Environmental Impact Statement
Barrhaven Conservancy West, Ottawa

December 6, 2022

Submitted To:

Zeyad Hassan
Caivan Communities
2934 Baseline Road, Suite 302
Ottawa, ON K2H 1B2

KILGOUR & ASSOCIATES LTD.
www.kilgourassociates.com

TABLE OF CONTENTS

List of Figures

List of Tables

List of Appendices

List of Acronyms and Abbreviations

AMO – Atlas of the Mammals of Ontario
DFO – Fisheries and Oceans Canada
ECCC - Environment and Climate Change Canada
EIS – Environmental Impact Statement
EMP – Environmental Management Plan
ESA – *Endangered Species Act*, 2007
FWCA - Fish and Wildlife Conservation Act
JRSWS – Jock River Reach One Subwatershed Study
KAL – Kilgour & Associates Ltd.
MBCA - *Migratory Bird Convention Act*
MNR – Ministry of Natural Resources
MNRF – Ministry of Natural Resources and Forestry
OBBA – Ontario Breeding Bird Atlas
OP – Official Plan
OPA – Official Plan Ammendment
PPS – Provincial Policy Statement
RVCA – Rideau Valley Conservation Authority
SAR – species at risk
SARA - *Species at Risk Act*
y - Year

1.0 INTRODUCTION

Barrhaven Conservancy Development Corporation (BCDC) is proposing a new residential subdivision named the Barrhaven Conservancy West (the "Site") located in the Barrhaven Conservancy Community area of Ottawa, Ontario (Figure 1). The Site is bordered by the Foster Watercourse to the east, and additional lands owned by the applicant and Ontario Highway 416 to the west, with the Foster stormwater management facility and a CN rail corridor along the north edge. Land directly to the south of the Site comprising part of the broader Barrhaven Conservancy land holdings is not currently subject to a development plan.

1.1 Property Information

The Site, along with the entire Barrhaven Conservancy Community, is owned by the Barrhaven Conservancy Development Corporation (2934 Baseline Rd Suite 302, Ottawa, ON K2H 1B2, 613-518-1864). The full Barrhaven Conservancy Community is comprised of seven contiguous property parcels at 3285, 3288, 3300, and 3305 Borrisokane Road, and 4305, 4345, and 4375 McKenna Casey Drive, and is located on Concession 3 Lots 13-14 and Concession 4 Lots 13-15. The Site itself includes portions of this area west of the Foster Watercourse, covering an area of approximately 36.5 ha. The Site is zoned Developmental Reserve (DR).

The Site is entirely within the City of Ottawa Urban Area. It was previously (i.e. prior to 2019) largely dominated by agricultural land uses and was located within the regulatory floodplain of the Jock River. The floodplain on the Site and the broader lands of the Barrhaven Conservancy Community was modified through a Cut and Fill Program under Official Plan Amendment (OPA) 212. All areas of the Site subject to development were regraded to a higher elevation through 2019 and 2020, removing them from the floodplain and razing all the natural landcover within the area.

1.2 Current Proposal

The full build-out of the community is anticipated to take several years to complete. The subject of this application for Barrhaven Conservancy West is a proposed residential development to take place between the Foster Watercourse and Highway 416, north of the new floodplain boundary and straddling the O'Keefe Drain, a municipal drain that flows from north to south through the centre of the Site.

Accompanying this new residential community will be the re-naturalization of the Jock River corridor west of the Foster Drain with (1) natural features such as wetlands and forest/canopy cover; and (2) recreational infrastructure (e.g. pathways). Plans for the restoration are currently being developed through consultation with the Rideau Valley Conservation Authority (RVCA) and the City of Ottawa. The restoration is anticipated to include areas of wetland habitat, forest habitat, and meadow habitat, increasing the ecological diversity of the corridor. The re-naturalization program, however, will be addressed by a separate review.

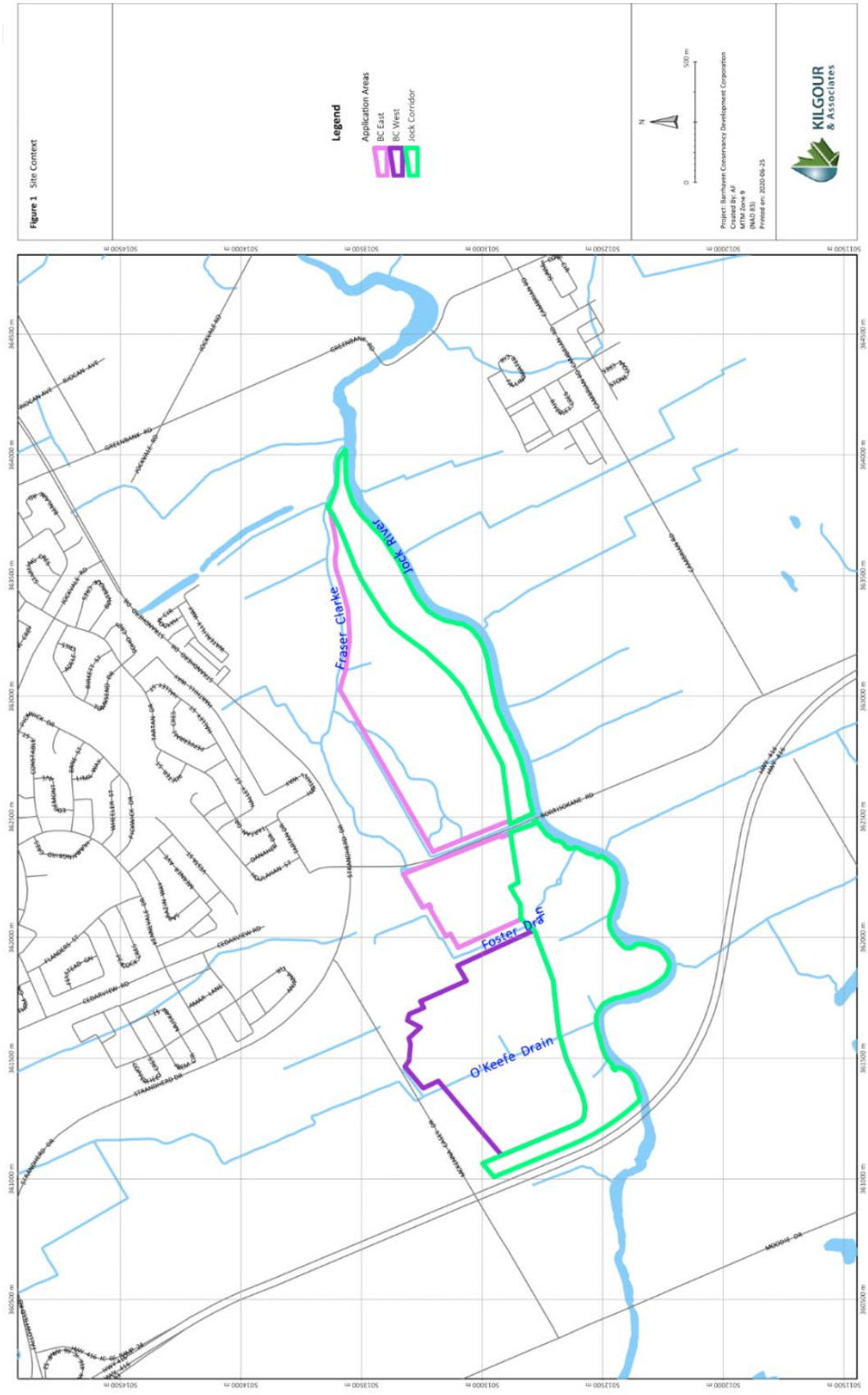
Figure 1 Site Context
Legend
Application Areas
BC East
BC West
Jock Corridor
N
0
500 m
Project: Barrhaven Conservancy Development Corporation
Created by: AF
MTM Zone 9
(NAD 83)
Printed on: 2020-06-25
KILGOUR & Associates
Jock River
Fraser Clarke
Foster Drain
O'Keefe Drain
GREENBANK RD
JOCKVALE RD
CEDARVIEW RD
STRANDHERD DR
MORRISONVILLE RD
MOONEY DR

1.3 Report Objectives

This report is the Environmental Impact Statement (EIS) for the proposed Barrhaven Conservancy West development. The purpose of this document is to review the overall development concept for the Site from a natural heritage perspective. The report includes a detailed review of both the natural heritage features currently present on the Site and the relevant natural heritage regulations under which site development would proceed. It follows from earlier EIS reports (KAL, 2017a, 2019, and 2020) that reviewed concepts for the broader Barrhaven Conservancy community, including the Conservancy West portion specifically addressed here. An EIS by KAL (2021) reviewed a proposal for the draft plan of subdivision for the Site (i.e. for the Conservancy West) that differed from the initial concepts by including a realignment of the O'Keefe Municipal Drain. This current EIS reviews a revised proposal for the draft plan of subdivision for the Site that does not propose a drain realignment. The report is intended to determine the potential impacts of proposed site development on existing natural heritage features, provide mitigation and/or design considerations to protect those elements, and highlight relevant regulations as detailed planning proceeds to allow the developer to remain compliant.

This EIS is structured generally following City of Ottawa *Environmental Impact Statement Guidelines* (City of Ottawa, 2012). Environmental Policy Context provided in Section 2 identifies the relevant natural heritage regulations under which site development and planning would proceed. Section 3 details the process by which existing site natural heritage conditions were determined, and Section 4 details the existing natural heritage conditions within the Site. Section 5 describes the proposed project. Designs at this stage are still conceptual rather than detailed, but the section outlines major components and general design elements to be considered in the review of potential natural heritage impacts. Section 6 reviews the likely impacts of the overall proposed community design, while Section 7 provides recommended mitigation for likely impacts on the natural environment.

All trees previously occurring on the Site were removed as part of the Cut and Fill Program in 2020 in accordance with a City of Ottawa Tree Cut Permit (File Number D06-01-19-0129). As such, this report does not include a Tree Conservation Report as no trees are remaining within or directly adjacent to the main development area that would be subject to the City's Tree Conservation By-law.

The build-out of the community will ultimately require two road crossings of the O'Keefe Drain, as well as two roads crossing over the Foster watercourse to connect the Conservancy West community area to Phase 5 of the Conservancy East development area. Both of these crossings will require permits from the Rideau Valley Conservation Authority (RVCA) and the removal of some trees within the watercourse corridors (though existing trees there are situated sufficiently far back from the community edge to be fully separated from the development of the Site otherwise - see Section 4.4). The specific details of, and permitting associated with, these crossings will be addressed in a separate review at a future date.

2.0 ENVIRONMENTAL REGULATORY CONTEXT

Natural heritage policies and legislation relevant to this EIS are outlined below.

2.1 The Provincial Policy Statement, 2020

The Provincial Policy Statement (PPS, 2020) was issued under Section 3 of the *Planning Act* (1990). The latest revision of the PPS was approved by the Ministry of Municipal Affairs and Housing on February 28, 2020, and came into effect on May 1, 2020. Natural features are afforded protections under Section 2.1 of the PPS. Protections may include maintenance, restoration, and improved function of diversity, connectivity, ecological function, and biodiversity of natural heritage systems. These protections restrict development and site alteration in significant natural areas (e.g. woodlands, wetlands, wildlife habitat) unless it can be demonstrated that there will be no negative effects on the features and ecological functions of those natural areas. Technical guidance for implementing the natural heritage policies of the PPS is found in the second edition of the *Manual for Natural Heritage Policies of the Provincial Policy Statement* (Ministry of Natural Resources (MNR), 2010). This manual recommends the approach and technical criteria for protecting natural heritage features and areas in Ontario.

2.2 City of Ottawa Official Plan

The City of Ottawa Official Plan (2021) provides direction for future growth in the City and is a policy framework to guide physical development to 2031 in accordance with the PPS. The Official Plan was first approved in 2003 and is typically updated every five years. The Official Plan includes a Natural Heritage Features map, providing additional information on wetlands, watercourses, and wooded areas within the City boundaries (City of Ottawa, 2021).

2.2.1 Jock River Reach One Subwatershed Study, 2007

The Jock River Reach One Subwatershed Study (JRSWS; Stantec, 2007) is a planning document that describes existing environmental conditions throughout the lower Jock River subwatershed and provides recommendations for environmental protection, conservation and restoration to be incorporated into land development and land-use practices to ensure long-term ecological sustainability of the subwatershed.

The JRSWS notes that while the Jock River and its riparian lands provide the main wildlife corridor through the broader area, the forest cover and riparian vegetation throughout the subwatershed is limited and there is a lack of riparian vegetation along the river. The JRSWS indicates specific woodland and wetland areas to be preserved, though none of the features specifically addressed are located within or adjacent to the proposed development area. The JRSWS does not provide specific targets for forest or wetland coverage within development areas. To improve natural heritage conditions within the subwatershed, the JRSWS does provide three major categories of recommendations for development related to fish habitat compensation, stormwater management planning, and natural environment planning.

2.2.1.1 Fish Habitat Compensation

Fish habitat compensation requirements were only specifically prescribed for developments south of the Jock River within the JRSWS, as that report did not directly consider development on the north side. The intent, however, was to improve fish habitat where water features were altered. Alterations to the Corrigan Drain, the Todd Drain and the East and West Clarke Drains as part of development projects on the south side of the Jock River resulted in losses of fish habitat. Those losses were compensated for through the construction of the “Compensation Pond” and improvement to the Foster Pond, both located

on City-owned land west of Borrisokane Road, between the Jock River and the southern boundary of lands owned by BCDC.

2.2.1.2 Stormwater Management Planning

The JRSWS defines objectives for stormwater management planning in this area that will be addressed in detail through the functional servicing studies for the proposed development. The key points include:

For the Jock River:

- No quantity control storage is required for flood control purposes as the hydrograph from the subwatershed will peak before the upstream peak in the Jock River;
- No erosion control storage is required to maintain the predevelopment in-stream erosion condition; and,
- Quality control volume as per the Ministry of Environment, Conservation and Parks (MECP) Enhanced Treatment (80% removal of total suspended solids, TSS).

For existing drainage channels to the north bank of the Jock River (i.e. including those through the proposed development area):

- Quantity control storage as required to meet constraints within existing channels and/or at existing crossings (quantity control/level of control requirements to be determined through further detailed study);
- Erosion control storage as required to maintain stability and geomorphic function of the existing tributaries, as determined through further detailed study;
- Quality control storage as per the MECP Enhanced Treatment (80% TSS removal); and,
- All stormwater management facility outlets will be designed to augment low flows to the extent possible.

Through the development area generally:

- Implement structural infiltration practices in areas of suitable soil
- Implement non-structural best management practices (i.e. reduced grading, disconnected impervious areas, promotion of open space and parklands, maximizing vegetative cover) elsewhere in the system to reduce the magnitude of runoff volume.

2.2.1.3 Natural Environment Planning

Individual recommendations from the JRSWS associated with natural environment planning apply specifically to the catchments of drainage channels through the development area and/or of the Jock River itself. These recommendations have been numbered so that they may be directly referenced as they are addressed through this EIS (Table 1).

Table 1 Natural Environment Planning Recommendations from the JRSWS

Feature	Recommendation	Recommendation Number
Foster and O'Keefe Catchments		
Foster and O'Keefe Aquatic Habitat	Preserve and enhance the aquatic habitat and riparian zone of the tributary through future restoration opportunities.	JRRS-1
Watercourse Setback Requirement	Setback is to be the greater of the 100-y flood-line elevation/meander belt/aquatic setback (i.e. geotechnical, 15 m top of defined bank or 30 m from normal high-water mark)	JRSWS-2
O'Keefe Drain Corridor	Investigate the feasibility of establishing and enhancing the terrestrial linkage along the O'Keefe Drain from the Jock River corridor to Stony Swamp.	JRSWS-3
Recreational Trail	Incorporate trail system along O'Keefe Drain as identified in OP and Greenspace Master Plan.	JRSWS-4
Jock River Corridor		
Floodplain	Maintain the regulatory floodplain by not permitting active development within its limits. Some reduced-risk uses such as sports fields and trails may be considered subject to RVCA approval.	JRSWS-5
Riparian Corridor	Prepare a Jock River Corridor Riparian Planting Plan to improve and enhance riparian vegetation coverage along the banks and shoreline of the river.	JRSWS-6
Aquatic Habitat	Protect critical fish habitat and spawning areas along the Jock River and tributary mouths.	JRSWS-7
Creation of Aquatic Habitat (City lands)	Create pike spawning habitat area adjacent to Foster Dry Pond as compensation for the loss of fish habitat in tributaries within Barrhaven South.	JRSWS-8 Note: previously completed
Setback Requirement	Development setback for the Jock River will be the greater of the floodplain, meander belt width, geotechnical, 15 m top of the defined bank or 30 m from the normal high water mark	JRSWS-9
Erosion Investigations	Further detailed studies are required to confirm bank erosion areas, causes and to recommend bank stabilization and erosion protection measures	Objective for the City/RVCA
Recreational Pathway	Provide a recreational trail along the Jock River as per OP and Greenspace Master Plan.	JRSWS-10

2.2.2 South Nepean Urban Area Secondary Plan – Area 8

The City of Ottawa provides policies and an approach to guide the future development of the area bounded by Strandherd Drive on the north, the Jock River on the south, Borrisokane Road on the west and the Kennedy-Burnett Stormwater facility to the east in the *South Nepean Secondary Plan for Area 8* (City of Ottawa, 2021).

With respect to the general development of the area, the secondary plan recommended that the Jock River floodplain provide the divide between the "building intensive" and "land intensive" (e.g. conservation lands) categories of land use. Conservation lands were deemed to occur within the regulatory flood line for the Jock River together with any additional land required by the City or the Conservation Authority for flood mitigation or stormwater control facilities. The conservation lands were to be re-naturalized, while areas of mid- to high-density residential development with some areas of commercial development were to occur outside of the naturalized area (City of Ottawa, 2021). The floodplain on the Site was modified through the Cut and Fill Program under OPA 212. OPA 212 confirms areas of Conservation designation and of Residential designation (removing areas of commercial development) separated by the new regulatory floodline for the Jock River.

The City requires that future design of stormwater management facilities shall provide for pedestrian and cycling paths that connect to the adjacent areas and the Jock River. Whenever the stormwater facilities are reconstructed or new facilities are built, their design should have a more natural shoreline and vegetation than existing facilities. The rural landscape of the Jock River floodplain should also be conserved (City of Ottawa, 2021).

2.3 *Species at Risk Act*, 2002

The federal *Species at Risk Act* (SARA; 2002) is administered by Environment and Climate Change Canada (ECCC) and provides direction to protect and ensure the survival of wildlife species in Canada. The purpose of the SARA is to prevent populations of wildlife from becoming Extirpated, Endangered, or Threatened, provide recovery for Endangered or Threatened species, and to manage other species to prevent them from becoming Endangered or Threatened.

All species listed on Schedule 1 of SARA are afforded protection on federal lands. Aquatic species and species of migratory birds protected by the *Migratory Birds Convention Act* (MBCA; 1994) and listed as Endangered, Threatened, or Extirpated under Schedule 1 of SARA are protected wherever they occur in Canada, regardless of land ownership.

2.4 *Endangered Species Act*, 2007

The provincial *Endangered Species Act* (ESA; 2007) is administered by the Ministry of Environment, Conservation, and Parks (MECP) and provides protection for species at risk (SAR) and their habitat. The Act prohibits killing, harming, harassing, possessing, transporting, buying, or selling Extirpated, Endangered, and Threatened species. Species listed as Endangered, Threatened, or Extirpated and their habitats (e.g. areas essential for breeding, rearing, feeding, hibernation, and migration) are automatically afforded legal protection under the ESA.

2.5 *Fisheries Act*, 1985

The federal *Fisheries Act* (1985) is administered by Fisheries and Oceans Canada (DFO) and provides protections to fish, fish habitat, and fisheries. Specifically, the *Fisheries Act* provides:

- Protection for all fish and fish habitat
- Prohibition against the "harmful alteration, disruption or destruction of fish habitat"
- Prohibition against causing "the death of fish by means other than fishing"

Projects having a scope that does not fall within DFO-defined standards and codes of practice require submission of a request for review to DFO.

2.6 *Migratory Birds Convention Act*, 1994

The *Migratory Birds Convention Act* (MBCA) is legislation administered by the ECCC that provides protection for migratory birds listed in the Act. The disturbance, destruction, take and killing of migratory birds, their eggs, and their nests are prohibited in the Act. The “incidental take” and work that would

result in the destruction of active nests, or the wounding or killing of bird species protected under the MBCA and/or associated regulations (e.g. SARA) is prohibited.

2.7 *Fish and Wildlife Conservation Act*, 1997

The provincial *Fish and Wildlife Conservation Act* (FWCA; 1997) governs the hunting and trapping of a variety of wildlife including mammals, birds, reptiles, amphibians, and fish in Ontario, thereby facilitating the protection of wildlife and their habitat. The FWCA outlines the prohibition of hunting or trapping specially protected species and the requirement for provincially issued licenses for the hunting or trapping of "fur-bearing" or "game" animals.

2.8 *Conservation Authorities Act*, 1990

Conservation Authorities were created to address erosion, flooding, and drought concerns regionally by managing at the watershed level. Conservation Authorities were given the ability to regulate under Section 28 of the *Conservation Authorities Act*. The Act provides mechanisms to regulate works and site alterations that have potential to affect erosion, flooding, land conservation, and alterations to waterbodies within their jurisdiction. It is the obligation of all Conservation Authorities to implement their local Ontario *Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses*.

3.0 METHODOLOGY

3.1 Background Data Review

A detailed review of available background information was completed and is summarized for the proposed development. Much of the existing published information pertaining to natural systems is out of date since the Site was cleared and re-graded in 2020 as part of the Cut and Fill Program.

3.1.1 Agency Consultation

The Site is located within the jurisdiction of the Kemptville District of the MECP. A request for confirmation of potential SAR presence related to the Site was submitted to the MECP on May 5, 2020 (Appendix A). A response from MECP was received on October 5, 2020. No additional species have subsequently been protected under the *ESA*. Barn Swallow (*Hirundo rustica*), however, will be downlisted to Special Concern status in January 2023 (City of Ottawa, 2022b) and will thus no longer be subject to general protections under the ESA.

3.1.2 Records Review

The description of the existing natural environment is based on a review of previously completed studies, including:

- Environmental Impact Statement for Barrhaven Conservancy (KAL, 2017a);
- Headwater Drainage Feature Assessment Barrhaven Conservancy (KAL, 2017b);

- Jock River Restoration Project: Aquatic and Ecological Site Assessment Supporting Document (KAL, 2018);
- Barrhaven Conservancy Cut and Fill Environmental Impact Statement (KAL, 2019); and
- City of Ottawa Environmental Impact Statement for the Barrhaven Conservancy East (KAL, 2020).
    - Note: this report focused on the development within the Barrhaven Conservancy East but reviewed natural heritage features across the broader Conservancy area including Barrhaven Conservancy West.

On-line databases queried for SAR, provincially rare species, and natural heritage features as follows:

- DFO SAR Mapping (DFO, 2020);
- Ontario MNRF;
    - Natural Heritage Information Centre (NHIC, 2020);
    - Land Information Ontario (LIO) Make a Topographic Map (MNRF, 2020a);
    - Species at Risk in Ontario (SARO) List (MNRF, 2020b); and,
- SARA, Schedule 1 (Government of Canada, 2002);
- Ontario Breeding Bird Atlas (OBBA; Cadman et. al., 2007);
- Ontario Reptile and Amphibian Atlas (ORAA; Ontario Nature, 2020);
- Atlas of the Mammals of Ontario (AMO; Dobbyn, 1994);
- RVCA Mapping Geoportal (RVCA, 2020); and,
- City of Ottawa;
    - Official Plan (City of Ottawa, 2021);
    - GeoOttawa Mapping database (City of Ottawa, 2022a); and,
    - Characterization of Ottawa's Watersheds (City of Ottawa, 2011).

4.0 DESCRIPTION OF THE SITE AND THE NATURAL ENVIRONMENT

4.1 Designated Natural Heritage Features and Open Spaces

Designated Natural Heritage Features and Core Natural Areas are absent on the Site (City of Ottawa, 2021; NHIC, 2020).

Passive Open Spaces adjacent to the Barrhaven Conservancy Community generally follow the Jock River and Highway 416 corridor. The immediate corridor of the Jock River is also defined as a primary natural area that maintains natural features and functions in an urban context: lands in the floodplain beyond the riparian edge are further flagged as contributing passive recreational lands that can shape the character of communities and the perception of the quality of open space (City of Ottawa, 2006). Areas along the Jock River corridor will eventually be developed into recreational areas following the proposed development, but this future work will be addressed separately.

No Provincially Significant Wetlands, wetlands found in association with Significant Woodlands, Significant Valleylands, or Areas of Natural and Scientific Interest occur on or adjacent to the Site (City of Ottawa, 2021; NHIC, 2020). The nearest Provincially Significant Wetland is the Stony Swamp Wetland Complex, greater than 4 km away.

The nearest designated natural features to the Site include the Cambrian Road Complex and the Twin Elm Moraine Earth Science Area of Natural and Scientific Interest. The Cambrian Road Complex occurs to the south of the Jock River approximately 250 m west of Highway 416 (Brunton, 1997; City of Ottawa, 2011). The Twin Elm Moraine Earth Science Area of Natural and Scientific Interest is categorized as having moderate significance.

No Significant Woodlands occur on or adjacent to the Site, though riparian areas along the Jock River (south of the Site), the Foster Watercourse and the O'Keefe Drain are treed. These treed areas, however, are situated sufficiently well back from the Site boundaries that critical root zones (CRZs) do not intersect proposed development areas.

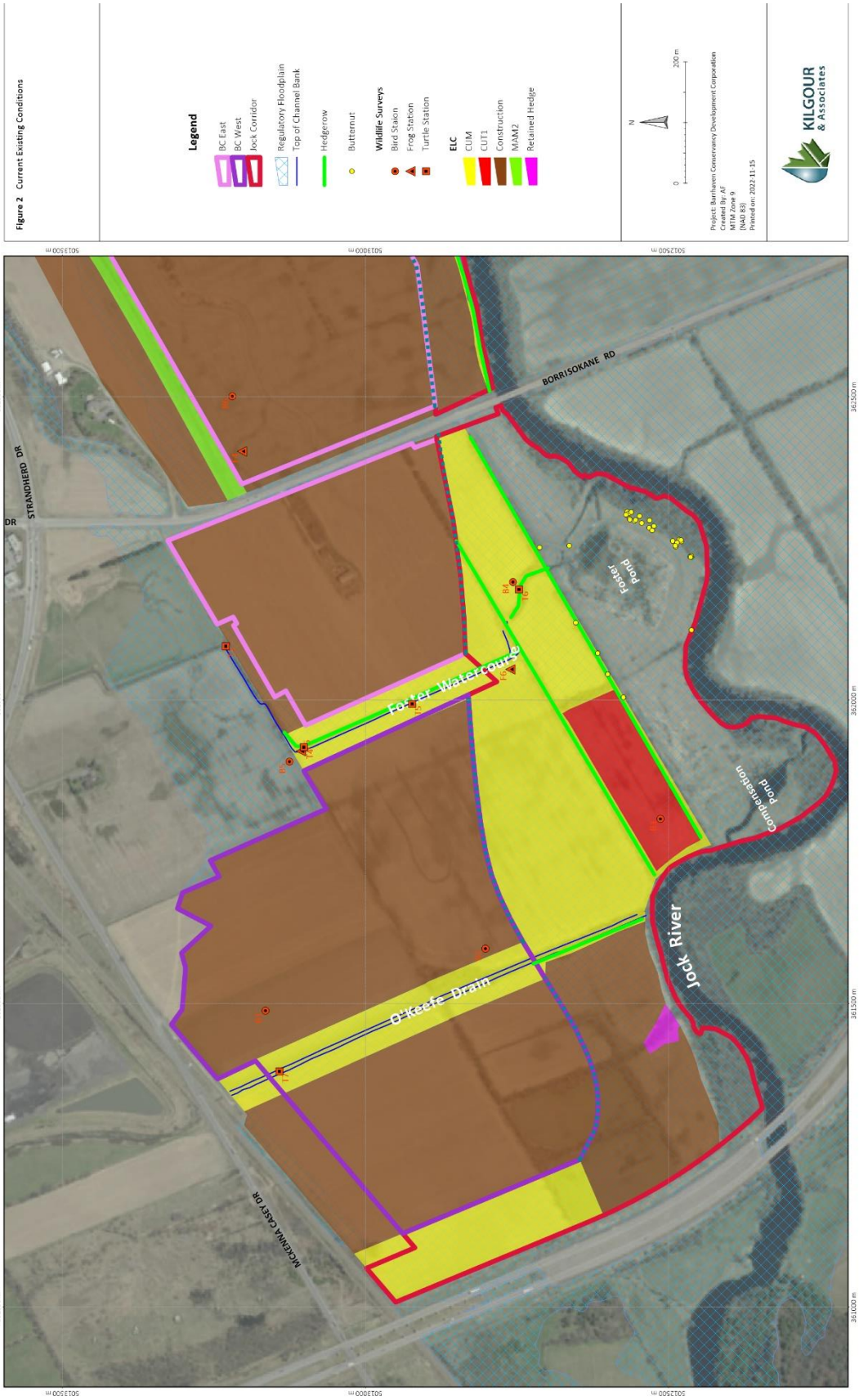
Figure 2 Current Existing Conditions
Legend
BC East
BC West
Jock Corridor
Regulatory Floodplain
Top of Channel Bank
Hedgerow
Butternut
Wildlife Surveys
Bird Station
Frog Station
Turtle Station
ELC
CUM
CUT1
Construction
MAM2
Retained Hedge
N
0
200 m
Project: Barrhaven Conservancy Development Corporation
Created By: AF
MTM Zone 9
(NAD 83)
Printed on: 2022-11-15
KILGOUR & Associates
BORRISOKANE RD
STRANDHERD DR
DR
Fowler Watercourse
Foster pond
Cumberland pond
Jock River
O'Keefe Drain
MCKENNA CASEY DR

4.2 Landforms, Soils and Geology

The property is located within the Ottawa Valley Clay Plains which are composed of Champlain Sea deposits, and specifically the Piperville, North Gower and Dalhousie soil associations. The Piperville association is a group of soils developed in slightly acid to neutral, moderately coarse to medium-textured, marine, estuarine, and fluvial materials, and are composed of Gleyed Melanic Brunisols, Orthic Humic Gleysols, and Rego Gleysols (Schut and Wilson, 1987). These soils are poorly drained Orthic Humic Gleysols found on level to very gently sloping topography (between 0% to 2%).

The Dalhousie association consists of soils developed in fine-textured, modified marine materials with soil profiles that include Gleyed Orthic Melanic Brunisols, Orthic Humic Gleysols, and Rego Gelysols (Schut and Wilson, 1987). These soils are dominantly poorly drained Orthic Humic Gleysols found on level to very gently sloping topography (between 0% and 2%).

The North Gower association is made up of soils developed in moderately fine-textured, modified marine parent materials, and includes Humic Gleysols, Rego Gleysols, and Gleyed Gray Brown Luvisols soil profiles (Schut and Wilson, 1987). These soils are poorly drained Orthic Humic Gleysols found on level to very gently sloping topography (between 0% and 2%).

4.3 Surface Water, Groundwater and Fish Habitat

4.3.1 Jock River

A revised 100-year floodplain boundary for the Jock River was approved by the RVCA in the spring of 2020 (RVCA, 2020; Figure 2). Other than the current O'Keefe Drain corridor, the Site does not include any areas within a regulatory floodplain. The floodplain of the Foster Drain does not overlap with the Site.

The Jock River flows from west to east along the southern boundary of the Barrhaven Conservancy Community, including the Barrhaven Conservancy West lands, for approximately 3 km to its confluence with the Rideau River (Figure 1). The Site is entirely within Reach 1 of the Jock River Subwatershed. The Jock River adjacent to the Site has a meandering channel with moderate macrophyte coverage and relatively steep banks. The river is largely 'run' habitat with substrate dominated by clay and muck/silt. Water velocities are relatively slow and depths at mid-channel are 3 to 4 m. Areas of course substrate (i.e. cobble, boulder, gravel) with shallower depths and higher flow velocities occur on the west end of the Site at Highway 416 and east of the Site at Greenbank Road (KAL, 2018).

Instream vegetation in the Jock River adjacent to the Barrhaven Conservancy Community is dominated by algae (RVCA, 2016). Small patches of submerged plants and broad-leaved emergent plants are present at the upstream and downstream ends of the Site.

The Jock River is classified as a warm/warm-cool water system that is home to a baitfish and recreational fishery of approximately 40 species (RVCA, 2016). Thirty-six species are known to occur in the section of the Jock River and its tributaries within and adjacent to the Site, including eight sportfish species: Bluegill (*Lepomis macrochirus*), Largemouth Bass (*Micropterus salmoides*), Muskellunge (*Esox masquinongy*), Northern Pike (*Esox lucius*), Pumpkinseed Sunfish (*Lepomis gibbosus*), Rockbass (*Ambloplites rupestris*), Smallmouth Bass (*Micropterus dolomieu*) and Walleye (*Sander vitreus*; RVCA, 2016).

Twenty-five fish species were captured in waterbodies in the general area of the Site during the electrofishing efforts in 2018 with 72% of the individuals caught being from five species: Blacknose Shiner (*Notropis heterolepis*; 34%), Common Shiner (*Notropis cornutus*; 16%), Pumpkinseed (*Lepomis gibbosus*; 11%), Golden Shiner (*Notemigonus crysoleucas*; 6%), Banded Killifish (*Fundulus diaphanus*; 5%; Table 2; KAL, 2018).

Table 2 Fish species identified in the Jock River and tributaries within and near the Site (KAL, 2018)

MNRF Species Code	Common Name	Taxonomic Name	Jock River	Todd Channel and Pond	Fraser Clarke Tributary	Fraser Clarke Drain	West Clarke Drain	Drain 2 / Center Drain	Borrisokane Ditch	Foster Drain	Fish Habitat Pond	O'Keefe Drain	
131	Northern Pike	*Esox lucius*	X								X		
132	Muskellunge	*Esox masquinongy*	X										
136	White Sucker	*Catostomus commersonii*	X	X			X			X	X		
141	Central Mudminnow	*Umbra limi*	X	X			X			X	X		
182	Northern Redbelly Dace	*Phoxinus eos*	X	X			X						
183	Finescale Dace	*Phoxinus neogaeus*	X										
186	Common Carp	*Cyprinus carpio*	X										
189	Brassy Minnow	*Hybognathus hankinsoni*	X	X									
192	Hornyhead Chub	*Nocomis biguttatus*	X										
194	Golden Shiner	*Notemigonus crysoleucas*	X	X							X		
198	Common Shiner	*Luxilus cornutus*	X	X		X	X			X	X	X	
199	Blackchin Shiner	*Notropis heterodon*	X	X			X						
200	Blacknose Shiner	*Notropis heterolepis*	X							X	X		
201	Spottail Shiner	*Notropis hudsonius*		X							X		
206	Spotfin Shiner	*Cyprinella spiloptera*	X										
208	Bluntnose Minnow	*Pimephales notatus*	X	X						X	X		
209	Fathead Minnow	*Pimephales promelas*	X	X			X			X	X	X	
210	Blacknose Dace	*Rhinichthys atratulus*	X							X			
211	Longnose Dace	*Rhinichthys cataractae*	X									X	
212	Creek Chub	*Semotilus atromaculatus*	X	X		X	X		X	X		X	
213	Fallfish	*Semotilus corporalis*	X										
214	Pearl Dace	*Margariscus margarita*	X				X						
233	Brown Bullhead	*Ameiurus nebulosus*	X	X							X		
235	Stonecat	*Noturus flavus*	X										
261	Banded Killifish	*Fundulus diaphanous*	X	X		X				X	X	X	
281	Brook Stickleback	*Culaea inconstans*	X	X			X	X		X			
311	Rockbass	*Ambloplites rupestris*	X	X			X			X	X		
313	Pumpkinseed Sunfish	*Lepomis gibbosus*	X	X						X	X	X	
314	Bluegill Sunfish	*Lepomis macrochirus*	X				X				X		
316	Smallmouth Bass	*Micropterus dolomieu*	X	X									
317	Largemouth Bass	*Micropterus salmoides*	X										
334	Walleye	*Sander vitreus*	X										
341	Johnny Darter	*Etheostoma nigrum*		X							X		
342	Logperch	*Percina caprodes*	X								X		
361	Brook Silverside	*Labidesthes sicculus*	X	X							X		
381	Mottled Sculpin	*Cottus bairdii*	X	X						X	X	X	

4.3.2 Permanent Watercourses

Two drains are associated with the Barrhaven Conservancy East site and flow to the Jock River: the Foster Watercourse and the O'Keefe Drain (Figure 2). The former is a decommissioned municipal former drain (hence the "watercourse" nomenclature), while the latter has current status as a municipal drain. The Fraser Clarke Watercourse is located east of Borrisokane Road and is not otherwise considered in this study. The normal high-water mark of the Foster Watercourse is situated 30 m east of the Site; its associated floodplain abuts the Site. The O'Keefe Drain is currently located centrally within the Site.

Most of the tributaries to the Jock River on/near the Site support fish species tolerant of warm water with some of the larger tributaries, such as the Todd Pond and associated channel and the Fraser Clarke Watercourse, supporting more diverse fish assemblages. The O'Keefe Drain, however, is considered to support a cool water fish community (KAL, 2018).

4.3.2.1 Foster Watercourse

The Foster Watercourse flows for 300 m along the eastern edge of the Site (Figure 2). The substrate consists of a mixture of clay and silt. Woody debris and submergent vegetation are abundant in this feature. Riparian vegetation is dominated by grasses, with shrubs and trees becoming more prevalent downstream (KAL, 2018). Land use in this area was historically agricultural cropland.

Thirteen species of common fish were identified in this feature as the result of work completed on the Kennedy Burnett Stormwater Project (Muncaster Environmental Planning Inc., 2009).

4.3.2.2 O'Keefe Drain

Approximately 540 m of the O'Keefe Drain crosses the Barrhaven Conservancy West lands (Figure 2). Land use in this area of the drain had historically been agricultural cropland with fields ploughed to within ~7 m of the channel. Adjacent lands are now mostly disturbed and barren following the Cut and Fill Project. The substrate is clay and silt, with sand and gravel deposits in the upstream areas. Woody debris is the dominant cover at the downstream end and submergent vegetation is more common upstream. Riparian vegetation is a mix of grasses, shrubs, and trees in the downstream area with grasses dominating the upstream area (KAL, 2018).

Seven fish species were identified in the O'Keefe Drain (KAL, 2018). The fish community is dominated by small-bodied fish and one Centrarchidae species (i.e. Pumpkinseed; Table 2).

4.3.3 Headwater Drainage Features

A Headwater Drainage Features Assessment (HDFA; KAL, 2017b) previously reviewed 16 surface water features on the Site prior to RVCA's approval of the Cut and Fill Program, including the permanent features addressed above in Section 4.3.2 (KAL, 2019). Other than the three permanent watercourses, the remaining headwater features consisted of small agricultural drains, roadside ditches, wet depressions, and shallow swales. None of these were located on the Site (i.e. they were located in the broader Barrhaven Conservancy Community).

4.3.4 Groundwater

Indicators of groundwater discharge (e.g. springs/seeps, watercress, iron staining, significant temperature change, rainbow mineral film) were observed in two locations in some proximity to the Site (RVCA, 2016), though the specific locations of these observations were not provided other than that they correspond with the City of Ottawa lands along the Jock River. In the five years of field studies and site works after the 2016 RVCA report (including the substantial regrading of the entire BCDC property), no apparent groundwater discharges have been observed on the BCDC property.

The Jock River-Barrhaven drainage catchment is considered to have a Highly Vulnerable Aquifer (RVCA, 2016).

4.4 Vegetation Communities

The Site was historically agricultural lands with treed hedgerows between fields, a tree buffer along the southern boundary of the property, and some areas of regenerating scrubland in the southwest corner (Figure 2; City of Ottawa, 2021). The previously existing hedgerows were primarily composed of deciduous tree species such as Manitoba Maple (*Acer negundo*), Crack Willow (*Salix fragilis*), Glossy Buckthorn (*Rhamnus frangula*), Trembling Aspen (*Populus tremuloides*), American Elm (*Ulmus Americana*), Green Ash (*Fraxinus pennsylvanica*), Black Cherry (*Prunus serotina*), Sugar Maple (*Acer saccharum*), Bur Oak (*Quercus macrocarpa*), and American Basswood (*Tilia americana*; KAL, 2018). The largest trees were approximately 20 - 50 cm in diameter at breast height (DBH). Many of the American Elm and Green Ash were dead or in visibly poor health.

Following the Cut and Fill Program, no trees remain within the Site or directly adjacent to its boundaries.

4.4.1 Ecological Land Classification

The Ecological Land Classification (ELC) completed prior to the Cut and Fill Program identified five distinct vegetation communities within the broader lands of the Barrhaven Conservancy, including cultural meadow, mixed mineral meadow marsh, ash mineral deciduous swamp, and mineral cultural thicket (KAL, 2018; Table 3). These features were fully removed during the Cut and Fill Program.

Table 3 Ecological Land Classification vegetation communities within the broader Barrhaven Conservancy lands (KAL, 2018)

Ecological Land Classification Type	Community Description
CUM Cultural Meadow	Fringes of former agricultural lands that were not directly subject to the Cut and Fill Program have some limited grass and forb growth but are regularly cleared.
MAM2 Mixed Mineral Meadow Marsh	Contains various meadow species including goldenrod (Solidago sp.), Swamp Milkweed (*Asclepias incarnata*), Wild Parsnip (*Pastinaca satvia*), Wild Carrot (*Daucus carota*), sedge species (Carex sp.), cattail (Typha sp.), and others.

Ecological Land Classification Type	Community Description
SWT2 Willow Mineral Deciduous Thicket	Contains willow (Salix sp.), Manitoba Maple, Common apple (Malus sp.), and other shrub species combined with grass and forb species. Butternut saplings were identified in this portion of this ecosite east of the Fraser-Clarke Watercourse and were subject to a *Notice of Impact* submitted to the MNRF in 2018.
SWD2 Ash Mineral Deciduous Swamp	Composed mainly of Green Ash and Manitoba Maple, with subordinate species of Bur Oak, Basswood, Crack Willow, and Silver Maple (*Acer saccharinum*). Green Ash, Crack Willow, and Silver Maple were the largest trees observed and on average were between 30 and 50 cm DBH.
CUT1 Mineral Cultural Thicket	An area of approximately 2.6 ha in the southwest corner of the Site. This area was not actively cultivated and had become revegetated with shrubs and saplings mimicking surrounding communities.

4.4.1.1 Ecological Significance of Remaining Vegetation Communities

The existing conditions currently on Site are unlikely to provide meaningful habitat for wildlife. The lack of habitat complexity, diverse foraging habitats, and general lack of vegetation and topographic relief are not suitable for many bird and mammal species (Figure 2).

4.5 Wildlife

4.5.1 Amphibians

Five species of amphibians were identified during amphibian surveys (Northern Leopard Frog (*Lithobates pipiens*), American Toad (*Anaxyrus americanus*), Green Frog (Rana clamitans*)*, American Bullfrog (*Lithobates catesbeianus*), Gray Treefrog (*Hyla versicolor;* Figure 2; KAL, 2018). Amphibian observations were generally associated with existing drain features and off-property stormwater management ponds. These areas did not support enough individual amphibians and amphibian species to constitute Significant Wildlife Habitat (MNRF, 2015).

4.5.2 Birds

A total of 52 species were observed during the breeding bird surveys in 2017 (Table 4; Figure 2; KAL, 2018). Most of the birds observed on the Site were common species and had a reasonable likelihood of breeding on or nearby the Site. Red-winged Blackbird (*Agelaius phoeniceus*) was the most abundant species on Site followed by Song Sparrow (*Melospiza melodia*) and Cedar Waxwing (*Bombycilla cedrorum*).

Table 4 Breeding birds observed during field surveys in 2017

Common Name	Scientific Name	Breeding Probability	Common Name	Scientific Name	Breeding Probability
American Crow	*Corvus brachyrhynchos*	Likely	Indigo Bunting	*Passerina cyanea*	Likely
American Goldfinch	*Carduelis tristis*	Probable	Killdeer	*Charadrius vociferus*	Probable
American Kestrel	*Falco sparverius*	Likely	Least Flycatcher	*Empidonax minimus*	Likely
American Redstart	*Setophaga ruticilla*	Likely	Lesser Yellowlegs	*Tringa flavipes*	Possible

Common Name	Scientific Name	Breeding Probability	Common Name	Scientific Name	Breeding Probability
American Robin	*Turdus migratorius*	Likely	Mallard	*Anas platyrhynchos*	Possible
Baltimore Oriole	*Icterus galbula*	Likely	Mourning Dove	*Zenaida macroura*	Possible
Barn Swallow *	*Hirundo rustica*	Probable	Northern Flicker	*Colaptes auratus*	Likely
Belted Kingfisher	*Ceryle alcyon*	Likely	Northern Cardinal	*Cardinalis cardinalis*	Likely
Black-and-White Warbler	*Mniotilta varia*	Likely	Northern Rough-winged Swallow	*Stelgidopteryx serripennis*	Likely
Black-billed Cuckoo	*Coccyzus erythropthalmus*	Probable	Osprey	*Pandion haliaetus*	Possible
Black-capped Chickadee	*Poecile atricapillus*	Likely	Purple Finch	*Carpodacus purpureus*	Likely
Brown-headed Cowbird	*Molothrus ater*	Likely	Red-breasted Nuthatch	*Sitta canadensis*	Likely
Canada Goose	*Branta canadensis*	Possible	Red-eyed Vireo	*Vireo olivaceus*	Likely
Cedar Waxwing	*Bombycilla cedrorum*	Likely	Red-winged Blackbird	*Agelaius phoeniceus*	Likely
Chipping Sparrow	*Spizella passerina*	Likely	Ring-billed Gull	*Larus delawarensis*	Unlikely
Common Grackle	*Quiscalus quiscula*	Likely	Rock Pigeon	*Columba livia*	Likely
Common Yellowthroat	*Geothlypis trichas*	Likely	Savannah Sparrow	*Passerculus sandwichensis*	Probable
Double-crested Cormorant	*Phalacrocorax auritus*	Low	Song Sparrow	*Melospiza melodia*	Likely
Downy Woodpecker	*Picoides pubescens*	Likely	Spotted Sandpiper	*Actitis macularius*	Likely
Eastern Kingbird	*Tyrannus tyrannus*	Likely	Swamp Sparrow	*Melospiza georgiana*	Likely
Eastern Phoebe	*Sayornis phoebe*	Likely	Tree Swallow	*Tachycineta bicolor*	Likely
European Starling	*Sturnus vulgaris*	Possible	Turkey Vulture	*Cathartes aura*	Probable
Gray Catbird	*Dumetella carolinensis*	Likely	Warbling Vireo	*Vireo gilvus*	Likely
Great Crested Flycatcher	*Myiarchus crinitus*	Likely	White-breasted Nuthatch	*Sitta carolinensis*	Likely
Green Heron	*Butorides virescens*	Likely	Wild Turkey	*Meleagris gallopavo*	Likely
Hairy Woodpecker	*Picoides villosus*	Possible	Willow Flycatcher	*Empidonax traillii*	Likely
House Sparrow	*Passer domesticus*	Probable	Wood Duck	*Aix sponsa*	Likely
House Wren	*Troglodytes aedon*	Likely	Yellow Warbler	*Setophaga petechia*	Likely

Table Notes: Breeding bird survey data as reported in from KAL (2018) *Species at risk under the ESA and/or SARA.
Breeding potential = Likely: Species showing breeding behaviour and preferred breeding habitat observed. Possible: preferred breeding habitat observed on site. Probable: preferred breeding habitat is possible on or adjacent to the site. Unlikely: species not showing breeding behaviour and preferred breeding habitat not observed on site.

Barn Swallow (*Hirundo rustica*) is listed as threatened under the ESA and SARA and was observed on Site during the breeding bird surveys. This species was observed foraging over the hayfields of the northwest corner of the Site as well as the stormwater ponds to the northeast of the Site. No Barn Swallow nests were found on the Site. The ESA protects Barn Swallow nests and the surrounding 200 m (MECP, 2021); it was therefore unlikely that the Site contained protected habitat for Barn Swallow.

4.5.3 Turtles

Turtle basking surveys associated with the on-site drain features were completed on the Site in 2016 and 2017 (Figure 2; KAL, 2018). Most turtles observed during the surveys were basking on logs along the Jock River or were basking on the bank of the river. Some turtles were observed in mating behaviour along the banks of the Jock River. No turtles were observed nesting in the study area, nor were any remnant turtle nests observed. Three species of turtles were identified: Snapping Turtle (*Chelydra serpentina*), Painted Turtle (*Chrysemys picta*) and Northern Map Turtle (*Graptemys geographica*). Painted Turtle was the most observed species (KAL, 2018). Blanding's Turtles are known to occur in the Jock River closer to (upstream of) the Village of Richmond, but focused studies in 2016 and 2017 (KAL, 2018) did result in observations of this species near the Site.

It is unlikely that the drainage features on the Site function as overwintering habitat because they are too shallow in the winter. Blanding's Turtles specifically prefer ponds with > 1 m of water and an organic bottom. Blanding's Turtle and other turtle species hibernate in areas that do not freeze (ECCC, 2016) because they need free-standing water between the substrate they rest on and the overlying ice. The drainage features on the Site are therefore unsuitable for overwintering but may be movement corridors that could be used by any species of turtle that occurs in the general area during the active season.

4.5.4 Mammals

Three mammals were observed during the site visits previously conducted by KAL: Beaver (*Castor canadensis*), Muskrat (*Ondatra zibethicus*), and Mink (*Neovison vison*). None of these mammals are protected under the ESA but they are regulated under the *Fish and Wildlife Conservation Act* (Ontario, 1997) as fur-bearing mammals.

4.6 Habitat for Species at Risk

The City of Ottawa identifies 69 SAR that are known to occur or have historically occurred within the City (City of Ottawa, 2022b). Of those, fourteen SAR under ESA and SARA were identified with high or moderate potential interaction with the project based on land cover, occurrence records, and fieldwork previously performed by KAL (Table 5). Four species listed on the ESA were observed within the Site.

Table 5 Species at Risk with potential to occur in the vicinity of the Site

Common Name	Taxonomic Name	ESA Status	SARA Schedule 1 Status	Occurrence Record Information Source
Bank Swallow	*Riparia riparia*	Threatened	Threatened	OBBA
Barn Swallow*	*Hirundo rustica*	Threatened	Threatened	NHIC, OBBA, KAL (2018)
Bobolink	*Dolichonyx oryzivorus*	Threatened	Threatened	OBBA
Chimney Swift	*Chaetura pelagica*	Threatened	Threatened	OBBA
Eastern Meadowlark	*Sturnella magna*	Threatened	Threatened	OBBA
Eastern Wood-pewee	*Contopus virens*	Special Concern	Special Concern	NHIC, OBBA
Grasshopper Sparrow	*Ammodramus savannarum*	No status	Special Concern	OBBA
Short-eared Owl	*Asio flammeus*	Special Concern	Special Concern	OBBA
Wood Thrush	*Hylocichla mustelina*	Special Concern	Threatened	OBBA
Blanding's Turtle	*Emydoidea blandingii*	Threatened	Threatened	Ontario Nature
Northern Map Turtle*	*Graptemys geographica*	Special Concern	Special Concern	Ontario Nature, KAL (2018)
Snapping Turtle*	*Chelydra serpentine*	Special Concern	Special Concern	NHIC, KAL (2018)
Western Chorus Frog	*Pseudacris triseriata*	Not at Risk	Threatened	Ontario Nature
Butternut*	*Juglans cinereal*	Endangered	Endangered	Observed by KAL (2018)

* Species observed on or near the Site.

Grasshopper Sparrow is listed on Schedule 1 of SARA but has no status under the ESA. However, migratory bird species that are listed on SARA are protected wherever they occur in Canada. Grasshopper Sparrow will therefore be considered as a SAR in this document.

Western Chorus Frog is listed on Schedule 1 of SARA but has no status under the ESA and is therefore only protected on federal lands. There are no federal lands on the Site and therefore Western Chorus Frog will not be considered further in this document.

An assessment of potential project interaction with the SAR listed in Table 3 is provided below based on the updated land cover on the Site since the Cut and Fill Program.

- Bank Swallow - Colonial nesters that build nests near water in steep sand, dirt, or gravel banks; in burrows dug near the top of the bank, including road embankments; materials stockpiles, and other human-made settings. Areas suitable for nesting may become present on the Site in association with aggregate (sand, earth) piles.

- Barn Swallow - Prefers farmlands or rural areas; cliffs, caves, rock niches; buildings or other human-made structures for nesting; typically feeds in open country near bodies of water. There are no suitable nesting structures on the Site, but the Site provides suitable foraging habitat, and this species was previously observed foraging in the periphery of the area.

- Bobolink/Eastern Meadowlark – Prefer open grassy meadows, farmland, pastures, hayfields, or grasslands with elevated singing perches; cultivated land and weedy areas with trees; and old orchards with adjacent open grassy areas. The Site has been seeded with a grass mix that will be manicured and maintained, leaving no suitable nesting areas on Site for these species.

- Chimney Swift - Commonly found in urban areas near buildings; less commonly, nests in large hollow trees (>60 cm diameter at breast height), crevices of rock cliffs, chimneys; highly gregarious; feeds over open water. These features do not occur on Site.

- Eastern Wood-pewee – Prefers open, deciduous, mixed or coniferous forest; dominated by oak with little understory; forest clearings, edges; farm woodlots, parks. This habitat does not occur on Site.

- Grasshopper Sparrow - Nests in open grasslands, hayfields, pastures, alvars, and prairies. Preferably areas that are sparsely vegetated. The Site has been seeded with a grass mix that will be manicured and maintained, leaving no suitable nesting areas on Site for this species.

- Short-eared Owl – Prefers grasslands, open areas or meadows that are grassy or bushy; marshes, bogs or tundra; ground nester; requires 75-100 ha of contiguous open habitat. This habitat does not occur on Site.

- Wood Thrush – Prefers undisturbed moist mature deciduous or mixed forest with deciduous sapling growth; near ponds or swamp; hardwood forest edges; must have some trees higher than 12 m. This habitat does not occur on Site.

- Blanding's Turtle – Prefers shallow water marshes, bogs, ponds or swamps, or coves in larger lakes with soft, muddy bottoms and aquatic vegetation; basks on logs, stumps, or banks. Prefers quiet lakes, streams, and wetlands with abundant emergent vegetation; frequently occurs in adjacent upland forests. There is potential for this species to occur in or adjacent to the Jock River next to the Site.

- Northern Map Turtle – Prefers large bodies of water with soft bottoms, and aquatic vegetation; basks on logs or rocks or beaches and grassy edges, will bask in groups; uses soft soil or clean dry sand for nest sites; may nest at some distance from water. Known to occur in the Jock River near the Site.

- Snapping Turtle- The preferred habitat is slow-moving water with a soft mud bottom and dense aquatic vegetation. Nests in soft gravel, including gravel roadside shoulders. Known to occur in the Jock River near the Site.

- Butternut - Mainly encountered as a minor component of deciduous stands, growing best in rich, moist, and well-drained soils often found along streams and often grows in sunny openings and near forest edges. Butternut was observed on other portions of the broader development area, but no individuals occur within >200 m of the Site. There is currently no concern for Butternut interaction with the project.

The identified SAR with a potential to occur on or near the Site, or otherwise interact with the current development project, are limited to Bank Swallow, Barn Swallow, Northern Map Turtle, Snapping Turtle, and Blanding's Turtle.

The MECP reply to the submitted SAR review (Appendix A) advised the consideration of seven species (Peregrine Falcon, Canada Warbler, Little Brown Myotis, Northern Myotis, Eastern Small-footed Myotis, Tricolored Bat and Monarch) having occurrence records within the broader vicinity of the Site. None of these species, however, would likely have had suitable habitat within the active farm fields that previously dominated the Site, or will have suitable habitat within the current land cover of the Site following the Cut and Fill Program.

5.0 DESCRIPTION OF THE PROPOSED PROJECT

Development of the Barrhaven Conservancy West Community will consist of two stages. Stage 1 is the residential land development of houses, roadways, and parks, along both sides of the O'Keefe Drain; the current study only reviews Stage 1. Stage 2 will be the restoration of the Jock River floodplain corridor including the establishment of forests and wetland features, and stormwater management. Stage 2 will also include pathway connections along the Jock River. The current community plan for Stage 1 does not include a pathway extension directly along the O'Keefe Drain, northward but does retain green space >100 m in width along its western side, which would be included as a part of the Stage 2 works, through which a northward pathway could be run.

The proposed Barrhaven Conservancy West development will be a residential community consisting of detached and multiple attached dwellings (townhomes and back-to-back [B2B] townhomes), parkland, walkway blocks and pathways (Figure 3).

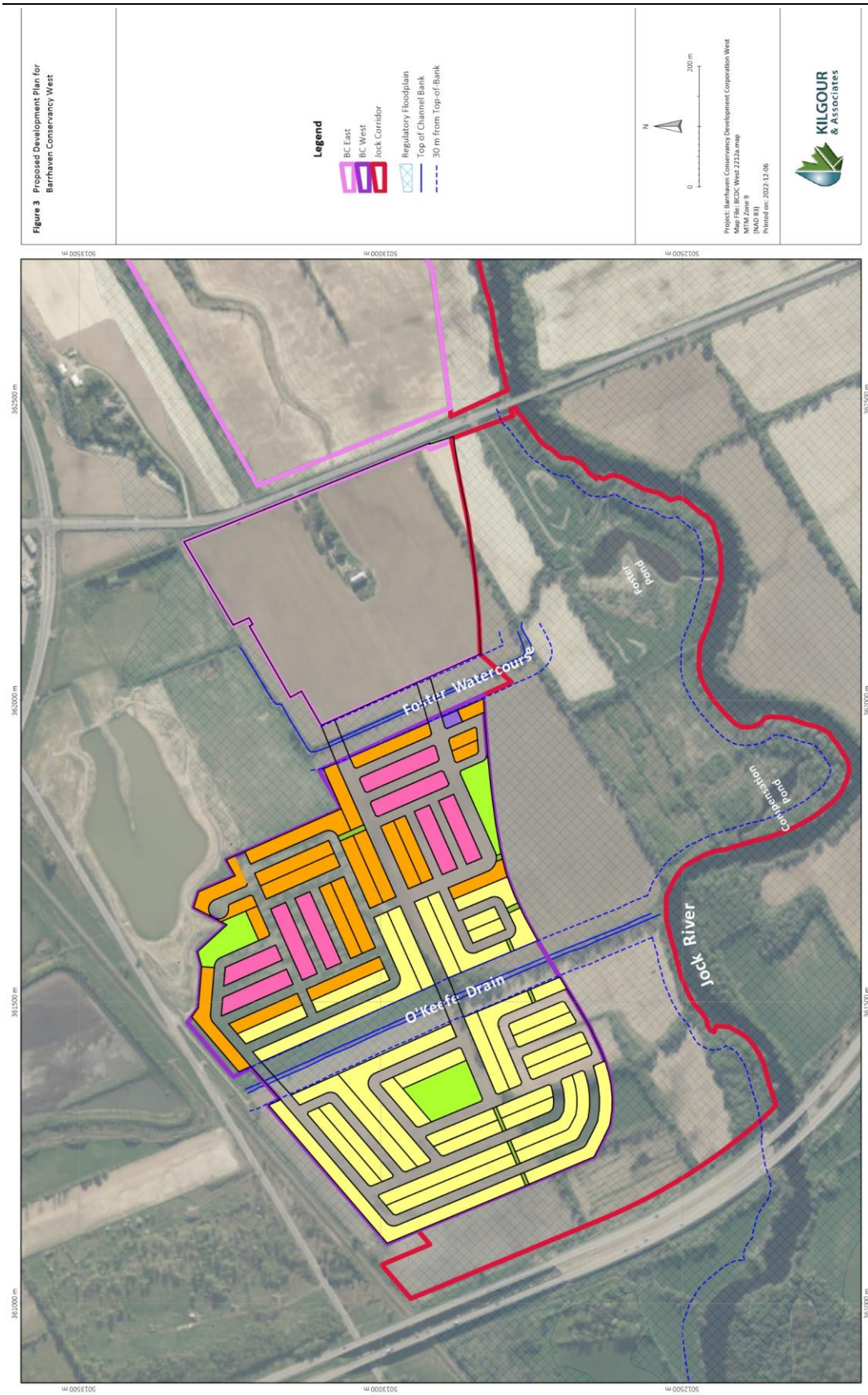
Figure 3 Proposed Development Plan for Barrhaven Conservancy West
Legend
BC East
BC West
Jock Corridor
Regulatory Floodplain
Top of Channel Bank
30 m from Top-of-Bank
N
0
200 m
Project: Barrhaven Conservancy Development Corporation West
Map File: BCDC West 2723a.mxp
MTM Zone 9
(NAD 83)
Printed on: 2022-12-06
KILGOUR & Associates
Foster Pond
Fosters Watercourse
Compensation Pond
Jock River
O'Keeffe Drain

The new community will require bridge crossings over the Foster Watercourse and the O'Keefe Drain. These crossings, however, will be addressed separately from this current project through an application to the RVCA.

5.1 Constraints

Constraints associated with the natural environment are limited due to the lack of natural features currently on the Site. The Site terrain was recently regraded and has been temporarily stabilized with a grass seed mix. Redevelopment of the Site is anticipated to be a multi-year process. The grass seed mix was applied as an erosion and sediment control measure to limit the potential for wind and water erosion in portions of the Site where redevelopment has not yet actively started. This temporary ground-covering vegetation will be manicured and maintained during the development process to limit potential use by wildlife and SAR prior to the completion of development or re-naturalization within each portion.

5.1.1 Species at Risk

Fourteen SAR were identified with the potential to occur on the Site and four of those species were observed on the Site prior to the Cut and Fill Program. In its current condition, the Site has the potential to interact with five of those species.

5.1.1.1 Bank Swallow

Nesting habitat of Bank Swallow is frequently associated with water. Though the species has not been observed nesting anywhere on the Site, Bank Swallow had been documented by KAL biologists nesting at former aggregate quarry sites located ~1.5 km south of the Site. These quarries have now been closed and regraded, removing their nesting potential. New Bank Swallow nests may be dug near the top of steep sand, dirt, or gravel banks along the edge of inland waterways, in gravel pits, and in road embankments. This suggests that a future occurrence of the species on the Site is not impossible given the possible use of aggregate piles during construction. The banks of the Jock River adjacent to the Site are densely vegetated and are thus considered very unlikely to support the species should they search for new nest sites in the vicinity. Road edges along Borrisokane Road are similarly limited in their nest-supporting potential. The greatest likelihood of new nesting colonies occurring on the Site is associated with fill piles that may be unintentionally created during construction activities.

Suitable mitigation measures including rounding or tarping fill piles (i.e. avoiding the creation of exposed vertical edges) will be provided to address Bank Swallow and other migratory birds.

5.1.1.2 Barn Swallow

Barn Swallows nest almost exclusively on human-made structures. As site development proceeds, it is possible that Barn Swallows could begin nesting on new structures adjacent to the open lands of the Jock River floodplain. The species, however, will be delisted to Special Concern in January 2023. As such any birds that did begin nesting in the area following that date would not be protected as SAR under the ESA, though individuals would still be subject to standard protections as migratory birds under the MBCA.

5.1.1.3 Butternut

The Site was surveyed for Butternut trees in 2018 and five were identified on the Site prior to the Cut and Fill Program. Those trees were addressed through the MECP notification process and have been removed following appropriate permissions and obligations.

Additional Butternuts were identified on the City of Ottawa lands along the Jock River (Figure 2). Butternut Health Assessments have not been completed on these trees as they occur greater than 50 m from the limits of construction and therefore will not be impacted by the project.

No additional Butternuts occur on the Site. If tree clearing is required along the banks of the Jock River to accommodate the outlet of the realigned O'Keefe Drain, that area should be re-checked for any new Butternut presence prior to the commencement of construction.

5.1.1.4 Turtles

Northern Map Turtle and Snapping Turtle have been observed near the Site in the main channel of the Jock River (KAL, 2018). There is potential for this Blanding's Turtle to occur in or adjacent to the Jock River. The species has been documented in the Jock River near (upstream of) the Village of Richmond (KAL observations). Works in and adjacent to turtle habitat would occur outside of the overwintering period (mid-October to ice-off; approximately early April).

5.1.2 Setbacks and Buffers

Development around waterbodies (e.g. watercourses, ponds, lakes) has the potential to impact the aquatic and terrestrial habitat of these water bodies. Setback requirements for the Site are established by JRSWS (Table 1; Figure 3; Stantec, 2007).

The Foster Watercourse and O'Keefe Drain, as (former) municipal drains with linear channel forms, have high watermarks that essentially correspond with the tops of their steep, well-defined banks. As such, setbacks from the tops-of-bank (15 m required) and from the high watermarks (30 m required) would effectively be measured from the same point, thus removing the relevance of the smaller distance. No geotechnical hazard limit exists for these features. The largest width between the tops-of-bank along both features within the Site is 8 m. The retained corridors within the community of both features follow their associated regulatory floodplain boundaries providing a 70 m total corridor width, which fully accommodates the channel widths and the 30 m top of bank setbacks (Figure 3). These corridors extend onto land areas that were former agricultural fields The corridors will be revegetated and re-naturalized following recommendations in the JRSWS under landscape plans to be developed as part of the detailed design phase of the proposed development (Table 1; Stantec, 2007).

The required setback for the Jock River corresponds with the edge of the 100-year floodplain (Table 1; Figure 3).

5.1.3 Conservation Areas

South Nepean Urban Area Secondary Plan identifies conservation lands between the Jock River and the regulatory flood line (City of Ottawa, 2021). The project will establish the required conservation lands. Detailed planning for this area (i.e. south of the regulatory floodplain line) will be developed through subsequent consultation with the City and RVCA.

6.0 IMPACT ASSESSMENT

The assessment of impacts here is based on the proposed development compared to the existing Site conditions since the Cut and Fill Program.

6.1 Impacts to Surface Water Features

No development work will occur within the newly defined floodplain or within 30 m of the normal high-water mark of the Jock River. The two existing drainage features (i.e. the Foster Watercourse and the realigned O'Keefe Drain) will be protected with setbacks 30 m from the normal high-water mark (Figure 3). Existing roadside ditches will be maintained but do not require setbacks.

Prior to the Cut and Fill Program, the entire development area consisted of active agricultural fields cultivated to within several metres of the Jock River and its tributaries. The project plan includes fully vegetated buffers adjacent to all watercourses ranging in width from a minimum of 30m.

Detailed stormwater management plans have not yet been developed for the Site. Site runoff from the developed areas will be collected via stormwater conveyance systems and treated by passage through oil/grit separator units to MECP water quality standards for such residential developments (JFSA, 2021).

There are no predicted negative impacts to surface water features on or adjacent to the Site related to site development given the application of conventional construction-phase mitigations, proposed stormwater treatment, and proposed enhancements to the corridor adjacent to the Jock River and associated tributaries.

6.2 Impacts to Trees

All trees on the Site have been removed as part of the Cut and Fill Program. Remaining trees along the Foster Water Course and O'Keefe Drain will be retained within the 30 m buffer surrounding these features (Figure 2). Riparian forest areas along the Jock River will remain intact.

A tree planting plan will be created as part of the landscape plan for the development. The implementation of suitable mitigation measures will minimize the risk to existing trees.

6.3 Impacts to Species at Risk

Five SAR have potential to be impacted by the development project: Bank Swallow, Barn Swallow, Snapping Turtle, Northern Map Turtle, and Blanding's Turtle.

Bank Swallow has not been observed nesting on the Site. However, landscape conditions created during the Cut and Fill Program and subsequent construction activities may result in suitable nesting habitats. There is therefore some potential (in the absence of mitigation) for the project to interact with Bank Swallow. The implementation of suitable mitigation measures will minimize the risk resulting in no impacts to Bank Swallow.

Barn Swallow nests have not been observed on or adjacent to the Site, though some individuals may feed over the Site beyond the protected 200 m from likely nest locations off-site. The implementation of

standard wildlife protection measures (Section 7.4) will minimize the risk resulting in no impacts to Barn Swallow.

The three at-risk turtle species are most likely to occur in the Jock River or the drainage features on the Site. The planned realignment of the O'Keefe Drain and future wetland enhancement along the Jock River corridor will provide an increased amount of higher-quality habitat for turtles. The implementation of suitable mitigation measures during the construction period will minimize the risk resulting in no impact to turtles.

6.4 Impacts to Wildlife

The current land cover of the Site makes it unlikely to support wildlife. Amphibian habitats were adjacent to the Site in the Jock River and (to a limited extent) in the Foster Watercourse and O'Keefe Drain. The development will be at least 30 m from these water features and is not anticipated to alter any of these features. The implementation of suitable mitigation measures will minimize the risk resulting in no impacts to amphibians.

Migratory birds have limited potential to occur and nest on the Site. The implementation of suitable mitigation measures will minimize the risk resulting in no impacts to migratory birds.

The riparian forest along the Jock River functions as a wildlife corridor and will remain in place during and after site development. The implementation of suitable mitigation measures will minimize the risk resulting in no impacts to wildlife.

6.5 "No Negative Impact"

Historical land uses on the Site were largely agricultural and contained few natural features that had marginal ecological function. The recent Cut and Fill Program has resulted in the removal of the marginal habitats (e.g. hedgerows) that were previously present on the Site. Consideration of features of higher importance (e.g. Jock River and associated drain features, SAR) were included in the EIS for the Cut and Fill Program (KAL, 2019) to ensure these features were protected appropriately.

Protection of the remaining natural features within the development area will be carried forward for this project with minimal impacts given the previous Cut and Fill Program. Additionally, natural feature enhancements will be incorporated into the development to meet or exceed the City of Ottawa targets for the natural environment, where and as they exist. These enhancements will include diverse environmental conditions to support multi-trophic habitats such as constructed wetlands, grasslands, and forests, resulting in a "net positive" impact to the environment.

7.0 MITIGATION

General mitigation measures to consider for all existing features include:

- Ensure machinery is in good working condition, free of fluid leaks
- Refuelling of equipment should be conducted away from slopes and at least 30 m away from any surface water. A designated refuelling area should be implemented for the Site

- Operate, store and maintain (e.g. re-fuel, lubricate) all equipment and associated materials in a manner that prevents the entry of any deleterious substance to the waterbody
- Ensure the Site and all disturbed areas are stabilized following construction
- Vegetation that is removed should be replaced with an appropriate native mix of vegetation endemic to the area and compatible with the existing land features
- Temporarily store, handle and dispose of all materials used or generated (e.g. organics, soils, woody debris, temporary stockpiles, construction debris such as concrete, sheet pile, wood forms, etc.) during site preparation, construction and clean-up in a manner that prevents their use by ground-nesting birds (e.g. cover with sheeting)
- Ensure a Spills Management Plan (including materials, instructions regarding their use, education of contract personnel, and emergency contact numbers) on-site at all times for implementation in event of an accidental spill during construction

7.1 Mitigation for Surface Water Features

The Foster Watercourse will not be altered by the project and a 30 m buffer shall be placed around it. The realignment of the O'Keefe Drain will require authorization from both the RVCA and DFO. Required mitigation measures specific to the realignment will be established through the permitting process and must be complied with to ensure no negative impacts to aquatic habitat in the vicinity of the Site.

There is some potential for indirect impacts via sediment deposition and overland erosion from the Site. All impacts to surface water features can be managed with the implementation of appropriate mitigation measures, such as:

- Implementation of natural channel design principals in the design process
- Design and implement erosion and sediment controls to contain/isolate the construction zone, manage site drainage/runoff and prevent erosion of exposed soils and migration of sediment
- An Erosion and Sediment Control Plan outlining mitigation measures to limit the potential for sediment and erosion to enter these watercourses. Mitigation measures will include silt fences, stone and/or straw bale check dams, monitoring frequency, and reporting requirements.

7.2 Mitigation for Trees

The following recommendations are to minimize impacts to any trees remaining adjacent to the Site:

- Tree removal should be limited to that which is necessary to accommodate site construction.
- To minimize impact to remaining trees during future site development:
    - Erect a fence beyond the critical root zone (CRZ; i.e. 10 x the trunk diameter) of trees. The fence should be highly visible (e.g. orange construction fence) and paired with erosion

control fencing. Pruning of branches is recommended in areas of potential conflict with construction equipment

- There must be a sign attached to the CRZ fence every 6.0 m indicating:
  a) the fencing is to protect the tree's CRZ; and
  b) that the fence must not be moved
- Do not place any material or equipment within the CRZ of the tree
- Do not attach any signs, notices or posters to any tree
- Do not raise or lower the existing grade within the CRZ without approval
- Tunnel or bore when digging within the CRZ of a tree
- Do not damage the root system, trunk or branches of any tree
- Ensure that exhaust fumes from all equipment are NOT directed toward any tree's canopy

Tree planting plans will be created as part of the landscape plan for the development (KAL, 2020). The tree planting plan for the residential areas of the Site is to include directives that will lead to at least 15% canopy cover at maturity within the residential development (i.e. considering trees planted on private lots and in common areas). Trees and other plants identified in landscape plans must be non-invasive and locally appropriate native species. Floodplain areas associated with the Jock River and along the west side of the community, however, will be extensively re-naturalized as part of subsequent works including significant tree planting. Tree planting plans for these areas are to be directed to achieve a canopy cover target for the combined community and floodplain areas of 40% at maturity.

7.3 Mitigation for Species at Risk

- All on-site staff should undergo environmental awareness training to be able to identify the potential SAR that may be encountered
- If the preparation works are to occur between April 1st – October 30th, consider isolating the Site with suitable fencing prior to commencing work to prevent turtles from accessing the Site
- Removal of vegetation suitable as nesting habitat should occur outside of the breeding bird season (April 1 to August 31)
- Perform daily pre-work searches of the construction area to ensure no wildlife has entered the work area

Bank Swallows, Barn Swallows and turtles may occur on the Site. General wildlife mitigation measures will be sufficient to protect turtles. If construction requires fill piles on the Site, rounding or tarping fill piles (i.e. avoiding the creation of exposed vertical edges) would prevent attracting Bank Swallow to the Site.

The Butternuts remaining near the Site are far enough away from the proposed work areas that no specific mitigation is required to protect the species.

7.4 Mitigation for Wildlife

The following mitigation measures shall be implemented during construction of the project on Site:

- Isolate work areas to prevent wildlife from entering the active work area
- Perform daily pre-work searches of the construction area to ensure no wildlife has entered the work area overnight
- Construction activities should not occur during sensitive times of the year for wildlife, unless appropriate mitigation measures are implemented and/or the habitat has been inspected by a qualified biologist
- If removal of vegetation must occur within the breeding bird season (April 1 to August 31), a qualified biologist should be retained to provide guidance on how to avoid impact to breeding birds. If active migratory bird nests are discovered within the construction area, further alteration should be postponed allowing young birds time to fledge
- Do not harm, feed, or unnecessarily harass wildlife
- Food wastes and other garbage – effective mitigation measures include waste control (prevent littering); keeping all trash secured in wildlife-proof containers, and prompt removal from the Site (especially in warm weather)
- Cove and/or contain piles of soil, fill, brush, rocks, and other loose materials; capping ends of pipes where necessary to keep wildlife out; ensuring that trailers, bins, boxes, and vacant buildings are secured at the end of each workday to prevent access by wildlife
- Checking the work area for wildlife prior to beginning work each day
- Inspecting protective fencing or other installed measures regularly and after each rain event to ensure their integrity and continued function
- Monitoring construction activities to ensure compliance with the project-specific protocol (where applicable) or any other requirements

8.0 SUMMARY AND RECOMMENDATIONS

8.1 Concordance with Jock River Reach One Subwatershed Study

No discrepancies occur between the proposed development and recommendations in the Jock River Reach One Subwatershed Study (Stantec, 2007; Table 6)

Table 6 Natural Environment Planning Recommendations from the Jock River Reach One Subwatershed Study (Stantec, 2007)

Recommendation Number	Recommendation	Concordance
Foster and O'Keefe Catchments		
JRSWS-1	Preserve and enhance the aquatic habitat and riparian zone of the tributary through future restoration opportunities.	The Foster and O'Keefe will be retained in their current forms Both channels will be situated within corridors with a minimum 70 m of width with enhanced riparian vegetation.
JRSWS - 2	Setback is to be the greater of the 100-year flood line elevation/meander belt/aquatic setback (i.e. geotechnical, 15 m top of defined bank or 30 m from normal high-water mark)	The setback to the watercourses is set at 30 m from the normal high-water mark, which also respects the floodplain boundaries.
JRSWS-3	Investigate the feasibility of establishing and enhancing the terrestrial linkage along the O'Keefe Drain from the Jock River corridor to Stony Swamp.	The O'Keefe Drain m will include a 70 m wide, re-naturalized corridor, allowing for a terrestrial linkage substantially wider than the ~15 m of sparsely treed width that had existed between previous agricultural fields of the Site. This corridor will eventually be paralleled by a >100 m wide re-naturalized corridor along the western side of the Site, further augmenting the potential for wildlife passage.
JRSWS-4	Incorporate trail system along O'Keefe Drain as identified in Official Plan and Greenspace Master Plan.	The western edge of the Site will include a >100 m wide open space allowing sufficient space for a north-south recreational pathway to connect the Jock River to upper reach areas of the O'Keefe Drain (i.e. north of the Site)
Jock River Corridor		
JRSWS-5	Maintain the regulatory floodplain by not permitting active development within its limits. Some reduced-risk uses such as sports fields and trails may be considered subject to RVCA approval.	Development is not proposed within the floodplain. The floodplain corridor will be naturalized.
JRSWS-6	Prepare a Jock River Corridor Riparian Planting Plan to improve and enhance riparian vegetation coverage along the banks and shoreline of the river.	A detailed planting plan will be developed as part of the final landscape plan for the area to fully detail the proposed design for new forest and wetland areas along the floodplain.
JRSWS-7	Protect critical fish habitat and spawning areas along the Jock River and tributary mouths.	The banks of the Jock River and the tributaries to it have been and will be maintained as intact retaining their existing vegetation. Riparian areas previously consisting of bare soil and/or agricultural crops will be revegetated.
JRSWS-8	Create pike spawning habitat area adjacent to Foster Dry Pond as compensation for the loss of fish habitat in tributaries within Barrhaven South.	The Compensation Pond and Foster Pond, previously developed as compensatory fish habitat, are located on City-owned land and will not be altered by the proposed development.
JRSWS-9	Development setbacks for the Jock River will be the greater of the floodplain, meander belt width, geotechnical, 15 m top of the defined bank or 30 m from the normal high water mark	The setback to the Jock River is defined by the 100-year floodplain, which corresponds to a setback of 80-400m from the top of the defined bank.
JRSWS-10	Provide a recreational trail along the Jock River as per OP and Greenspace Master Plan.	The proposed re-naturalization of the Jock River floodplain will include a trail system along its northern boundary.

8.2 Conclusions

The proposed residential development and corridor restoration was designed to be consistent with the goals of the Jock River Subwatershed Study. Key features of the design that are consistent with the subwatershed study goals include 30 m setbacks for the Foster Watercourse and O'Keefe Drain, and recreational pathways.

The development of this community will support a re-established and re-naturalized riparian corridor within floodplain areas associated with the Jock River between 70 and 400 m wide.

Drainage features through the proposed community (i.e. the Foster Watercourse and O'Keefe Drain) will be retained and protected with 30 m setbacks from their normal high-water marks. The retained corridors, which extend over areas that are currently barren, will be replanted and re-naturalized. Requirements from the subwatershed study related to stormwater management will be addressed under functional servicing studies for the area.

Previously developed natural features (i.e. fish habitat compensation pond and the Foster Dry pond) will not be impacted by the proposed residential or corridor restoration designs, but rather can be a focus for integration with the restored corridor. The proposed restoration development will represent a significant increase the diversity of natural features within the Site, as well as for the broader communities of Barrhaven and the City of Ottawa. The natural feature improvements to the existing ecological features (e.g. wetlands, meadow habitats, fish habitat) and the creation of new features (e.g. habitat for Species at Risk), will benefit the ecological diversity of the Site while simultaneously creating recreational opportunities for the public.

The identified species at risk with some potential to interact with the proposed development project are: Bank Swallow, Barn Swallow, Northern Map Turtle, Snapping Turtle, and Blanding's Turtle. The risk of harm to transient individuals during construction can be mitigated through appropriate and conventional mitigation measures. The restored corridor has the potential to provide enhanced habitat for turtles.

It is our professional opinion that no significant negative impacts are anticipated to species at risk or their habitats, or to significant natural heritage features present in the broader project vicinity under the proposed project.

9.0 CLOSURE

This report was prepared for exclusive use by Barrhaven Development Corporation and may be distributed only by Barrhaven Development Corporation. Questions relating to the data and interpretation can be addressed to the undersigned.

Respectfully submitted,

Anthony Francis, PhD
Senior Ecologist

Bruce Kilgour, Phd
President

10.0 LITERATURE CITED

Brunton, D.F., 1997. Summary natural area reports for natural areas west of Rideau River (500 Series). Prepared for: Regional Municipality of Ottawa-Carleton Planning & Development Approvals Department. March 1997. #28-08d.

Cadman, M., Sutherland, D., and G. Beck. 2007. Atlas of the Breeding Birds of Ontario: 2001-2005. Bird Studies Canada. Available online: http://www.birdsontario.org/atlas/index.jsp

Canada, Government of. (Canada). 1994. Migratory Bird Convention Act. S.C. 1994, c. 22.

Canada, Government of (Canada). 2002. Species at Risk Act. S.C. 2002, c. 29.

City of Ottawa. 2006. Greenspace Master Plan - Strategies for Ottawa's Urban Greenspaces. Publication: 4-01. 59 pp.

City of Ottawa. 2011. Characterization of Ottawa's Watersheds.

City of Ottawa. 2012. Environmental Impact Statement Guidelines. Planning and Growth Management Department. Policy Development and Urban Design Branch. Land Use and Natural Systems Unit. Second Edition. April 2012.

City of Ottawa. 2021. The New Official Plan. Available online at: https://ottawa.ca/en/planning-development-and-construction/official-plan-and-master-plans/official-plan#section-5c6edcaa-24f7-419a-95a4-6bff807b2734

City of Ottawa. 2022a. geoOttawa online database. http://maps.ottawa.ca/geoOttawa/

City of Ottawa. 2022b. Species at Risk in Ottawa. June 6, 2022. Distributed by Amy MacPherson, Natural Systems Planner, City of Ottawa.

Dobbyn, J.S. 1994. Atlas of the Mammals of Ontario. Federation of Ontario Naturalists, Don Mills, Ontario, 120 pp.

Environment and Climate Change Canada (ECCC). 2016. Management Plan for the Snapping Turtle (*Chelydra serpentina*) in Canada [Proposed]. Species at Risk Act Management Plan Series. Ottawa, Environment and Climate Change Canada, Ottawa, iv + 39 p.

Fisheries and Oceans Canada (DFO). 2020. Aquatic Species at Risk Map. URL: https://www.dfo-mpo.gc.ca/species-especes/sara-lep/map-carte/index-eng.html

Geomorphix. 2021. Geomorphological Considerations of Jock River Conceptual Floodplain Restoration & O'Keefe Drain Realignment. Report Number: PN18056. Report Date: August 6, 2021.

J.F. Sabourin and Associates Inc. (JFSA). 2021. BCDC Phase 2 – Preliminary Water Balance & Water Quality Controls. Memo Date: March 4, 2021.

Kilgour & Associates Ltd (KAL). 2017a. Environmental Impact Statement for Barrhaven Conservancy Phase I, November 23, 2017. Submitted to Barrhaven Conservancy East Inc. 26 pp.

Kilgour & Associates Ltd. (KAL). 2017b. Headwater Drainage Feature Assessment, Barrhaven Conservancy. September 8, 2017.

Kilgour & Associates Ltd (KAL). 2018. Jock River Restoration Project: Aquatic and Ecological Site Assessment Supporting Document, March 26, 2018. Submitted to Barrhaven Conservancy Development Corporation. 25 pp.

Kilgour & Associates Ltd (KAL). 2019. Environmental Impact Statement Barrhaven Conservancy Cut and Fill, November 20, 2019. Submitted to Barrhaven Conservancy East Inc. 26 pp.

Kilgour & Associates Ltd (KAL). 2020. City of Ottawa Environmental Impact Statement for the Barrhaven Conservancy East. Report Date: August 5, 2020.

Kilgour & Associates Ltd (KAL). 2021. Environmental Impact Statement Barrhaven Conservancy West, Ottawa. Report Date: October 21, 2021.

Muncaster Environmental Planning Inc. 2009. Foster and Kennedy Burnett Stormwater Project. Fish Habitat Assessments – Foster and Fraser Clarke Drains, Barrhaven. Prepared for the City of Ottawa.

Natural Heritage Information Centre (NHIC). 2020. Make Natural heritage Map: Natural Heritage Information Centre Ontario. Ministry of Natural Resources and Forestry. URL: http://www.gisapplication.lrc.gov.on.ca/mamnh/Index.html?site=MNR_NHLUPS_NaturalHeritage&viewer=NaturalHeritage&locale=en-US

Ministry of Natural Resources (MNR). 2000. Significant Wildlife Habitat Technical Guide. Toronto: Queen's Printer for Ontario. 396 pp.

Ministry of Natural Resources (MNR). 2010. Natural Heritage Reference Manual for Natural Heritage Policies of the Provincial Policy Statement, 2005. Second Edition. Toronto: Queen's Printer for Ontario. 248 pp.

Ministry of Natural Resources (MNR). 2015. General Habitat Description for the Blanding's Turtle (*Emydoidea blandingii*). [https://files.ontario.ca/environment-and-energy/species-at-risk/mnr_sar_ghd_bln_trtl_en.pdf].

Ministry of Natural Resources and Forestry (MNRF). 2020a. Land Information Ontario. Make a Topographic Map. URL: https://www.ontario.ca/page/topographic-maps

Ministry of Natural Resources and Forestry (MNRF). 2020b. Species at Risk in Ontario List. URL: https://www.ontario.ca/page/species-risk-ontario

Ontario Nature. 2020. Reptile and Amphibian Atlas. URL: https://ontarionature.org/programs/citizen-science/reptile-amphibian-atlas/species/

Ontario, Government of. 1990. Planning Act. URL: https://www.ontario.ca/laws/statute/90p13

Ontario, Government of. 2007. Endangered Species Act (ESA). URL: https://www.ontario.ca/laws/statute/07e06

Ontario, Government of. 2020. Provincial Policy Statement, 2020. Under the Planning Act.

Rideau Valley Conservation Authority (RVCA). 2016. Jock River Barrhaven Catchment – Jock River Subwatershed Report 2016. Rideau Valley Conservation Authority, 71 pp.

Rideau Valley Conservation Authority (RVCA). 2020. Jennifer Lamoreaux, email correspondence email correspondence dated May 5, 2020.

Rideau Valley Conservation Authority (RVCA). 2020. Mapping Geoportal. URL: https://gis.rvca.ca/html5/?viewer=rvcageoportal

Schut, L.W. and E.A. Wilson. 1987. The Soils of the Regional Municipality of Ottawa-Carleton (excluding the Ottawa Urban Fringe). Vols. 1 & 2. Report No. 58 of the Ontario Institute of Pedology.

Stantec. 2007. Jock River Reach 1 Subwatershed Study - Final Report. 2 Volumes. Prepared by Stantec Consulting Ltd. June 2007.

Appendix A - Agency Correspondence

SAR Screening Letter to MECP