

PHASE ONE MAPS-ELBOW RIVER

RIPARIAN AREAS MAPPING PROJECT FOR THE CITY OF CALGARY

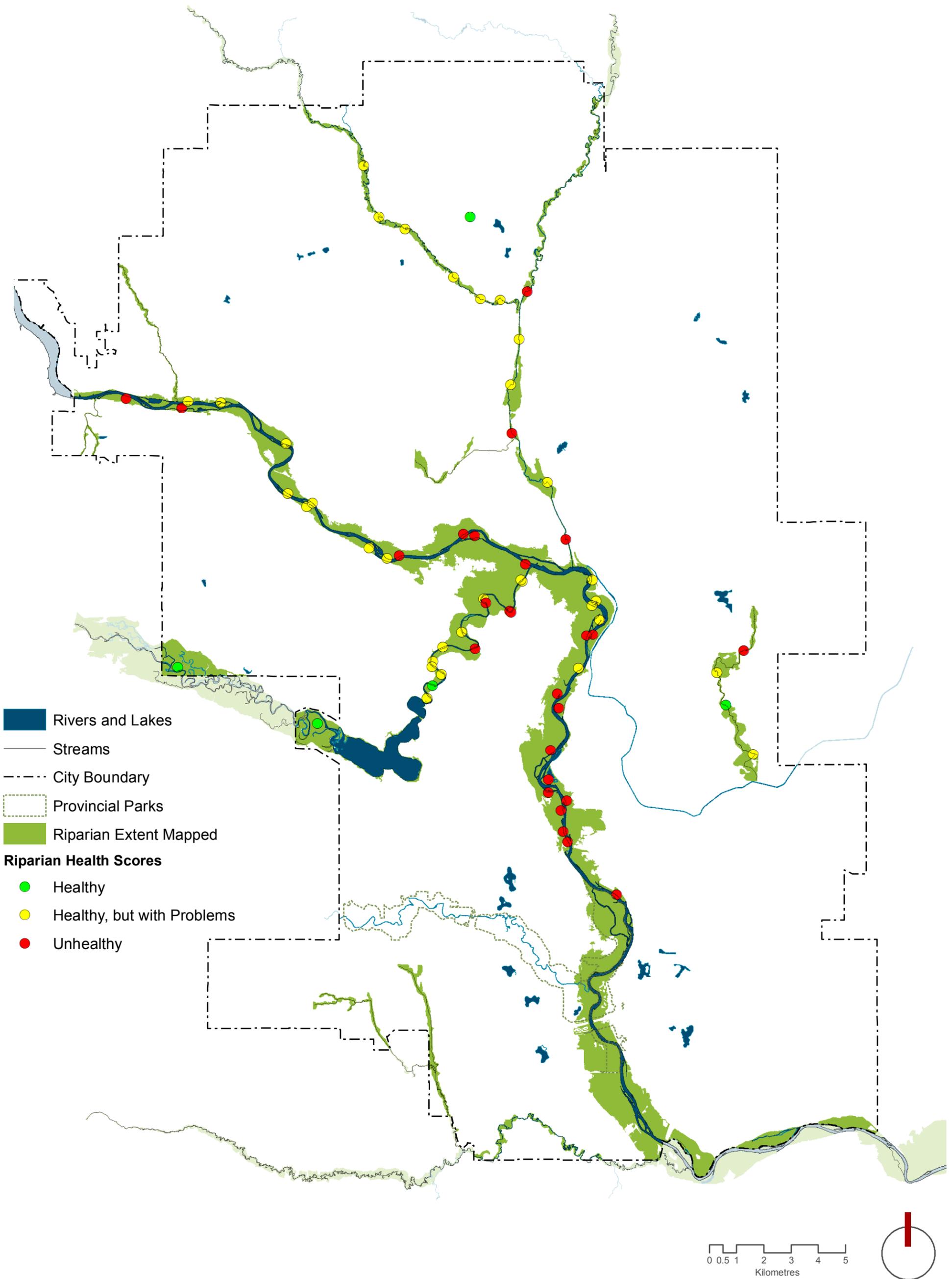
Prepared by: O2 Planning + Design Inc. with
The Alberta Riparian Habitat Management Society (Cows and Fish)

Submitted to: The City of Calgary Water Resources

October 19 | 2012

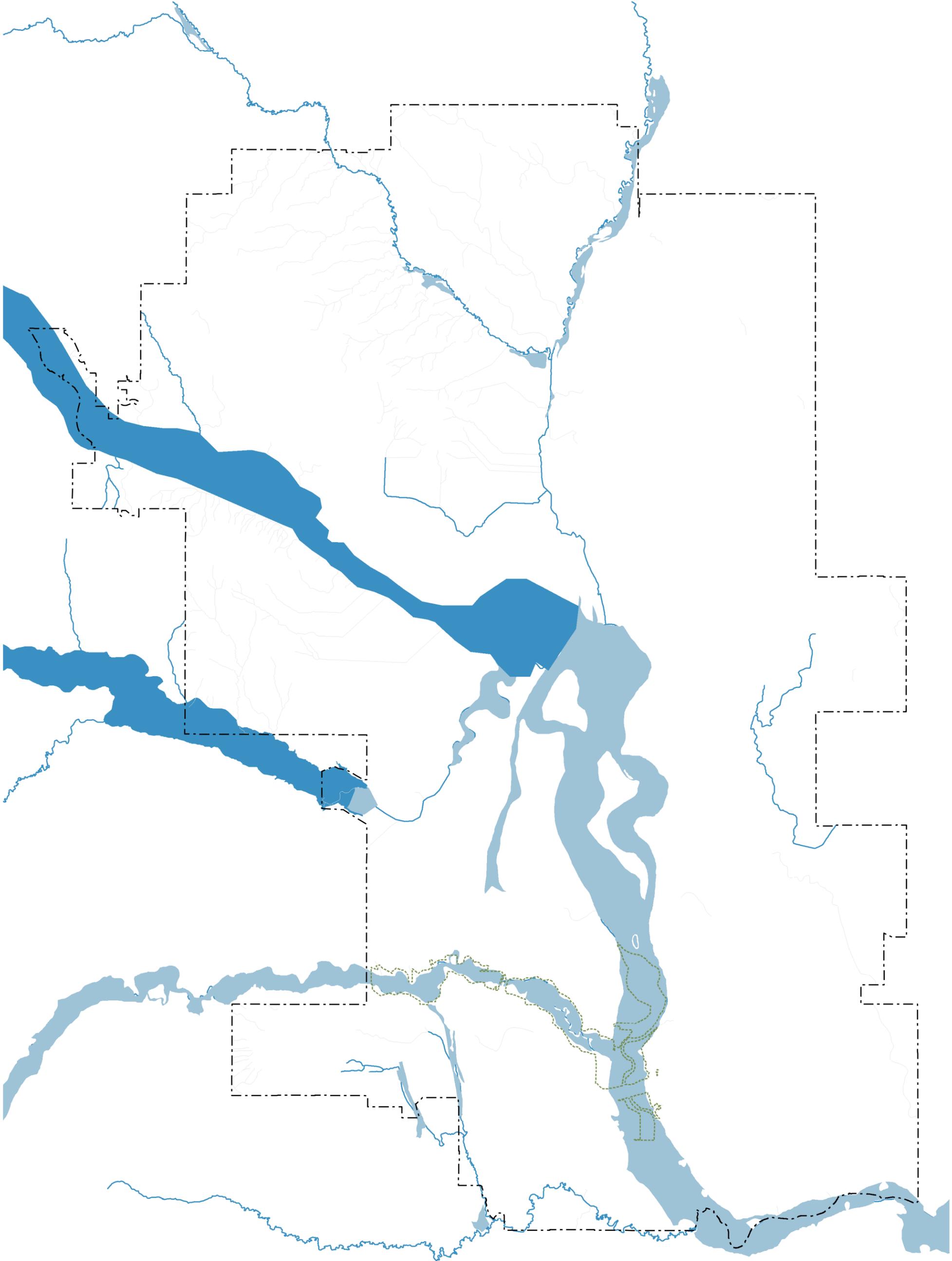
RIPARIAN AREAS MAP PROJECT

CITY WIDE MAP - RIPARIAN LOCATION AND FUNCTION

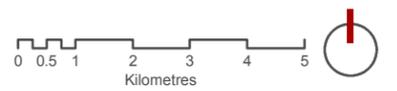


RIPARIAN AREAS MAP PROJECT

CITY WIDE MAP - ALLUVIAL AQUIFERS

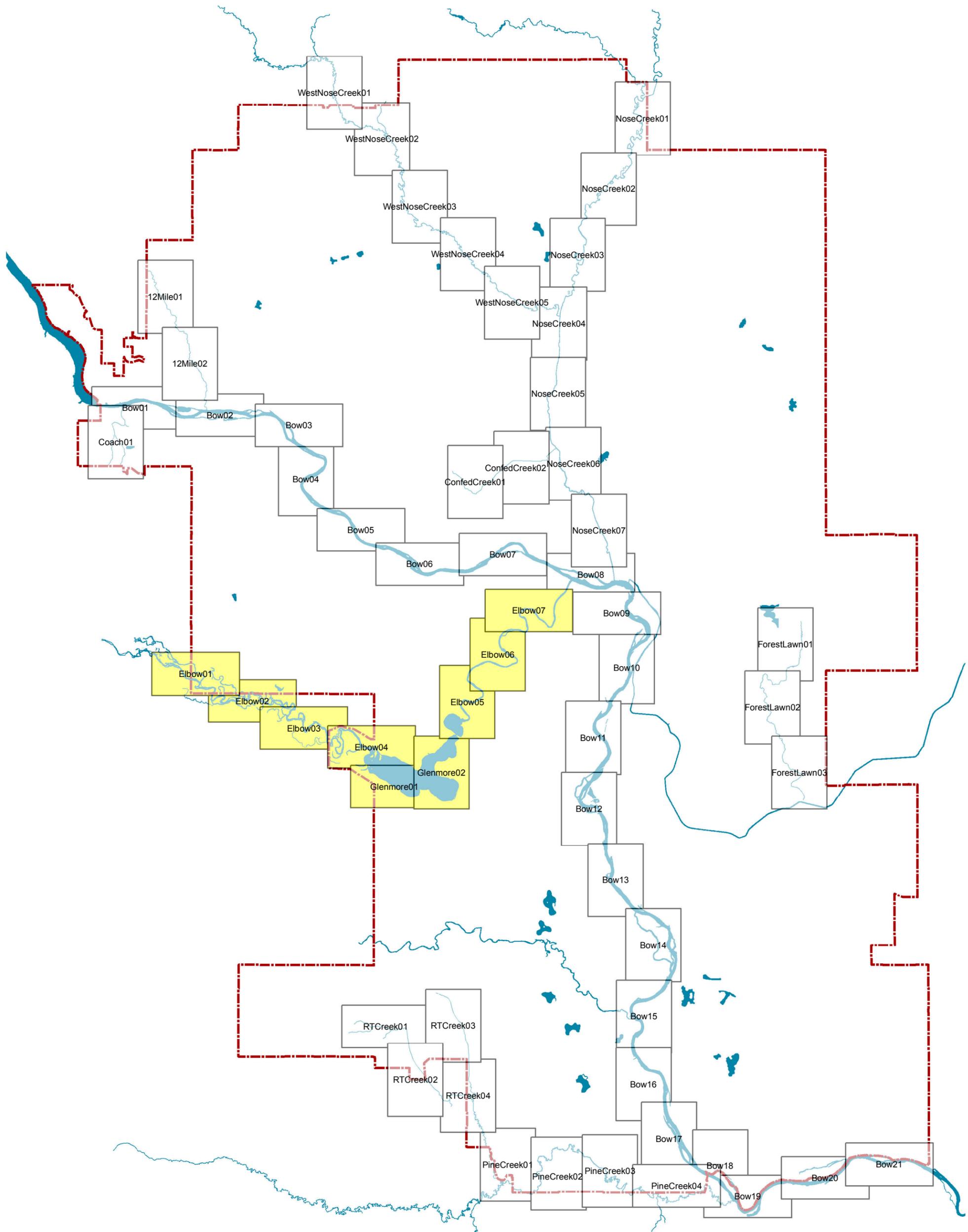


- City Boundary
- - - Fish Creek Provincial Park
- Mapped Alluvial Aquifer (ARC 2009)
- Potential Large Alluvial Aquifers in Coarse Sediments (Moran 1986)
- Streams / Rivers
- Lower Order Streams



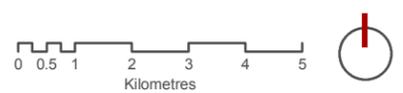
RIPARIAN AREAS MAP PROJECT

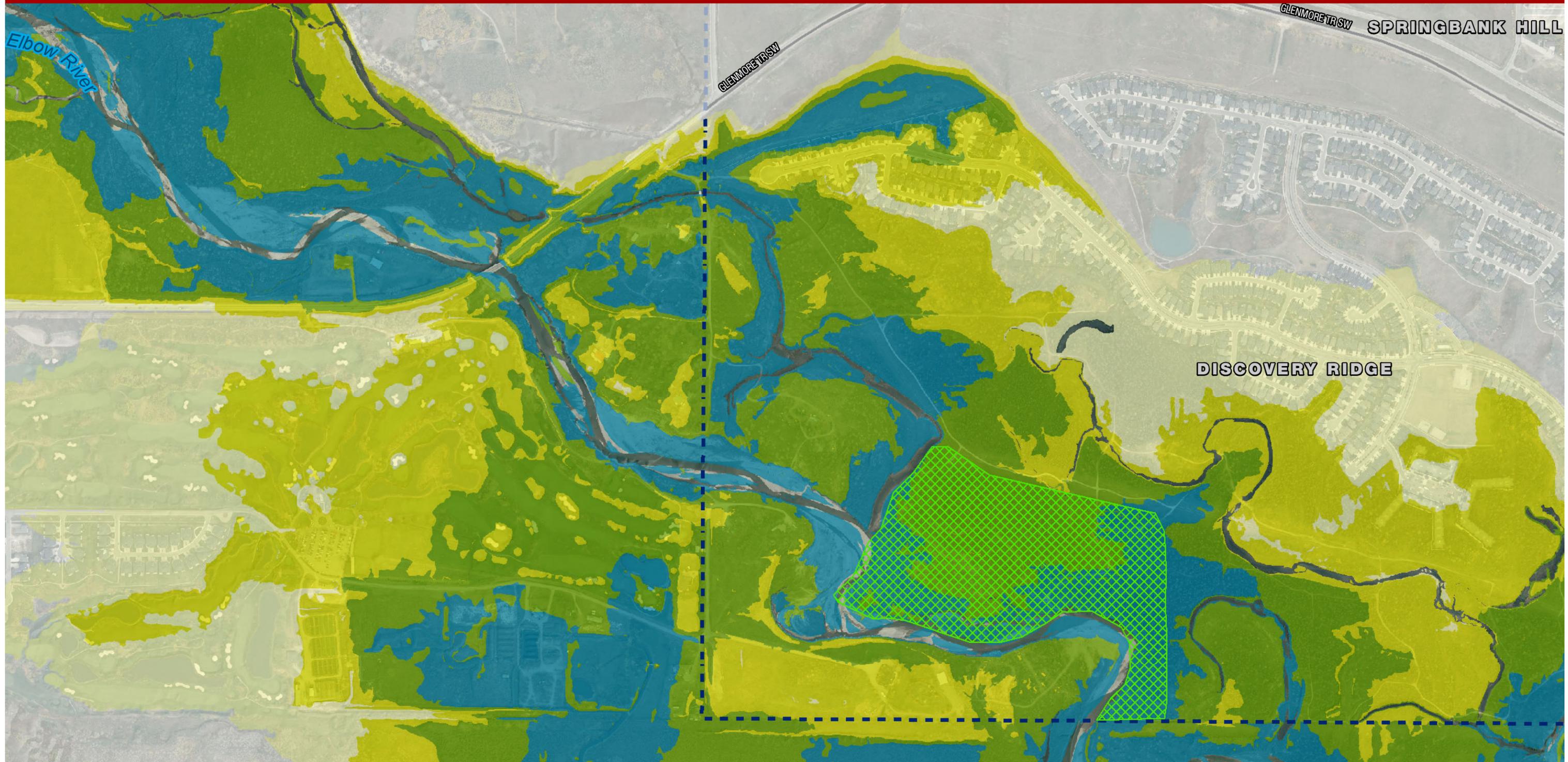
CITY WIDE MAP - MAP BLOCK CODE



Legend

- Map Block Code ID
- City of Calgary Boundary
- Water Surface





- Riparian Zone***
- Inner Riparian Zone
 - Middle Riparian Zone
 - Outer Riparian Zone
 - Potential Outermost Riparian Zone

- Riparian Health****
- Healthy
 - Healthy, but with Problems
 - Unhealthy

- Bank Health*****
- Good
 - Moderate
 - Poor

- City Boundary
- Major Roads
- Rail
- Streams
- Fish Creek Provincial Park

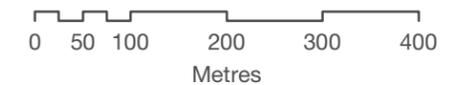
***Based on field studies of major rivers / creeks, excluding private residential riverfront lots or steep valley slopes with limited riparian habitat

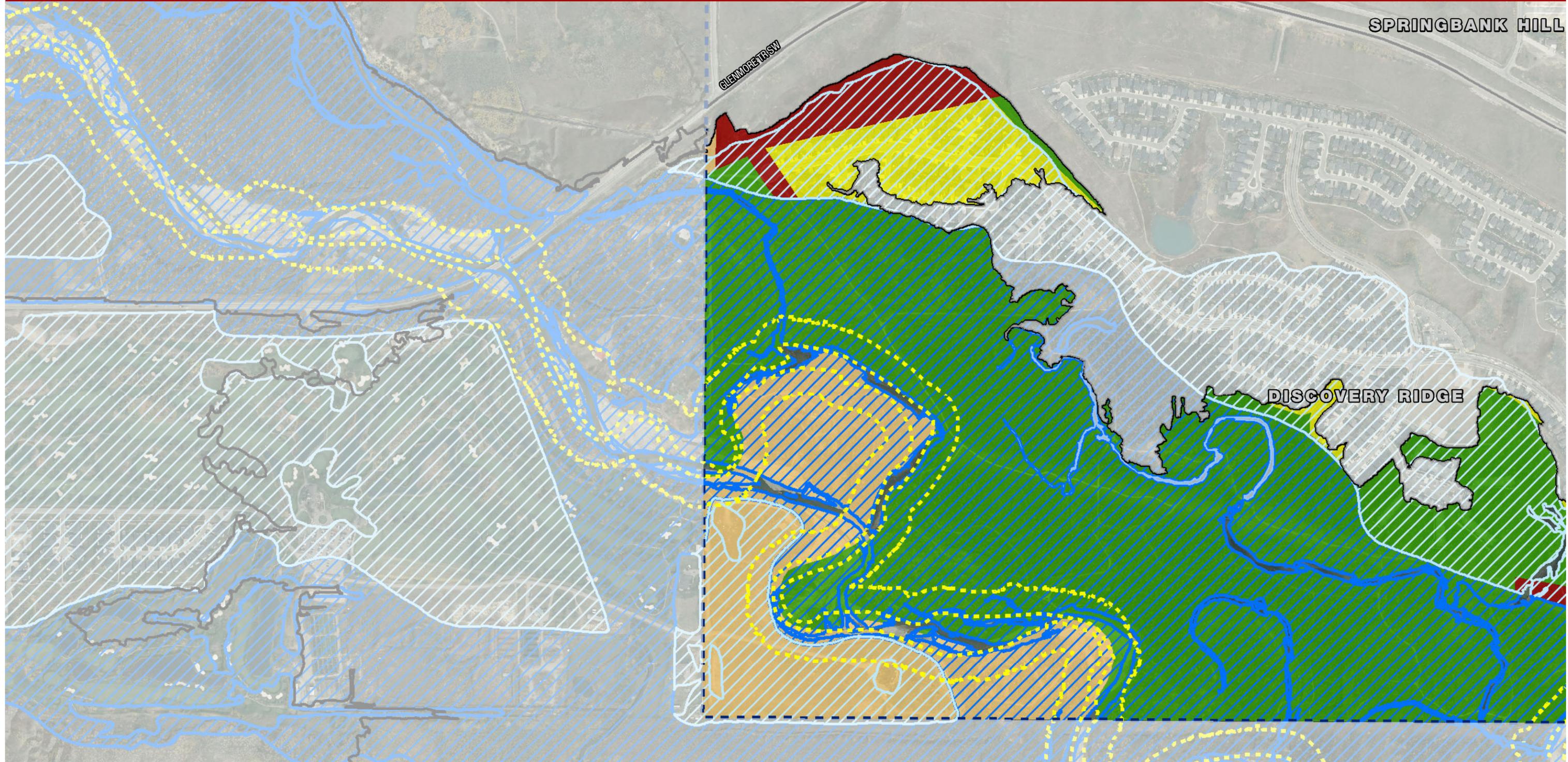
**Based on field studies of sampled riparian polygons only

*Variable Width Riparian Model Outputs



THE CITY OF
CALGARY





Land Use Type

- Commercial
- Future Urban Development
- Industrial
- Institutional
- Major Infrastructure
- Mixed Use
- Residential
- Parks, Recreation and Public Education
- Golf Course

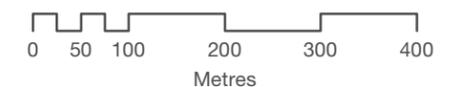
- City of Calgary ER Setback Policy*
- Nose Creek Water Management Plan Setback**
- Floodway
- Flood Fringe
- Flood Extent - 100 Year (Nose Creek/West Nose Creek)
- Outer Riparian Zone Boundary
- Streams
- Major Roads
- ++++ Rail
- City Boundary
- Fish Creek Provincial Park

*Note that ER setbacks for lower order streams are not mapped as they were out of the project scope

**Recommended setback boundary of Nose Creek Watershed Partnership including floodplain, meander belt width and adjacent escarpments >15%



THE CITY OF
CALGARY





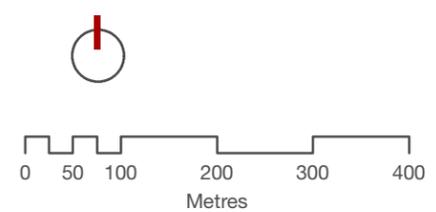
- Storm Outflow Location
- Stormwater Lift Station
- Storm Main (> 900mm diameter)
- Sanitary Main (>600mm diameter)
- Water Main (>400mm diameter)
- Siphon
- Pipeline River Crossing Locations
- Water / Waste Water Treatment Plants
- Existing Storm Retrofit Pond
- Possible Location of Storm Retrofit Pond

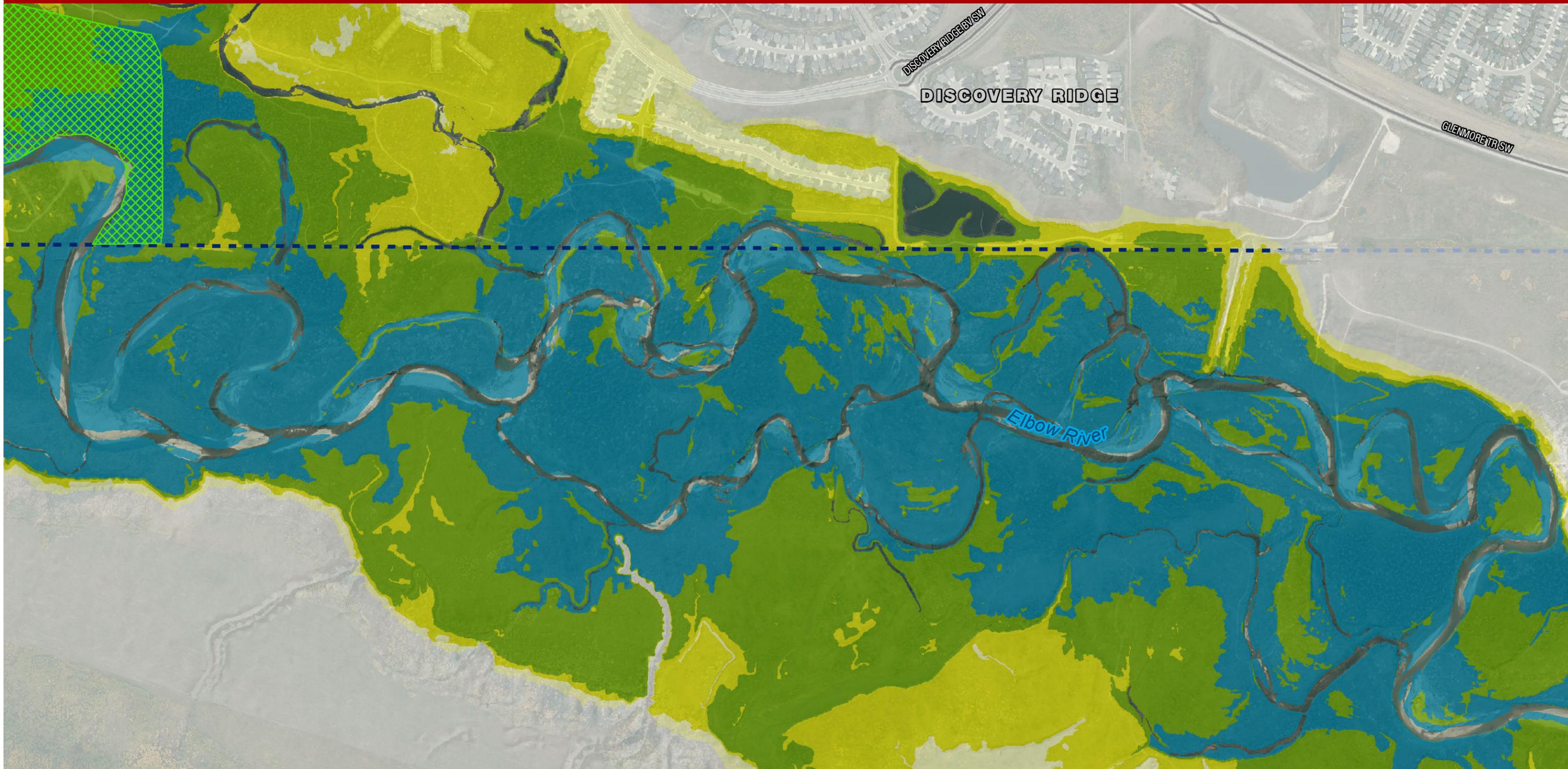
- Existing Storm Pond
- Existing Bank Infrastructure (e.g., Rip Rap, Retaining Walls, Weirs)
- Bank Erosion Hotspot
- Candidate Flood / Erosion Control Projects
- Paved Trails
- Gravel Trails
- Bridge
- Buildings
- Parks (Maintained Turf Areas)

- City Boundary
 - Major Roads
 - Rail
 - Streams
 - Fish Creek Provincial Park
- The non-masked area is based on the greater of:
- (i) outer riparian zone of the variable width model,
 - (ii) City ER setback policy boundary,
 - (iii) Nose Creek Watershed Partnership recommended setback policy
- (See Theme 2-Land and Regulatory Issues)

THE CITY OF
CALGARY

O2 PLANNING + DESIGN





- Riparian Zone***
- Inner Riparian Zone
 - Middle Riparian Zone
 - Outer Riparian Zone
 - Potential Outermost Riparian Zone

- Riparian Health****
- Healthy
 - Healthy, but with Problems
 - Unhealthy

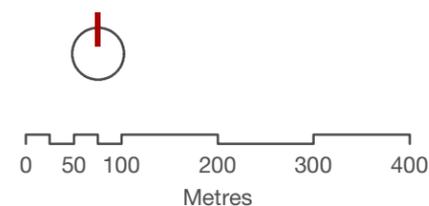
- Bank Health*****
- Good
 - Moderate
 - Poor

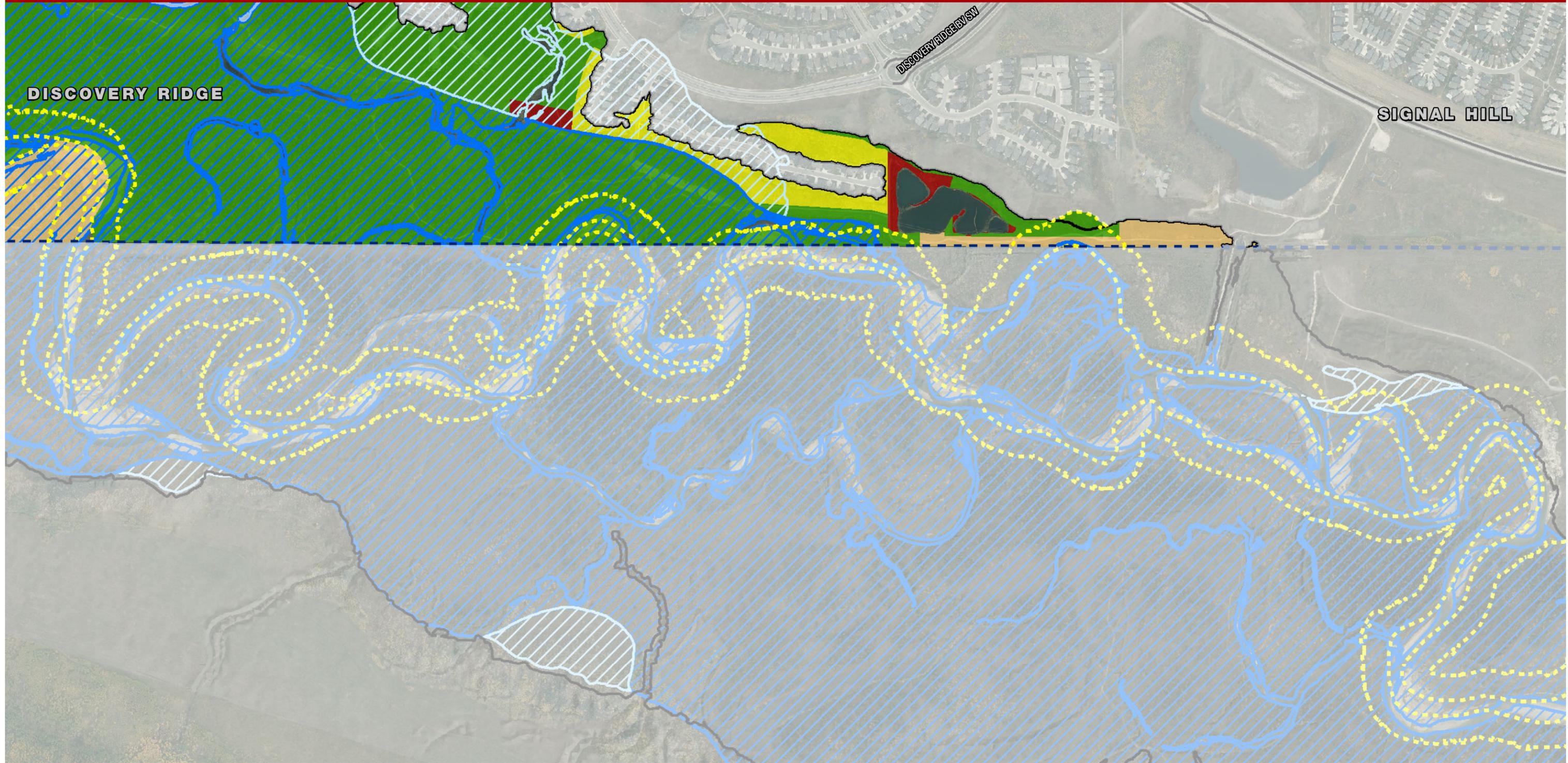
- City Boundary
- Major Roads
- Rail
- Streams
- Fish Creek Provincial Park

*Variable Width Riparian Model Outputs

**Based on field studies of sampled riparian polygons only

***Based on field studies of major rivers / creeks, excluding private residential riverfront lots or steep valley slopes with limited riparian habitat





Land Use Type

- Commercial
- Future Urban Development
- Industrial
- Institutional
- Major Infrastructure
- Mixed Use
- Residential
- Parks, Recreation and Public Education
- Golf Course

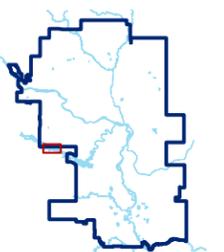
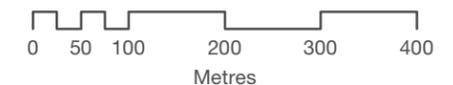
- City of Calgary ER Setback Policy*
- Nose Creek Water Management Plan Setback **
- Floodway
- Flood Fringe
- Flood Extent - 100 Year (Nose Creek/West Nose Creek)
- Outer Riparian Zone Boundary
- Streams
- Major Roads
- Rail
- City Boundary
- Fish Creek Provincial Park

*Note that ER setbacks for lower order streams are not mapped as they were out of the project scope

**Recommended setback boundary of Nose Creek Watershed Partnership including floodplain, meander belt width and adjacent escarpments >15%



THE CITY OF
CALGARY





- Storm Outflow Location
- Stormwater Lift Station
- Storm Main (> 900mm diameter)
- Sanitary Main (>600mm diameter)
- Water Main (>400mm diameter)
- Siphon
- Pipeline River Crossing Locations
- Water / Waste Water Treatment Plants
- Existing Storm Retrofit Pond
- Possible Location of Storm Retrofit Pond

- Existing Storm Pond
- Existing Bank Infrastructure (e.g., Rip Rap, Retaining Walls, Weirs)
- Bank Erosion Hotspot
- Candidate Flood / Erosion Control Projects
- Paved Trails
- Gravel Trails
- Bridge
- Buildings
- Parks (Maintained Turf Areas)

- City Boundary
- Major Roads
- Rail
- Streams
- Fish Creek Provincial Park

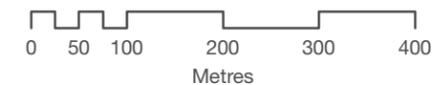
The non-masked area is based on the greater of:

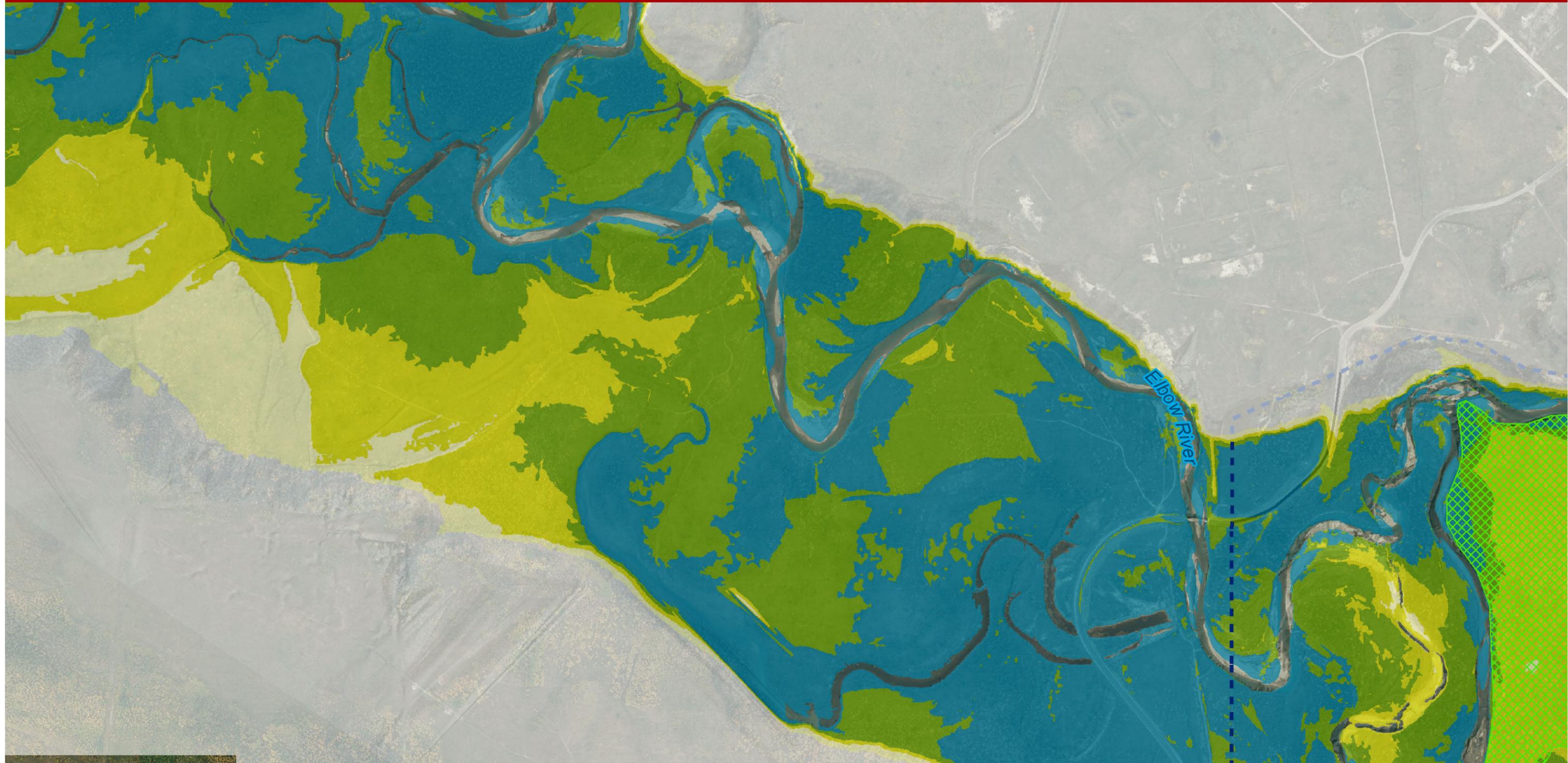
- (i) outer riparian zone of the variable width model,
- (ii) City ER setback policy boundary,
- (iii) Nose Creek Watershed Partnership recommended setback policy

(See Theme 2-Land and Regulatory Issues)



THE CITY OF
CALGARY





- Riparian Zone***
- Inner Riparian Zone
 - Middle Riparian Zone
 - Outer Riparian Zone
 - Potential Outermost Riparian Zone

- Riparian Health****
- Healthy
 - Healthy, but with Problems
 - Unhealthy

- Bank Health*****
- Good
 - Moderate
 - Poor

- City Boundary
- Major Roads
- Rail
- Streams
- Fish Creek Provincial Park

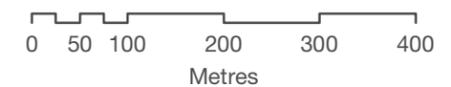
***Based on field studies of major rivers / creeks, excluding private residential riverfront lots or steep valley slopes with limited riparian habitat

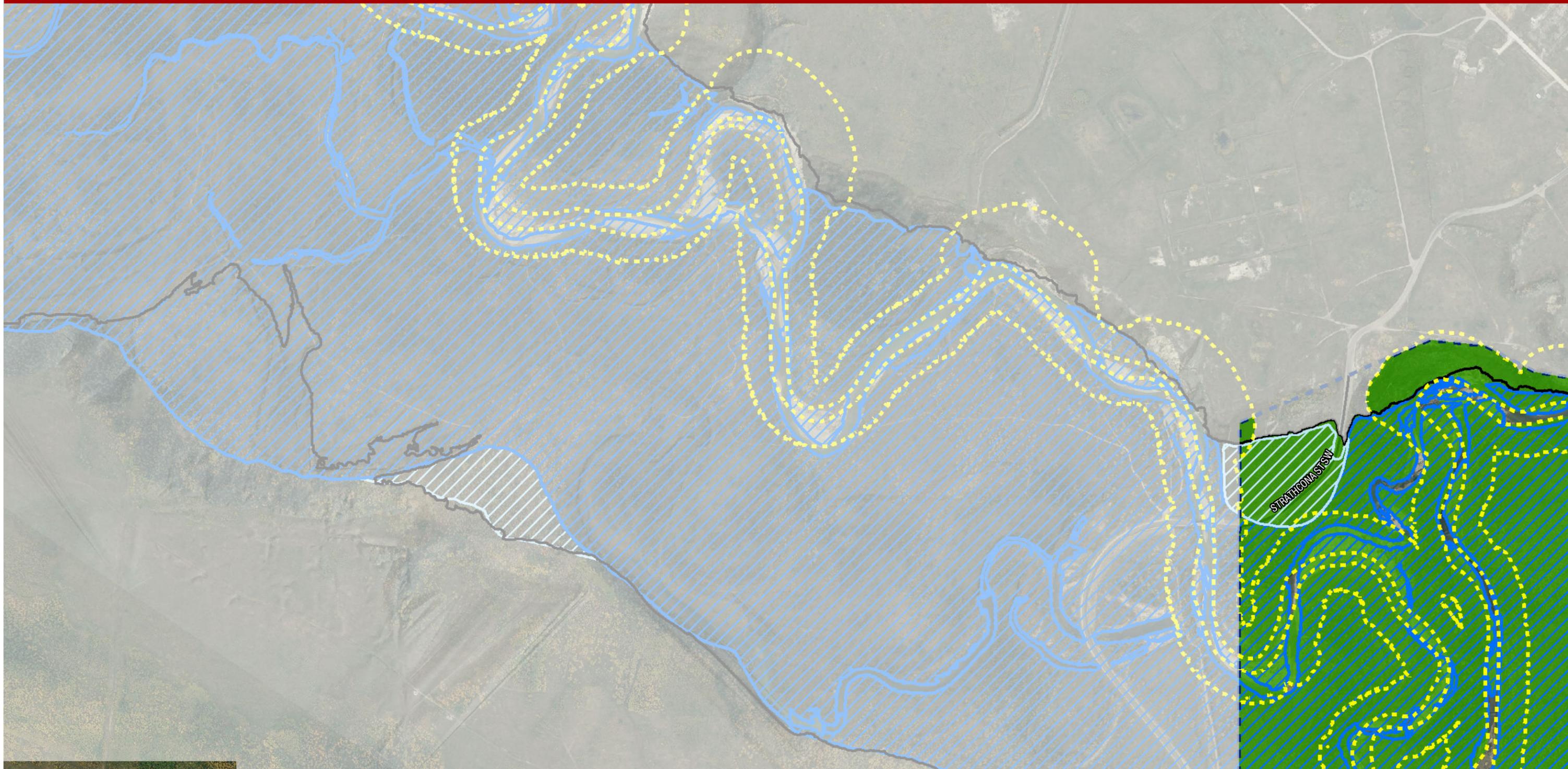
**Based on field studies of sampled riparian polygons only

*Variable Width Riparian Model Outputs



THE CITY OF
CALGARY



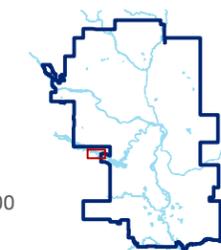
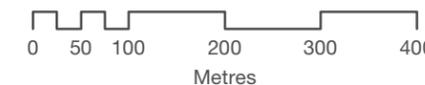


*Note that ER setbacks for lower order streams are not mapped as they were out of the project scope

**Recommended setback boundary of Nose Creek Watershed Partnership including floodplain, meander belt width and adjacent escarpments >15%



THE CITY OF
CALGARY





- Storm Outflow Location
- Stormwater Lift Station
- Storm Main (> 900mm diameter)
- Sanitary Main (>600mm diameter)
- Water Main (>400mm diameter)
- Siphon
- Pipeline River Crossing Locations
- Water / Waste Water Treatment Plants
- Existing Storm Retrofit Pond
- Possible Location of Storm Retrofit Pond

- Existing Storm Pond
- Existing Bank Infrastructure (e.g., Rip Rap, Retaining Walls, Weirs)
- Bank Erosion Hotspot
- Candidate Flood / Erosion Control Projects
- Paved Trails
- Gravel Trails
- Bridge
- Buildings
- Parks (Maintained Turf Areas)

- City Boundary
- Major Roads
- Rail
- Streams
- Fish Creek Provincial Park

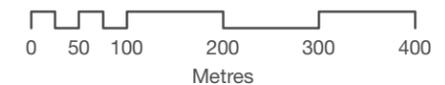
The non-masked area is based on the greater of:

- (i) outer riparian zone of the variable width model,
- (ii) City ER setback policy boundary,
- (iii) Nose Creek Watershed Partnership recommended setback policy

(See Theme 2-Land and Regulatory Issues)



THE CITY OF
CALGARY





- Riparian Zone***
- Inner Riparian Zone
 - Middle Riparian Zone
 - Outer Riparian Zone
 - Potential Outermost Riparian Zone

- Riparian Health****
- Healthy
 - Healthy, but with Problems
 - Unhealthy

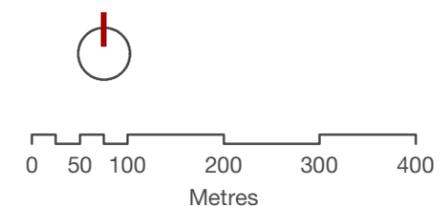
- Bank Health*****
- Good
 - Moderate
 - Poor

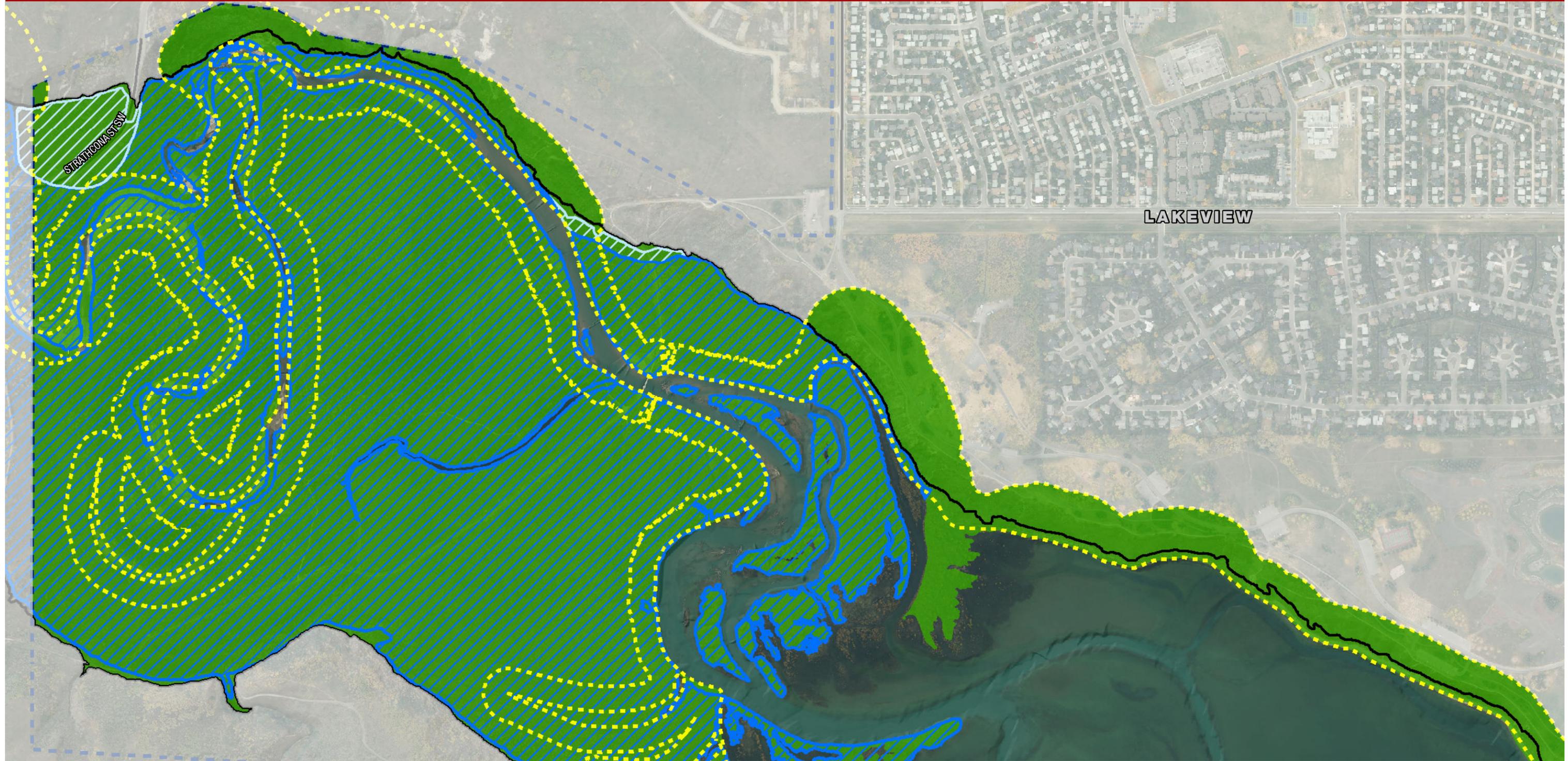
- City Boundary
- Major Roads
- Rail
- Streams
- Fish Creek Provincial Park

***Based on field studies of major rivers / creeks, excluding private residential riverfront lots or steep valley slopes with limited riparian habitat

**Based on field studies of sampled riparian polygons only

*Variable Width Riparian Model Outputs





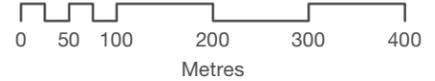
Land Use Type	Major Infrastructure	City of Calgary ER Setback Policy*	Streams
Commercial	Mixed Use	Nose Creek Water Management Plan Setback **	Major Roads
Future Urban Development	Residential	Floodway	Rail
Industrial	Parks, Recreation and Public Education	Flood Fringe	City Boundary
Institutional	Golf Course	Flood Extent - 100 Year (Nose Creek/West Nose Creek)	Fish Creek Provincial Park
		Outer Riparian Zone Boundary	

*Note that ER setbacks for lower order streams are not mapped as they were out of the project scope
 **Recommended setback boundary of Nose Creek Watershed Partnership including floodplain, meander belt width and adjacent escarpments >15%



THE CITY OF
CALGARY










PLANNING + DESIGN



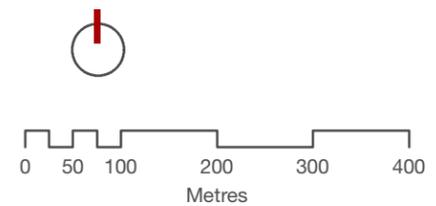
- Storm Outflow Location
- Stormwater Lift Station
- Storm Main (> 900mm diameter)
- Sanitary Main (>600mm diameter)
- Water Main (>400mm diameter)
- Siphon
- Pipeline River Crossing Locations
- ▲ Water / Waste Water Treatment Plants
- ▭ Existing Storm Retrofit Pond
- ▭ Possible Location of Storm Retrofit Pond

- ▭ Existing Storm Pond
- Existing Bank Infrastructure (e.g., Rip Rap, Retaining Walls, Weirs)
- Bank Erosion Hotspot
- ▲ Candidate Flood / Erosion Control Projects
- Paved Trails
- Gravel Trails
- ▭ Bridge
- ▭ Buildings
- ▭ Parks (Maintained Turf Areas)

- City Boundary
 - Major Roads
 - + + + + Rail
 - Streams
 - ▭ Fish Creek Provincial Park
- The non-masked area is based on the greater of:
- (i) outer riparian zone of the variable width model,
 - (ii) City ER setback policy boundary,
 - (iii) Nose Creek Watershed Partnership recommended setback policy
- (See Theme 2-Land and Regulatory Issues)

THE CITY OF
CALGARY

O2 PLANNING + DESIGN





- Riparian Zone***
- Inner Riparian Zone
 - Middle Riparian Zone
 - Outer Riparian Zone
 - Potential Outermost Riparian Zone

- Riparian Health****
- Healthy
 - Healthy, but with Problems
 - Unhealthy

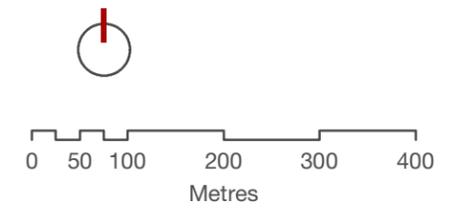
- Bank Health*****
- Good
 - Moderate
 - Poor

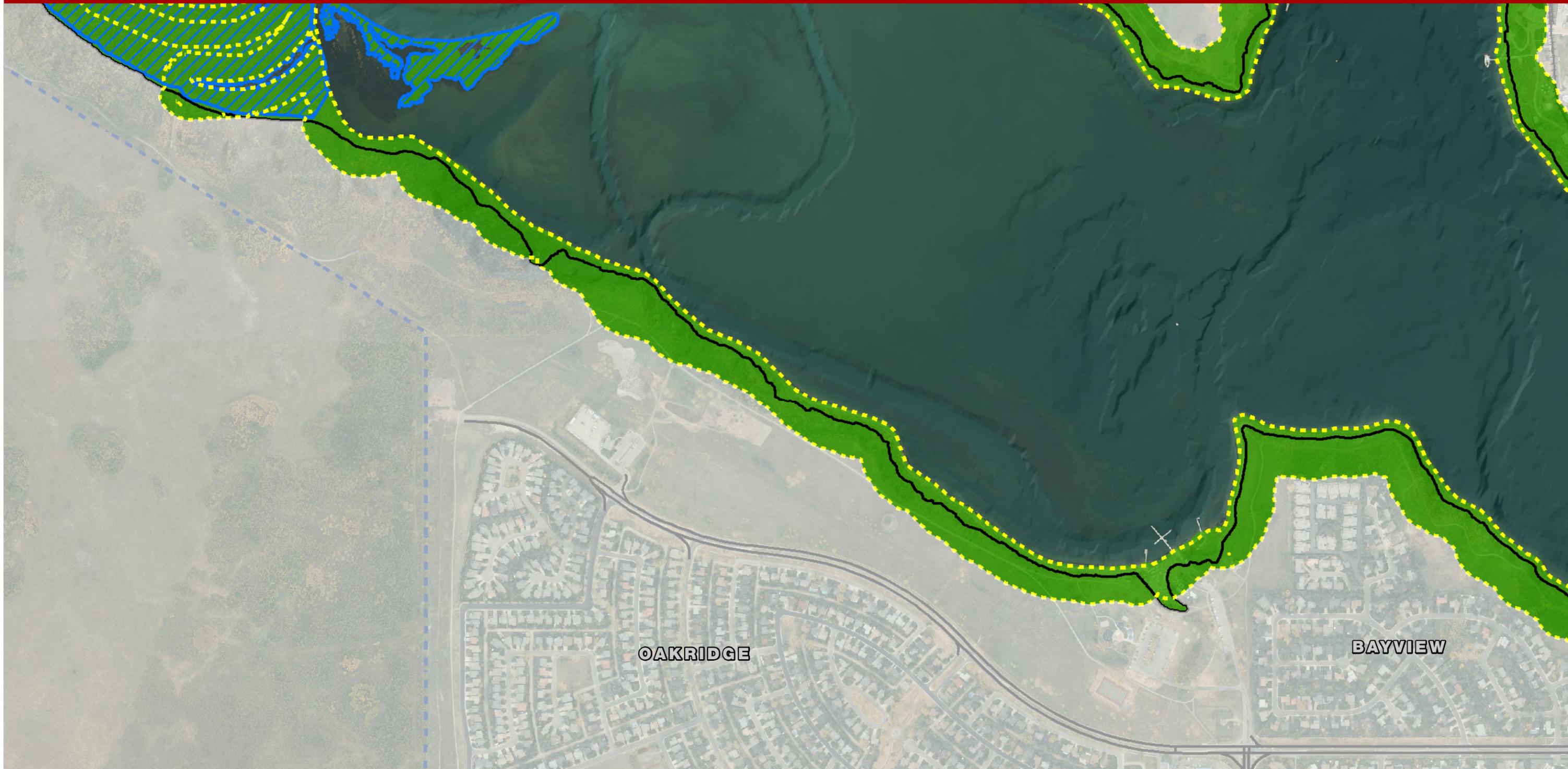
- City Boundary
- Major Roads
- Rail
- Streams
- Fish Creek Provincial Park

***Based on field studies of major rivers / creeks, excluding private residential riverfront lots or steep valley slopes with limited riparian habitat

**Based on field studies of sampled riparian polygons only

*Variable Width Riparian Model Outputs





Land Use Type

- Commercial
- Future Urban Development
- Industrial
- Institutional
- Major Infrastructure
- Mixed Use
- Residential
- Parks, Recreation and Public Education
- Golf Course

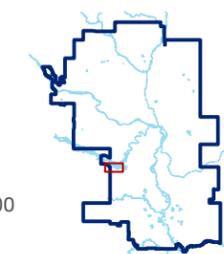
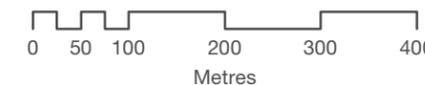
- City of Calgary ER Setback Policy*
- Nose Creek Water Management Plan Setback **
- Floodway
- Flood Fringe
- Flood Extent - 100 Year (Nose Creek/West Nose Creek)
- Outer Riparian Zone Boundary
- Streams
- Major Roads
- Rail
- City Boundary
- Fish Creek Provincial Park

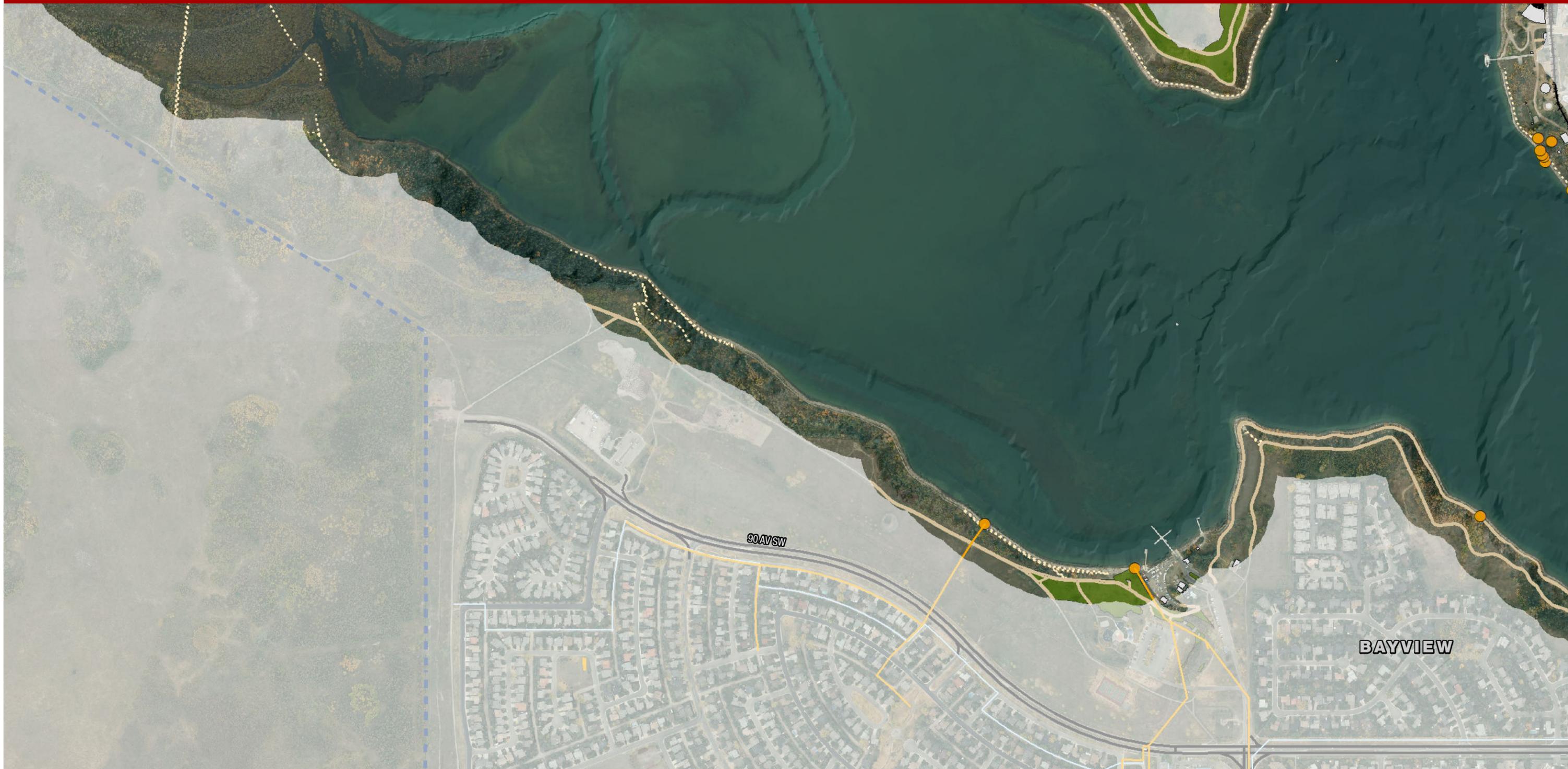
*Note that ER setbacks for lower order streams are not mapped as they were out of the project scope

**Recommended setback boundary of Nose Creek Watershed Partnership including floodplain, meander belt width and adjacent escarpments >15%



THE CITY OF
CALGARY



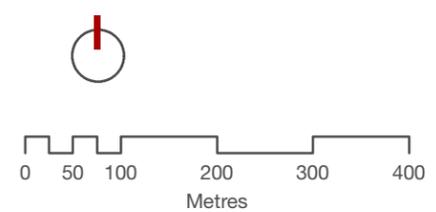


- Storm Outflow Location
- Stormwater Lift Station
- Storm Main (> 900mm diameter)
- Sanitary Main (>600mm diameter)
- Water Main (>400mm diameter)
- Siphon
- Pipeline River Crossing Locations
- Water / Waste Water Treatment Plants
- Existing Storm Retrofit Pond
- Possible Location of Storm Retrofit Pond
- Existing Storm Pond
- Existing Bank Infrastructure (e.g., Rip Rap, Retaining Walls, Weirs)
- Bank Erosion Hotspot
- Candidate Flood / Erosion Control Projects
- Paved Trails
- Gravel Trails
- Bridge
- Buildings
- Parks (Maintained Turf Areas)

- City Boundary
 - Major Roads
 - Rail
 - Streams
 - Fish Creek Provincial Park
- The non-masked area is based on the greater of:
- (i) outer riparian zone of the variable width model,
 - (ii) City ER setback policy boundary,
 - (iii) Nose Creek Watershed Partnership recommended setback policy
- (See Theme 2-Land and Regulatory Issues)

THE CITY OF
CALGARY

O2 PLANNING + DESIGN





Riparian Zone*

-  Inner Riparian Zone
-  Middle Riparian Zone
-  Outer Riparian Zone
-  Potential Outermost Riparian Zone

Riparian Health**

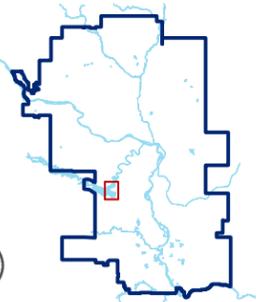
-  Healthy
-  Healthy, but with Problems
-  Unhealthy

Bank Health***

-  Good
-  Moderate
-  Poor

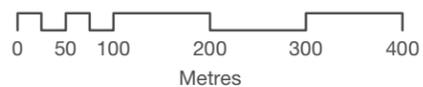
***Based on field studies of major rivers / creeks, excluding private residential riverfront lots or steep valley slopes with limited riparian habitat

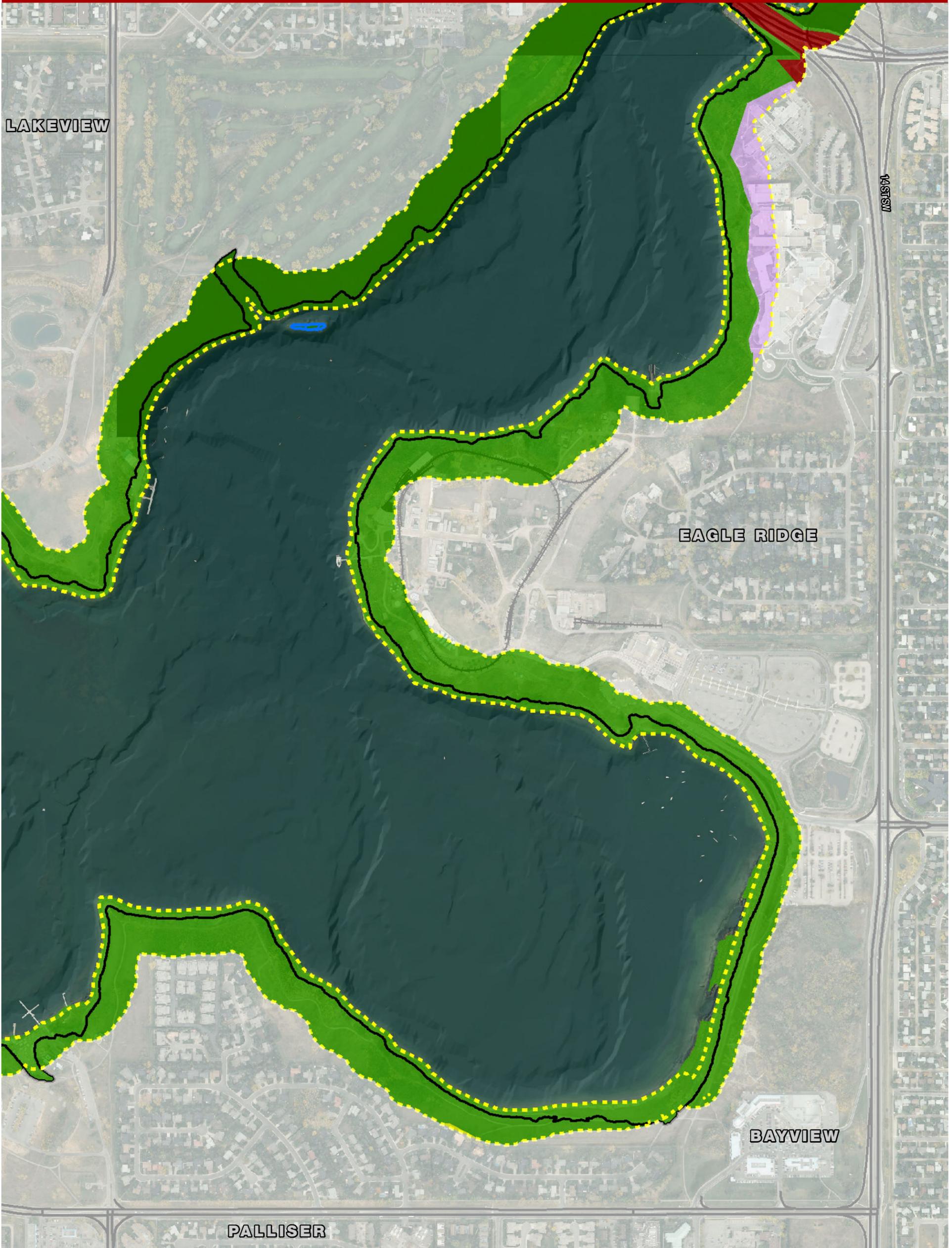
-  City Boundary
-  Major Roads
-  Rail
-  Streams
-  Fish Creek Provincial Park



*Variable Width Riparian Model Outputs

**Based on field studies of sampled riparian polygons only





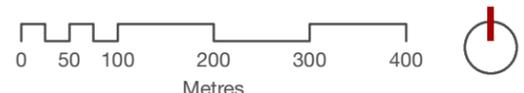
Land Use Type

- Commercial
- Future Urban Development
- Industrial
- Institutional
- Major Infrastructure
- Mixed Use
- Residential
- Parks, Recreation and Public Education
- Golf Course

- City of Calgary ER Setback Policy*
- Nose Creek Watershed Partnership Setback**
- Floodway
- Flood Fringe
- Flood Extent - 100 Year (Nose Creek/West Nose Creek)
- Outer Riparian Zone Boundary
- Streams
- Major Roads
- Rail

- City Boundary
- Fish Creek Provincial Park

*Note that ER setbacks for lower order streams are not mapped as they were out of the project scope
 **Recommended setback boundary of Nose Creek Watershed Partnership including floodplain, meander belt width and adjacent escarpments >15%

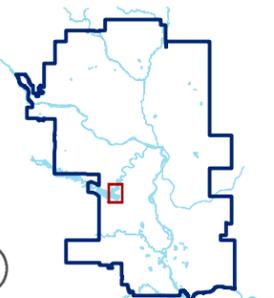
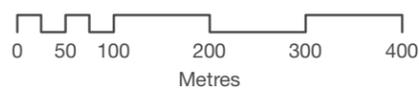


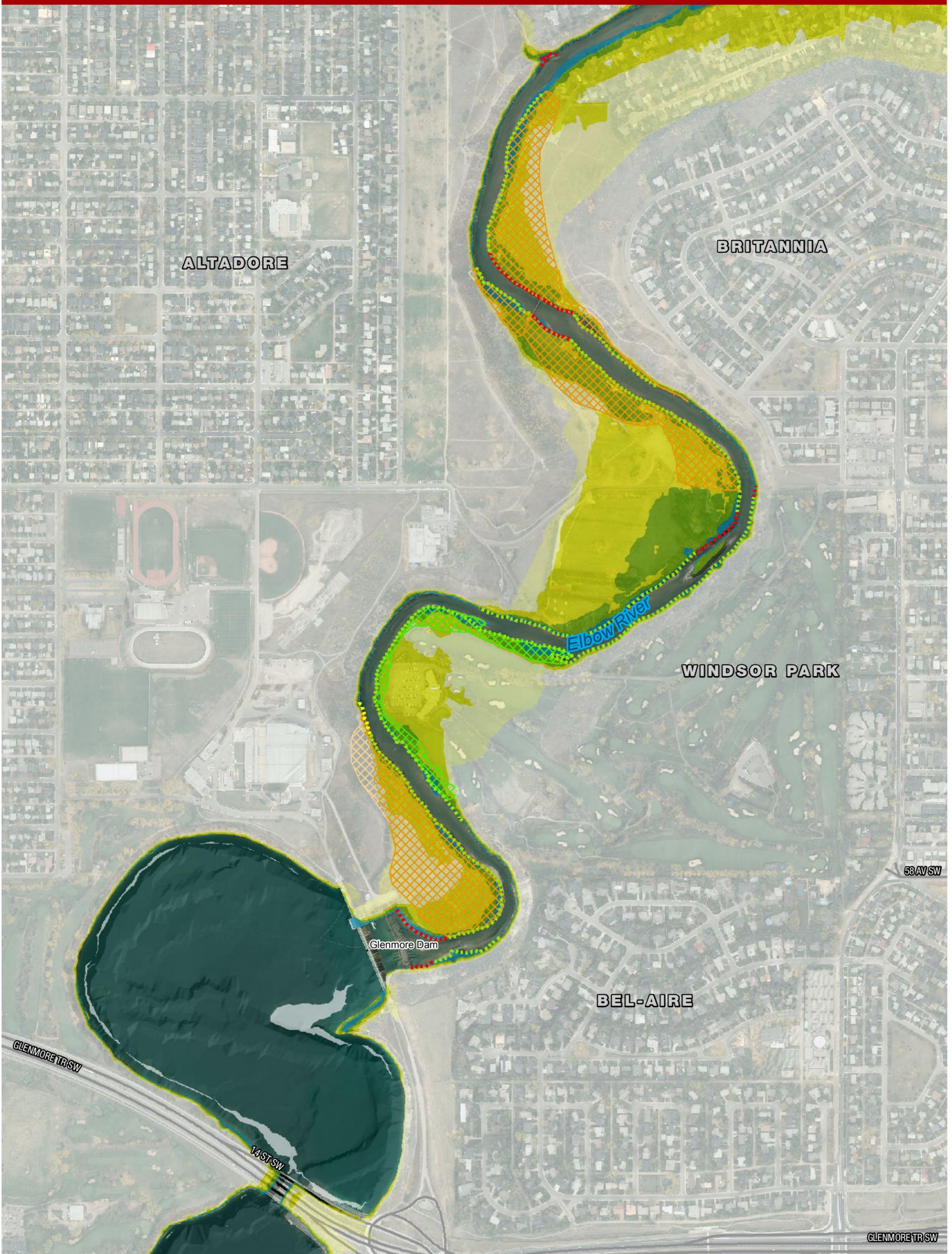


- Storm Outflow Location
- Stormwater Lift Station
- Storm Main (>900mm diameter)
- Sanitary Main (>600mm diameter)
- Water Main (>400mm diameter)
- - - Siphon
- Pipeline River Crossing Locations
- ▲ Water / Waste Water Treatment Plants
- ▭ Existing Storm Retrofit Pond
- ▭ Possible Location of Storm Retrofit Pond
- ▭ Existing Storm Pond
- Existing Bank Infrastructure (e.g., Rip Rap, Retaining Walls, Weirs)
- Bank Erosion Hotspot

- ▲ Candidate Flood / Erosion Control Projects
- Paved Trails
- - - Gravel Trails
- Bridge
- ▭ Buildings
- ▭ Parks (Maintained Turf Areas)
- City Boundary
- Major Roads
- + — Rail
- Streams
- ▭ Fish Creek Provincial Park

The non-masked area is based on the greater of:
 (i) outer riparian zone of the variable width model,
 (ii) City ER setback policy boundary,
 (iii) Nose Creek Watershed Partnership recommended setback policy
 (See Theme 2-Land and Regulatory Issues)





Riparian Zone*

- Inner Riparian Zone
- Middle Riparian Zone
- Outer Riparian Zone
- Potential Outermost Riparian Zone

Riparian Health**

- Healthy
- Healthy, but with Problems
- Unhealthy

Bank Health***

- Good
- Moderate
- Poor

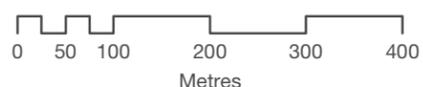
***Based on field studies of major rivers / creeks, excluding private residential riverfront lots or steep valley slopes with limited riparian habitat

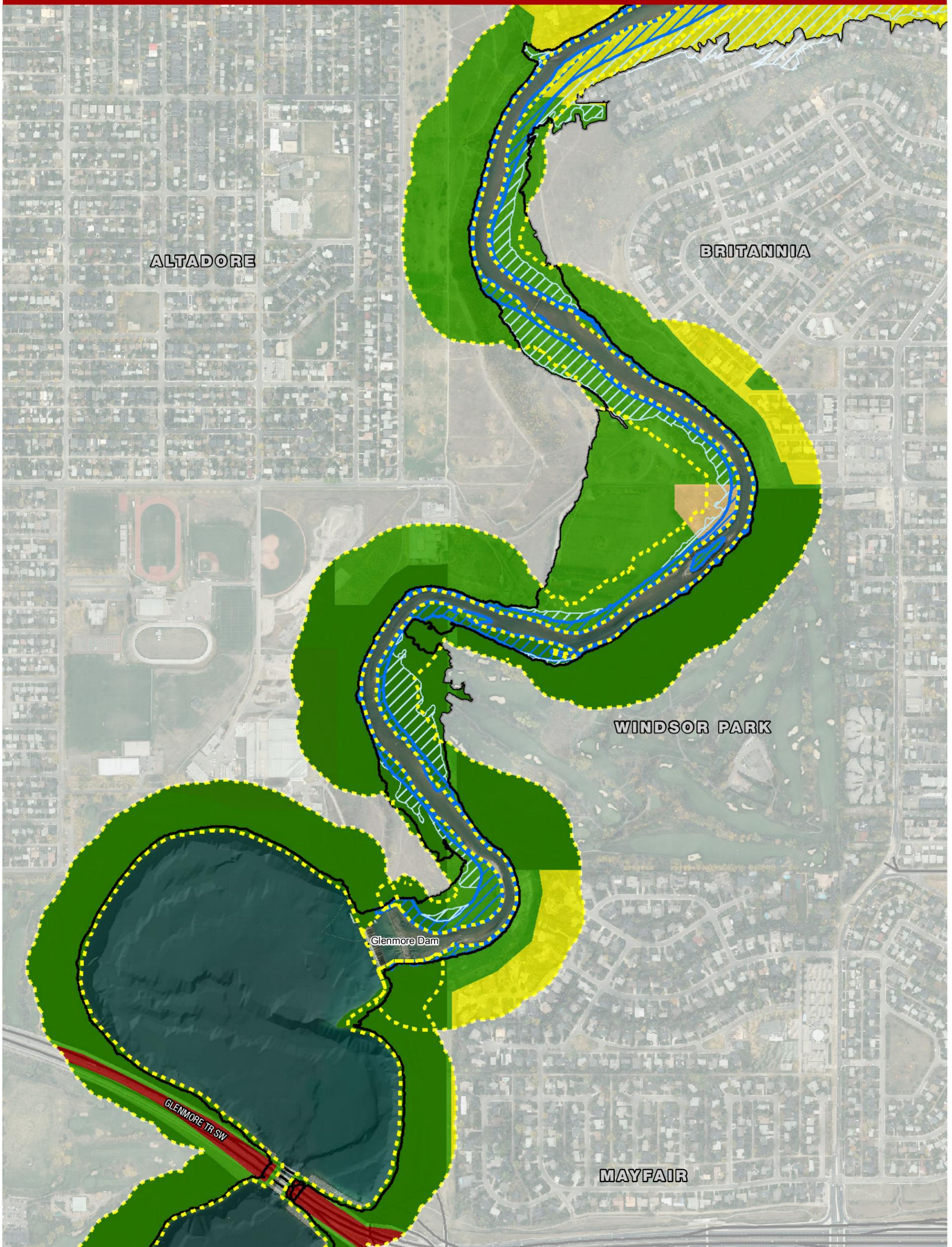
- City Boundary
- Major Roads
- Rail
- Streams
- Fish Creek Provincial Park



*Variable Width Riparian Model Outputs

**Based on field studies of sampled riparian polygons only





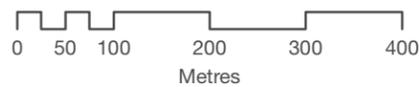
Land Use Type

Commercial
Future Urban Development
Industrial
Institutional
Major Infrastructure
Mixed Use
Residential
Parks, Recreation and Public Education
Golf Course

	City of Calgary ER Setback Policy*
	Nose Creek Watershed Partnership Setback**
	Floodway
	Flood Fringe
	Flood Extent - 100 Year (Nose Creek/West Nose Creek)
	Outer Riparian Zone Boundary
	Streams
	Major Roads
	Rail

	City Boundary
	Fish Creek Provincial Park

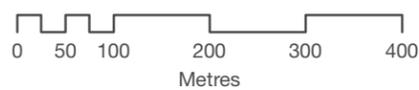
*Note that ER setbacks for lower order streams are not mapped as they were out of the project scope
 **Recommended setback boundary of Nose Creek Watershed Partnership including floodplain, meander belt width and adjacent escarpments >15%





- Storm Outflow Location
- Stormwater Lift Station
- Storm Main (>900mm diameter)
- Sanitary Main (>600mm diameter)
- Water Main (>400mm diameter)
- - - Siphon
- Pipeline River Crossing Locations
- ▲ Water / Waste Water Treatment Plants
- ▲ Existing Storm Retrofit Pond
- Possible Location of Storm Retrofit Pond
- Existing Storm Pond
- Existing Bank Infrastructure (e.g., Rip Rap, Retaining Walls, Weirs)
- Bank Erosion Hotspot
- ▲ Candidate Flood / Erosion Control Projects
- Paved Trails
- - - Gravel Trails
- Bridge
- Buildings
- Parks (Maintained Turf Areas)
- City Boundary
- Major Roads
- Rail
- Streams
- Fish Creek Provincial Park

The non-masked area is based on the greater of:
 (i) outer riparian zone of the variable width model,
 (ii) City ER setback policy boundary,
 (iii) Nose Creek Watershed Partnership recommended setback policy
 (See Theme 2-Land and Regulatory Issues)





Riparian Zone*

- Inner Riparian Zone
- Middle Riparian Zone
- Outer Riparian Zone
- Potential Outermost Riparian Zone

Riparian Health**

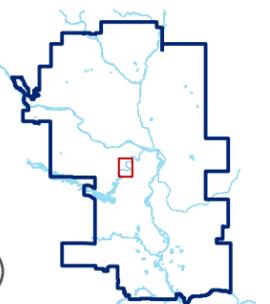
- Healthy
- Healthy, but with Problems
- Unhealthy

Bank Health***

- Good
- Moderate
- Poor

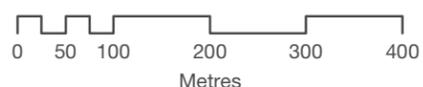
***Based on field studies of major rivers / creeks, excluding private residential riverfront lots or steep valley slopes with limited riparian habitat

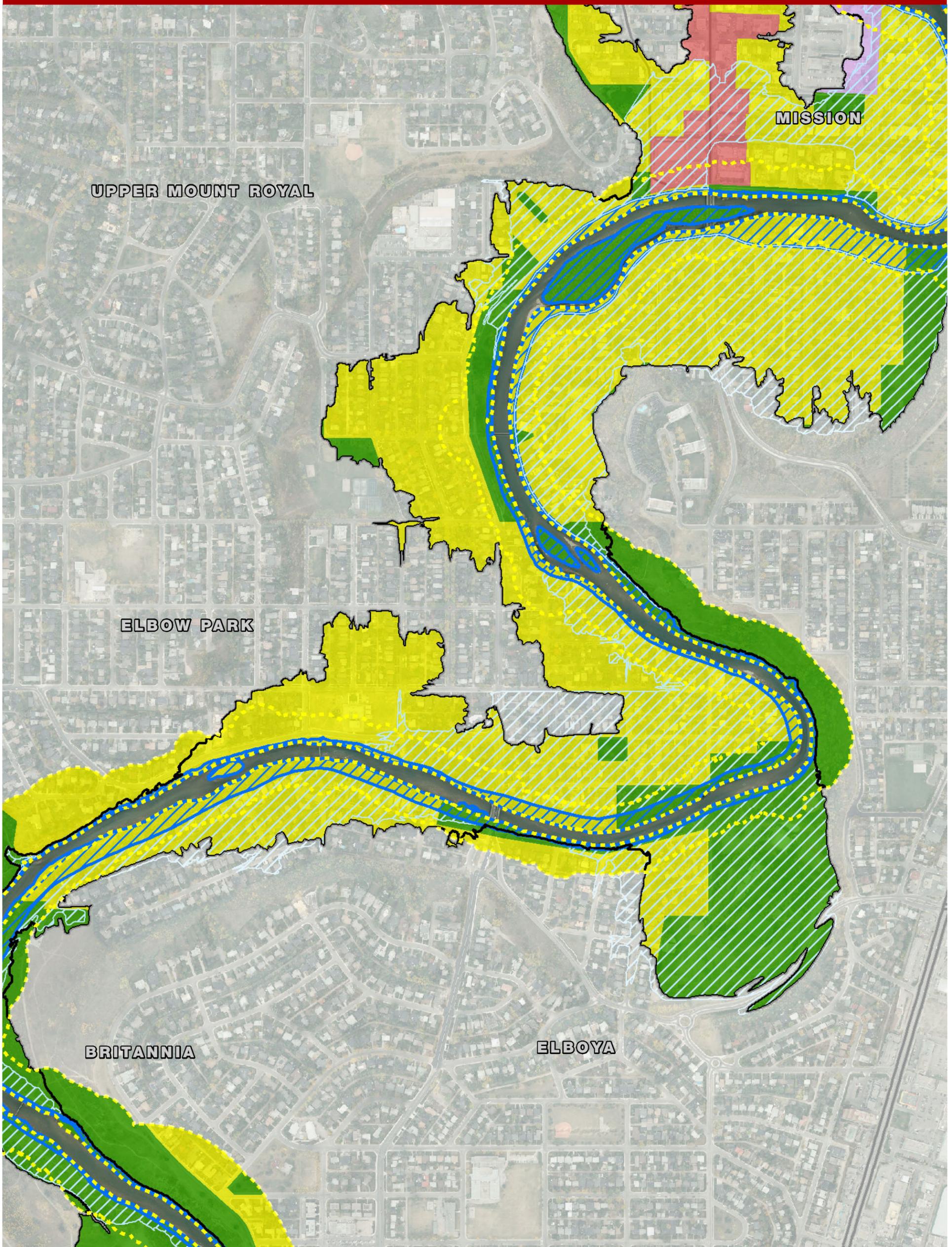
- City Boundary
- Major Roads
- Rail
- Streams
- Fish Creek Provincial Park



*Variable Width Riparian Model Outputs

**Based on field studies of sampled riparian polygons only





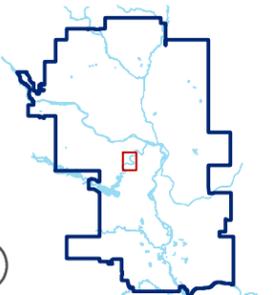
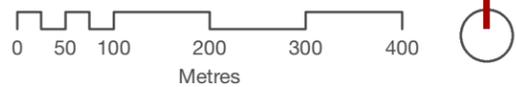
Land Use Type

- Commercial
- Future Urban Development
- Industrial
- Institutional
- Major Infrastructure
- Mixed Use
- Residential
- Parks, Recreation and Public Education
- Golf Course

- City of Calgary ER Setback Policy*
- Nose Creek Watershed Partnership Setback**
- Floodway
- Flood Fringe
- Flood Extent - 100 Year (Nose Creek/West Nose Creek)
- Outer Riparian Zone Boundary
- Streams
- Major Roads
- Rail

- City Boundary
- Fish Creek Provincial Park

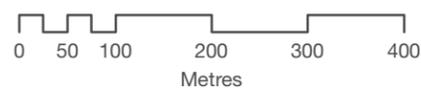
*Note that ER setbacks for lower order streams are not mapped as they were out of the project scope
 **Recommended setback boundary of Nose Creek Watershed Partnership including floodplain, meander belt width and adjacent escarpments >15%

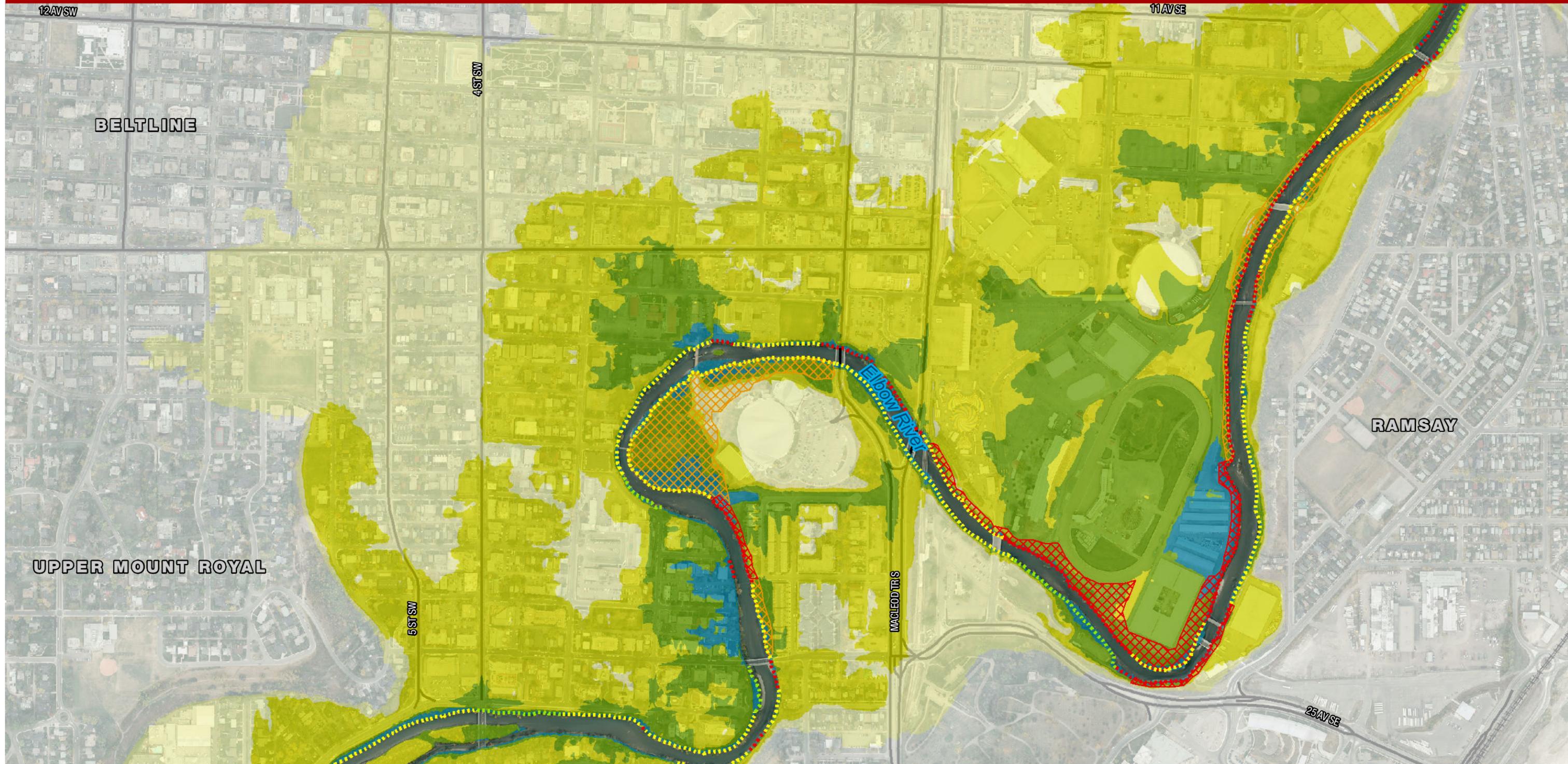




- Storm Outflow Location
- Stormwater Lift Station
- Storm Main (>900mm diameter)
- Sanitary Main (>600mm diameter)
- Water Main (>400mm diameter)
- - - Siphon
- Pipeline River Crossing Locations
- ▲ Water / Waste Water Treatment Plants
- ▭ Existing Storm Retrofit Pond
- ▭ Possible Location of Storm Retrofit Pond
- ▭ Existing Storm Pond
- Existing Bank Infrastructure (e.g., Rip Rap, Retaining Walls, Weirs)
- Bank Erosion Hotspot
- ▲ Candidate Flood / Erosion Control Projects
- Paved Trails
- Gravel Trails
- Bridge
- ▭ Buildings
- ▭ Parks (Maintained Turf Areas)
- City Boundary
- Major Roads
- Rail
- Streams
- ▭ Fish Creek Provincial Park

The non-masked area is based on the greater of:
 (i) outer riparian zone of the variable width model,
 (ii) City ER setback policy boundary,
 (iii) Nose Creek Watershed Partnership recommended setback policy
 (See Theme 2-Land and Regulatory Issues)





- Riparian Zone***
- Inner Riparian Zone
 - Middle Riparian Zone
 - Outer Riparian Zone
 - Potential Outermost Riparian Zone

- Riparian Health****
- Healthy
 - Healthy, but with Problems
 - Unhealthy

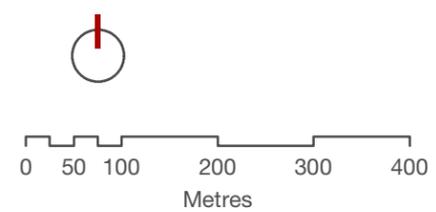
- Bank Health*****
- Good
 - Moderate
 - Poor

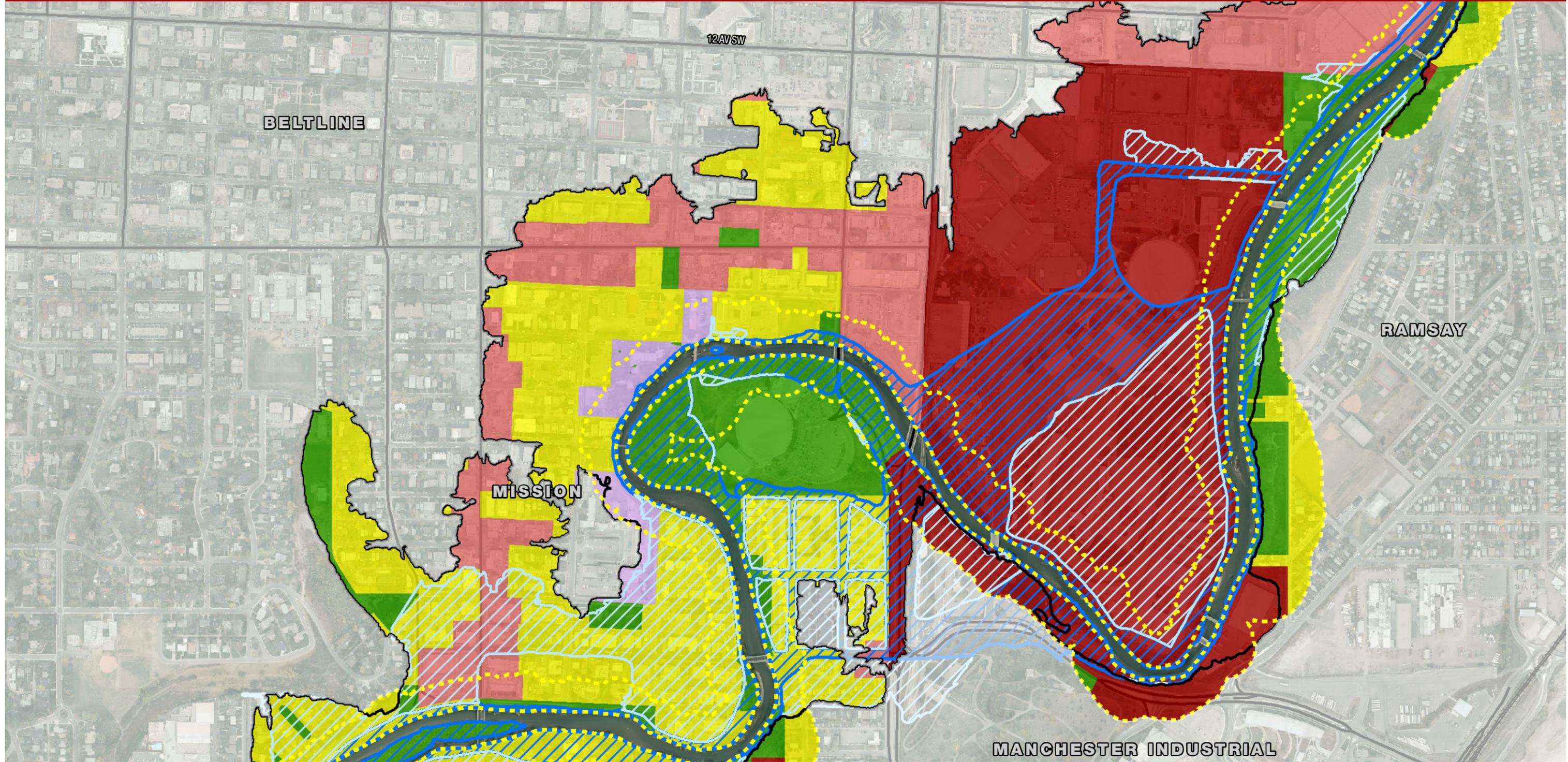
- City Boundary
- Major Roads
- Rail
- Streams
- Fish Creek Provincial Park

***Based on field studies of major rivers / creeks, excluding private residential riverfront lots or steep valley slopes with limited riparian habitat

**Based on field studies of sampled riparian polygons only

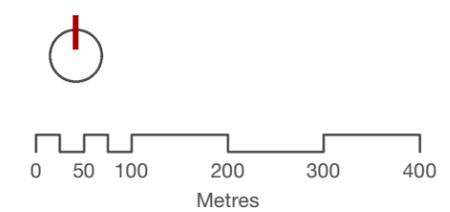
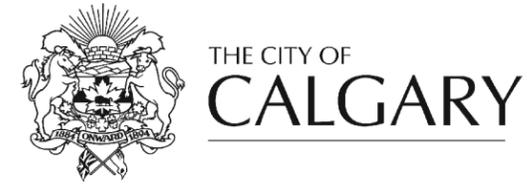
*Variable Width Riparian Model Outputs





Land Use Type	Major Infrastructure	City of Calgary ER Setback Policy*	Streams
Commercial	Mixed Use	Nose Creek Water Management Plan Setback **	Major Roads
Future Urban Development	Residential	Floodway	Rail
Industrial	Parks, Recreation and Public Education	Flood Fringe	City Boundary
Institutional	Golf Course	Flood Extent - 100 Year (Nose Creek/West Nose Creek)	Fish Creek Provincial Park
		Outer Riparian Zone Boundary	

*Note that ER setbacks for lower order streams are not mapped as they were out of the project scope
 **Recommended setback boundary of Nose Creek Watershed Partnership including floodplain, meander belt width and adjacent escarpments >15%



RIPARIAN AREAS MAP PROJECT

EXISTING INFRASTRUCTURE AND POSSIBLE IMPROVEMENTS ELBOW RIVER 07



- Storm Outflow Location
- Stormwater Lift Station
- Storm Main (> 900mm diameter)
- Sanitary Main (>600mm diameter)
- Water Main (>400mm diameter)
- - - Siphon
- Pipeline River Crossing Locations
- ▲ Water / Waste Water Treatment Plants
- ▨ Existing Storm Retrofit Pond
- ▨ Possible Location of Storm Retrofit Pond
- Existing Storm Pond
- Existing Bank Infrastructure (e.g., Rip Rap, Retaining Walls, Weirs)
- Bank Erosion Hotspot
- ▲ Candidate Flood / Erosion Control Projects
- Paved Trails
- Gravel Trails
- Bridge
- Buildings
- Parks (Maintained Turf Areas)

- City Boundary
 - Major Roads
 - + + + Rail
 - Streams
 - Fish Creek Provincial Park
- The non-masked area is based on the greater of:
- (i) outer riparian zone of the variable width model,
 - (ii) City ER setback policy boundary,
 - (iii) Nose Creek Watershed Partnership recommended setback policy
- (See Theme 2-Land and Regulatory Issues)

THE CITY OF
CALGARY

O2 PLANNING + DESIGN

