

Incomplete draft that only describes the baseline assessment and methodology, the impact assessment will be completed when the design and construction plan is finalized.



BIOPHYSICAL IMPACT ASSESSMENT BOW RIVER 10TH STREET GRAVEL BAR PROJECT

Prepared for:
O2 AND THE CITY OF CALGARY

Prepared by:
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BIOPHYSICAL IMPACT ASSESSMENT
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Prepared for O2 and The City of Calgary, October 2023

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EXECUTIVE SUMMARY

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ABBREVIATIONS

ACIMS	Alberta Conservation Information Management System
AGRASID	Agricultural Region of Alberta Soil Inventory Database
AEP	Alberta Environment and Parks
AWID	Alberta Wetland Identification and Delineation Directive
BAA	Biophysical Assessment Area
BIA	Biophysical Impact Assessment
BMP	best management practices
CN	Canadian National
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
ECO	environmental construction and operations
EE	environmental education
ESA	Environmentally Significant Areas
ESC	erosion and sediment control
DFO	Fisheries and Oceans Canada
FWIMT	Fish and Wildlife Internet Mapping Tool
ha	hectare
HRIA	Historic Resources Impact Assessment
pHRIA	Palaeontological Historic Resources Impact Assessment
HRMB	Historic Resources Management Branch
HRP	habitat restoration plan
HRV	historical resource value
IBS	Inglewood Bird Sanctuary
IMBS	Inglewood Migratory Bird Sanctuary
km	kilometre
m	metre
QAES	qualified aquatic environmental specialist
RAP	restricted activity period
SAR	species at risk
SARA	<i>Species at Risk Act</i>
SSRP	South Saskatchewan Regional Plan
the City	The City of Calgary
TPP	tree protection plan
TWS	Tweedsmuir soil series
WMP	weed management plan

1 INTRODUCTION

Matrix Solutions Inc. a Montrose Environmental Company (Matrix) was retained by O2 Planning + Design (O2) to complete a biophysical impact assessment (BIA) for the proposed Bow River 10th Street Gravel Bar Project (the Project). The Project includes river and riparian design to address several interrelated concerns, opportunities, and challenges near the existing 10th Street bridge (the Louise Bridge). The vision for the Project area will result in a resolution to concerns in the river reach and ensure that people can congregate and interact with in fun and safe ways. The proposed work includes reshaping the gravel bar under the Louise Bridge to reduce flood levels, construction of a recreational wave and associated amenities in the river and along the south bank, stabilization and erosion protection of the south riverbank, and construction of fish habitat channels along the north riverbank. The Project location is shown on Figure 1. The project area has been divided into six design nodes which are discussed in more detail in Section 2 (Project Description).

The Project is within the Foothills Fescue Natural Subregion (Natural Regions Committee 2006). Much of the project construction activities will be within the Bow River channel, as well as along the banks of the Bow River and directly adjacent riparian areas, from the 14th Street SW bridge at the upstream end almost reaching the Peace Bridge at the downstream end. The Project area includes Eau Claire Park on the south side, Poppy Plaza on the north side of the Bow River, the 10th street bridge, and the LRT bridge. The biophysical assessment area (BAA) is shown on Figure 1. The vegetation communities in the BAA include upland treed deciduous forest, manicured/park area; riparian treed deciduous riparian, shrubby riparian, beach/gravel bar, a seasonal graminoid marsh wetland, and riprap. Non-vegetated landscapes include the Bow River and several paths and roads.

A BIA report is required by the City to meet the requirements of the *Biophysical Impact Assessment Framework* (The City of Calgary 2010). The objective of the BIA is to collect site-specific information and characterize existing biophysical resources for the Project area. The information collected is used to assess potential impacts, identify environmental impacts and mitigations, and assess residual and cumulative effects of the Project on biophysical resources. Biophysical resource-specific mitigations are provided and are used to guide Project planning to minimize potential negative impacts of the Project during the planning, design, construction, and restoration stages.

In addition to this report, there has been an abundance of information collected over the years for nearby City projects that were reviewed to support and inform the Project (e.g., Eau Claire Bridge Projects - Bow River Lagoon Matrix 2019, Biophysical Impact Assessment – West Eau Claire Park Phase 1 Matrix 2016, Biophysical Impact Assessment – 12 Street SE Bridge Replacement 2016, Baines Bridge Rehabilitation Project – Biophysical Impact Assessment Update 2016, Calgary Zoo Sheet Pile Cofferdam – Flood Mitigation Project Biophysical Impact Assessment 2015). This BIA summarizes information for addressing impacts and mitigation to terrestrial resources for the Project.

I:\02Planning\Ave\Designs\34737\FiguresAndTables\Report\BIA\Figure-1_Location_Plan_and_Biophysical_Impact_Assessment_Area.mxd - Tabloid_L - 25-Oct-23, 09:52 PM - Insect - TID005



DRAFT

Calgary

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1:4,500 metres

50 0 50 100

NAD 1983 UTM Zone 11N

O2

Matrix Solutions Inc.
A Montrose Environmental Company

O2 Planning & Design Inc. and the City of Calgary
Bow River 10th Street Gravel Bar Project - BIA

Location Plan
Project Nodes and Biophysical
Impact Assessment Area

Date: October 2023	Project: 34737	Submitter: J. Kemper	Reviewer: K. Curtis
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Figure 1

Easting (m)

703575 703800 704025 704250 704475 704700

North (m)

5659875

5659650

5659425

5659200

5659975



Twsp. 24

- Biophysical Assessment Area
- Riparian Health Assessment Location
- Vegetation Community Confirmation Plot
- Rare Plant Meander

Wetlands

- Seasonal Graminoid Marsh

Vegetation Community Types

Upland Vegetation Communities

- Treed Deciduous Forest
- Manicured/Park Area

Riparian Vegetation Communities

- Treed Deciduous Riparian
- Shrubby Riparian
- Beach/Gravel Bar
- Riprap

Non-vegetated Landscapes

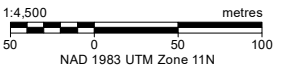
- Bow River
- Disturbed - paths/trails/roads

Alberta Weed Classification

- Prohibited Noxious
- Noxious Weed

Prohibited Noxious and Noxious Weeds within the Biophysical Assessment Area:

Common Burdock (*Arctium minus*)
Downy Brome (*Bromus tectorum*)
Creeping Bellflower (*Campanula rapunculoides*)
Creeping Thistle (*Cirsium arvense*)
Yellow Clematis (*Clematis tangutica*)
Black Henbane (*Hyoscyamus niger*)
Common Toadflax (*Linaria vulgaris*)
White Cockle, Bladder Campion (*Silene latifolia*)
Perennial Sow-Thistle (*Sonchus arvensis*)
Common Tansy (*Tanacetum vulgare*)
Ox-Eye Daisy (*Leucanthemum vulgare*)
Purple Loosestrife (*Lythrum salicaria*)
Scentless Chamomile (*Tripleurospermum inodorum*)
Russian Leafy Spurge (*Euphorbia virgata*)



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O2 Planning & Design Inc. and the City of Calgary
Bow River 10th Street Gravel Bar Project - BIA

Vegetation Community Distribution, Survey Points, and Weed Species

Date: October 2023 Project: 34737 Submitter: J. Kemper Reviewer: K. Ostermann

Figure 2

2 PROJECT DESCRIPTION

2.1 Project Need

A gravel bar below the 10th street bridge has undergone several changes over time, influenced by historical bridges, sawmill activities including a dam, major floods, and normal river processes. The 2013 flood of record caused significant deposition and growth of the gravel bar and it now poses a flood hazard (Rood 2020, CoC 2022, Qingcheng Yu et. Al 2022); this potential for flooding increases the risk to infrastructure. There are also long-term fluvial morphological stability concerns and any remedial activities to address the gravel bar may result in both social and environmental impacts. The south bank of the Bow River in this area is also experiencing erosion and existing concrete and asphalt debris are providing the primary erosion protection. The Project area is also adjacent to multiple parks and walking paths. A popular river surf wave developed after the 2013 flood below the 10th street bridge on the south side of the river but has since deteriorated and is not usable. Surf Anywhere proposed an Urban Surf Beach and River Waves Project (Surf Anywhere, 2019) that would add a wave forming structure across the side channel between the Louise Bar and the south bank.

The Project will achieve improvement in five areas: environment, recreational activities, history and reconciliation, infrastructure and economy, and flooding and erosion. Goals within each of these are provided in Figure A. This BIA focuses on the environmental components of the Project.



FIGURE A Project Goals

2.2 Project Setting

The Project area spans the Bow River and adjacent riparian areas, from 14th St. SW at the upstream end almost reaching the Peace Bridge at the downstream end. The span also includes the 10th St. NW and LRT bridges (Figure 1). The Project area is greater than 21 hectares and includes over 1.3 km of riverbank on the north bank, and 1.4 km along the south bank of the Bow River. The south extents of the Project are directly adjacent to the planned RiverWalk West Project, which is currently undergoing a design competition. The six project nodes, shown on Figure 1, are: The Louise Bar, The Wave, The Wave Deck, The Landing, The South Slopes, and The North Channel. The nodes are further described in Section 2.4.

2.3 Option Analysis

2.4 Construction Activities

The Project is described in detail in the *10th Street Bridge Design Report* (O2 Planning and Design 2023, in progress) and shown on the design drawings (Appendix A). Activities at each node include:

- The Louise Bar – reshaping the gravel bar under the Louise Bridge and removing some of its vegetation to reduce flood levels and discourage future growth of the gravel bar by providing a morphologically stable design. The remaining bar will be armoured to provide stable hydraulics for the Wave.
- The Wave – construction of a recreational wave structure including reshaping of the riverbed in the approach and departure channels. The wave structure will include gates that can be raised, lowered, or adjusted as needed for safety and operations. The gates will be lowered each night and when river flow exceeds the safe boating advisory on the Bow River.
- The Wave Deck – construction of supporting facilities and amenity space adjacent to the Wave.
- The Landing – excavation and construction of a shallow bay for public use and for users of the Wave to exit the river.
- The South Slopes – placement of excess material excavated from the gravel bar and other areas of the river along the south bank to create more pathway opportunities along this reach.
- The North Channel – construction of two channels to enhance fish habitat and contribute to the morphologically stable design of this reach of the Bow River to discourage sediment deposition at the Louise Bridge.

2.5 Schedule

The planning and design phase started in 2023, and construction is expected to commence in fall 2024, pending regulatory approvals. Construction activities will take into consideration the environmental windows of least risk including the spring and summer fish windows, the bird nesting window, and the bat roosting window described in Section 6 (Impact Assessment). Construction sequencing and schedule is described in Table 1.

TABLE 1 Project Construction Schedule and Environmental Windows of Least Risk

Construction Sequence	Schedule	Activities Within Environmental Windows of Least Risk			
		Spring Fish (April 6 to April 30)	Summer Fish (July 16 to September 15)	Bird Nesting (August 21 to February 14)	Bat Roosting (September 1 to April 14)
Year 1					
Install instream cofferdams/isolation structures	2024				
Begin bulk earthworks	2024				
Year 2					
Complete bulk earthworks	2025				
Complete in water work within spring fish window	2025				
Begin construction of recreational wave	2025				
Begin landscaping	2025				
Year 3					
Complete construction of wave structure	2026				
Complete landscaping	2026				
Remove instream cofferdams/ isolation structures	2026				

2.6 Project Aesthetics

3 REGULATORY REQUIREMENTS

The Project will have federal, provincial, and municipal regulatory requirements. There will aquatic and terrestrial habitat potential impacted by the Project. All regulatory approvals will be in place before construction begins.

3.1 Provincial and Federal Legislation

Table 2 summarizes the potential provincial and federal regulatory requirements for any development within the BAA.

TABLE 2 Provincial and Federal Regulatory Requirements

Regulation	Regulatory Context	Potential Requirements
Provincial		
<i>Public Lands Act</i>	The Act establishes the role of the Alberta government in managing public land.	Most activities that cause a permanent alteration to Crown claimed bed or banks of water bodies, or have the potential to affect the aquatic environment, require an approval under the provincial <i>Public Lands Act</i> and <i>Water Act</i> .
<i>Soils Conservation Act</i>	Regulations exist to ensure that soil resources are not lost or deteriorated.	Ensure that best management practices are implemented to reduce impacts to soil quality and quantity.
<i>Water Act</i>	Wetlands and waterbodies are protected under the <i>Water Act</i>. In the context of fish and fish habitat, Alberta's <i>Water Act</i> is designed to protect Alberta's rivers, streams, lakes, and wetlands, by requiring that a strategy for the aquatic environment be developed as part of the provincial water management planning framework.	If a development is planned in a wetland or water body a Wetland Assessment and Impact Report (WAIR) or Wetland Assessment and Impact Report Form (WAIF) would be required. Most activities that cause a permanent alteration to Crown claimed bed or banks of water bodies, or have the potential to affect the aquatic environment, require an approval under the provincial <i>Public Lands Act</i> and <i>Water Act</i>. Activities that do not require approval are those that can be completed under Codes of Practice associated with the <i>Water Act</i>.
<i>Weed Control Act</i>	Prohibited noxious weeds must be destroyed and noxious weeds must be controlled as per the <i>Weed Control Act</i> .	Implement weed management.
<i>Wildlife Act</i>	The <i>Wildlife Act</i> and associated regulations provides protection and conservation of wild animals in Alberta. Species listed as endangered or threatened under the <i>Wildlife Act</i> (Province of Alberta 2020) or listed in the <i>Alberta Wild Species General Status Listing – 2015</i> (GoA 2017a) as at risk, may be at risk, or sensitive are included here.	A nest or wildlife sweep may be required prior to work, if activities are scheduled within the migratory bird nesting period or sensitive raptor nesting period (i.e., March 15 to July 15; ESRD 2013). Active nests or other important wildlife features (e.g., dens, mineral licks) may be subject to mitigations (e.g., timing restrictions, setbacks, monitoring).
Federal		
<i>Fisheries Act</i>	The federal <i>Fisheries Act</i> is administered by Fisheries and Oceans Canada (DFO). Pursuant to fish and fish habitat protection provisions of the <i>Fisheries Act</i>, proponents must comply with the fish and fish habitat protection provisions of the <i>Fisheries Act</i> by incorporating measures to avoid: causing the death of fish	Proponents must identify potential project effects resulting from their projects i.e., identify the cause and effect relationship between project activities to a potential stressor, and then to fish and fish habitat (effects pathway). Where possible, mitigations are applied to each pathway to reduce or eliminate a potential effect. When mitigation measures cannot be applied, or cannot fully address a stressor, the

Regulation	Regulatory Context	Potential Requirements
	- the harmful alteration, disruption, or destruction (HADD) of fish habitat - the deposition of deleterious substances in the watercourse Section 35(1) prohibits carrying on any work, undertaking, or activity that results in HADD of fish habitat. The <i>Fish and Fish Habitat Protection Policy Statement, August 2019</i> (DFO 2019a) interprets HADD of fish habitat as “any temporary or permanent change to fish habitat that directly or indirectly impairs the habitat’s capacity to support one or more life processes of fish.” The killing of fish by means other than fishing is prohibited by Section 34.4(1) of the <i>Fisheries Act</i>. Section 36(3) prohibits the release of deleterious substances, including suspended sediments, to waters frequented by fish.	remaining effect is referred to as a residual effect. Residual effects remaining after the implementation of avoidance and mitigation measures are evaluated on their potential to cause HADD or the death of fish. A request for review should be submitted to DFO to determine HADD or the death of fish where project outcomes are unclear. Where HADD or death of fish occurs, an application for a <i>Fisheries Act</i> Authorization with accompanying fish habitat offsetting plan must be submitted to DFO. <u>Where project activities interact with the critical habitat or an individual of an aquatic SAR, DFO may authorize activities through a <i>Fisheries Act</i> Authorization or SARA Permit.</u>
<i>Migratory Birds Convention Act</i>	Migratory birds (e.g., songbirds, waterfowl) and their nests are protected under the federal MBCA and associated regulations. The federal government has also provided additional guidance on timing restrictions and setbacks for nests of migratory bird species.	A nest sweep may be required prior to work, if activities are scheduled within the migratory bird nesting period (i.e., zone B4; April 15 to August 31; ECCC 2018). Active nests may be subject to mitigations (e.g., timing restrictions, setbacks, monitoring).
<i>Species at Risk Act</i>	Wildlife, vegetation and aquatic SAR and their habitat features (e.g., active dens, hibernacula) and critical habitat are protected under the SARA and associated regulations. This legislation exists to protect species that are extirpated, endangered, threatened, or considered species of special concern because of human activity.	Project proponents are expected to complete all required wildlife, vegetation and aquatic surveys to determine the presence of important features, critical habitat, or presence of SAR prior to project initiation. Federal and provincial mitigations may apply to wildlife, and vegetation SAR listed under SARA and are discussed below. SARA regulations pertaining to aquatic SAR are administered by Fisheries and Oceans Canada (DFO) and is discussed below.

MBCA - *Migratory Birds Convention Act*

3.2 Municipal and Provincial Policies and Bylaws

The City regulatory policies, plans, and guidelines that are listed in Table 3 are considered relevant to this BIA report.

TABLE 3 Regulatory Policies, Plans and Guidelines

Regulatory Policies, Plans and Guidelines	Potential Requirements
Municipal	
<i>Municipal Development Plan 2020 Adopted 2009 and Updated 2020</i>	The City of Calgary's Municipal Development Plan is a strategic policy document that guides Calgary's growth and city building. <i>Alberta's Municipal Government Act</i> requires that the council of every municipality must adopt a Municipal Development Plan by bylaw.
<i>Biophysical Impact Assessment Framework (The City of Calgary 2010)</i>	The BIA framework describes the process for scoping and undertaking environmental assessments in the City. The intent of the framework is to provide a consistent process for review and approval of BIA reports to ensure equitability and transparency throughout City of Calgary Parks, as well as provide project proponents and environmental specialists a decision-making process to undertake the appropriate level of assessment.
<i>Calgary River Valleys Plan – The Plan and Policies (The City of Calgary 1984)</i>	The Calgary River Valleys Plan provides a range of policies to establish a coordinated approach to the development, use, and conservation of the City's rivers, creeks, and immediately adjacent lands. The plan addresses recreation, water quality, flood plain management, preservation, and enhancement of the riverine environment and public education.
<i>Calgary Wetland Conservation Plan (The City of Calgary 2004)</i>	The <i>Calgary Wetland Conservation Plan</i> outlines wetland conservation policies within the City. The plan describes regional planning, habitat management, monitoring, research and development programs, and objectives. This plan includes wetland mitigation objectives aimed at avoiding, minimizing, and compensating impacts to wetlands in the City. The <i>Calgary Wetland Conservation Plan</i> also provides guidance for monitoring programs for the restoration and management of wetland habitats.
<i>Natural Area Management Plan (Calgary Parks and Recreation and Recreation 1994)</i>	The Natural Areas Management Plan was developed by City of Calgary Parks and provides inventory, planning, and management information to ensure the long-term viability and public support for the City's natural environments. This plan identifies key issues and policies, an inventory and assessment, and provides management recommendations for natural environments in the City.
<i>Open Space Plan (The City of Calgary 2003)</i>	The <i>Open Space Plan</i> provides a long-term planning document for the management, development, and use of open space in the City. This plan is a comprehensive plan intended to ensure open space needs are met in a consistent manner in the long-term. The document provides information about land use policies, other City policies and plans, environmental assessments, BIAs, wetland evaluations, and assessment of environmentally significant areas.
<i>Riparian Strategy: Sustaining Healthy Rivers and Communities (The City of Calgary 2013)</i>	The Riparian Strategy was created by the City and includes the vision, goals, and strategies for riparian areas in the City. The key goals include protection of riparian health, connecting the public to riparian areas, identifying the value of riparian areas, and ensuring riparian areas planning is effective and consistent. The Riparian Strategy describes these specific goals and associates them with specific management strategies and implementation

Regulatory Policies, Plans and Guidelines	Potential Requirements
	actions. <i>The Riparian Action Program: A Blueprint for Resilience</i> (The City of Calgary 2017) has been developed based on the strategies identified in the Riparian Strategy.
<i>Our BiodiverCity: Calgary's 10-year Biodiversity Strategic Plan</i> (The City of Calgary 2015)	This plan provides a long-term comprehensive and systematic approach to protecting, developing, and managing natural and built environments for healthy ecological processes in support of the conservation of biodiversity in the City. It describes a 10-year strategic plan with commitments and actions to promote ecological literacy, ecological resilience, collaboration, and integration of procedures and projects to manage and conserve biodiversity in the City.
<i>Habitat Restoration Project Framework</i> (The City of Calgary and AEP 2014)	This document provides the framework for restoration and protection of natural habitats from human disturbances. The framework integrates industry, municipal, provincial, and federal standards and guidelines to guide the preparation of Habitat Restoration Plans (HRPs), as well as the regulatory triggers, planning, and reporting requirements through a project lifecycle.
<i>Urban Forest Strategic Plan</i> (The City of Calgary 2007)	The plan provides vision and strategic direction for the growth, sustainability, preservation, and enhancement of the urban forest. It also provides common outcomes and principles for the City and its partners. The intent of the document is to drive future urban forest decision-making, to ensure a consistent, practical approach to the management and practices, and to realize the City's vision.
<i>Cultural Landscape Strategic Plan</i> (The City of Calgary 2011)	This document establishes a set of policies and strategies to identify, protect, manage, and celebrate the rich, unique collection of historical resources found within Calgary's open space system. The document also includes a description of cultural landscapes and historical resources within The City of Calgary Parks.
Provincial	
<i>South Saskatchewan Regional Plan</i> (SSRP; GoA 2017)	The SSRP describes long-term planning policies and commitments for economic, environmental, and social outcomes and accounts for the management of cumulative effects to air, water, and biodiversity in the context of economic development and social considerations. The intent of the plan is to ensure that air, water, and biodiversity components are sustained at a regional level. The SSRP describes specific strategies, actions, and approaches to achieve the desired outcomes and establishes monitoring, evaluation, and reporting commitments to assess progress from 2014 to 2024. The SSRP is administered by the Government of Alberta.
<i>The Alberta Wetland Policy</i> (ESRD 2013)	The <i>Alberta Wetland Policy</i> provides the strategic direction required to conserve, restore, protect, and manage Alberta wetlands. The policy minimizes the loss and degradation of wetlands, while allowing for continued growth and economic development in the province. The goal of the policy is to sustain the benefits wetlands provide to the environment, society, and economy.

Regulatory Policies, Plans and Guidelines	Potential Requirements
<i>Alberta Wetland Mitigation Directive</i> (GoA 2015)	In accordance with the <i>Alberta Wetland Mitigation Directive</i>, proponents must minimize wetland impacts where wetland avoidance is not feasible (GoA 2015). Wetland replacement is required when permanent loss of a wetland occurs as a result of wetland impacts that cannot be avoided or minimized. Proponents have two options for wetland replacement: • Pay a wetland replacement fee to the Government of Alberta. • Undertake permittee-responsible construction or restoration. The WAIF or WAIR must include evidence of wetland avoidance, minimization, and replacement.
<i>Water Management Plan for the South Saskatchewan River Basin</i> (AENV 2006)	The plan provides guidance on protecting the aquatic environment and water allocation of rivers in the South Saskatchewan River Basin and acts as a foundation for future watershed planning of sub-basins.
<i>Bow Basin Watershed Management Plan</i> (BRBC 2012)	The plan provides guidance and recommendations regarding land and water resources in the Bow Basin Watershed.

4 BIOPHYSICAL IMPACT ASSESSMENT METHODS

Biophysical resources were assessed based on the BIA framework (The City of Calgary 2010). Assessment scope, methods, including desktop assessment, specific biophysical resource survey protocols, and impact assessment criteria are described in the sections below. The existing environment is described in Section 5. The desktop and survey results are used to describe environmental impacts and complete the impact assessment (Section 6), describe mitigation measures and residual effects (Section 6), and assess potential cumulative effects (Section 7). Monitoring recommendations, additional documentation, and overall conclusions are provided in Sections 8 to 9, respectively.

4.1 Biophysical Assessment Area

This BIA focuses on the project nodes since all direct terrestrial impacts will occur within the project node boundaries. Wildlife surveys (e.g., breeding bird surveys, bats surveys) were completed within a larger area (i.e., within or adjacent to the project components) to account for wildlife movements and setback distances for certain wildlife species, if present (AEP and AER 2018, ASRD 2011). Vegetation surveys were also completed in a larger area to account for potential changes in project nodes. The desktop review and field surveys were completed in the BAA to include information collected from other studies previously completed, or to identify potential occurrences of important biophysical elements (e.g., rare plant records).

The BAA accounts for potential direct and indirect project specific impacts on biophysical resources. The study area for the cumulative effects assessment (Section 7) extends in a 5 km radius surrounding the BAA.

4.2 Desktop Assessments

Existing information about the BAA and within a 5 km radius was acquired from a desktop information review, previous reports, and previous field surveys completed for soils, vegetation, wetlands, and wildlife, including;

- *Results of Environmental Soil Sampling Program for the Inglewood Bird Sanctuary Erosion Mitigation and Fish Habitat Project, 2410 - 9 Avenue SE and 2900 Sanctuary Rd SE, Calgary, Alberta* (Golder 2019b)
- *Potential Material Re-use Options Based on Results of Environmental Soil Sampling Program for the Inglewood Bird Sanctuary Erosion Mitigation and Fish Habitat Project, 2410 - 9 Avenue SE and 2900 Sanctuary Rd SE, Calgary, Alberta* (Golder 2019a)
- *Inglewood Bird Sanctuary Proposed Pedestrian Bridge Repair Vegetation and Wildlife Assessment* (Matrix 2014a)
- *Riparian Health Inventory Summary Report Bow River, west (right) bank* (Cows and Fish 2019)
- Riparian reports, produced by Cows and Fish
- Louise Island in the Bow River at Calgary: Mitigation of a Growing Flood Hazard and Prospective Environmental Impacts from the Urban Surf Beach and River Waves Project (Rood 2020)
- *Inglewood Bird Sanctuary Snake Hibernacula Field Summary* (Matrix 2019)
- *Inglewood Bird Sanctuary Snake Hibernacula Field Summary* (Matrix 2018a)
- *City of Calgary Snake Hibernacula Surveys: Inglewood Bird Sanctuary, Bowmont East, Bowmont West, Memorial Drive, Hidden Valley, Nose Creek, and Evanston* (Matrix 2015)
- *Inglewood Bird Sanctuary Nest Sweep Prior to Weed Control* (Matrix 2018b)
- *2014 Nest Sweep for the Inglewood Bird Sanctuary* (Matrix 2014b)
- *Biophysical Impact Assessment - Outdoor Learning Centre Calgary Inglewood Bird Sanctuary* (Matrix 2017)
- *Bend in the Bow Design Phase 1 Redevelopment Plan Scoped Biophysical Impact Assessment* (O2 Planning and Design 2016)
- *Biophysical Impact Assessment - Nature Centre Expansion Calgary Inglewood Bird Sanctuary* (Matrix 2018c)
- *Scoped Biophysical Impact Assessment for the Inglewood Bird Sanctuary* (Westhoff 2013)
- *Eau Claire Bridges* (Matrix 2016)
- *Bow River Lagoon Matrix 2019*
- *Biophysical Impact Assessment – West Eau Claire Park Phase 1 Matrix 2016*
- *Biophysical Impact Assessment – 12 Street SE Bridge Replacement 2016*
- *Baines Bridge Rehabilitation Project – Biophysical Impact assessment Update 2016*
- Other applicable publicly available information was reviewed as needed and is described within appropriate sections of this BIA report.

construction activities for the Project may have direct and indirect impacts on various biophysical resources in and adjacent to the Project, therefore, according to the Biophysical Impact Assessment

Framework (The City of Calgary 2010) the proposed Project requires a scoped BIA . A scope BIA is the highest level of environmental review in the BIA framework. Consultation with The City of Calgary Parks as well as a review of existing information was completed to focus the information collected about the biophysical resources within the BAA.

Based on review of existing information from the City, the following biophysical resources were included in the BIA and are described in Table 4:

- topography and soils
- vegetation, including vegetation communities, species at risk (SAR; i.e., rare plants), rare ecological communities, regulated weeds and invasive species, and riparian health
- wetlands
- wildlife and wildlife habitat, including SAR (e.g., bats), special status species, and other potentially impacted species (e.g., migratory birds, semi-aquatic mammals)
- aquatics and fish habitat
- hydrology
- land and resource use
- visual resources and aesthetics
- historical and archaeological resources

TABLE 4 Biophysical Resources Selected for Assessment

Biophysical Resources	Why Selected	Rationale
Topography and soils	Topsoil stripping, clearing, and grading and terrain modifications	Valued resource, is protected by the <i>Soil Conservation Act</i> , can impact success of revegetation if required ³
Vegetation, including species at risk, regulated weeds, and riparian health	Rare plants, rare ecological communities, regulated weeds, and riparian habitat	Protected by legislation and regulations, and the Riparian Strategy ⁴
Wetlands	Habitat, hydrology, and biodiversity functions	Protected by legislation and regulations
Wildlife and wildlife habitat, including SAR, special status species, and other potentially impacted species	SAR and species of management concern	Protected by legislation and regulations
Aquatics and Fish Habitat	Habitat, water quality, and SAR species	Protected by legislation and regulations
Hydrology	Surface and subsurface flows, surface hydraulic connectivity	Important for ecosystem functions, flood water risk, or drainage
Land and resource use	Surrounding land use and areas designated with special status (e.g., environmentally significant areas)	Potential for conflict with adjacent residential areas, recreational users, and special status areas
Visual resources and aesthetics	Project area is located along the Bow River and accessed by residents	Changes to aesthetics or natural character affecting visitor experience

Biophysical Resources	Why Selected	Rationale
Historical and archaeological resources	Project area is located along the Bow River and would have been frequently used by First Nations	Protected by legislation and regulations

Detailed information pertaining to hydrology and historical and archaeological resources are presented in other documents and are therefore only briefly addressed in this BIA. No specific field surveys were completed for hydrology and historical and archaeological resources by Matrix.

Aquatic resources (i.e., fish and fish habitat), are being assessed by Matrix, and a report will be provided under separate cover by a Qualified Aquatic Environmental Specialist (QAES). Geology/geomorphology and hydrogeology are being assessed by Matrix, and a hydrotechnical report will provided under separate cover.

The desktop methods used to evaluate the biophysical resources described in Table 4 were tailored to each biophysical resource as described below.

4.2.1 Topography and Soils

A review of the following reports and databases was completed to describe baseline information for topography and soils.

- *Agricultural Regions of Alberta Soil Inventory Database* (AGRASID Version 4.1; AF 2023)
- *Soil Survey of the Calgary Urban Perimeter* (MacMillan 1987)

4.2.2 Vegetation

Matrix conducted a desktop review to identify vegetation resources, including vegetation community mapping, rare plants and rare ecological communities, and weeds and invasive species that are known to occur or may occur in the project area and within the BAA, as well as information pertaining to riparian health. Sources reviewed included:

- Natural Regions and Subregions of Alberta (Natural Regions Committee 2006).
- Tracked and watched species and communities as listed in the Alberta Conservation Information Management System (ACIMS; ATPR 2022).
- ACIMS Ecological Community Tracking List (Allen 2014).
- Riparian Areas Mapping Project (O2 Planning and Design 2013).
- Riparian Action Program (The City of Calgary 2017).
- Riparian Health Inventory Summary Report (Cows and Fish 2020b).
- Riparian Strategy: Sustaining Healthy Rivers and Communities (City of Calgary 2014).
- 2022 World Imagery (ESRI 2022).

4.2.3 Wetlands

During the desktop review Matrix used available satellite imagery, the Alberta Merged Wetland Inventory, and Alberta Biodiversity Monitoring Institute wetland inventory resources to identify and delineate wetlands in the BAA for verification during the field surveys.

4.2.4 Wildlife and Wildlife Habitat

Matrix conducted a desktop review to identify wildlife species, including SAR, and wildlife habitat that may occur in the project components and within the BAA. Resources reviewed included the following:

historical wildlife detections using AEP's *Fish and Wildlife Internet Mapping Tool* (FWIMT; AEP 2023)
 historical and recent wildlife detections from Matrix wildlife surveys completed within and in proximity to the project (i.e., Matrix 2016; Matrix 2015)

- sensitive wildlife ranges, waterbodies, zones, and areas using EPA's *Wildlife Sensitivity Data Layers* (EPA 2023c)
- ecological network map for the City (The City of Calgary 2020a)
- bird species checklists for the Calgary region (eBird 2023; Pinel et al. 2012)
- wildlife species range maps and characterization of preferred habitats (FAN 2007, Naughton 2012, Russell and Bauer 2000)

The results of the desktop review were used to compile a list of wildlife species, including SAR that may occur in the BAA (Appendix A). Wildlife SAR are identified as those species listed by:

- the *General Status of Alberta Wild Species 2020* (AEP 2020) as "At Risk," "May be at Risk," or "Sensitive"
- the *Alberta Wildlife Act* (Province of Alberta 2022b) as "Endangered" or "Threatened"
- the *Alberta Endangered Species Conservation Committee* (EPA 2023a) as "Endangered," "Threatened," or "Special Concern"
- *Species at Risk Public Registry* (Government of Canada 2023a) as "Endangered," "Threatened," or "Special Concern"

4.2.5 Aquatics, Fish and Fish Habitat

The following data sources were used during the desktop assessment:

- ESRI imagery (2023)
- Fish and Wildlife Management Information System (FWMIS; AEP 2023)
- Code of Practice for Pipelines and Telecommunication Lines Crossing a Water Body, Code of Practice for Watercourse Crossings Area Class Maps for watercourse classes and restricted activity periods (RAPs)- Calgary Management Area (ESRD 2012)
- Environment and Protected Areas (EPA) Fish Sustainability Index maps

- DFO Aquatic Species at Risk Map (DFO 2022a)
- DFO's Bull Trout (*Salvelinus confluentus*), Saskatchewan-Nelson Rivers: Recovery Strategy, 2020 (proposed) (Government of Canada 2020)

Information collected from the desktop assessment was used to plan the field survey for the project. The results of the FWMIS database query and other source reviews were used to determine known or potential fish presence and habitat sensitivities within the vicinity of the project area. Detailed information on aquatics and fish habitat are provided under separate cover (Matrix 2023a).

4.2.6 Hydrology

Information on hydrology is provided under separate cover in the hydrotechnical report (Matrix 2023a).

4.2.7 Land and Resource Use

The Environmentally Significant Areas in Alberta: 2014 Update (Fiera 2014), was reviewed to identify current land uses and areas with special designations, such as ESAs.

The BIA framework (The City of Calgary 2010) defines an ESA as *"a natural site that has been inventoried prior to potential development on the basis of meeting one or all of the criteria as listed: Quality of Biotic Community, Ecological Function, Distinctive and/or Unusual Land Form and Uniqueness. Because of its features or characteristics, these sites are considered as significant from an environmental perspective to Calgary, and have the potential to remain viable in an urban development. They may include patches of native vegetation, streams, wetlands, spatially continuous wildlife corridors, and unique landscapes."*

Provincial ESAs are not protected by legislation, but represent places in Alberta that are important to "the long term maintenance of biological diversity, physical landscape features and/or other natural processes, both locally and within a larger spatial context" (Fiera 2014). The provincial ESA dataset includes a set of multidiscipline criteria to inform land use and watershed planning for those areas identified as having high environmental significance (Fiera 2014). The following four classes of criteria exist to determine if a quarter section of land is considered a provincial ESA:

- Criterion 1: areas that contain rare, unique, or focal species
- Criterion 2: areas that contain rare, unique, or focal habitat
- Criterion 3: areas with ecological integrity
- Criterion 4: areas that contribute to water quality and quantity

The environmentally significant areas (ESAs) of the Calgary region (R.J Lamoureux & Associates Ltd. 1983) was reviewed to identify significant natural landscapes within the BAA. Significant natural landscapes are defined as *"landscapes or landscape features that are remnant, rare, unusual, diverse or of an exceptional character, in a Regional context. A landscape could also be considered significant by virtue of its*

representativeness. That is, it incorporates the salient characteristics of a major landscape type in the Region.”

4.2.8 Visual Resources and Aesthetics

Visual resources identify potential areas of interest or concern where visual impacts may occur as a result work and are qualitatively described based on results of the desktop assessment and field surveys. Content is included in the Design Report and accompanying architectural renderings of future conditions to be produced by landscape architects/design professionals at O2.

4.2.9 Historical and Archaeological Resources

Information on historical and archaeological resources are provided under a separate cover completed for the Project by Lifeways and are not included in this BIA.

4.3 Field Surveys

Field survey methods for the biophysical resources in the BAA are provided below. No field studies were conducted to assess land and resource use or visual resources and aesthetics.

4.3.1 Topography and Soils

No field studies were conducted to assess this resource due lack of soils on the Louise Bar and in the North Channel area, and due to the disturbed nature of the riverbanks in the BAA.

4.3.2 Vegetation

The vegetation field program was designed with a focus on the verification and characterization of vegetation communities, locating rare plants or rare ecological communities, and documenting weeds. Field surveys were completed on June 16, and July 25 to 27, 2023.

Rare plants (vascular and non-vascular) and lichens are defined as:

- listed by the ACIMS (ACIMS 2022) with the following ranks
 - ✦ globally rare (G1, G2)
 - ✦ provincially rare (S1, S2, SH)
 - ✦ Ranked G3, S3, currently unranked (SNR), or unrankable (SU) AND listed as tracked or watched by ACIMS
 - ✦ rankings that incorporate a “?” (e.g., S1?) and combination rankings (e.g., S2S3)
- listed provincially under the *Wildlife Act* as Endangered or Threatened, or federally under the Species at Risk Public Registry, *Species at Risk Act* (SARA), Schedules 1, 2 or 3 as “Endangered,” “Threatened,” or of “Special Concern”

- listed federally under the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as “Endangered,” “Threatened”, or of “special concern” (2023).

Procedures for the rare plant and rare ecological community surveys were based on protocols identified in the Alberta Native Plant Council *Guidelines for Rare Vascular Plant surveys in Alberta - 2012 Update* (ANPC 2012) and comparison to Allen (2014).

Species identified as weeds are defined as those identified by the Government of Alberta and listed under the *Weed Control Act* (Province of Alberta 2010). Prohibited noxious and noxious weed species designated under the *Weed Control Act* along with other non-native and/or potentially invasive species were recorded, if observed.

Riparian health assessments (RHAs) were conducted July 25 to 27, 2023, by Matrix personnel within each riparian community along the Bow River within the BAA. RHAs were completed according to the large river systems methods outlined by Cows and Fish (Cows and Fish 2020).

4.3.3 Wetlands and Waterbodies

Any wetland(s) identified during the desktop review were visited in conjunction with the vegetation community confirmation surveys on June 16, and from July 25 to 27, 2023. Wetland verification surveys were completed, and the following were collected at each wetland(s):

- Vegetation species
- Vegetation species cover
- Surface water data
- Preliminary delineations

4.3.4 Wildlife and Wildlife Habitat

The purpose of the wildlife surveys was to collect data on wildlife presence and habitat use, focusing on wildlife SAR, important wildlife features (e.g., dens, nests, and hibernacula) that may require mitigation (e.g., timing restrictions and setbacks), and species potentially impacted by the project (e.g., migratory birds and semi-aquatic mammals). All observations of wildlife species and their signs (e.g., tracks and scat) were recorded during the wildlife surveys. Locations of wildlife SAR and important wildlife features were recorded with a GPS.

Surveys targeting amphibians (e.g., nocturnal acoustic amphibian surveys) were not completed in 2023 since the BAA does not overlap with the sensitive amphibian range (EPA 2023c) and amphibian SAR are not suspected to occur. Although the BAA is within the sharp-tailed grouse survey area (EPA 2023c), no sharp-tailed grouse surveys were conducted in 2023 as there is no appropriate habitat for sharp-tailed grouse lekking (i.e., open prairie and grassland) within the BAA. Surveys targeting reptiles (e.g., snake

den surveys) were not completed in 2023 due to timing constraints; however, snake surveys are planned for spring 2024.

4.3.4.1 Breeding Bird Survey

Two breeding bird surveys were completed by qualified wildlife biologists on June 8, 2023, and June 22, 2023. The purpose of the surveys was to identify presence and habitat use of breeding bird species present within the BAA. Methods for the breeding bird surveys followed the protocols described for grassland birds in the *Sensitive Species Inventory Guidelines* (GoA 2013). Nine point-count locations were surveyed on June 8, 2023 and 11 point-count locations were surveyed on June 22, 2023. An additional two point-count locations were completed during the second breeding bird survey to ensure coverage of Louise Bar since biologists were unable to safely access this area during the first survey.

Point-count locations were distributed throughout the BAA with a focus on proposed project components to provide adequate coverage of different habitat types and higher quality habitats for SAR. All evidence of bird activity was recorded; however, the survey focused on recording observations of singing territorial males within a 100 m radius. Birds were identified by sight and sound for a period of 5 minutes at each point-count location. The field survey was conducted during optimal weather conditions (minimal wind and precipitation) and during the early morning period (30 minutes before sunrise to 10:00 a.m.) which is the peak activity period for most species of birds (Bibby et al. 2000). Incidental wildlife observations, including waterfowl and raptors, were also recorded during the breeding bird survey.

The biologists also recorded any active nests within the BAA. Acoustic evidence of nesting such as agitated alarm calls by nesting pairs or regular territorial singing at a particular location (e.g., tree or shrub) was noted. If nests are found during the survey, their location was georeferenced using GPS and where appropriate species-specific setbacks may be determined and applied.

4.3.4.2 Wildlife Reconnaissance Survey

A general wildlife reconnaissance survey was completed within the BAA concurrent with the breeding bird and raptor surveys on June 8, and 22, 2023. The purpose of the survey was to describe and identify wildlife habitat and important wildlife features (e.g., wildlife corridors, mammal dens) potentially impacted by the project. Specific surveys targeting mammals (e.g., winter tracking) were not completed in 2023, however, mammal observations were incidentally recorded during the wildlife surveys, if detected. This included observations, evidence of use (e.g., tracks, scat), and important wildlife features (e.g., dens).

4.3.4.3 Raptor Survey

A visual raptor survey was completed on June 22, 2023, in conjunction with the second breeding bird survey to detect raptors and stick nests within the BAA. The biologist searched on foot and used binoculars to look for stick nests and/or to observe any raptors in the BAA.

4.3.4.4 Acoustic Bat Survey

An acoustic bat survey was conducted on July 18 and 19, 2023 by a qualified bat biologist. To detect roosting and foraging bats, the biologist visually surveyed and used an Echo Meter™ bat detector to acoustically detect bats within four project components (i.e., the South Slopes, the North Channel, Louise Bar and the Landing) within the BAA. The project components contain mature balsam poplar trees and snags and meet the roosting and foraging habitat requirements of bats. In each project component, the biologists conducted 10 minutes of visual and acoustic surveys at separate survey locations followed by a walking transect in the same location with the Echo Meter™ bat detector still recording. Bat calls were recorded, and species identification was completed within the Echo Meter™ software. Surveys were conducted from 9:30 pm to 11:00 pm.

4.3.5 Aquatics, Fish and Fish Habitat

A site visit was conducted on August 1, 2023. The site visit included the following components:

- measure and document biophysical and morphological channel conditions
- identify and map fish habitat features
- identify potentially sensitive habitat within the anticipated construction area

4.4 Impact Assessment Criteria

Assessment criteria consistent with the Responsible Authority's Guide to the *Canadian Environmental Assessment Act* (FEARO 1994) were used to describe and evaluate the predicted impacts for the selected biophysical resources. Conclusions for the impact criteria are based primarily on qualitative evaluations based on best professional judgement when environmental thresholds are not available or quantitative predictions are not feasible.

Impacts were measured based on a number of criteria: direction, magnitude; duration, frequency, spatial extent, reversibility, and probability of the impact occurring. Consideration of these criteria were used to determine whether a biophysical resource would be impacted. Descriptions for each of the impact criteria are provided in Table 5. Conclusions for the criteria are qualitative and based on professional judgement. The integration of the various impact criteria results in a significance rating.

TABLE 5 Impact Assessment Criteria

Direction: Describes the direction of the impact whether there is a net benefit, net loss, or a net balance	
Positive	The impact has a benefit and/or is desirable
Neutral	The impact has no net benefit or loss
Negative	The impact results in a net loss and/or is considered undesirable or adverse
Magnitude: Describes the scale and severity of the impact	
Negligible	No discernible change from existing conditions
Low	Change is detectable and within expected natural variation, but biophysical resource is completely self-recoverable
Moderate	Change is detectable and beyond expected natural variation. Biophysical resource likely remains self-recoverable
High	Change is detectable and beyond expected natural variation; biophysical resource is unlikely to self-recover without avoidance and/or effective mitigation
Duration: Describes how long the impact will persist	
Immediate	2 days or less
Short-term	Occurs during the construction phase or for less than 1 year during operation
Medium-term	Occurs during the construction and/or operation phase or between 1 to 10 years
Long-term	Occurs during the construction and/or operation phase and persists for more than 10 years
Frequency of Occurrence: Describes how often the impact occurs within a set time period	
Incidental	Impact occurs only as a result of an unanticipated or infrequent event
Isolated	Impact is confined to a specific time or Project activity
Occasional	Impact occurs intermittently and sporadically over the assessment period
Periodic	Impact occurs repeatedly during the assessment period
Continuous	Impact occurs continually during the assessment period
Spatial Extent: Describes the area within which the impact occurs	
Project Nodes	The area within which direct and indirect impacts of the Project are anticipated to occur
Outside Biophysical Assessment Area	The area within and outside of the Project Area where direct and indirect impacts are anticipated to occur
Reversibility: Describes the potential for the recovery from or reversibility of an impact	
Reversible immediately	Less than 2 days
Reversible in short-term	Less than 1 year
Reversible in medium-term	1 to 10 years
Reversible in long-term	Greater than 10 years
Irreversible (permanent)	Impact is not reversible
Probability of Occurrence: Describes the likelihood of impact.	
Low	Unlikely to occur
High	Likely to occur

Prediction Confidence: Describes the certainty associated with the significance evaluation and considers data quality, and rigor of the assessment/measurement approach	
Low	Determination of significance based on an incomplete understanding of cause-effect relationships and coarse, low resolution, or incomplete data for the Project Area
Moderate	Determination of significance based on a good understanding of cause-effect relationships and coarse or low resolution data or high-resolution quality data, but poor understanding of cause-effect relationships
High	Determination of significance based on a good understanding of cause-effect relationships and good quality data for the Project Area

The potential Project impacts prior to implementation of mitigation for each biophysical resource are discussed in Section 6 (Impact Assessment). Residual effects (those that remain after mitigation measures are applied) are described in Section 7 (Mitigation and Residual Effects). Where a residual effect is expected, a significance rating is also applied as follows:

- **Significant:** A moderate or high magnitude impact remains following implementation of mitigation measures and is likely to persist into the long-term. Effectiveness of mitigation measures may be less certain.
- **Not-significant:** A negligible or low magnitude impact remains following implementation of mitigation measures. Mitigation success is considered likely.

5 EXISTING ENVIRONMENT

The desktop and field assessments provided an understanding of biophysical resources present within the BAA, the extent to which they had been previously evaluated, and an understanding of potential environmental sensitivities including rare ecological communities, rare plants, and wildlife based on previously reported occurrences. Details on the biophysical resources are provided below. Potential impacts and mitigations to these resources are provided in Section 6.

5.1 Topography and Soils

The project area parallels the Bow River and is located in Soil Correlation Area 6 (AF 2020); the thin black soil zone of south-central Alberta. Based on the desktop review, the project area is characterized by shallow riverbanks, with nearly level slopes ranging from 0.5 to 2% on the upper banks, and mid and toe bank positions ranging from 10 to 15% slopes. Slopes range from 20 to 25% where the river has eroded the riverbank. There are a few locations experiencing erosion along the riverbanks and have steep slopes.

Soils in the BAA are Regosols and or Chernozems. Regosols are common along the Bow River and are developed on moderately coarse fluvial deposits, and are associated with strongly dissected and active and/or abandoned drainage channels (MacMillan 1987). These soils are often classified as rough broken

which describes a complex of soil where materials cannot be classified separately and are often associated with steep erosional escarpments of riverbanks. They are commonly mapped along the banks and escarpments of rivers in this region.

5.2 Vegetation

The project area is located within the Foothills Fescue Natural Subregion of the Grassland Natural Region, where balsam poplar (*Populus balsamifera*), aspen (*Populus tremuloides*), and plains cottonwood (*Populus deltoides*) wooded areas are prevalent along rivers. Willow (*Salix* spp.), sedge (*Carex* spp.), and grass dominated communities are also common in riparian areas (Natural Regions Committee 2006).

Vegetation desktop results are provided in Appendix C, a species list is provided in Appendix D, photographs are provided in Appendix E, and riparian health field data are in Appendix F. All of these are discussed in more detail below.

5.2.1 Vegetation Communities

Vegetation community types mapped within the BAA could be grouped into upland, riparian, and disturbed vegetation communities. Upland communities included deciduous forest and manicured/park areas. Lowland communities included both deciduous and shrubby riparian areas, as well as beach/gravel bar vegetation community types (Table 6, Figure 2). Disturbed vegetation communities included riprap areas along the riverbanks. Vegetation communities are further discussed below.

TABLE 6 Vegetation Community Distribution within the Biophysical Assessment Area

Vegetation Community Types	Baseline Area (ha)	Proportion of LSA (%)
Upland Vegetation Communities		
Treed Deciduous Forest	1.3	4
Manicured/Park Area	5.4	19
Riparian Vegetation Communities		
Treed Deciduous Riparian	2.3	8
Shrubby Riparian	2.9	10
Beach/Gravel Bar	0.4	1
Seasonal Graminoid Marsh	0.2	1
Riprap	0.5	2
Non-vegetated Landscapes		
Bow River	13.1	45
Disturbed – paths/trails/roads	3.1	11
TOTAL	29.1	100

LSA - local study area

5.2.1.1 Upland Vegetation Communities

Treed Deciduous Forest

The deciduous forest community was dominated by young to mature balsam poplar, as well as a mix of native shrub species such as Saskatoon (*Amelanchier alnifolia*) and red-osier dogwood (*Cornus sericea*), and non-native shrub species such as Peking cotoneaster (*Cotoneaster lucidus*). Common native herbaceous species included star-flowered Solomon's-seal (*Maianthemum stellatum*), tall goldenrod (*Solidago altissima*), and smooth aster (*Symphyotrichum leave*). Common non-native herbaceous species were abundant and included smooth brome (*Bromus inermis*) and creeping bellflower (*Campanula rapunculoides*). This vegetation community is located within Poppy Plaza, which experiences significant recreational activity, resulting in compacted footpaths throughout the area.

Manicured/Park Area

Portions of two Calgary parks, Eau Claire and Poppy Plaza, fall within the BAA. Maintained and landscaped areas of these parks consisted primarily of introduced species such as American elm (*Ulmus americana*), ash (*Fraxinus* sp.), and Peking cotoneaster, as well as mowed turf grasses. Non-native herbaceous species such as creeping bellflower and creeping thistle (*Cirsium arvense*) were also observed in several locations throughout these areas.

5.2.1.2 Riparian Vegetation Communities

Treed Deciduous Riparian

While exhibiting similar vegetation community characteristics to the upland deciduous forest community, treed deciduous riparian areas were found within the flood plain along the north and south banks of the Bow River. Dominant trees included balsam poplar, with immature white spruce (*Picea glauca*) in the understory. Vegetation cover in this area also consisted of a mix of native shrub species such as water birch (*Betula occidentalis*), Saskatoon, and red-osier dogwood, and non-native shrub species such as Tatarian honeysuckle (*Lonicera tatarica*) and Peking cotoneaster. Herbaceous species within this vegetation community included native species such as star-flowered Solomon's-seal, wild vetch (*Vicia americana*), and common horsetail (*Equisetum arvense*), and non-native species such as creeping bellflower, Russian leafy spurge (*Euphorbia virgata*), and common tansy (*Tanacetum vulgare*). There are varying levels of anthropogenic disturbances within this vegetation community, including compacted footpaths and garbage littered throughout.

Shrubby Riparian

The shrubby riparian community was found within the floodplain along the north and south banks of the Bow River. Vegetation species consisted of balsam poplar saplings, red-osier dogwood, and narrow-leaf willow (*Salix exigua*). Herbaceous species included bluejoint reedgrass (*Calamagrostis canadensis*), wild vetch, and several sedge species (*Carex* spp.). Non-native species included creeping thistle, Russian leafy spurge, and common tansy. Along the South Slopes Project node the shrubby riparian vegetation

community is primarily common caragana (*Caragana arborescens*) (Figure 2) which is an unregulated nuisance weed that can be invasive.

Beach/Gravel Bar

The beach/gravel bar community had low vegetation cover and is flooded annually for a period of time reducing the ability for vegetation to mature. These habitats are often inundated by changing water levels and receive sediment loads from flood events. Shrub species were short and consisted of narrow-leaf willow and an ash species. Herbaceous species included a mix of native species such as tufted hair grass (*Deschampsia cespitosa*), alpine rush (*Juncus alpinoarticulatus*), and flat-topped goldenrod (*Euthamia graminifolia*), and non-native species such as Kentucky bluegrass (*Poa pratensis* ssp. *Pratensis*), yellow clematis (*Clematis tangutica*), and common toadflax (*Linaria vulgaris*).

Seasonal Graminoid Marsh

The seasonal graminoid marsh community was found within the 1:2-year high water mark along the north bank of the Bow River in the centre of the North Channel node (Figure 2). Herbaceous species included Sprengel's sedge (*Carex sprengelii*) and common great bulrush (*Schoenoplectus tabernaemontani*).

Riprap

Areas of riprap were found predominantly along the north bank of the Bow River, closer to the east end of the BAA. Vegetation within these areas was sparse and consisted almost entirely of non-native species. Species observed included creeping bellflower, creeping thistle, perennial sow-thistle (*Sonchus arvensis*), and scentless chamomile (*Tripleurospermum inodorum*), and willow species.

5.2.2 Rare Plants and Rare Ecological Communities

The desktop ACIMS search of rare plants within 1 km of the BAA included four rare plant species: hairy bugseed (*Corispermum vollosum*; S2), Pallas' bugseed (*Corispermum pallasii*; S2), sandhills cinquefoil (*Potentilla lasiodonta*; S3), and western blue flag (*Iris missouriensis*; S2) (Appendix C). No rare ecological communities were identified by ACIMS within the legal land location.

No rare plants or rare ecological communities were observed during the vegetation surveys. Potential for rare plants to occur within the BAA is low, except in the semi-permanent graminoid marsh where rare plant potential is medium to high. Locations of the rare plant and rare ecological community survey is shown as a rare plant meander on Figure 2.

5.2.3 Non-native, Weeds, and Invasive Species

A total of one prohibited noxious, 13 noxious and 44 other non-native and potentially invasive species were identified within the BAA (Appendix D, Figure 2).

5.2.4 Riparian Health

Riparian health was calculated based on vegetation, soil and hydrology factors, using the *Alberta Wetland Health Assessment for Large River Systems* (Cows and Fish 2020). The RHA plots evaluated within the BAA remains healthy, but with problems, receiving a 77% health score. Some parameters evaluated such as regeneration of preferred shrub species, and standing decadent and dead woody material received the maximum score within all RHA plots, while parameters such as density distribution of invasive plant species (weeds) and control of flood peak and timing by upstream dam(s) received low scores within all RHA plots. Results of the RHA plots are provided in Appendix F, and photographs are provided in Appendix E.

5.2.5 Wetlands and Water Bodies

One semi-permanent graminoid marsh (M.G.IV) was identified within the BAA during the vegetation community surveys (Figure 2). It was delineated in the field based on terrain, dominant vegetation, and hydrology indicators. This wetland is approximately 0.2 ha in size and is located within the shrubby riparian vegetation community type on the north bank of the Bow River.

5.3 Wildlife and Wildlife Habitat

5.3.1 Potential Wildlife Species

The results of the desktop review were used to compile a list of wildlife species, including SAR that may occur in the BAA (Appendix B).

A total of 6 amphibian, 3 reptile, 189 resident bird, 78 migratory or winter birds, and 37 mammal species have been observed or have the potential to occur in the BAA (Appendix B). Actual wildlife species presence or use of habitats depends on seasonal conditions, habitat conditions, existing development, and human use in the BAA. As a result, the species identified that may occur in any given year are expected to vary.

A total of 73 wildlife SAR have ranges that overlap with the BAA, and 10 of those have been detected within the BAA (Appendix B). However, some wildlife SAR may only be present during seasonal migration or were observed historically and are no longer present in the area due to range contractions and widespread population declines. For example, northern leopard frog has been historically detected in Calgary, Alberta, but has not been recorded since 2005 (Environment Canada 2013, Kendell et al. 2007).

5.3.2 Wildlife Habitat

The habitat within the BAA is mostly disturbed (varying levels of anthropogenic disturbances), fragmented, and of lower wildlife habitat quality relative to other habitat along the Bow River within The City of Calgary limits (e.g., Inglewood Bird Sanctuary). Wildlife habitat in the BAA consists of primarily deciduous forest and manicured/park areas, deciduous and shrubby riparian areas, as well as

beach/gravel bar vegetation community types (Table 5). Disturbed vegetation communities included riprap areas along the riverbanks. The only wetland present within the BAA is a seasonal graminoid marsh within the shrubby riparian vegetation community type (Figure 2). The BAA provides habitat for migratory birds, raptors, water birds, waterfowl, and semi-aquatic mammals that are accustomed to urban disturbances (e.g., human and traffic noise).

5.3.2.1 Ecological Network and Sensitive Species Ranges

The BAA is located within a primary corridor within Calgary's ecological network (The City of Calgary 2020a). Corridors consist of natural and semi-natural open spaces that link habitats to facilitate ecological function and reduce habitat fragmentation (The City of Calgary 2020a). Primary corridors connect ecological networks throughout Calgary and consist of riparian zones along Calgary's major watercourses such as the Bow River (The City of Calgary 2020a). Mammals such as ungulates or furbearers, may use the Bow River corridor for movement between habitats.

The BAA occurs within the provincially designated sharp-tailed grouse survey range and sensitive raptor range (EPA 2023c). Sharp-tailed grouse have not been detected and are not expected in the BAA due to the absence of suitable lekking habitat and surrounding urban development. There is suitable raptor nesting habitat in the BAA, however, no raptor nests were identified during the field surveys. No other provincially recognized wildlife ranges, water bodies, zones, and areas were identified in the BAA.

5.3.3 Amphibians and Reptiles

Amphibians potentially occurring in the BAA include one salamander species, two toad species, and three frog species (Appendix B). Common amphibian species, including the boreal chorus frog and wood frog, are expected to occur in the BAA based on sightings of these species at other natural areas in Calgary. Amphibian SAR (i.e., tiger salamander, Western toad, Canadian toad, and northern leopard frog) are not expected to occur in the BAA as there is a high amount of disturbance, limited suitable habitat and/or the ranges for these species has contracted from their historic ranges. Although there is habitat for some amphibians in the BAA (i.e., seasonal graminoid marsh, margins of the Bow River), none were observed during the wildlife surveys completed in 2023 (Appendix B). However, no targeted amphibian surveys (e.g., nocturnal call) have been recently completed within the project components.

Reptile species potentially occurring, historically observed, or recently observed in the BAA include three species of garter snake (i.e., wandering, plains, and red-sided) (Appendix B). Garter snakes are often found near the Bow River in Calgary and may den, forage and travel through riparian habitats in the BAA. Wandering garter snakes have been observed along the banks of the river south of memorial drive during a snake hibernacula survey in 2015 including in the western extent of BAA near the 14th street bridge, and an historical inactive snake hibernaculum was identified by the City east of the 10th street bridge south of the old firehall (Matrix 2015).

5.3.4 Birds

Natural areas within the BAA (e.g., Bow River and riparian habitats) provide nesting, foraging, and winter habitat for a variety of bird species. The BAA is not particularly unique for the Bow River as it runs through the central highly disturbed area of The City of Calgary. Most of the recently observed breeding bird species are commonly found in natural environment parks within Calgary. Potential bird habitat in the BAA includes deciduous forest, manicured/park areas, shrubby riparian areas and the vegetation along the beach/gravel bar, wetland, and open water river habitats. All habitats (including disturbed and developed areas) in the BAA may be used by birds, although the less disturbed areas (e.g., deciduous forest and shrubby riparian areas) are higher quality habitat.

A total of 29 bird species were observed during the recent breeding bird surveys conducted in June 2023. Thirteen additional bird species were detected historically (i.e., wood duck, barred owl, short-eared owl, least flycatcher, eastern kingbird, tree swallow, white-breasted nuthatch, house wren, gray catbird, yellow warbler, chipping sparrow, and clay-coloured sparrow; Appendix B). Many of these species are commonly observed along the Bow River and within Calgary. Although no active nests were found during surveys of the BAA in 2023, many of these species have the potential to nest in the area in future years. Of the species observed during the 2023 surveys, one species (i.e., sora) is considered SAR. Species observed are listed by bird guilds below and details (including status and seasonal occurrence) are provided in Appendix B.

- Waterfowl and Shorebirds/Waterbirds
 - ✦ Canada goose
 - ✦ American wigeon
 - ✦ Mallard
 - ✦ Common merganser
 - ✦ Double-crested cormorant
 - ✦ Sora (SAR – “Sensitive” AEPA status)
 - ✦ American coot
 - ✦ Spotted sandpiper
 - ✦ Solitary sandpiper
 - ✦ Wilson’s snipe
 - ✦ Franklin’s gull
- Raptors
 - ✦ Osprey

- Passerines (Perching Birds/Songbirds)

- ✦ Yellow-bellied sapsucker
- ✦ Northern flicker
- ✦ Downy woodpecker
- ✦ Black-capped chickadee
- ✦ Red-breasted nuthatch
- ✦ American robin
- ✦ European starling
- ✦ Cedar waxwing
- ✦ Song sparrow
- ✦ Red-winged blackbird
- ✦ Brown-headed cowbird
- ✦ House finch
- ✦ House sparrow
- ✦ Common tern

- Other Birds

- ✦ Black-billed magpie (nest observed in tree)
- ✦ American crow
- ✦ Common raven

One inactive cliff swallow nest was identified during the breeding bird surveys. Nests for this species and most of the species observed during the breeding bird survey (excluding European starling, red-winged blackbird, house sparrow, black-billed magpie, American crow and common raven) are protected under the *Migratory Birds Convention Act* when active. Active nests for these species require setbacks until they become inactive.

The following general habitat information was taken for each project component:

- The Louise Bar - The ground was rocky and dominated by poplar shrubs with a few mature poplar trees. One larger tree that is close to the bridge has more potential as nesting habitat. Limited use by birds was observed during the breeding bird surveys.
- The Wave Deck – Fairly open and disturbed area, but some medium sized trees providing moderate habitat quality for birds and bats.
- South Slopes – The habitat was noted as a very thin row of vegetation flanked by lots of disturbance and the river. The habitat is suitable for breeding birds but was relatively quiet during the breeding bird surveys.

- The Landing - The habitat was lushier than the South Slopes with areas less disturbed by noise from people or the river. High quality bird and bat habitat was noted in this area (e.g., potential roosts in older poplar trees). This area is also known as the 'Eau Claire Woodland' (Rood, 2020).
- The North Channel – There is a mix of habitat in this area with some high quality bat and bird roosting habitat noted. A seasonal graminoid marsh was noted where the sora was detected (Figure 3).

5.3.5 Mammals

Due to the project's central urban location, mammal use except for bats, is expected to be limited to common urban species, including small mammals (e.g., white-tailed jackrabbit and eastern gray squirrel), coyote, deer, and semi-aquatic mammals (e.g., muskrat and beaver). These species have adapted to human activity and likely use the area at times when human activity is reduced (e.g., dawn, dusk, or night). Deer are frequently observed travelling and foraging along balsam poplar forest adjacent to the Bow River in Calgary.

5.3.5.1 Bats

Bat species potentially occurring in the BAA include 7 species, 5 of which are SAR (Appendix B). Bats may potentially use cavities in the mature poplar trees within the various project components for roosting and the Bow River for foraging during the spring and summer seasons. It is unlikely that bats would be hibernating within the project components as several of the bat species that would be present in the area in summer are expected to migrate further south for the winter, although hibernation has been observed elsewhere in the region (e.g., Banff National Park and Dinosaur Provincial Park; Derworiz 2016, Lausen and Barclay 2006).

A total of 46 call files were recorded during the survey spread out within the Landing and the North Channel and bats were visually observed flying over forested stands in these project components. No bats were detected visually or acoustically along the South Slopes or the Louise Bar. Bat calls, including *Myotis* spp. can be challenging to identify to species; therefore, there is uncertainty in the specific species that may be present. The majority of the calls were identified by the Echo Meter™ software as little brown myotis (n=38), with the remaining calls being identified as long-legged myotis (n=8). Given the number of detections, it is likely that both of these species are present in the area. Bat detections occurred shortly after sunset, indicating that roosting is likely occurring in close proximity to the survey locations. Overall, there was suitable roosting habitat (e.g., snags) noted in the Landing and the North Channel and bats are expected to be using these areas for nightly roosting during the summer based on the survey results.

5.3.6 Wildlife Features

No active important wildlife features (e.g., nests, dens, burrows) with provincially or federally recommended setbacks were identified during any of the wildlife surveys completed for the project in

2023. Setbacks are required from these features when they are active (e.g., eggs, young). Mitigation for important wildlife features is described in Section 7.

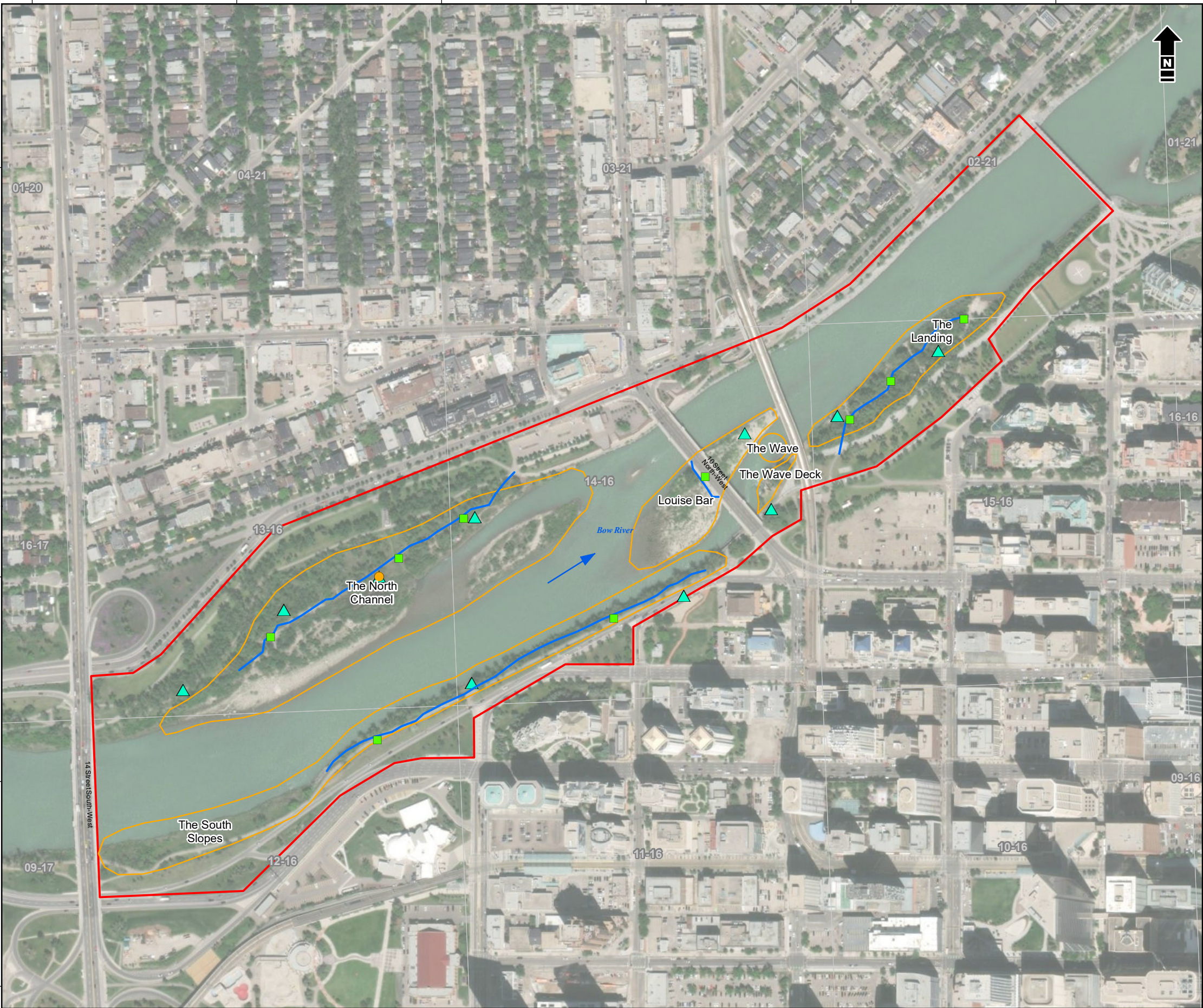
Easting (m)

703575 703800 704025 704250 704475 704700

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North (m)

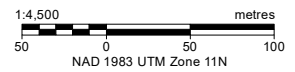
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Twp. 24

- Biophysical Assessment Area
- Project Node
- Flow Direction
- Bat Survey Transect
- Bat Survey Location
- Breeding Bird Survey Location
- Wildlife Species At Risk Observation
- Sora

The following Wildlife Sensitivity Ranges are within the Biophysical Assessment Area:
Sensitive Raptor (Bald Eagle, Golden Eagle and Prairie Falcon)



Reference: Contains information licensed under the Open Government Licence - City of Calgary. Data obtained from Altalis © Government of Alberta used under license. Imagery (2022) Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

O2

 **Matrix Solutions Inc.**
A Montrose Environmental Company

O2 Planning & Design Inc. and the City of Calgary
Bow River 10th Street Gravel Bar Project - BIA

Wildlife Survey Locations, Species at Risk, and Important Wildlife Features

Date: October 2023	Project: 34737	Submitter: J. Kemper	Reviewer: K. Curtis
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5.4 Aquatics, Fish and Fish Habitat

The section of the Bow River within the BAA is located within the Calgary Management Area (AEP 2018) and is classified as a Class C watercourse under the Code of Practice for Pipelines and Telecommunication Lines Crossing a Water Body, Code of Practice for Watercourse Crossings, Code of Practice for Outfall Structures on Water Bodies, Calgary Management Area Map (ESRD 2012). This area of the Bow River has two RAPs: May 1 to July 15 and September 16 to April 5. The RAPs are in place to protect the spring, fall, and winter spawning fish species in the Bow River during sensitive life cycle stages (ESRD 2012).

The Bow River supports over 40 fish species along its 587 km length (BRBC 2005). Of those, 20 have been reported within 10 km of the project site (EPA 2023) including, but not limited to: Brook Trout (*Salvelinus fontinalis*), Brown Trout (*Salmo trutta*), Burbot (*Lota lota*), Lake Whitefish (*Coregonus clupeaformis*), Mountain Whitefish (*Prosopium williamsoni*), Northern Pike (*Esox Lucius*), Rainbow Trout (*Oncorhynchus mykiss*), and Yellow Perch (*Perca flavescens*).

DFO (2023) shows Bull Trout (*Salvelinus confluentus*) distribution within the BAA. Bull Trout (Saskatchewan - Nelson Rivers populations) are listed as "Threatened" in the SARA registry (Government of Canada 2019). Although DFO (2023) shows Bull Trout within the BAA, they have not been found in the historical reports within 10 km of the project site. However, Bull Trout are known to be present in other reaches of the Bow River and individuals could be found in the vicinity of the project. No critical habitat for these species is found within the project site according to the aquatic SAR map (DFO 2018).

Pure-strain Westslope Cutthroat Trout (*Oncorhynchus clarkii lewisi*) are listed as "Threatened" in the SARA registry but are not present in this portion of the Bow River (Costello 2006).

Detailed information on aquatics and fish habitat are provided under separate cover (Matrix 2023a).

5.5 Land and Resource Use

The BAA is currently used by residents for recreational activities (e.g., walking, rafting, surfing). The proximity to the downtown area makes the area popular with City residents.

5.5.1 Environmentally Significant Areas

The BAA is within national ESA # 289. The larger ESA is considered to be of national significance because it includes the Bow River, unique landforms, observations of species of concern, important wildlife habitat, intact riparian areas and headwater streams, and large natural areas (Westhoff 2013).

No provincial ESAs are present within the BAA based on the 2014 provincial update (Fiera 2014). There are no ESAs of the Calgary region present within the BAA (Lamoureux & Associates Ltd. 1983).

5.6 Visual Resources and Aesthetics

Project activities will take place in and adjacent to the Bow River. Walking paths on both the north and south side of the BAA offer views of the Bow River.

6 IMPACT ASSESSMENT

The following sections describe Project-related impacts for each biophysical resource included in this report. The impacts of the Project are described for each biophysical resource and are measured based on several criteria presented in Section 4.4 (Impact Assessment Criteria). Changes to vegetation due to the Project will impact both vegetation and wildlife habitat. A summary of changes to the different vegetation communities is provided in Table 7.

Mitigation measures designed to guide planning and design, construction and construction monitoring, and restoration activities and aimed at reducing the potential risk to biophysical resources are provided in Table 8, and residual effects are subsequently determined considering implementation of the mitigation measures proposed.

A detailed aquatic effects assessment following DFO guidelines for identifying and evaluating effects to fish and fish habitat is provided under separate cover (Matrix 2023a).

TABLE 7 Change in Vegetation Community Types Associated With the 10th Street Gravel Bar Project

Vegetation Community Types	Baseline Area (ha)	Baseline Area of LSA (%)	Total Construction Area (ha)	Proportion of LSA in Construction Area (%)	Restored Temporary Disturbance Area (ha)	Proportion of LSA in Restored Temporary Disturbance (%)	Post-Construction Area (ha)	Net Change Area of LSA (%)
Upland Vegetation Communities								
Treed Deciduous Forest								
Manicured/Park Area								
Lowland Vegetation Communities								
Treed Deciduous Riparian								
Shrubby Riparian								
Beach/Gravel Bar								
Seasonal Graminoid Marsh								
Riprap								
Non-vegetated Landscapes								
Bow River								
Disturbed – paths/trails/roads								
TOTAL								

Note:
1 Total construction area represents the entire project footprint, restored temporary disturbance represents areas that will be returned to their previous vegetation community type, and the net change indicates a decrease in the original distribution of vegetation community types of xxx ha. It should be noted however that the net change does not represent a net decrease in vegetation communities, rather a redistribution of vegetation community types. Post-construction restoration and target vegetation communities are discussed further in Section 7.0.

TABLE 8 Potential Impacts, Mitigation Measures, Impact Rankings, and Residual Effects

Biophysical Resource	Potential Impact	Phase	Mitigation Measures	Project Impact Rankings & Residual Effects ¹
Vegetation	Removal of and changes to vegetation communities	Construction and operation	• Avoid or minimize the extent of the project area affecting vegetation communities. • Minimize the removal of existing trees (i.e., refer to TPP). • Develop and implement TPP during construction. • Minimize disturbance to soils when clearing vegetation. • Use matting in sensitive areas where compaction could impact tree roots or if soil quality may be compromised (e.g., wet conditions). Contact Urban Forestry if there is potential for root damage. • If tree pruning or branch clearing activities are required beyond the TPP, contact Urban Forestry and employ a certified arborist. • Install temporary barriers or flagging to mark trees and shrubs that are not to be disturbed. • Implement the restoration plan using native species and reference communities defined in the as soon as possible in areas where construction is complete.	Direction: Negative Magnitude: Negligible Duration: long-term Frequency: Isolated Extent: Project Area Reversibility: Reversible in long-term Probability: High Confidence: High A negligible residual effect on the current distribution of vegetation communities is anticipated, and is considered not-significant. Impacts from removal of mature trees are discussed under wildlife and wildlife habitat.

Note:
¹ Project Impact Ratings are assessed before mitigation measures are applied, while residual effects and significance statements reflect circumstances following mitigation implementation.
TPP - tree protection plan

7 CUMULATIVE EFFECTS

TABLE 10 Summary of Residual and Potential Cumulative Effects

Biophysical Resource	Residual Effect (from Table 9)	Cumulative Effect	Significance	
			Project Area	Within 5 km Radius of Project Area
Topography and soil				
Vegetation: community distribution				
Vegetation: rare plants and rare ecological communities				
Vegetation: non-native and weed species				
Vegetation: Riparian health				
Wetlands and water bodies				
Wildlife and wildlife habitat, including SAR, special status species and other potentially impacted species				
Wildlife including direct/indirect mortality, sensory disturbance, and barriers to movement				
Hydrology, including surface water levels, velocity, water quality, and erosion risk				
Land and resource use, including environmentally significant areas				
Visual resources and aesthetics				
Historical and archaeological resources				

SAR - species at risk

8 ENVIRONMENTAL MONITORING AND FOLLOW UP

8.1 HABITAT RESTORATION

8.2 MONITORING

8.3 ADDITIONAL DOCUMENTATION

9 CONCLUSIONS

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