- MOE "Normal" Level Protection water quality should be provided to remove 70% of the total suspended solids from the stormwater, prior to discharging to the local storm sewers.

- Since the site is located at the upstream end of an existing 4.3 km long urban storm sewershed that discharges directly to the Thames River, no erosion control storage is recommended.

4.2 ALTERNATIVE SOLUTIONS

Descriptions of the alternative solutions that were developed to satisfy the design constraints and address the project problem statement are presented below.

4.2.1 Alternative 1 – Do Nothing

While this scenario does not meet future development needs, it must be considered in every EA. Evaluating this alternative can help verify the project necessity, clarify the project requirements and objectives, identify additional project benefits or detriments, and provide a basis against which other alternative solutions can be compared.

In this alternative, the LPH lands remain in their current development state and no new stormwater management controls are constructed. All site runoff is conveyed by the existing infrastructure to the existing site outlets. The corresponding drainage plan is illustrated on Figure 4.1.

4.2.2 Alternative 2 – On-Site SWM Controls

The purpose of this scenario is to evaluate the feasibility of serving as much of the proposed development as reasonably possible using on-site stormwater management controls. Under this alternative, runoff from each high density residential, medium density residential, commercial, and institutional property located within the study area is treated by on-site SWM measures before being discharged to the local storm sewer. In contrast, the runoff from road and railway right-of-ways, single family residential lots, and parks & open spaces is treated by a regional SWM pond, since on-site SMW controls are generally not suitable for these landuses.

The runoff from approximately 21.2 ha of the proposed site is conveyed to the existing Highbury Avenue storm sewer. Of this, approximately 13.2 ha is comprised of the LPH lands, and the remaining portion is comprised of the Department of National Defense (DND) lands. Since the development timing for the DND lands is uncertain, the on-site SWM controls for the LPH lands are designed to meet the SWM control requirements if the DND lands remain in their current state.

The runoff from approximately 47.8 ha of the proposed site is conveyed to SWM 1. SWM 1 provides erosion control storage to the runoff from the entire drainage area to meet the requirements of the Pottersburg Creek Subwatershed Study. However, SWM 1 is only sized to provide water quality control and peak discharge attenuation to the runoff from the portion of the drainage area that is not treated by on-site SWM controls.

The corresponding drainage plan is illustrated on Figure 4.2.

4.2.3 Alternative 3 – Single Regional SWM Facility

The purpose of this scenario is to evaluate the feasibility of serving as much of the proposed development as reasonably possible using a single regional SWM facility. The runoff from the portion of the existing site that fronts onto Highbury Avenue is treated by on-site SWM controls that outlet to the Highbury Avenue storm sewer, to take advantage of this existing site outlet.

The runoff from the remainder of the site is collected and conveyed to a large regional SWM pond that outlets to Pottersburg Creek. The location of the proposed SWM pond was selected based on its compatibility with the proposed landuse plan, the existing site topography, and its proximity to the existing outlet pipe. The proposed regional SWM facility is a wet SWM pond that is designed to provide all necessary peak flow attenuation, water quality treatment and erosion control to the runoff from the upstream service area.

The corresponding drainage plan is illustrated on Figure 4.3.

4.2.4 Alternative 4 – Multiple SWM Facilities

This option is used to explore the possibility of distributing stormwater management ponds throughout the proposed site. Two proposed ponds are integrated with open space features to enhance the visual aesthetics of these areas. In particular, SWM 2 is located immediately adjacent to a heritage feature, and incorporates enhanced landscaping and design elements that result in an aesthetically pleasing feature with passive recreation benefits.

SWM 2 is designed to provide peak flow attenuation to the runoff from the upstream drainage area, and discharges to the local storm sewer. SWM 1 provides additional peak flow attenuation, as well as the necessary water quality treatment and erosion control to the runoff from the entire proposed development area. The possibility of having SWM 2 discharge directly to Pottersburg Creek was qualitatively evaluated and was rejected due to the significant additional cost of constructing a separate pipe from SWM 2 to the existing site outlet.

The corresponding drainage plan is illustrated on Figure 4.4.

4.3 HYDROLOGICAL ANALYSIS

A hydrological analysis was completed to estimate the stormwater storage requirements for each of the alternative solutions. The analysis assumptions, methodology and results are described below.

4.3.1 Design Storm Events

As per direction provided by City of London staff, the hydrologic calculations were performed using the 3-hour Chicago storm distribution of all of the modelled design events because this design storm was used in the Pottersburg Creek Subwatershed Study hydrological analysis.

4.3.2 Hydrologic Modelling

A hydrologic model was created for each alternative using SWMHYMO. The corresponding model input parameters, schematics, drainage plans, and input files are presented in Appendix C.

4.3.3 Discharge Targets

Target discharges were developed for each of the existing stormwater outlets based on the peak discharges that were calculated for Alternative 1 (existing conditions) and the outlet constraints identified in Section 4.1. The resulting target discharges are summarized in the following table, and the peak discharge criteria developed for each outlet is described below.

Table 4.2 –Calculated Target Discharges (cms)

Design Event	Central Thames Subwatershed					Locally Significant Wetland	Pottersburg Creek
	Overland Flow Route 1	Highbury Avenue Storm Sewer	Overland Flow Route 2	Dundas Street Storm Sewer	Overland Flow Route 3		
25 mm	0.00	1.02	0.00	0.02	0.00	0.03	0.17
2-year	0.00	1.74	0.00	0.04	0.00	0.05	0.32
5-year	0.00	1.74	0.85	0.04	0.04	0.11	0.44
10-year	0.00	1.74	1.42	0.04	0.06	0.14	0.51
25-year	0.00	1.74	2.26	0.04	0.09	0.18	0.60
50-year	0.00	1.74	2.84	0.04	0.11	0.21	0.67
100-year	0.00	1.74	3.44	0.04	0.14	0.24	0.74
250-year	0.61	1.74	4.36	0.04	0.25	0.40	1.06

Overland Flow Route 1 – The long-term sustainability of this existing overland flow route is uncertain. Thus, the design flows conveyed to this outlet should be limited to the runoff from events that are greater than the 100-year design storm.

Highbury Avenue Storm Sewer & Overland Flow Route 2 – The design solutions should reduce the peak discharges to magnitudes that can be conveyed by the existing storm sewer. Thus, the post-development target discharges to this outlet should be reduced to the existing condition 2-year peak magnitude for all storms up to and including the 100-year design event. The additional runoff from larger events will be conveyed by Overland Flow Route 2 to the Mornington SWM pond.

Dundas Street Storm Sewer & Overland Flow Route 3 – The design solutions should reduce the peak discharges to magnitudes that can be conveyed by the existing storm sewer. Thus, the post-development target discharges to this outlet should be reduced to the existing condition 2-year peak magnitude for all storms up to and including the 100-year design event. The additional runoff from larger events will be conveyed by Overland Flow Route 3 to the Dundas Street right-of-way.

Locally Significant Wetland – In accordance with guidance provided by the UTRCA, the post-development target discharges at the existing locally significant wetland should mimic the existing condition calculated discharges summarized in Table 4.2.

Pottersburg Creek – The post-development target discharges at the site outlet to Pottersburg Creek should be less than or equal to the existing condition calculated discharges summarized in Table 4.2.

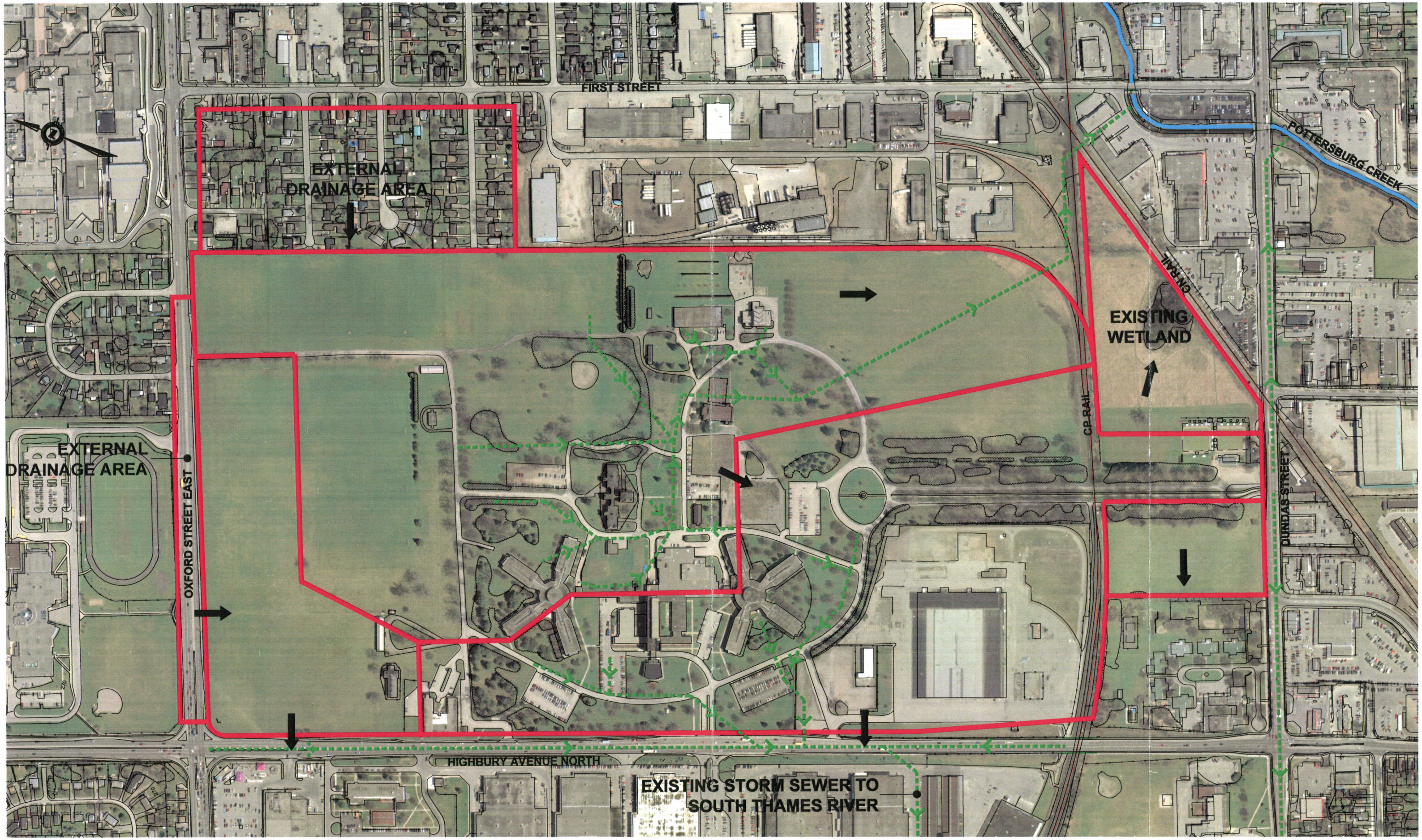
4.3.4 Model Results

The hydrologic models were used to estimate the quantity control storage volumes required to attenuate the post-development peak discharges to the established target discharge values presented in Table 4.2 for each of the evaluated design alternatives. The corresponding results are summarized in the following table.

Table 4.3 – SWM Storage Summary

Alternative	On-Site SWM Controls		SWM Pond	
	Service Area [1] (ha)	Total Volume (m^3)	Service Area [1, 2] (ha)	Total Volume [3] (m^3)
Alternative 1	0	0	0	0
Alternative 2	27.5	9,900	44.0	14,600
Alternative 3	10.1	2,700	61.4	24,400
Alternative 4	10.1	2,700	61.4	25,300

Notes:
[1] Does not include future SWM controls on DND lands.
[2] Includes external drainage areas.
[3] Total pond volume, excluding freeboard.



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Legend

- EXISTING DRAINAGE BOUNDARY
- EXISTING STORM SEWER
- OVERLAND FLOW DIRECTION

Scale

0 50 150 250m

1:5000

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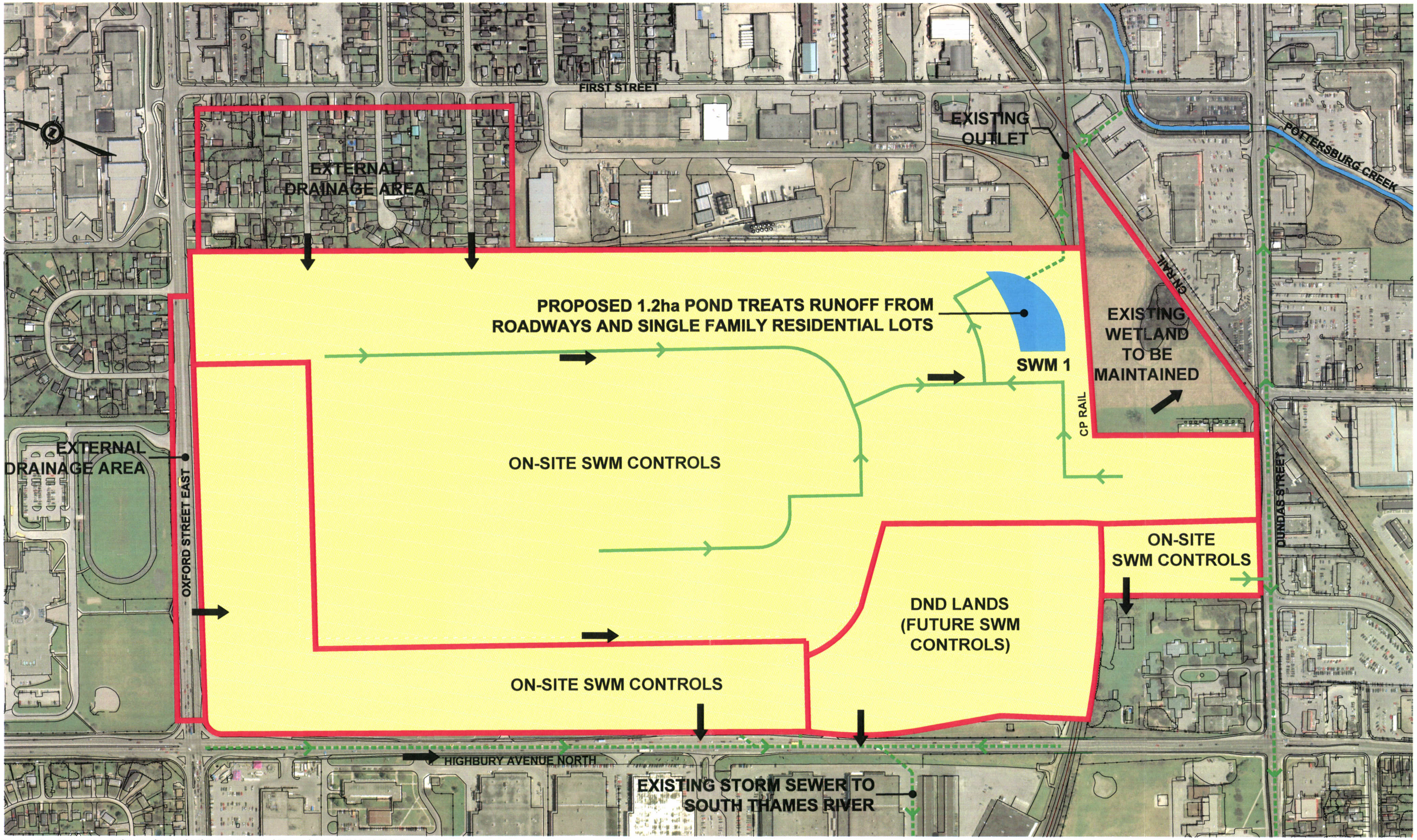
ENVIRONMENTAL ASSESSMENT

Figure No.

4.1

Title

ALTERNATIVE 1



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Legend

- PROPOSED DRAINAGE BOUNDARY
- EXISTING STORM SEWER
- OVERLAND FLOW DIRECTION
- PROPOSED STORM SEWER

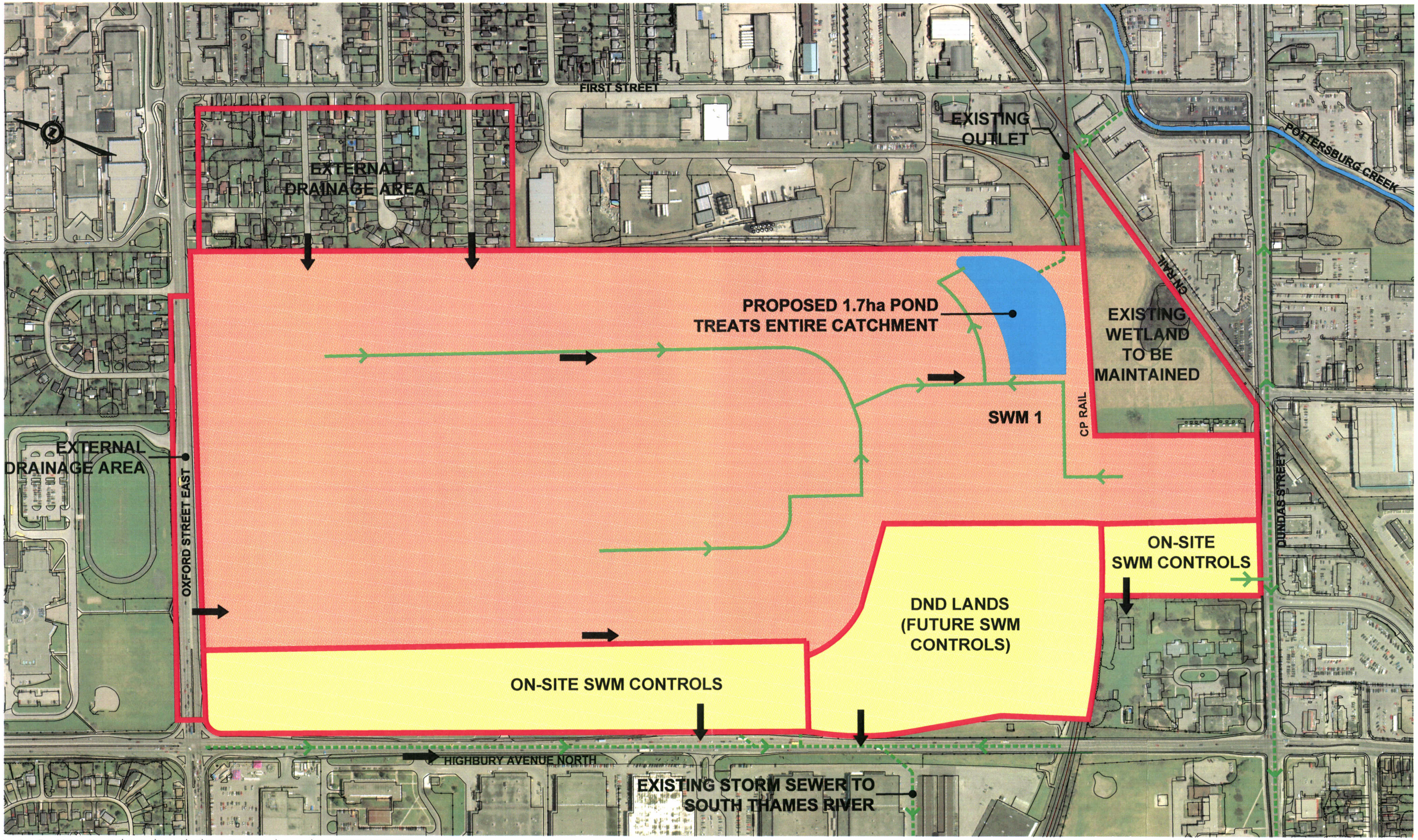
Scale

1:5000 — 0, 50, 150, 250m

Client/Project
ONTARIO REALTY CORPORATION
STORMWATER SERVICING
ENVIRONMENTAL ASSESSMENT

Figure No.
4.2

Title
ALTERNATIVE 2



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Legend

- PROPOSED DRAINAGE BOUNDARY
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- PROPOSED STORM SEWER

Scale

0 50 150 250m
1:5000

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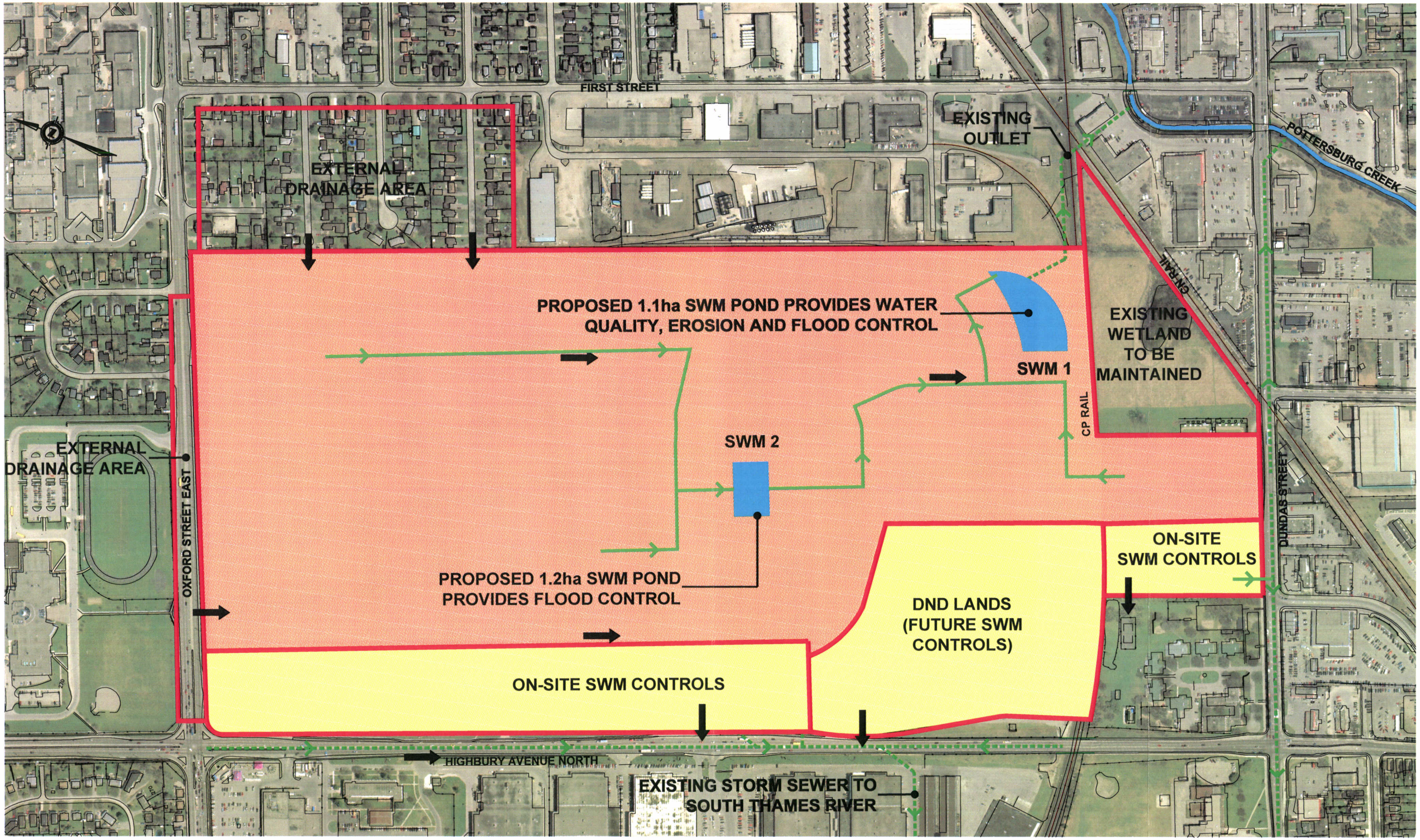
ENVIRONMENTAL ASSESSMENT

Figure No.
4.3

Title
ALTERNATIVE 3



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Legend

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- PROPOSED STORM SEWER

Scale

1:5000 0 50 150 250m

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Figure No.

4.4

Title

ALTERNATIVE 4

5.0 Alternative Evaluation

5.1 EVALUATION CATEGORIES

The proposed SWM alternatives were evaluated using criteria that address specific issues in the following broad categories:

- **Social/Cultural** – Impacts of the proposed solution on local residents and how they live. Examples include: aesthetics of the proposed solution, public health and safety.
- **Natural Environment** – Impacts of the proposed solution on the local natural heritage features. Examples include: effects on aquatic and terrestrial wildlife habitat & vegetation, effects on Pottersburg Creek.
- **Technical** – Feasibility and relative effectiveness of the proposed solution to satisfy the problem statement, and ease of long term operation and maintenance.
- **Planning** – This category will be used to evaluate the proposed alternatives' compliance with good landuse planning practices, ability to incorporate new urbanism principles, and anticipation of future difficulties in obtaining agency approvals.
- **Economic** – Costs of implementing and maintaining the proposed solution.

5.2 DECISION MATRIX SCORING

The decision matrix presented in Figure 5.1 was used to select the preferred alternative. Each alternative is assigned a score for each criterion in the decision matrix. The scores are values from 1 to 4 that rate the impact/effectiveness of the proposed alternative on that specific criterion. A value of 1 was assigned when the alternative had a negative impact or was ineffective in addressing the evaluation criterion. A value of 4 was assigned when the alternative had a positive impact or was effective in addressing the evaluation criterion. Each score was assigned based on the effectiveness/impact of the alternative, relative to the other three alternatives.

An average criteria score was calculated for each of the categories described in section 5.1. These values were summed to calculate a total score for each of the solution alternatives. The alternative with the highest total score is the solution that best addresses the evaluation criteria.

5.3 ALTERNATIVE COMPARISON

As shown on Figure 5.1, Alternative 3 achieved the highest score in the decision matrix, and is thus the stormwater management solution that best addresses the evaluation criteria. However, the total scores for Alternatives 3 and 4 are nearly equal. Alternative 4 offers several advantages over Alternative 3 including additional opportunities to create aquatic habitat, integration of the proposed SWM works with heritage lands, and placemaking possibilities. But these advantages are balanced by the additional costs of constructing and maintaining a second SWM facility, and the additional complexity of the proposed design.

Alternative 1 received a relatively low score since it does not address the EA problem statement. Alternative 2 scored poorly since the proposed SWM works provide few opportunities for aesthetic enhancement of the proposed site, present little opportunity for providing additional aquatic habitat, are a technically complex solution that will likely require a cumbersome review and approval process, and are relatively costly.

Based on the results of the decision matrix, Alternative 3 is the preferred alternative solution.