



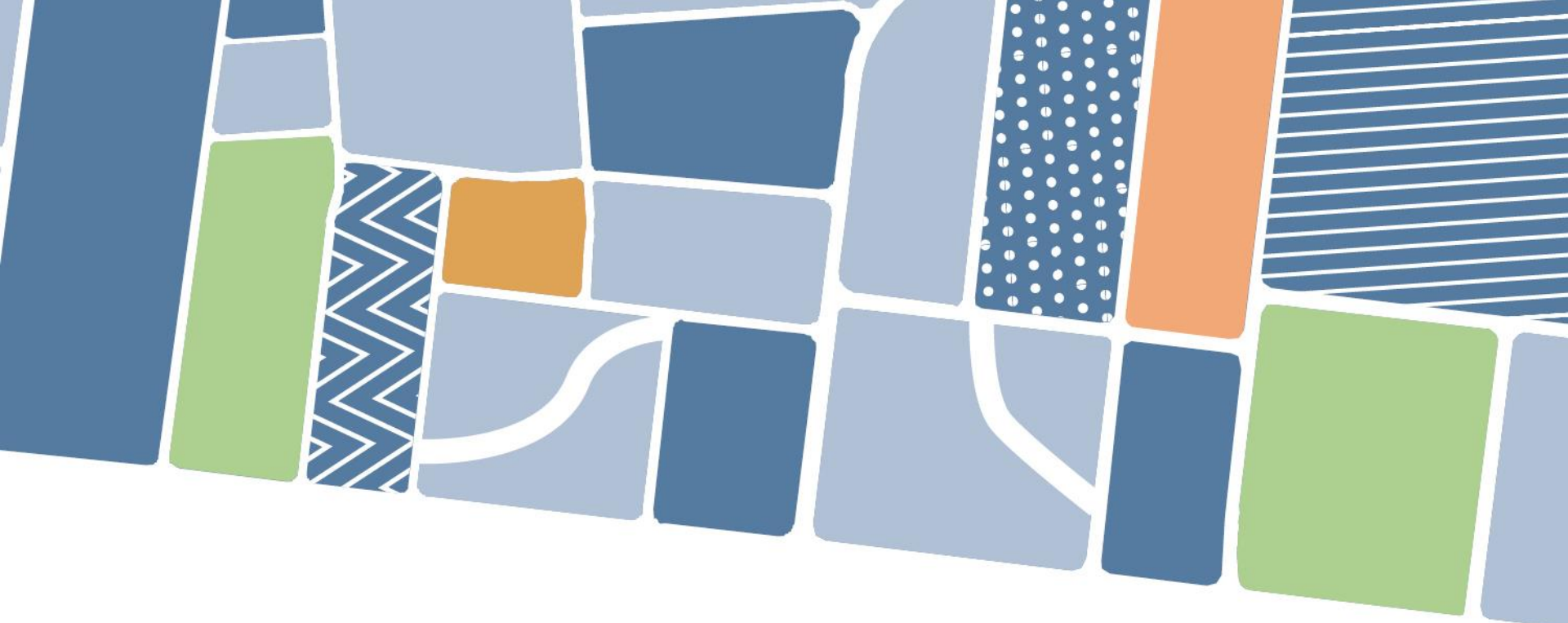
**Phase 3 – Impact Assessment and
Preliminary Management Strategies**

Clair-Maltby

Transform. Connect. Community.

Presentation Outline

1. Project Background and Process
2. Study Area Characterization
3. Impact Assessment
4. Preliminary Management Approach and Strategies



Clair-Maltby

Transform. Connect. Community.

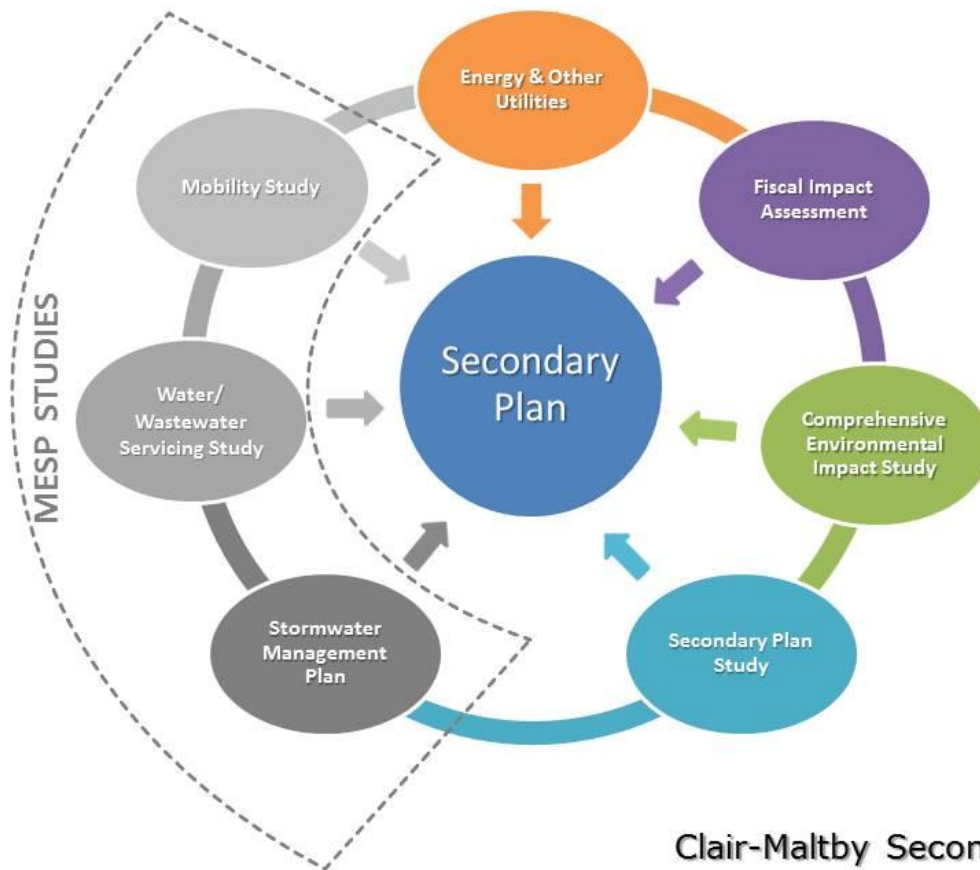
1. Project Background and Process

wood.



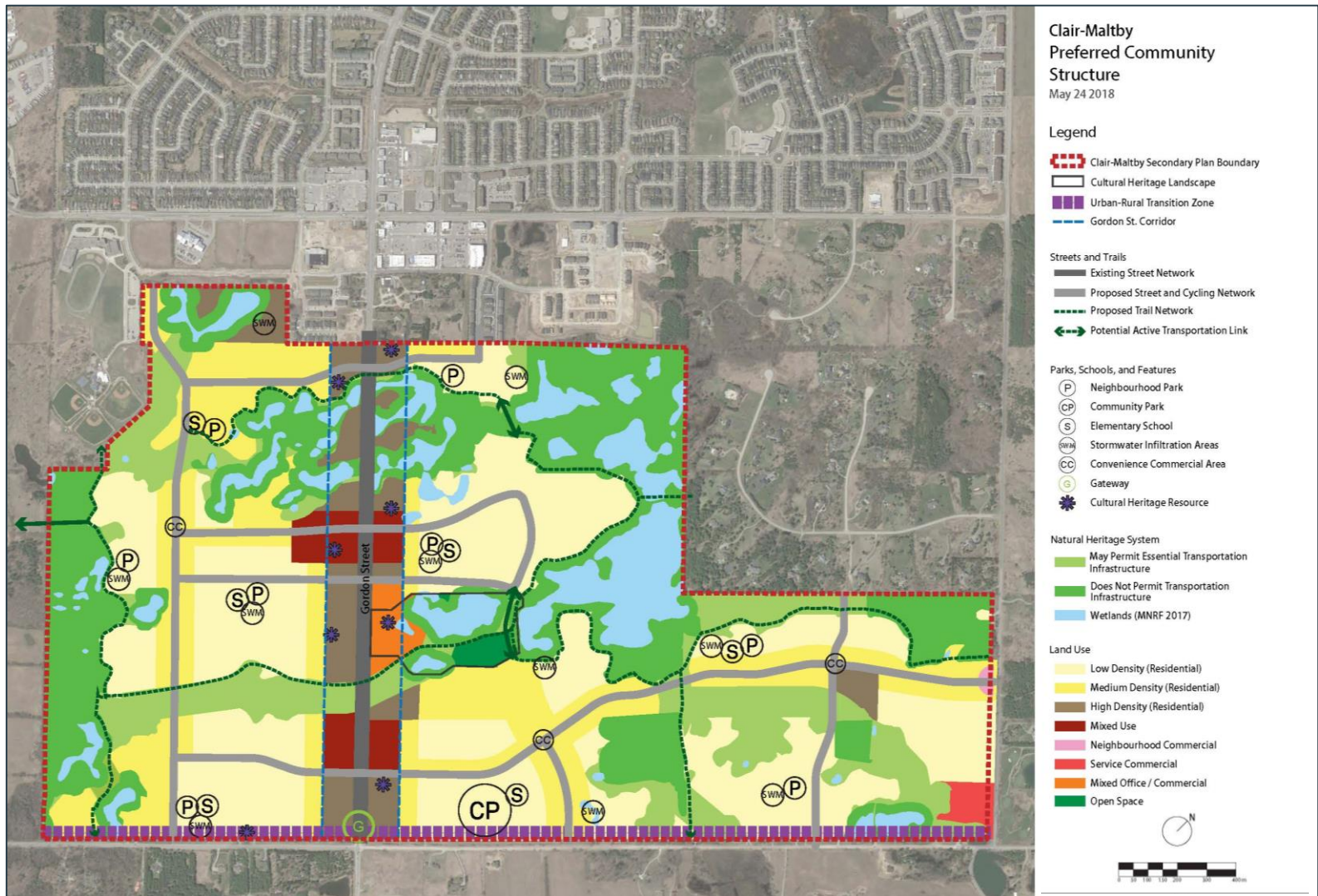
1. Project Background and Process

Integrated Study Relationship



Clair-Maltby Secondary Plan
Process Diagram

1. Project Background and Process – Preferred Community Structure – June, 2018



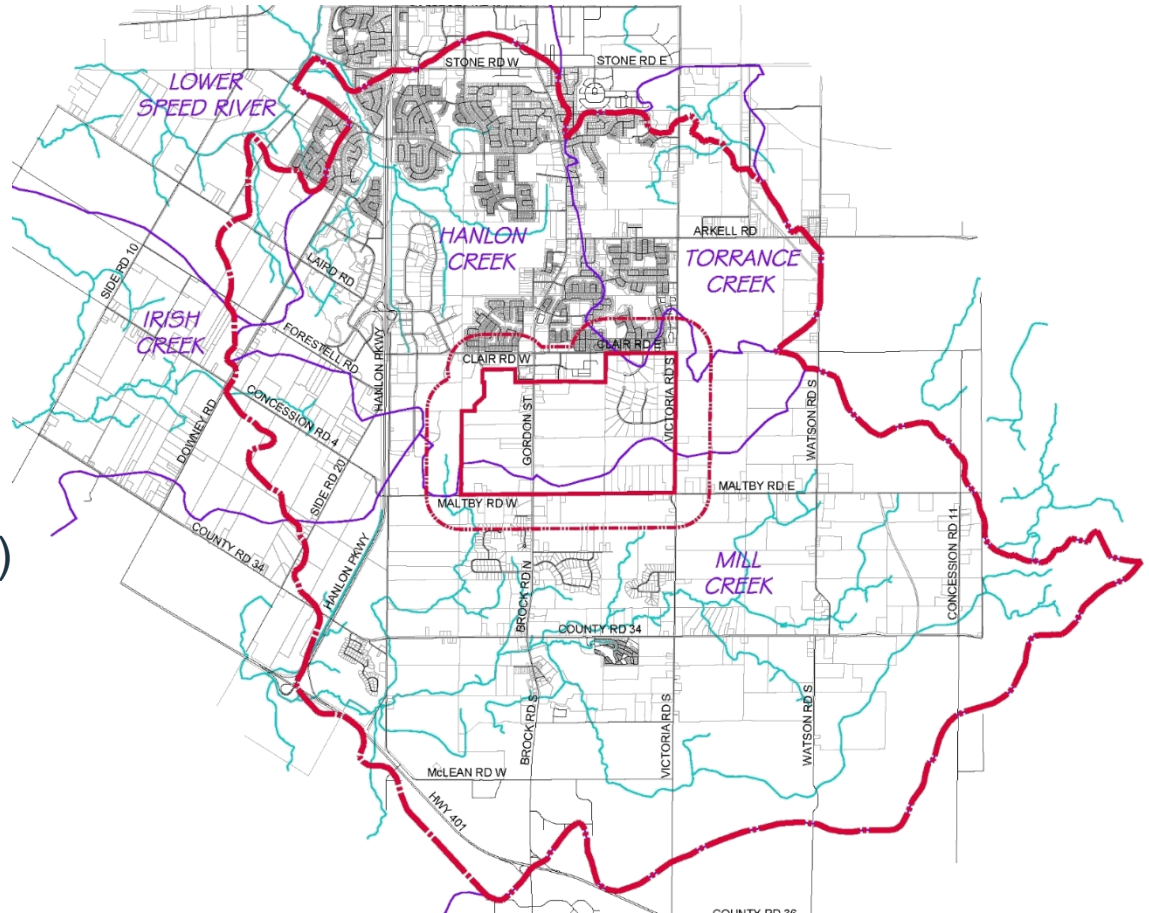
1. Project Background and Process

Study Scales

Secondary Plan Area (SPA)
536 ha

Primary Study Area (PSA)
1127 ha

Secondary Study Area (SSA)
9624 ha



1. Project Background and Process

Key CEIS Tasks

- Phases 1 and 2
 - Verification / refinement / assessment of environmental features and functions
 - Assessment of the role of water in the study areas to support natural systems (groundwater / surface water)
 - Constraints and opportunities definition
- Phase 3
 - Assessment of impacts associated with preliminary community structure
 - Establishment of preliminary integrated management strategies
 - Input to land use refinement

1. Project Background and Process

Study Approach

- Review of background information
- Multi-year monitoring and field studies
 - 2016, 2017, 2018
 - *Meteorology*
 - *Surface Water*
 - *Ground Water*
 - *Natural Systems*
- Modelling of surface and groundwater
- Agency and stakeholder consultation



Clair-Maltby

Transform. Connect. Community.

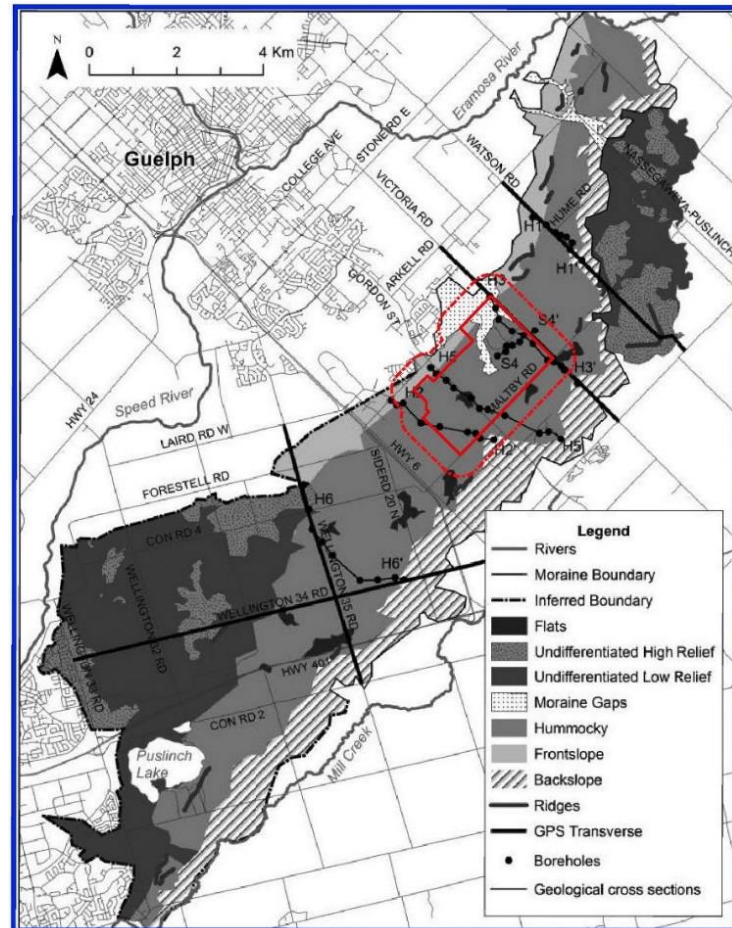
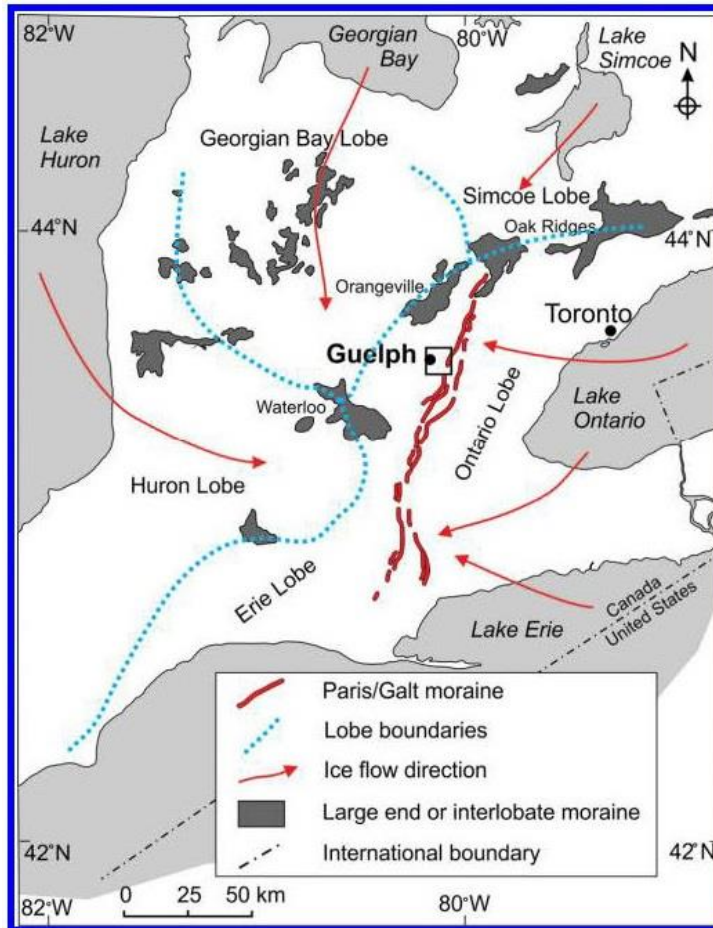
2. Study Area Characterization

wood.



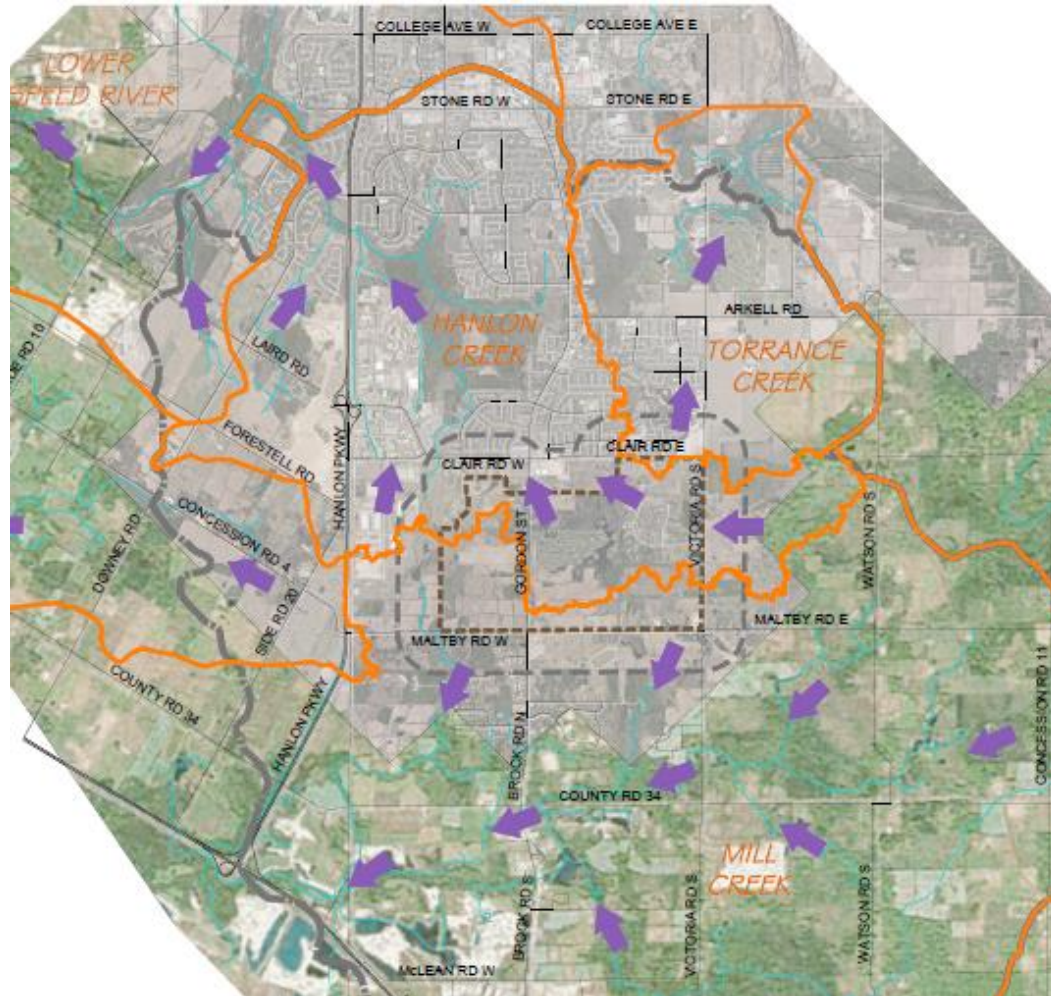
2. Study Area Characterization – Existing Conditions

Landform: Paris Galt Moraine and Paris Moraine



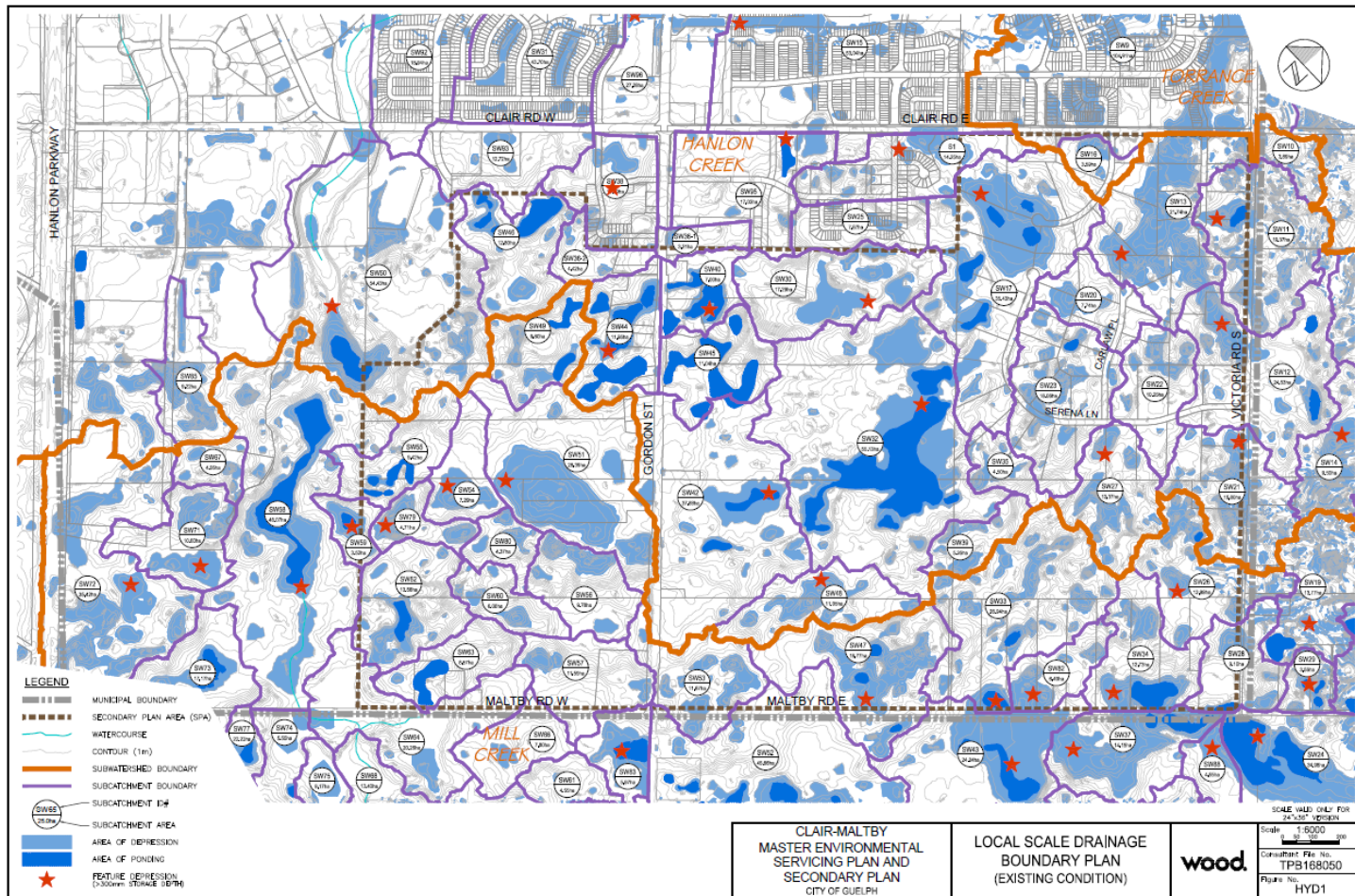
2. Study Area Characterization

Surface Water: *Headwaters of Mill, Torrance, Hanlon Watersheds*



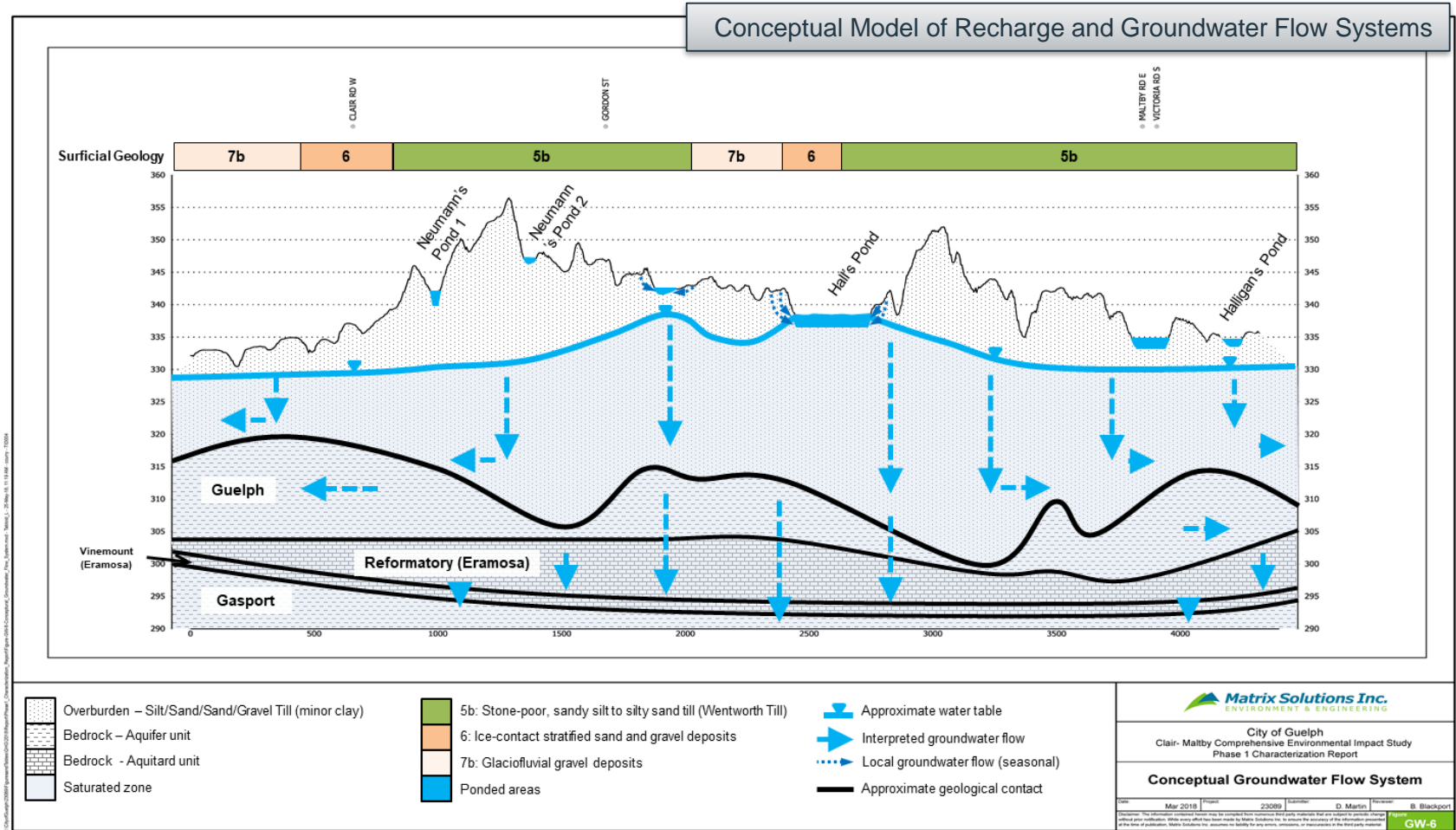
2. Study Area Characterization

Surface Water: Numerous Wet / Dry Depressions



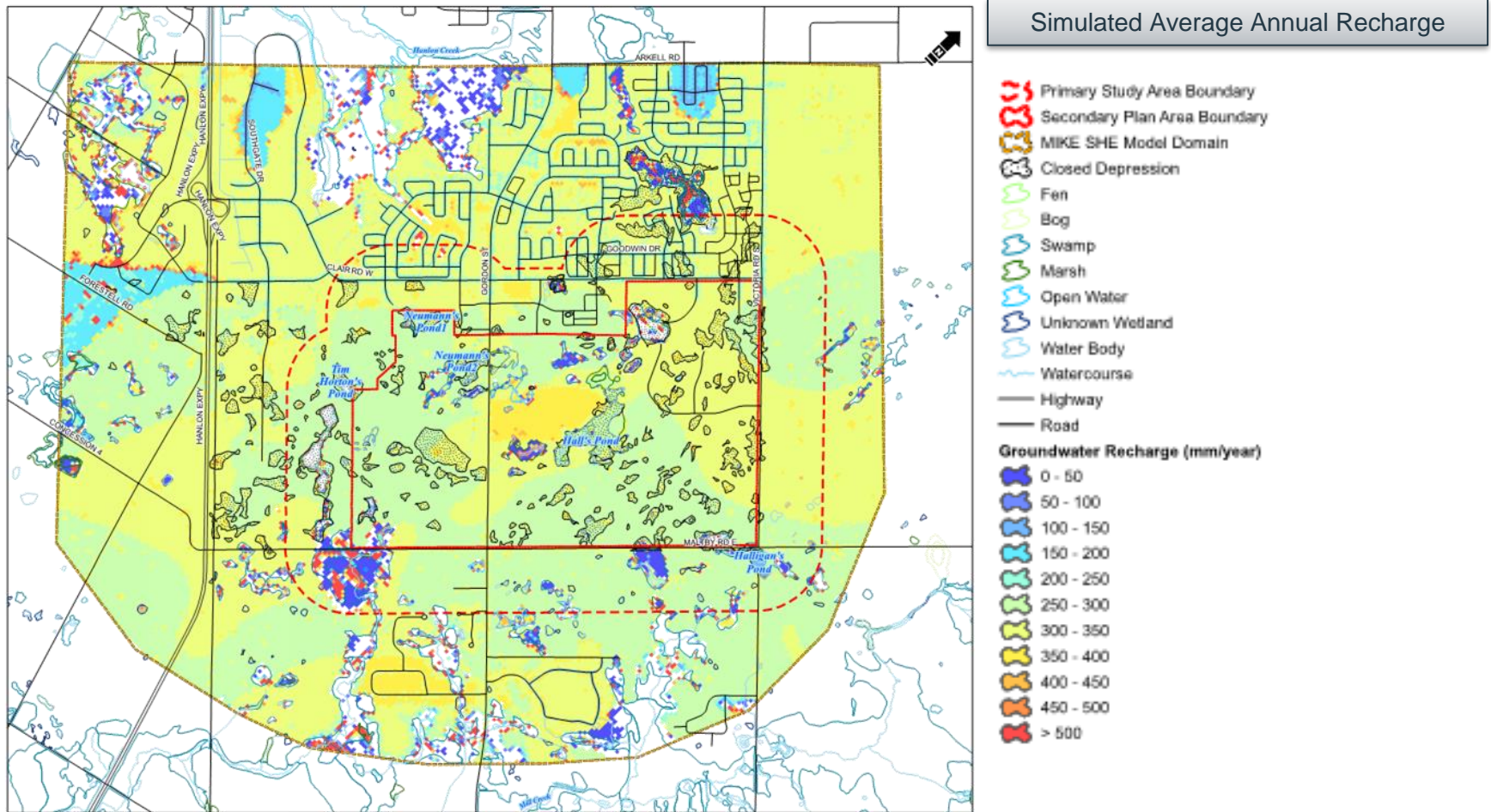
2. Study Area Characterization

Hydrogeology: Surface Water Interaction with Shallow / Deep Systems



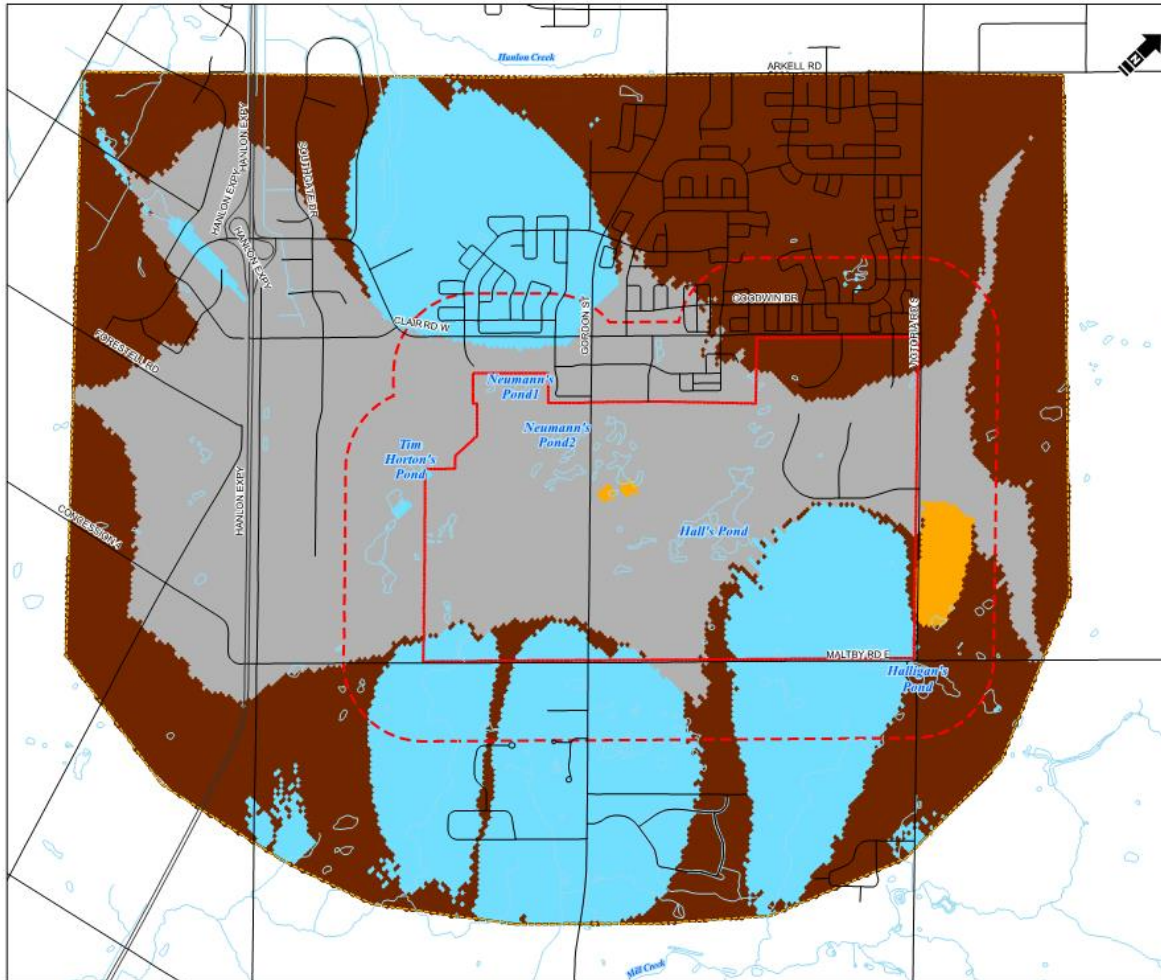
2. Study Area Characterization

Hydrogeology: *Significant Annual Recharge (250-400 mm/year)*



2. Study Area Characterization

Hydrogeology: *Where does recharge go?*

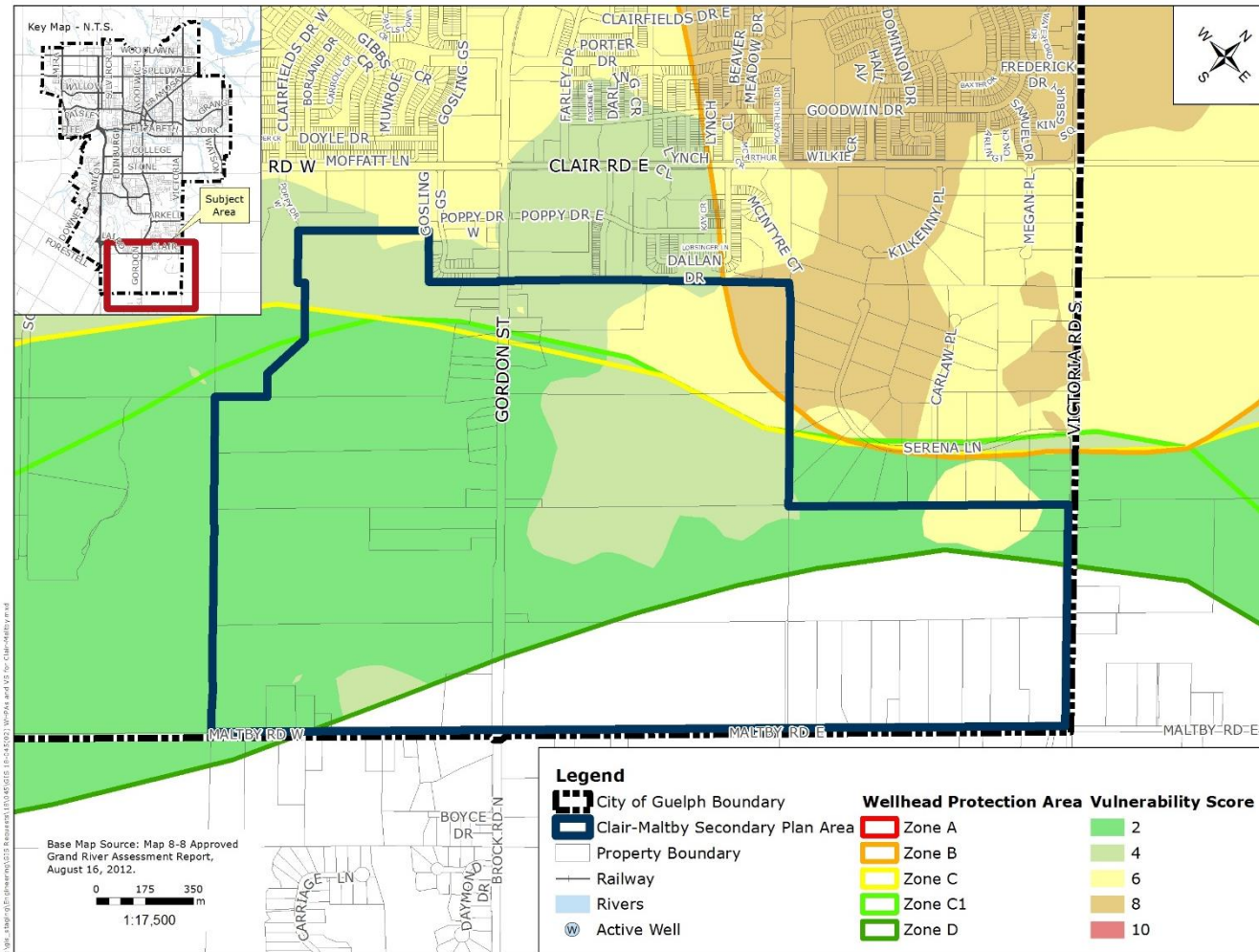


Simulated Recharge – Discharge Linkage – Where does recharge go?

- Primary Study Area Boundary
- Secondary Plan Area Boundary
- MIKE SHE Model Domain
- Water Body
- Watercourse
- Highway
- Road
- Particle Track**
 - Vertical Groundwater Flow Out (Across Vinemount Formation)
 - Lateral Groundwater Flow Out (Overburden and Bedrock)
 - Captured by Pumping Well
 - Discharge to Streams and Water Bodies

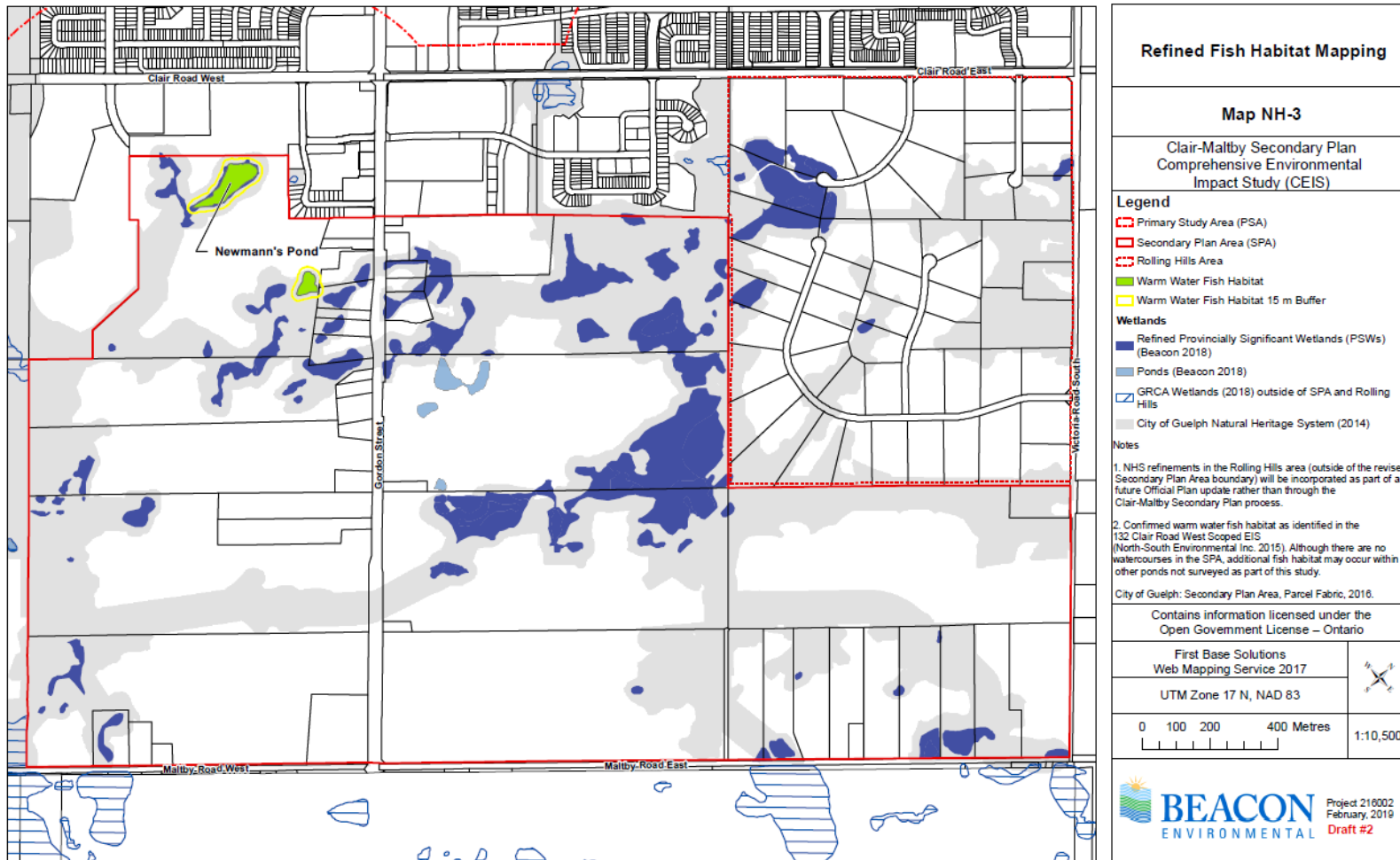
2. Study Area Characterization

Hydrogeology: Groundwater Vulnerability



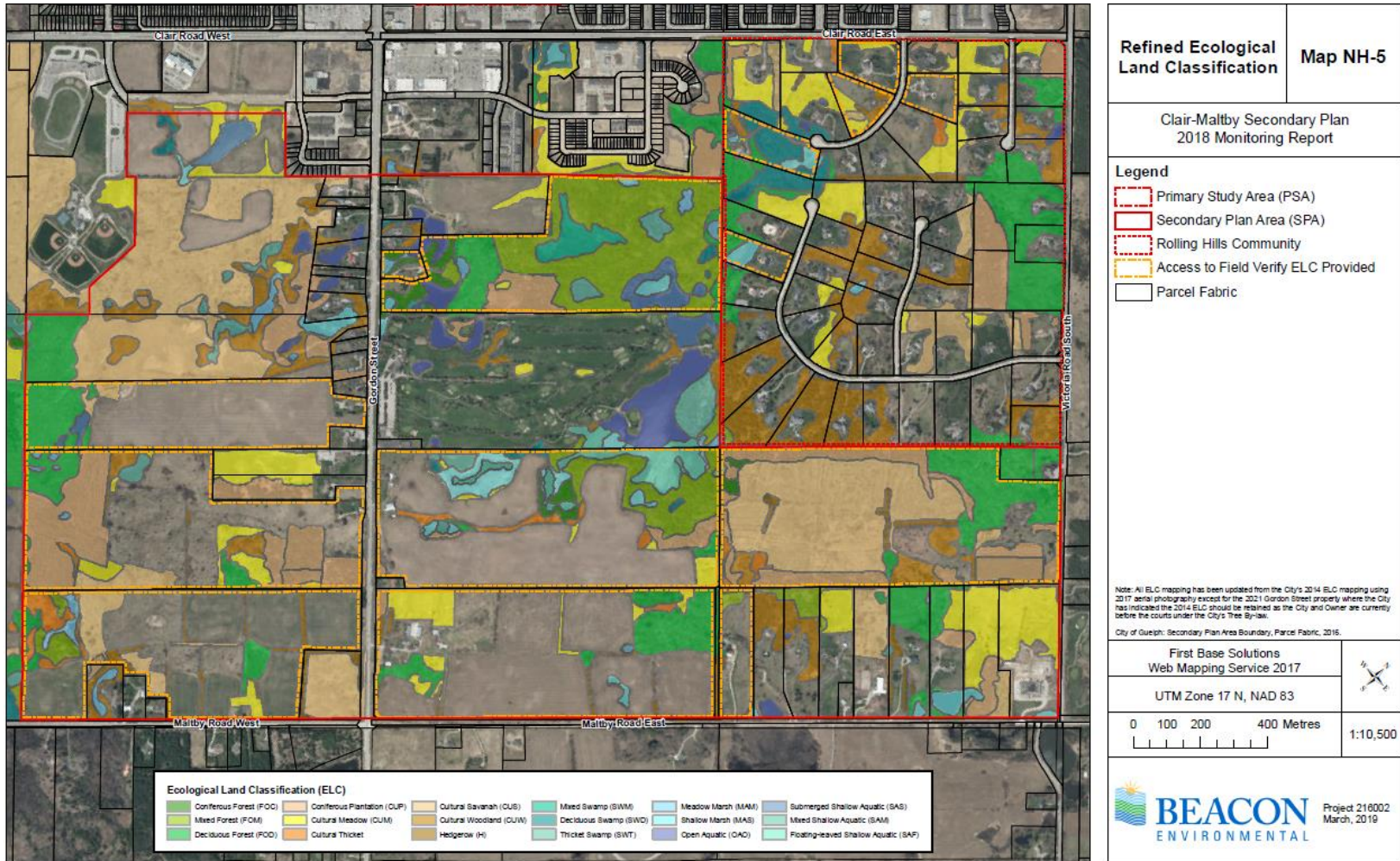
2. Study Area Characterization

NHS Findings: *Surface Water Features and Fish Habitat*



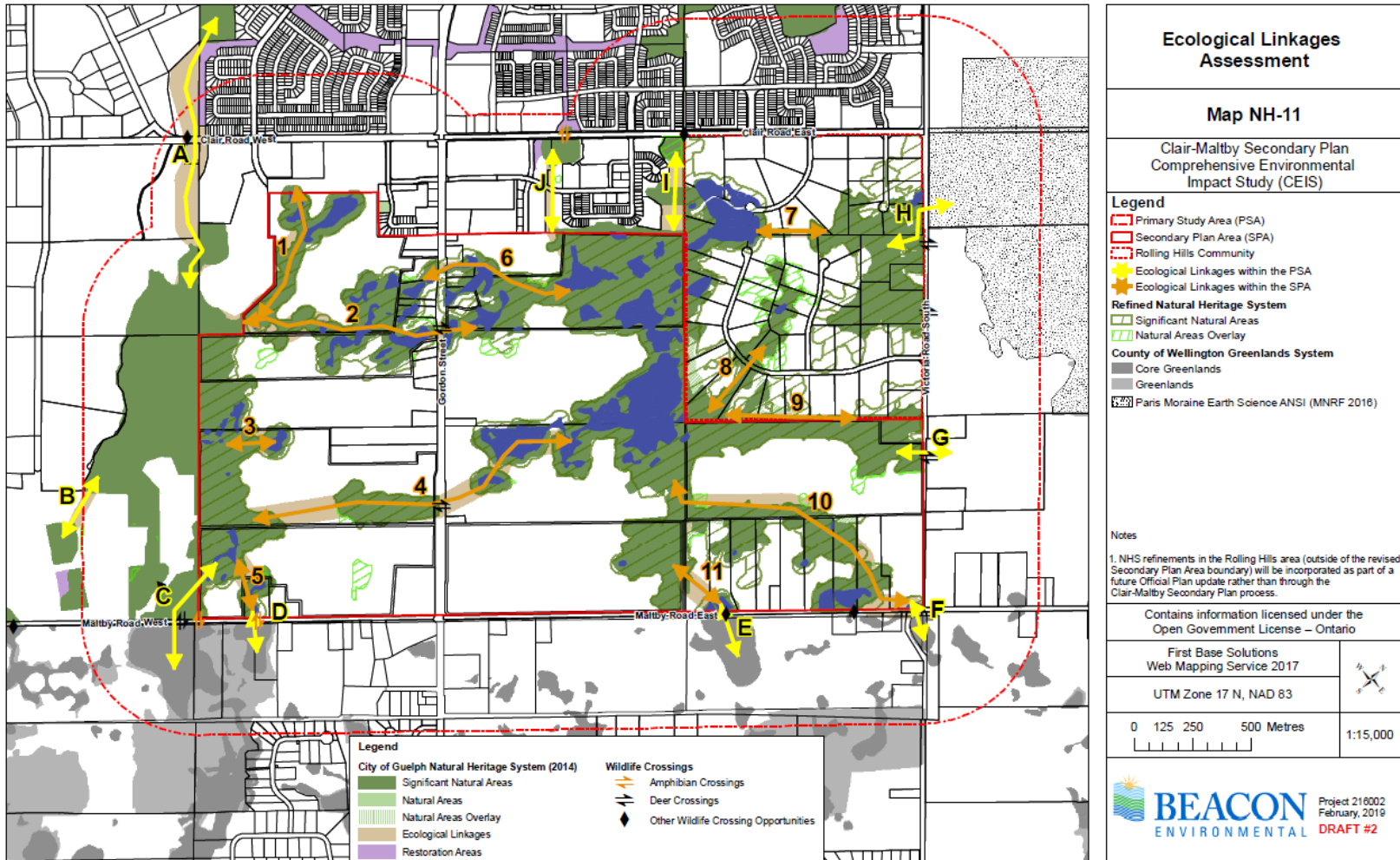
2. Study Area Characterization

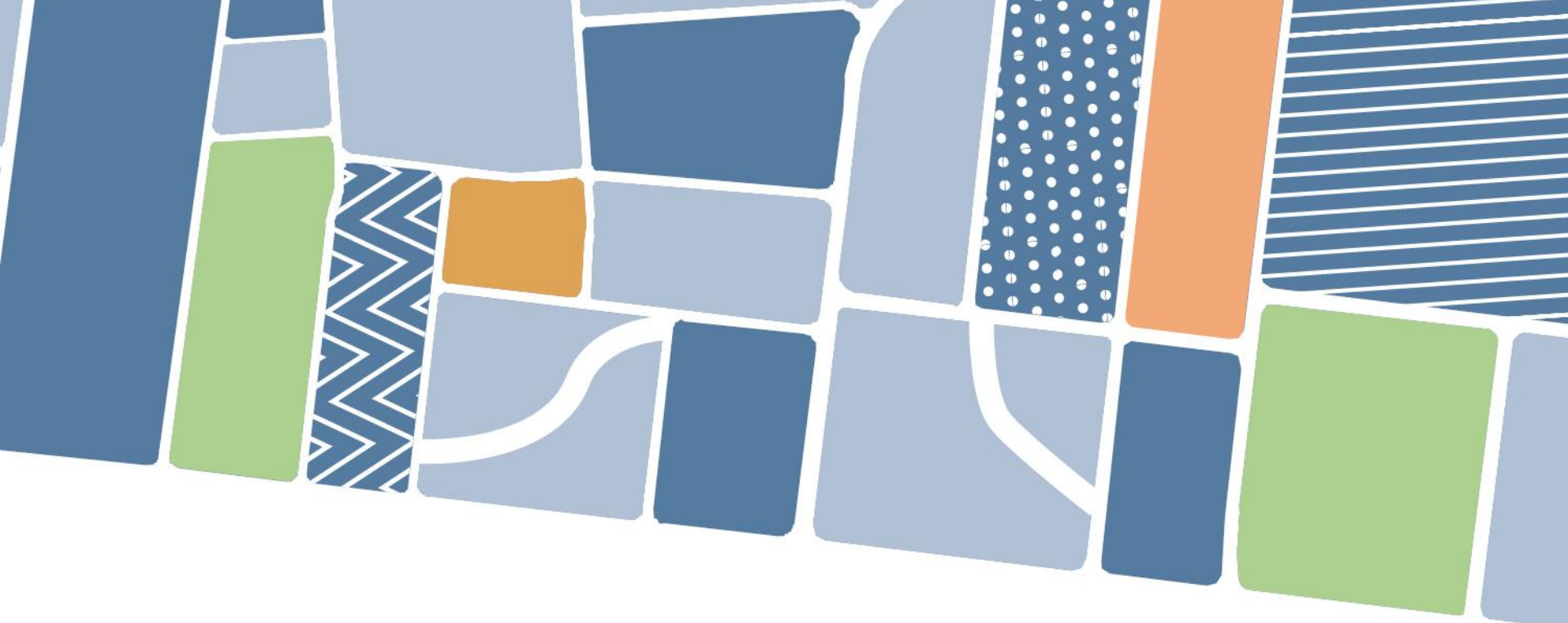
Natural Environment: *Wetlands, Woodlands and Wildlife*



2. Study Area Characterization

Natural Environment: *Ecological Linkages and Connectivity*





Clair-Maltby

Transform. Connect. Community.

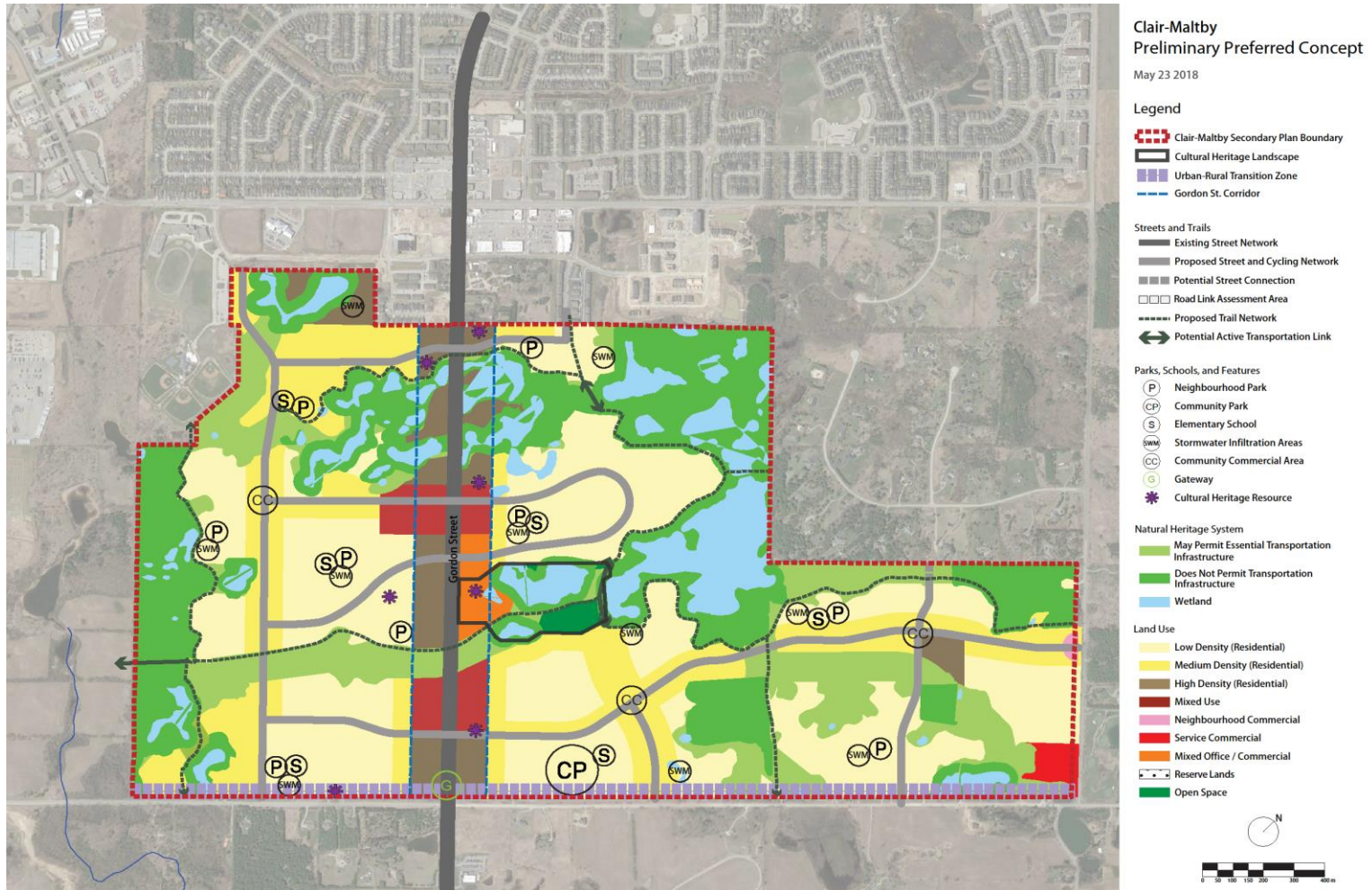
3. Impact Assessment

wood.



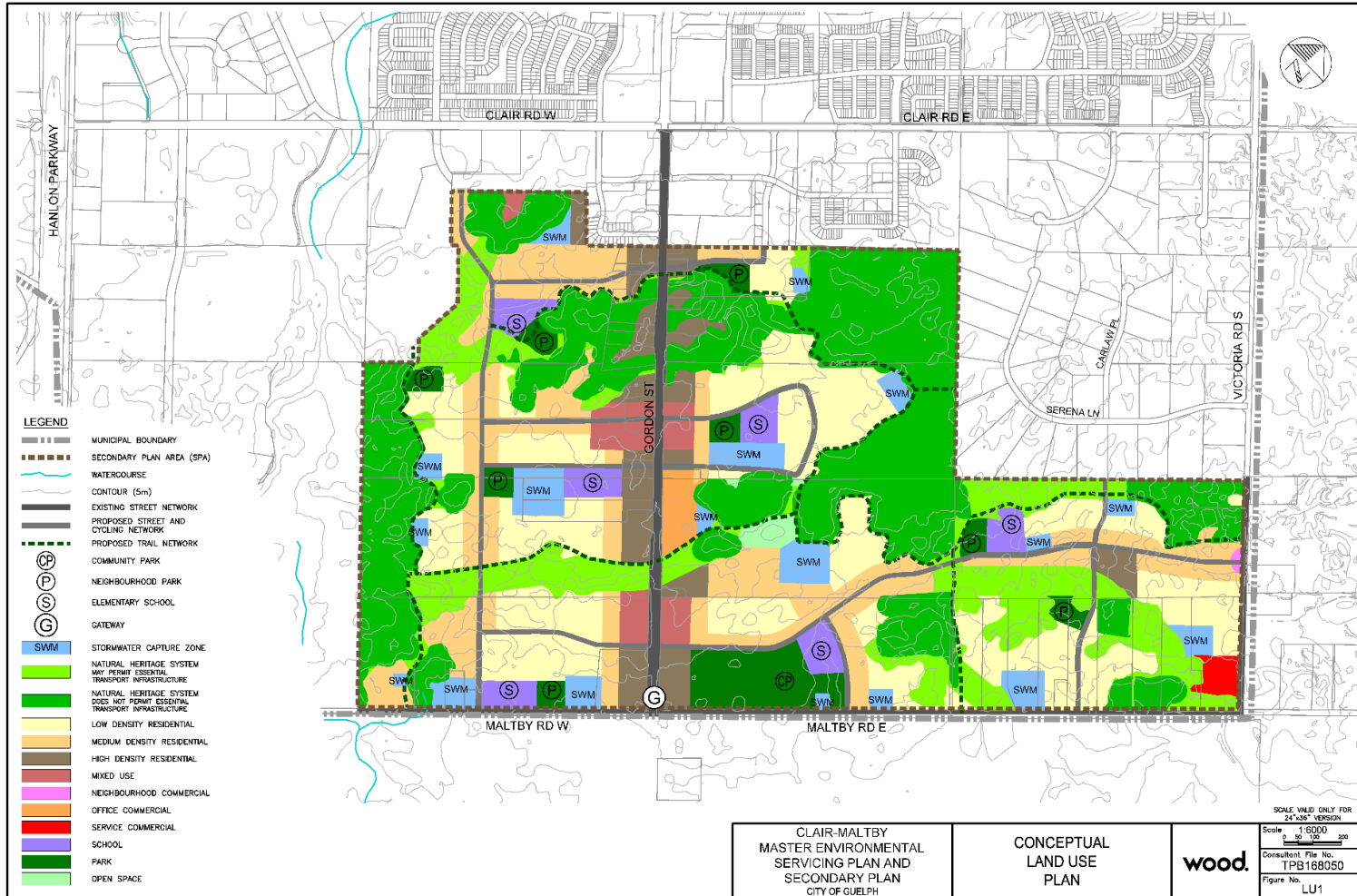
3. Impact Assessment

Land Use Plan – Preliminary Preferred Community Structure



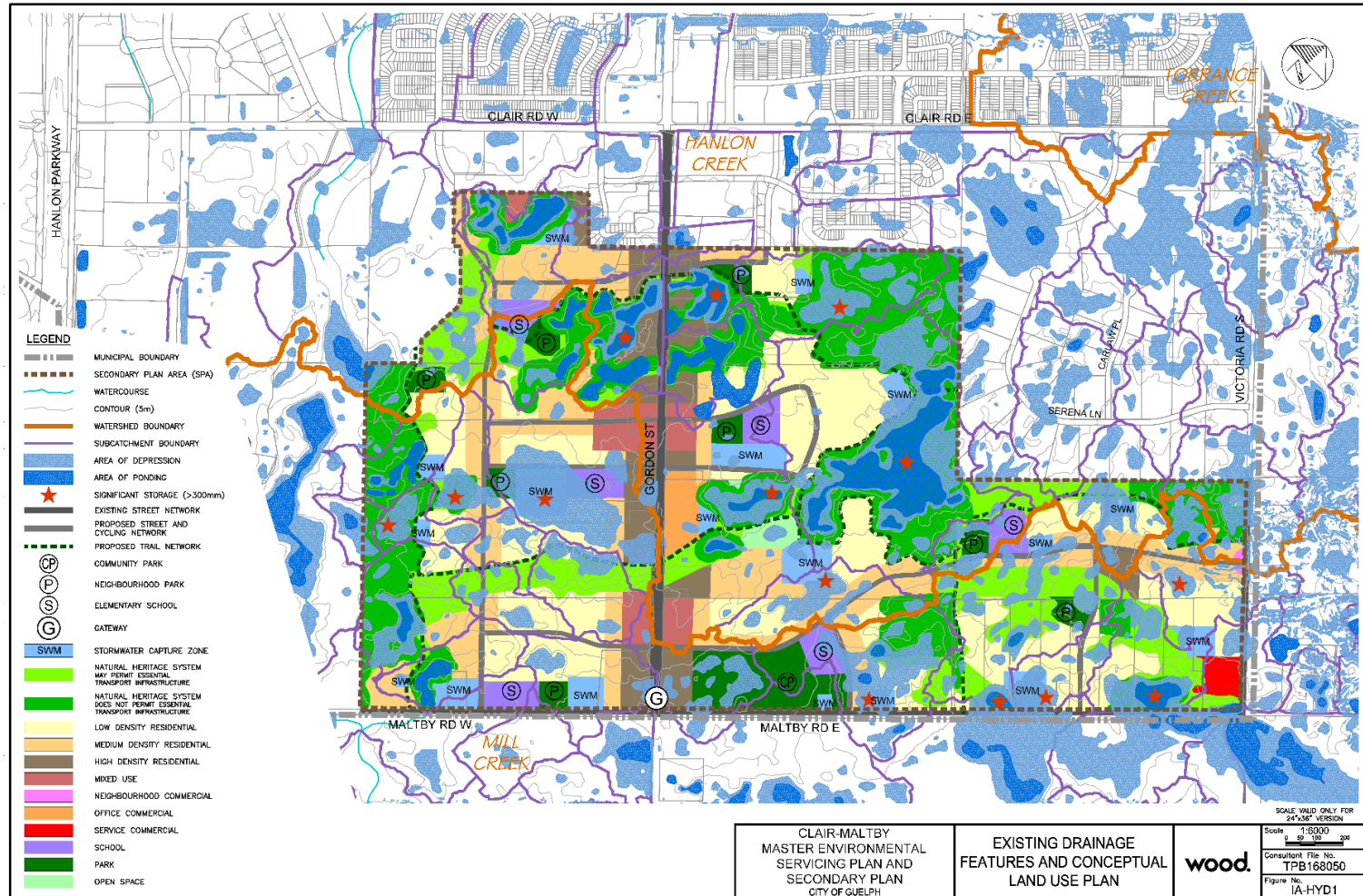
3. Impact Assessment

Land Use Plan – Schools, Parks, SWCA dimensioned



3. Impact Assessment

Surface Water – depressional overlay



3. Impact Assessment

Surface Water – *analytical approach*

- Existing conditions PCSWMM hydrologic model used to assess proposed land use plan
- NHS areas and associated depressional areas maintained within PCSWMM model
- Catchment slopes (1-5%) determined based on maintaining existing grades and setting based grades for surface water capture areas
- Soil parameterization maintained as per existing conditions
- Proposed land use impervious coverages established, while existing land use coverage maintained

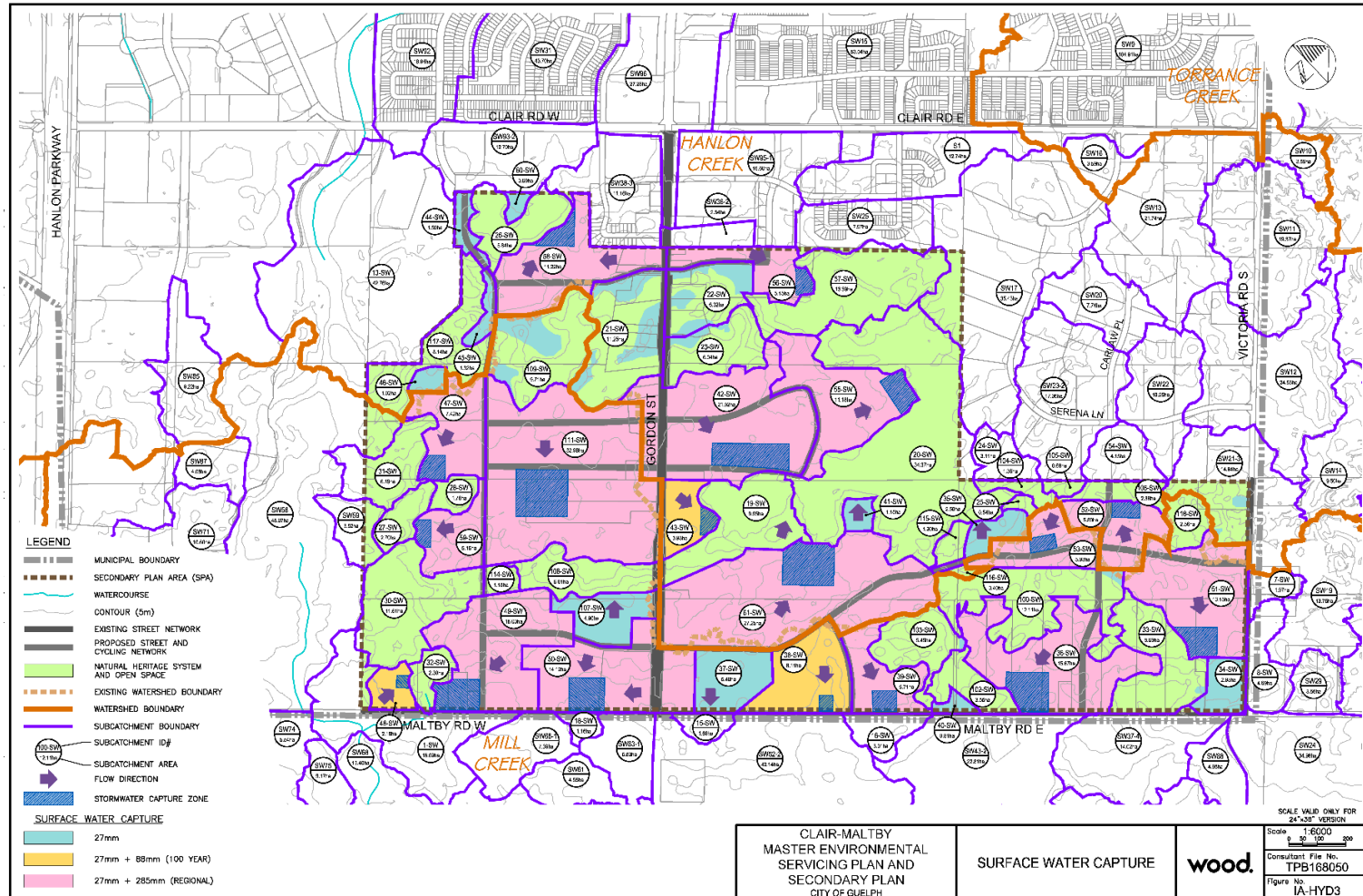
3. Impact Assessment

Surface Water: *Impervious Coverages*

Proposed Land Use Impervious Coverages		
Land Use Types	Total Imperviousness (%)	Routing Over Pervious (%)
Mixed Use	88	0
Office Commercial	85	0
Neighbourhood Commercial	85	0
Service Commercial	85	0
School	65	40
High-density Residential	80	0
Medium density Residential	70	30
Low-density Residential	65	40
ROW (Local / Collector)	65	0
ROW (Arterial)	75	0
Park (Neighbourhood)	20	25
Park (Community)	35	25
Open Space	10	100
Natural Heritage	5	100
Stormwater Management	10	100

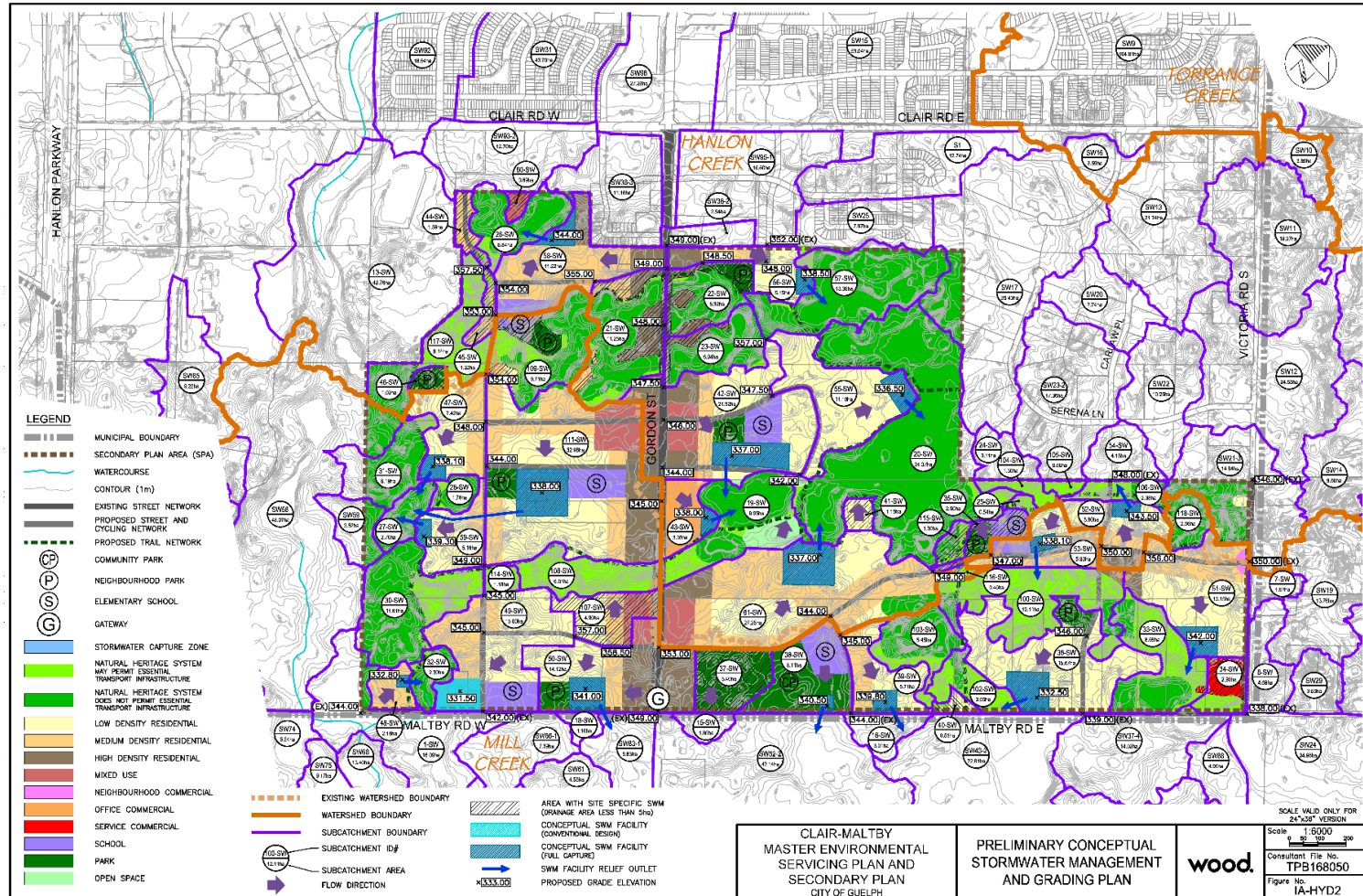
3. Impact Assessment

Surface Water: Assumed future drainage areas



3. Impact Assessment

Surface Water: SWM Layout and Grading



3. Impact Assessment

Surface Water

- PCSWMM hydrologic model used to:
 - Set existing flow targets (Hanlon / Mill)
 - Size surface water capture areas (SWCA)
 - Simulate distributed surface water management (capture at-source)

- Results show:
 - SWCA (8-11% of DA) – Regional / 100 year
 - Flow Targets met (external)
 - Surface water budget met (validated with both PCSWMM and MIKE SHE)

3. Impact Assessment

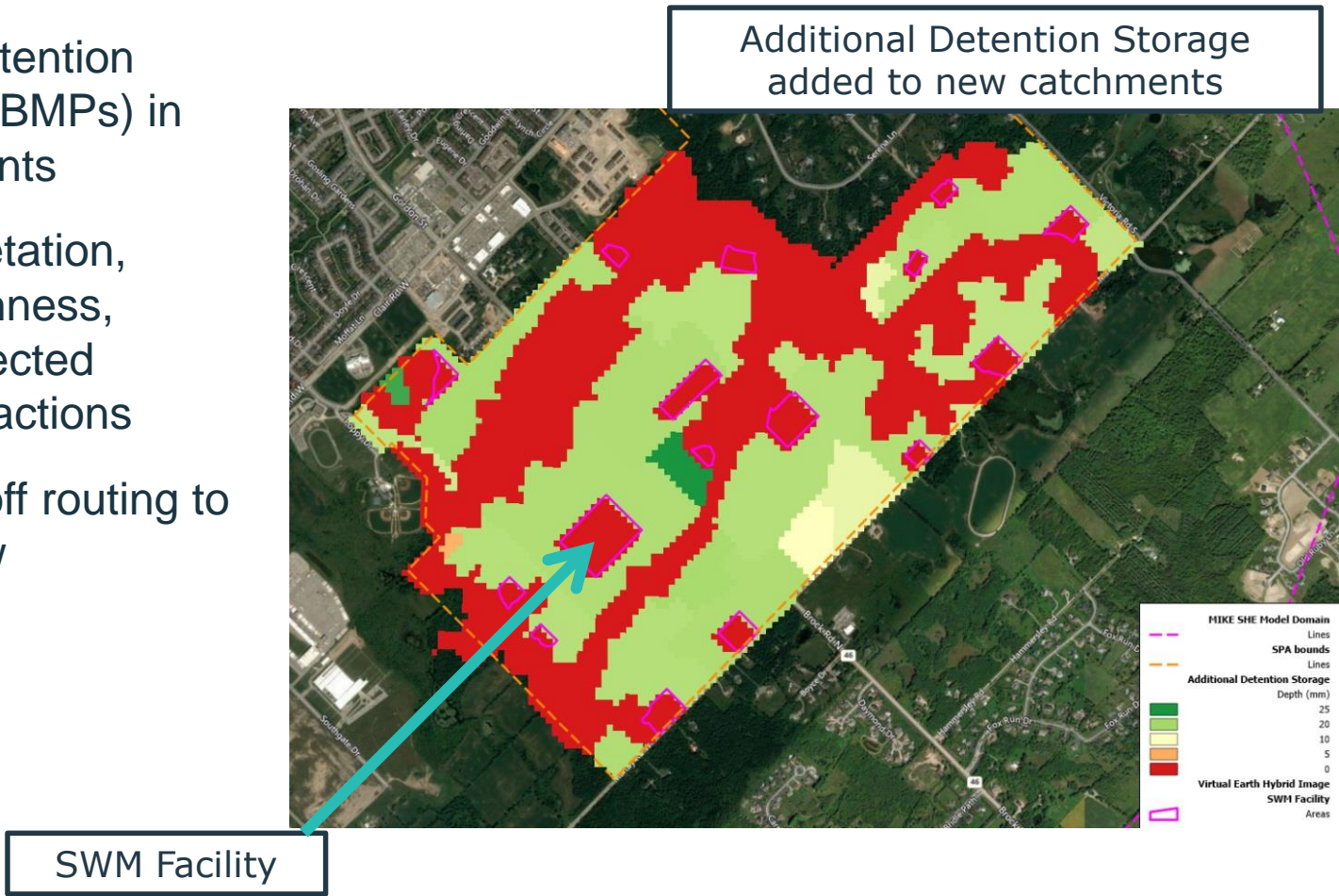
Groundwater Assessment

- MIKE SHE modelling:
 - Existing and proposed land use conditions
 - Simulate future land use with SWCA and distributed capture (at source)
- Metrics used include :
 - Groundwater flow directions
 - Groundwater discharge to Hanlon, Torrance, Mill Creek
 - Groundwater discharge to wetlands outside the SPA and one within the SPA.
 - Deep recharge to the bedrock aquifer, supplying Guelph municipal wells

3. Impact Assessment

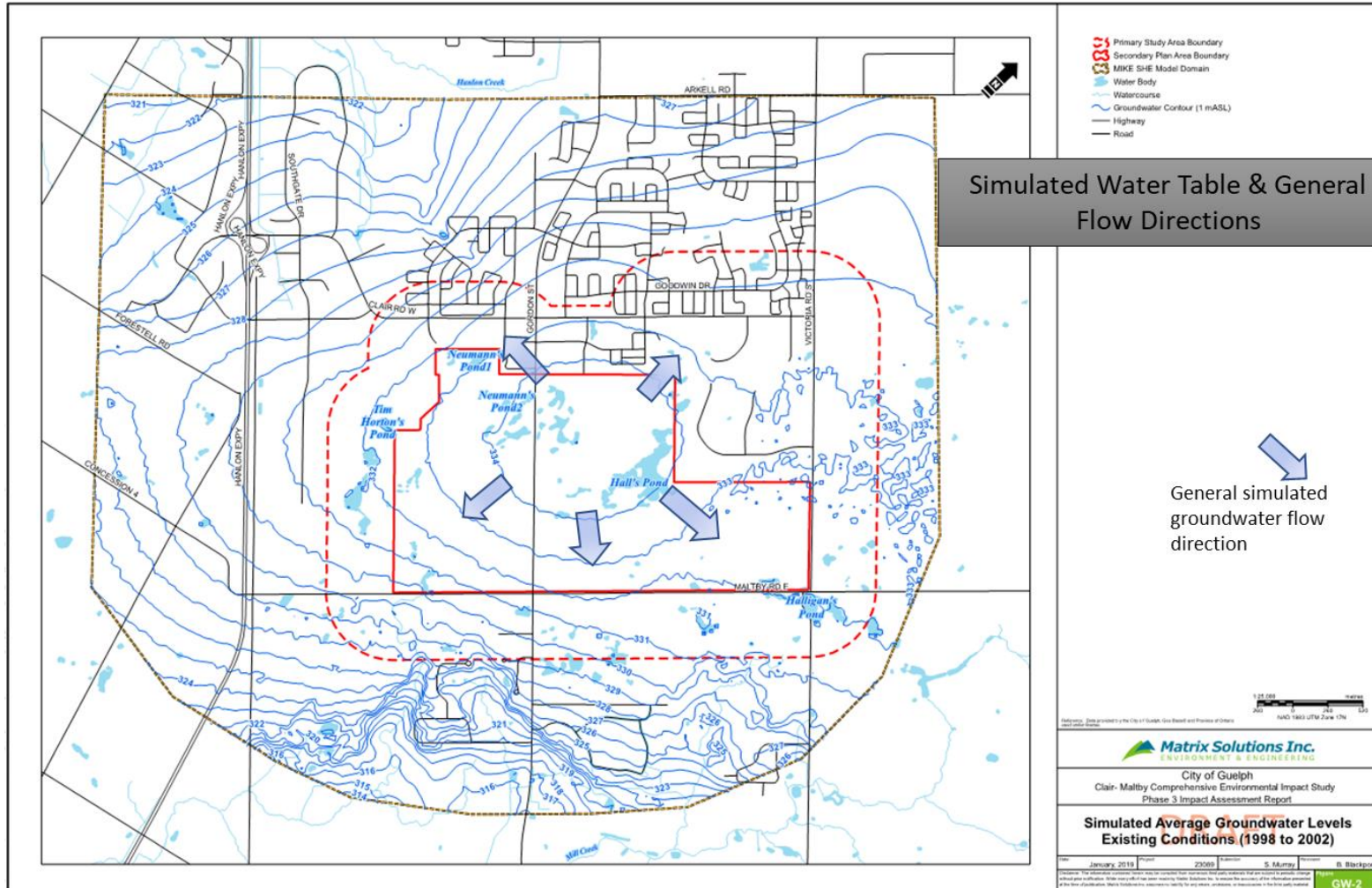
Hydrogeology: *Impact Simulation Approach*

- Additional Detention Storage (LID BMPs) in new catchments
- Revised vegetation, surface roughness, directly connected impervious fractions
- Updated runoff routing to SWCA in new catchments



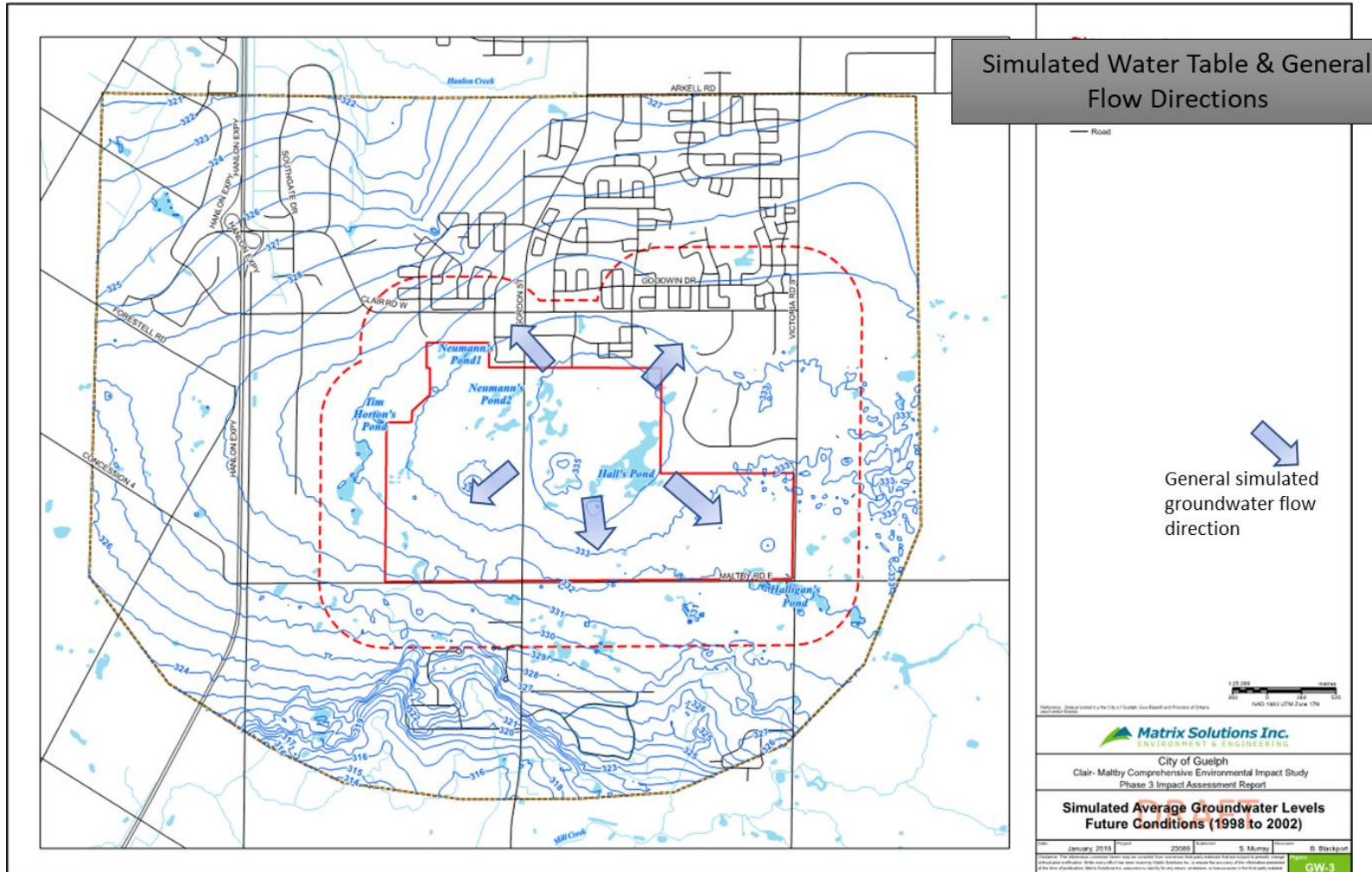
3. Impact Assessment

Hydrogeology: Existing Groundwater Flow



3. Impact Assessment

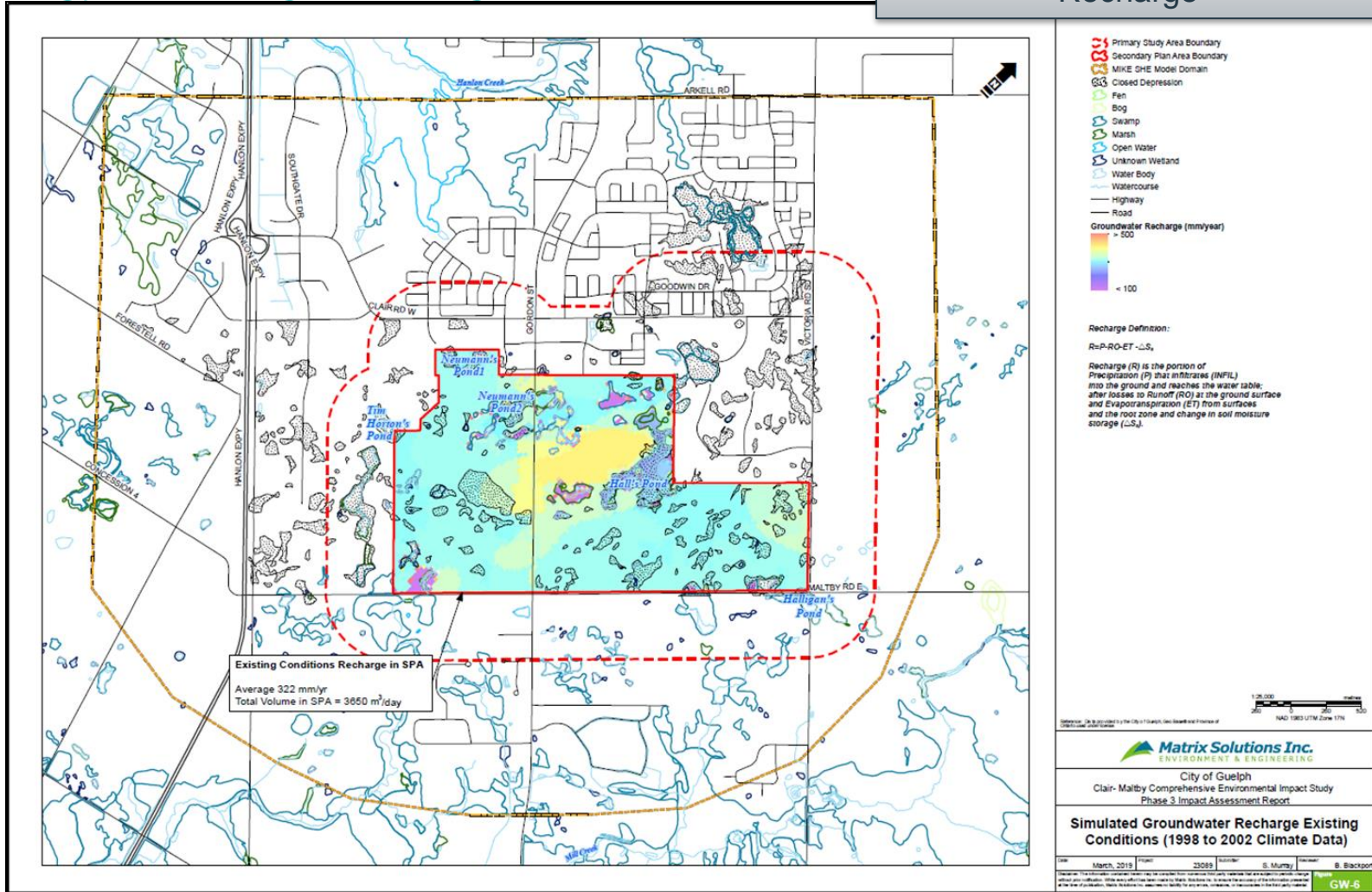
Hydrogeology: Future Groundwater Flow



3. Impact Assessment

Hydrogeology: Existing Recharge

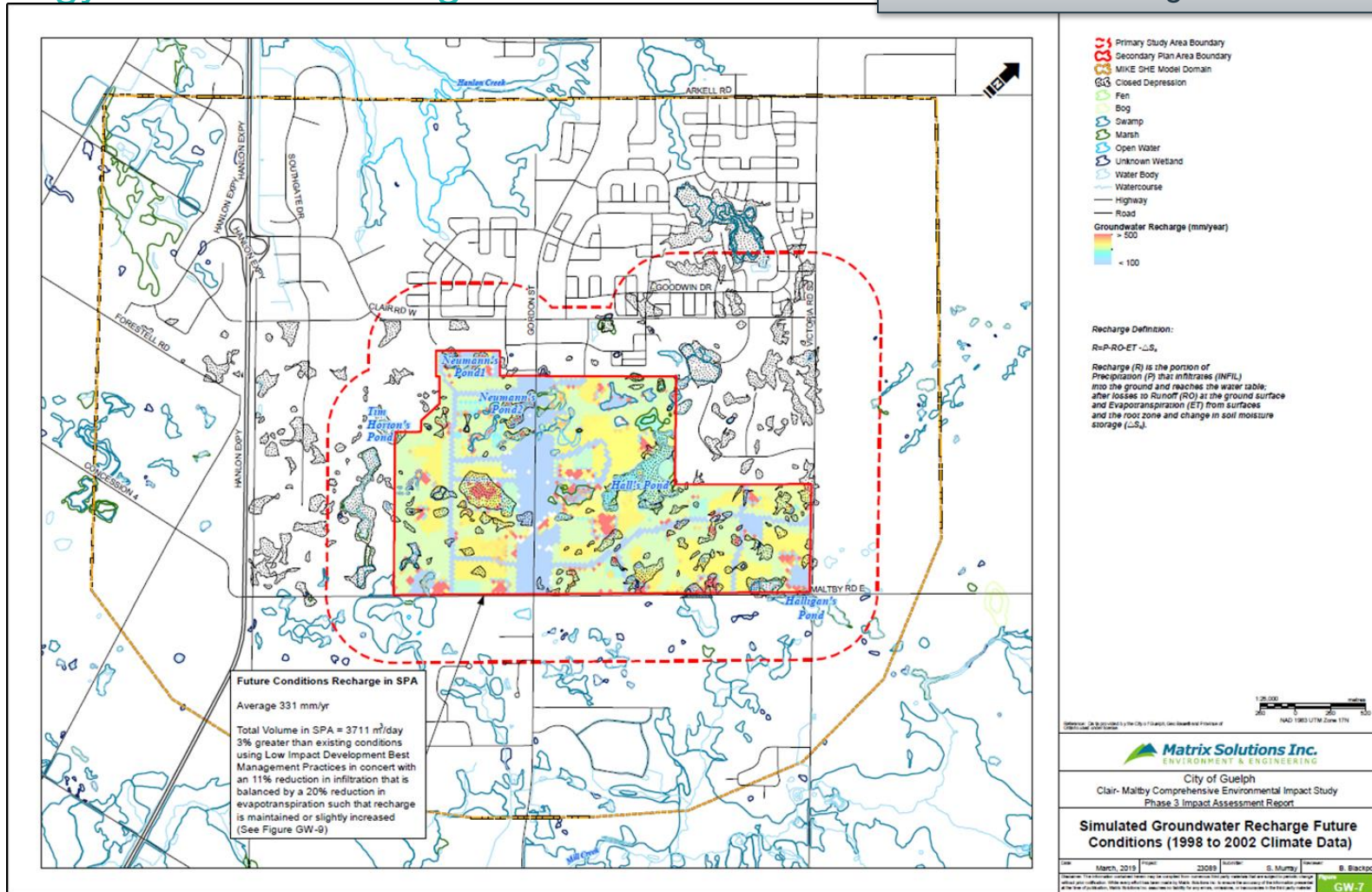
Simulated Average Annual Recharge



3. Impact Assessment

Hydrogeology: *Future Recharge*

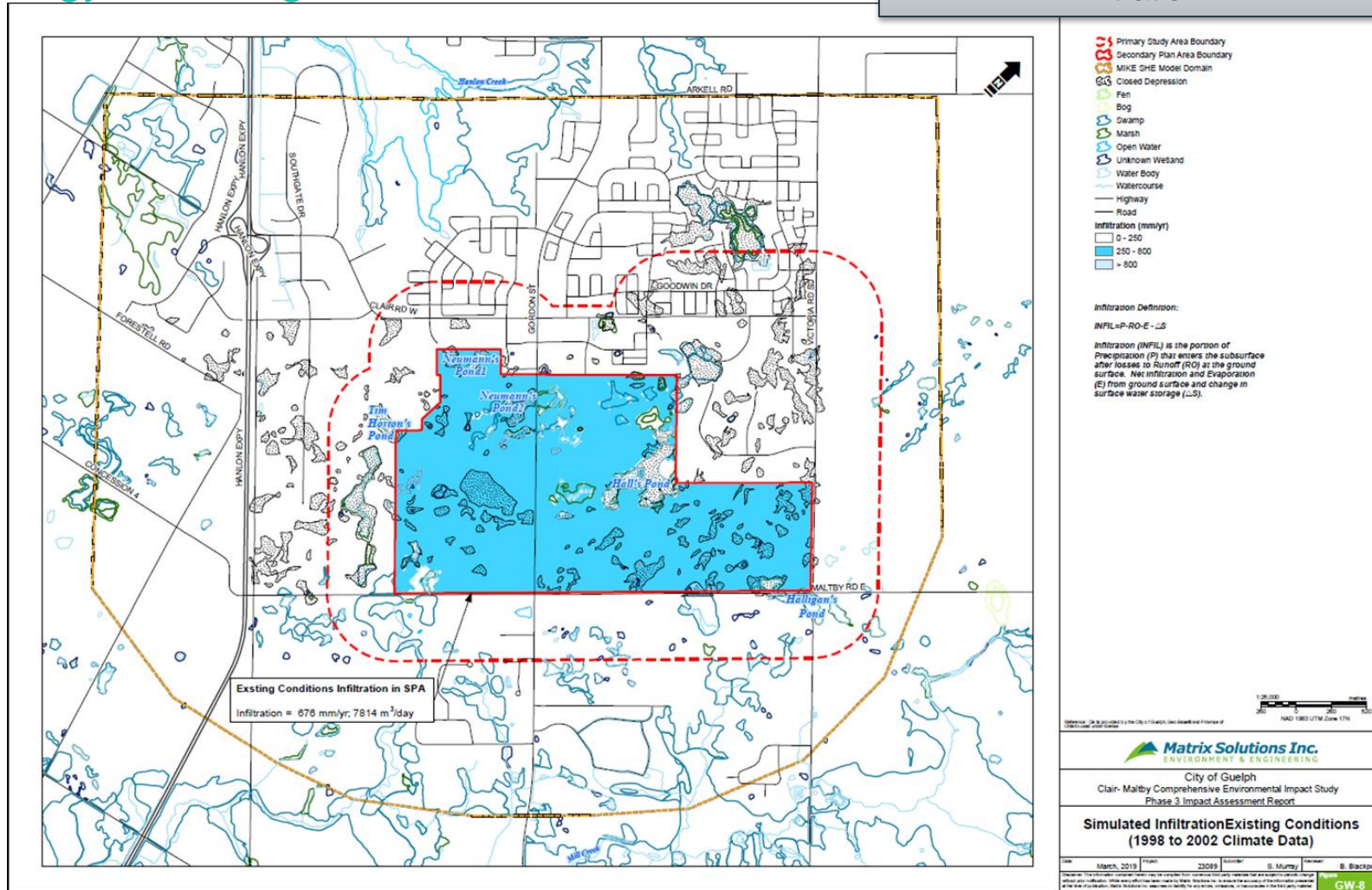
Simulated Average Annual Recharge



3. Impact Assessment

Hydrogeology: Existing Infiltration

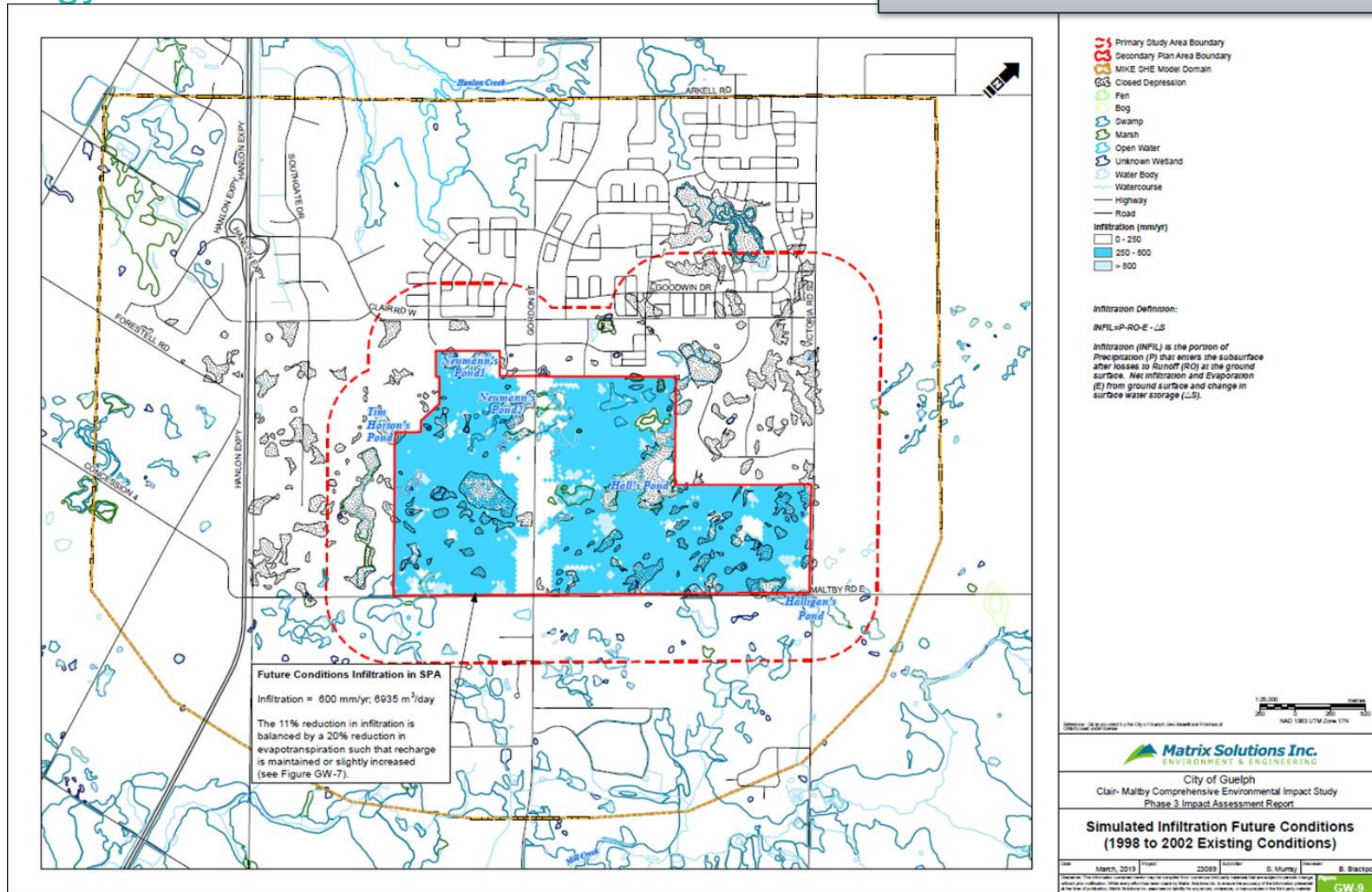
Simulated Average Annual Infiltration



3. Impact Assessment

Hydrogeology: Future Infiltration

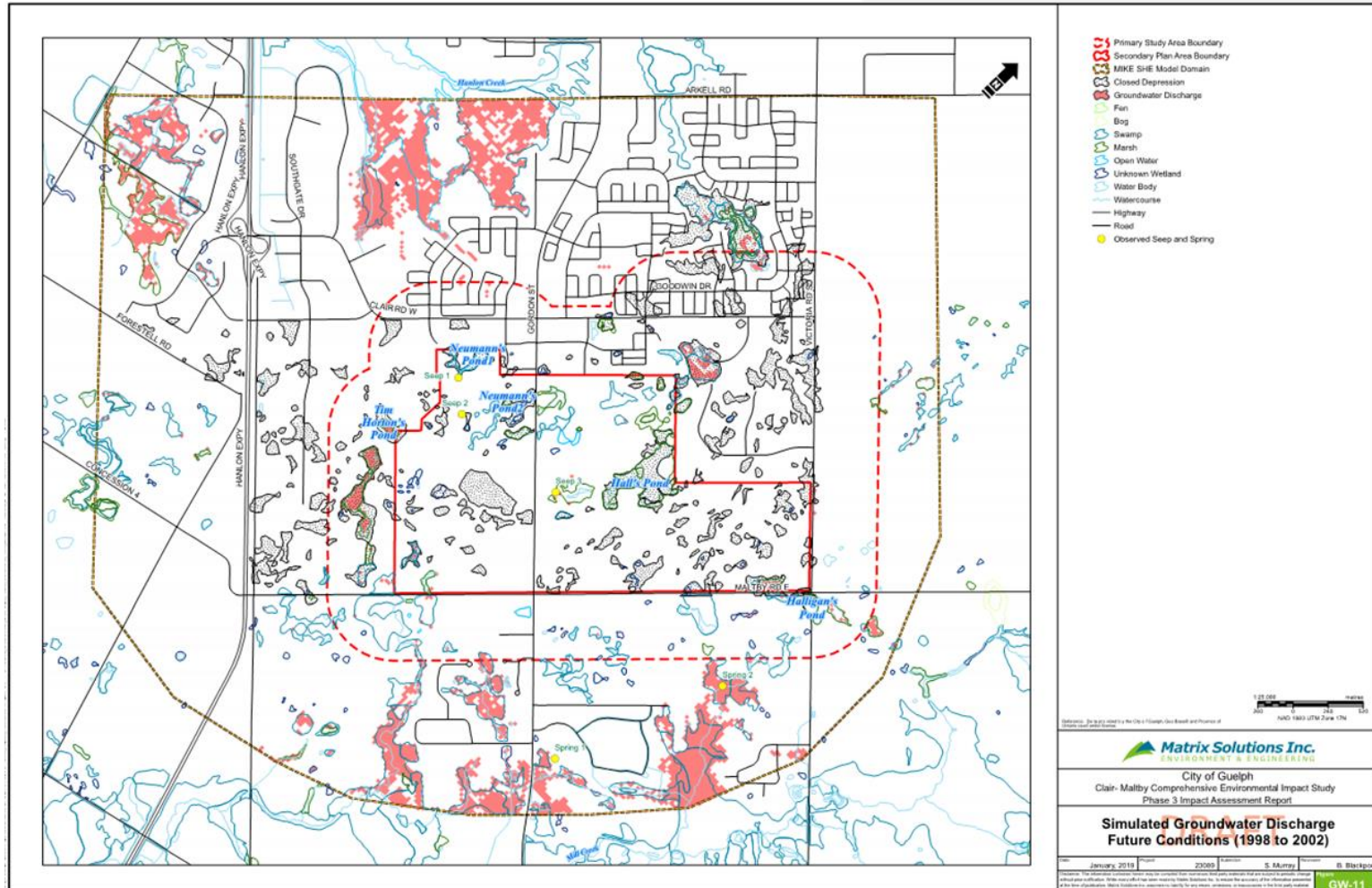
Simulated Average Annual Infiltration



3. Impact Assessment

Hydrogeology: *Future Groundwater Discharge*

Simulated Average Annual Discharge to Surface Water



3. Impact Assessment

Hydrogeology: Summary

- **Maintained:**
 - Recharge to bedrock aquifer (flux out of the bottom of the model)
 - Groundwater flow directions and depth to water
 - Groundwater discharge to Hanlon, Torrance, Mill Creek
 - Groundwater discharge to wetlands outside the SPA, associated with Hanlon, Torrance and Mill Creek, including the area west of the SPA but east of the Hanlon
- **Potential Increases:**
 - Runoff increase into the Halls, Halligan, Neumann ponds, negligible (~2 cm increase in pond water level), not expected to influence hydroperiod
 - Further refinement to management strategy part of next round of assessment
- **Opportunities for Refinement.**
 - Potential to further optimize capture and still maintain function

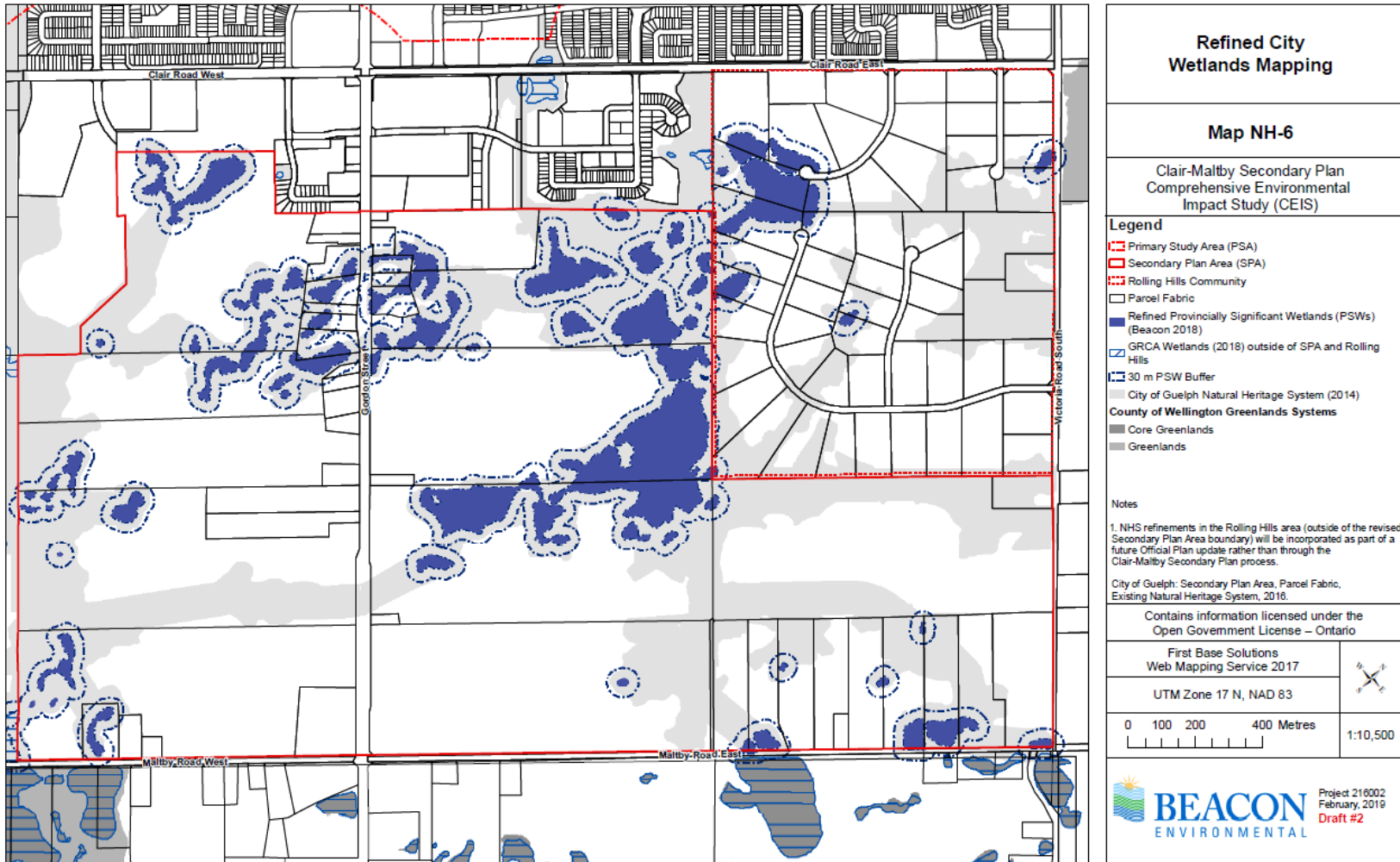
3. Impact Assessment

Natural Heritage System

- Refinement of Significant Wetlands and other Wetlands
- Refinement of Woodland areas
- Significant Wildlife Habitat
- Significant Landform
- Refinement of Ecological Linkages and Wildlife Crossings
- Input to Community Structure

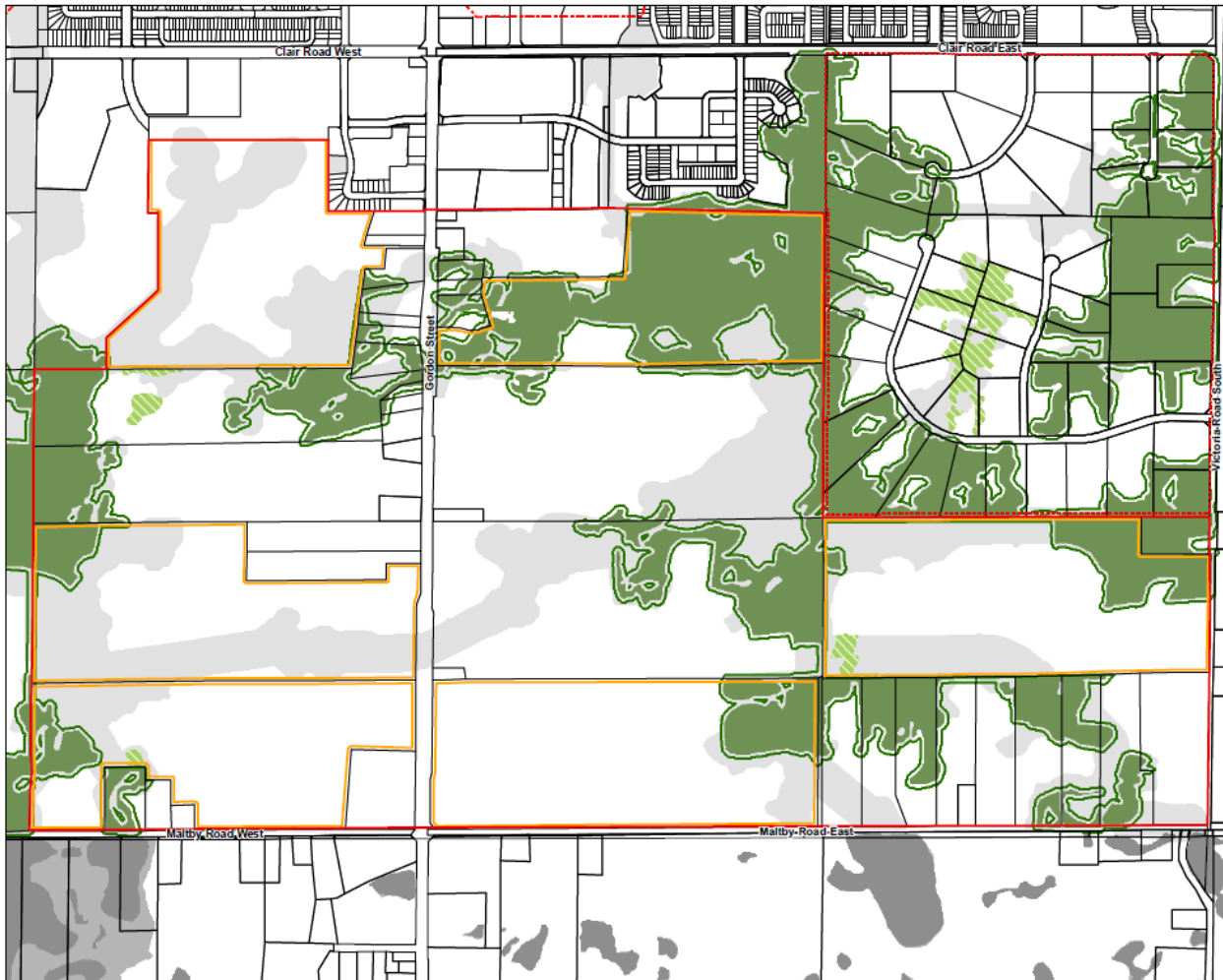
3. Impact Assessment

NHS Findings: Integrated Refined Wetlands Mapping



3. Impact Assessment

NHS Findings: Refined Woodlands Mapping



Refined City Woodlands Mapping	
Map NH-8	
Clair-Maltby Secondary Plan Comprehensive Environmental Impact Study (CEIS)	
Legend	
	Primary Study Area (PSA)
	Secondary Plan Area (SPA)
	Rolling Hills Community
	Parcel Fabric
	Woodlands Mapping from City 2014 NHS
	Significant Woodland
	Cultural Woodland Overlay
	10 m Significant Woodland Buffer
City of Guelph Natural Heritage System (2014)	
County of Wellington Greenlands System	
	Core Greenlands
	Greenlands
Notes	
1. NHS refinements in the Rolling Hills area (outside of the revised Secondary Plan Area boundary) will be incorporated as part of a future Official Plan update rather than through the Clair-Maltby Secondary Plan process.	
2. Woodlands mapping from City NHS (2014) has been retained on properties with settlements under OPA42 or that are currently before the courts.	
City of Guelph: Secondary Plan Area, Parcel Fabric, 2016.	
Contains information licensed under the Open Government License – Ontario	
First Base Solutions Web Mapping Service 2017	
UTM Zone 17 N, NAD 83	
0 100 200 400 Metres	1:10,500
BEACON ENVIRONMENTAL	
Project 216002 February, 2018 Draft #2	



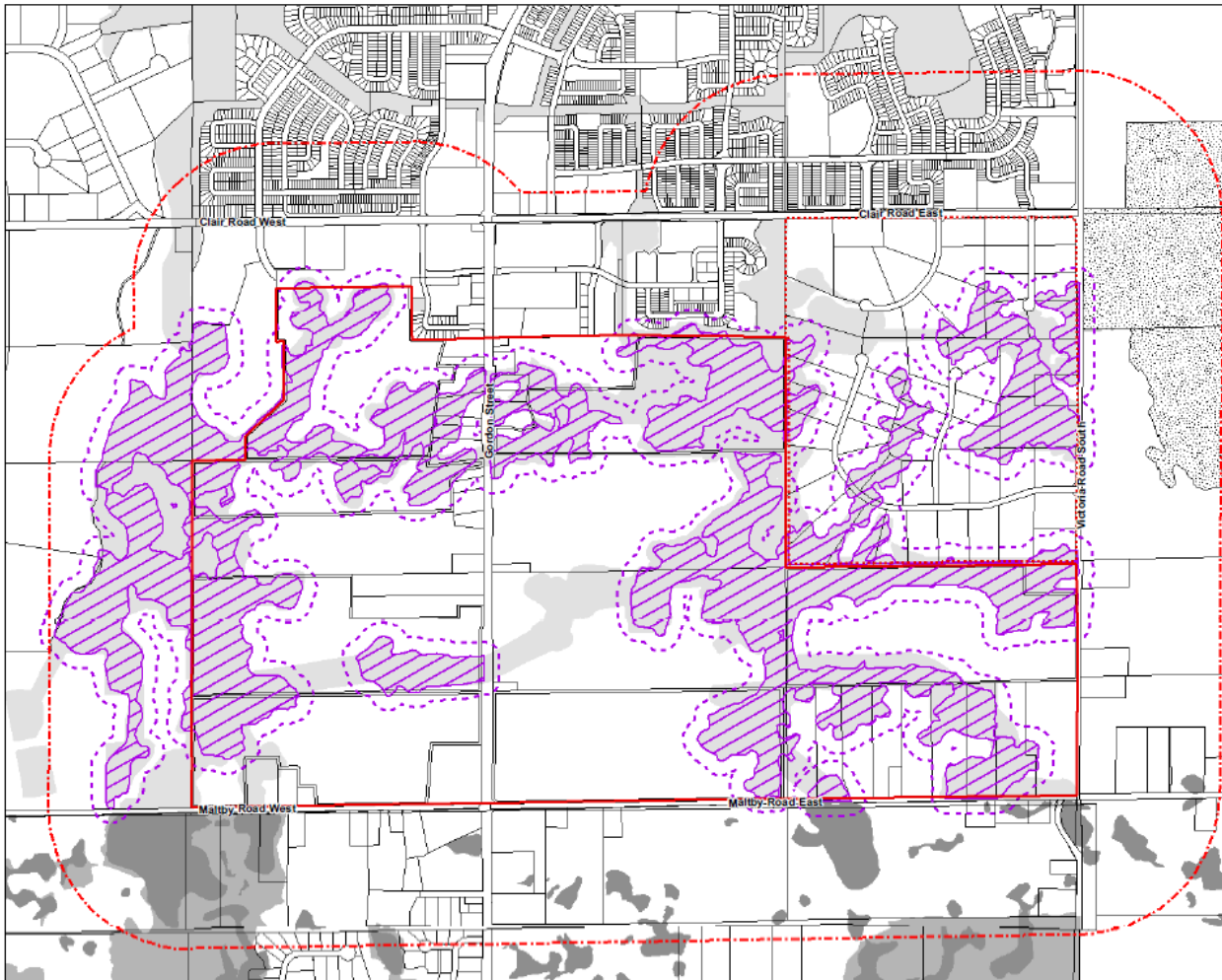
3. Impact Assessment

NHS Findings: Simplified Significant Wildlife Habitat



3. Impact Assessment

NHS Findings: Significant Landform



Significant Landform	
Map NH-13	
Clair-Malby Secondary Plan Comprehensive Environmental Impact Study (CEIS)	
Legend	
	Primary Study Area (PSA)
	Secondary Plan Area (SPA)
	Rolling Hills Community
	Significant Landform (City of Guelph 2014)
	Significant Landform (2014) 50 m Adjacent Lands Setback
	Paris Moraine Earth Science ANSI (MNR 2016)
	City of Guelph Natural Heritage System (2014)
County of Wellington Greenlands Systems	
	Core Greenlands
	Greenlands
Notes	
1. NHS refinements in the Rolling Hills area (outside of the revised Secondary Plan Area boundary) will be incorporated as part of a future Official Plan update rather than through the Clair-Malby Secondary Plan process.	
City of Guelph: Secondary Plan Area, Parcel Fabric, 2016.	
Contains information licensed under the Open Government License – Ontario	
First Base Solutions Web Mapping Service 2017	
UTM Zone 17 N, NAD 83	
0 125 250 500 Metres	1:14,000
Project 216002 February, 2019 Draft #2	



3. Impact Assessment

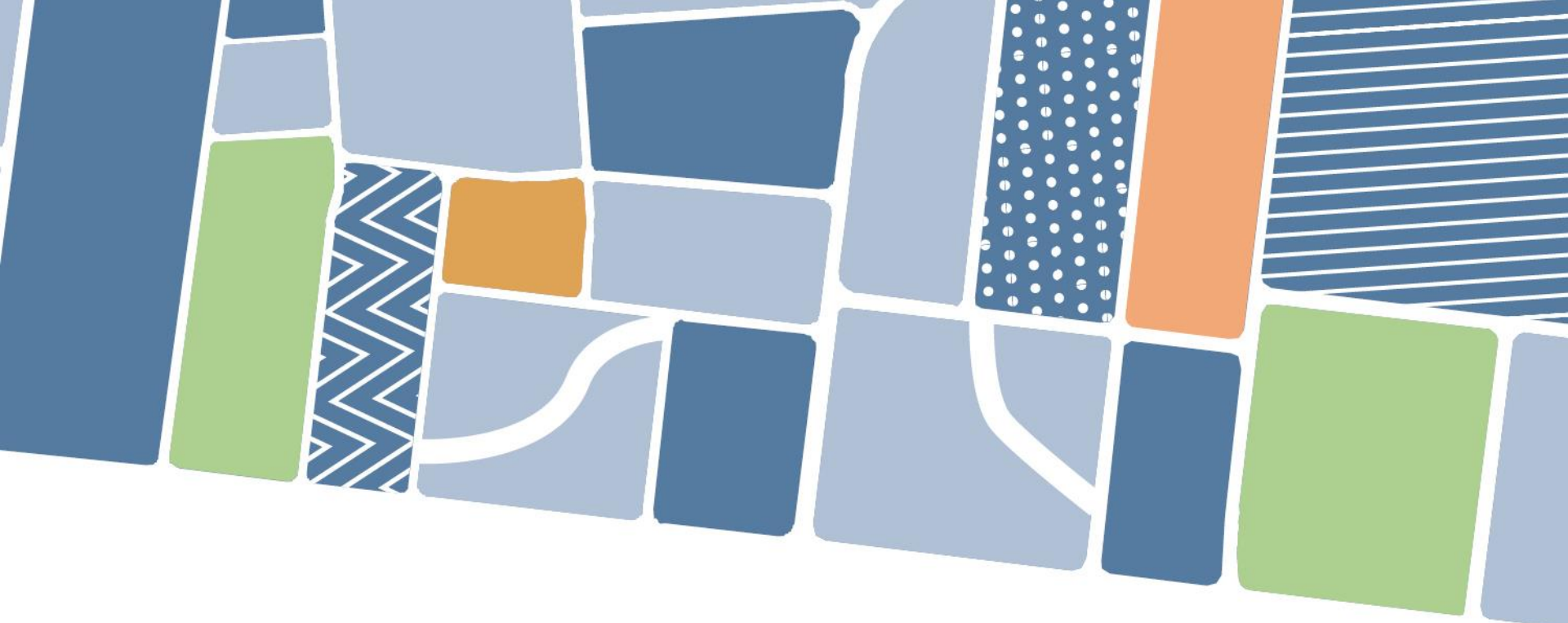
Input to Community Structure: NHS Refinements



3. Impact Assessment

Input to Community Structure: NHS Refinements (Areas)

NHS Component	2014 NHS in the SPA (ha)	Refined NHS in the SPA (ha)	2014 NHS in Rolling Hills (ha)	Refined NHS in Rolling Hills (ha)
Significant Natural Areas	160.22	173.87	40.96	63.05
Natural Areas Overlay	0.76	4.31	1.58	3.74
Linkages	14.01	11.19	1.19	0.93
TOTALS	174.99	189.37 (14.38 net gain)	43.73	67.72 (23.99 net gain)



Clair-Maltby

Transform. Connect. Community.

4. Preliminary Management Approach and Strategies

4. Preliminary Management Approach and Strategies

Summary of Findings

- a. Flows within Hanlon and Mill Creek are low, but have baseflow from contributing groundwater discharge
- b. 93% to 97% precipitation either infiltrates or evaporates / transpires
- c. There are 47 significant depressional features with over 300 mm of storage depth
- d. Only 7 out of 47 significant depressional features (>300 mm capture) exhibited a discharge over 67 years of simulation period
- e. Surface water contributions to wetlands are significant

4. Preliminary Management Approach and Strategies

SWM Considerations

1. No on-site watercourses hence traditional 'post- to pre-' runoff targets not appropriate
2. Modelling (groundwater and surface water) has shown strong connections between surface water capture / infiltration and linkage to wetlands
3. Depressional capture of surface runoff is distributed / widespread
4. Infiltration water feeds both local ecosystems and potable aquifers



4. Preliminary Management Approach and Strategies

Stormwater Management System: *Planning Principles*

- a. 'Maintain' existing drainage boundaries
- b. 'Preserve' topography
- c. Define primary / core locations for stormwater runoff capture (SWCA)
- d. Size systems for full capture / retention of design event (100 year / Regional Storm) plus *climate change* buffer
- e. Provide relief overflow to adjacent natural features in the event of major storm beyond design capacity and to offer added resiliency for *climate change*

4. Preliminary Management Approach and Strategies

Stormwater and Groundwater Management System: *Planning Principles*

- f. Provide pre-treatment upstream of designated capture systems:
 - Separate ‘clean’ water from ‘dirty’ water
 - Oil/Grit Separators for roadways
 - Vegetated filters prior to discharge to capture zones (lined) – *treatment train*
- g. Distributed LID BMPs throughout to mimic current condition (Public / Private Realm) – further build *Climate Change* resiliency
- h. Site porous land uses adjacent / near capture zones (schools, parks, linkages) to provide buffer / resiliency

4. Preliminary Management Approach and Strategies

Groundwater Management System: *Planning Principles*

- a. Maintain groundwater flow directions and gradients
- b. Maintain groundwater discharge to Hanlon, Torrance and Mill Creeks
- c. Maintain groundwater discharge to wetlands outside SPA and one (1) within the SPA
- d. Maintain deep recharge to bedrock aquifer, supplying Guelph municipal wells

4. Preliminary Management Approach and Strategies

Natural Heritage System: *Planning Principles*

Aquatic Habitats

- a. Protect fish habitat in accordance with applicable Federal regulations
- b. Protect, conserve, mitigate or maintain headwater drainage features in accordance with City and GRCA policies with consideration for relevant guidelines

Protected Species Habitat and Specialized Habitats

- c. Protect habitat for Provincially Endangered and Threatened species in accordance with the *Endangered Species Act (2007)* and in consultation with the appropriate Ministry
- d. Protect confirmed habitat for Significant Wildlife Habitat and habitat of locally significant species in accordance with the City of Guelph's policies with consideration for applicable Provincial guidance

4. Preliminary Management Approach and Strategies

Natural Heritage System: *Planning Principles (continued)*

Terrestrial Habitats (including Wetlands)

- e. Protect Significant Wetlands, Significant Woodlands, Other Wetlands, Cultural Woodlands and their buffers in accordance with applicable Provincial, GRCA and City policies
- f. Ensure pre-development area-specific water balances within each catchment are maintained to sustain feature hydrology
- g. Ensure the water quality of all protected wetlands is maintained or improved
- h. Pursue opportunities to enhance local biodiversity through naturalization

Significant Landform

- i. Ensure no net loss of designated Significant Landform areas
- j. Protect the functional characteristics of Significant Landform areas (including associated drainage and natural heritage functions)
- k. Integrate Significant Landform into the community such that its visual uniqueness is not negatively impacted

4. Preliminary Management Approach and Strategies

Natural Heritage System: *Planning Principles (continued)*

Ecological Linkages and Connectivity

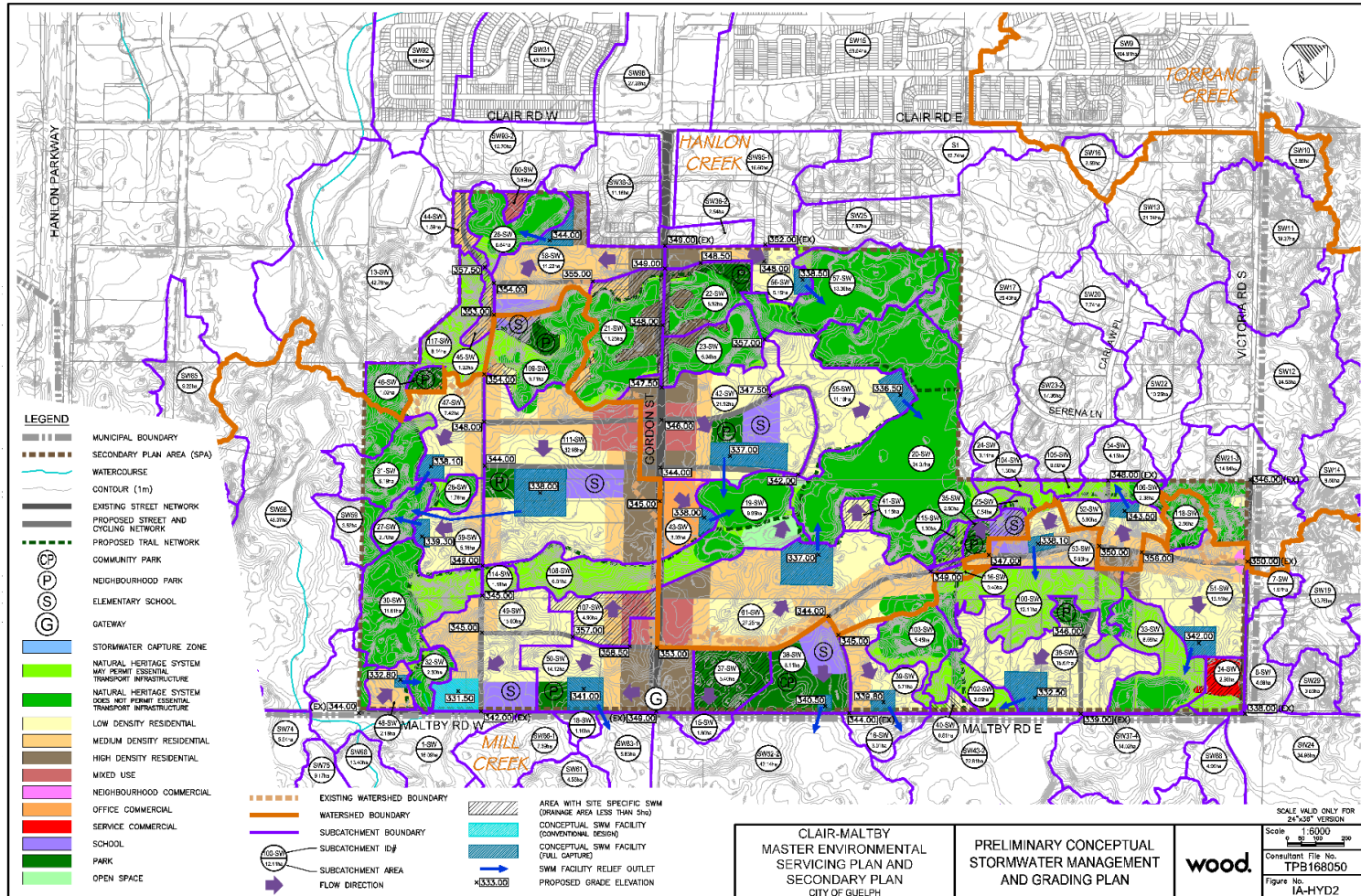
- l. Maintain connections between and among Significant Natural Areas and protected Natural Areas in accordance with Provincial and City policies, and also considering connectivity to natural areas outside the City
- m. Pursue opportunities to support and enhance local biodiversity and connectivity through restoration, naturalization and implementation of measures to provide for safe wildlife movement across roads

Minimize and manage encroachments into the NHS by:

- n. Having a sensitively designed trail system that balances access and connectivity with NHS protection
- o. Committing to ongoing stewardship education and engagement
- p. Implementing strategies intended to manage encroachments (e.g., fencing, dog parks, etc.) as the Secondary Plan is implemented

4. Preliminary Management Approach and Strategies

Proposed Conditions



Questions?

Wrap up and Next Steps

- Technical information to inform amendments to the Preferred Community Structure
- May 13 - Planning Council
 - Final Directions Report
 - Project Timelines