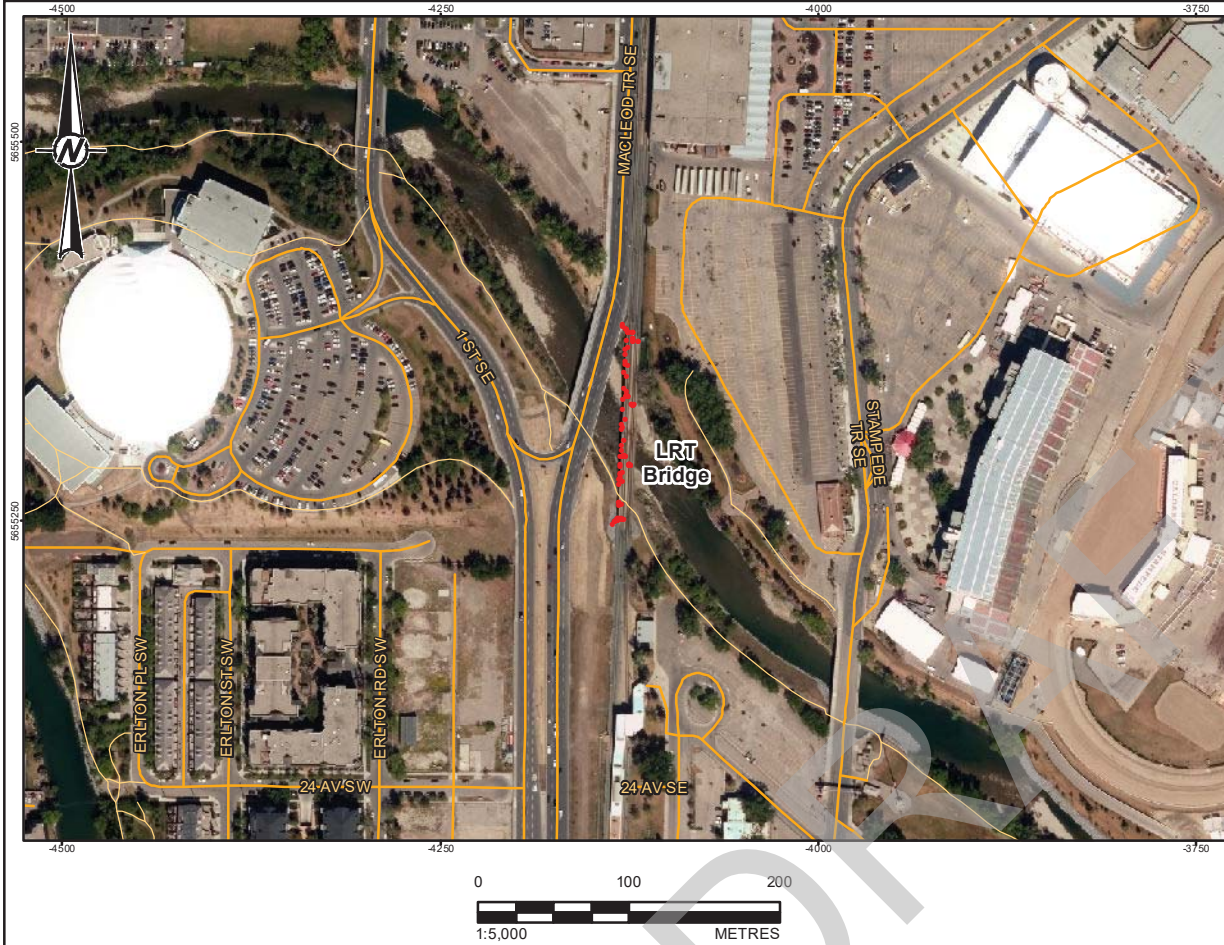
LEFT BANK, ABUTMENT



PHOTO 2

RIGHT BANK, LOOKING UPSTREAM





TITLE
LRT BRIDGE

LOCATION	ELBOW RIVER
DESCRIPTION	-
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	-
YEAR BUILT	1967
TOTAL LENGTH OF SPAN (m)	124
DECK WIDTH OF BRIDGE (m)	9.3
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1047.87
AVERAGE LOW CHORD ELEVATION (m)	1046.72
AVERAGE DECK HEIGHT	1.15
NUMBER OF PIERS	2

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	102.83	1.4	CONCRETE	CYLINDER
2	142.83	1.4	CONCRETE	CYLINDER
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

LEGEND

- BRIDGE SURVEY POINT
- ROAD
- PATHWAY

NOTE(S)

ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.

REFERENCE(S)

BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT

ALBERTA ENVIRONMENT AND PARKS

PROJECT

BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT

YYYY-MM-DD 2017-06-09



DESIGNED W.PLOEGER

PREPARED V.VALLIS

REVIEWED W.PLOEGER

APPROVED D.LONG

PROJECT NO.
1536673

CONTROL

REV.
0

FIGURE
C-63

PHOTO 1 RIGHT BANK, LOOKING DOWNSTREAM



PHOTO 2 LEFT BANK, ABUTMENT



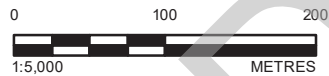
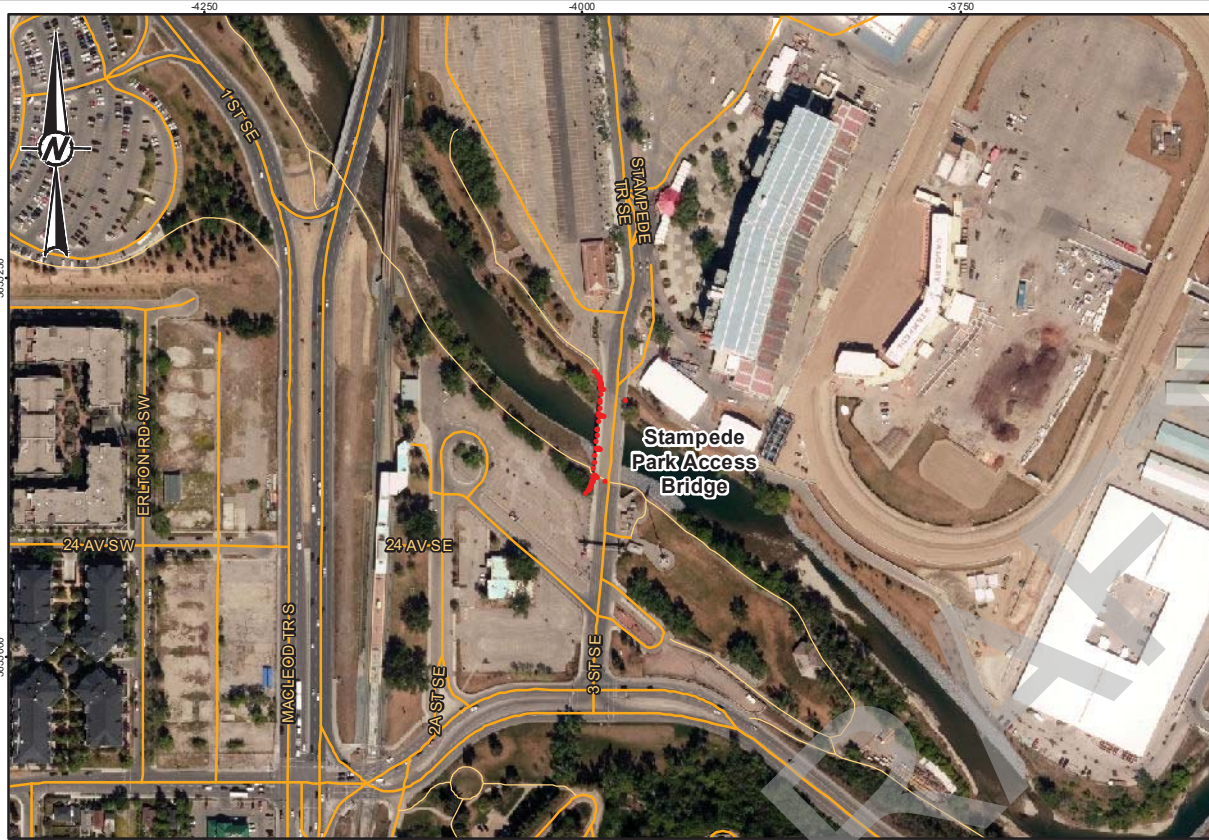


PHOTO 1 RIGHT BANK, LOOKING DOWNSTREAM



PHOTO 2 RIGHT BANK, ABUTMENT



TITLE
STAMPEDE PARK ACCESS BRIDGE

LOCATION	ELBOW RIVER
DESCRIPTION	3RD STREET SE
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	-
YEAR BUILT	1978
TOTAL LENGTH OF SPAN (m)	58.58
DECK WIDTH OF BRIDGE (m)	17.7
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1046.90
AVERAGE LOW CHORD ELEVATION (m)	1045.85
AVERAGE DECK HEIGHT	1.05
NUMBER OF PIERS	2

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	75.49	2.33	CONCRETE	RECTANGULAR
2	97.39	2.3	CONCRETE	RECTANGULAR
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

LEGEND

- BRIDGE SURVEY POINT
- ROAD
- PATHWAY

NOTE(S)

ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.

REFERENCE(S)

BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT

ALBERTA ENVIRONMENT AND PARKS

PROJECT

BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT



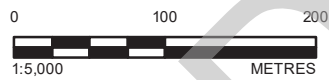
YYYY-MM-DD	2017-06-09
DESIGNED	W.PLOEGER
PREPARED	V.VALLIS
REVIEWED	W.PLOEGER
APPROVED	D.LONG

PROJECT NO.
1536673

CONTROL

REV.
0

FIGURE
C-64



TITLE
HORSE BARN BRIDGE (NEW)

LOCATION	ELBOW RIVER
DESCRIPTION	-
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	-
YEAR BUILT	2010
TOTAL LENGTH OF SPAN (m)	46.21
DECK WIDTH OF BRIDGE (m)	12.9
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1045.52
AVERAGE LOW CHORD ELEVATION (m)	1044.65
AVERAGE DECK HEIGHT	0.87
NUMBER OF PIERS	0

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	-	-	-	-
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

LEGEND

- BRIDGE SURVEY POINT
- ROAD
- PATHWAY

NOTE(S)

ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.

REFERENCE(S)

BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT

ALBERTA ENVIRONMENT AND PARKS

PROJECT

BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT



YYYY-MM-DD	2017-06-09
DESIGNED	W.PLOEGER
PREPARED	V.VALLIS
REVIEWED	W.PLOEGER
APPROVED	D.LONG

PROJECT NO.
1536673

CONTROL

REV.
0

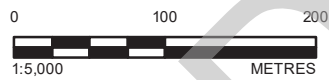
FIGURE
C-65

PHOTO 1 RIGHT BANK, LOOKING DOWNSTREAM



PHOTO 2 RIGHT BANK, LOOKING DOWNSTREAM





TITLE
HORSE BARN BRIDGE (OLD)

LOCATION	ELBOW RIVER
DESCRIPTION	-
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	-
YEAR BUILT	1971
TOTAL LENGTH OF SPAN (m)	45.01
DECK WIDTH OF BRIDGE (m)	6.5
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1045.30
AVERAGE LOW CHORD ELEVATION (m)	1044.27
AVERAGE DECK HEIGHT	1.02
NUMBER OF PIERS	2

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	172.24	0.39	CONCRETE	TRAPEZOIDAL
2	190.29	0.4	CONCRETE	TRAPEZOIDAL
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

LEGEND

- BRIDGE SURVEY POINT
- ROAD
- PATHWAY

NOTE(S)

ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.

REFERENCE(S)

BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT

ALBERTA ENVIRONMENT AND PARKS

PROJECT

BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT



YYYY-MM-DD	2017-06-09
DESIGNED	W.PLOEGER
PREPARED	V.VALLIS
REVIEWED	W.PLOEGER
APPROVED	D.LONG

PROJECT NO.
1536673

CONTROL

REV.
0

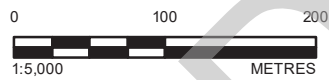
FIGURE
C-66

PHOTO 1 RIGHT BANK, LOOKING DOWNSTREAM



PHOTO 2 RIGHT BANK, LOOKING DOWNSTREAM





TITLE
WEADICK CROSSING

LOCATION	ELBOW RIVER
DESCRIPTION	STAMPEDE PARK SOUTH SADDLEDOME ACCESS BRIDGE
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	-
YEAR BUILT	2014
TOTAL LENGTH OF SPAN (m)	34.25
DECK WIDTH OF BRIDGE (m)	7.5
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1042.77
AVERAGE LOW CHORD ELEVATION (m)	1041.93
AVERAGE DECK HEIGHT	0.83
NUMBER OF PIERS	0

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	-	-	-	-
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

LEGEND

- BRIDGE SURVEY POINT
- ROAD
- PATHWAY

NOTE(S)

ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.

REFERENCE(S)

BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT

ALBERTA ENVIRONMENT AND PARKS

PROJECT

BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT



YYYY-MM-DD	2017-06-09
DESIGNED	W.PLOEGER
PREPARED	V.VALLIS
REVIEWED	W.PLOEGER
APPROVED	D.LONG

PROJECT NO.
1536673

CONTROL

REV.
0

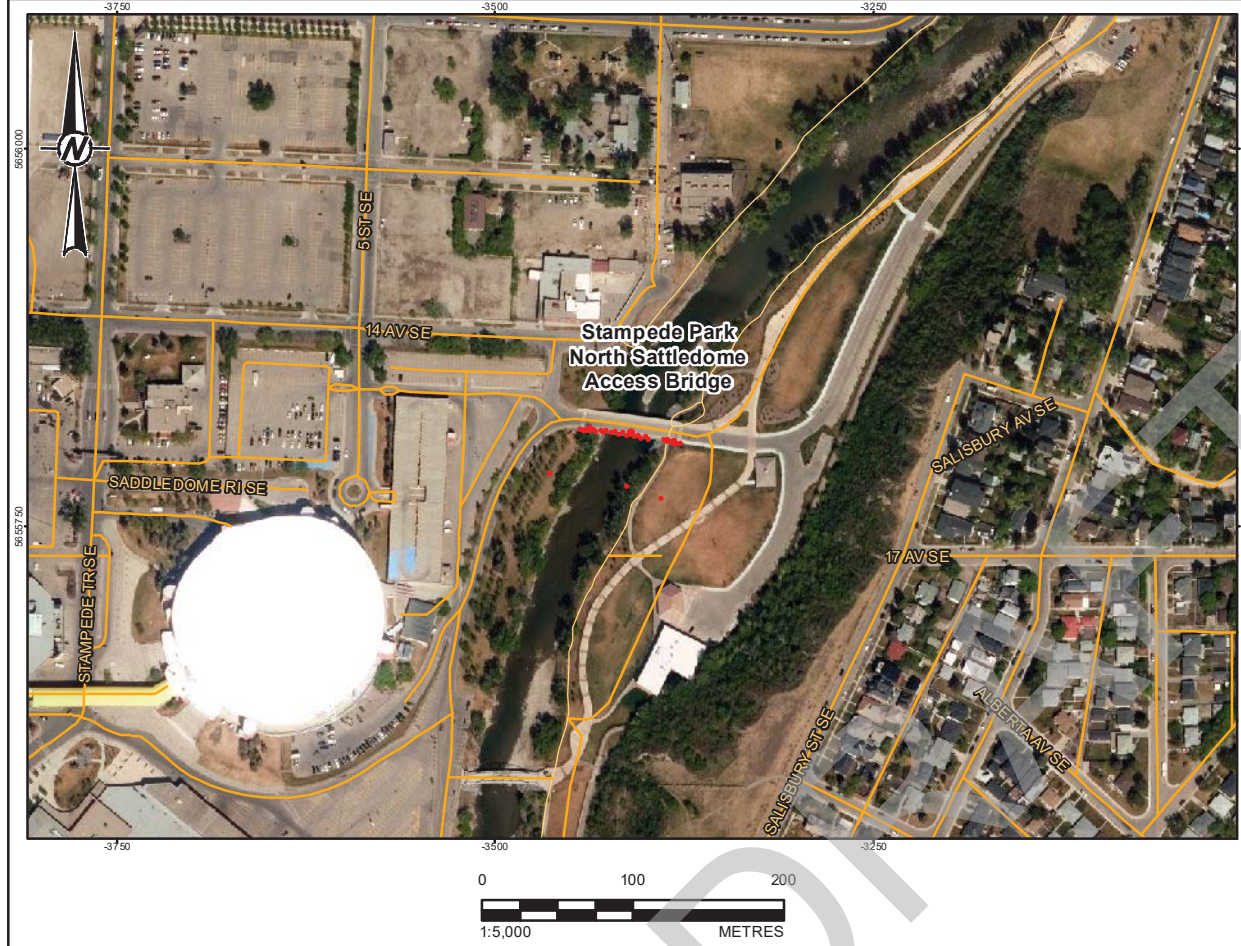
FIGURE
C-67

PHOTO 1 RIGHT BANK, LOOKING DOWNSTREAM



PHOTO 2 LEFT BANK, LOOKING DOWNSTREAM





TITLE
STAMPEDE PARK NORTH SATTLEDOME ACCESS BRIDGE

LOCATION	ELBOW RIVER
DESCRIPTION	SATTLEDOME ACCESS BRIDGE
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	-
YEAR BUILT	1982
TOTAL LENGTH OF SPAN (m)	57.384
DECK WIDTH OF BRIDGE (m)	14
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1044.53
AVERAGE LOW CHORD ELEVATION (m)	1043.05
AVERAGE DECK HEIGHT	1.49
NUMBER OF PIERS	1

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	359.22	1.2	CONCRETE	CYLINDER
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

- LEGEND**
- BRIDGE SURVEY POINT
 - ROAD
 - PATHWAY

NOTE(S)
 ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.
REFERENCE(S)
 BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
 ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
 DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT
 ALBERTA ENVIRONMENT AND PARKS

PROJECT
 BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT	YYYY-MM-DD	2017-06-09
	DESIGNED	W.PLOEGER
	PREPARED	V.VALLIS
	REVIEWED	W.PLOEGER
	APPROVED	D.LONG



PHOTO 1 RIGHT BANK, LOOKING DOWNSTREAM



PHOTO 2 LEFT BANK, LOOKING DOWNSTREAM



25mm IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM ANSA



TITLE
MACDONALD BRIDGE

LOCATION	ELBOW RIVER
DESCRIPTION	MACDONALD AVENUE
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	-
YEAR BUILT	1986
TOTAL LENGTH OF SPAN (m)	42.73
DECK WIDTH OF BRIDGE (m)	11.2
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1042.31
AVERAGE LOW CHORD ELEVATION (m)	1042.10
AVERAGE DECK HEIGHT	0.21
NUMBER OF PIERS	0

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	-	-	-	-
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

LEGEND

- BRIDGE SURVEY POINT
- ROAD
- PATHWAY

NOTE(S)

ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.

REFERENCE(S)

BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT

ALBERTA ENVIRONMENT AND PARKS

PROJECT

BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT



YYYY-MM-DD	2017-06-09
DESIGNED	W.PLOEGER
PREPARED	V.VALLIS
REVIEWED	W.PLOEGER
APPROVED	D.LONG

PROJECT NO.
1536673

CONTROL

REV.
0

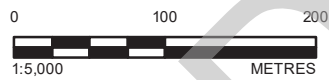
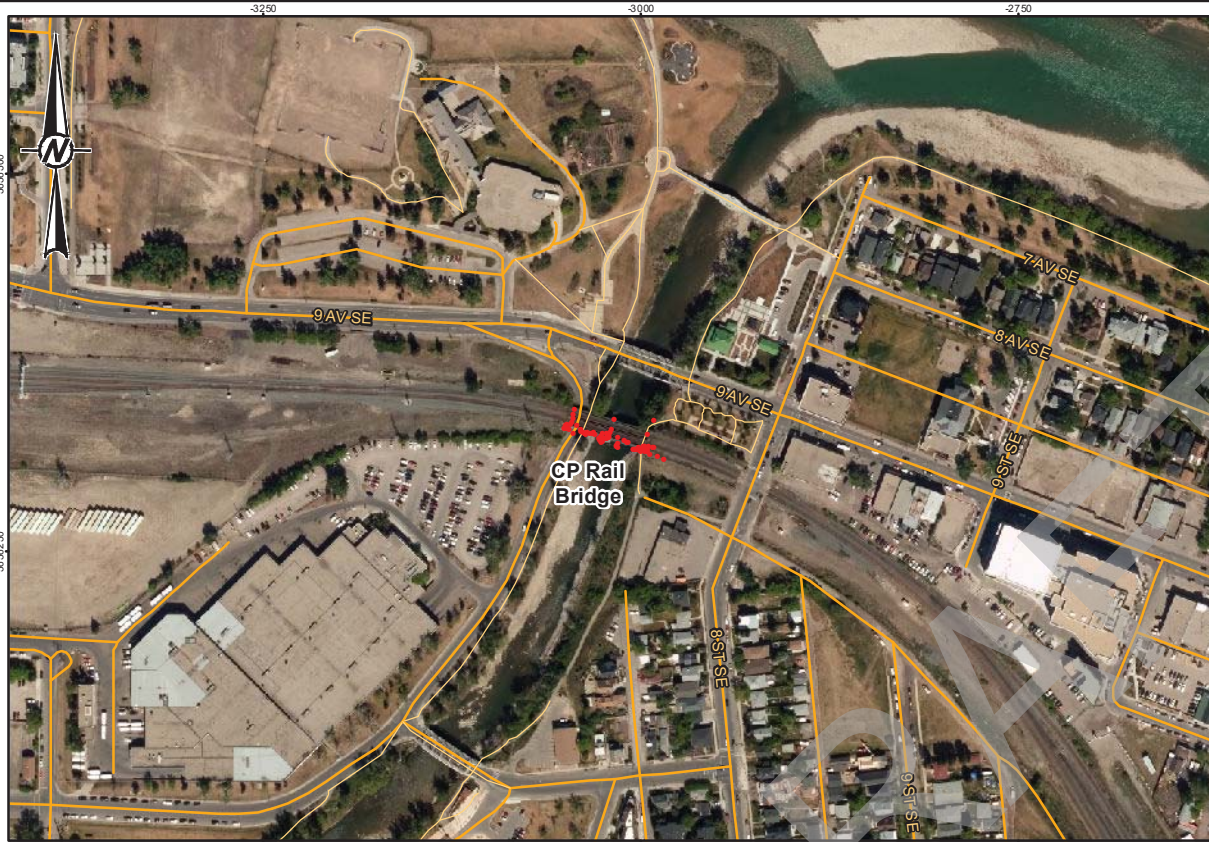
FIGURE
C-69

PHOTO 1 RIGHT BANK, LOOKING DOWNSTREAM



PHOTO 2 RIGHT BANK, ABUTMENT





TITLE
CP RAIL BRIDGE

LOCATION	ELBOW RIVER
DESCRIPTION	9TH AVENUE SE, RAIL BRIDGE
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	-
YEAR BUILT	-
TOTAL LENGTH OF SPAN (m)	57.11
DECK WIDTH OF BRIDGE (m)	13.7
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1044.65
AVERAGE LOW CHORD ELEVATION (m)	1042.06
AVERAGE DECK HEIGHT	2.60
NUMBER OF PIERS	1

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	153.33	1.83	CONCRETE	TRIANGULAR NOSE
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

LEGEND

- BRIDGE SURVEY POINT
- ROAD
- PATHWAY

NOTE(S)

ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.

REFERENCE(S)

BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT

ALBERTA ENVIRONMENT AND PARKS

PROJECT

BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT



YYYY-MM-DD	2017-06-09
DESIGNED	W.PLOEGER
PREPARED	V.VALLIS
REVIEWED	W.PLOEGER
APPROVED	D.LONG

PROJECT NO.
1536673

CONTROL

REV.
0

FIGURE
C-70

PHOTO 1 RIGHT BANK, LOOKING UPSTREAM

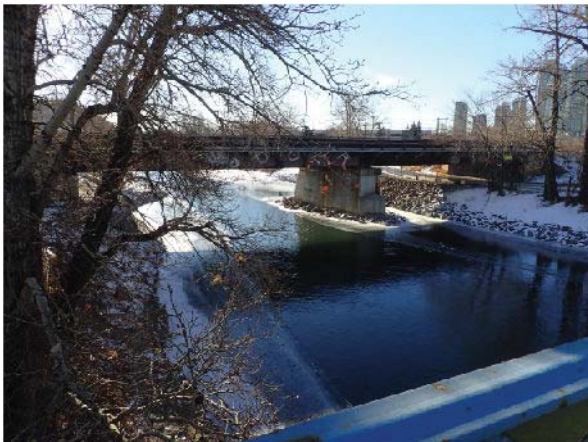
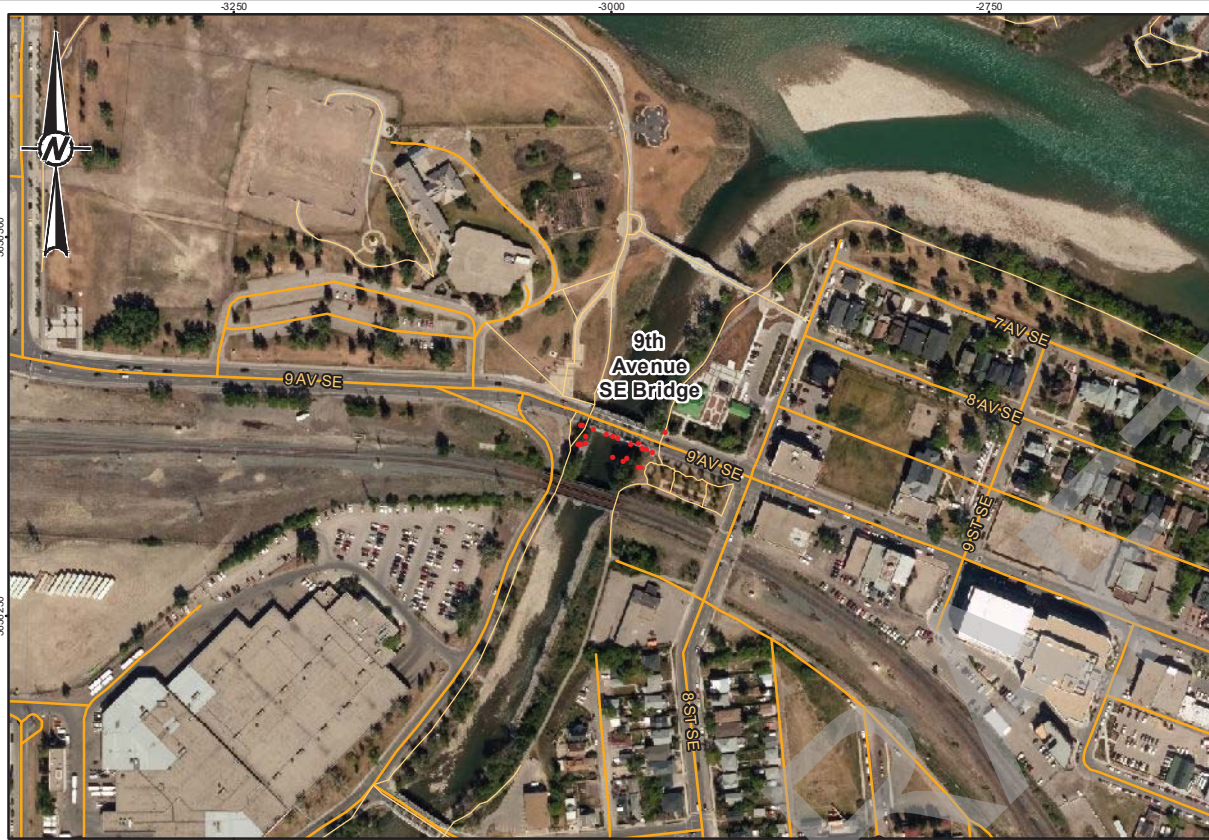


PHOTO 2 RIGHT BANK, LOOKING DOWNSTREAM





TITLE
9TH AVENUE SE BRIDGE

LOCATION	ELBOW RIVER
DESCRIPTION	INGLEWOOD
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	-
YEAR BUILT	1986
TOTAL LENGTH OF SPAN (m)	45.2
DECK WIDTH OF BRIDGE (m)	16
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1042.55
AVERAGE LOW CHORD ELEVATION (m)	1041.37
AVERAGE DECK HEIGHT	1.18
NUMBER OF PIERS	0

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	-	-	-	-
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

LEGEND

- BRIDGE SURVEY POINT
- ROAD
- PATHWAY

NOTE(S)

ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.

REFERENCE(S)

BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT

ALBERTA ENVIRONMENT AND PARKS

PROJECT

BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT



YYYY-MM-DD	2017-06-09
DESIGNED	W.PLOEGER
PREPARED	V.VALLIS
REVIEWED	W.PLOEGER
APPROVED	D.LONG

PROJECT NO.
1536673

CONTROL

REV.
0

FIGURE
C-71

PHOTO 1 RIGHT BANK, LOOKING UPSTREAM



PHOTO 2 RIGHT BANK, LOOKING ACROSS THE RIVER





TITLE
ELBOW RIVER TRAVERSE

LOCATION	ELBOW RIVER
DESCRIPTION	NEAR ELBOW RIVER CONFLUENCE
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	-
YEAR BUILT	2015
TOTAL LENGTH OF SPAN (m)	63.6
DECK WIDTH OF BRIDGE (m)	4.4
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1043.26
AVERAGE LOW CHORD ELEVATION (m)	1042.64
AVERAGE DECK HEIGHT	0.62
NUMBER OF PIERS	0

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	-	-	-	-
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

- LEGEND**
- BRIDGE SURVEY POINT
 - ROAD
 - PATHWAY

NOTE(S)
ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.
REFERENCE(S)
BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT
ALBERTA ENVIRONMENT AND PARKS

PROJECT
BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT	YYYY-MM-DD	2017-06-09
	DESIGNED	W.PLOEGER
	PREPARED	V.VALLIS
	REVIEWED	W.PLOEGER
	APPROVED	D.LONG



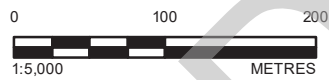
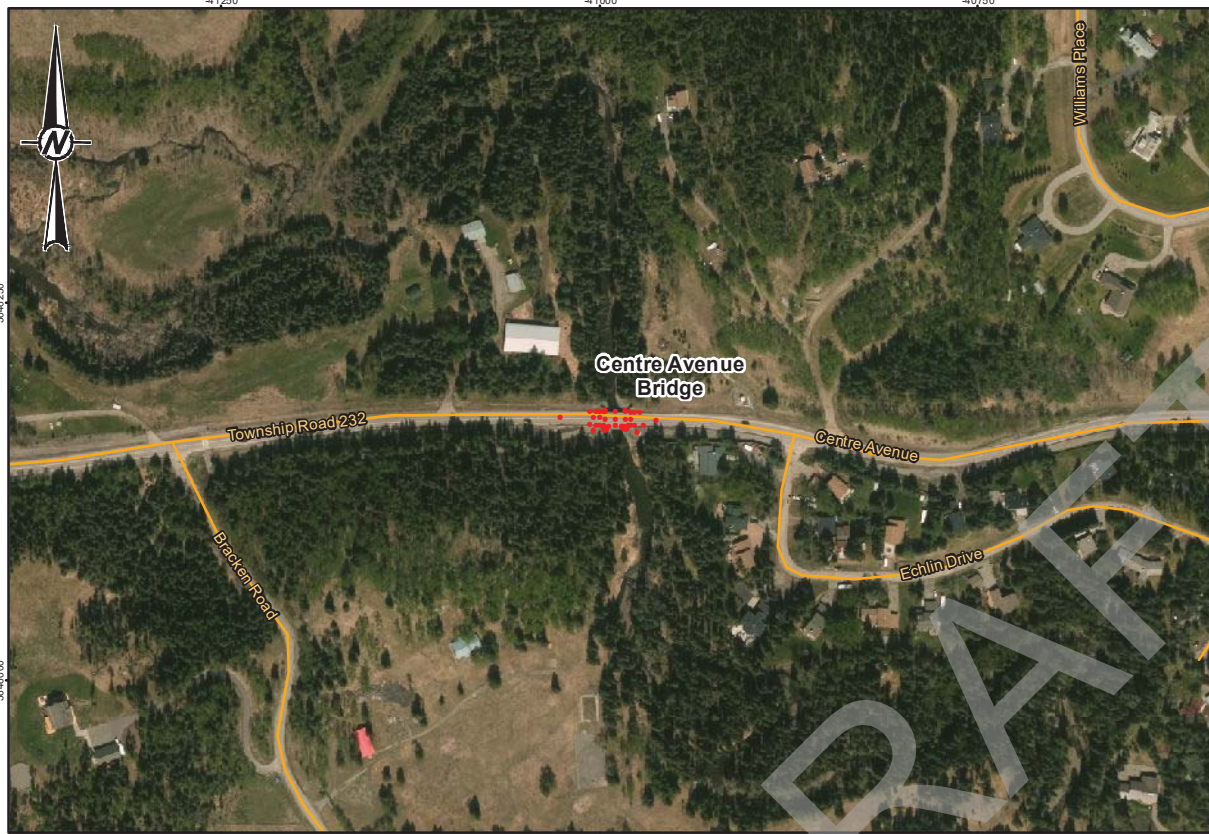
PHOTO 1 RIGHT BANK, LOOKING DOWNSTREAM



PHOTO 2



IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM ANSA



TITLE
CENTRE AVENUE BRIDGE

LOCATION	BRAGG CREEK
DESCRIPTION	IN BRAGG CREEK
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	71951
YEAR BUILT	-
TOTAL LENGTH OF SPAN (m)	13.9
DECK WIDTH OF BRIDGE (m)	11.2
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1316.58
AVERAGE LOW CHORD ELEVATION (m)	1315.89
AVERAGE DECK HEIGHT	0.69
NUMBER OF PIERS	0

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	-	-	-	-
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

LEGEND

- BRIDGE SURVEY POINT
- ROAD
- PATHWAY

NOTE(S)

ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.

REFERENCE(S)

BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT

ALBERTA ENVIRONMENT AND PARKS

PROJECT

BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT



YYYY-MM-DD	2017-06-09
DESIGNED	W.PLOEGER
PREPARED	V.VALLIS
REVIEWED	W.PLOEGER
APPROVED	D.LONG

PROJECT NO.
1536673

CONTROL

REV.
0

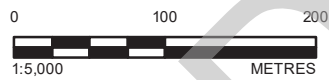
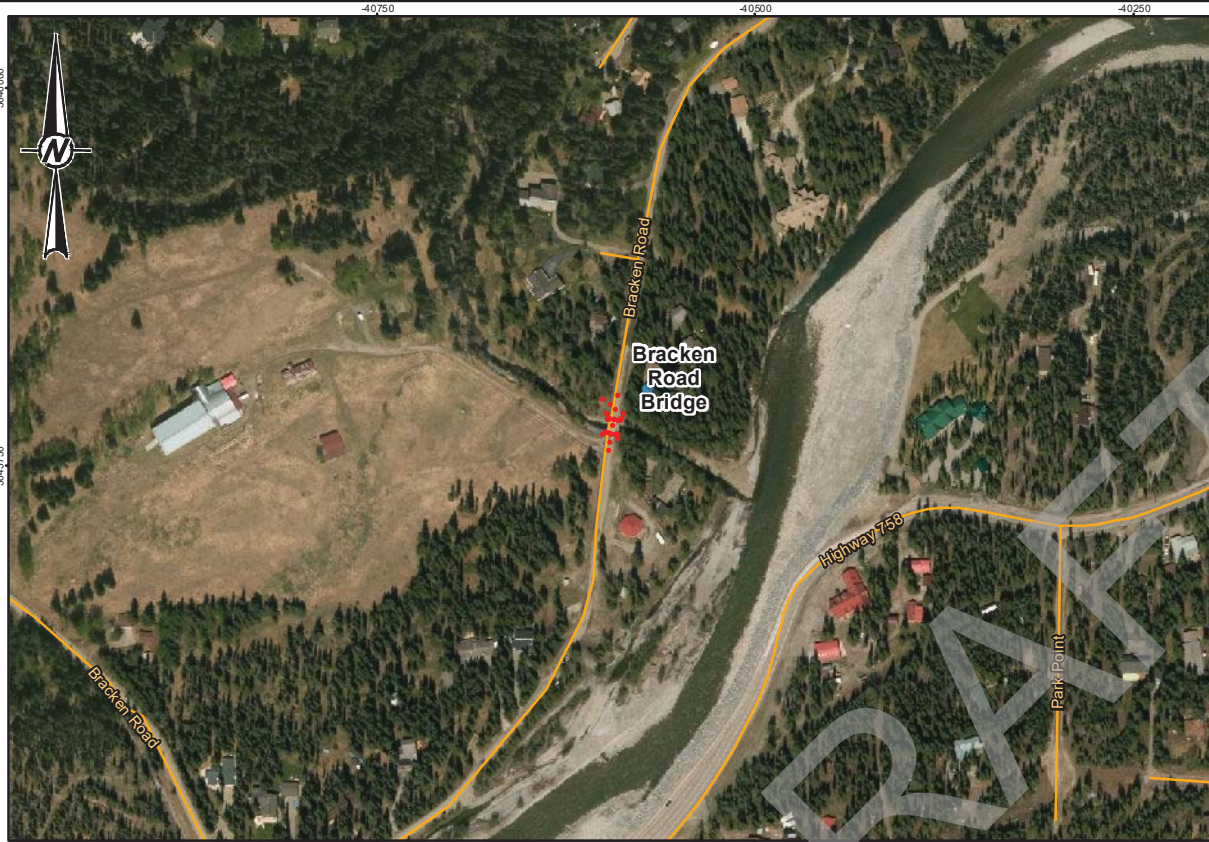
FIGURE
C-73

PHOTO 1 LEFT BANK, LOOKING DOWNSTREAM



PHOTO 2 LEFT BANK, LOOKING DOWNSTREAM





TITLE
BRACKEN ROAD BRIDGE

LOCATION	BRAGG CREEK
DESCRIPTION	IN BRAGG CREEK
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	72292
YEAR BUILT	-
TOTAL LENGTH OF SPAN (m)	9.4
DECK WIDTH OF BRIDGE (m)	7.3
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1307.02
AVERAGE LOW CHORD ELEVATION (m)	1306.18
AVERAGE DECK HEIGHT	0.83
NUMBER OF PIERS	0

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	-	-	-	-
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

LEGEND

- BRIDGE SURVEY POINT
- ROAD
- PATHWAY

NOTE(S)

ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.

REFERENCE(S)

BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT

ALBERTA ENVIRONMENT AND PARKS

PROJECT

BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT



YYYY-MM-DD	2017-06-09
DESIGNED	W.PLOEGER
PREPARED	V.VALLIS
REVIEWED	W.PLOEGER
APPROVED	D.LONG

PROJECT NO.
1536673

CONTROL

REV.
0

FIGURE
C-74

PHOTO 1 RIGHT BANK, LOOKING DOWNSTREAM



PHOTO 2 RIGHT BANK, ABUTMENT



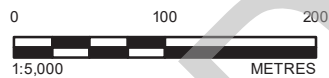
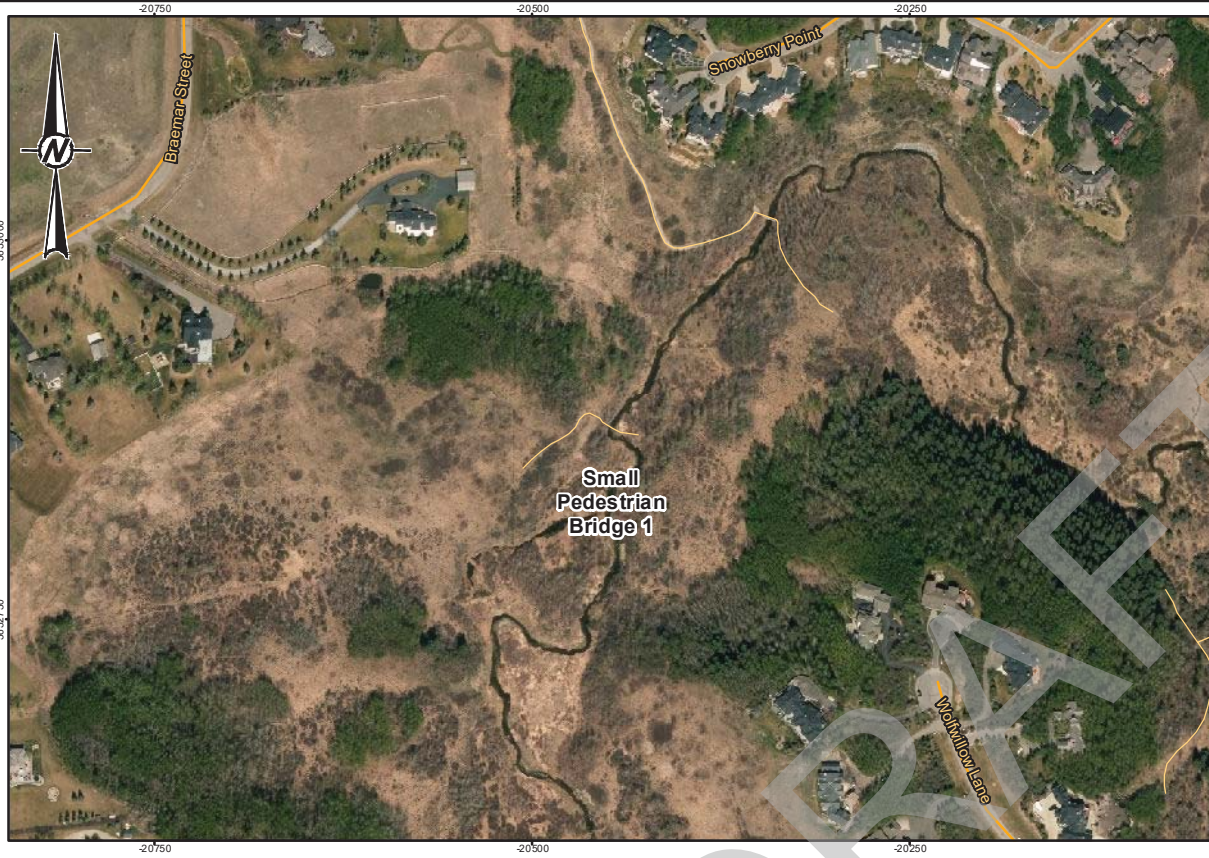


PHOTO 1 LOOKING AT BRIDGE



PHOTO 2

TITLE
SMALL PEDESTRIAN BRIDGE 1

LOCATION	LOTT CREEK
DESCRIPTION	SMALL TIMBER BEAM BRIDGE WITH NO PIERS OR ABUTMENTS
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	-
YEAR BUILT	-
TOTAL LENGTH OF SPAN (m)	9.1
DECK WIDTH OF BRIDGE (m)	1.2
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1124.07
AVERAGE LOW CHORD ELEVATION (m)	1123.80
AVERAGE DECK HEIGHT	0.28
NUMBER OF PIERS	0

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	-	-	-	-
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

LEGEND

- BRIDGE SURVEY POINT
- ROAD
- PATHWAY

NOTE(S)

ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.

REFERENCE(S)

BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT
ALBERTA ENVIRONMENT AND PARKS

PROJECT
BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT	YYYY-MM-DD	2017-06-09
DESIGNED	W.PLOEGER	
PREPARED	V.VALLIS	
REVIEWED	W.PLOEGER	
APPROVED	D.LONG	



PROJECT NO. 1536673	CONTROL	REV. 0	FIGURE C-75
------------------------	---------	-----------	-----------------------



TITLE
SMALL PEDESTRIAN BRIDGE 2

LOCATION LOTT CREEK

DESCRIPTION SMALL TIMBER BEAM BRIDGE WITH NO PIERS OR ABUTMENTS

ALBERTA TRANSPORTATION BRIDGE FILE NUMBER -

YEAR BUILT -

TOTAL LENGTH OF SPAN (m) 9.1

DECK WIDTH OF BRIDGE (m) 1.2

AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m) 1119.45

AVERAGE LOW CHORD ELEVATION (m) 1119.18

AVERAGE DECK HEIGHT 0.28

NUMBER OF PIERS 0

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	-	-	-	-
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

LEGEND

- BRIDGE SURVEY POINT
- ROAD
- PATHWAY

NOTE(S)

ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.

REFERENCE(S)

BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT

ALBERTA ENVIRONMENT AND PARKS

PROJECT

BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT



YYYY-MM-DD	2017-06-09
DESIGNED	W.PLOEGER
PREPARED	V.VALLIS
REVIEWED	W.PLOEGER
APPROVED	D.LONG

PROJECT NO.
1536673

CONTROL

REV.
0

FIGURE
C-76

PHOTO 1

LOOKING ACROSS BRIDGE



PHOTO 2

LOOKING DOWNSTREAM



IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM ANS/A

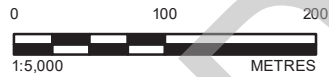
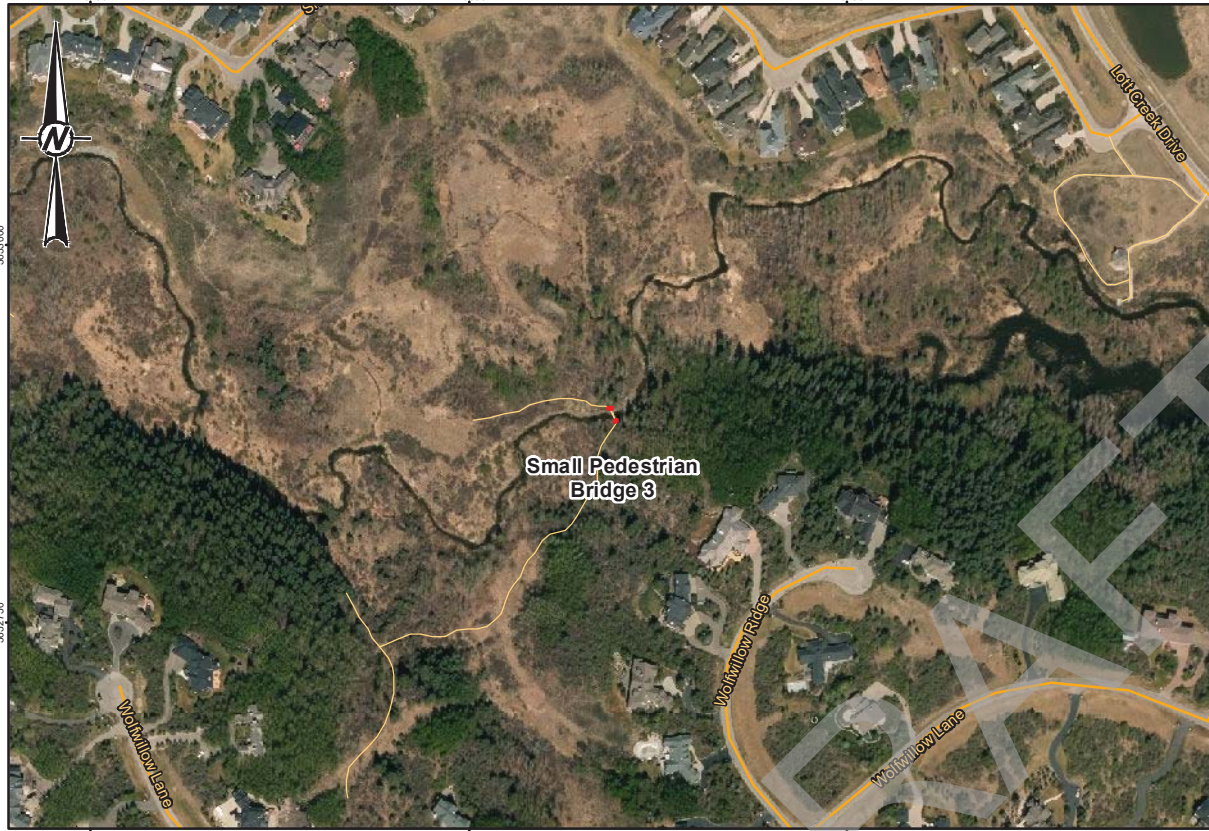


PHOTO 1 LEFT BANK, LOOKING UPSTREAM



PHOTO 2 LOOKING ACROSS BRIDGE



TITLE
SMALL PEDESTRIAN BRIDGE 3

LOCATION	LOTT CREEK
DESCRIPTION	SMALL TIMBER BEAM BRIDGE WITH NO PIERS OR ABUTMENTS
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	-
YEAR BUILT	-
TOTAL LENGTH OF SPAN (m)	9.1
DECK WIDTH OF BRIDGE (m)	1.2
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1119.62
AVERAGE LOW CHORD ELEVATION (m)	1119.35
AVERAGE DECK HEIGHT	0.28
NUMBER OF PIERS	0

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	-	-	-	-
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

- LEGEND**
- BRIDGE SURVEY POINT
 - ROAD
 - PATHWAY

NOTE(S)
ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.
REFERENCE(S)
BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT
ALBERTA ENVIRONMENT AND PARKS

PROJECT
BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT	YYYY-MM-DD	2017-06-09
	DESIGNED	W.PLOEGER
	PREPARED	V.VALLIS
	REVIEWED	W.PLOEGER
	APPROVED	D.LONG



IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM ANS/A



TITLE	
MISTY MORNING DRIVE CULVERT	
DESCRIPTION	LOTT CREEK DRIVE AND MISTY MORNING DRIVE
NUMBER OF CULVERTS	1
TOTAL LENGTH OF CULVERT (m)	12.00
RISE OF CULVERT (m)	1.30
SPAN OF CULVERT (m)	2.40
DIAMETER OF CULVERT	-
CULVERT TYPE	CONCRETE BOX
CULVERT INVERT ELEVATION - UPSTREAM END (m)	1114.58
CULVERT INVERT ELEVATION - DOWNSTREAM END (m)	1114.27

LEGEND	
	SURVEY POINT
	ROAD
	PATHWAY

NOTE(S)
 SEE REPORT SECTION 2.3 FOR MORE INFORMATION.
 WHERE THERE ARE MULTIPLE CULVERTS, SUBSEQUENT INFORMATION IS APPLICABLE FOR ALL CULVERTS.

REFERENCE(S)
 HYDRAULIC STRUCTURE SURVEY AND STRUCTURE PHOTOS BY GOLDER ASSOCIATES LTD. 2016.
 ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
 DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT
 ALBERTA ENVIRONMENT AND PARKS

PROJECT
 BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT	YYYY-MM-DD	2017-06-09
	DESIGNED	W.PLOEGER
	PREPARED	V.VALLIS
	REVIEWED	W.PLOEGER
	APPROVED	D.LONG

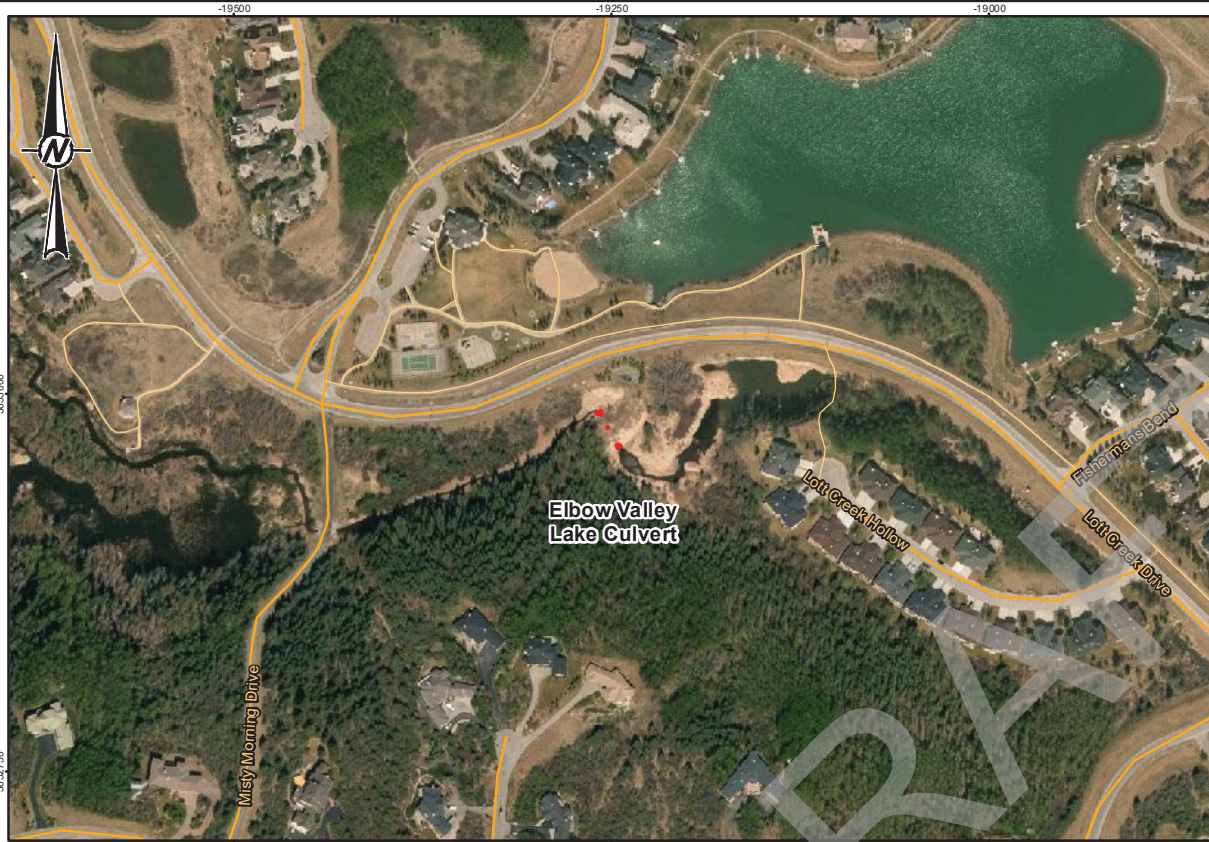
PROJECT NO.	CONTROL	REV.	FIGURE
1536669		0	C-78

PHOTO 1 LEFT BANK, LOOKING DOWNSTREAM



PHOTO 2 LEFT BANK, LOOKING UPSTREAM





TITLE
ELBOW VALLEY LAKE CULVERT

DESCRIPTION	BETWEEN LOTT CREEK HOLLOW AND MISTY MORNING DRIVE
NUMBER OF CULVERTS	1
TOTAL LENGTH OF CULVERT (m)	23.00
RISE OF CULVERT (m)	-
SPAN OF CULVERT (m)	-
DIAMETER OF CULVERT	1.00
CULVERT TYPE	CONCRETE PIPE
CULVERT INVERT ELEVATION - UPSTREAM END (m)	1113.56
CULVERT INVERT ELEVATION - DOWNSTREAM END (m)	1113.20

LEGEND

- SURVEY POINT
- ROAD
- PATHWAY

NOTE(S)

SEE REPORT SECTION 2.3 FOR MORE INFORMATION. WHERE THERE ARE MULTIPLE CULVERTS, SUBSEQUENT INFORMATION IS APPLICABLE FOR ALL CULVERTS.

REFERENCE(S)

HYDRAULIC STRUCTURE SURVEY AND STRUCTURE PHOTOS BY GOLDER ASSOCIATES LTD. 2016.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT

ALBERTA ENVIRONMENT AND PARKS

PROJECT

BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT



YYYY-MM-DD	2017-06-09
DESIGNED	W.PLOEGER
PREPARED	V.VALLIS
REVIEWED	W.PLOEGER
APPROVED	D.LONG

PROJECT NO.
1536669

CONTROL

REV.
0

FIGURE
C-79

PHOTO 1

LEFT BANK, LOOKING DOWNSTREAM



PHOTO 2



TITLE
SMALL PEDESTRIAN BRIDGE 4

LOCATION	LOTT CREEK
DESCRIPTION	SMALL TIMBER BEAM BRIDGE WITH NO PIERS OR ABUTMENTS
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	-
YEAR BUILT	-
TOTAL LENGTH OF SPAN (m)	2.9
DECK WIDTH OF BRIDGE (m)	0.6
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1114.01
AVERAGE LOW CHORD ELEVATION (m)	1113.83
AVERAGE DECK HEIGHT	0.18
NUMBER OF PIERS	0

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	-	-	-	-
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

- LEGEND**
- BRIDGE SURVEY POINT
 - ROAD
 - PATHWAY

NOTE(S)
ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.
REFERENCE(S)
BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT
ALBERTA ENVIRONMENT AND PARKS

PROJECT
BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT	YYYY-MM-DD	2017-06-09
DESIGNED	W.PLOEGER	
PREPARED	V.VALLIS	
REVIEWED	W.PLOEGER	
APPROVED	D.LONG	



PHOTO 1 LOOKING ACROSS BRIDGE



PHOTO 2

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM ANS/A



TITLE
LOTT CREEK HOLLOW CULVERT

DESCRIPTION	LOTT CREEK DRIVE AND LOTT CREEK HOLLOW
NUMBER OF CULVERTS	2
TOTAL LENGTH OF CULVERT (m)	59.00
RISE OF CULVERT (m)	-
SPAN OF CULVERT (m)	-
DIAMETER OF CULVERT	1.20
CULVERT TYPE	CORRUGATED STEEL PIPE
CULVERT INVERT ELEVATION - UPSTREAM END (m)	1112.72
CULVERT INVERT ELEVATION - DOWNSTREAM END (m)	1112.33

LEGEND

- SURVEY POINT
- ROAD
- PATHWAY

NOTE(S)
SEE REPORT SECTION 2.3 FOR MORE INFORMATION.
WHERE THERE ARE MULTIPLE CULVERTS, SUBSEQUENT INFORMATION IS APPLICABLE FOR ALL CULVERTS.

REFERENCE(S)
HYDRAULIC STRUCTURE SURVEY AND STRUCTURE PHOTOS BY GOLDER ASSOCIATES LTD. 2016.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT
ALBERTA ENVIRONMENT AND PARKS

PROJECT
BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT	YYYY-MM-DD	2017-06-09
	DESIGNED	W.PLOEGER
	PREPARED	V.VALLIS
	REVIEWED	W.PLOEGER
	APPROVED	D.LONG



PROJECT NO. 1536669	CONTROL	REV. 0	FIGURE C-81
-------------------------------	----------------	------------------	------------------------------

PHOTO 1 RIGHT BANK, LOOKING UPSTREAM



PHOTO 2 RIGHT BANK, LOOKING DOWNSTREAM



IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM ANS/A

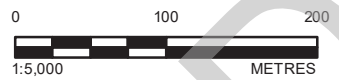
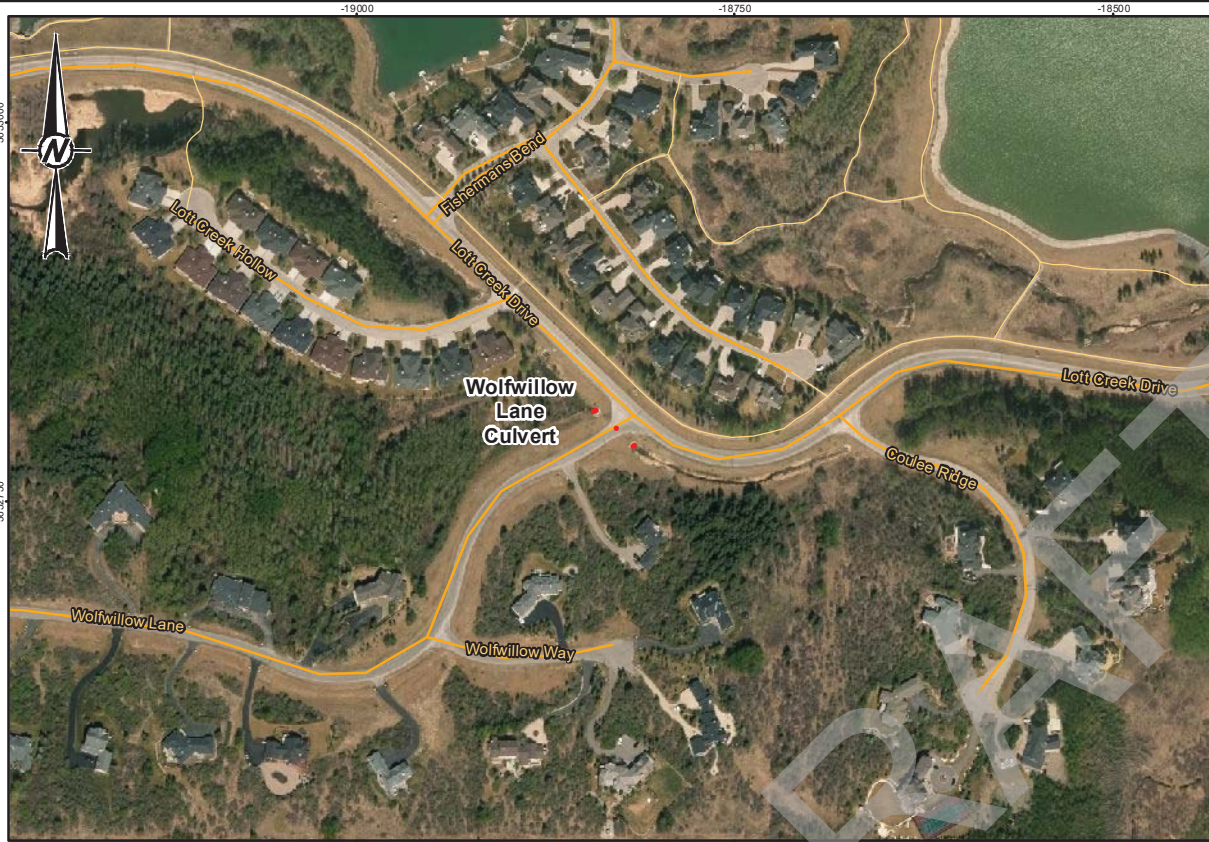


PHOTO 1 LEFT BANK, LOOKING UPSTREAM



PHOTO 2 LEFT BANK, LOOKING DOWNSTREAM



TITLE	
WOLFWillow Lane Culvert	
DESCRIPTION	LOTI CREEK DRIVE AND WOLFWillow Lane
NUMBER OF CULVERTS	2
TOTAL LENGTH OF CULVERT (m)	35.00
RISE OF CULVERT (m)	-
SPAN OF CULVERT (m)	-
DIAMETER OF CULVERT	1.20
CULVERT TYPE	CORRUGATED STEEL PIPE
CULVERT INVERT ELEVATION - UPSTREAM END (m)	1112.22
CULVERT INVERT ELEVATION - DOWNSTREAM END (m)	1112.12

LEGEND	
•	SURVEY POINT
—	ROAD
—	PATHWAY

NOTE(S)
 SEE REPORT SECTION 2.3 FOR MORE INFORMATION.
 WHERE THERE ARE MULTIPLE CULVERTS, SUBSEQUENT INFORMATION IS APPLICABLE FOR ALL CULVERTS.

REFERENCE(S)
 HYDRAULIC STRUCTURE SURVEY AND STRUCTURE PHOTOS BY GOLDER ASSOCIATES LTD. 2016.
 ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
 DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT		
ALBERTA ENVIRONMENT AND PARKS		
PROJECT		
BOW AND ELBOW RIVER HAZARD STUDY		
CONSULTANT	YYYY-MM-DD	2017-06-09
	DESIGNED	W.PLOEGER
	PREPARED	V.VALLIS
	REVIEWED	W.PLOEGER
	APPROVED	D.LONG



PROJECT NO.	CONTROL	REV.	FIGURE
1536669		0	C-82

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM ANS/A

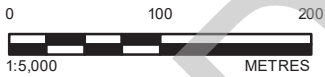


PHOTO 1 LEFT BANK, LOOKING DOWNSTREAM



PHOTO 2 LEFT BANK, LOOKING DOWNSTREAM



TITLE
COULEE RIDGE CULVERT

DESCRIPTION	LOTT CREEK DRIVE AND COULEE RIDGE
NUMBER OF CULVERTS	2
TOTAL LENGTH OF CULVERT (m)	90.00
RISE OF CULVERT (m)	-
SPAN OF CULVERT (m)	-
DIAMETER OF CULVERT	1.40
CULVERT TYPE	CORRUGATED STEEL PIPE
CULVERT INVERT ELEVATION - UPSTREAM END (m)	1110.41
CULVERT INVERT ELEVATION - DOWNSTREAM END (m)	1107.70

LEGEND

- SURVEY POINT
- ROAD
- PATHWAY

NOTE(S)
SEE REPORT SECTION 2.3 FOR MORE INFORMATION.
WHERE THERE ARE MULTIPLE CULVERTS, SUBSEQUENT INFORMATION IS APPLICABLE FOR ALL CULVERTS.

REFERENCE(S)
HYDRAULIC STRUCTURE SURVEY AND STRUCTURE PHOTOS BY GOLDER ASSOCIATES LTD. 2016.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT
ALBERTA ENVIRONMENT AND PARKS

PROJECT
BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT	YYYY-MM-DD	2017-06-09
	DESIGNED	W.PLOEGER
	PREPARED	V.VALLIS
	REVIEWED	W.PLOEGER
	APPROVED	D.LONG



PROJECT NO. 1536669	CONTROL	REV. 0	FIGURE C-83
------------------------	---------	-----------	-----------------------

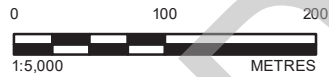
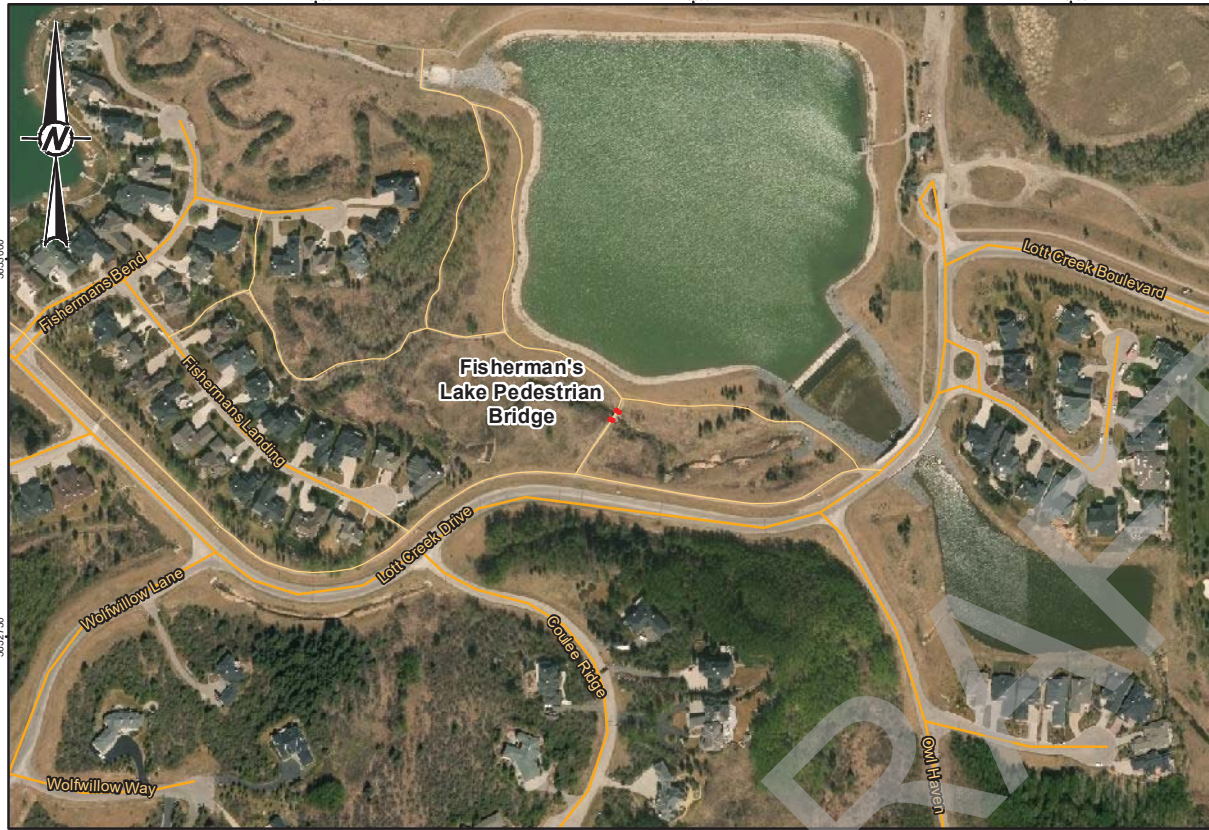


PHOTO 1 LEFT BANK, LOOKING DOWNSTREAM



PHOTO 2 RIGHT BANK, LOOKING UPSTREAM



TITLE
FISHERMAN'S LAKE PEDESTRIAN BRIDGE

LOCATION	LOTT CREEK
DESCRIPTION	BETWEEN OWL HAVEN AND COULEE RIDGE
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	-
YEAR BUILT	-
TOTAL LENGTH OF SPAN (m)	7.1
DECK WIDTH OF BRIDGE (m)	2.1
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1110.19
AVERAGE LOW CHORD ELEVATION (m)	1109.66
AVERAGE DECK HEIGHT	0.53
NUMBER OF PIERS	0

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	-	-	-	-
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

- LEGEND**
- BRIDGE SURVEY POINT
 - ROAD
 - PATHWAY

NOTE(S)
ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.
REFERENCE(S)
BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT
ALBERTA ENVIRONMENT AND PARKS

PROJECT
BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT	YYYY-MM-DD	2017-06-09
	DESIGNED	W.PLOEGER
	PREPARED	V.VALLIS
	REVIEWED	W.PLOEGER
	APPROVED	D.LONG



25mm IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM ANSA

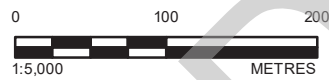


PHOTO 1 LEFT BANK, LOOKING DOWNSTREAM



PHOTO 2 LEFT BANK, LOOKING UPSTREAM



TITLE
OWL HAVEN CULVERT

DESCRIPTION	NORTH OF LOTT CREEK DRIVE AND OWL HAVEN
NUMBER OF CULVERTS	1
TOTAL LENGTH OF CULVERT (m)	21.00
RISE OF CULVERT (m)	-
SPAN OF CULVERT (m)	-
DIAMETER OF CULVERT	1.70
CULVERT TYPE	CORRUGATED STEEL PIPE
CULVERT INVERT ELEVATION - UPSTREAM END (m)	1106.70
CULVERT INVERT ELEVATION - DOWNSTREAM END (m)	1106.65

LEGEND

- SURVEY POINT
- ROAD
- PATHWAY

NOTE(S)

SEE REPORT SECTION 2.3 FOR MORE INFORMATION.
WHERE THERE ARE MULTIPLE CULVERTS, SUBSEQUENT INFORMATION IS APPLICABLE FOR ALL CULVERTS.

REFERENCE(S)

HYDRAULIC STRUCTURE SURVEY AND STRUCTURE PHOTOS BY GOLDER ASSOCIATES LTD. 2016.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

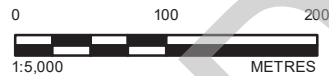
CLIENT
ALBERTA ENVIRONMENT AND PARKS

PROJECT
BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT	YYYY-MM-DD	2017-06-09
DESIGNED	W.PLOEGER	
PREPARED	V.VALLIS	
REVIEWED	W.PLOEGER	
APPROVED	D.LONG	



PROJECT NO. 1536669	CONTROL	REV. 0	FIGURE C-85
------------------------	---------	-----------	-----------------------



TITLE
LOTT CREEK DRIVE BRIDGE

DESCRIPTION	LOTT CREEK DRIVE NEAR CROOKED POND GREEN
NUMBER OF CULVERTS	1
TOTAL LENGTH OF CULVERT (m)	17.70
RISE OF CULVERT (m)	3.70
SPAN OF CULVERT (m)	8.00
DIAMETER OF CULVERT	-
CULVERT TYPE	CORRUGATED STEEL ARCH
CULVERT INVERT ELEVATION - UPSTREAM END (m)	1106.11
CULVERT INVERT ELEVATION - DOWNSTREAM END (m)	1105.92

LEGEND

- SURVEY POINT
- ROAD
- PATHWAY

NOTE(S)

SEE REPORT SECTION 2.3 FOR MORE INFORMATION.
WHERE THERE ARE MULTIPLE CULVERTS, SUBSEQUENT INFORMATION IS APPLICABLE FOR ALL CULVERTS.

REFERENCE(S)

HYDRAULIC STRUCTURE SURVEY AND STRUCTURE PHOTOS BY GOLDER ASSOCIATES LTD. 2016.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT
ALBERTA ENVIRONMENT AND PARKS

PROJECT
BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT	YYYY-MM-DD	2017-06-09
	DESIGNED	W.PLOEGER
	PREPARED	V.VALLIS
	REVIEWED	W.PLOEGER
	APPROVED	D.LONG



PROJECT NO. 1536669	CONTROL	REV. 0	FIGURE C-86
------------------------	---------	-----------	-----------------------

PHOTO 1 RIGHT BANK, LOOKING UPSTREAM



PHOTO 2 RIGHT BANK, LOOKING DOWNSTREAM





TITLE
GOLF COURSE BRIDGE 1

LOCATION	LOTT CREEK
DESCRIPTION	ELBOW SPRINGS GOLF CLUB
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	-
YEAR BUILT	-
TOTAL LENGTH OF SPAN (m)	8.5
DECK WIDTH OF BRIDGE (m)	2.4
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1107.61
AVERAGE LOW CHORD ELEVATION (m)	1106.86
AVERAGE DECK HEIGHT	0.75
NUMBER OF PIERS	0

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	-	-	-	-
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

LEGEND

- BRIDGE SURVEY POINT
- ROAD
- PATHWAY

NOTE(S)

ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.

REFERENCE(S)

BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT

ALBERTA ENVIRONMENT AND PARKS

PROJECT

BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT



YYYY-MM-DD	2017-06-09
DESIGNED	W.PLOEGER
PREPARED	V.VALLIS
REVIEWED	W.PLOEGER
APPROVED	D.LONG

PROJECT NO.
1536673

CONTROL

REV.
0

FIGURE
C-87

PHOTO 1 LEFT BANK, LOOKING UPSTREAM



PHOTO 2 RIGHT BANK, LOOKING UPSTREAM



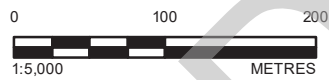
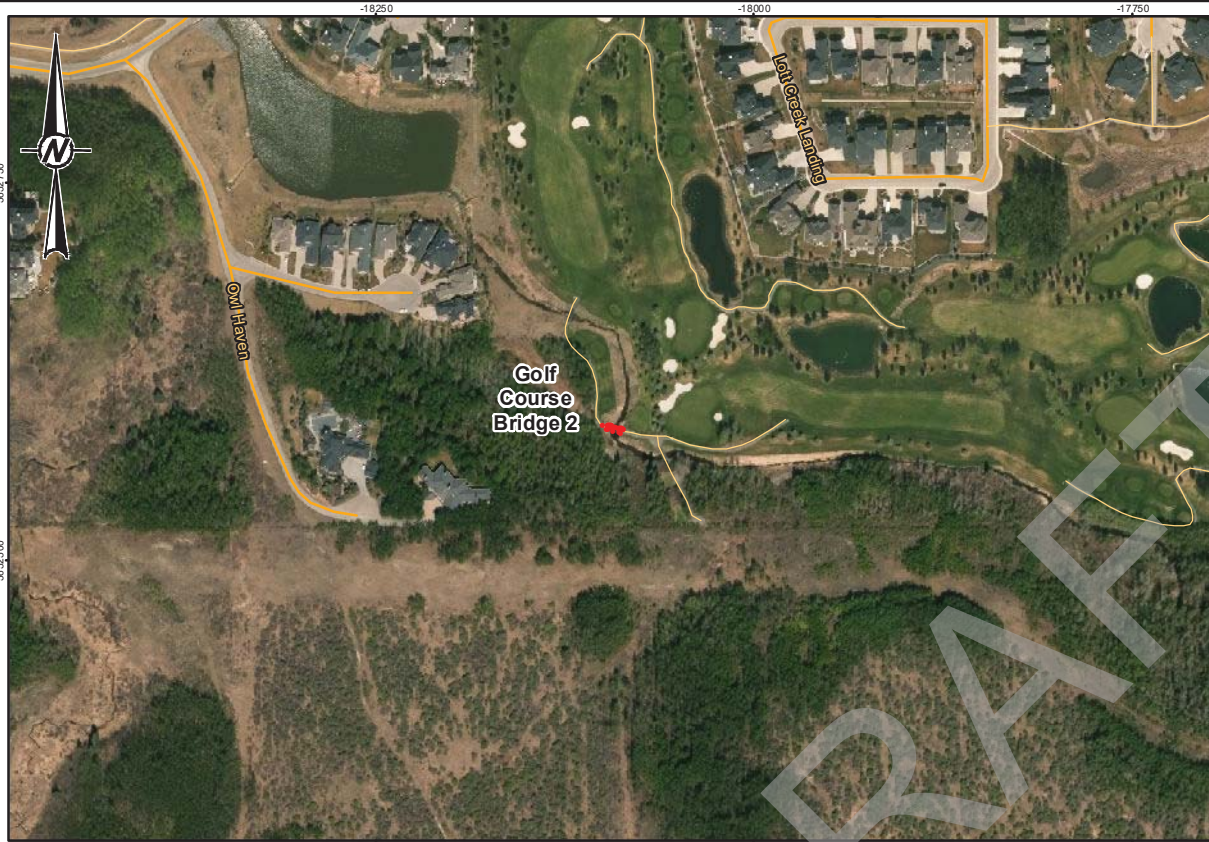


PHOTO 1 LEFT BANK, LOOKING DOWNSTREAM



PHOTO 2

TITLE
GOLF COURSE BRIDGE 2

LOCATION	LOTT CREEK
DESCRIPTION	ELBOW SPRINGS GOLF CLUB
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	-
YEAR BUILT	-
TOTAL LENGTH OF SPAN (m)	8.5
DECK WIDTH OF BRIDGE (m)	2.2
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1107.24
AVERAGE LOW CHORD ELEVATION (m)	1106.51
AVERAGE DECK HEIGHT	0.73
NUMBER OF PIERS	0

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	-	-	-	-
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

- LEGEND**
- BRIDGE SURVEY POINT
 - ROAD
 - PATHWAY

NOTE(S)
ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.
REFERENCE(S)
BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT
ALBERTA ENVIRONMENT AND PARKS

PROJECT
BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT	YYYY-MM-DD	2017-06-09
DESIGNED	W.PLOEGER	
PREPARED	V.VALLIS	
REVIEWED	W.PLOEGER	
APPROVED	D.LONG	



IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM ANS/A

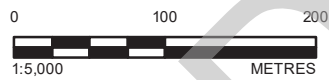


PHOTO 1 RIGHT BANK, LOOKING DOWNSTREAM



PHOTO 2 RIGHT BANK, LOOKING UPSTREAM



TITLE
GOLF COURSE BRIDGE 3

LOCATION	LOTT CREEK
DESCRIPTION	ELBOW SPRINGS GOLF CLUB
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	-
YEAR BUILT	-
TOTAL LENGTH OF SPAN (m)	9
DECK WIDTH OF BRIDGE (m)	2.2
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1107.31
AVERAGE LOW CHORD ELEVATION (m)	1107.01
AVERAGE DECK HEIGHT	0.30
NUMBER OF PIERS	0

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	-	-	-	-
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

LEGEND

- BRIDGE SURVEY POINT
- ROAD
- PATHWAY

NOTE(S)

ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.

REFERENCE(S)

BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

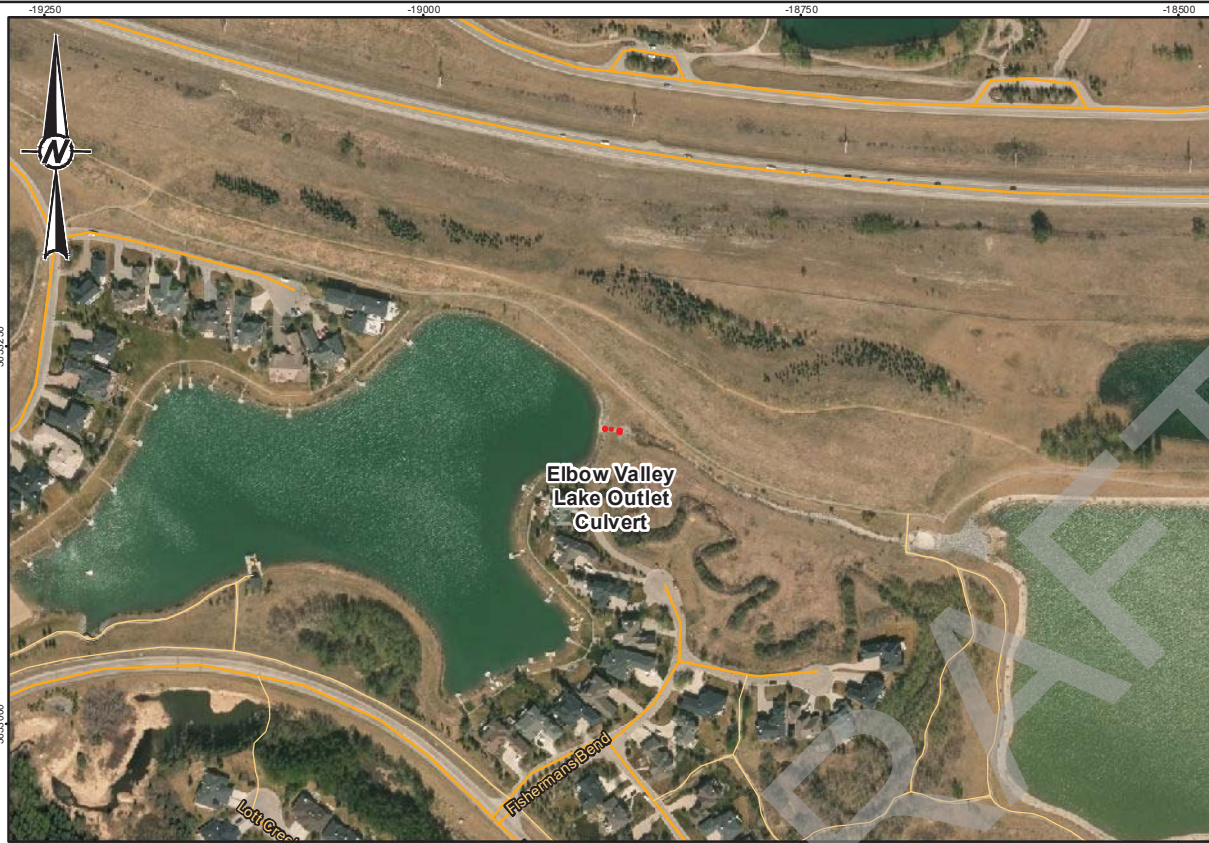
CLIENT
ALBERTA ENVIRONMENT AND PARKS

PROJECT
BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT	YYYY-MM-DD	2017-06-09
	DESIGNED	W.PLOEGER
	PREPARED	V.VALLIS
	REVIEWED	W.PLOEGER
	APPROVED	D.LONG



PROJECT NO. 1536673	CONTROL	REV. 0	FIGURE C-89
------------------------	---------	-----------	-----------------------



TITLE
ELBOW VALLEY LAKE OUTLET CULVERT

DESCRIPTION	NORTH OF FISHERMANS BEND
NUMBER OF CULVERTS	1
TOTAL LENGTH OF CULVERT (m)	9.50
RISE OF CULVERT (m)	0.6
SPAN OF CULVERT (m)	1.0
DIAMETER OF CULVERT	-
CULVERT TYPE	CONCRETE BOX
CULVERT INVERT ELEVATION - UPSTREAM END (m)	1112.05
CULVERT INVERT ELEVATION - DOWNSTREAM END (m)	1111.60

LEGEND

- SURVEY POINT
- ROAD
- PATHWAY

NOTE(S)

SEE REPORT SECTION 2.3 FOR MORE INFORMATION.
WHERE THERE ARE MULTIPLE CULVERTS, SUBSEQUENT INFORMATION IS APPLICABLE FOR ALL CULVERTS.

REFERENCE(S)

HYDRAULIC STRUCTURE SURVEY AND STRUCTURE PHOTOS BY GOLDER ASSOCIATES LTD. 2016.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT
ALBERTA ENVIRONMENT AND PARKS

PROJECT
BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT	YYYY-MM-DD	2017-06-09
	DESIGNED	W.PLOEGER
	PREPARED	V.VALLIS
	REVIEWED	W.PLOEGER
	APPROVED	D.LONG



PROJECT NO. 1536669	CONTROL	REV. 0	FIGURE C-90
------------------------	---------	-----------	-----------------------

PHOTO 1 LOOKING UPSTREAM



PHOTO 2 LOOKING DOWNSTREAM



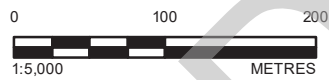
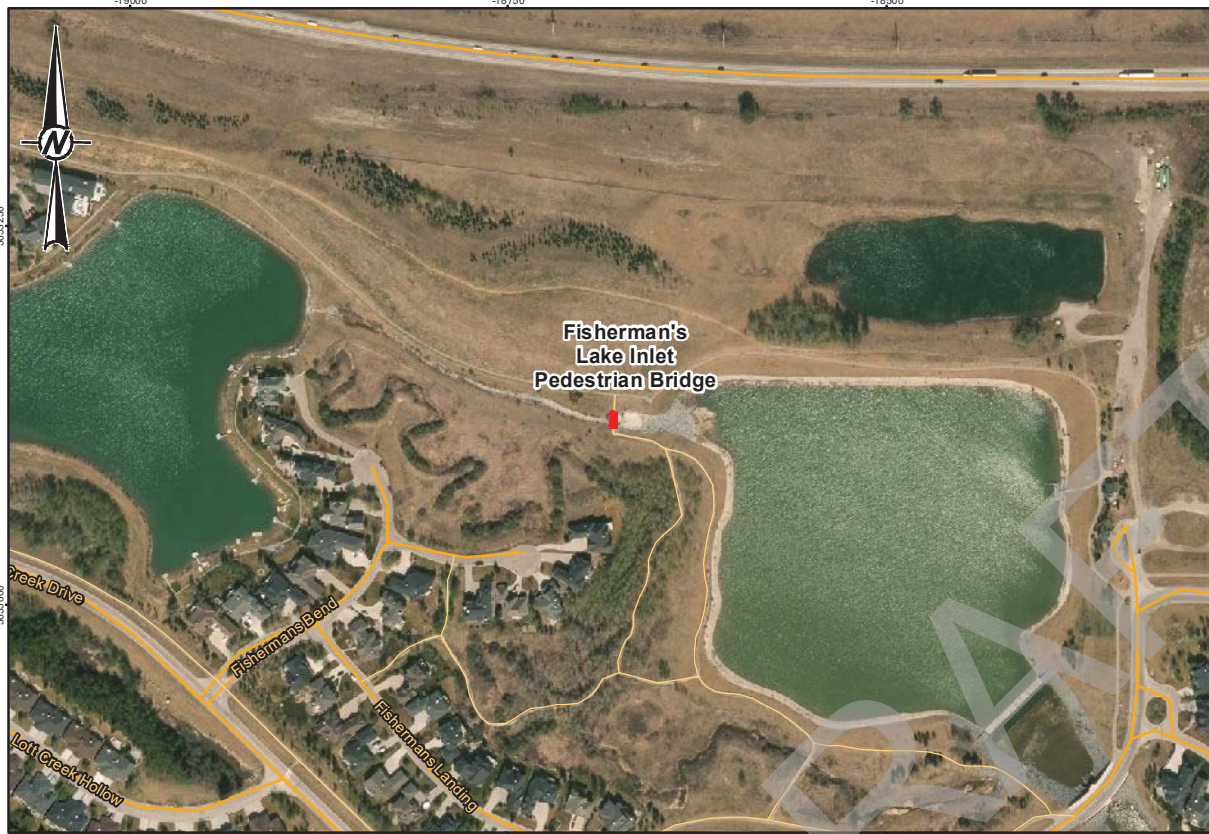


PHOTO 1 LEFT BANK, LOOKING DOWNSTREAM



PHOTO 2

TITLE
FISHERMAN'S LAKE INLET PEDESTRIAN BRIDGE

LOCATION	LOTT CREEK LAKES
DESCRIPTION	AT INLET OF FISHERMAN'S LAKE
ALBERTA TRANSPORTATION BRIDGE FILE NUMBER	-
YEAR BUILT	-
TOTAL LENGTH OF SPAN (m)	9
DECK WIDTH OF BRIDGE (m)	2
AVERAGE TOP OF CURB OR SOLID GUARD RAIL ELEVATION (m)	1112.08
AVERAGE LOW CHORD ELEVATION (m)	1111.78
AVERAGE DECK HEIGHT	0.30
NUMBER OF PIERS	0

PIER	CENTRE STATION (m)	WIDTH (m)	TYPE	SHAPE
1	-	-	-	-
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

- LEGEND**
- BRIDGE SURVEY POINT
 - ROAD
 - PATHWAY

NOTE(S)
ALL DETAILS OF BRIDGE SURVEY WILL BE USED FOR HYDRAULIC MODELLING. PIERS HAVE VARIED WIDTH, ONLY LARGEST WIDTH IS SHOWN IN TABLE. PIER CENTRE STATION REFERS TO STATION IN THE HYDRAULIC MODEL.

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.

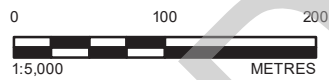
REFERENCE(S)
BRIDGE SURVEY AND BRIDGE PHOTOS BY GOLDER ASSOCIATES LTD.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT
ALBERTA ENVIRONMENT AND PARKS

PROJECT
BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT	YYYY-MM-DD	2017-06-09
	DESIGNED	W.PLOEGER
	PREPARED	V.VALLIS
	REVIEWED	W.PLOEGER
	APPROVED	D.LONG





TITLE
PRINCE'S LAGOON WEIRS

DESCRIPTION	2 OBERMEYER GATES
NUMBER OF WEIRS	2
WIDTH OF WEIRS (m)	5.5
WEIR TYPE	OBERMEYER GATES
WEIR CREST ELEVATION - FULLY OPEN (m)	1043.35

LEGEND

- ROAD
- PATHWAY

NOTE(S)

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.

REFERENCE(S)

STRUCTURE PHOTOS BY GOLDER ASSOCIATES LTD. 2016.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT
ALBERTA ENVIRONMENT AND PARKS

PROJECT
BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT	YYYY-MM-DD	2017-06-09
	DESIGNED	W.PLOEGER
	PREPARED	V.VALLIS
	REVIEWED	W.PLOEGER
	APPROVED	D.LONG

PROJECT NO. CONTROL
1536669

REV. 0

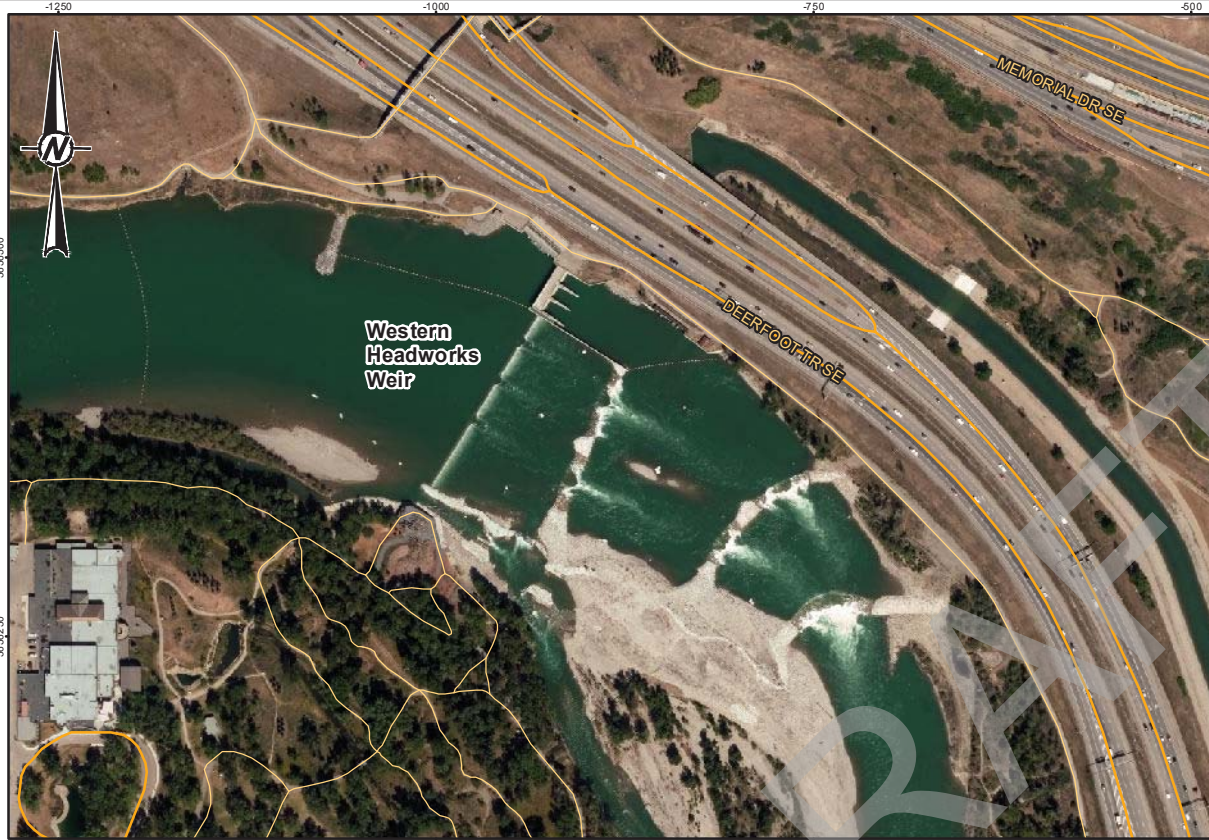
FIGURE
C-93

PHOTO 1 LOOKING DOWNSTREAM



PHOTO 2 LOOKING UPSTREAM

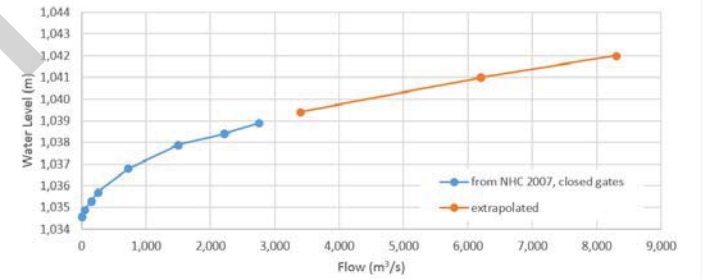




TITLE
WESTERN HEADWORKS WEIR

DESCRIPTION	WEIR WITH SLUICE GATES
NUMBER OF SLUICE GATES	3
HEIGHT OF GATES (m)	6.95
WIDTH OF GATES (m)	9.15
INVERT OF GATES (m)	1032.5
WIDTH OF WEIR (m)	151
INVERT OF WEIR (m)	1034.57

Western Headworks Weir Rating Curve



LEGEND

- ROAD
- PATHWAY

NOTE(S)

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.

REFERENCE(S)

DESIGN DRAWINGS PROVIDED BY THE CITY OF CALGARY. RATING CURVE BASED ON PHYSICAL MODEL BY NHC 2007. STRUCTURE PHOTOS BY GOLDER ASSOCIATES LTD. 2016. ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP. DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT

ALBERTA ENVIRONMENT AND PARKS

PROJECT

BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT



YYYY-MM-DD	2017-06-09
DESIGNED	W.PLOEGER
PREPARED	V.VALLIS
REVIEWED	W.PLOEGER
APPROVED	D.LONG

PROJECT NO.
1536669

CONTROL

REV.
0

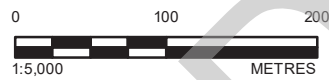
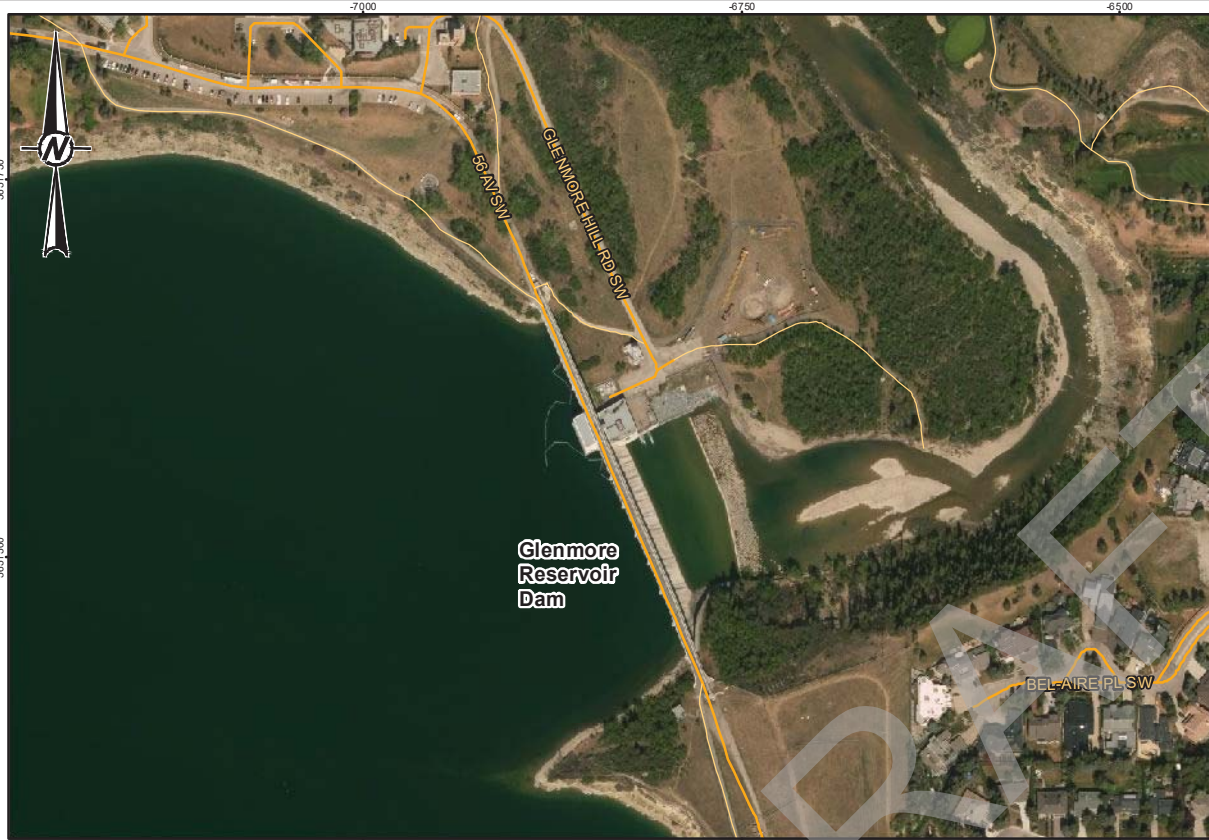
FIGURE
C-94

PHOTO 1 LOOKING DOWNSTREAM



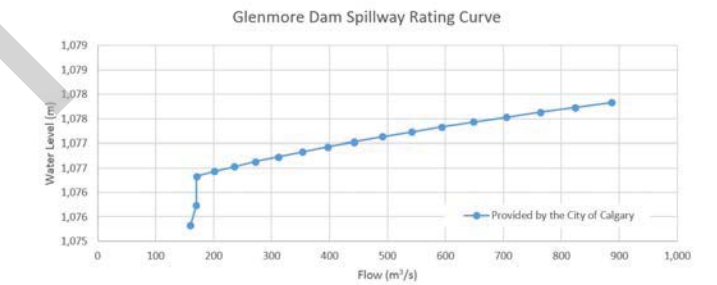
PHOTO 2 LOOKING UPSTREAM





TITLE
GLENMORE RESERVOIR DAM

DESCRIPTION	WATER SUPPLY CONCRETE GRAVITY DAM
LENGTH OF DAM (m)	320
HEIGHT OF DAM (m)	30



LEGEND

- ROAD
- PATHWAY

NOTE(S)
SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.

REFERENCE(S)
STRUCTURE PHOTOS BY GOLDER ASSOCIATES LTD. 2016.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT
ALBERTA ENVIRONMENT AND PARKS

PROJECT
BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT	YYYY-MM-DD	2017-06-09
	DESIGNED	W.PLOEGER
	PREPARED	V.VALLIS
	REVIEWED	W.PLOEGER
	APPROVED	D.LONG



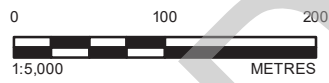
PROJECT NO. 1536669	CONTROL	REV. 0	FIGURE C-95
-------------------------------	----------------	------------------	------------------------------

PHOTO 1 UPSTREAM END



PHOTO 2 DOWNSTREAM END





TITLE
ELBOW VALLEY DROP-INLET STRUCTURE AND CULVERT

DESCRIPTION	DROP-INLET STRUCTURE WITH WEIR ON ALL 4 SIDES
NUMBER OF WEIRS	1
WIDTH OF WEIRS (m)	10
WEIR TYPE	SHARP CRESTED WEIR
WEIR CREST ELEVATION (m)	1115.20 M

LEGEND

- SURVEY POINT
- ROAD
- PATHWAY

NOTE(S)

SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.

REFERENCE(S)

STRUCTURE PHOTOS BY GOLDER ASSOCIATES LTD. 2016.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT
ALBERTA ENVIRONMENT AND PARKS

PROJECT
BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT	YYYY-MM-DD	2017-06-09
	DESIGNED	W.PLOEGER
	PREPARED	V.VALLIS
	REVIEWED	W.PLOEGER
	APPROVED	D.LONG

PROJECT NO. CONTROL
1536669

REV. 0

FIGURE
C-96

PHOTO 1 STRUCTURE OUTSIDE VIEW



PHOTO 2 STRUCTURE INSIDE VIEW



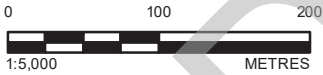
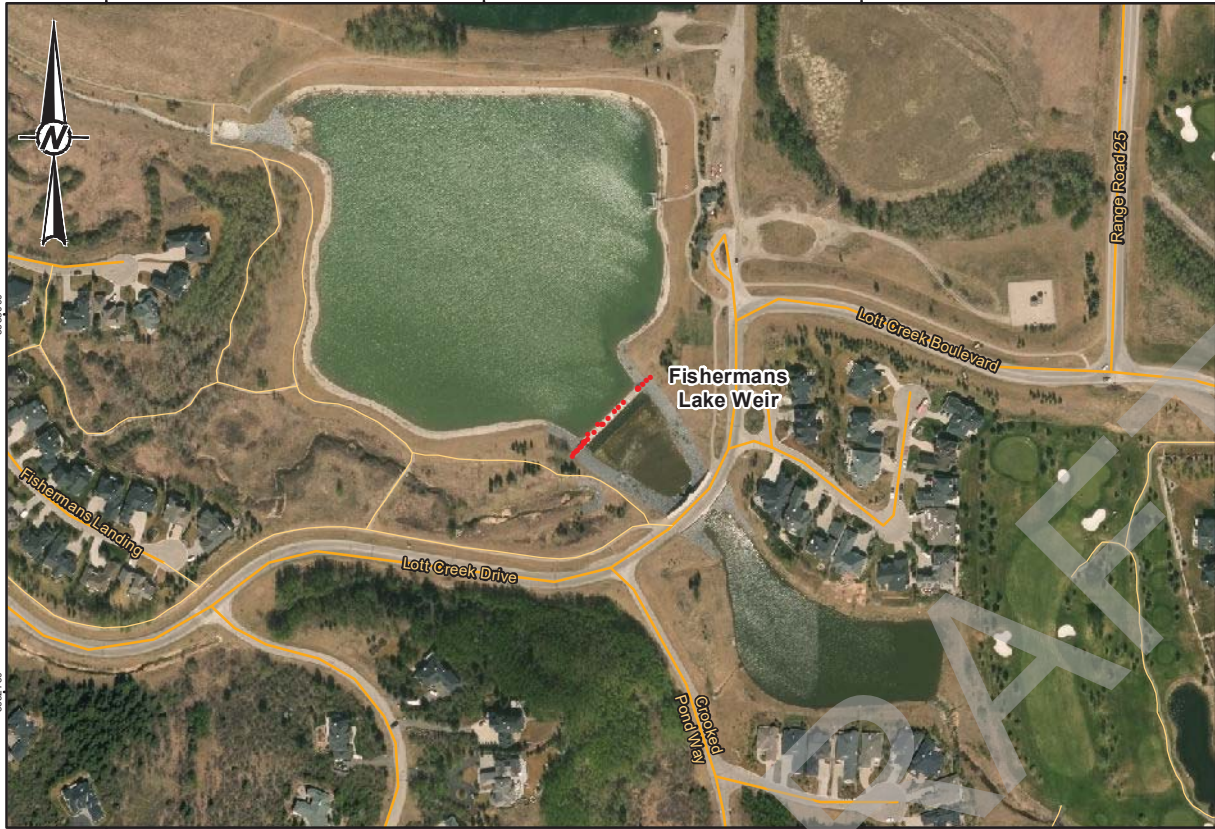


PHOTO 1 LOOKING DOWNSTREAM



PHOTO 2

TITLE
FISHERMANS LAKE WEIR

DESCRIPTION	BROAD CRESTED WEIR
NUMBER OF WEIRS	1
WIDTH OF WEIRS (m)	50
WEIR TYPE	Broad Crested Weir
WEIR CREST ELEVATION (m)	1108.45

LEGEND

- SURVEY POINT
- ROAD
- PATHWAY

NOTE(S)
SEE REPORT SECTION 2.3 AND HYDRAULIC MODEL FOR MORE INFORMATION.

REFERENCE(S)
STRUCTURE PHOTOS BY GOLDER ASSOCIATES LTD. 2016.
ROADS PROVIDED BY THE CITY OF CALGARY. 2016 AERIAL IMAGERY PROVIDED BY AEP.
DATUM: NAD 83 CSRS PROJECTION: 3TM 114

CLIENT
ALBERTA ENVIRONMENT AND PARKS

PROJECT
BOW AND ELBOW RIVER HAZARD STUDY

CONSULTANT	YYYY-MM-DD	2017-06-09
DESIGNED	W.PLOEGER	
PREPARED	V.VALLIS	
REVIEWED	W.PLOEGER	
APPROVED	D.LONG	



IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM ANS/A