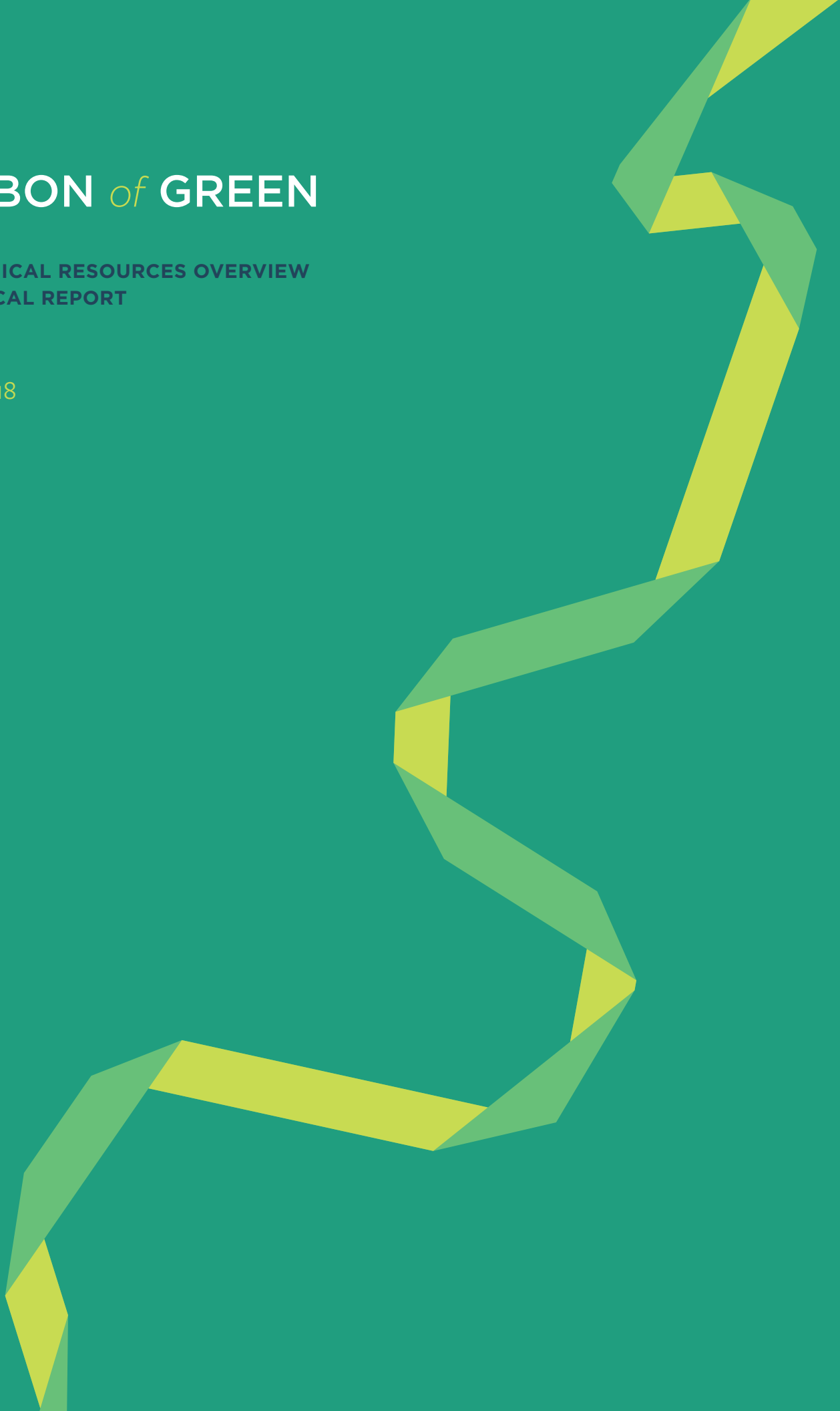
RIBBON *of* GREEN

ECOLOGICAL RESOURCES OVERVIEW
TECHNICAL REPORT

April 2018



Prepared for

City of Edmonton

Prepared by

02 Planning + Design

02

CONTENTS

1 INTRODUCTION

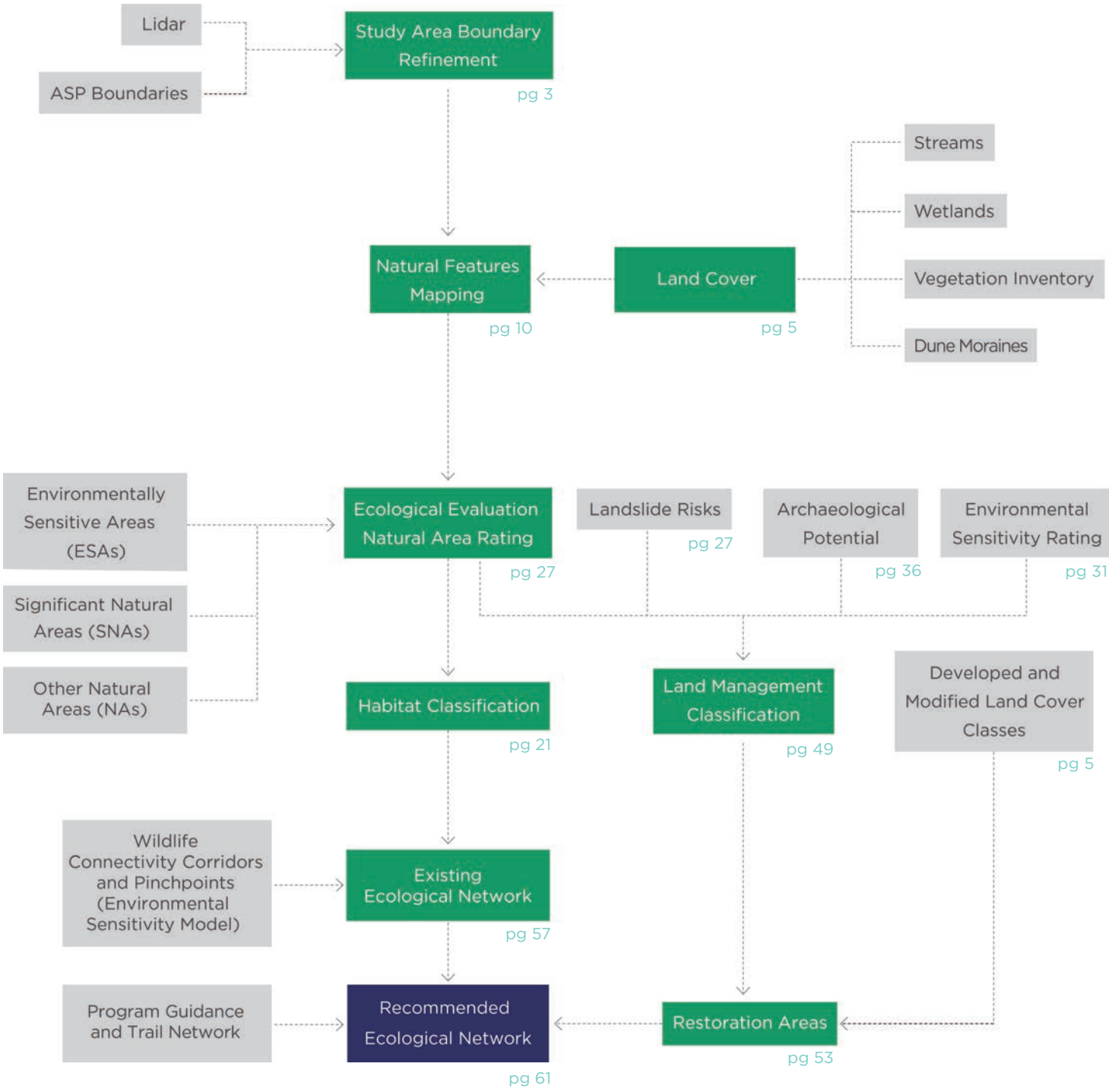
The development of the **Recommended Ecological Network** (page 61) for the Ribbon of Green project involved a number of technical spatial assessments. The **Study Area Boundary** (page 3) was revised to reflect the current top-of-bank and approved developments (as identified through approved plans, including Area Structure and Neighbourhood Structure Plans). An initial assessment of **Natural Features** (page 10) provided the overall context for the assessment and design of this valued and irreplaceable landscape.

Following the direction in the Phase II Ecological Network Report Terms of Reference and previous City delineations of Environmentally Significant Areas (ESAs), Significant Natural Areas (SNAs), and other Natural Areas (NAs), an Ecological Evaluation was conducted for the Ribbon of Green study area. The resulting **Ecological Evaluation And Natural Areas Rating** (page 15) identified High, Moderate and Low value natural habitats, and in turn informed the **Habitat Classification** (page 21) of the study area into Core Areas, Habitat Patches, Corridors and Stepping Stones.

The **Land Management Classification** (page 25) for the Ribbon of Green project draws upon available spatial datasets, coupled with additional analysis and expert recommendations, to highlight important natural areas, and choose appropriate locations for recreational use and development. The Land Management Classifications were informed by the results of the ecological evaluation balanced with the limited opportunities for public access and suitable locations of amenity node placement, and by additional spatial datasets that highlghted areas of special significance and sensitivity: landslide risks, environmental sensitivity and historically important cultural areas. The entire study area is allocated into three Land Management Classifications:

- **PRESERVATION:** The intent of preservation areas is to protect the integrity of the natural environment and restore natural functioning with minimal disturbance to wildlife and vegetation; as a result, opportunities for people to access these areas will be limited.
- **CONSERVATION:** The intent of conservation areas is to introduce people to the natural environment of the River Valley and Ravine System, provide opportunities to enjoy this natural setting, and gain a greater appreciation for the system while minimizing environmental impact and restoring ecological functioning, when possible.
- **ACTIVE/WORKING LANDSCAPES:** active/working landscapes are public spaces that provide opportunities for people to interact with each other and participate in a variety of recreational activities within a river valley and ravine setting. This classification also acknowledges existing uses, including urban services. Like the other two classifications, opportunities will be sought in this classification to restore and/or enhance natural functions.

ANALYSIS FLOWCHART



STUDY AREA BOUNDARY

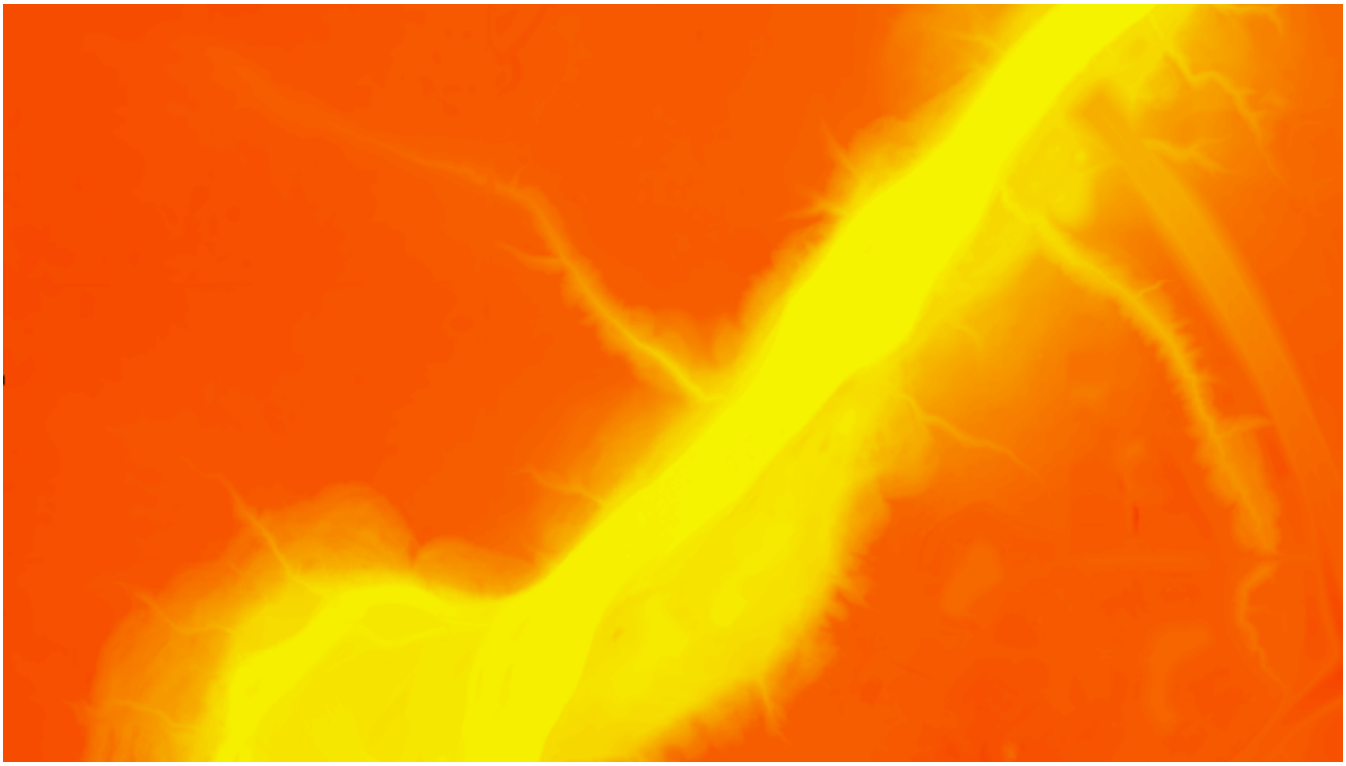
The study area boundary was initially based on the ***North Saskatchewan River Valley and Ravine System Area Redevelopment Plan*** boundary. The study area boundary was further refined with LiDAR-derived elevation models in order to more accurately reflect the top-of-bank. Further updates were then made manually, informed by slope, aerial imagery and existing Area Structure Plans for the surrounding area.

Original Study Area based on River Valley and Ravine Dataset

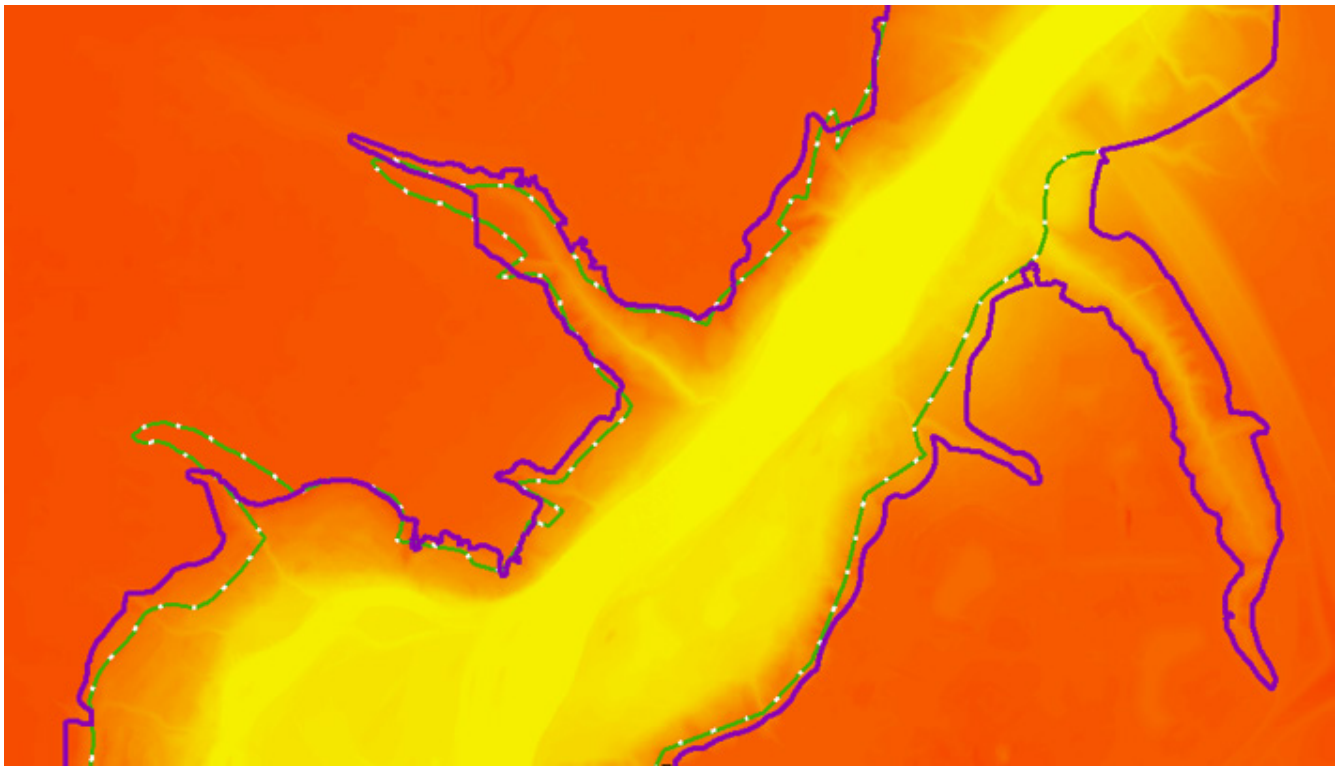
Using LiDAR datasets provided by the City of Edmonton, O2 developed a Digital Elevation Model (DEM) which identified slopes with 1m precision. Using this DEM, existing vegetation and aerial photography (with 25cm precision) from 2016, O2 refined the study area boundaries, which were subsequently approved by the City of Edmonton. The end result is a study-area boundary that more closely follows the top of bank, includes relevant ravines and gullies, and provides a more suitable starting point for the planning process.

Additional study area boundary changes were made to reflect approved Area Structure Plan extents, ensuring that the Ribbon of Green recommendations remain in sync with developments on the tablelands.

Digital Elevation Model (DEM)



Study Area Boundary Comparison - Original (Green), Updated (Purple)



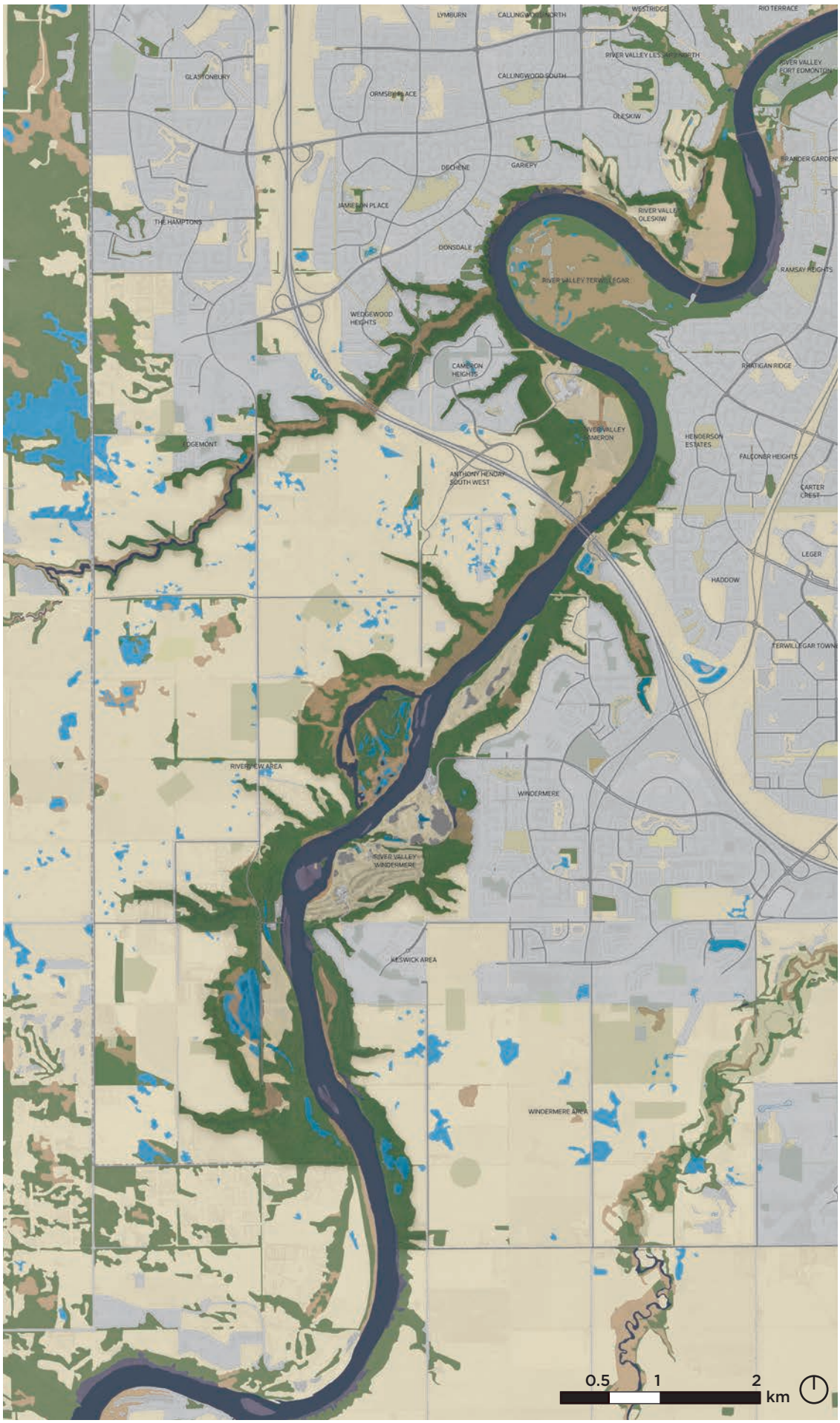
LAND COVER CLASSIFICATION

The various surfaces which make up the landscape are referred to as 'land cover'. This cover may include water bodies, native vegetation, planted or otherwise non-native vegetation, and more impermeable constructed surfaces such as roads, parking lots, and built structures. It is an essential layer which informs the broad understanding of the composition of the planning area, informing subsequent analysis of connectivity, and the recommended management classification. Land cover was derived from the Urban Primary Land and Vegetation Inventory polygon data layer, with broad classifications assessed using the Land Classification. The following six major classes are mapped in the following pages:

- MODIFIED
  - Vegetated with anthropogenic origin.
- NATURALLY WOODED
  - Vegetated having greater than or equal to 6% tree cover.
- WETLAND
  - Vegetated with a minimum hygric moisture regimes.
- NATURALLY NON-WOODED
  - Vegetated having less than 6% total tree cover
- NATURAL
  - Non-vegetated naturally occurring features (e.g. Open Water, Sand or Exposed Soils).
- DEVELOPED
  - Non-vegetated with anthropogenic origin.

PRIMARY CLASS	LAND CLASS	SITE TYPE
Vegetated Landscape (VEG)	Modified (MOD)	Maintained Grass Site (MG)
		Transplant Treed Site (TT)
		Non-maintained Grass/Shrub Site (NG)
		Annual Crops (CA)
		Tame Pasture (CP)
		Rough Pasture (CPR)
		Treed Shelterbelt (TS)
		Recent Clearing (CL)
		Acreage Subdivision (AS)
		Farmyard/Acreage Site (FS)
		Nursery/Tree Farm (NT)
		Agriculture Hygric Tillage Site (HT)
	Naturally Wooded (NAW)	Forested (FT)
	Wetland (WET) includes Stewart and Kantrud Classification System	Treed Bog (WT)
		Shrubby Bog (WS)
		Treed Fen (TF)
		Shrubby Fen (SF)
		Grass Fen (GF)
		Marsh (M)
		Swamp (SW)
	Naturally Non-Wooded (NNW)	Open Shrub (OS)
		Medial Shrub (MS)
		Closed Shrub (CS)
		Native Grass (HG)
Non-Vegetated (NVE)	Natural (NAT)	Natural Water Bodies (NW)
		Exposed Mineral Soil (EMS)
		Sand (NMS)
	Developed (DEV)	Anthropogenic Water Body (AW)
		Established Residential Community (ERC)
		Residential Development Site (RDS)
		Established Commercial/Industrial Site (ECS)
		Commercial/Industrial Develop. Site (CDS)
		Building and/or Parking Complex (BPC)
		Aggregates and/or Fill Site (AF)
		Oil and/or Gas Field Site (OG)
		Maintained Trails (MT)
		Transportation Surface (AIH)

SW LAND COVER CLASSES



Land Cover Classes

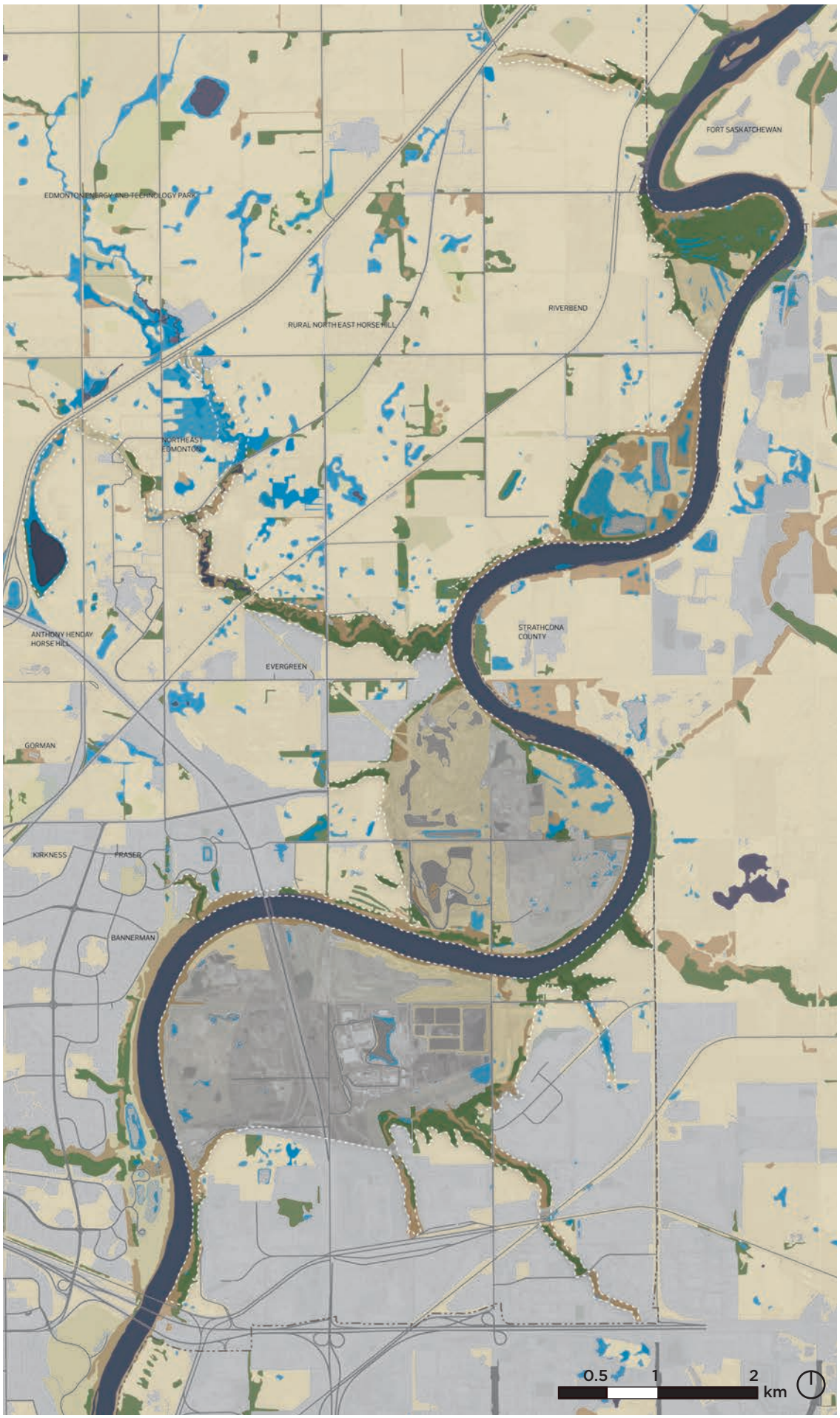
- Developed
- Modified
- Natural - Non-Vegetated
- Natural - Wooded
- Natural - Non-Wooded
- Wetland
- Arterial and Collector Roads
- Existing Parks
- Future Parks

RAVINE LAND COVER CLASSES

Land Cover Classes

- Developed
- Modified
- Natural - Non-Vegetated
- Natural - Wooded
- Natural - Non-Wooded
- Wetland
- Arterial and Collector Roads
- Existing Parks
- Future Parks

NE LAND COVER CLASSES



Land Cover Classes

- Developed
- Modified
- Natural - Non-Vegetated
- Natural - Wooded
- Natural - Non-Wooded
- Wetland
- Arterial and Collector Roads
- Existing Parks
- Future Parks

NATURAL FEATURES MAPPING

An initial assessment of the natural features present in and around the Ribbon of Green area provides important context to subsequent planning of the river valley. Natural features were identified using two primary datasets: the Urban Primary Land and Vegetation Inventory, and the components of the City's Environmental Sensitivity Model. Together, this data provides the most up-to-date picture of the natural features found in the river valley, and will contribute to the analyses described throughout the rest of this report.

From uPLVI (2015):

- Natural Water Body (aka: open water = Site Type: NW)
- Sand (Site Type: NMS)
- Exposed Mineral Soil (Site Type: EMS)
- Wetlands >0.5 ha
- Stand Type (Use all classes of STNDLABEL1 except for NF)
- Shrub (Site Type: CS, MS, and OS)
- Herbaceous Grass (Site Type: HG)
- Treed Shelterbelt (Site Type: TS and TT)
- Non-maintained Grass/Shrubs (Site Type: NG)

From Environmental Sensitivity Data:

- Drainage courses/streams (Strahler Class 3 and above)
- Desktop derived wetlands (all wetlands not verified by the uPLVI work)
- Potential microclimate sites
- Flood zone and flood way

SW NATURAL FEATURES

LEGEND

Study Area Features

- Natural Water Bodies
- Storm Water Management Features
- Floodway / Floodplain *
- Potential Microclimate (Desktop Derived)

Wetlands

- Not Classified
- Class I
- Class II
- Class III
- Class IV
- Class V
- Class VIII

Streams

- Strahler 3
- Strahler 4
- Strahler 5
- Strahler 6

Forest Stand Type

- Aspen
- Balsam Poplar
- Black Spruce
- White Spruce
- Coniferous Mixed-wood
- Deciduous Mixed-wood

Land Cover Site Type

- Non-Maintained Grass
- Sand
- Exposed Soil
- Shrubs
- Herbaceous Grass

- Existing Parks
- Future Parks

** Flood zone mapping has not been completed in Wedgewood Ravine. To be reviewed in site-specific studies.*

RAVINE NATURAL FEATURES

LEGEND

Study Area Features *

- Natural Water Bodies
- Storm Water Management Features
- Potential Microclimate (Desktop Derived)

Wetlands

- Not Classified
- Class I
- Class II
- Class III
- Class IV
- Class V
- Class VIII

Streams

- Strahler 3
- Strahler 4
- Strahler 5
- Strahler 6

Forest Stand Type

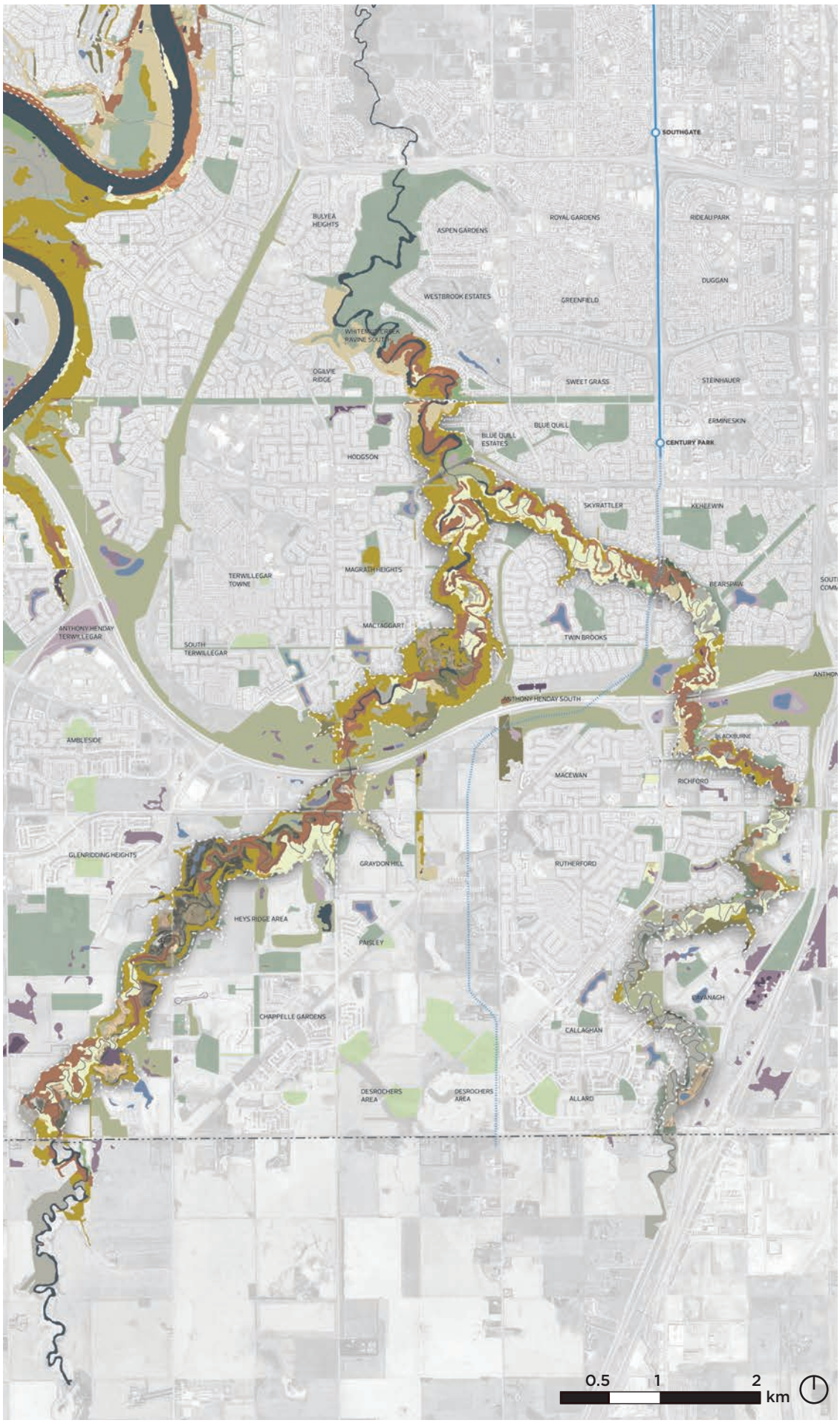
- Aspen
- Balsam Poplar
- Black Spruce
- White Spruce
- Coniferous Mixed-wood
- Deciduous Mixed-wood

Land Cover Site Type

- Non-Maintained Grass
- Sand
- Exposed Soil
- Shrubs
- Herbaceous Grass

- Existing Parks
- Future Parks

** Flood zone mapping has not been completed in the Ravine Areas. To be reviewed in site-specific studies.*



NE NATURAL FEATURES

LEGEND

Study Area Features

- Natural Water Bodies
- Storm Water Management Features
- Floodway / Floodplain *
- Potential Microclimate (Desktop Derived)

Wetlands

- Not Classified
- Class I
- Class II
- Class III
- Class IV
- Class V
- Class VIII

Streams

- Strahler 3
- Strahler 4
- Strahler 5
- Strahler 6

Forest Stand Type

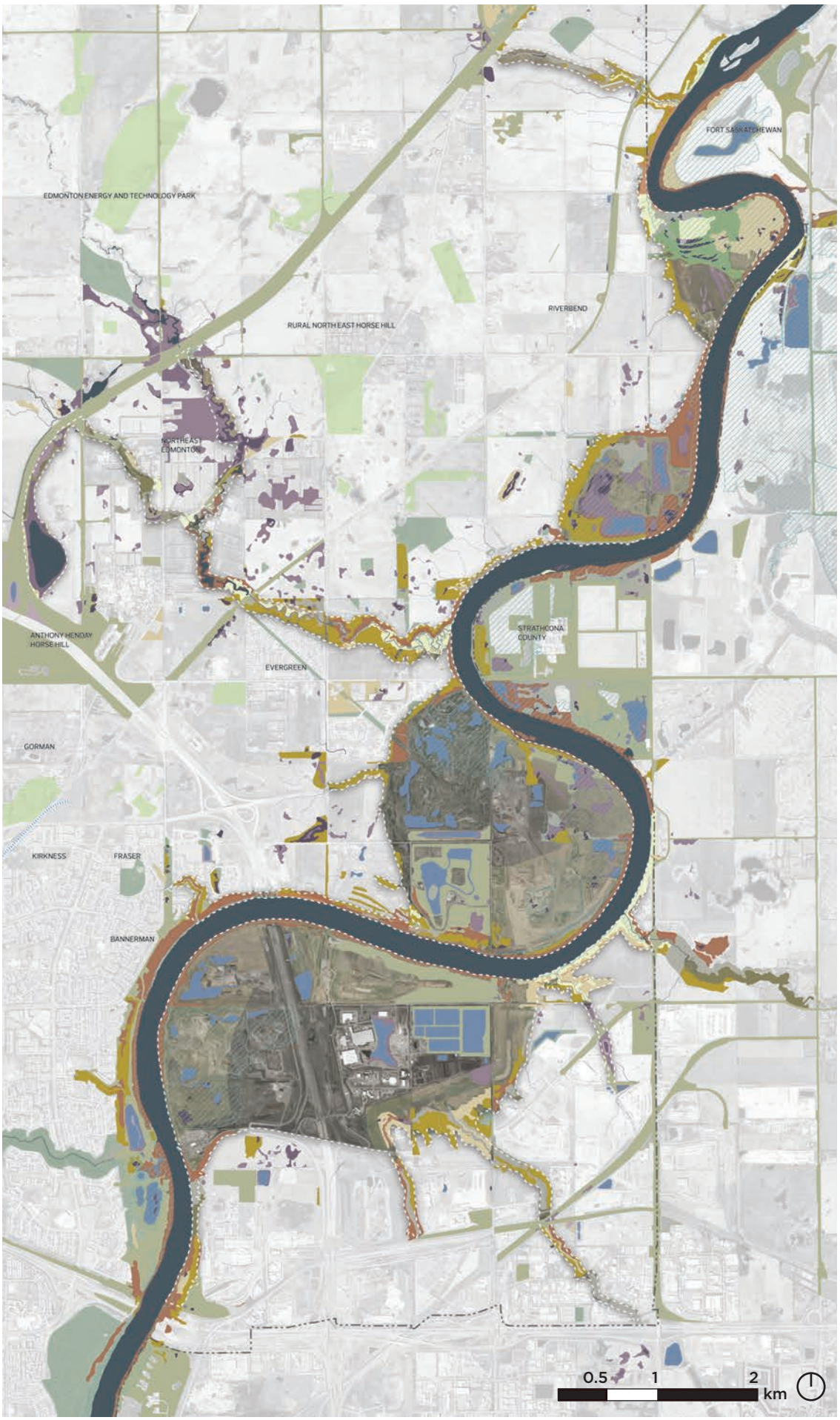
- Aspen
- Balsam Poplar
- Black Spruce
- White Spruce
- Coniferous Mixed-wood
- Deciduous Mixed-wood

Land Cover Site Type

- Non-Maintained Grass
- Sand
- Exposed Soil
- Shrubs
- Herbaceous Grass

- Existing Parks
- Future Parks

** Flood zone mapping has not been completed in Horse Hills Ravine. To be reviewed in site-specific studies.*



2 ECOLOGICAL EVALUATION

An ecological evaluation of the natural areas within the Ribbon of Green provides an important lens with which to determine the irreplaceable and highly valuable natural components of the River Valley and Ravine System (the System). The evaluation of these natural areas allows a relative assesment of the most valuable lands, which in turn ensures that land use decisions are made with more comprehensive knowledge of the tradeoffs inherent in the development and preservation of the landscape. In this section, the underlying scoring methodology is described, the classified results of the ecological evaluation tool are presented, and a habitat classification is constructed. The results have strongly influenced the land management classification, the trail network routing and access management strategy, and the placement and design of amenity nodes within the System.

ECOLOGICAL EVALUATION AND NATURAL AREAS RATING

EVALUATION UNITS

The spatial evaluation units for this analysis are drawn from the City's 2013 mapping of Environmentally Significant Areas (ESAs) and Significant Natural Areas (SNAs), supplemented by all additional Natural Areas, as defined in the Environmental Senstivity final report, using the urban Primary Land and Vegetation Inventory (uPLVI) dataset (City of Edmonton ESM Final Report 2016). As there is significant overlap between ESAs and SNAs, ESA polygons were allowed to take precedence, and SNA polygons occur only where they are not already covered by ESAs. Similarly, Natural Area polygons were only included when they did not overlap with identified ESAs and SNAs. Contiguous natural land cover polygons were dissolved into a single polygon. Any ESAs containing small gaps and internal holes were filled during this step, to prevent these gaps from skewing the assessment of polygon shape, and ensure that this metric produced intuitive results.

SCORING THE ECOLOGICAL EVALUATION

The desktop and bonus components of the Ecological Evaluation Tool (as outlined in the City's Phase II Ecological Network Report Terms of Reference 2014) were assesed for each evaluation unit, providing an estimate of the relative value of each polygon, with respect to biodiversity potential, ecological connectivity, and representative value.

Biodiversity Potential

- Size
- Shape
- Habitat Diversity

Ecological Connectivity

- Nearby Upland Habitat
- Nearby Wetland Habitat

Representative Value

- City-wide Rare/Unique Vegetation
- Locally Rare/Unique Vegetation
- Dune Moraine Landforms
- Riparian Wetlands

As the site level field surveys have not been conducted, this evaluation should be seen as a minimum value, which may be further increased once local components of species richness are included. As a caveat, it should be noted that since the units of evaluation vary in size and shape, the specific score associated with each polygon may not apply to the entire polygon itself. Field verification should always occur before any modifications or impacts are considered.

NATURAL AREA RATING

The resulting summed ecological evaluation score ranged from a high of 61 (in large, compact highly diverse natural areas), to -5 (in small, elongated and isolated remnants of single natural cover types) and was classified using natural breaks into Low (score < 21), Moderate (21-38), or High (>= 39) categories.

FACTOR	VARIABLE	METRIC	CRITERIA	SCORING
Biodiversity Potential	Size	Area (ha)	<0.5	0
			0.5-1	1
			>1– 3	2
			>3 – 6	5
			>6 – 9	8
			>9– 12	11
			>12	15
	Shape	Ratio of Polygon Perimeter to Convex Hull Perimeter	Simple round/square shape (ratio >= 0.75)	0
			A few linear/narrow areas (ratio 0.5 - 0.75)	-2
			Mix of linear/narrow areas and rounder/wider areas (ratio 0.25-0.5)	-4
			Linear/narrow throughout (ratio < 0.25)	-8
	Habitat Diversity	Number of different habitat types (> 0.5 ha) present within the natural area	Open water	3
			Marsh wetland	3
			Shrub wetland	2
			Peatland (bog or fen)	4
			Deciduous upland	2
			Coniferous upland	2
			Mixedwood upland	3
			Meadow/Naturalized field	1
Ecological Connectivity	Presence of Nearby Upland Habitat	Area (ha) of wooded, meadow, or naturalized field habitat within 100 m buffer	0-0.5	0
			>0.5 – 1	1
			>1 – 2	3
			>2 – 3	5
			>3 – 5	7
			>5	10
	Presence of Nearby Wetland Habitat	Area (ha) of wetland habitat within 100 m buffer	0-1	0
			>1-3	3
			>3-5	5
			>5	10

FACTOR	VARIABLE	METRIC	CRITERIA	SCORING
Representative Value	City-Wide Rarity/ Uniqueness	Presence of rare/unique vegetation types (at a city-wide scale)	Polygons Identified as 'Unique Vegetation' in the Environmental Sensitivity Model	5
	Local Rarity/ Uniqueness	Presence of Rare/unique vegetation types (at a local scale)	Natural land cover polygons from the uPLVI that cover less than 20% of the local area Southwest . Site Type Classes: Closed Shrub, Grass Fen, Herbaceous Grass, Marsh, Medial Shrub, Natural Water Body, Open Shrub, Shrub Fen, Exposed Mineral Soil, Sand . Stand Type Classes: White Spruce, Deciduous Lead Mixedwood, Conifer Lead Mixedwood Ravines . Site Type Classes: Medial Shrub, Herbaceous Grass, Closed Shrub, Natural Water Body, Exposed Mineral Soil, Sand . Stand Type Classes: White Spruce, Balsam Poplar, Deciduous Lead Mixedwood, Conifer Lead Mixedwood Northwest . Site Type Classes: Closed Shrub, Grass Fen, Herbaceous Grass, Marsh, Natural Water Body, Shrub Fen, Forested, Exposed Mineral Soil, Sand	5
	Dune Moraines	Presence of unique and irreplaceable dune moraine landforms	Polygons Identified as 'Unique Landforms' in the Environmental Sensitivity Model	5
	Riparian Wetlands	Presence of riparian wetlands (found rarely in the city)	Wetland polygons which fall within the floodplain/floodway extent	5

SW NATURAL AREA RATING

LEGEND

Natural Area Rating

- Low
- Moderate
- High

- Existing Parks
- Future Parks

RAVINE NATURAL AREA RATING

LEGEND

Natural Area Rating

- Low
- Moderate
- High

- Existing Parks
- Future Parks

NE NATURAL AREA RATING

LEGEND

Natural Area Rating

- Low
- Moderate
- High

- Existing Parks
- Future Parks

HABITAT CLASSIFICATION

Following the creation of the the Ecological Evaluation Classification (page 15), a Habitat Classification was performed, which allocated natural areas and non-maintained semi-natural areas, such as road verges, into a set of four habitat classes: Core Habitat, Habitat, Corridors, and Stepping Stones. Although the initial classification drew extensively from the formal evaluation scoring results, additional hand-edits were requested by the City's ecological experts in order to arrive at a more fulsome classification that aligned with common-sense. Notable hand edits included merging small patches of habitat (< 2000m^2) which bordered or were contained by core habitat, and splitting long corridor polygons which passed through or adjoined core areas. Additionally, non-maintained grass and treed shelterbelts (which are technically identified as 'semi-natural' land cover and thus not included in the ecological evaluation of natural areas) are included here for their functional contribution as habitat and corridors, respectively.

CORE

(EcoEvalClass = 'High' AND ShapeScr >= -4) OR (Corridor polygons which touch Core polygons)

CORRIDOR

(EcoEvalClass = 'Low' AND (ShapeScr = -4 OR ShapeScr= -8)) OR ((EcoEvalClass = 'Moderate' OR EcoEvalClass = 'High') AND (ShapeScr= -8)) OR (site-type = treed shelterbelt)

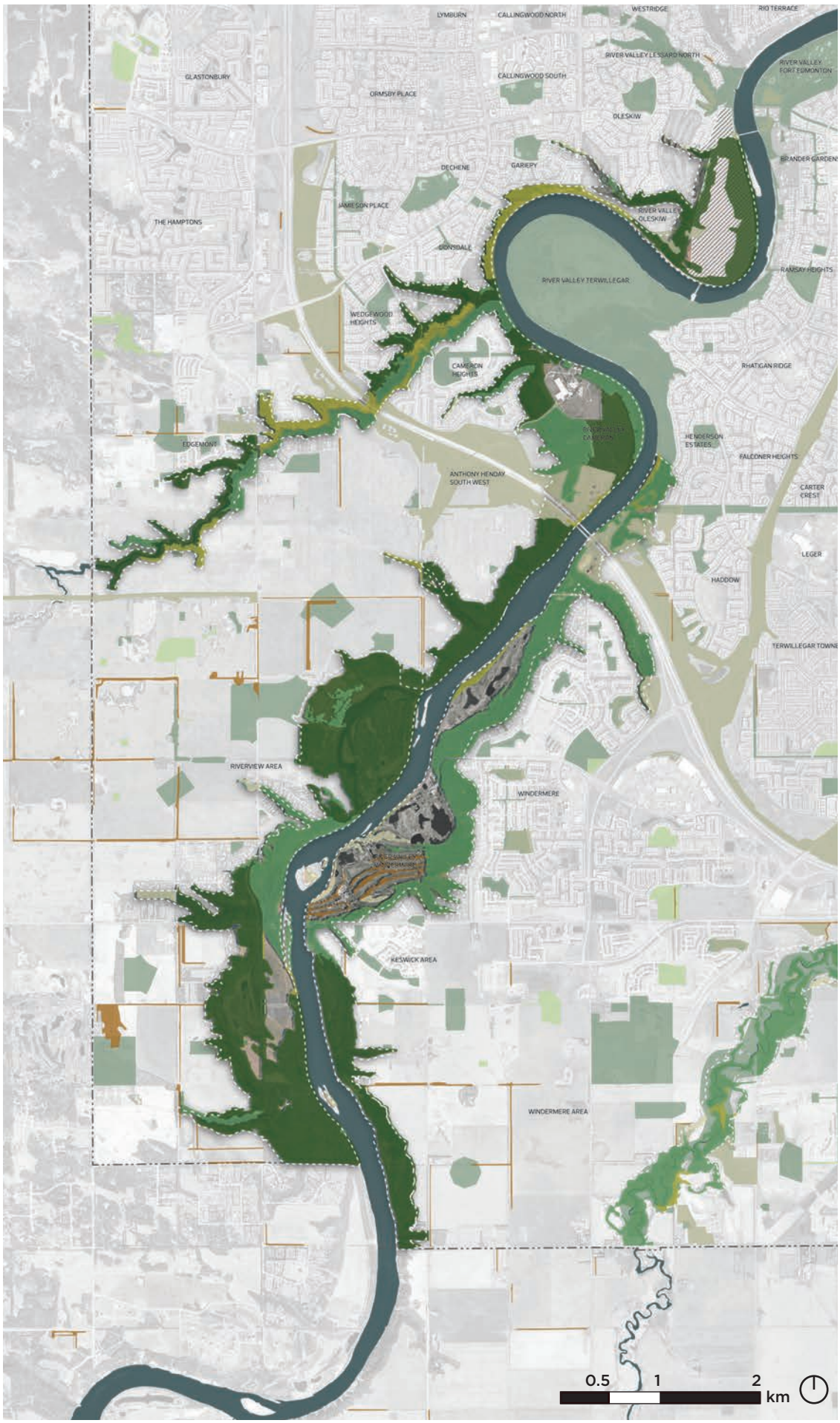
HABITAT

(EcoEvalClass = 'Moderate' AND ShapeScr = -2) OR (EcoEvalClass = 'Moderate' AND ShapeScr = 0) OR ((EcoEvalClass = 'Low'AND ShapeScr > -4) AND (Physically Connected to Core/Habitat)) OR ((EcoEvalClass <> 'High' AND AreaScr >= 12) OR (site-type = non-maintained grass)

STEPPING STONE

(EcoEvalClass = 'Low'AND ShapeScr > -4) AND (Not Physically Connected to Core/Habitat/Corridor)

SW HABITAT CLASSIFICATIONS



LEGEND

Habitat Classifications

- Core (Natural Cover)
- Corridor (Natural Cover)
- Corridor (Treed Shelterbelt)
- Habitat (Natural Cover)
- Habitat (Non-maintained Grass)
- Stepping Stone (Natural Cover)

- Existing Parks
- Future Parks

RAVINE HABITAT CLASSIFICATIONS

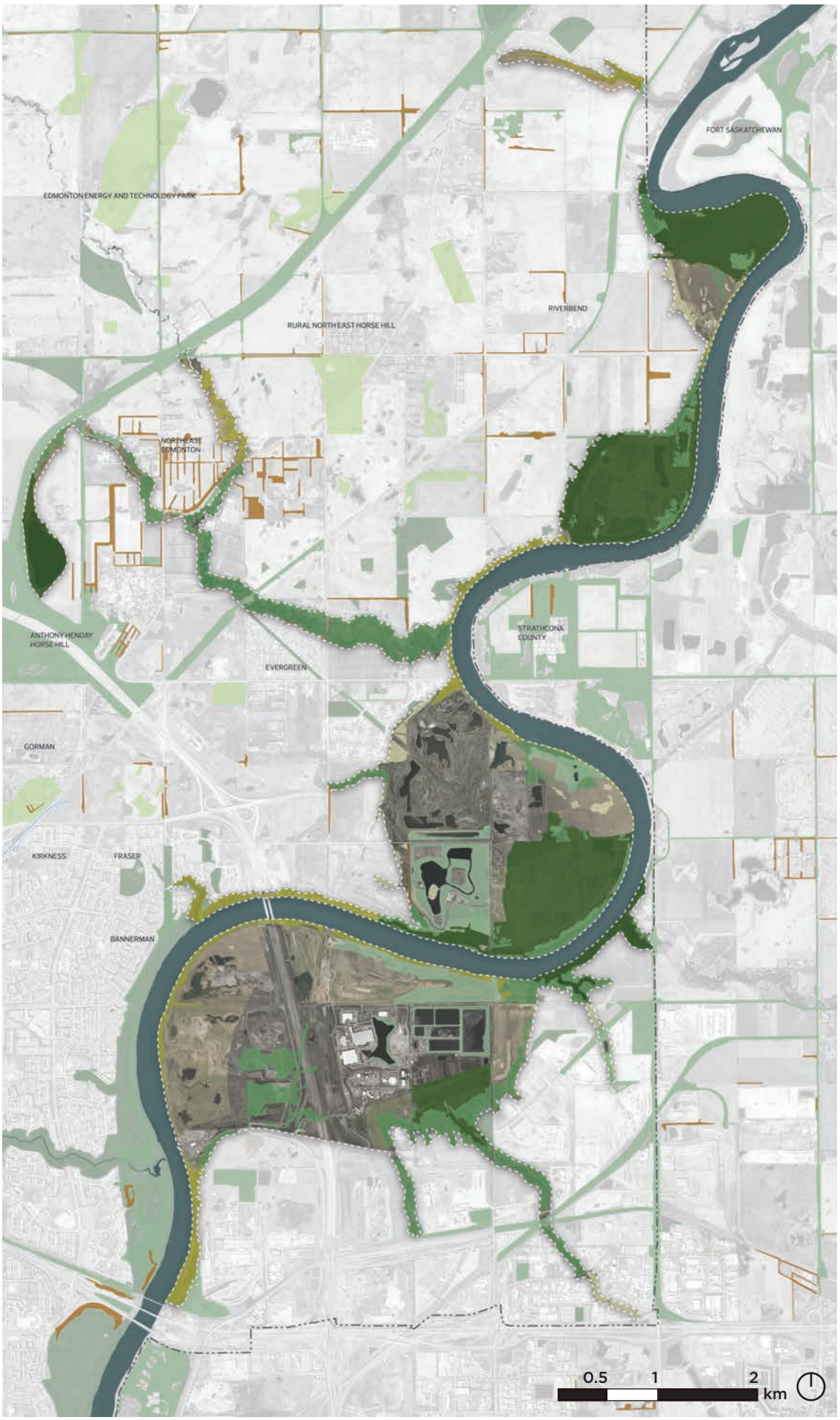
LEGEND

Habitat Classifications

- Core (Natural Cover)
- Corridor (Natural Cover)
- Corridor (Treed Shelterbelt)
- Habitat (Natural Cover)
- Habitat (Non-maintained Grass)
- Stepping Stone (Natural Cover)

- Existing Parks
- Future Parks

NE HABITAT CLASSIFICATIONS



LEGEND

Habitat Classifications

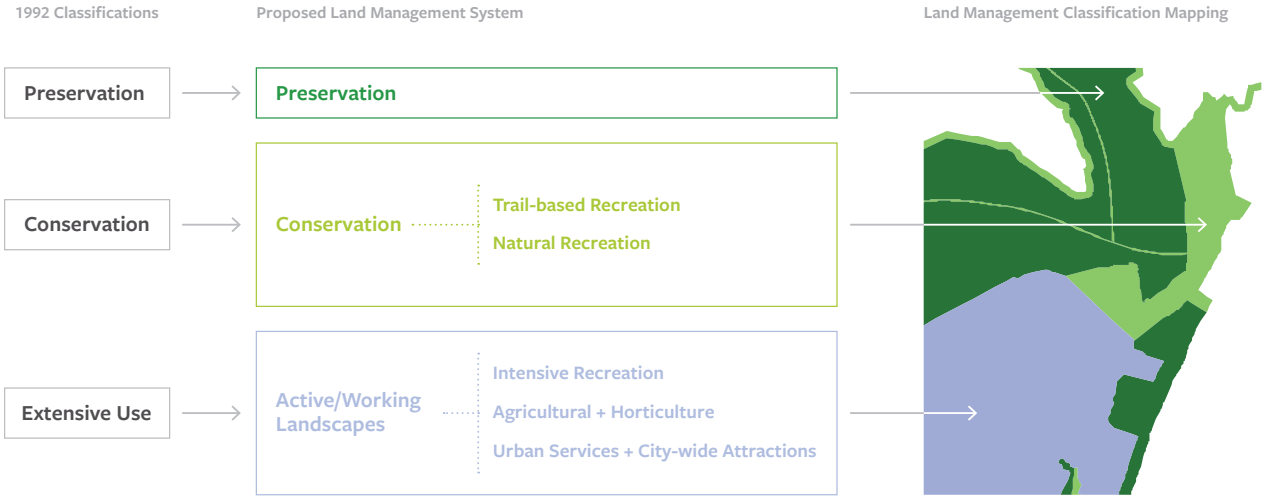
- Core (Natural Cover)
- Corridor (Natural Cover)
- Corridor (Treed Shelterbelt)
- Habitat (Natural Cover)
- Habitat (Non-maintained Grass)
- Stepping Stone (Natural Cover)

- Existing Parks
- Future Parks

3 LAND MANAGEMENT CLASSIFICATION

Land Management Classifications define the physical site conditions, operations, activities and amenities within the entire River Valley and Ravine System (the System). These management classifications outline the level of protection or permitted development within each area.

In turn, these classifications will guide design and programming decisions to create park amenities and operations standards appropriate to their location within the System. The Land Management Classifications are based on the original Ribbon of Green Master Plan from 1992. The feedback received from the first stage of public engagement, best practice research, and site analysis helped inform the revisions to the original 1992 management units.



The Land Management Classification was a two part process and this section provides an overview of this process:

STEP 1: Data-Derived Land Management Classifications: The initial identification of Land Management Classifications was developed using the following datasets (as described in this chapter):

- **Ecological Evaluation Natural Area Ratings**
- **Landslide risks**
- **The City's Environmental Sensitivity Model (ESM)**
- **Archaeological Potential**

Data from each component was assigned a Land Management Classification based on their sensitivity (e.g. Landslide Risk areas were assigned to Preservation). Each dataset individually allocates portions of land into Preservation, Conservation, and Active/Working Landscapes categories, based on the recommendations of the experts who created the data, as mentioned in the above sections. These were then consolidated into a single Land Management Classification Map.

STEP 2: Manual Refinement of Land Management Classifications: After delineating the Land Management Classifications using the data available, a manual refinement was required to reflect past, existing and planned conditions, uses and accesses. Modifications to the management classifications were implemented where necessary to allow for current uses and existing and future recreation nodes as well as to provide additional buffering and protection to sensitive areas.

The following three principles provided a basis for the manual refinements:

1. **Direct activity to areas with lower ecological value –** all land in the System is important and future planning for all Land Management Classifications will need to protect its ecological integrity. To minimize the impact on this ecological integrity, recreational opportunities are focused in areas with lower ecological value.
2. **Concentrate activity in already disturbed areas** – given the need to preserve the intact core habitat areas found in the System, it is important to focus programming and development in areas that are already disturbed, and consider opportunities for restoration and mitigation to improve ecological functioning of the site.
3. **Focus activity, when possible, in areas with good access (roads, trails etc.)** – due to the steep and delicate slopes within the System, it is prudent to focus future recreational activity in areas with accesses in place, for vehicles, bicycles and/or pedestrians.

The manual refinements, described later in this chapter, elaborate on how each of these three principles is reflected in the Land Management Classifications.

Following the development of the Land Management Classification, land cover from the Urban Primary Land and Vegetation Inventory (uPLVI) distinguished between existing non-natural human footprints, semi-natural cover, and the remaining relatively undisturbed natural vegetation. Areas of non-natural land cover that fell within Preservation and Conservation classes were identified as **Potential Restoration Areas** (page 53).

Building from the assessment of the **Existing Ecological Network** (page 57), these assessments were subsequently incorporated into the **Recommended Ecological Network** (page 61), which includes the Habitat Classification (page 21), Potential Restoration Areas (page 53), Wildlife Corridors and pinch points (provided by the City's Environmental Sensitivity Model project), additional Natural Features, and barriers posed by human footprints.

DATA-DERIVED LAND MANAGEMENT CLASSIFICATION

ECOLOGICAL EVALUATION RATING	RIBBON OF GREEN CLASS
HIGH	Preservation
MODERATE	Conservation
LOW	Active / Working Landscapes
LANDSLIDE RISK	**RIBBON OF GREEN CLASS**
HIGH	Preservation
ENVIRONMENTAL SENSITIVITY MODEL	**RIBBON OF GREEN CLASS**
EXTREMELY HIGH	Preservation
VERY HIGH	Preservation
HIGH	Conservation
MODERATE	Conservation
LOW	Active / Working Landscapes
ARCHAEOLOGICAL EVALUATION	**RIBBON OF GREEN CLASS**
ARCHAEOLOGICAL UNKNOWN (ALLOWS LOW IMPACT)	Preservation
ARCHAEOLOGICAL UNKNOWN (ALLOWS MODERATE	Conservation
ARCHAEOLOGICAL UNKNOWN (ALLOWS HIGH IMPACT)	Active / Working Landscapes

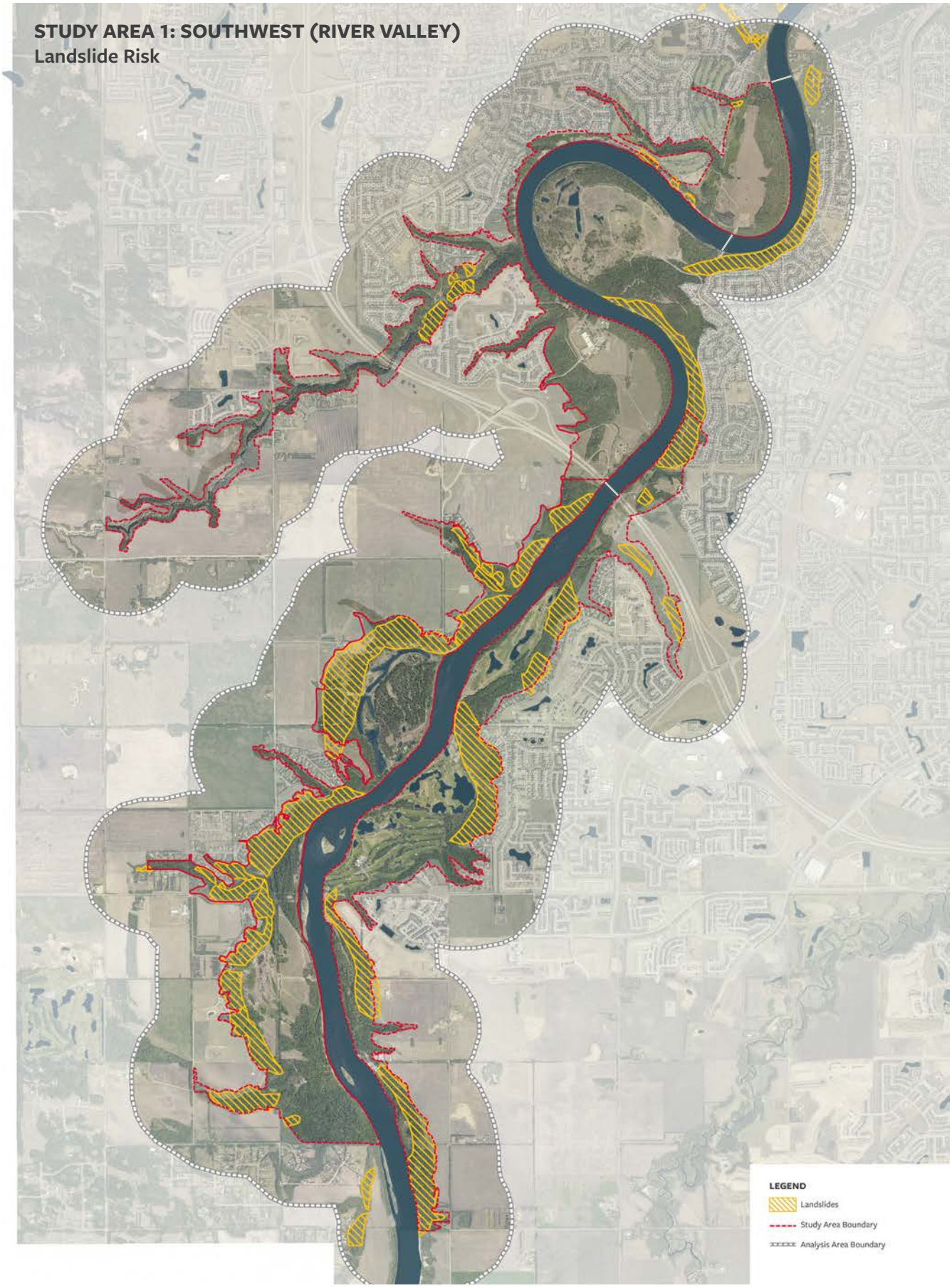
ECOLOGICAL EVALUATION RATING

Areas identified in the Ecological Evaluation (Page 14) as having a 'High' rating (score greater than 38) were assigned to the Preservation Class. Those natural areas placed into the 'Moderate' rating (score between 21 and 38), were assigned to the Conservation class. Finally, areas given a 'Low' rating (score below 21) were assigned to the Active/Working Landscapes class.

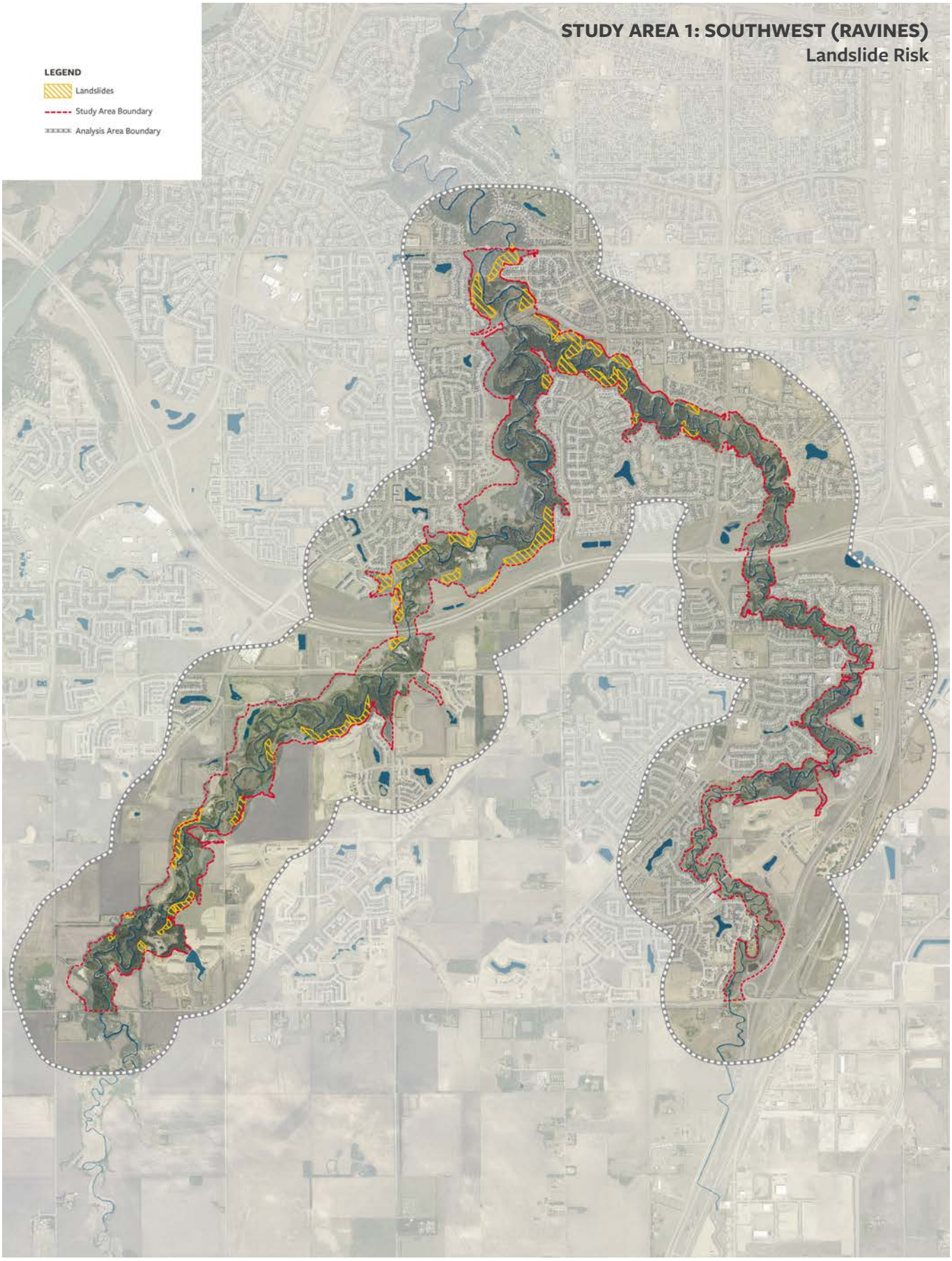
LANDSLIDE RISKS

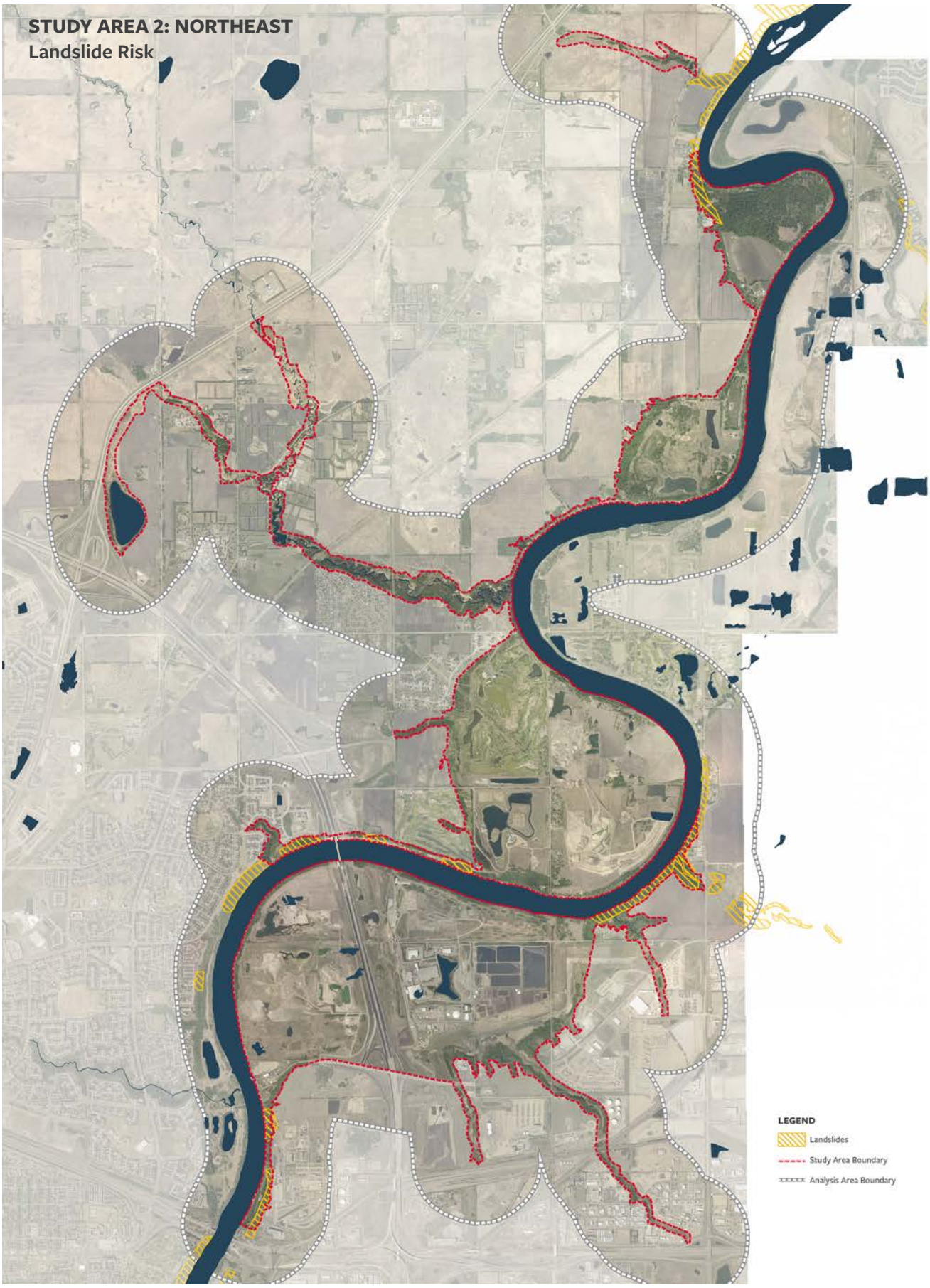
The geotechnical analysis was done by Thurber Engineering Ltd. (Thurber). Bare earth LiDAR from 2015 was used to identify landslides along the valley slopes of the North Saskatchewan River Valley and its tributary ravines. Approximate locations of these landslide features are shown on Figure 6 and 7. At the active landslide locations, the river has actively eroded the toe of the slope, triggering slumping of the upper portions of the slope. Landslide risk analysis formed an important part of the initial Geotechnical assessment; this Geotechnical Evaluation has also been used to inform Ribbon of Green policy and design direction.

STUDY AREA 1: SOUTHWEST (RIVER VALLEY)
Landslide Risk



STUDY AREA 1: SOUTHWEST (RAVINES)
Landslide Risk




STUDY AREA 2: NORTHEAST
Landslide Risk
LEGEND
Landslides
Study Area Boundary
Analysis Area Boundary

ENVIRONMENTAL SENSITIVITY MODEL

The Environmental Sensitivity Model (ESM) dataset was developed by Solstice for the City of Edmonton. The goals of the ESM are to:

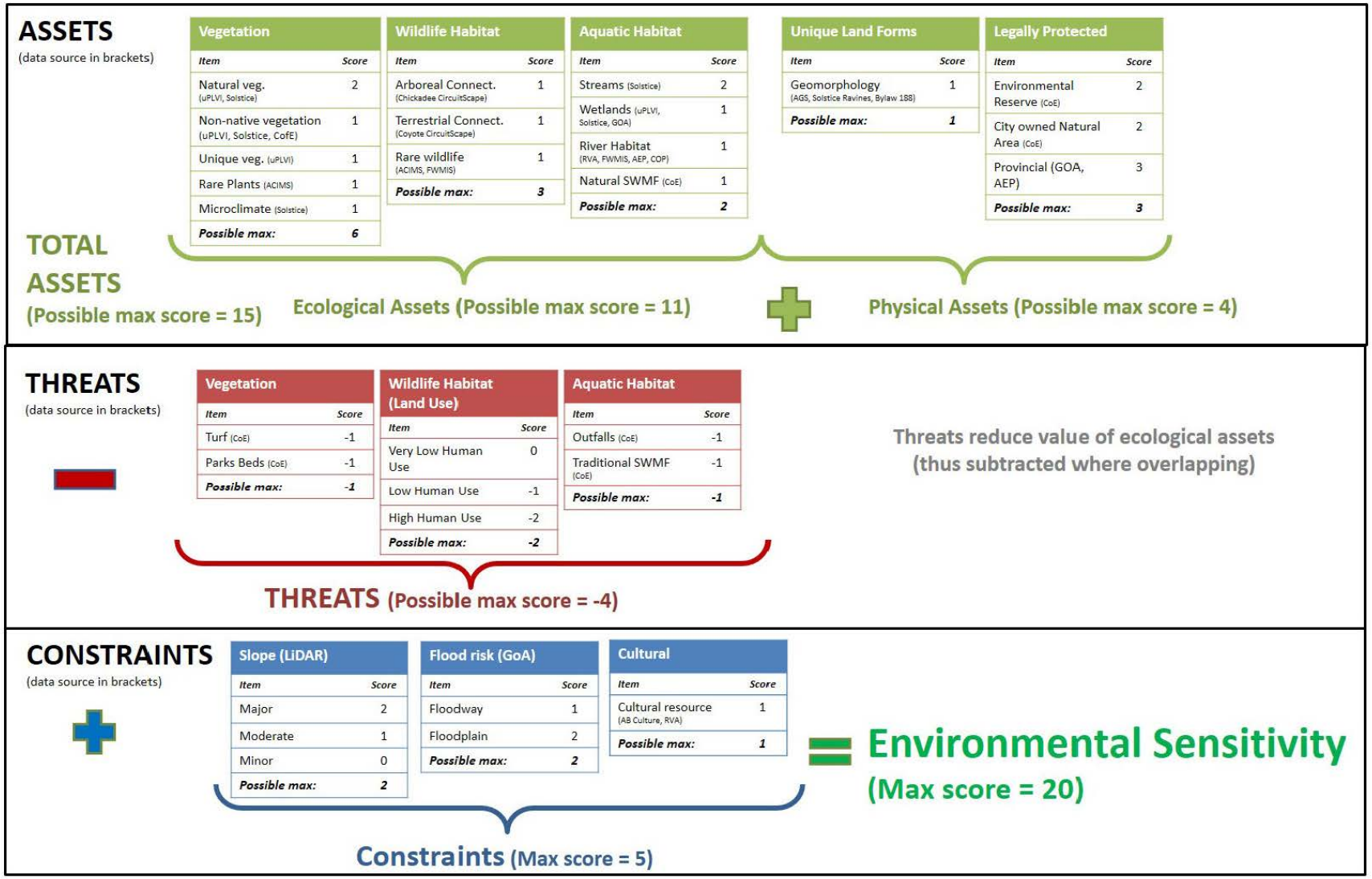
- Advance The City of Edmonton's goal to protect, understand and restore its ecological network, as outlined in the Way We Grow (2010)
- Identify areas with significant ecological value (assets), threats to those valued assets, physical constraints and cultural resources
- Summarize these factors as "environmentally sensitive"
- Identify potential restoration sites

MODEL OUTPUT SCORE = *ASSETS* **+** *DEVELOPMENT CONSTRAINTS* **-** *THREATS*

The model used to develop this dataset was based on 26 different datasets describing ecological and physical assets, threats and development constraints. The figure on the following page describes the manner in which these datasets are combined to create a single Environmental Sensitivity scoring, which were further classified into Low, Moderate, High, Very High and Extremely High categories.

Based on the recommendations from the Environmental Sensitivity Report, O2 assigned Land Management Classifications based on the ESM classes. Extremely High and Very High Values from the ESM data were translated into the Preservation classification; High and Moderate Values were translated into the Conservation classification; and Low Value areas translated into the Active/Working Landscapes classification.

Figure 1. From City of Edmonton Environmental Sensitivities Report 2017



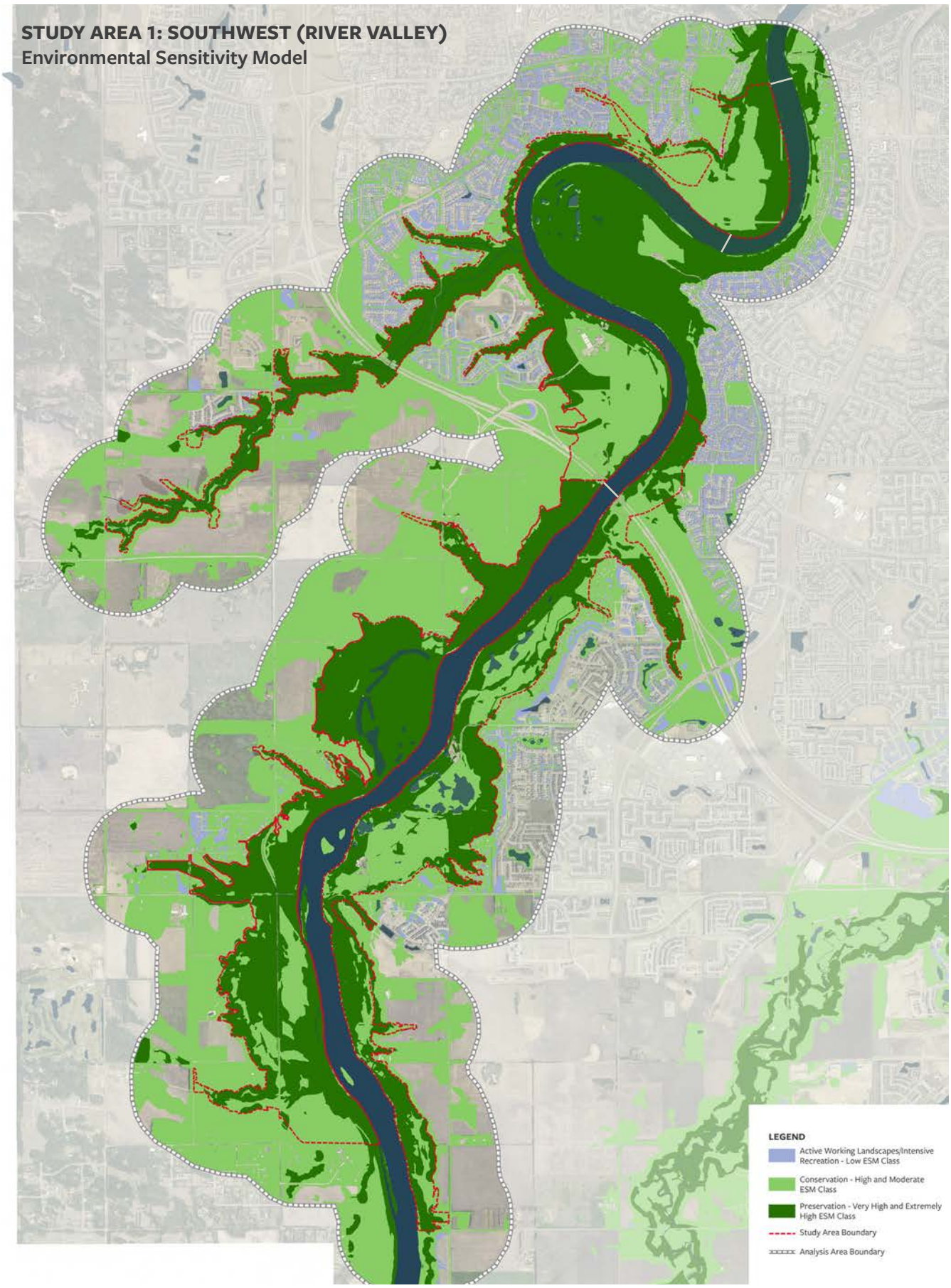
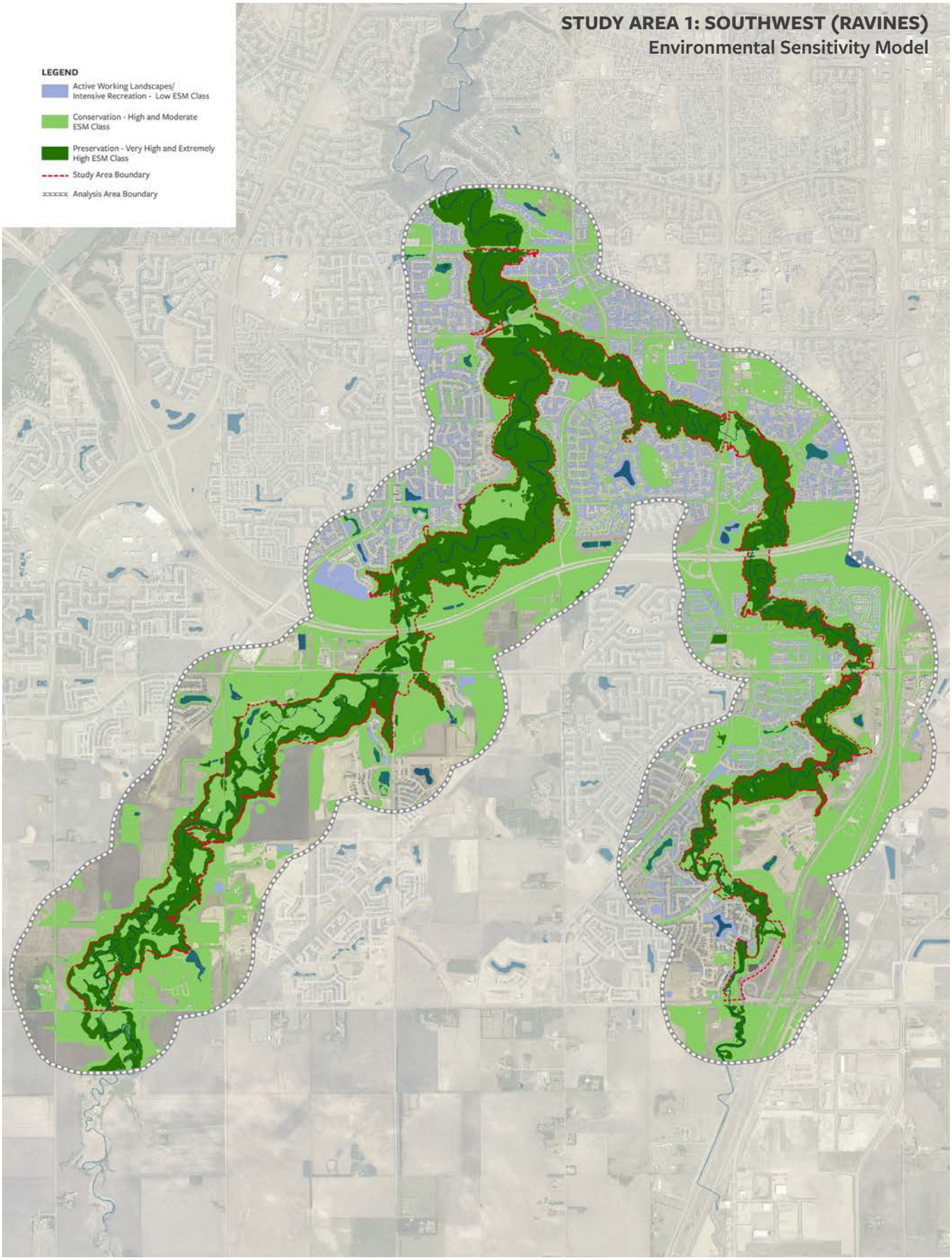
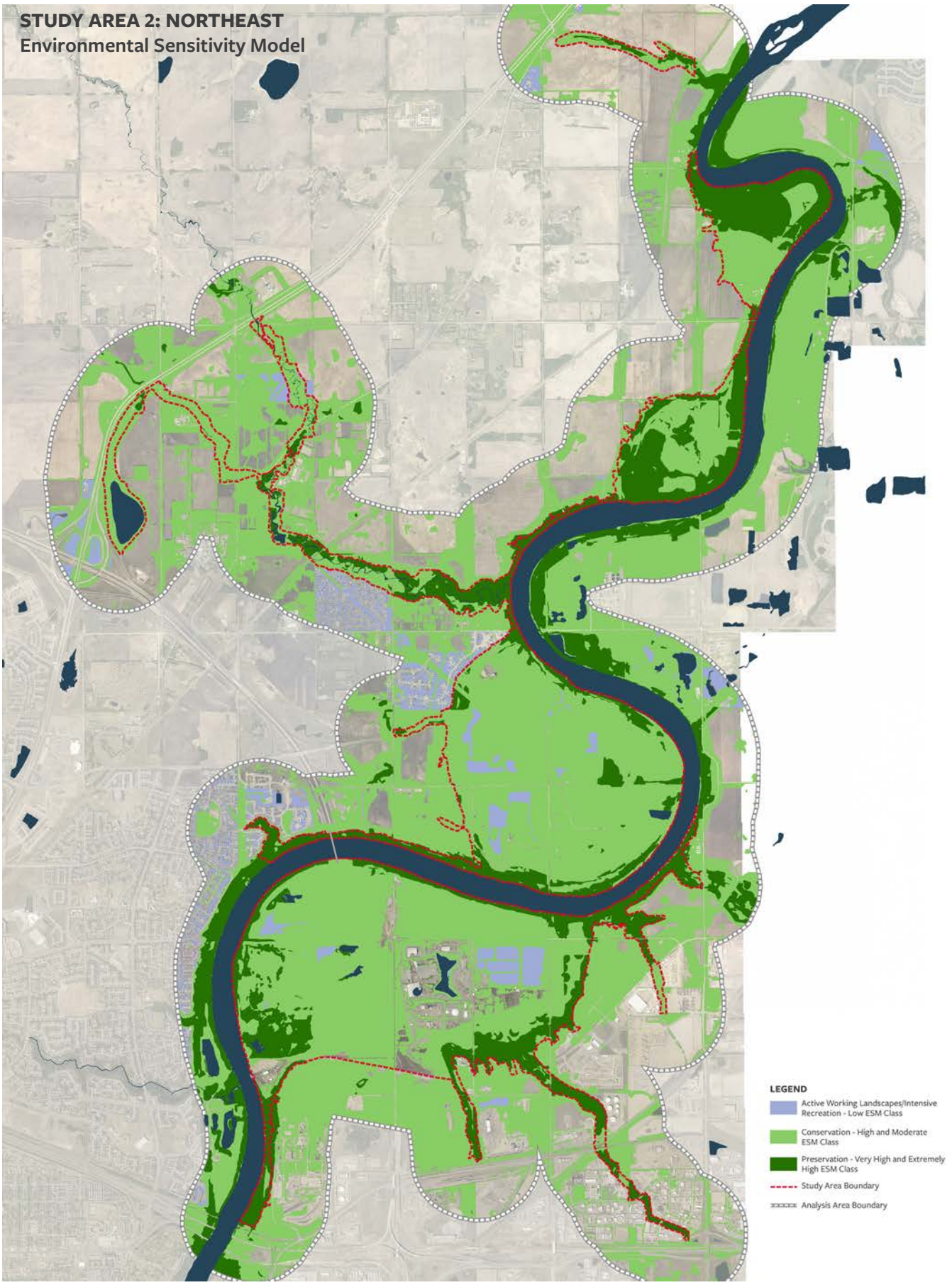


Figure 2. Southwest Ecology ESM (River Valley)

STUDY AREA 1: SOUTHWEST (RAVINES)
Environmental Sensitivity Model



STUDY AREA 2: NORTHEAST
Environmental Sensitivity Model



ARCHAEOLOGICAL POTENTIAL

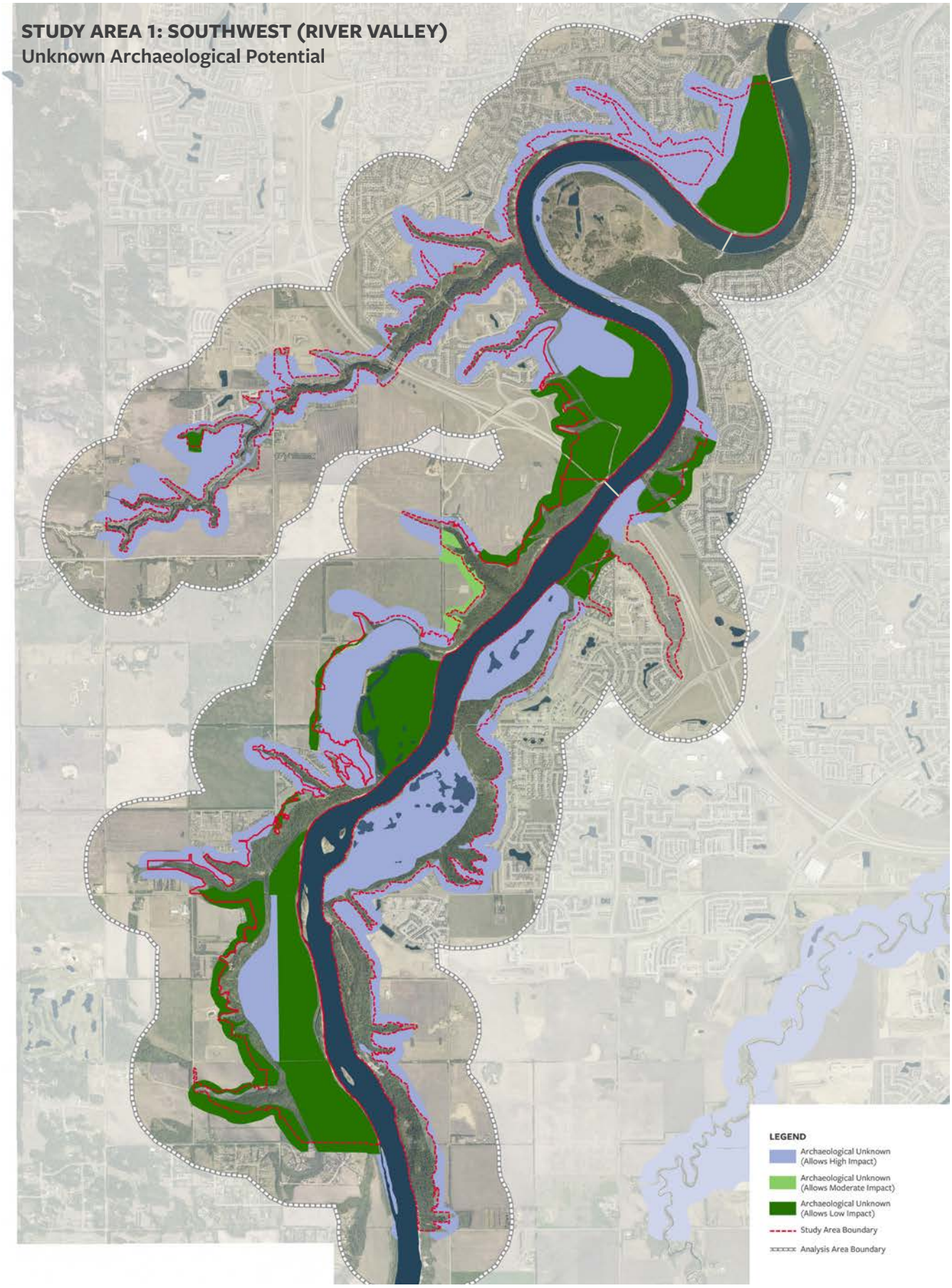
An archaeological potential dataset was developed by Western Heritage for their Historic Resources Overview Report, who recommended the classification of areas into Preservation, Conservation and Active/Working Landscapes based on the likelihood of important historic, cultural or archaeological artifacts.

Two datasets were used: a set of buffered (100m) point locations around areas of Known Archaeological Resources and Historic Sites, and a broader spatial assessment of Unknown Archaeological Resources (based on the anticipated probability of encountering or disturbing archaeological resources). Each resource was mapped and classified by Western Heritage according to the level of development impact the site could withstand (high, moderate or low/none). These findings were subsequently translated into Land Management Classifications. Areas with known highly valuable resources or with unknown resource potential that could only tolerate low impacts were assigned to Preservation. For Conservation, areas with known resources that could accommodate moderate impacts or areas with unknown resource potential, which can tolerate moderate impacts delineated. The remaining areas were classified under Active/Working Landscapes.

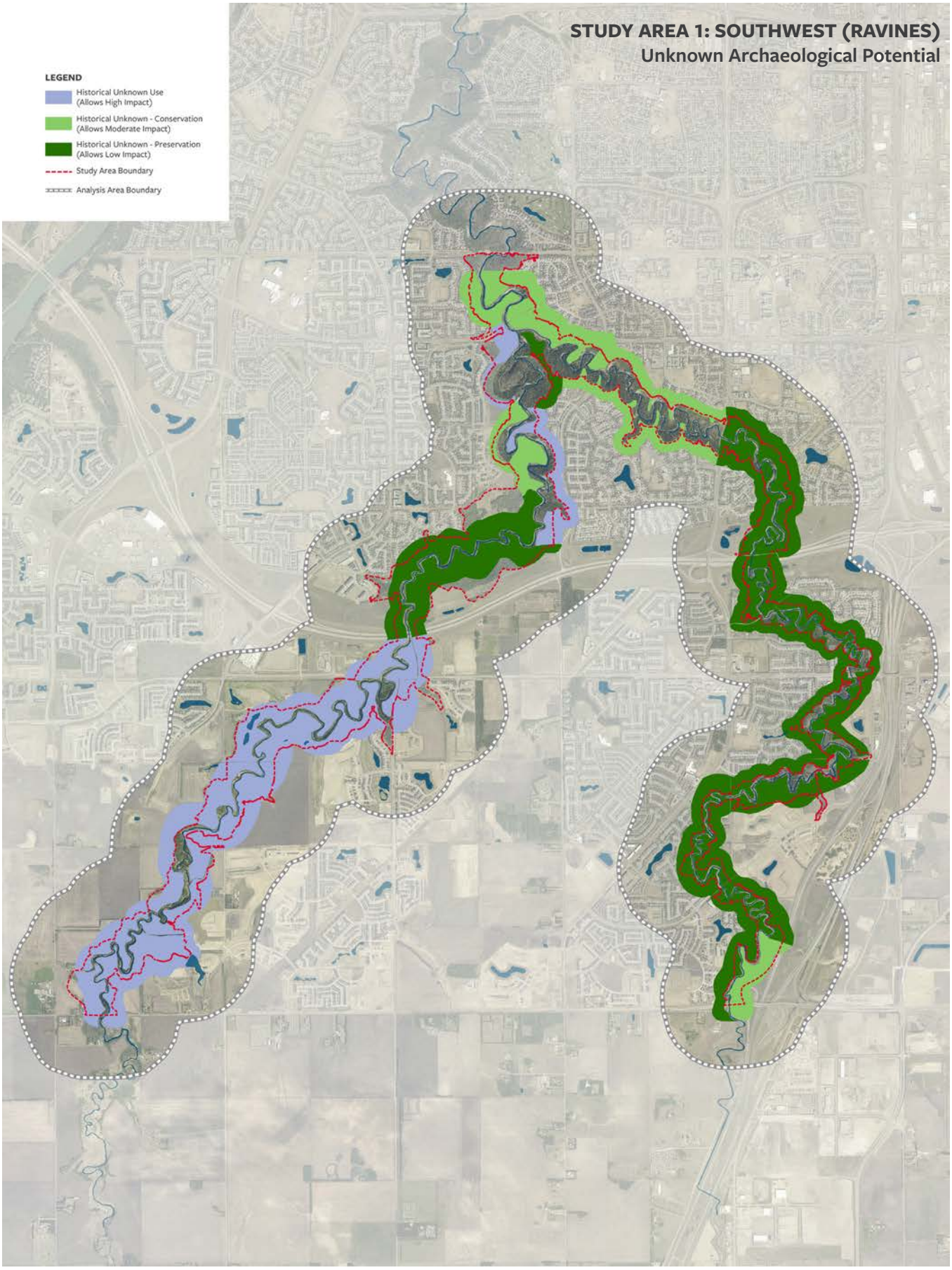
To resolve overlaps, the Preservation classification was defined as the highest priority, overriding the others. The Conservation classification in turn overrides the Active/Working Landscapes classification.

Refer to the Ribbon of Green Historical Resources Overview for further detail.

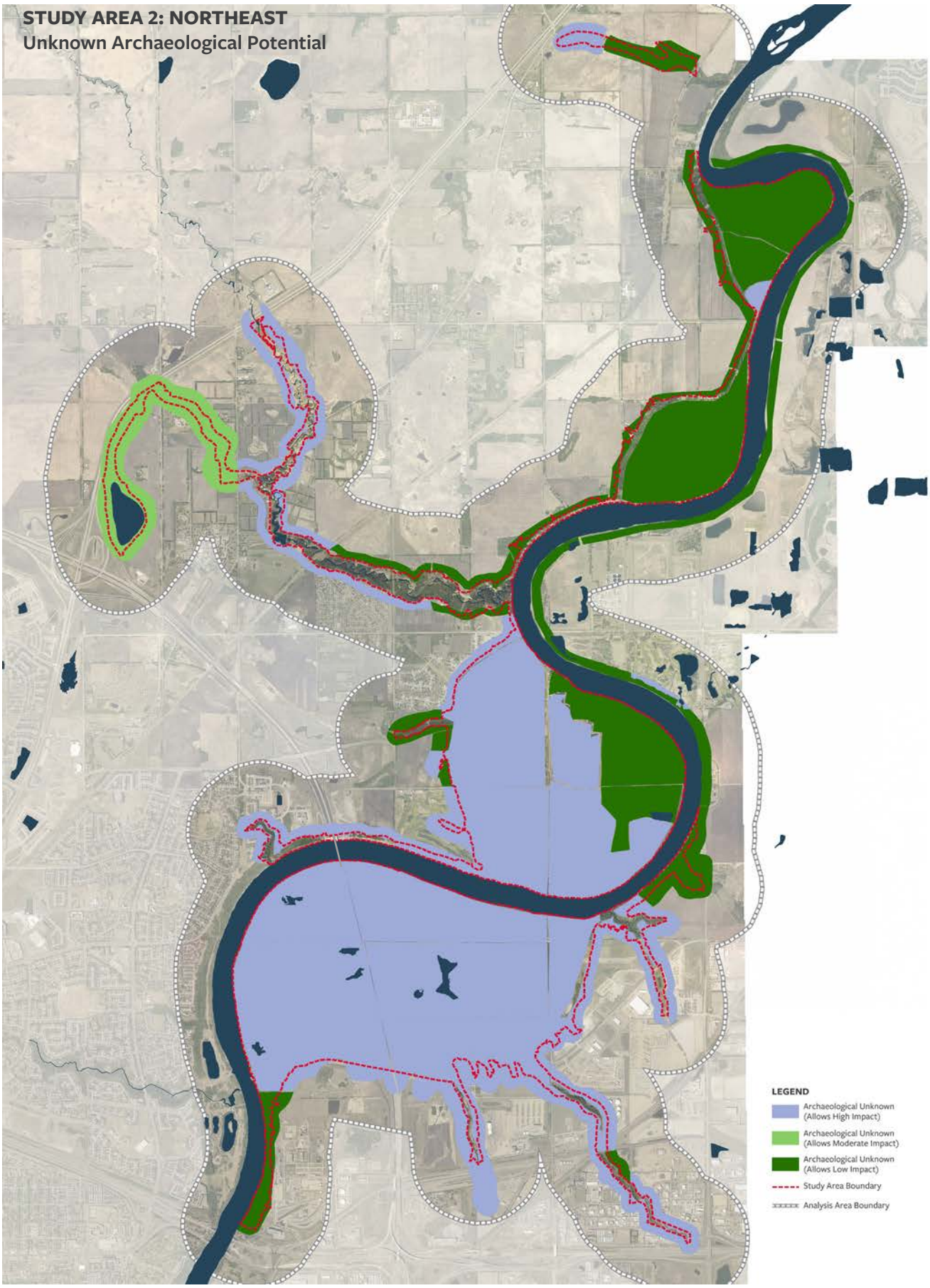
STUDY AREA 1: SOUTHWEST (RIVER VALLEY)
Unknown Archaeological Potential



STUDY AREA 1: SOUTHWEST (RAVINES)
Unknown Archaeological Potential



STUDY AREA 2: NORTHEAST
Unknown Archaeological Potential



DATA DERIVED LAND MANAGEMENT CLASSIFICATION

The recommended Land Management Classification (Preservation, Conservation and Active/Working Landscapes) was informed initially by three major spatial datasets:

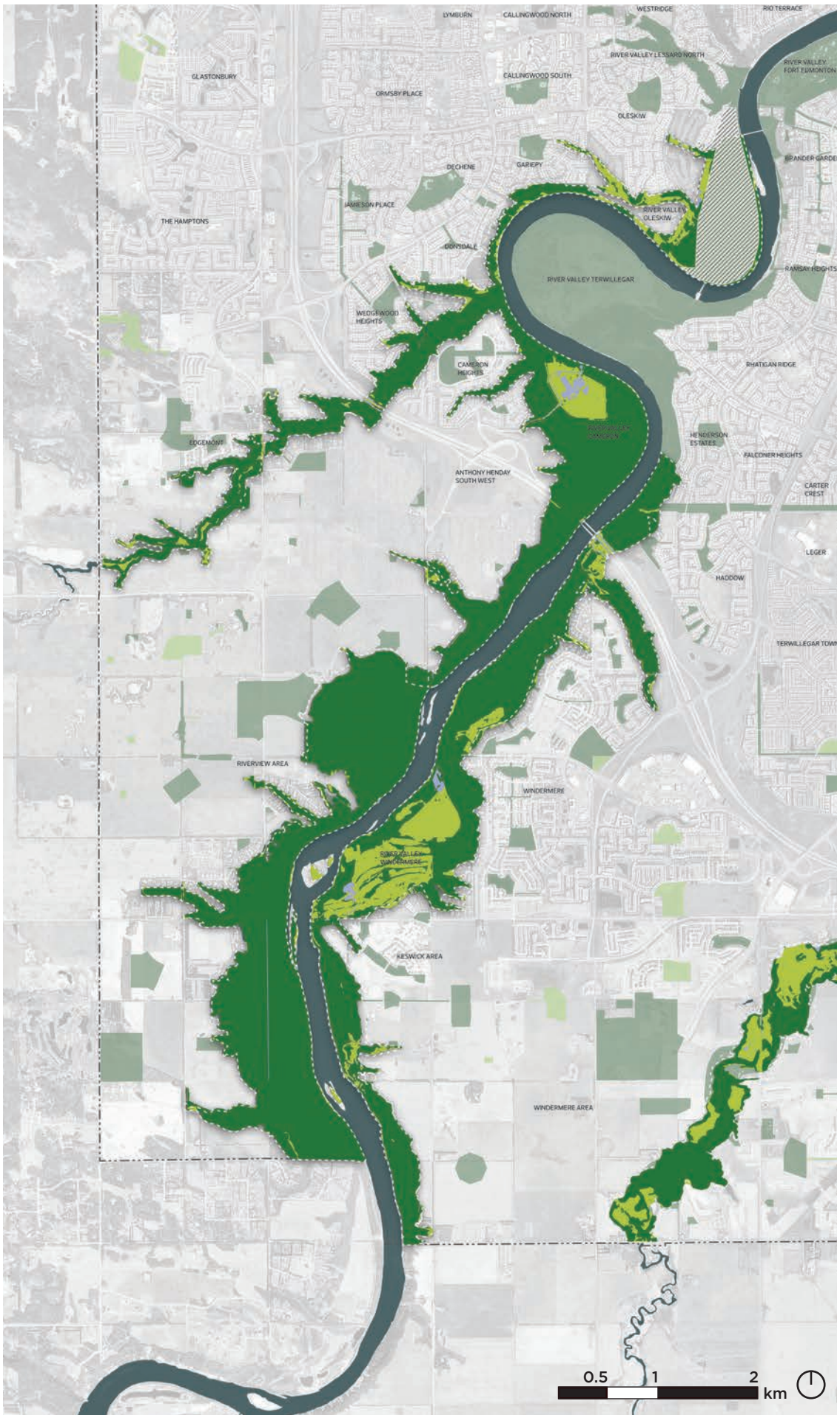
- **Ecological Evaluation Natural Area Ratings** were used to identify important existing natural areas within the study region.
- **Landslide risks** were identified during the geotechnical assessment, drawing on LiDAR and aerial imagery to identify where slopes had previously been compromised
- **The City's Environmental Sensitivity Model** makes recommendations for the appropriate classifications, based on a 26 individual datasets.
- **Archaeological Potential,** drawing from expert recommendations, identifies known and likely locations of cultural and archaeological finds.

The combination of these datasets resulted in an initial data-recommended spatial delineation of the Land Management Classifications, which through consultation with the City has been adapted and manually revised to create the proposed Land Management Classification Map. presented on the following pages.

Individual data layers (natural area rating, landslide risks, land cover, ESM, archaeological potential) were unioned together, with the combined classification taking the most restrictive category, Preservation > Conservation > Active/Working Landscapes. An area is allocated into the Preservation classification if any of the associated data layers included a Preservation recommendation. Similarly, Conservation areas had at least one dataset recommend the Conservation classification (and no Preservation recommendations). Active/Working Landscapes are restricted to those areas with neither Preservation nor Conservation features.

Modification to the data-recommended management classification was made to ensure that it aligned with the intended plans and existing conditions within the study area. Areas of recreational use (such as existing private golf courses), planned parks (such as Oleskiw River Valley Park), historic recreational use (such as the Old Klondike Campground) and areas with vehicle access (such Woodbend Natural Area) had some appropriate areas of the site shifted to Active/Working Landscapes with buffers of Conservation added to separate the more intensive use from Preservation areas.

SW DATA-DERIVED LAND MANAGEMENT CLASSIFICATION



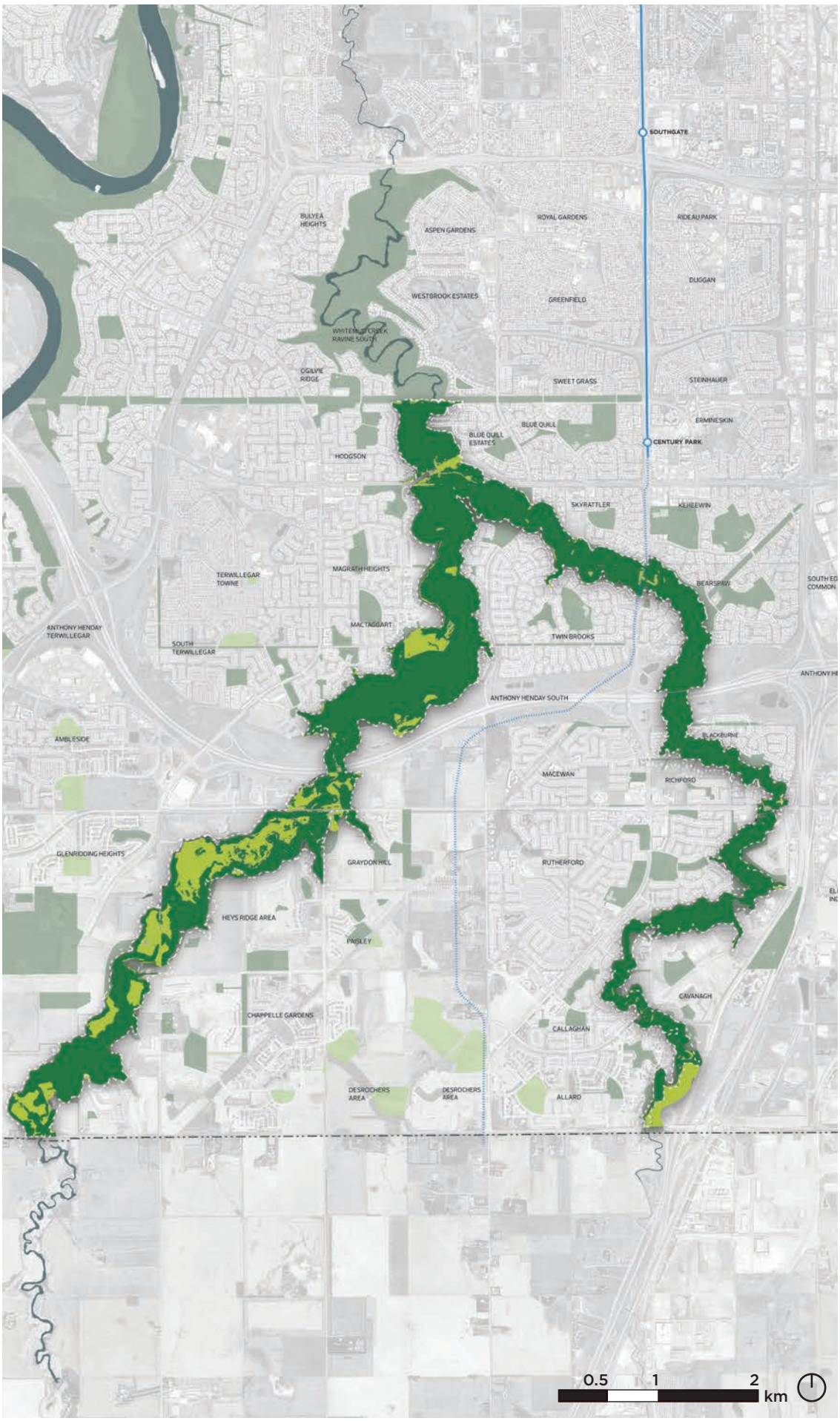
LEGEND

- Existing Parks
- Future Parks

Management Classification

- Preservation
- Conservation
- Active / Working Landscapes

RAVINE DATA-DERIVED LAND MANAGEMENT CLASSIFICATION



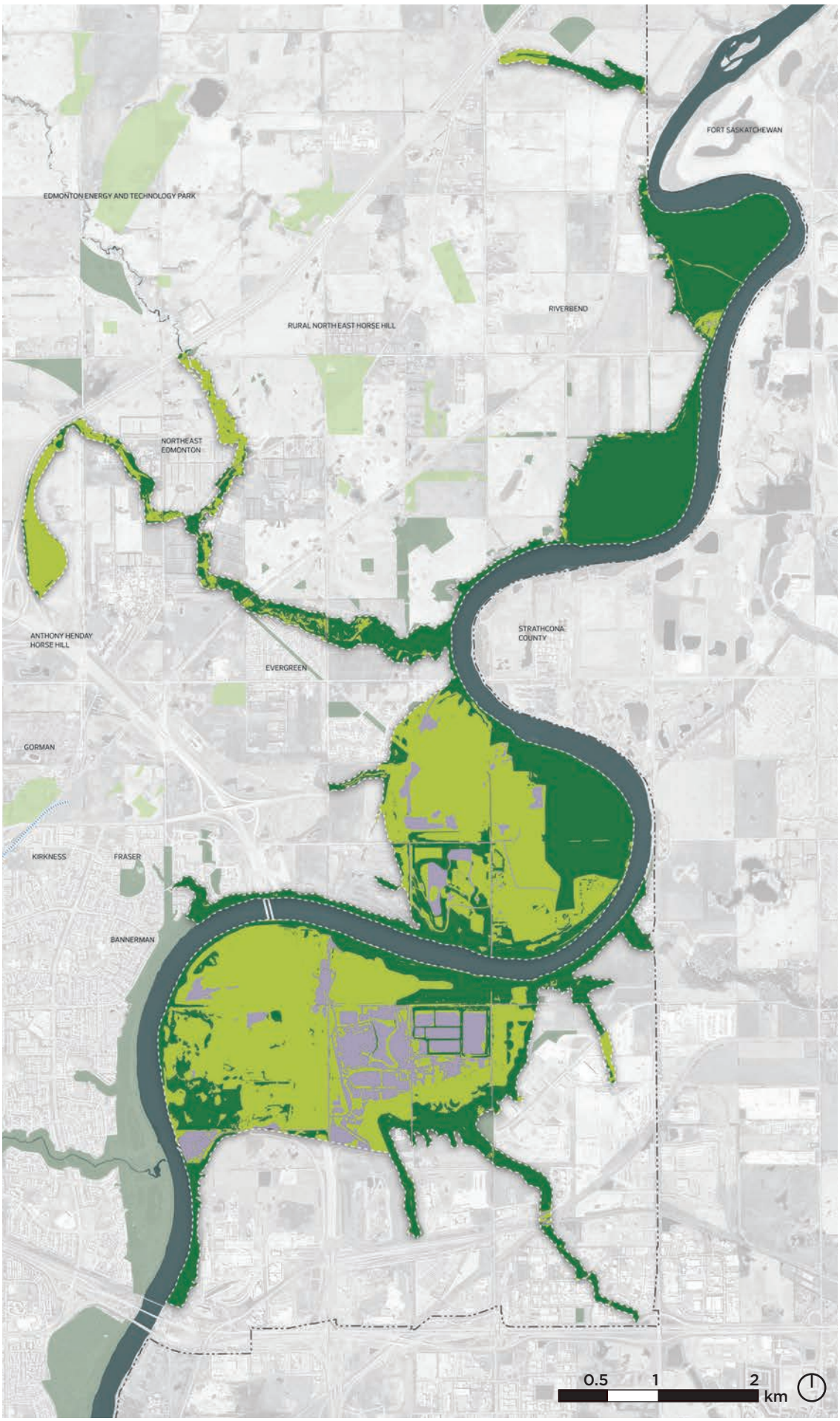
LEGEND

- Existing Parks
- Future Parks

Management Classification

- Preservation
- Conservation
- Active / Working Landscapes

NE DATA-DERIVED LAND MANAGEMENT CLASSIFICATION



LEGEND

- Existing Parks
- Future Parks

Management Classification

- Preservation
- Conservation
- Active / Working Landscapes

MANUAL REFINEMENT OF LAND MANAGEMENT CLASSIFICATIONS

When planning both study areas, it is important to consider the anticipated population growth around each study area: approximately 300,000 in the SW and 150,000 in the NE. This is in addition to the anticipated overall growth within the City and increasing demand for River Valley and Ravine System (System) opportunities, which is a city-wide asset. Coupled with the ongoing challenge of user-generated trails (natural trails developed by individuals that are not planned or maintained by the City of Edmonton), recreational and access opportunities in the System are and will continue to be in high demand. This requires careful planning to protect significant areas while accommodating recreation.

After generating the data-derived classification, a manual refinement of the Land Management Classifications occurred to account for land use (planned and existing) and access. These manual refinements are described below:

CONVERSION TO PRESERVATION

- Whenever possible, areas that were recommended by the data-derived analyses for Preservation were retained as Preservation, with adjustments introduced only to provide recreational opportunities (as described below) or acknowledge an existing use.
- Forested areas that were classified as Conservation areas were changed into Preservation areas to fill gaps and create a more contiguous and easily protected set of Preservation areas.

CONVERSION TO CONSERVATION

- All proposed active recreation trails are allocated to Conservation, with their specific footprint and intensity of use contributing to the necessary width of the Conservation delineation. These are major regional connections and access points that will require verification during site-specific planning.
- Conservation buffers around Preservation areas were applied when appropriate and feasible to minimize disturbances to the Preservation areas. Their size and shape was determined by terrain and land cover.

CONVERSION TO ACTIVE WORKING LANDSCAPES/INTENSIVE RECREATION

- **Principle 1: Direct activity to areas with lower ecological value** – There are locations throughout the System that were previously used for agriculture and other purposes that are now areas of semi-natural vegetation (land cover disturbed as a result of human activity, such as former agricultural land). When these semi-natural areas do not contain any or contain only limited amounts of significant riparian areas, unique or rare vegetation or identified wildlife corridors and pinch points, they provide an opportunity for more recreational activity without disturbing more sensitive areas.

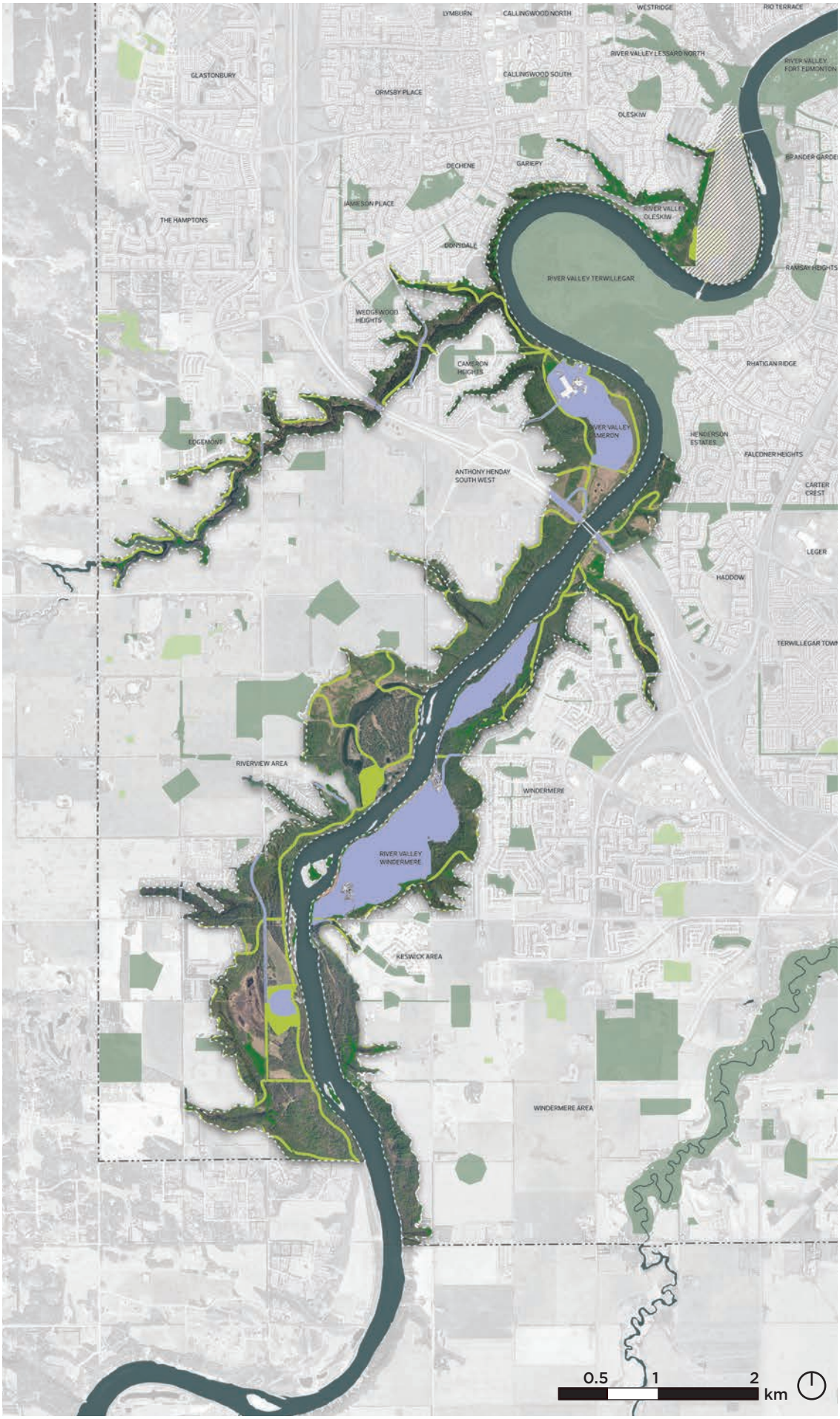
- **Principle 2: Concentrate activity in already disturbed areas –** In both study areas, there are locations that are currently being used for purposes other than parks or natural protection. Specifically, the following are used for industrial, recreational, and agricultural purposes:
  - The E.L. Smith Water Treatment Plant
  - Riverbend Gardens
  - The Edmonton Waste Management Centre
  - Windermere Golf and Country Club, Rivers Edge Golf and Country Club, Edmonton Country Club and Golf Course, Jagare Ridge Golf Club, Raven Crest Golf and Country Club, and The Quarry Golf Club

  Since the current use of these sites is in alignment with the Active/Working Landscape classification these areas were re-classified to ensure that current uses align with the Ribbon of Green. The final Ribbon of Green document will contain policy to guide the restoration and appropriate repurposing of these sites if they cease to be needed/ used for their current purpose.

- **Principle 3: Focus activity, when possible, in areas with good access (roads, trails etc.)** – Given the slopes and sensitivity of the Ribbon of Green, and thus the limited opportunities to provide access into the System, it is important to take advantage of existing access points to focus activity:
  - Since 199 Street goes through the Woodbend Natural area, an area of Active/Working Landscapes is defined on the east side of the road to provide river access and recreational opportunities.
  - Existing trail access and paved areas in the Old Klondike Campground (converted to Conservation and some Active Working Landscapes) provide a location to focus future recreational opportunities.
  - Grandisle Road (currently a private road) could, in the future, connect to the southern part of Big Island (converted to Conservation).
  - Like Big Island, an area within the southernmost section of the South Whitemud Ravine (converted to Active/ Working Landscapes) currently has private road access that in the future can potentially accommodate public access.
  - There are also instances of current and future road crossings that were reclassified as Active/Working landscapes to accommodate this function.

  Like with all other sites converted to Active/Working Landscapes, it is important to plan for ecologically sensitive design and programming, and restore areas whenever possible.

SW LAND MANAGEMENT CLASSIFICATIONS MANUAL EDITS



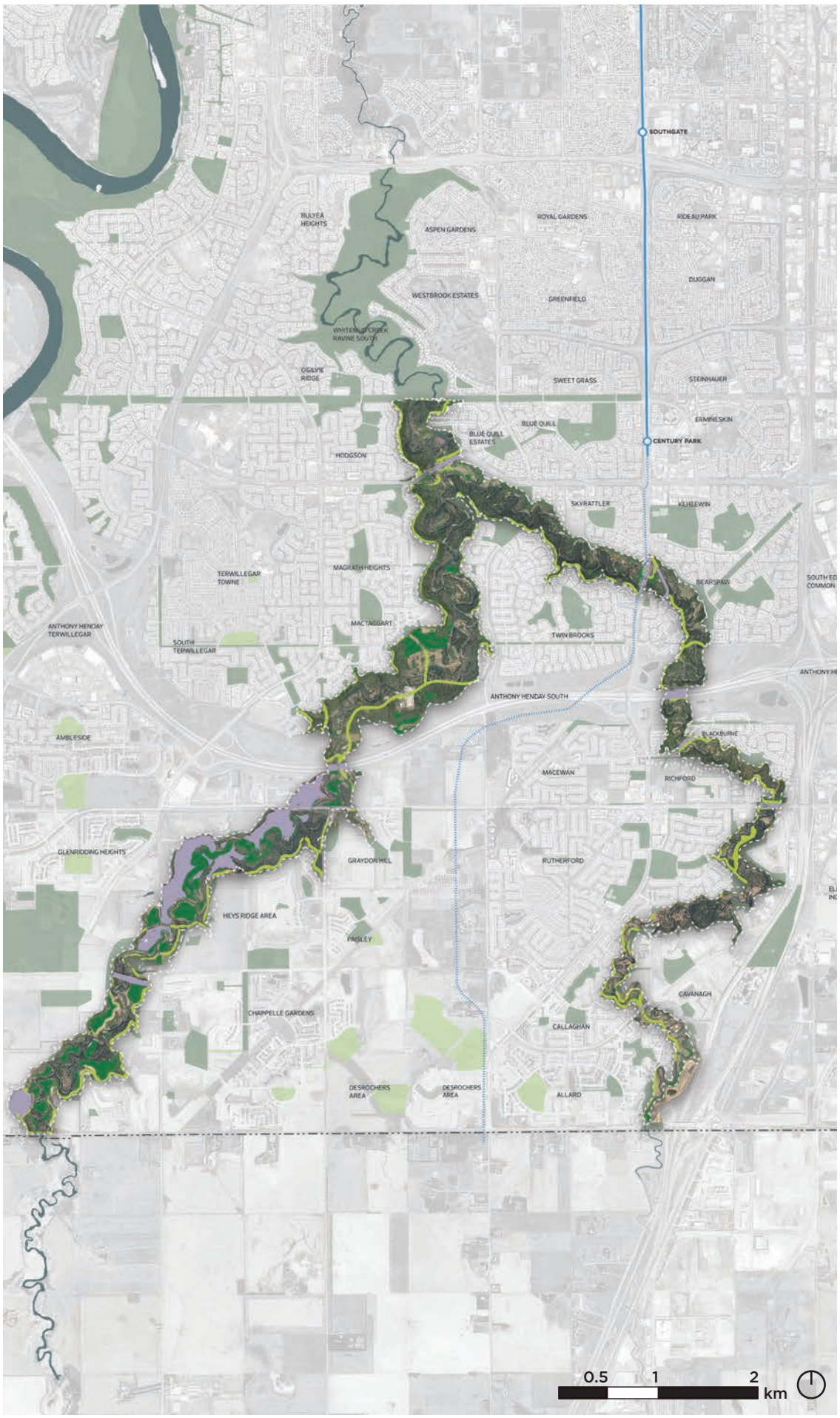
LEGEND

- Existing Parks
- Future Parks

Manually Adjusted To

- Preservation
- Conservation
- Active / Working

RAVINE LAND MANAGEMENT CLASSIFICATIONS MANUAL EDITS



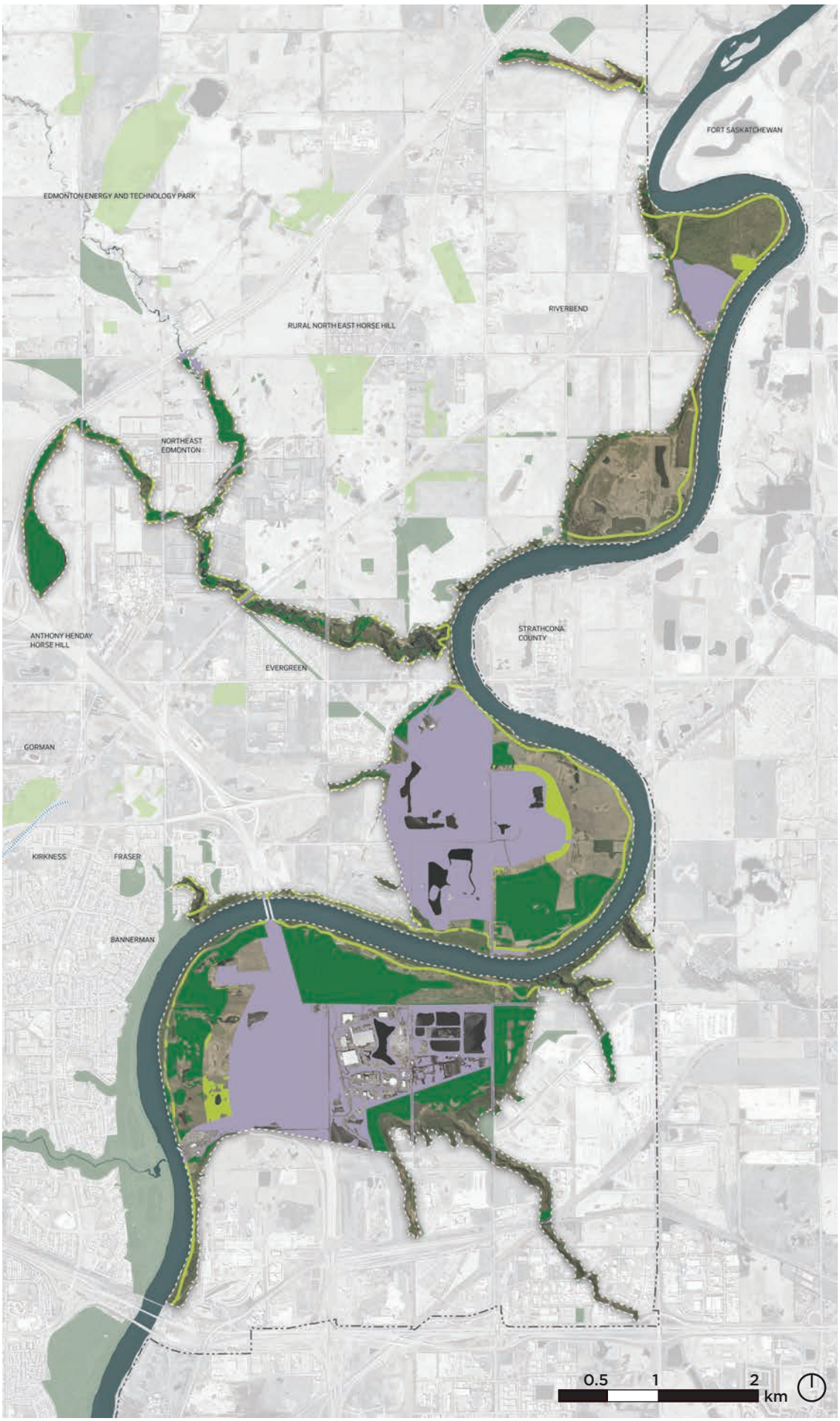
LEGEND

- Existing Parks
- Future Parks

Manually Adjusted To

- Preservation
- Conservation
- Active / Working

NE LAND MANAGEMENT CLASSIFICATIONS MANUAL EDITS



LEGEND

- Existing Parks
- Future Parks

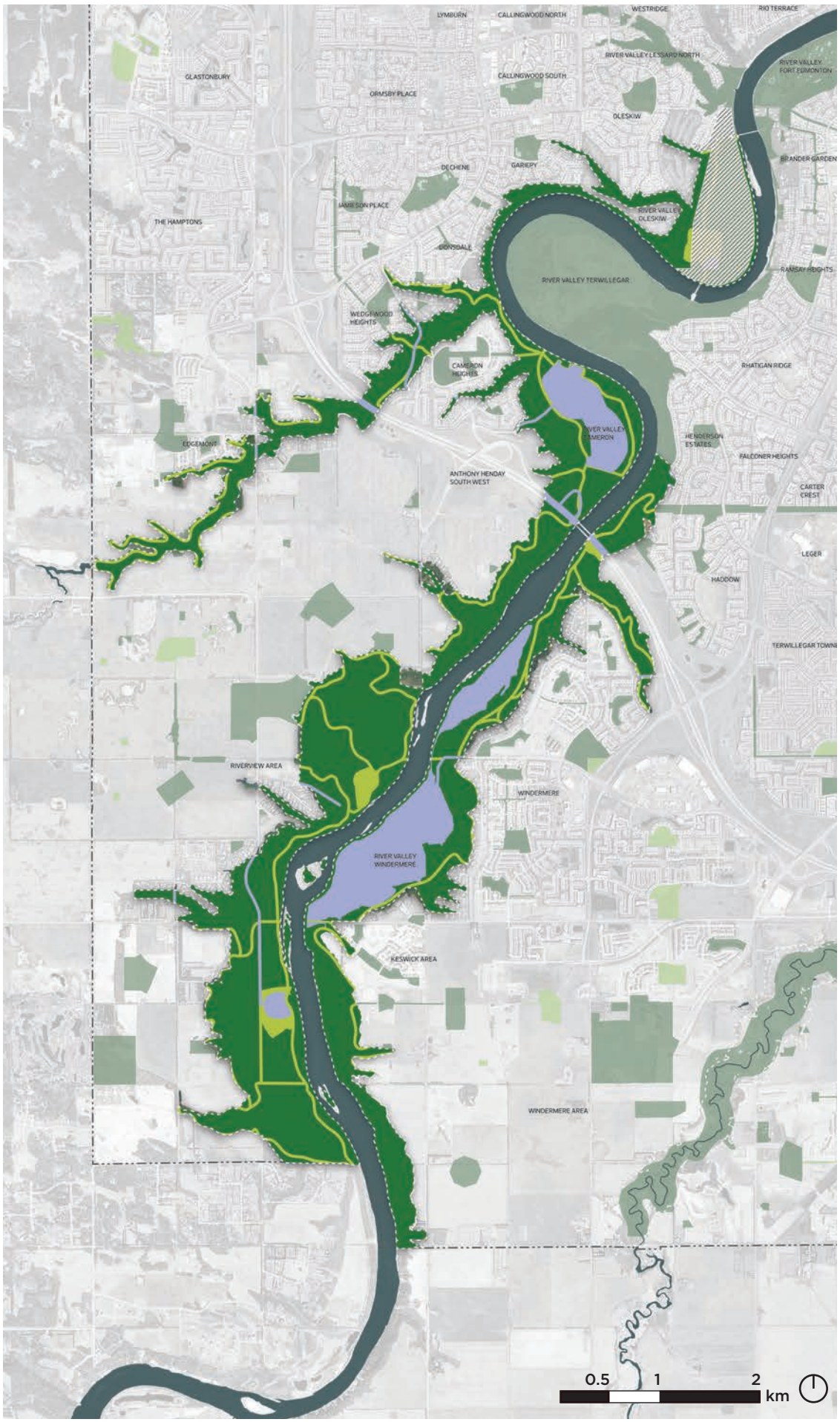
Manually Adjusted To

- Preservation
- Conservation
- Active / Working

LAND MANAGEMENT CLASSIFICATION

Existing datasets, consultation with the client and detailed expert evaluation informed the delineation of the Land Management Classification. This delineation broadly classifies areas into Preservation, Conservation and Active/Working Landscapes. Any further refinement based on site conditions and the application of sub-classifications will be spatially denoted during more fine-scale planning stages.

SW LAND MANAGEMENT CLASSIFICATION



LEGEND

- Existing Parks
- Future Parks

Management Classification

- Preservation
- Conservation
- Active / Working Landscapes

RAVINE LAND MANAGEMENT CLASSIFICATION

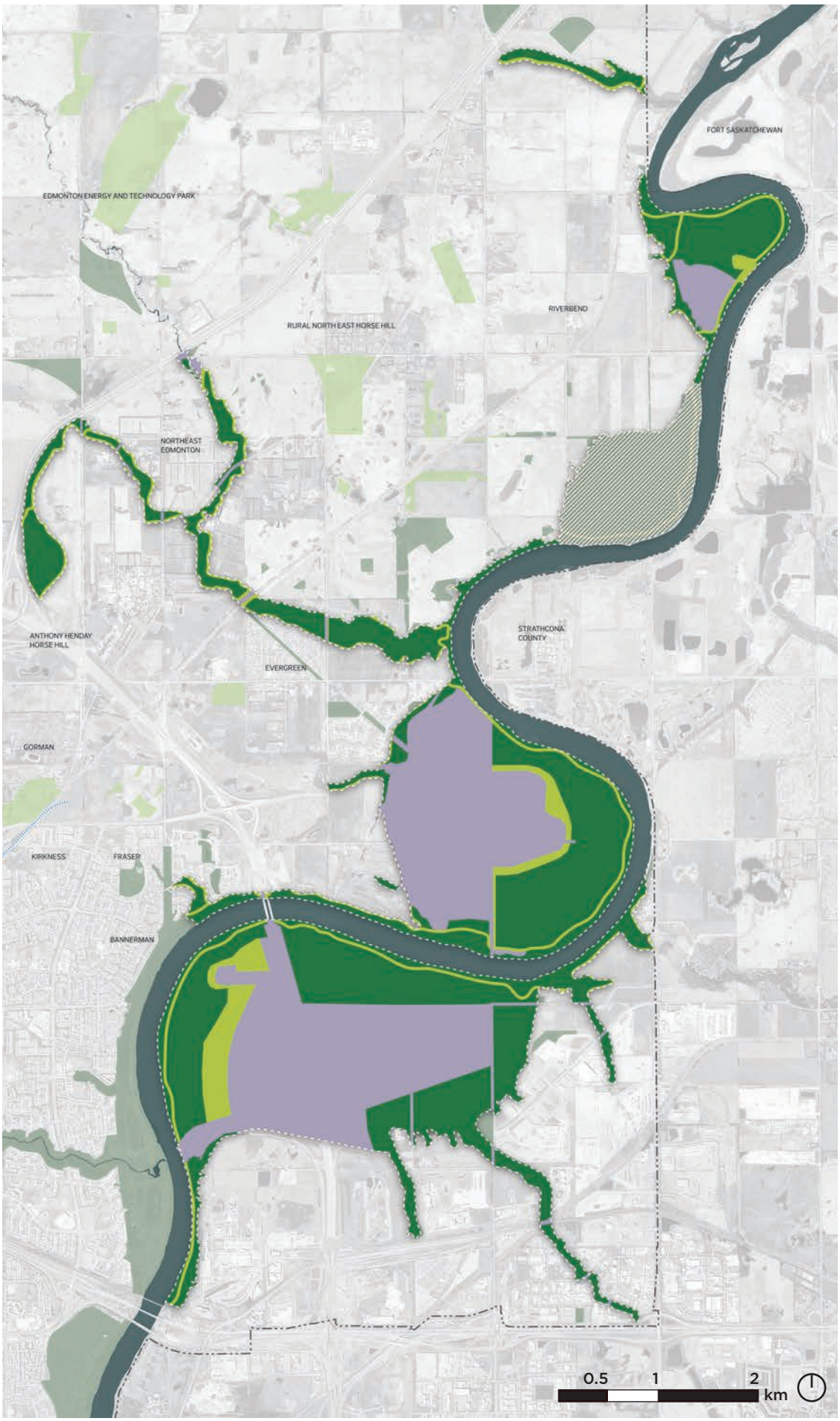
LEGEND

- Existing Parks
- Future Parks

Management Classification

- Preservation
- Conservation
- Active / Working Landscapes

NE LAND MANAGEMENT CLASSIFICATION



LEGEND

- Existing Parks
- Future Parks

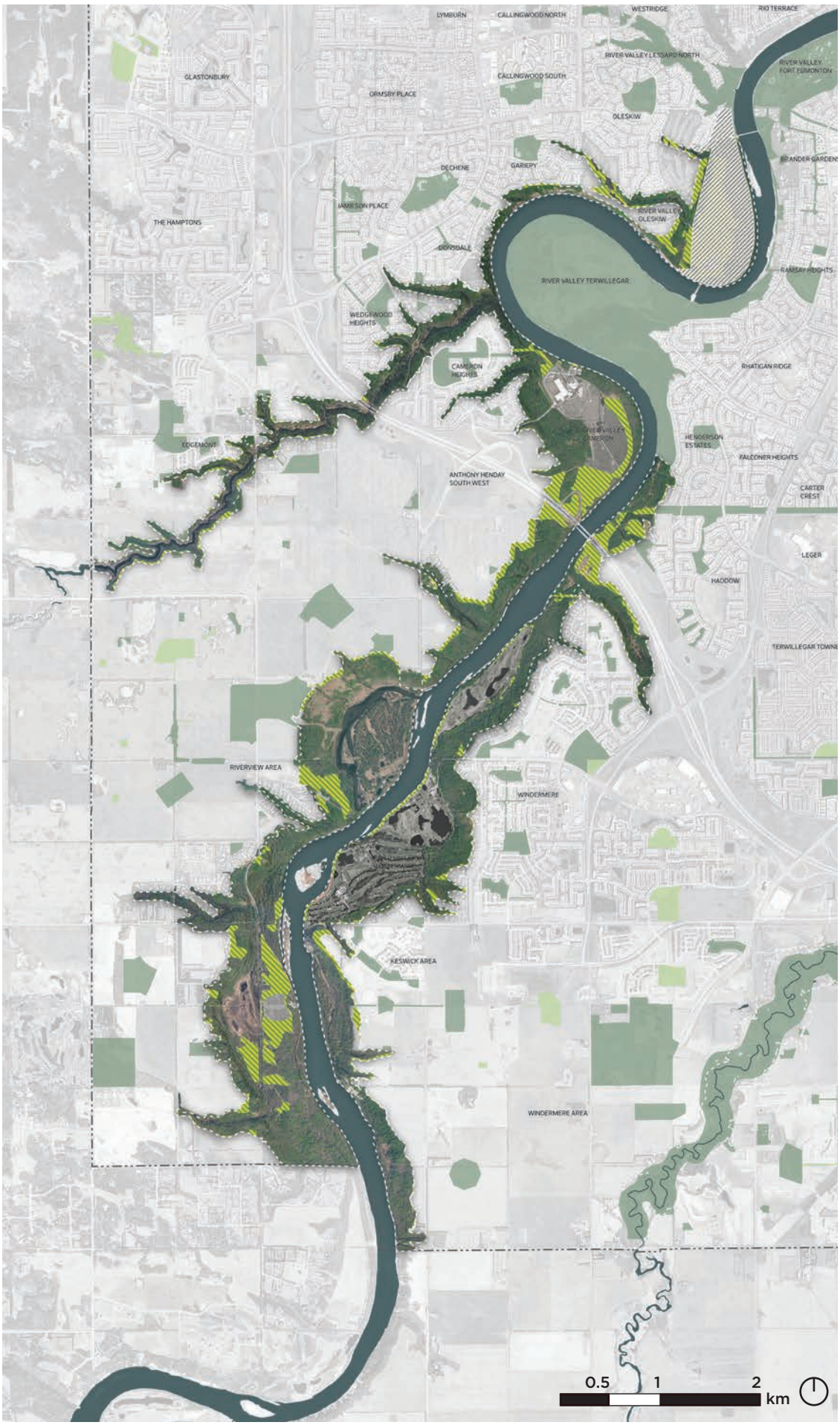
Management Classification

- Preservation
- Conservation
- Active / Working Landscapes

POTENTIAL RESTORATION AREAS

Following the development of the Land Management Classifications (page 49), potential restoration areas are identified by intersecting Preservation and Conservation Areas with developed and modified land cover classes. The resulting set of sites reflect areas which may be beneficially restored to more natural land cover types, increasing the overall supply of natural habitat, and providing potential improvement to the ecological functioning of the existing natural cover. As more detailed site-level plans and comprehensive inventories are conducted, validation and refinement of these potential restoration areas will undoubtedly provide a clearer picture of the most appropriate use of these lands. Similarly, as finer-scale plans are developed, prioritization of these restoration efforts will ensure cost-effective and successful outcomes which maximize the improvement of natural functioning in these landscapes.

SW POTENTIAL RESTORATION AREAS



LEGEND

Restoration Areas

Existing Parks

Future Parks

RAVINE POTENTIAL RESTORATION AREAS

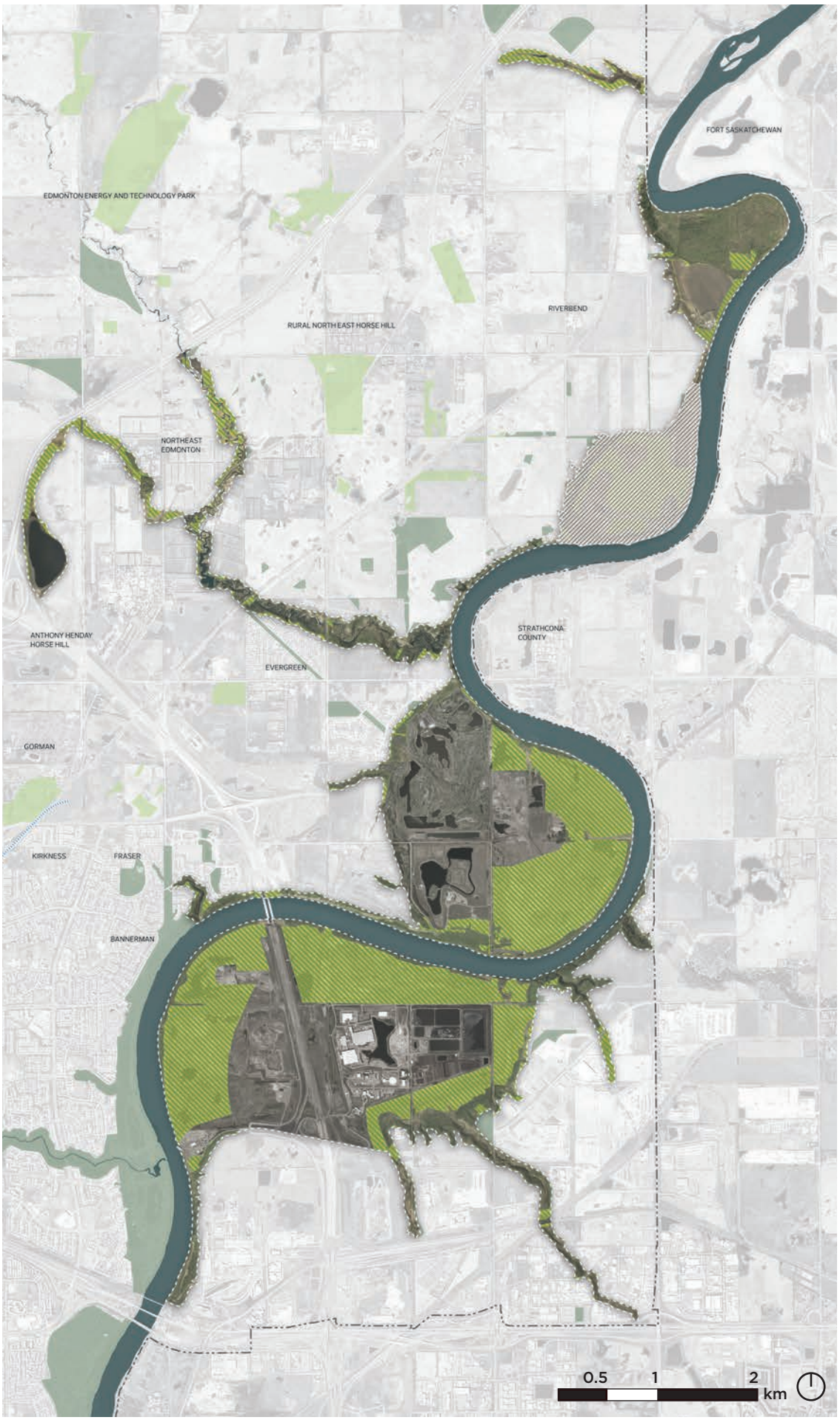
LEGEND

Restoration Areas

Existing Parks

Future Parks

NE POTENTIAL RESTORATION AREAS



LEGEND

- Restoration Areas
- Existing Parks
- Future Parks

4 THE EXISTING ECOLOGICAL NETWORK

The Existing Ecological Network map highlights the existing ecological conditions of the study area and the region surrounding it. These maps are meant to provide context for the current conditions of the region, and highlight valued natural features in and around the study area. They provide a synthesis of the important existing features on the landscape that contribute to the natural functioning of the area, and highlight existing challenges occur. These maps include the following components:

- The Ecological Evaluation Natural Areas Rating (methodology described in (page 15))
- Wetlands
- Stormwater management features
- Open water
- Streams with Strahler Order 3 and above
- Existing trails
- Wildlife passages
- Major roads
- The Environmental Sensitivity Model's coyote and chickadee corridors and key pinchpoints

These maps represent the current state of understanding of these lands, based on a snapshot of ecological value in the area derived from currently available data. Since this data has not necessarily been collected as part of a detailed inventory of the area, the absence of data does not necessarily guarantee the absence of ecological value.

SW EXISTING ECOLOGICAL NETWORK

LEGEND

Study Area Features

- Wildlife Passages
- Arterial and Collector Roads
- Natural Water Bodies
- Storm Water Management Features
- 30m Stream/Wetland Buffer

Circulation features

- Existing Trail

Streams

- Strahler 3
- Strahler 4
- Strahler 5
- Strahler 6

Wetlands

- Not Classified
- Class I
- Class II
- Class III
- Class IV
- Class V
- Class VIII

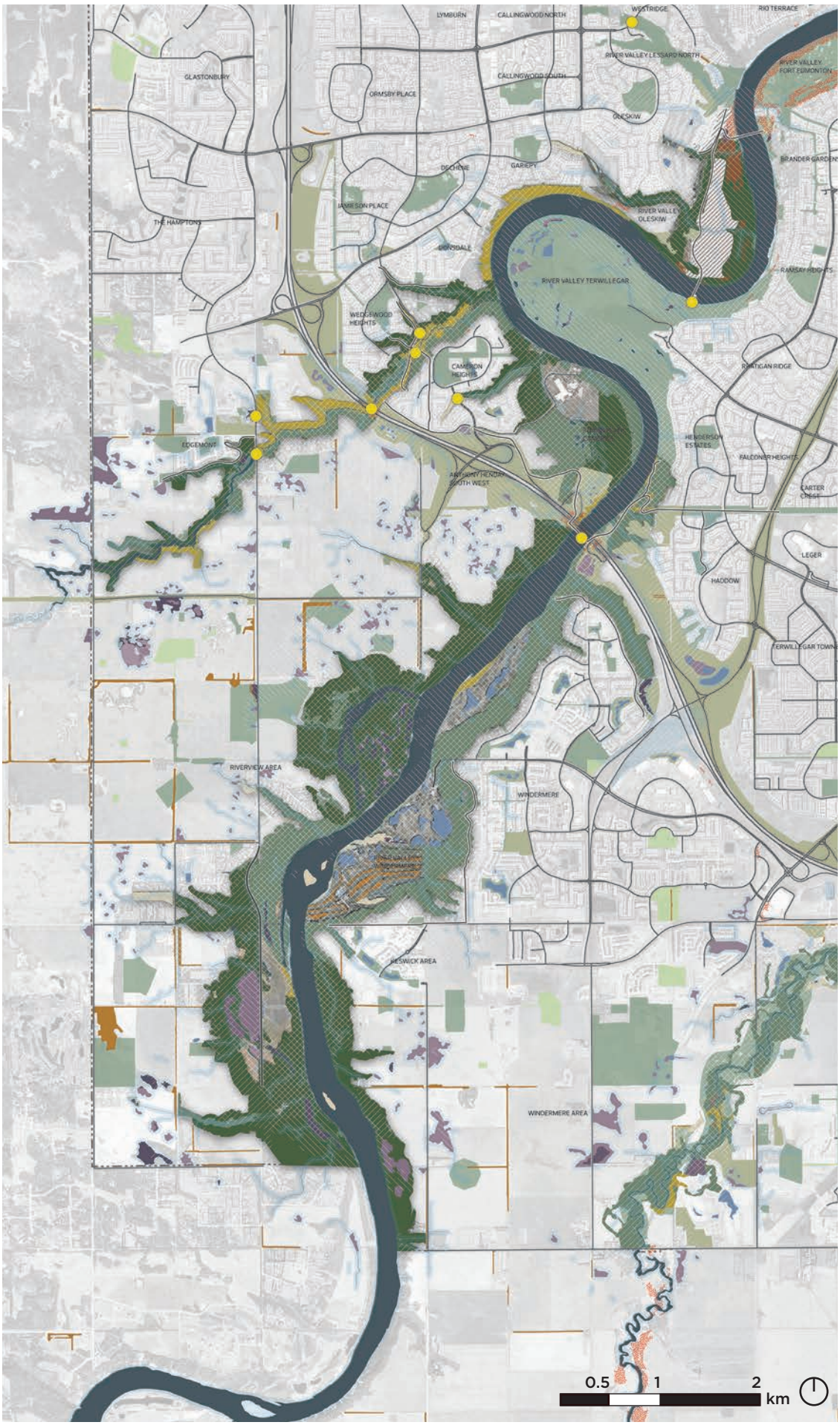
Habitat Classifications

- Core (Natural Cover)
- Corridor (Natural Cover)
- Corridor (Treed Shelterbelt)
- Habitat (Natural Cover)
- Habitat (Non-maintained Grass)
- Stepping Stone (Natural Cover)

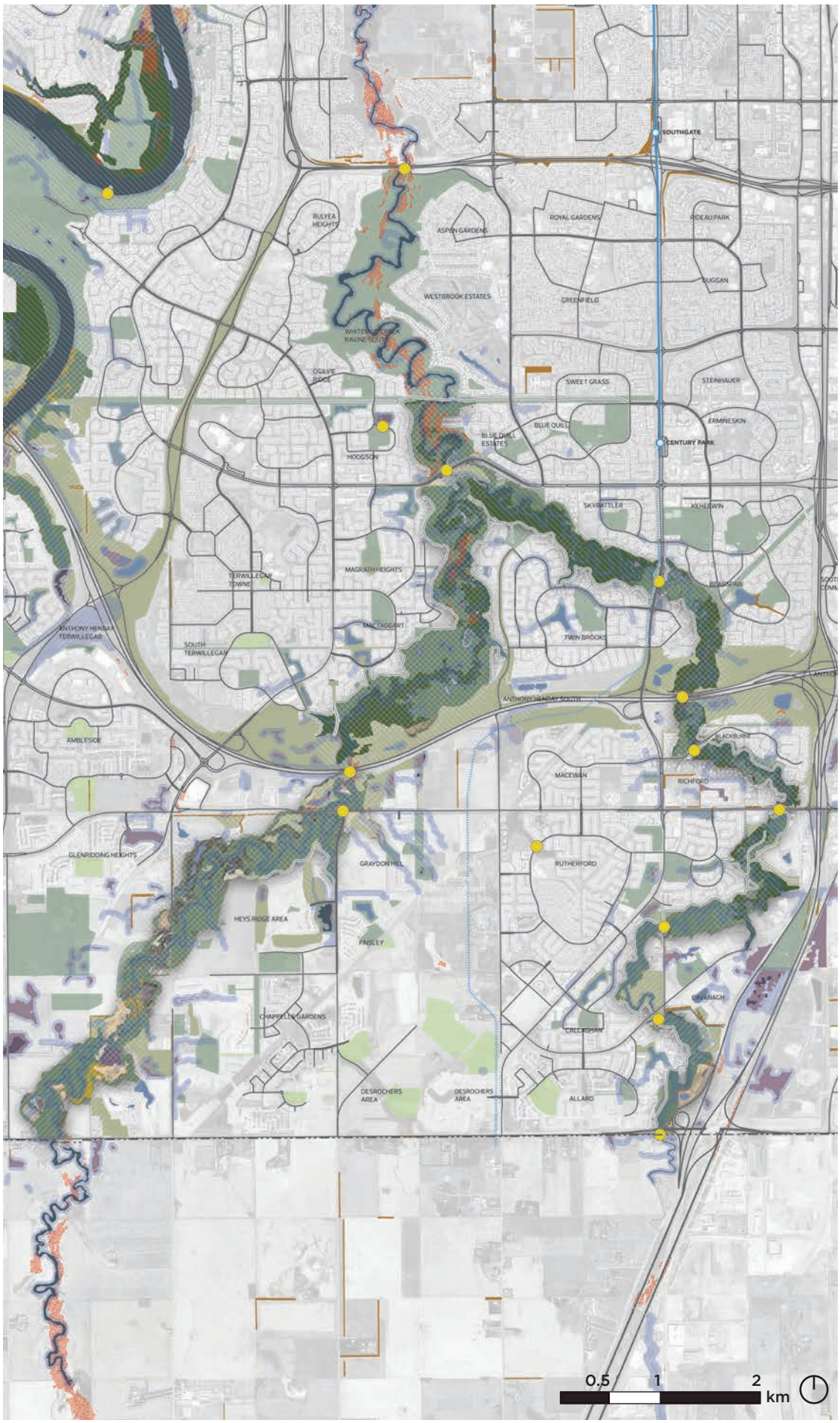
Wildlife Corridors (ESM)

- Chickadee Corridor
- Coyote Corridor
- Overlap (Chickadee and Coyote Corridors)
- Wildlife Pinchpoints

- Existing Parks
- Future Parks



RAVINE EXISTING ECOLOGICAL NETWORK



LEGEND

Study Area Features

- Wildlife Passages
- Arterial and Collector Roads
- Natural Water Bodies
- Storm Water Management Features
- 30m Stream/Wetland Buffer

Circulation features

- Existing Trail

Streams

- Strahler 3
- Strahler 4
- Strahler 5
- Strahler 6

Wetlands

- Not Classified
- Class I
- Class II
- Class III
- Class IV
- Class V
- Class VIII

Habitat Classifications

- Core (Natural Cover)
- Corridor (Natural Cover)
- Corridor (Treed Shelterbelt)
- Habitat (Natural Cover)
- Habitat (Non-maintained Grass)
- Stepping Stone (Natural Cover)

Wildlife Corridors (ESM)

- Chickadee Corridor
- Coyote Corridor
- Overlap (Chickadee and Coyote Corridors)
- Wildlife Pinchpoints

- Existing Parks
- Future Parks

NE EXISTING ECOLOGICAL NETWORK

LEGEND

Study Area Features

- Wildlife Passages
- Arterial and Collector Roads
- Natural Water Bodies
- Storm Water Management Features
- 30m Stream/Wetland

Circulation features

- Existing Trail

Streams

- Strahler 3
- Strahler 4
- Strahler 5
- Strahler 6

Wetlands

- Not Classified
- Class I
- Class II
- Class III
- Class IV
- Class V
- Class VIII

Habitat Classifications

- Core (Natural Cover)
- Corridor (Natural Cover)
- Corridor (Treed Shelterbelt)
- Habitat (Natural Cover)
- Habitat (Non-maintained Grass)
- Stepping Stone (Natural Cover)

Wildlife Corridors (ESM)

- Chickadee Corridor
- Coyote Corridor
- Overlap (Chickadee and Coyote Corridors)
- Wildlife Pinchpoints

- Existing Parks
- Future Parks

5 THE RECOMMENDED ECOLOGICAL NETWORK

The Recommended Ecological Network map builds upon the existing ecological conditions of the study area and the region surrounding it. Proposed trail and amenity nodes are highlighted, along with areas that the Ribbon of Green recommends as potential candidates for restoration. These maps are meant to provide context for the project and highlight the benefits and impacts the plan is intended to have on the valued natural features in and around the study area. They provide a synthesis of the important existing features on the landscape that contribute to the natural functioning of the area, and highlight where improvements should be made. These maps include the following components:

- The Ecological Evaluation Natural Areas Rating (methodology described in (page 15))
- Wetlands
- Storm water management features
- Open water
- Streams with Strahler Order 3 and above
- Existing trails
- Potential restoration areas (methodology described in (page 53))
- Proposed key access points and regional trail connections and proposed amenity node programming
- Wildlife passages
- Major roads
- The Environmental Sensitivity Model's coyote and chickadee corridors and key pinchpoints

The recommended ecological network map shows the overall intent of ecological management in this area, providing greater detail than the overarching Land Management Classifications. Finer scale on-site assessment will always be necessary prior to restoration, development or other modification to the landscape, to ensure that ecological function is not unexpectedly compromised and that intended improvements to natural functioning will have the intended effect. Information in these network maps will help ensure that the larger regional ecological context is considered and respected during future site-specific planning.

SW RECOMMENDED ECOLOGICAL NETWORK

LEGEND

Study Area Features

- Wildlife Passages
- Arterial and Collector Roads
- Natural Water Bodies
- Storm Water Management Features
- Potential Restoration
- Potential Programming
- 30m Stream/Wetland Buffer

Circulation features

- Existing Trail
- Proposed Trail (T1 - Paved)
- Proposed Trail (T2 - Granular)
- Proposed Trail (T3 - Natural)

Streams

- Strahler 3
- Strahler 4
- Strahler 5
- Strahler 6

Wetlands

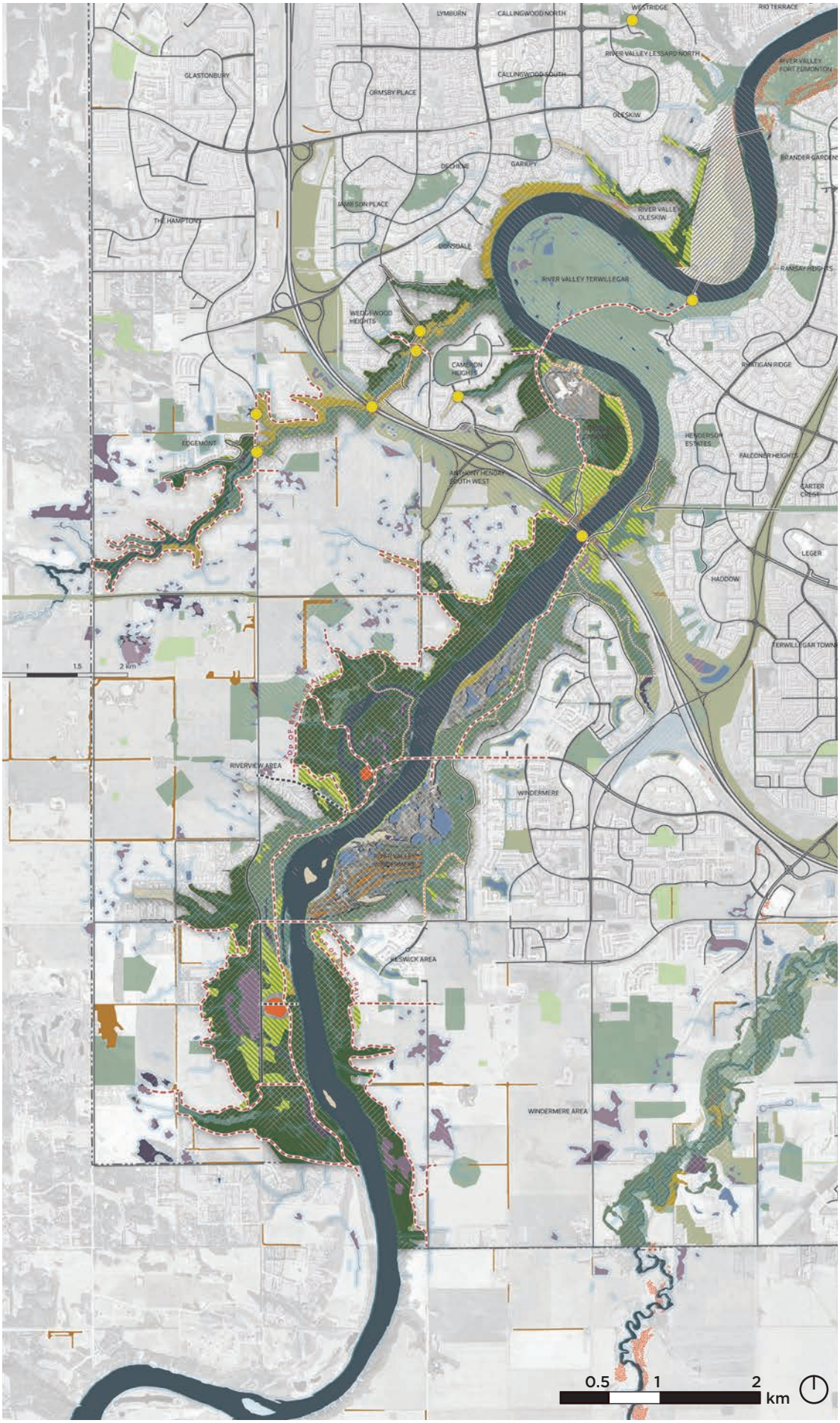
- Not Classified
- Class I
- Class II
- Class III
- Class IV
- Class V
- Class VIII

Habitat Classifications

- Core (Natural Cover)
- Corridor (Natural Cover)
- Corridor (Treed Shelterbelt)
- Habitat (Natural Cover)
- Habitat (Non-maintained Grass)
- Stepping Stone (Natural Cover)

Wildlife Corridors (ESM)

- Chickadee Corridor
- Coyote Corridor
- Overlap (Chickadee and Coyote Corridors)
- Wildlife Pinchpoints



RAVINE RECOMMENDED ECOLOGICAL NETWORK

LEGEND

Study Area Features

- Wildlife Passages
- Arterial and Collector Roads
- Natural Water Bodies
- Storm Water Management Features
- Potential Restoration
- Potential Programming
- 30m Stream/Wetland Buffer

Circulation features

- Existing Trail
- Proposed Trail (T1 - Paved)
- Proposed Trail (T2 - Granular)
- Proposed Trail (T3 - Natural)

Streams

- Strahler 3
- Strahler 4
- Strahler 5
- Strahler 6

Wetlands

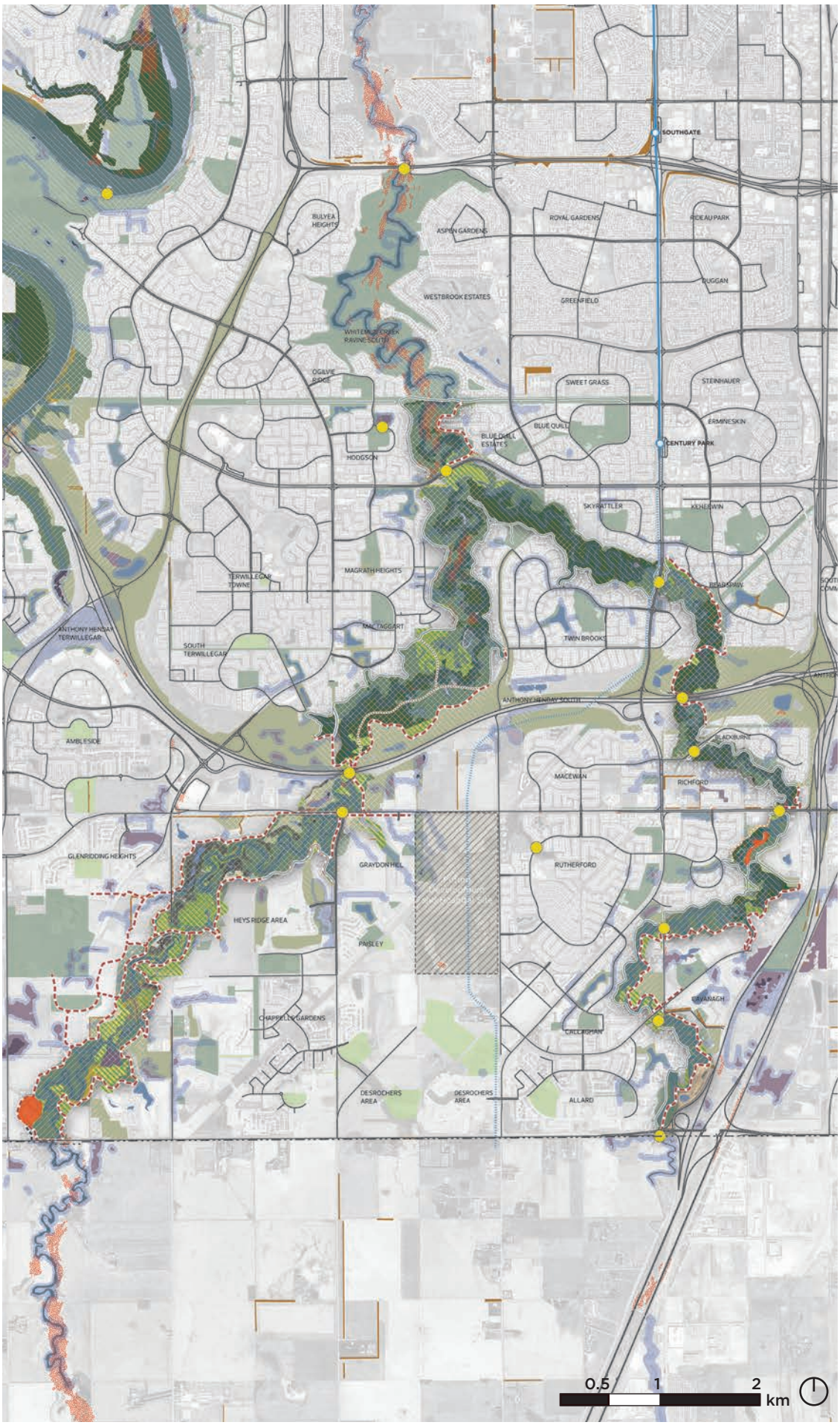
- Not Classified
- Class I
- Class II
- Class III
- Class IV
- Class V
- Class VIII

Habitat Classifications

- Core (Natural Cover)
- Corridor (Natural Cover)
- Corridor (Treed Shelterbelt)
- Habitat (Natural Cover)
- Habitat (Non-maintained Grass)
- Stepping Stone (Natural Cover)

Wildlife Corridors (ESM)

- Chickadee Corridor
- Coyote Corridor
- Overlap (Chickadee and Coyote Corridors)
- Wildlife Pinchpoints



NE RECOMMENDED ECOLOGICAL NETWORK

LEGEND

Study Area Features

- Wildlife Passages
- Arterial and Collector Roads
- Natural Water Bodies
- Storm Water Management Features
- Potential Restoration
- Potential Programming
- 30m Stream/Wetland Buffer

Circulation features

- Existing Trail
- Proposed Trail (T1 - Paved)
- Proposed Trail (T2 - Granular)
- Proposed Trail (T3 - Natural)

Streams

- Strahler 3
- Strahler 4
- Strahler 5
- Strahler 6

Wetlands

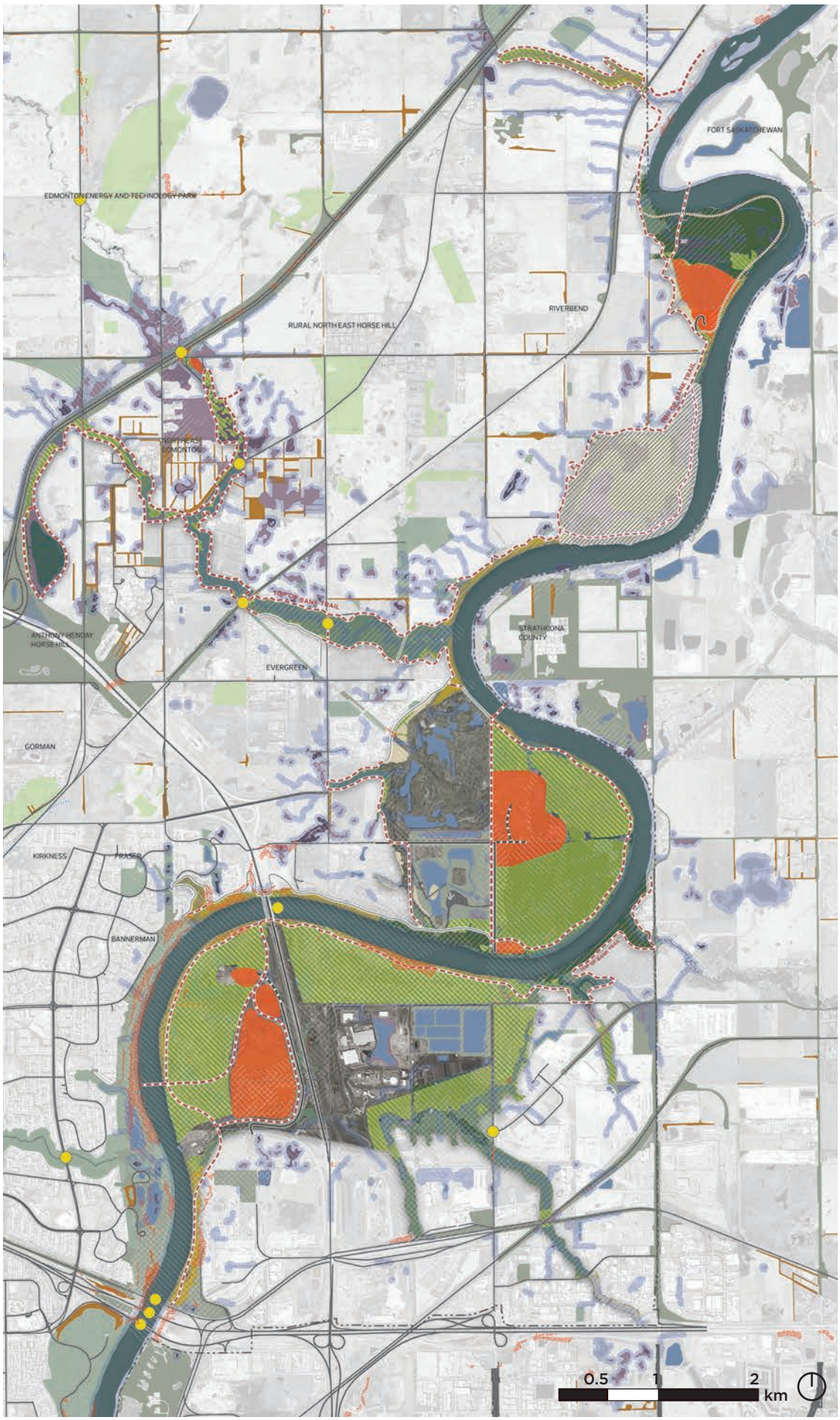
- Not Classified
- Class I
- Class II
- Class III
- Class IV
- Class V
- Class VIII

Habitat Classifications

- Core (Natural Cover)
- Corridor (Natural Cover)
- Corridor (Treed Shelterbelt)
- Habitat (Natural Cover)
- Habitat (Non-maintained Grass)
- Stepping Stone (Natural Cover)

Wildlife Corridors (ESM)

- Chickadee Corridor
- Coyote Corridor
- Overlap (Chickadee and Coyote Corridors)
- Wildlife Pinchpoints



6 SPATIAL DATASETS

Input Datasets

NAME	SOURCE	USE/NOTES
Environmental Sensitivity	City of Edmonton - Environmental Sensitivity Project	Land Management Classification definition, trails delineation
Active Slides	Thurber Engineering LTD.	Land Management Classification definition, trails delineation
Historical Sites. Known	Western Heritage	Land Management Classification definition, trails delineation
Transportation Features	Bunt & Associates	Transportation access analysis and map, trails delineation
Historical Sites. Unknown	Western Heritage	Land Management Classification definition, trails delineation
Recreational Features	RC Strategies	Recreation Assessment and maps, trails delineation
Aerial Imagery 2016	City of Edmonton	Base map, data proofing and digitizing, trails delineation
Aerial Imagery 2014	City of Edmonton	base map, data proofing and digitizing, trails delineation
Full Feature Lidar	City of Edmonton	Digital Elevation Model - Bare Earth, Digital Surface Model - All Object on Ground, contours
Open Spaces	City of Edmonton - Breathe Project	Base map, trails delineation
Urban Primary Land and Vegetation Inventory	City of Edmonton	Ecological Evaluation, Land Management Classification definition, trails delineation, recommended ecological network
North Saskatchewan River Valley and Ravine System	City of Edmonton	Land Management Classification definition, trails delineation, used as a base of study area
Wildlife connectivity	City of Edmonton - Breathe Project	Ecological Network, Land Management Classification definition, trails delineation
Bridges\River Crossings	City of Edmonton - Breathe Project	Recreation maps, trails delineation
Bike Routes	City of Edmonton - Breathe Project	Recreation maps, trails delineation
Bus Stops	City of Edmonton	Context layers, trails delineation
Recreational Facilities	City of Edmonton - Recreational Facilities	Context layers, trails delineation
Flood Fringe	River Forecast Section, Alberta Environment and Parks, Government of Alberta	Flood analysis map, trails delineation
Flood Way	River Forecast Section, Alberta Environment and Parks, Government of Alberta	Flood analysis map, trails delineation
Streams	City of edmonton	Strahler Stream Order 3 and above, trail delineation, ecological network

Derived Datasets

NAME	SOURCE	USE/NOTES
NE, SW and Ravine Study Area Boundaries	Digitization based on DEM, Rivers and Creeks and Aerial Photo Interpretation	Area to define final Land Management Classifications
NE, SW and Ravine Analysis Area Boundaries	600m buffer around NE and SW Study Areas	Most of datasets used for analysis are clipped by this extent
Land Management Classifications	Derived from data inputs, and modified to account for existing and planned land uses. Described in greater detail in this report.	Define management plans
Viewsheds from River	Viewshed analysis from observers on the river placed every 100m	River viewsheds, (how much natural area could be seen from the river view points)
Contours	Contours tool from ArcGIS	Trails delineation
Digital Elevation Model - Bare Earth	LASTools was used to create raster DEM dataset as the last return from LiDAR	Base map, Trails delineation, Ravines and River Valley delineation, Land Management Classifications Definition
Digital Surface Model - All Objects	LASTools was used to create raster DEM dataset as the last return from LiDAR	Viewsheds
Terrain Ruggedness Index	QGIS TRI Tool	Terrain Ruggedness Map, Ravines and River Valley delineation
Ecological Evaluation Score	Derived from input data	In accordance with the Ecological Network Report Phase II
Natural Area Rating	Ecological Evaluation score	High/Moderate/Low classifed using natural breaks
Habitat Classification	Informed by Natural Area Rating	Modified in accordance with City input