# FUNCTIONAL SERVICING REPORT

## INFRASTRUCTURE ONTARIO

PROVINCIAL LANDS EAST AND WEST OF TRAFALGAR ROAD, TOWN OF OAKVILLE

Project No.: 2022-0019-10

April 13, 2022

WALTERFEDY

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## FUNCTIONAL SERVICING REPORT
Provincial Lands East and West of Trafalgar Road, Town of Oakville

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# 1.0 INTRODUCTION

WalterFedy was retained by Infrastructure Ontario to prepare the following Functional Servicing Report (Report) to review potential servicing constraints and opportunities for two parcels of land located on the eastern and western sides of Trafalgar Road, south of Highway 407. This Report has been prepared in support of a proposed Official Plan Amendment application to add Residential land uses to the mix of uses permitted in the Trafalgar Urban Core Area 1 land use designation in the North Oakville East Secondary Plan applicable to the portions of the Provincial Lands proximate to Trafalgar Road. The subject Lands have a total area of approximately 53.4 ha (33.0 ha east + 20.4 ha west) and are currently vacant land used for agricultural purposes. See Figure 1.0 for a Site Location Plan.

Two Illustrative Development Concepts were prepared by GSP Group Inc. identifying two development scenarios for the Lands. Scenario A would see the Trafalgar Corridor Lands developed with 70% residential development and 30% employment development, while Scenario B would be equally split between residential and employment land use. No Site Plans or Draft Plan of Subdivision applications have been developed at this time, only conceptual sketches and estimated population/employment densities. See Appendix A for a conceptual figure showing the built-out form of the Subject Lands as presented in the GSP documents.

The purpose of this Report is to review the existing background information, as well information that is currently in the design process, and to provide a general overview of the of the servicing requirements for the subject Lands to support the requested Official Plan Amendment to the North Oakville East Secondary Plan. Of particular interest is the sanitary sewer drainage and downstream sanitary sewer capacity as it relates to the proposed development scenarios indicated above.

## 1.1 Reference Reports

In the preparation of this functional servicing report, the following reports/drawings were referenced:

1. *North Oakville Creeks Subwatershed Study (NOCSS)*, Town of Oakville, August 2006.
2. *North Oakville Creeks Subwatershed Study Addendum*, Town of Oakville, September 5, 2007
3. *Official Plan Amendment Number 272, North Oakville East Secondary Plan*, February 2008.
4. *North Oakville East Secondary Plan – Area Servicing Plan, Oakville* Ontario, MMM Group Limited, April 2011.
5. *Trafalgar Road Corridor Improvements EA, Cornwall Road to Highway 407 – Stormwater Management Report*, AECOM, April 2015.
6. *407/Trafalgar Illustrative Concept Plans*, GSP Group, April 2020.
7. *Technical Memorandum – Trafalgar Road (Phase 2) – Hays Boulevard to William Halton Parkway Sanitary Sewer Design*, R.V. Anderson Associates Limited, November 8, 2021.
8. *600mm Sanitary Sewer – Trafalgar Road (Reg. Rd. 3) – Plan Profile Dwgs. 36-42 (Rev.1, 60% Review)*, R.V. Anderson Associates Limited, November 8, 2021.
9. *Green Ginger Subdivision – Stages 1 & 2 – Plan Profile Dwgs for Wheat Boom Drive and Ernest Appelbe Boulevard (As-Constructed)*, DSEL, various dates.
10. Correspondence from DSEL regarding Sanitary Sewer Population, DSEL (late 2021).
11. *Water and Wastewater Linear Design Manual*, Regional Municipality of Halton, April 2019.

# 2.0 EXISTING SITE CONDITIONS

The subject Lands are located on the eastern and western sides of Trafalgar Road, south of Highway 407. The eastern property is located north of William Halton Parkway and is bound by the Highway 407 right-of-way to the north, Trafalgar Road to the west, and agricultural lands to the east and south. The western property is bisected by William Halton Parkway and bound by an existing commuter parking lot to the north, Trafalgar Road to the east, agricultural lands to the west, and agricultural lands and an existing Region of Halton water tower to the south. Refer to Figure 1.0 for a Site Location Plan.

## 2.1 Existing Topography, Soils, and Hydrogeology

The subject Lands are located in the northwest headwaters of the Joshua's Creek subwatershed and are predominantly used for agricultural row crops. The western property drains in a southeasterly direction at a slope of 1.5% to 2.0% towards roadside ditches on the western side of the Trafalgar Road right-of-way. Four existing culvert crossings convey surface runoff to the eastern side of Trafalgar Road. The property on the eastern side of Trafalgar Road flows in a southerly direction overland and via intermittent agricultural swales/drains towards existing culvert crossings under William Halton Parkway.

A site-specific geotechnical investigation for the subject Lands will be completed during the future re-zoning or detailed design stage. However, based on the Ministry of Agriculture, Food and Rural Affairs AgMaps website, and the Trafalgar Road SWM report the subsurface soils generally consist of Chinguacousy clay loam and Oneida clay loam. These soils are characteristic of Hydrologic Soil Groups C and D, respectively.

The subject Lands fall within the jurisdiction of Conservation Halton, but it does not appear that the lands are located with the authority's regulation limit. Moreover, the site is not located in a source water protection area.

There are no significant natural heritage features within the subject Lands. Two low-constraint, intermittent watercourses containing no habitat were identified crossing the eastern property in the NOCSS.

## 2.2 Water, Sanitary, and Storm Servicing

Existing servicing infrastructure information was provided by the Region of Halton, the Town of Oakville, and Conservation Halton. Existing utilities information was obtained from utility drawings prepared as part of the Trafalgar Road study.

### 2.2.1 Sanitary Servicing

There is no existing sanitary sewer infrastructure on Trafalgar Road or William Halton Parkway adjacent to the Subject Lands.

### 2.2.2 Water Servicing

An existing 750-mm-diameter watermain is located on Trafalgar Road that runs between Dundas Street and the elevated water tower located south of the western property. An existing 1200 mm transmission watermain is located on the Burnhamthorpe Road (west of Trafalgar Road) that runs north along Trafalgar Road. See Appendix C for Area Servicing Plan Report. The subject Lands are located wholly within Halton Pressure Zone 4.

### 2.2.3 Storm Servicing

Trafalgar Road is a mix of urbanized and unimproved/rural road cross-sections. Trafalgar Road drains to roadside ditches from Burnhamthorpe Road to south of William Halton Parkway, where it turns into an urbanized cross-section for approximately 230 m north, at which point the road section reverts back to an unimproved/rural cross-section at the commuter parking lot entrance. Within the urbanized cross-section areas, localized storm sewers drain the right-of-way and outlet flows to the eastern side of Trafalgar Road where surface runoff is collected by tributaries of Joshua's Creek. Within the unimproved sections, Trafalgar Road drains southerly in roadside ditches to culvert crossings under Trafalgar Road.

### 2.2.4 Hydro, Gas, and Other Utilities

Overhead hydro lines are located on the eastern side of Trafalgar Road. Subsurface utility locate drawings prepared for the Trafalgar Road study indicate a buried Bell service on the western side of Trafalgar Road, north of Burnhamthorpe Road. No information related to natural gas or other telecommunications is available at this time. The availability of services/utilities in proximity to the subject Lands will be confirmed as part of future engineering design works.

# 3.0 REVIEW AGENCIES

### 3.1 Town of Oakville

The Town of Oakville will be responsible for the review and approval of development applications associated with the site.

### 3.2 Region of Halton

The Region of Halton will also provide review services associated with any development applications for the subject Lands related to sanitary and water servicing. In addition, both Trafalgar Road and William Halton Parkway are Regional Roads. All associated road works or service connections will require review, approval, and permitting by the Region of Halton.

### 3.3 Conservation Halton

The subject Lands are located within the jurisdiction of Conservation Halton. It does not appear that the lands are located with the authority's regulated area, but any future storm runoff will be directed to tributaries of Joshua's Creek, which is regulated by Conservation Halton.

### 3.4 Ministry of Transportation Ontario (MTO)

The subject Lands are located within MTO's Permit Control Area to Highway 407 and will require MTO approval. The eastern property, being located closer to Highway 407 is impacted more than the western property, based on MTO's Highway Corridor Management online mapping.

# 4.0 SITE SERVICING AND GRADING

Using the background information reference above, the general servicing design concept for the subject Lands is described below.

### 4.1 Sanitary Services

Based on the Area Servicing Plan, future sanitary drainage from the subject Lands will be directed to two outlets. Sanitary effluent from the eastern property is proposed to be conveyed southeast to a trunk sanitary

sewer on William Cutmore Boulevard. Sanitary effluent from the western property is proposed to outlet to the future trunk sanitary sewer on Trafalgar Road that will carry the sanitary flow south to Dundas Street. Within the subject Lands, a local sanitary sewer system will be constructed to service the buildings. The routing of the local sewer mains to the outlet on Trafalgar Road will be determined during the functional design stage as part of development of the Future Draft Plans of Subdivision and Site Plans.

R.V. Anderson is currently designing a 600-mm-diameter (at 0.55% slope) sanitary sewer on Trafalgar Road from Burnhamthorpe Road, south to the future Wheat Boom Drive right-of-way on the western side of Trafalgar Road. A future sanitary sewer on West Boom Drive between Trafalgar Road and East Morrison Creek will be constructed that will connect to the existing 600-mm-diameter sanitary sewer on West Boom Drive within the Green Ginger Subdivision. The existing sanitary sewer flows west to Ernest Appelbe Boulevard where it connects to an existing 675-mm-diameter sewer that flows south connecting to the existing trunk sewer on Dundas Street. See Figure 2.0 for a schematic of the sanitary sewer outlet for the subject Lands. Table 4.1 summarizes the trunk sanitary sewer capacities for the future and existing sewers that will be the ultimate outlet for the western side of the subject Lands. For reference, the table also includes the sewer capacity at 70% of full flow capacity, which is the Region target flow capacity for sanitary sewers greater than 450-mm-diameter.

**Table 4.1 – Existing and Future Sanitary Sewer Characteristics and Capacities**

| Trunk Sanitary Sewer Location | Approx. Length (m) | Diameter (mm) *(Actual ID)* | Slope | Full Flow Capacity (l/s) | 70% Full Flow [3] Capacity (l/s) |
|---|---|---|---|---|---|
| Trafalgar Road – proposed by R.V. Anderson (Burnhamthorpe Road to Wheat Boom Drive) | 1695 | 600 *(610)*[1] | 0.55% | 476 | 333 |
| Existing Wheat Boom Drive (west of East Morrison Creek) [2] | 229 | 600 *(610)* | 0.28% to 0.32% | 340 – 363 | 238 – 254 |
| Existing Ernest Appelbe Boulevard (Wheat Boom Drive to Dundas Street) | 351 | 675 *(686)* | 0.22% to 0.35% | 417 – 519 | 292 – 363 |

[1] The R.V. Anderson analysis used an actual diameter of 625 mm. A review of various pre-casters literature indicated an ID of 610 mm for nominal 600-mm-diameter concrete pipe.
[2] The section of trunk sanitary sewer on Wheat Boom Drive from Trafalgar Road to western side of East Morrison Creek (including the creek crossing) has not been constructed yet.
[3] Halton Region design criteria for sanitary sewers greater than 450 mm is to target maximum 70% full flow capacity.

A sanitary sewer design sheet was prepared (Appendix B) that was used to estimate the sanitary peak flow resulting from the different development scenarios for residential and employment lands proposed for the IO lands. The methodology is outlined on each design sheet. As part of the R.V. Anderson analysis (Appendix B), the Region of Halton provided a design sheet which provided a breakdown of areas for the different land uses (townhouse, apartment, and light commercial) for the general area around Burnhamthorpe Road and lands north. This information was used to adjust the population for the two IO scenarios. For reference, the original Regional analysis is comprised of 47% residential and 53% light commercial. This assumption is similar to the contemplated IO Scenario B of an equal distribution of uses. The IO scenarios will result in the following additional flows compared to the R.V. Anderson calculated flows:

- A 70% residential and 30% employment land use (Scenario A) on the western property will increase the sanitary sewage flow by 13 l/s.
- A 50% residential and 50% employment land use (Scenario B) on the western property will increase the sanitary sewage flow by 7 l/s.

Table 4.2 summarizes the sanitary flows calculated as part of the original R.V. Anderson analysis, as well as the IO scenarios and the capacity utilization within the existing Wheat Boom Drive sanitary sewer. The table shows that, based on the analysis prepared by R.V. Anderson, the sewer would be operating at 79% to 84% of full flow capacity. The scenarios proposed for the IO lands could potentially increase that utilization by an additional 3% to 4%. The Region of Halton design criteria states that sanitary mains larger than 450 mm should be sized to operate at a maximum 70% of full flow capacity and be triggered for upsizing if capacity reaches 80%. Therefore, per the Region criteria, upsizing of the sanitary sewer on Wheat Boom Drive would be considered necessary to support this development approach.

Ernest Appelbe Boulevard from Wheat Boom Drive to Dundas Street collects sanitary flow from an eastern branch (Trafalgar Road) and a western branch (residential lands north and west). Information provided by DSEL (see figure in Appendix D) indicates that the western branch currently has a population that is 8,000 people greater than the original Area Study estimate, and the sewers on Ernest Appelbe Boulevard would be operating at full-flow capacity (if not greater, based on the as-built slopes) without any population intensification within the lands along Trafalgar Road, which include the IO lands.

Based on the discussion above, the Wheat Boom Drive sanitary sewer is operating below full flow capacity, but at a greater capacity than prescribed by the Region of Halton. The Ernest Appelbe Boulevard sanitary sewer is essentially operating at capacity under current conditions (existing development plus original population estimates from the Area Study). As such, based on the Region criteria and engineering practice, both these sanitary sewers would be candidates for upsizing or twinning to create additional capacity. However, upsizing or twinning the existing sanitary sewers using an open cut method is not feasible. The existing trunk sanitary sewers on Ernest Appelbe Boulevard and Wheat Boom Drive are located between 8 m and 9 m below grade in the existing roads within a shale formation. Along much of Ernest Appelbe Boulevard and Wheat Boom Drive the existing subdivision design incorporates a shallow local sanitary sewer system located above the trunk sanitary in addition to the storm sewer system and watermain. Therefore, any proposed works may be prohibitively disruptive to the existing residents and the existing infrastructure.

One potential option to understand the operation of the sanitary sewer system is a dynamic (wet weather/dry weather) sanitary sewer model that will account for temporal affects of the flow and characterize the degree of surcharge hourly throughout the day that the trunk sewer might experience for various upstream population densities and intensification and to better understand if there is additional utilized capacity within the system. Since the trunk sewer is deep (greater than 4m below the local sanitary sewer), the affects of overcapacity sewers or minor surcharging will likely not adversely affect operation and functionality of the shallow local sanitary sewer system.

While open cut construction methods are not considered feasible, another consideration for increasing sanitary capacity might be the use of trenchless technologies. Directional drilling represents an effective construction method that may be utilized to twin the existing sanitary sewer system along Wheat Boom Drive and Ernest Appelbe Boulevard. The feasibility of this approach would require further review and consideration because costs tend to be higher than traditional open cut construction methodologies, but it would limit disturbances within the existing rights-of-way to localized areas (beginning/end of pipe runs, turns in the sewer). The twin pipes would share common manhole structures to allow incoming sanitary sewer flows to utilize the capacity of both pipes

Given the number of years since the original Area Servicing Study was completed, it is recommended that the future purchaser of the IO lands and the other landowner groups consider undertaking an update to the Area Study that incorporates current market trends and land use needs based on their preferred land usage/intensification to be determined at the Zoning By-Law and Site Plan stage to provide a more fulsome assessment of the anticipated sanitary flows from the sewershed and the impacts on the downstream system. Alternative options can be explored to address the downstream capacity issues and the routing of sanitary flows in consultation with the agency stakeholders.

Preparation of an Area Servicing Plan will require time to undertake and implement. In the interim, as a landowner in the sewershed, the IO lands on the west side of Trafalgar Road represent approximately 20.6% of the sewershed area north of Burnhamthorpe Road (total area is approximately 90 ha). Therefore 20.6%, or

approximately 26.1 l/s of the total 126.74 l/s peak flow from this area is allocated to the IO lands. The IO lands should therefore be entitled to that capacity allocation to support construction of initial phases of the envisioned development on the lands regardless of land use.

**Table 4.2 – Wheat Boom Drive Sanitary Sewer Utilization**

| Development Scenario | Existing Wheat Boom Drive | | | |
|---|---|---|---|---|
| | Flow (l/s) | Full Flow Capacity (l/s) | Flow at 70% Capacity (l/s) | Actual Utilization (%) |
| Original Analysis (R.V. Anderson) | 285.90 | 340 – 363 | 238 – 254 | 79 – 84 |
| IO Scenario A<br>With IO Trafalgar lands (western side) at 70% Res. + 50% Employment | 298.90 | | | 82 – 88 |
| IO Scenario B<br>With IO Trafalgar lands (western side) at 50% Res. + 50% Employment | 292.92 | | | 81 – 86 |

## 4.2 Municipal Water

The primary source of municipal water for the subject Lands will be the existing 1200-mm-diameter transmission watermain on Trafalgar Road. The Area Servicing Plan undertook hydraulic modeling of existing and proposed watermains 300 mm in diameter and greater. See the figure in Appendix C showing watermain layout from the Area Servicing Plan. It is proposed to connect 300 mm watermains from the existing 1200 mm transmission watermain on Trafalgar Road into the eastern and western properties of the subject Lands, creating a looped watermain system within the internal roads. The sizing of additional watermain interconnections within the local streets will be determined during detailed engineering for individual sites/blocks.

The Area Servicing Plan modeling determined that there will be adequate flow and pressure at all Pressure Zone 4 nodes during the maximum day and peak hour demand scenarios. The Area Servicing Plan (see figure in Appendix C) determined that maximum day pressures at nodes within the subject Lands could range from 58 psi to 72 psi. In addition, the Area Servicing Plan undertook maximum day + fire flow modelling to confirm that the water distribution could meet the Region's requirements of 5,000 l/min (92 l/s) for residential development and 15,000 l/min (250 l/s) for commercial, industrial, and institutional land uses. The analysis was performed targeting a minimum allowable pressure of 30 psi (versus the typical 20 psi) to account for additional system head losses that may occur when smaller diameter watermains infill within the final Site Plans and development blocks.

### 4.2.1 Domestic Demands

An estimate of the domestic water demand for the two development scenarios is provided in Appendix C. To be conservative, it was assumed that the future residential developments would be in the form of apartment/condo type units which carry a higher population density. Scenario A (70% Res + 30% Employment) generates a population that is 2083 people greater than Scenario B (50% Res + 50% Employment). As a result, the Scenario A domestic demands for the average day, maximum day, and peak hour will be 6.6 l/s, 14.9 l/s, and 31.9 l/s greater than the Scenario B demands, respectively. Demands from any of the scenarios will be evenly distributed throughout the proposed development area and, if the future water system is sufficiently looped, the additional domestic demand would not be expected to adversely impact the water distribution system.

#### 4.2.2 Fire Flow Demands

Fire flow demands for any future developments will be subject to the methodology outlined in the *Water Supply for Public Fire Protection* document published by Fire Underwriters Survey (FUS, 1999). During the detailed design stage, the Site Plan(s) and architectural building plans will be used to calculate the required FUS fire flows for each building. If the system is able to supply 15,000 l/min (250 l/s) as indicated in the Area Servicing Plan, then sufficient flow will be available to satisfy the fire flow requirements regardless of the development scenario and ultimate residential/employment land split as the building forms will be similar.

### 4.3 Storm

There is no existing storm sewer infrastructure suitable to service the subject Lands at this time. As part of the future development, it will be necessary to design and construct a storm sewer system to collect and convey surface runoff to a downstream stormwater management (SWM) facility designed consistent with the recommendations of the NOCSS. Future storm sewers will be designed to provide capacity to convey the surface runoff during a 5-year storm event per the Town of Oakville requirements. Any future storm sewer design will also need to take into consideration flows from external areas entering the IO property, as well as the downstream routing of flows to the eastern side of Trafalgar Road.

### 4.4 Stormwater Management

The NOCSS and the Secondary Plan (see figure in Appendix A) identified areas to be used for potential SWM facilities. For the property on the western side of Trafalgar Road, a future SWM facility is proposed on the IO lands immediately east of the existing water tower. It is noted that incorporation of this into the future detailed design, could reduce the sanitary sewer and water demands associated with future development applications. On the eastern side of Trafalgar Road, the secondary plan proposes two SWM facilities on the northern side of Burnhamthorpe Road on either side of the existing watercourse - see Figure 3.0 for SWM facility locations with respect to the subject Lands.

SWM criteria for the subject Lands is taken from the North Oakville Creeks Subwatershed Study (NOCSS) report and the NOCSS Addendum and the Ministry of the Environment, Conservation and Parks guidelines. The SWM requirements are as follows:

- Water Quality Control
    - Total phosphorus (TP) loadings must not increase after development.
    - A Normal (70% TSS removal) level of water quality protection is stipulated for Joshua's Creek; in order to achieve the TP removal criterion, an Enhanced (80% TSS removal) level of protection should be implemented.
    - A dissolved oxygen level of 6 mg/L is required for Joshua's Creek.
    - Chlorides - The Town of Oakville adopted a Salt Management Plan. The requirement for salt management should be reviewed during the detailed design stage.
- Peak Flow Control
    - Post-development peak flows for the 2-year to 100-year storm events and the Regional Storm are to be controlled based on target unit flow rates ($m^3/s/ha$) as outlined in Table 7.4.1 in the NOCSS Addendum (Appendix D). These targets are based on maintaining existing condition flow rates.
    - Provide infiltration if possible.

The subject Lands are located within subcatchments JC7 and JC8 as identified in Figure 7.4.7 of the NOCSS. Surface drainage crosses under Burnhamthorpe Road at culverts JC-B10 and JC-B9, respectively. Drainage from both subcatchments ultimately drains to culvert JC-D1 at Dundas Street. Table 4.3 summarizes the unit area target flow rates from the NOCSS Addendum.

| Table 4.3 – Target Unit Flow Rates | |
|---|---|
| Storm Event | Target Flow ($m^3/s/ha$) |
| 2-year | 0.007 |
| 5-year | 0.011 |
| 10-year | 0.013 |
| 25-year | 0.017 |
| 50-year | 0.019 |
| 100-year | 0.021 |
| Regional | 0.052 |

Based on the criteria outlined above and the ultimate drainage areas, the SWM facilities will be MECP wet pond facilities complete with a permanent pool and forebay for quality control. The ponds will include an active storage component that will provide erosion and quantity (peak flow) control via an outlet control structure.

For the western property, the SWM facility location identified on the Secondary Plan (see Appendix A and Figure 3.0) is located within the IO lands. Depending on the timing of the proposed development and the upstream development lands, this location can be used to provide a temporary SWM facility or the ultimate SWM facility.

For the eastern property, unless the ultimate SWM facilities are constructed north of Burnhamthorpe Road, temporary on-site facility(ies) will be required within the IO lands to provide interim stormwater management until such time as the municipal facility is constructed.

### 4.5 Other Services

Gas servicing for the site would need to be coordinated with Enbridge during detailed design. Oakville Hydro lines bound the site and could readily provide service. Coordination would be required during detailed design. Coordination with Bell and other telecommunications services would be required during detailed design.

### 4.6 Surface Grading and Drainage

As indicated previously, the existing lands drain in a southeasterly direction with an ultimate storm water outlet to Joshua's Creek on the eastern side of Trafalgar Road. It is expected that proposed grading schemes for any future developments will direct underground (piped) and surface runoff (major overland flow) in the same general direction.

### 4.7 Erosion and Sediment Control

Erosion and sediment controls must be implemented during construction. At a minimum, any sediment that is tracked onto the roadway during the course of construction will be cleaned by the Contractor at the end of each day. Temporary siltation protection in the form of silt sacks will be installed on all existing and new catchbasins on the Site and within the immediately adjacent rights-of-way. Sediment control fence will be required around the perimeter of the active work area and to protect the interior wetland. In addition, depending on the size of area stripped for any future works, temporary sediment and erosion control ponds will be constructed.

# 5.0 CONCLUSIONS

Based on a review of the existing background information, the IO lands on Trafalgar Road can be serviced as follows:

- Sanitary servicing for the eastern property will be via a sanitary sewer system that will drain east through the future development to William Cutmore Boulevard. Sanitary runoff from the western property will be directed to a future Trafalgar Road sanitary sewer that will drain south to Wheat Boom Drive and Ernest Appelbe Boulevard. It appears that the downstream sanitary sewers will be operating at full capacity or greater based on the original Area Study. Land uses that intensify the population by IO or other proponents will exacerbate the capacity issue. Due to the depth of the downstream trunk sanitary sewer, consideration might be given to the preparation of a dynamic wastewater model to characterize and understand the impacts of sanitary flow that exceeds the free flow capacity of the system. The feasibility of trenchless technologies to construct the infrastructure necessary to achieve additional capacity exist and should be considered. In the interim, the capacity allocation for the IO lands, and while not capable of supporting full build-out, should be available for use and support initial phases of development.
- A future water distribution system will need to be extended from the existing watermain on Trafalgar Road and looped through the subject Lands to provide domestic and fire water supply for the future developments.
- The NOCSS will require that future developments drain to SWM facilities that will provide the requisite controls. The Secondary Plan identified a SWM facility at the southeastern corner of the western property adjacent to the existing water tower. Depending on the timing of developments in the area, a temporary ultimate SWM facility can be constructed at this location to the service the Lands. For the eastern property, the ultimate SWM facilities servicing the property are located downstream on the northern side of Burnhamthorpe Road. If these facilities are not constructed at the time of site development, then a temporary facility(ies) can be constructed within the IO lands as an interim measure.
- It is anticipated that future development applications will require detailed servicing studies/plans to identify existing and necessary infrastructure to support future development of the subject Lands. These would be subject to review and approval by the Town of Oakville, Region of Halton, and other circulated review agencies.

All of which is respectfully submitted,

**WALTERFEDY**

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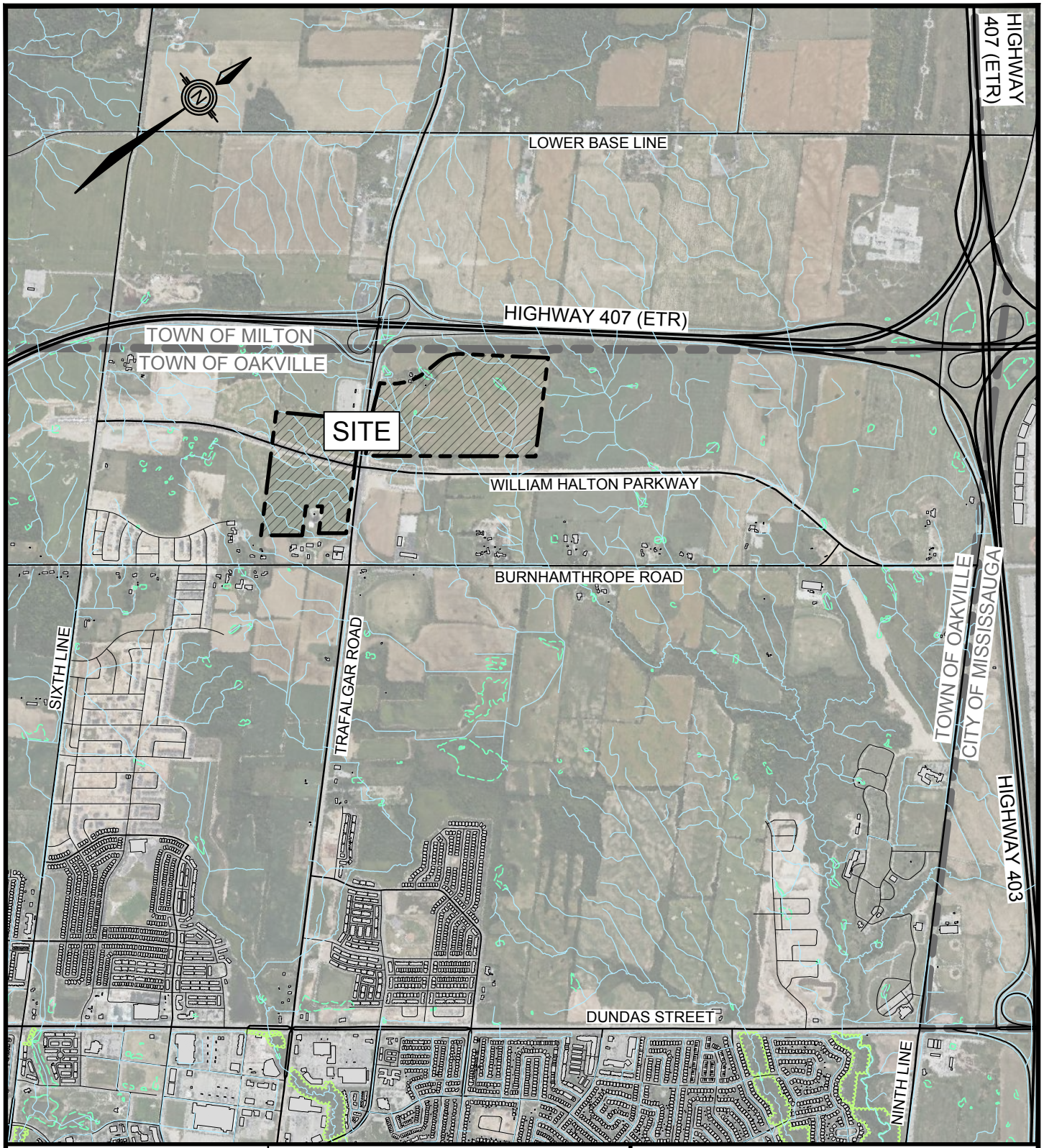
# FIGURES




PROJECT:
TRAFALGAR CORRIDOR
FUNCTIONAL SERVICING REPORT
OAKVILLE, ONTRIO

TITLE:
SITE LOCATION



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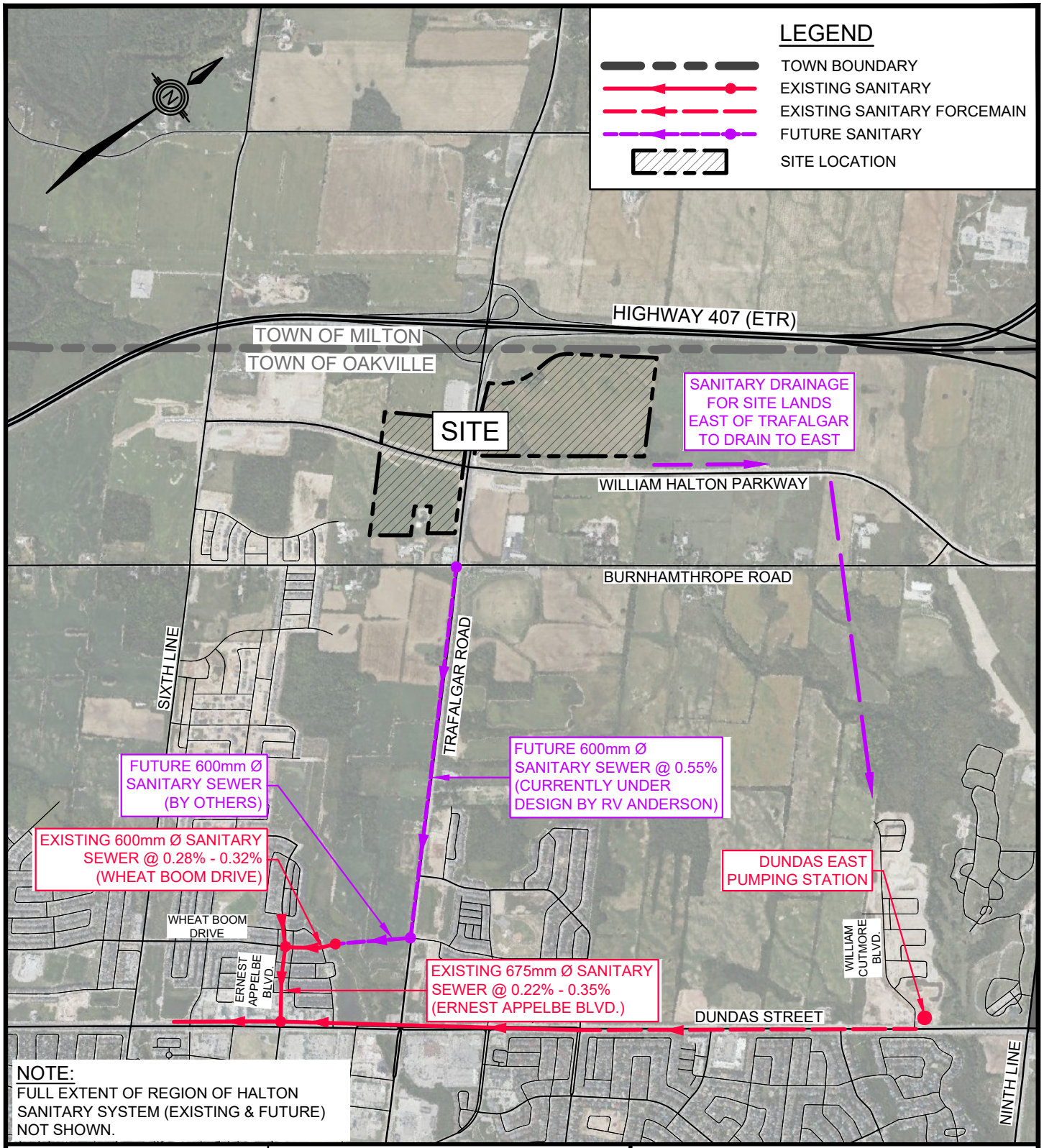
| SCALE: | 1:25000 | DATE: | 2022-03-03 |
| DRAWN BY: | JJ | PROJECT NO.: | 2022-0019-10 |
| CHECKED BY: | JO | FILE: | 2022-0019-10 SITE LOCATION |
| SHEET NO.: | | | |

**fig 1.0**




NOTE:
FULL EXTENT OF REGION OF HALTON SANITARY SYSTEM (EXISTING & FUTURE) NOT SHOWN.

PROJECT:
TRAFALGAR CORRIDOR FUNCTIONAL SERVICING REPORT OAKVILLE, ONTRIO

TITLE:
EXISTING AND FUTURE SANITARY SYSTEM



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| SCALE: | 1:25000 | DATE: | 2022-03-03 |
| DRAWN BY: | JJ | PROJECT NO.: | 2022-0019-10 |
| CHECKED BY: | JO | FILE: | 2022-0019-10 EX SAN |
| SHEET NO.: | | | |

**fig 2.0**

SIXTH LINE

TRAFALGAR ROAD

HIGHWAY 407 (ETR)

EXISTING SWM POND

TOWN OF MILTON

TOWN OF OAKVILLE

8.22ha

11.54ha

9.81ha

21.43ha

20.81ha

109.28ha

SITE

900mmØ CONC

800mmØ CSP

FUTURE INTERIM / TEMPORARY SWM FACILITIES IF FUTURE DOWNSTREAM PONDS ARE NOT CONSTRUCTED

24.50ha

17.87ha

1500mmØ CONC

FUTURE SWM POND

WILLIAM HALTON PARKWAY

2.0 x 4.0m CONC BOX

EX. CIRCULAR CONC CULVERT

EX. BOX CONC CULVERT

EX. CIRCULAR CONC CULVERT

BURNHAMTHROPE ROAD

EXISTING SWM POND

FUTURE SWM POND

1600mmØ CSP

TWIN 1.39 x 0.97m CSP ARCH

JOSHUA'S CREEK TRIB

MORRISON CREEK (EAST BRANCH)

TRAFALGAR ROAD

## LEGEND

- TOWN BOUNDARY
- EXISTING CULVERT
- EXISTING DRAINAGE BOUNDARY PER TRAFALGAR ROAD SWM STUDY (AECOM) AND PER LATEST LIDAR MAPPING
- 17.87ha — EXISTING DRAINAGE AREA
- WATERCOURSE CENTRELINE (GIS)
- 180 — LIDAR CONTOURS
- SITE LOCATION
- EXISTING SWM POND
- FUTURE SWM FACILITY PER NOCSS OR SECONDARY PLAN
- POTENTIAL INTERIM / TEMPORARY SWM FACILITY IF REQUIRED UNTIL ULTIMATE FUTURE PONDS CONSTRUCTED

P:\2022\0019\10\06-DWGS\CIVIL\Plot Files\2022-0019-10 EX STM; fig 3.0; None; Jennifer Jantzen; 3/7/2022 11:21:21 AM


WALTERFEDY

KITCHENER OFFICE
675 Queen Street South, Suite 111, Kitchener, Ontario N2M 1A1
T: 519.576.2150 F: 519.576.5499 walterfedy.com

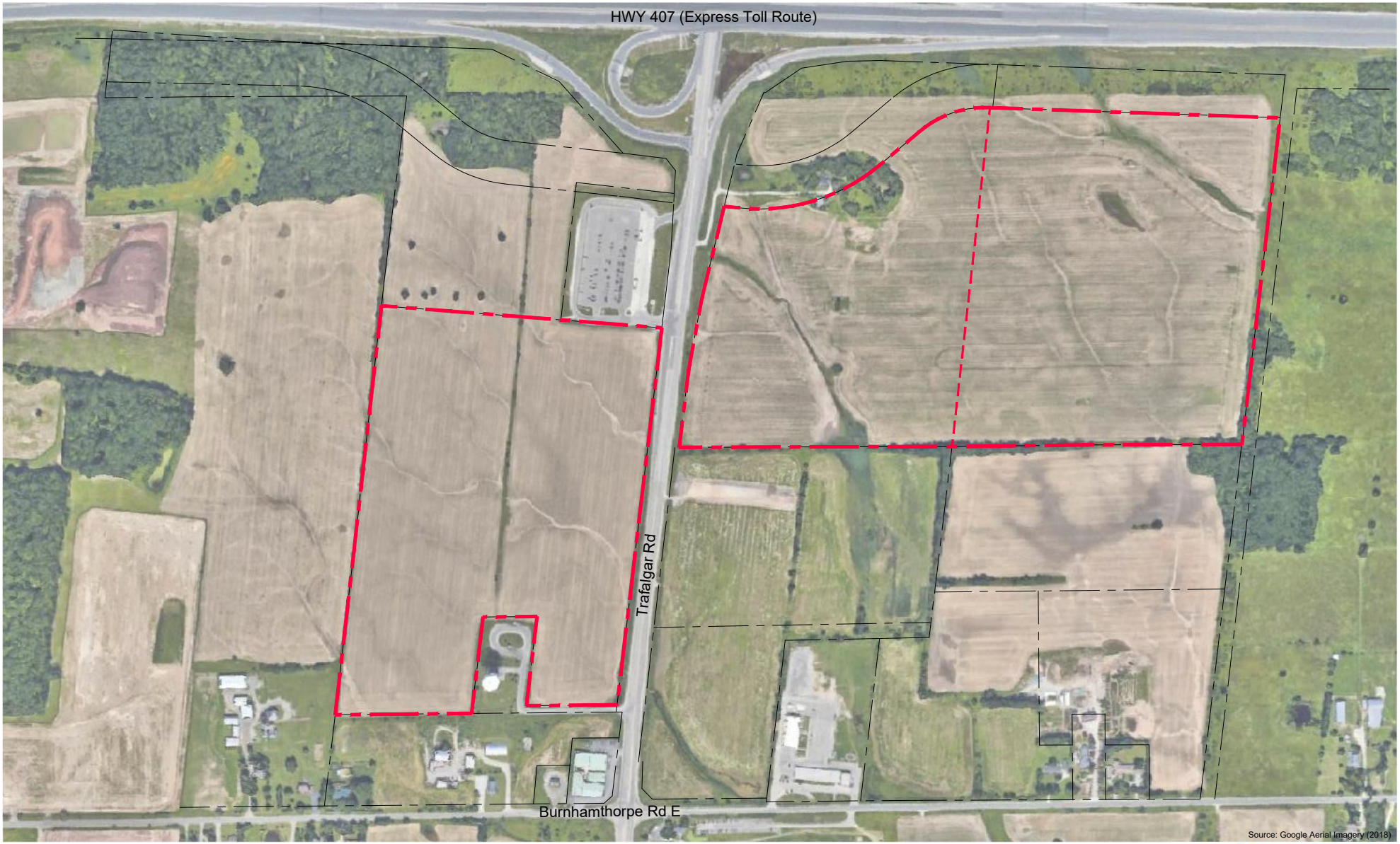

| | |
|---|---|
| SCALE: | 1:10000 |
| DRAWN BY: | JJ |
| CHECKED BY: | JO |
| DATE: | 2022-03-03 |
| PROJECT NO.: | 2022-0019-10 |
| FILE: | 2022-0019-10 EX STM |
| SHEET NO: | fig 3.0 |

PROJECT:
TRAFALGAR CORRIDOR FUNCTIONAL SERVICING REPORT
OAKVILLE, ONTARIO

TITLE:
EXISTING AND FUTURE STORM SYSTEM

# APPENDIX A

## General Background Information

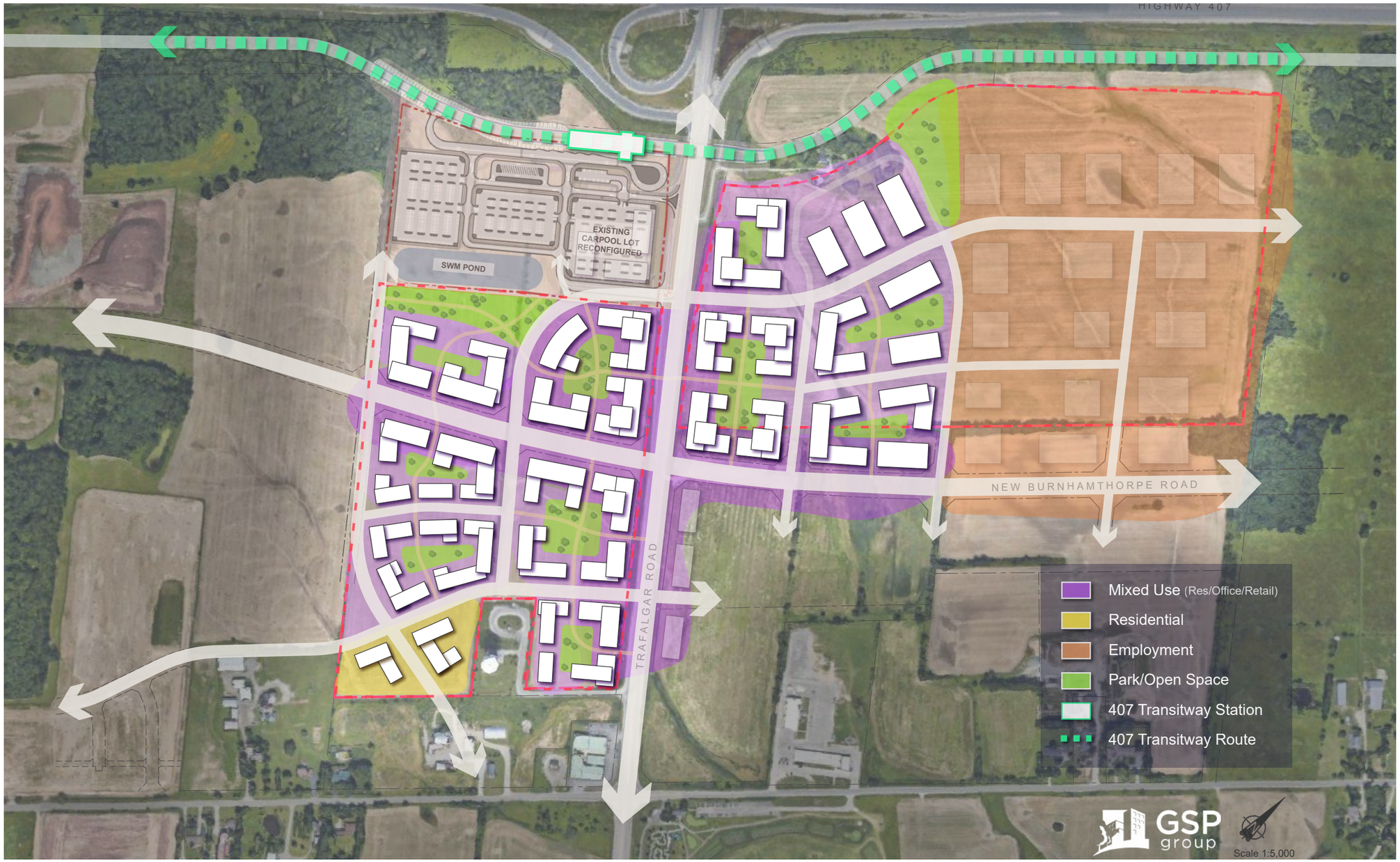



# SITE LOCATION

## I.O. Trafalgar Corridor, Oakville

Scale 1:5000 | September 9, 2020 | Project No.: 13118 | Drawn By: MN

GSP group


HIGHWAY 407
EXISTING CARPOOL LOT RECONFIGURED
SWM POND
NEW BURNHAMTHORPE ROAD
TRAFALGAR ROAD
Mixed Use (Res/Office/Retail)
Residential
Employment
Park/Open Space
407 Transitway Station
407 Transitway Route
GSP group
Scale 1:5,000

## Scenario A: 70% Residential Focus

*Site Statistics*

| | |
|---|---|
| Total Site Area (incl. Employment land) | 53.4 ha (132 ac) |
| Developable Area (Blocks 1-11) | 26.3 ha |
| Total Gross Floor Area | 707,000 $m^2$ (7.61 million $ft^2$) |
| Overall Floor Space Ratio | 2.68 |
| Residential GFA | 494,900 $m^2$ (5.3 million $ft^2$) |
| Approximate # of Units (70 $m^2$) | 5,660 |
| Non-Residential GFA | 212,100 $m^2$ (2.3 million $ft^2$) |
| Approximate # of Jobs (1 per 20 $m^2$) | 8,450 (321 jobs/ha) |

| Block | Area ($m^2$) | Gross Floor Area ($m^2$) | FSR |
|---|---|---|---|
| 1 | 45,087 | 118,380 | 2.6 |
| 2 | 29,290 | 105,492 | 3.6 |
| 3 | 29,540 | 134,596 | 4.6 |
| 4 | 23,772 | 63,440 | 2.7 |
| 5 | 21,833 | 47,308 | 2.2 |
| 6 | 27,701 | 70,728 | 2.6 |
| 7 | 14,928 | 42,047 | 2.8 |
| 8 | 18,731 | 40,955 | 2.2 |
| 9 | 18,655 | 39,081 | 2.1 |
| 10 | 19,167 | 30,453 | 1.6 |
| 11 | 14,654 | 14,531 | 1 |

*These scenarios should be considered as hypothetical demonstration models that illustrate the development potential for the site. The developable area, number of units and floor areas are approximate and subject to detailed design and applicable planning approvals.*

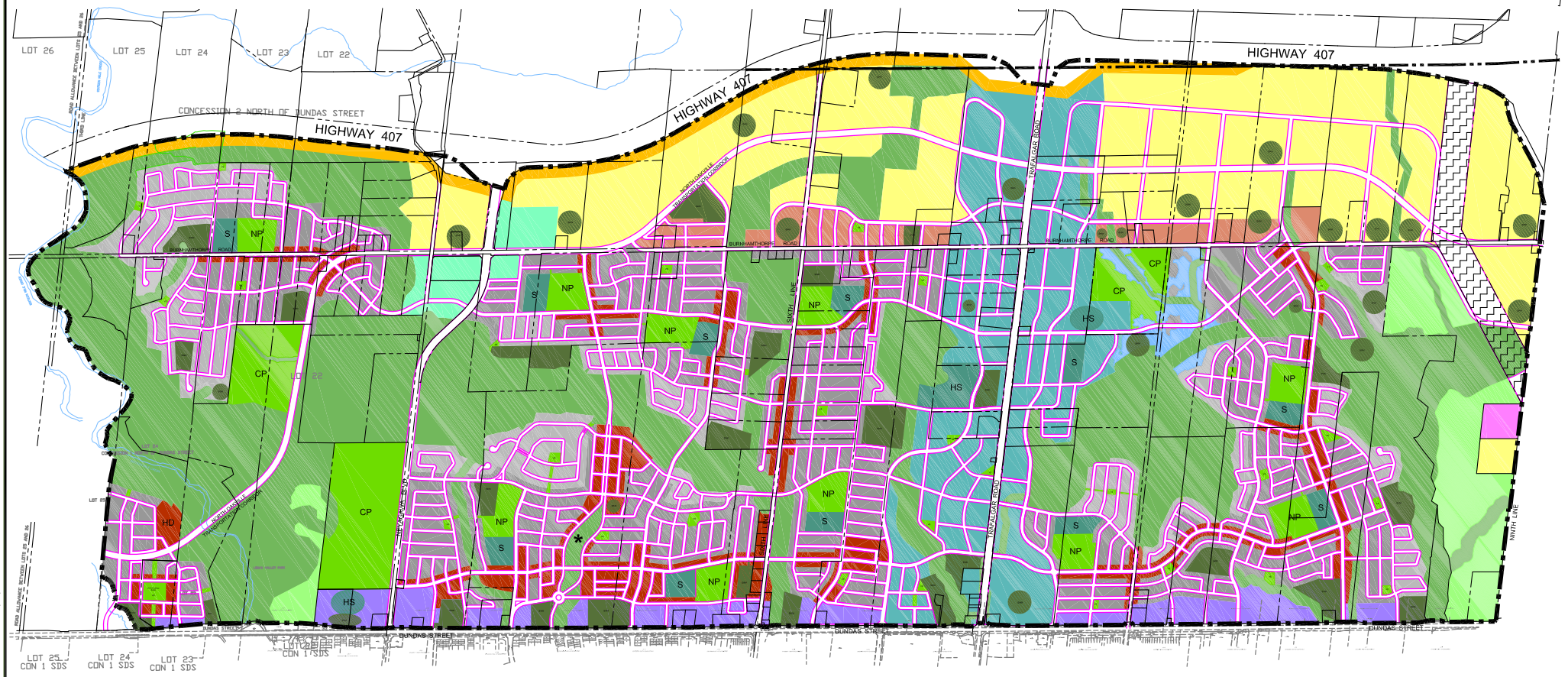

## Scenario B: 50% Employment Focus

*Site Statistics*

| | |
|---|---|
| Total Site Area (incl. Employment land) | 53.4 ha (132 ac) |
| Developable Area (Blocks 1-11) | 26.3 ha |
| Total Gross Floor Area | 711,000 $m^2$ (7.6 million $ft^2$) |
| Overall Floor Space Ratio | 2.70 |
| Residential GFA | 355,500 $m^2$ (3.8 million $ft^2$) |
| Approximate # of Units (70 $m^2$) | 4,060 |
| Non-Residential GFA | 355,500 $m^2$ (3.8 million $ft^2$) |
| Approximate # of Jobs (1 per 20 $m^2$) | 14,200 (540 jobs/ha) |

| Block | Area ($m^2$) | Gross Floor Area ($m^2$) | FSR |
|---|---|---|---|
| 1 | 45,087 | 118,380 | 2.6 |
| 2 | 29,290 | 105,492 | 3.6 |
| 3 | 29,540 | 134,596 | 4.6 |
| 4 | 23,772 | 63,440 | 2.7 |
| 5 | 21,833 | 47,352 | 2.2 |
| 6 | 27,701 | 70,728 | 2.6 |
| 7 | 14,928 | 42,047 | 2.8 |
| 8 | 18,731 | 38,583 | 2.1 |
| 9 | 18,655 | 39,069 | 2.1 |
| 10 | 19,167 | 31,573 | 1.6 |
| 11 | 14,654 | 20,160 | 1.4 |

*These scenarios should be considered as hypothetical demonstration models that illustrate the development potential for the site. The developable area, number of units and floor areas are approximate and subject to detailed design and applicable planning approvals.*


SOURCE: BASEPLAN FROM NORTH OAKVILLE MASTER PLAN APPENDIX 7.3 BY THE TOWN OF OAKVILLE ON AUGUST 13, 2007

500 300 100 0 750 metres
400 200

**LEGEND**

- SECONDARY PLAN AREA BOUNDARY
- OAKVILLE / MILTON MUNICIPAL BOUNDARY
- TRANSITWAY
- DUNDAS STREET URBAN CORE AREA
- NEYAGAWA BLVD. URBAN CORE AREA
- TRAFALGAR ROAD URBAN CORE AREA
- TRANISITIONAL AREA
- EMPLOYMENT AREA
- NATURAL HERITAGE SYSTEM AREA
- INSTITUTIONAL AREA
- STORMWATER MANAGEMENT FACILITY (final location tbd)
- CP — COMMUNITY PARK AREA
- NP — NEIGHBOURHOOD PARK AREA
- VILLAGE SQUARE/URBAN SQUARE
- S — ELEMENTARY SCHOOL SITE
- HS — SECONDARY SCHOOL SITE
- JOSHUA CREEK FLOODPLAIN AREA
- UTILITY CORRIDOR
- NEIGHBOURHOOD ACTIVITY NODE
- CEMETERY AREA
- NEIGHBOURHOOD CENTRE AREA
- GENERAL URBAN AREA
- SUB URBAN AREA
- HD — HIGH DENSITY RESIDENTIAL AREA
- * — POLICY REFERENCE - SEE POLICY SECTION 7.4.7.2

PROJECT

NORTH OAKVILLE COMMUNITY BUILDERS INC.

TITLE

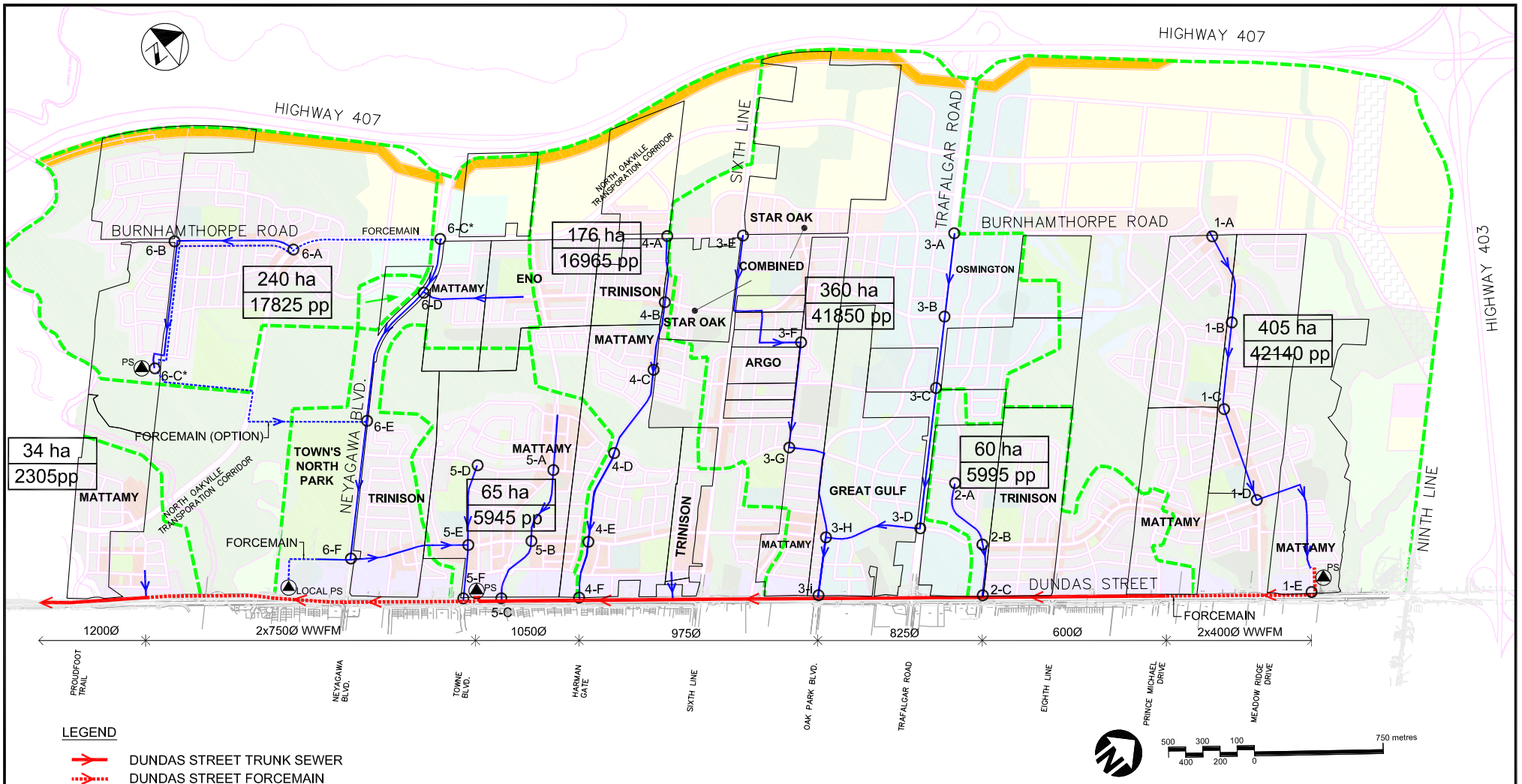
# SECONDARY PLAN - LAND USE

MMM GROUP

| | | | |
|---|---|---|---|
| Checked | A.W. | Drawn | |
| Date | MARCH 2008 | Proj. No. | 10-02076 |
| Scale | NTS | Exhibit No. | 1.1 |

# APPENDIX B

## Sanitary Sewer Information




LEGEND

- DUNDAS STREET TRUNK SEWER
- DUNDAS STREET FORCEMAIN
- SUB-TRUNK SEWER
- SUB-TRUNK FORCEMAIN
- PS — WASTEWATER PUMPING STATION (APPROXIMATE LOCATION)
- SUB-TRUNK DRAINAGE BOUNDARY
- 75 ha / 4000pp — DEVELOPABLE AREA POPULATION

PROJECT

NORTH OAKVILLE COMMUNITY BUILDERS INC.

TITLE

ULTIMATE WASTEWATER DRAINAGE PLAN

MMM GROUP

| | | | |
|---|---|---|---|
| Checked | M.A.E. | Drawn | T.Y. |
| Date | AUGUST 2010 | Proj. No. | 10-02076 |
| Scale | NTS | Exhibit No. | |

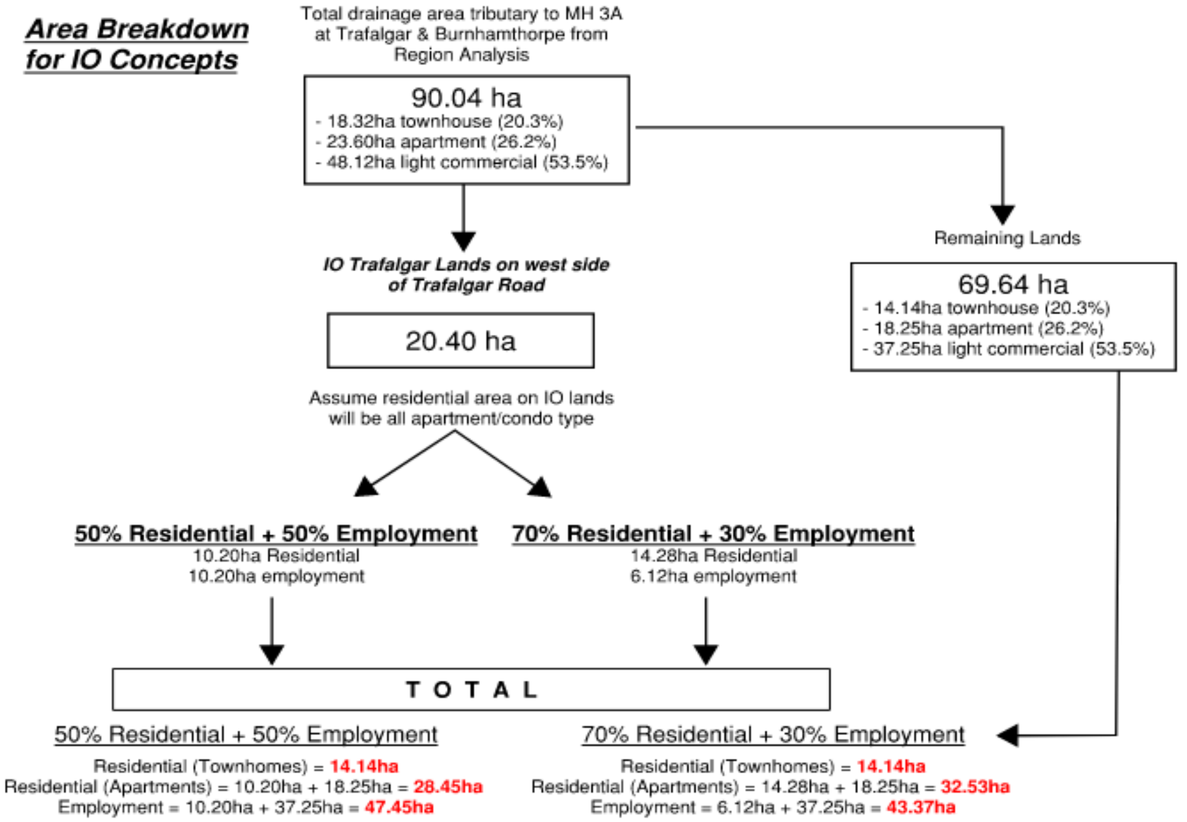
PRINTED ON: FILE NAME: H:\10-02076\MUN\general\PH1-Ultimate.dwg_DRAINAGE 11X17

Project No. 2022-019-10
Date: March 2022

TOWN OF OAKVILLE
# SANITARY SEWER DESIGN
Project: IO TRAFALGAR ROAD

Peaking Factor (Res)= $1+[14/(4+(P/1000)^{0.5}))]$
Peaking Factor (Comm)= $1+[14/(4+(P/1000)^{0.5}))] \times 0.80$
Dry Weather Flow = 275 l/c/d
Infiltration factor = 0.286 l/s/ha

| Area No. | Street Name | People per Hectare --> | Areas (ha) Townhouse 135 | Apartment 285 | Comm/Employ 90 | Total Area [ha] | Population Townhouse | Apartment | Comm/Employ | Total Population | Peaking Factor Residential | Comm/Employ | Average Flow Residential l/s | Comm/Employ l/s | Peak Flow Residential l/s | Comm/Employ l/s | Total | % Change in Flow |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Trafalgar Rd. - Original Analysis | | | 18.32 | 23.60 | 48.12 | 90.04 | 2473 | 6726 | 4331 | 13530 | 2.99 | 2.84 | 29.28 | 13.78 | 87.56 | 39.17 | **126.74** | |
| | | | | | | | | | | | | | | | | | | |
| **IO Lands - 50% Res & 50% Comm&Employ** | | | 14.14 | 28.45 | 47.45 | 90.04 | 1909 | 8108 | 4271 | 14288 | 2.95 | 2.85 | 31.88 | 13.59 | 94.18 | 38.69 | **132.87** | 4.8% |
| | | | | | | | | | | | | | | | | | | |
| **IO Lands - 70% Res & 30% Comm&Employ** | | | 14.14 | 32.53 | 43.37 | 90.04 | 1909 | 9271 | 3903 | 15083 | 2.91 | 2.87 | 35.58 | 12.42 | 103.42 | 35.71 | **139.13** | 9.8% |




SAN. TRUNK 2
REG. ID. 6551
SAN. TRUNK 1
REG. ID. 5062
525mm
450mm
600mm
MH 329A
MH 110A
105A
108A
1
2
3
4
5
6A
6B
6C

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2001 Sheppard Avenue East Suite 300
Toronto Ontario M2J 4Z8 Canada
Tel 416 497 8600 Fax 855 833 4022
www.rvanderson.com

# TECHNICAL MEMORANDUM

**TO:** Alexander Andrenkov, P.Eng., PMP. **RVA:** 163269

**FROM:** Peter Cho, P.Eng., PMP.

**DATE:** November 8, 2021

**SUBJECT:** Trafalgar Road (Phase 2) - Hays Boulevard to William Halton Parkway Sanitary Sewer Design (R2079-D)

---

## 1.0 PROJECT DESCRIPTION

Halton Region (Region) has retained RVA to provide the detailed design of road rehabilitation and widening for Trafalgar Road from Hays Boulevard to William Halton Parkway. This section of Trafalgar Road is proposed to be widened to accommodate 4.0m curb lane in each direction, as well as four (4) general purpose traffic lanes in accordance with recommendation of the Environmental Assessment Report (AECOM, 2015). A proposed multi-use trail and sidewalk will be provided along both sides of Trafalgar Road.

As part of this project, the Region has requested RVA to design a 2.2km sanitary sewer along Trafalgar Road to serve the future developments along the road corridor. This memo documents the design criteria and assumptions used for the design of the sanitary sewer.

## 2.0 SANITARY DESIGN

RVA reviewed the following background information provided by the Region:

- North Oakville East Secondary Plan – Area Servicing Plan Oakville, Ontario (ASP 2011)
- Three updated sanitary sewer design sheets from the Region assessing the upper, lower, and average population estimates
- Green Ginger subdivision drawings

These background documents have been appended to this memo for reference.

The ASP 2011 study delineated the wastewater drainage boundaries in the North Oakville community, including Trafalgar Road. Based on the Ultimate Waster Drainage Plan in the study, the proposed alignment of the sanitary sewer runs along Trafalgar Road from Burnhamthorpe to Wheat Boom Drive, going through the future Green Ginger development and eventually connects to the forcemain on Dundas Street. Refer to **Appendix A** for the route of the sanitary sewer (3A to 3D). The plan shows north of Burnhamthorpe Road, the area west of Trafalgar Road will drain towards the new sewer (3A). Between Burnhamthorpe Road and Road 'C' areas east and west of Trafalgar will drain towards the new sewer (3B and 3C). Between Road 'C' and Wheatboom Drive, areas west of Trafalgar will drain towards to the new sewer.

Although the ASP 2011 delineated the drainage boundaries for the new sanitary sewer, the population density shown was outdated. It should be noted at the time of this design, the future developments along Trafalgar Road were at various stages of planning, some of which have yet to submit their application, so the future population numbers for the Trafalgar Road corridor have not been established. Since the future sanitary sewer capacity requirement is heavily dependent on projected population numbers, the Region has provided their future upper, lower, and average population estimates considering possible variation of land use in their updated sanitary sewer design sheets. For a conservative approach, this sanitary design is based on the upper population estimate. Refer to **Appendix B** for the updated sanitary sewer design sheet provided by the Region.

Using the information from above background documents, the total peak flow under the upper population estimate scenario was determined following the Halton Water and Wastewater Linear Design Manual (version 4.0 April 2019) guidelines. Refer to **Appendix C** for our sanitary sewer design sheet and sanitary drainage area plan. The total peak flow is the sum of infiltration flow within the Trafalgar Road right-of-way, and the equivalent residential flow and the equivalent commercial and industrial flows. This design assumes residential, and commercial and industrial will be the predominate future land use based on the few permit applications submitted to the City of Oakville to date. The areas used in the design sheet are the tributary drainage areas between the sanitary manholes within the Trafalgar Road right-of-way.

The proposed plan and profile layout of the new sanitary sewer was based on our review of the existing site conditions and constructability considerations. The proposed sanitary alignment will run adjacent to the west curb along Trafalgar Road from Wheatboom Drive to north of Road 'D' to minimize lane shutdowns for future maintenance purposes. From north of Road 'D' (at sanitary MH #22), the sanitary alignment will turn and run in the west boulevard area to avoid conflict with the existing 750mm dia. watermain crossing. This layout minimizes impact to the existing watermain on Trafalgar Road.

The proposed sanitary profile was determined based on the existing sanitary manhole invert elevation on Wheatboom Drive within the Green Ginger subdivision – refer to **Appendix D**. Our design approach was to maximize the buried depth of the proposed sanitary sewer at Burnhamthorpe Road to provide greater flexibility for future developments to tie into their service connections. Due to the existing 750mm dia. watermain at Wheatboom Drive intersection, the section of sanitary sewer along Wheatboom Drive had to be steepened to 1% to meet the minimum vertical clearance. Along Trafalgar Road a 0.55% slope was selected for the proposed sanitary profile and the resulting invert elevation at Burnhamthorpe Road is 5.2m below the proposed road profile. This is the maximum buried depth achievable at Burnhamthorpe Road intersection to minimize the impact to the existing watermain on Trafalgar Road and for the new sanitary sewer to be able to tie back into the existing sanitary manhole within the Green Ginger subdivision.

Refer to **Appendix E** for proposed sanitary sewer plan and profile drawings and Sanitary Drainage drawings.

Based on the calculated total peak flow, a 600mm dia. PVC sanitary at 0.55% slope will meet the future drainage capacity requirements along Trafalgar Road under the upper population estimate. This results in a full flow velocity of 1.65m/s which is within the allowable range per Halton Water and Wastewater Linear Design Manual.

## 3.0 SUMMARY

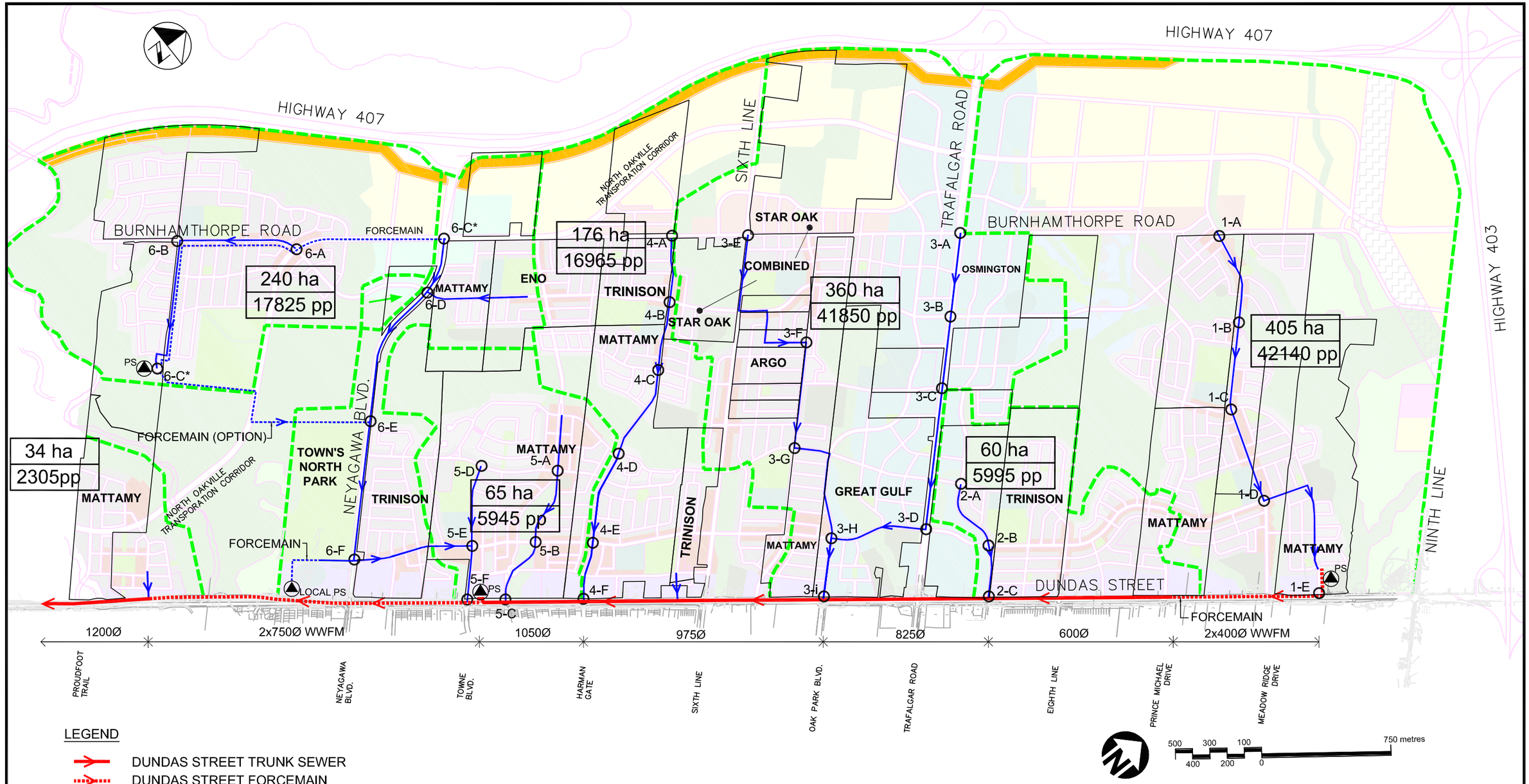
The road rehabilitation and widening on Trafalgar Road provides a good opportunity for the Region to install the new sanitary sewer as planned in the Region's ASP 2011 study in anticipation of the future developments. Since most of the developments have yet to submit their applications, this sanitary design was done based on reasonable assumptions made based on information provided by the Region and previous planning studies. Our finding that a 600mm dia. PVC sanitary sewer should provide sufficient drainage capacity for the projected population estimate under the conservative scenario coincides with the Region's findings in their updated sanitary sewer design sheet. Should more information on the future developments become available, the total peak flow in the area should be revisited to confirm that this sanitary sewer still meets the required drainage capacity and full flow velocity.

Peter Cho, P.Eng., PMP
Project Manager

R:\2016\163269 - Trafalgar Road Widening\ProjectData\Submission\20211108 - 60% Design\Sanitary Memo\20211108 -163269 - Trafalgar Road Sanitary Memo .docx

# APPENDIX A

# ULTIMATE SANITARY DRAINAGE PLAN




LEGEND

- DUNDAS STREET TRUNK SEWER
- DUNDAS STREET FORCEMAIN
- SUB-TRUNK SEWER
- SUB-TRUNK FORCEMAIN
- PS — WASTEWATER PUMPING STATION (APPROXIMATE LOCATION)
- SUB-TRUNK DRAINAGE BOUNDARY
- 75 ha / 4000pp — DEVELOPABLE AREA POPULATION

PROJECT

NORTH OAKVILLE COMMUNITY BUILDERS INC.

TITLE

ULTIMATE WASTEWATER DRAINAGE PLAN

MMM GROUP

| | | | |
|---|---|---|---|
| Checked | M.A.E. | Drawn | T.Y. |
| Date | AUGUST 2010 | Proj. No. | 10-02076 |
| Scale | NTS | Exhibit No. | |

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# APPENDIX B

# SANITARY POPULATION HIGH DENSITY CHECK

PROJECT NO & TITLE: ID7523 - Design Basis for Sewer Design (50% more apartments) - PRELIMINARY

LOCATION: North Oakville East DRAINAGE:

Manning's n: 0.013 Accuracy level (1=normal; 2=moderate; 3=best): 1

THE REGIONAL MUNICIPALITY OF HALTON

# SANITARY SEWER DESIGN SHEET

Calculation Period

DATE: October 20, 2020

DESIGNED BY: K. Connell

CHECKED BY:

| STREET/Sub-Area | MANHOLE FROM | MANHOLE TO | LENGTH | TRIBUTARY AREA (ha.) TYPE OF DEVELOPMENT/ POPULATION DENSITY FACTOR (restore default population density factors) Community Services | Single Family | Duplex | Townhouse | Apartment | Light Commercial | Light Industrial | Industrial | TOTAL AREA | Misc-Units (eg. Hospital Beds=4; Others = 0) | POPULATION TRIBUTARY LAND USE Residential & Community | Commercial | Industrial | TOTAL POPULATION | DRY WEATHER FLOW | AVERAGE DRY WEATHER FLOW per Sub-system cummulative | PEAK FACTOR | MAX DRY FLOW | RDII Rate | ROW INFILTRATION | MAX EXPECTED FLOW | SEWER PROPERTIES Sub-system (same number if fed by previous one) | SIZE (Diameter) | SLOPE | Full flow capacity | Actual Flow Rate (Q) | Flow velocity (V in m/s) Full | Flow velocity (V in m/s) Actual | Depth Ratio (%) | PI TYPE | PE CLASS | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 40 | 55.0 | 100 | 135 | 285 | 90 | 105 | 125 | | 0 | | | | | 275 | | 2.00 | | 0.286 | | | | | | 0.2% | | | | 30% | | | Clear |
| (Leave no blanks within a system) | | | (m) | | | | | | | | | (ha) | | RES'L | COMM'L | IND'L | (PE) | (L/s) | (L/s) | Design | (L/s) | (L/ha/s) | (L/s) | (L/s) | | (mm) | % | (L/s) | (L/s) | 0.6 | 2.5 | | | | |
| Subtrunk 3A | 3A | 3B | 450.00 | | | | 18.32 | 23.60 | 48.12 | | | 90.04 | | 9,198 | 4,331 | - | 13,529 | 43.1 | 43.1 | 2.82 | 121.6 | 0.286 | 25.8 | 147.3 | 1 | 450 | 0.60 | 230.4 | | 1.40 | | | | | |
| Subtrunk 3B | 3B | 3C | 450.00 | | | | 12.08 | 5.10 | 24.48 | | | 41.66 | | 3,084 | 2,203 | - | 5,288 | 16.8 | 59.9 | 2.68 | 160.4 | 0.286 | 11.9 | 198.1 | 1 | 525 | 0.60 | 347.5 | | 1.56 | | | | | |
| Subtrunk 3C | 3C | 3D | 850.00 | | | | 9.18 | 9.45 | 18.14 | | | 36.77 | | 3,933 | 1,633 | - | 5,565 | 17.7 | 77.6 | 2.57 | 199.2 | 0.286 | 10.5 | 247.3 | 1 | 525 | 0.60 | 347.5 | | 1.56 | | | | | |
| | | | | | | | | | | | | | | - | - | - | - | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | - | - | - | - | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | - | - | - | - | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | - | - | - | - | | | | | | | | | | | | | | | | | | |

# APPENDIX C

# SANITARY DESIGN SHEET

| PARAMETERS | |
|---|---|
| Peaking Factors - Residential | $1+[14/(4+(P/1000)^{0.5})]$ |
| Peaking Factors - Commercial and Industrial Land Use | $0.8 \times \{1+[14/(4+(P/1000)^{0.5})]\}$ |
| Residential Dry Weather Flow | 275 L/C/D |
| Commercial/Industrial Dry Weather Flow | 275 L/C/D |
| Inflow/ Infiltration Allowance = | 0.286 L/s/ha |

SOURCE: Halton Water and Wastewater Linear Design Manual (version 4.0 April 2019)

# SANITARY SEWER DESIGN SHEET



PROJECT: Trafalgar Road Widening (Region of Halton)

| STREET | MANHOLE | | POPULATION | | | | | AREAS (ha) | | FLOW (L/S) | | | | | SEWER DATA | | | | | | | | | Flow | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | FROM | TO | EXISTING RESIDENTIAL | RESIDENTIAL | COMMERCIAL AND INDUSTRIAL | TOTAL RESIDENTIAL POPULATION | TOTAL COMMERCIAL AND INDUSTRIAL POP | AREA | TOTAL AREA | RESIDENTAL PEAKING FACTOR | COMMERCIAL PEAKING FACTOR | EQUIVALENT RESIDENTIAL FLOW | EQUIVALENT COMMERCIAL AND INDUSTRIAL FLOW | INFILTRATION | TOTAL PEAK FLOW (L/s) | TOTAL CUMULATIVE PEAK FLOW (L/s) | NOMINAL DIAMETER (mm) | ACTUAL DIAMETER (mm) | SLOPE (%) | LENGTH (m) | TYPE OF PIPE | n | FULL FLOW CAPACITY (l/s) | FULL FLOW VELOCITY (m/s) | UNUSED CAPACITY (l/s) | U/S INVERT ELEV. (m) | D/S INVERT ELEV. (m) | FALL IN SEWER (m) |
| Burnhamthorpe Road | MH 26 | MH 19 | 0 | 9198 | 4331 | 9198 | 4331 | 90.000 | 90.000 | 2.99 | 3.30 | 87.55 | 45.52 | 25.74 | 158.82 | 158.82 | 600.00 | 610.00 | 0.55 | | PVC | 0.013 | 475.88 | 1.63 | 317.07 | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Road D | MH 19 | MH 13 | 0 | 3084 | 2203 | 3084 | 2203 | 42.000 | 42.000 | 3.43 | 3.55 | 33.69 | 24.91 | 12.01 | 70.61 | 70.61 | 600.00 | 610.00 | 0.55 | | PVC | 0.013 | 475.88 | 1.63 | 405.27 | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Road C | MH 13 | MH 2 | 0 | 3933 | 1633 | 3933 | 1633 | 37.000 | 37.000 | 3.34 | 3.65 | 41.81 | 18.98 | 10.58 | 71.38 | 71.38 | 600.00 | 610.00 | 0.55 | | PVC | 0.013 | 475.88 | 1.63 | 404.51 | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Trafalgar Road | MH26 | MH25 | 0 | 0 | 0 | 9198 | 4331 | 0.120 | 0.120 | 2.99 | 0.00 | 87.55 | 0.00 | 0.03 | 165.59 | 165.59 | 600.00 | 610.00 | 0.55 | 23.27 | PVC | 0.013 | 475.88 | 1.63 | 310.29 | 178.903 | 178.775 | 0.128 |
| Trafalgar Road | MH25 | MH24 | 0 | 0 | 0 | 9198 | 4331 | 0.910 | 1.030 | 2.99 | 0.00 | 87.55 | 0.00 | 0.29 | 165.85 | 165.85 | 600.00 | 610.00 | 0.55 | 150.00 | PVC | 0.013 | 475.88 | 1.63 | 310.03 | 178.745 | 177.917 | 0.828 |
| Trafalgar Road | MH24 | MH23 | 0 | 0 | 0 | 9198 | 4331 | 0.910 | 1.940 | 2.99 | 0.00 | 87.55 | 0.00 | 0.55 | 166.11 | 166.11 | 600.00 | 610.00 | 0.55 | 150.00 | PVC | 0.013 | 475.88 | 1.63 | 309.77 | 177.887 | 177.062 | 0.825 |
| Trafalgar Road | MH23 | MH22 | 0 | 0 | 0 | 9198 | 4331 | 0.100 | 2.040 | 2.99 | 2.64 | 87.55 | 36.42 | 0.58 | 202.56 | 202.56 | 600.00 | 610.00 | 0.55 | 17.40 | PVC | 0.013 | 475.88 | 1.63 | 273.33 | 177.032 | 176.936 | 0.096 |
| Trafalgar Road | MH22 | MH19 | 0 | 0 | 0 | 9198 | 4331 | 0.840 | 2.880 | 2.99 | 2.64 | 87.55 | 36.42 | 0.82 | 202.80 | 202.80 | 600.00 | 610.00 | 0.55 | 140.03 | PVC | 0.013 | 475.88 | 1.63 | 273.09 | 176.906 | 176.136 | 0.770 |
| Trafalgar Road | MH19 | MH18 | 0 | 0 | 0 | 12282 | 6534 | 0.490 | 3.370 | 2.87 | 2.51 | 112.02 | 52.17 | 0.96 | 243.15 | 243.15 | 600.00 | 610.00 | 0.55 | 81.85 | PVC | 0.013 | 475.88 | 1.63 | 232.74 | 176.106 | 175.656 | 0.450 |
| Trafalgar Road | MH18 | MH17 | 0 | 0 | 0 | 12282 | 6534 | 0.540 | 3.910 | 2.87 | 2.51 | 112.02 | 52.17 | 1.12 | 243.30 | 243.30 | 600.00 | 610.00 | 0.55 | 90.06 | PVC | 0.013 | 475.88 | 1.63 | 232.58 | 175.626 | 175.131 | 0.495 |
| Trafalgar Road | MH17 | MH16 | 0 | 0 | 0 | 12282 | 6534 | 0.540 | 4.450 | 2.87 | 2.51 | 112.02 | 52.17 | 1.27 | 243.46 | 243.46 | 600.00 | 610.00 | 0.55 | 90.84 | PVC | 0.013 | 475.88 | 1.63 | 232.43 | 175.101 | 174.601 | 0.500 |
| Trafalgar Road | MH16 | MH13 | 0 | 0 | 0 | 12282 | 6534 | 0.780 | 5.230 | 2.87 | 2.51 | 112.02 | 52.17 | 1.50 | 243.68 | 243.68 | 600.00 | 610.00 | 0.55 | 121.63 | PVC | 0.013 | 475.88 | 1.63 | 232.20 | 174.571 | 173.902 | 0.669 |
| Trafalgar Road | MH13 | MH11 | 0 | 0 | 0 | 16215 | 8167 | 0.820 | 6.050 | 2.74 | 2.43 | 141.63 | 63.25 | 1.73 | 284.61 | 284.61 | 600.00 | 610.00 | 0.55 | 128.30 | PVC | 0.013 | 475.88 | 1.63 | 191.28 | 173.872 | 173.166 | 0.706 |
| Trafalgar Road | MH11 | MH10 | 0 | 0 | 0 | 16215 | 8167 | 0.730 | 6.780 | 2.74 | 2.43 | 141.63 | 63.25 | 1.94 | 284.82 | 284.82 | 600.00 | 610.00 | 0.55 | 120.00 | PVC | 0.013 | 475.88 | 1.63 | 191.07 | 173.136 | 172.476 | 0.660 |
| Trafalgar Road | MH10 | MH9 | 0 | 0 | 0 | 16215 | 8167 | 0.560 | 7.340 | 2.74 | 2.43 | 141.63 | 63.25 | 2.10 | 284.98 | 284.98 | 600.00 | 610.00 | 0.55 | 90.98 | PVC | 0.013 | 475.88 | 1.63 | 190.91 | 172.446 | 171.946 | 0.500 |
| Trafalgar Road | MH9 | MH8 | 0 | 0 | 0 | 16215 | 8167 | 0.370 | 7.710 | 2.74 | 2.43 | 141.63 | 63.25 | 2.21 | 285.08 | 285.08 | 600.00 | 610.00 | 0.55 | 60.04 | PVC | 0.013 | 475.88 | 1.63 | 190.80 | 171.916 | 171.586 | 0.330 |
| Trafalgar Road | MH8 | MH7 | 0 | 0 | 0 | 16215 | 8167 | 0.540 | 8.250 | 2.74 | 2.43 | 141.63 | 63.25 | 2.36 | 285.24 | 285.24 | 600.00 | 610.00 | 0.55 | 89.06 | PVC | 0.013 | 475.88 | 1.63 | 190.65 | 171.556 | 171.066 | 0.490 |
| Trafalgar Road | MH7 | MH5 | 0 | 0 | 0 | 16215 | 8167 | 0.460 | 8.710 | 2.74 | 2.43 | 141.63 | 63.25 | 2.49 | 285.37 | 285.37 | 600.00 | 610.00 | 0.55 | 71.72 | PVC | 0.013 | 475.88 | 1.63 | 190.52 | 171.036 | 170.642 | 0.394 |
| Trafalgar Road | MH5 | MH4 | 0 | 0 | 0 | 16215 | 8167 | 0.940 | 9.650 | 2.74 | 2.43 | 141.63 | 63.25 | 2.76 | 285.64 | 285.64 | 600.00 | 610.00 | 0.55 | 145.00 | PVC | 0.013 | 475.88 | 1.63 | 190.25 | 170.612 | 169.814 | 0.798 |
| Trafalgar Road | MH4 | MH3 | 0 | 0 | 0 | 16215 | 8167 | 0.830 | 10.480 | 2.74 | 2.43 | 141.63 | 63.25 | 3.00 | 285.87 | 285.87 | 600.00 | 610.00 | 0.55 | 128.04 | PVC | 0.013 | 475.88 | 1.63 | 190.01 | 169.784 | 169.080 | 0.704 |
| Trafalgar Road | MH3 | MH2 | 0 | 0 | 0 | 16215 | 8167 | 0.100 | 10.580 | 2.74 | 2.43 | 141.63 | 63.25 | 3.03 | 285.90 | 285.90 | 600.00 | 610.00 | 0.55 | 17.28 | PVC | 0.013 | 475.88 | 1.63 | 189.98 | 169.020 | 168.934 | 0.086 |

# APPENDIX D

# WHEAT BOOM DRIVE DRAWING

PAVEMENT DESIGN

40mm HL-3 ASPHALT CONCRETE
100mm HL-8 ASPHALT CONCRETE
150mm GRANULAR "A"
350mm GRANULAR "B", TYPE II

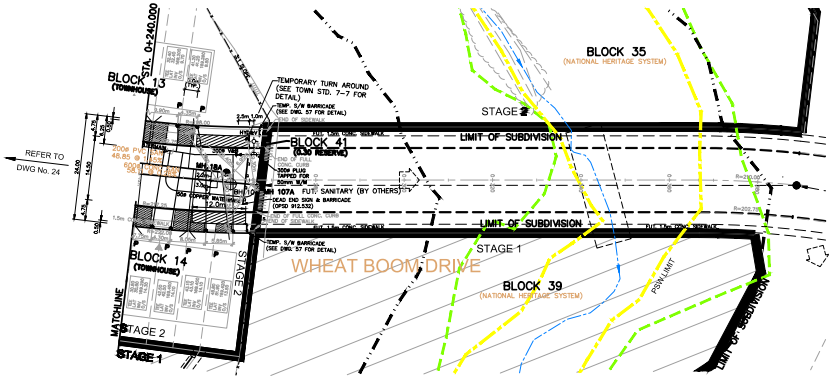
NOTE:
FOR BEDDING DESIGN, WHERE UNDERGROUND SERVICES WERE CONSTRUCTED AT OR BELOW THE GROUNDWATER TABLE, REFER TO GEOTECHNICAL CONSULTANT'S RECOMMENDATION

NOTE:
FOR FILL COMPACTION REQUIREMENT, WHERE FILL WAS MORE THAN 2.0m HIGH, REFER TO GEOTECHNICAL CONSULTANT'S RECOMMENDATION FOR DETAIL

NOTE:
ALL AS-CONSTRUCTED INFORMATION FOR GREEN GINGER STAGE 2 WAS PROVIDED BY TACC CONSTRUCTION LTD.

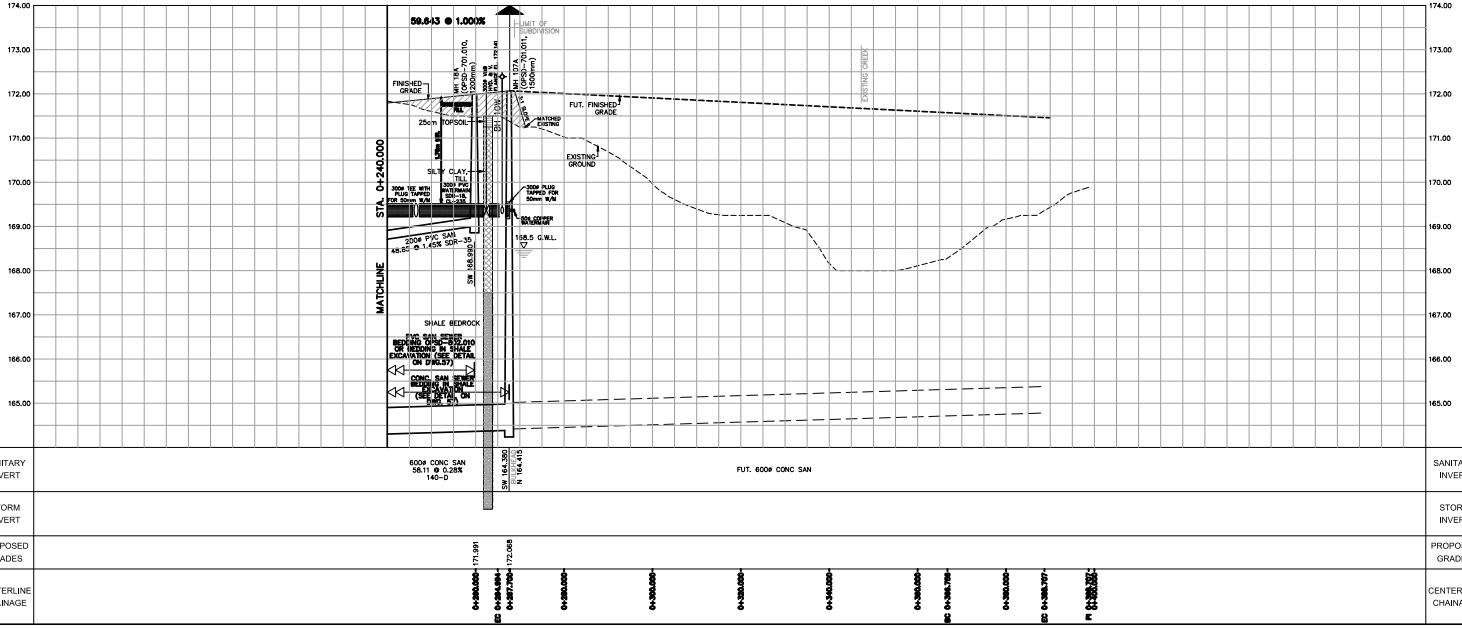
NOTE:
FOR HORIZONTAL CLEARANCE BETWEEN SEWER AND WATERMAIN, INCLUDING SERVICES, LESS THAN 2.5m, 0.50m VERTICAL CLEARANCE IS PROVIDED BETWEEN TO THE SATISFACTION OF REGION OF HALTON

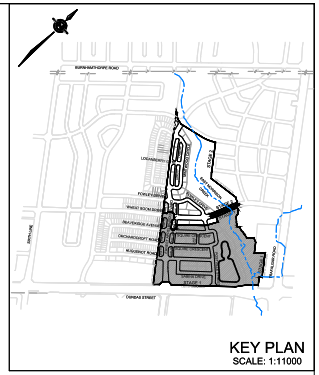
NOTE RE: WATERMAIN / WATER SERVICE
INSULATION PROVIDED FOR WATERMAIN / WATER SERVICE WHERE THE SEPARATION BETWEEN WATERMAIN / WATER SERVICE AND OTHER SERVICES AND STRUCTURES IS LESS THAN 2.5m AND THE COVER IS LESS THAN 1.7m. REFER TO DETAIL ON DWG. S7 UNLESS OTHERWISE SPECIFIED.




LEGEND

STORM MANHOLE
SANITARY MANHOLE
CATCHBASIN MANHOLE
STORM INLET
SINGLE SANITARY
HOUSE CONNECTION
DOUBLE STORM
HOUSE CONNECTION
SINGLE STORM
HOUSE CONNECTION
WATER CONNECTION
HYDRANT
TEE
VALVE & BOX
VALVE & CHAMBER
SINGLE CATCHBASIN
DOUBLE CATCHBASINS
HYDRO TRANSFORMER
COMMUNITY MAILBOX AND PAD LOCATION (WITH SIDEWALK)
(1) - ONE MODULE
(2) - TWO MODULES
(3) - THREE MODULES
LIGHT STANDARD
2.4m HIGH WOOD ACOUSTIC FENCE
1.8m HIGH WOOD PRIVACY FENCE
1.8m HIGH BLACK VINYL CHAIN LINK FENCE UNLESS OTHERWISE NOTED
RETAINING WALL (SEE NOTE 22 DWG. 1 & STRUCTURAL DWG FOR DETAILS)
OVERLAND OVERLAND FLOW DIRECTION
EXTERNAL OVERLAND FLOW DIRECTION
SLAB ON GRADE BLOCKS/UNITS LOTS EQUIPPED WITH SUMP PUMP
UNITS EQUIPPED WITH PRESSURE REDUCE VALVE
DRIVEWAY
STAGING LINE
TEE CROSSING (SEE DWG. S7 FOR DETAIL)
OTHER PHASES




TOPOGRAPHIC INFORMATION
TOPOGRAPHIC INFORMATION PROVIDED BY HOLDING JONES VANDERVEEN INC., JOB No. 13-2290 TOPO, TOPOGRAPHIC SURVEY DATED NOVEMBER 4, 2013.

LEGAL INFORMATION
CALCULATED M-PLAN PROVIDED BY HOLDING JONES VANDERVEEN INC., STAGING 1 PROJECT No. 13-2290-MPLANT, SURVEY DATED JULY 25, 2014 AND STAGING 2 PROJECT No. 13-2290-MPLANZ, SURVEY DATED JULY 25, 2014.

## AS-CONSTRUCTED

BENCHMARK No. G.B.M. #34 ELEVATION = 162.917m
ELEVATIONS ARE IN METRES AND ARE DERIVED FROM CONCRETE MONUMENT WITH BRASS CAP, AS SHOWN ON PLAN, LOCATED AT THE CURB ON THE EAST SIDE OF TRAFALGAR RD., OPPOSITE BUILDING #2274 (OAKVILLE PUBLIC WORKS).

| No. | DATE | BY | REVISIONS | APPROVED |
|---|---|---|---|---|
| 9. | 16-10-21 | K.A. | AS CONSTRUCTED (STORM, SANITARY, AND WATERMAIN) | |
| 8. | 16-10-21 | Z.L. | REVISED AS PER UPDATED M-PLAN | |
| 7. | 15-12-21 | Z.L. | REVISED AS PER ON COMMENTS | |
| 6. | 15-12-16 | Z.L. | 5th SUBMISSION TO REGION | |
| 5. | 15-08-30 | Z.L. | 4th SUBMISSION TO REGION | |
| 4. | 15-08-27 | Z.L. | 3rd SUBMISSION TO REGION | |
| 3. | 14-08-06 | Z.L. | 2nd SUBMISSION TO REGION | |
| 2. | 14-06-22 | Z.L. | 2nd SUBMISSION | |
| 1. | 13-12-10 | Z.L. | 1st SUBMISSION | |

DESIGNED BY: K.M./P.P. CHECKED BY: Z.L. DATE: JULY 2014
DRAWN BY: P.P./C.M. CHECKED BY: Z.L.
SCALE HORIZ. 1:500 0 5 10 15 20
VERT. 1:50 0 0.5 1.0 1.5 2.0
REFERENCES

APPROVALS

MUNICIPAL
APPROVED IN PRINCIPLE SUBJECT TO DETAIL CONSTRUCTION CONFORMING TO TOWN OF OAKVILLE STANDARDS AND SPECIFICATIONS
RITA JULIAO (ORIGINALLY SIGNED, FOR MANAGER) DEC 15, 2015
MANAGER OF DEVELOPMENT ENGINEERING DATE

REGIONAL
APPROVAL DESIGN OF SANITARY, WATER SERVICES AND REGIONAL ROAD WORKS APPROVED SUBJECT TO DETAIL CONSTRUCTION CONFORMING TO HALTON REGION STANDARDS & SPECIFICATIONS & LOCATIONAL APPROVAL FROM AREA MUNICIPALITY
RONALD MACKENZIE (ORIGINALLY SIGNED) DEC 21, 2015
LEGISLATIVE AND PLANNING SERVICES DATE

FIELD NOTES
BELL ☐ HYDRO ☐
GAS ☐ CABLE ☐
TRAFFIC ☐ WATER ☐

STAMP
ORIGINALLY SIGNED BY ZHENYONG LI, P.ENG DATED DEC. 16, 2015

P:\MISC\LOGO\DSEL_logo.jpg

600 Alden Road, Suite 500
Markham, Ontario, L3R 0E7
Tel. (905) 475-0090
Fax. (905) 475-0091
www.DSEL.ca

MUNICIPALITY
DEVELOPMENT ENGINEERING

REGION
The Regional Municipality of Halton

DEVELOPER
GREEN GINGER DEVELOPMENTS INC.

DEVELOPMENT MANAGER

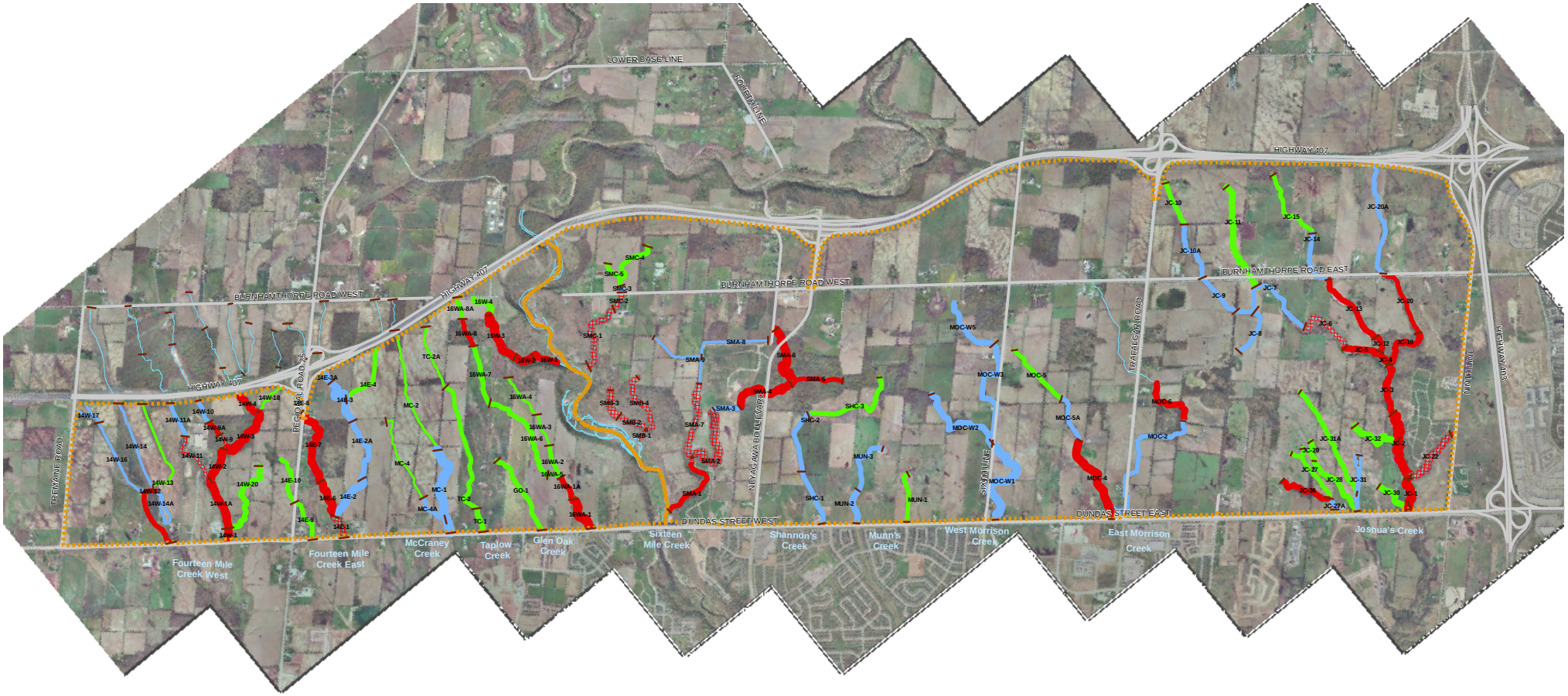
PROJECT
GREEN GINGER SUBDIVISION
STAGE 2 PLAN
24T-12001 20M-1175

TITLE
PLAN AND PROFILE OF
WHEAT BOOM DRIVE
(FROM STA. 0+240.000 TO STA. 0+398.707)
(FOWLEY DRIVE TO 150m EAST OF FOWLEY DRIVE) © DSEL

MUNICIPAL FILE NO. SD-591.0
REGIONAL FILE NO. DO-1013
PROJECT NO. 13-660
SHEET 25 OF 73

# APPENDIX E

# TRAFALGAR ROAD SANITARY DRAWINGS




NORTH OAKVILLE CREEKS SUBWATERSHED STUDY

TSH engineers architects planners
PARISH geomorphic
Natural Resource Solutions Inc.
Donald G. Weatherbe Associates
Morrison Environmental Limited
Environmental Water Resources Group Ltd.
OAKVILLE

August 2006

0 500 1,000
Meters

**Legend**

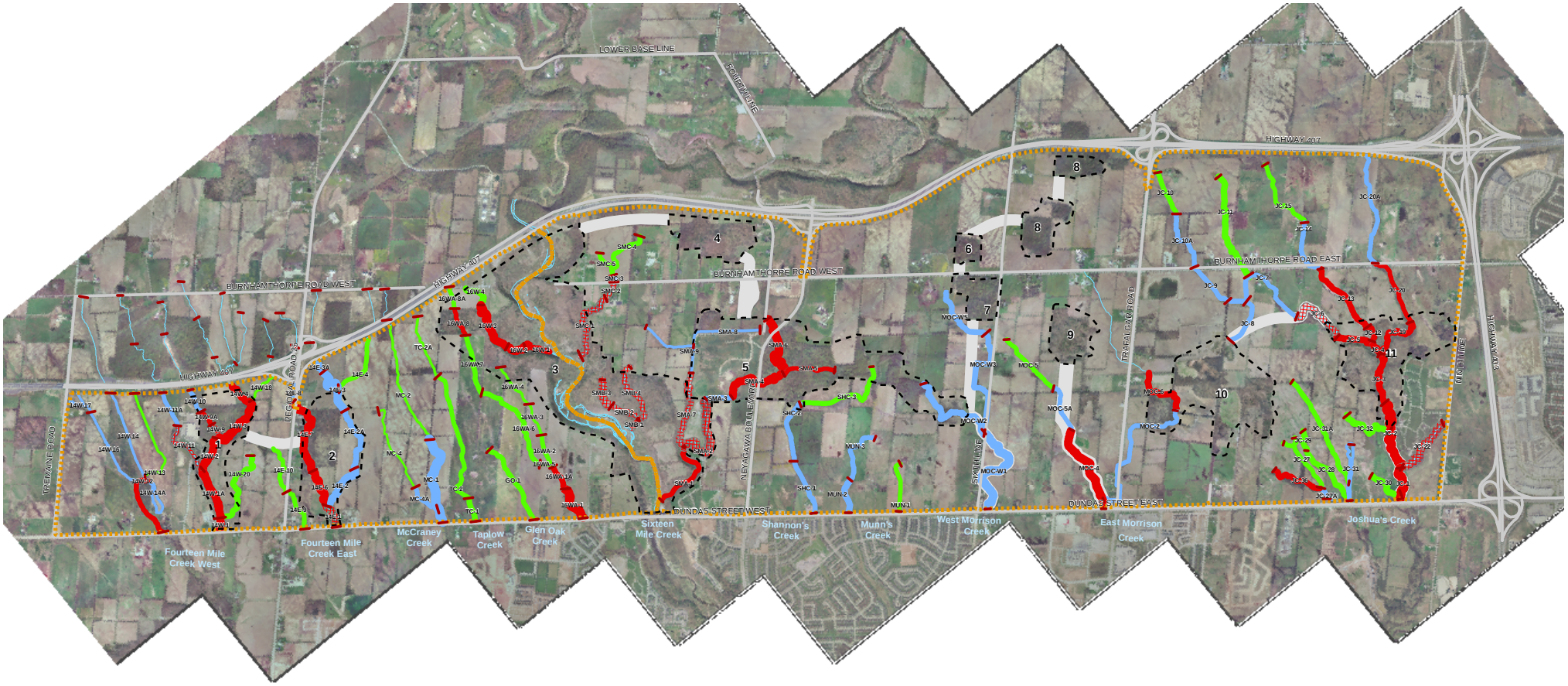
- Secondary Plan Boundary
- Road
- Reach Break

**Stream Corridor**

- High Constraint
- High Constraint - Requiring Rehabilitation
- Medium Constraint
- Low Constraint
- Watercourse

# Riparian Corridor Classification

Figure 6.3.13




NORTH OAKVILLE CREEKS SUBWATERSHED STUDY

engineers architects planners
PARISH geomorphic
Natural Resource Solutions Inc.
Donald G. Weatherbe Associates
Morrison Environmental Limited
Environmental Water Resources Group Ltd.
OAKVILLE

August 2006

0 500 1,000
Meters

**Legend**

- Secondary Plan Boundary
- Road
- Reach Break
- Core
- Linkage

**Stream Corridor**

- High Constraint
- High Constraint - Requiring Rehabilitation
- Medium Constraint
- Low Constraint
- Watercourse

# Management Strategy for the Natural Heritage System

Figure 6.3.16

# APPENDIX C

## Water Servicing Information

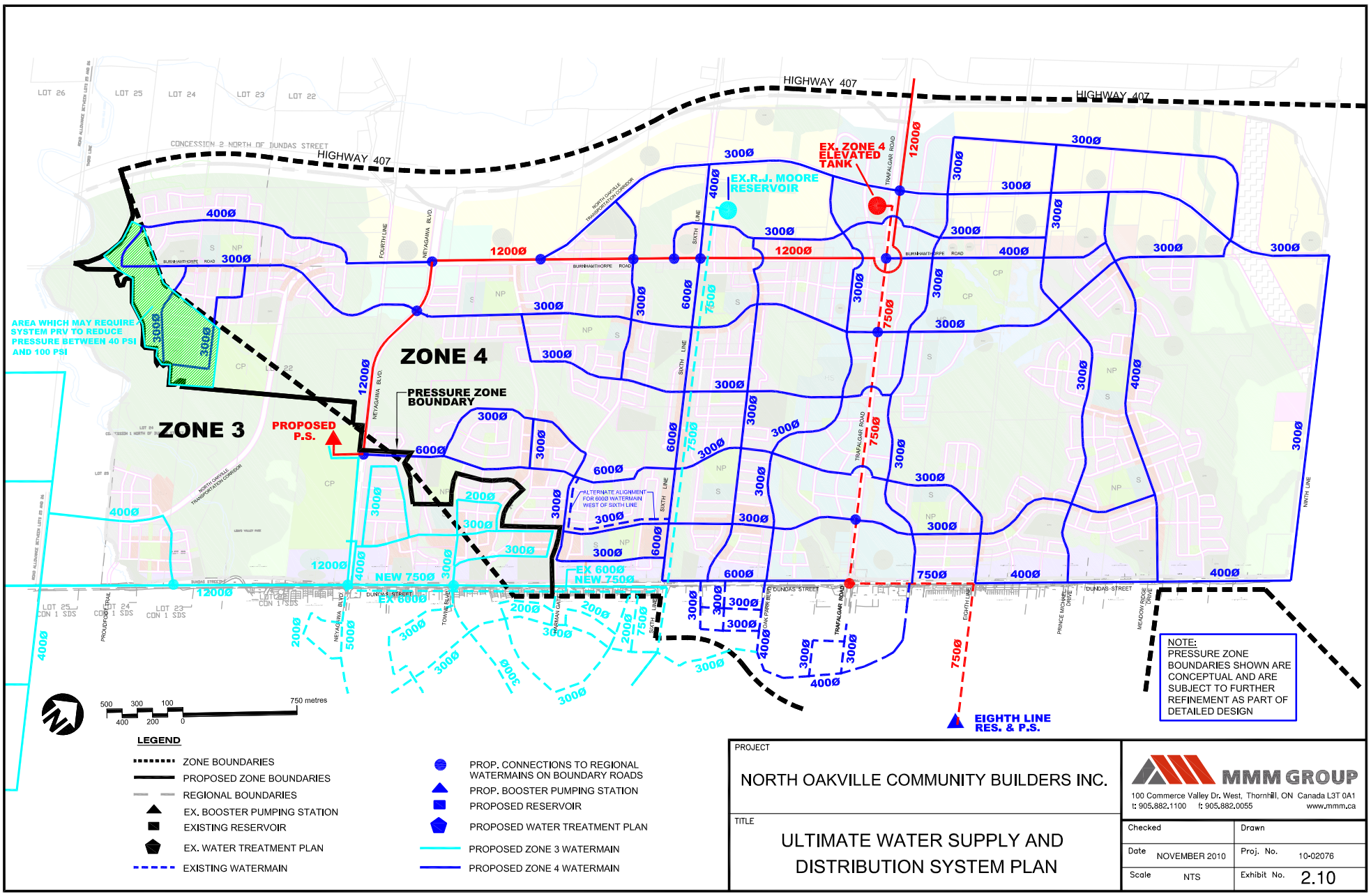
## Estimate of Domestic Water Demand for IO Trafalgar Lands

| | | |
|---|---|---|
| Total IO Area | 53.4 | ha (east and west side) |
| Per captia Flow | 275 | l/c/d |
| | | |
| Population Densities | | |
| Residential (apartment) | 285 | people/ha (assume all residential is apartment/condo style) |
| Employment | 90 | people/ha |
| | | |
| Peaking Factors | | |
| Max. Day = | 2.25 | |
| Peak Hr. (Res.) | 4.00 | |
| Peak Hr. (Comm.) | 2.25 | |

| Development Scenario | | Area (ha) | | Population | | | Avg. Day | Max. Day | Peak Hr. |
|---|---|---|---|---|---|---|---|---|---|
| | | Residential | Employment | Residential | Employment | Total | Flow (l/s) | Flow (l/s) | Flow (l/s) |
| Scenario A | 70% Res + 30% Emply. | 37.4 | 16.0 | 10653 | 1442 | 12095 | **38.5** | **86.6** | **146.0** |
| Scenario B | 50% Res + 50% Emply. | 26.7 | 26.7 | 7610 | 2403 | 10013 | **31.9** | **71.7** | **114.1** |
| | | | | | | Difference in Domestic Water Demand: | 6.6 | 14.9 | 31.9 |

Note: Design criteria per *Regional Municipality of Halton Version 5 Water and Wastewater Linear Design Manual, October 2019*


4180
4233
1200- CPP
1200- CPP
100- PVC
100- PVC
1200- CPP
600- CPP
H11376
191
273
4002
275
H44650
205
215
BURNHAMTHORPE ROAD EAST
1200- CPP
1200- CPP
3555
750- CPP
3558
H45504
140
180
205
220
86
64
750- CPP
340
210
TRAFALGAR ROAD




PROJECT

NORTH OAKVILLE COMMUNITY BUILDERS INC.

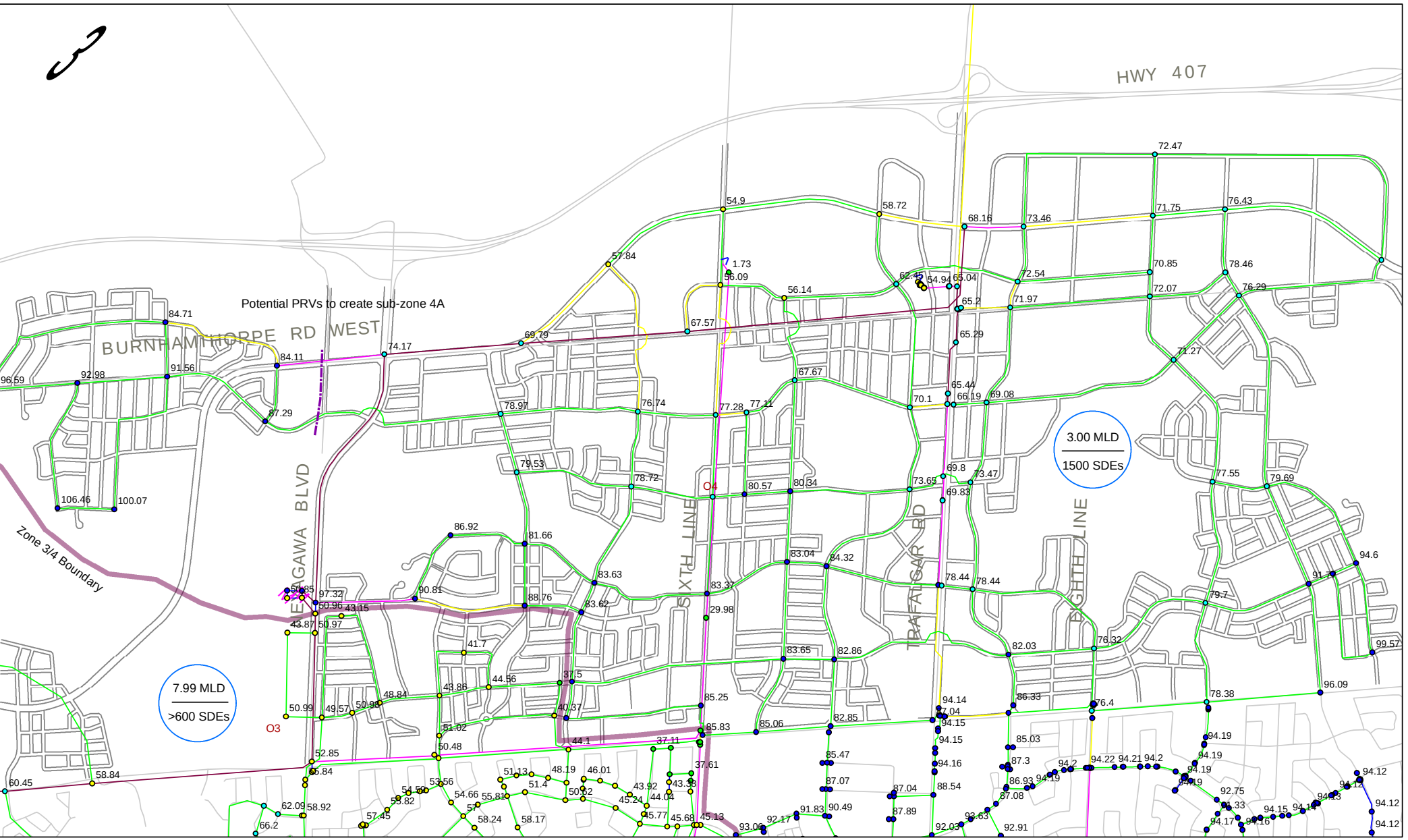
TITLE

ULTIMATE WATER SUPPLY AND DISTRIBUTION SYSTEM PLAN

MMM GROUP
100 Commerce Valley Dr. West, Thornhill, ON Canada L3T 0A1
t: 905.882.1100 f: 905.882.0055 www.mmm.ca

| | |
|---|---|
| Checked | Drawn |
| Date NOVEMBER 2010 | Proj. No. 10-02076 |
| Scale NTS | Exhibit No. 2.10 |

PRINTED ON: FILE NAME: H:\10-02076\design\Water\Water-Distribution-Ultimate-MAR5-2010.dwg_Fig. 2.10




Halton REGION

# North Oakville Development Plan
## Max Day Pressures (psi) and System Capacities

AECOM

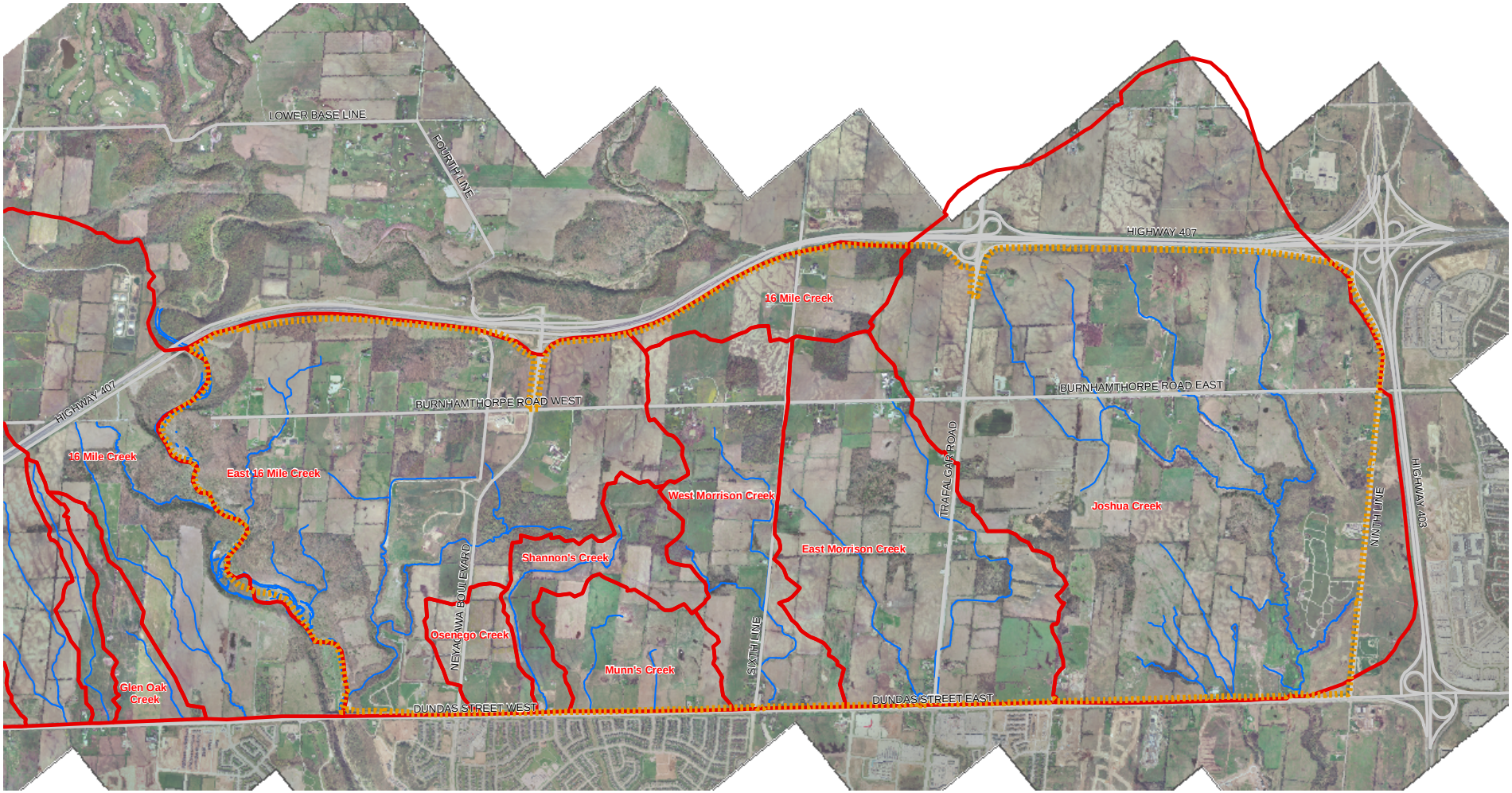
1:18,000

September 2009

Source: Infowater

# APPENDIX D

## Storm Drainage and SWM Information




NORTH OAKVILLE CREEKS SUBWATERSHED STUDY

TSH engineers architects planners
PARISH geomorphic
Natural Resource Solutions Inc.
Donald G. Weatherbe Associates
Morrison Environmental Limited
Environmental Water Resources Group Ltd.
OAKVILLE

August 2006

N

0 250 500 750
Meters

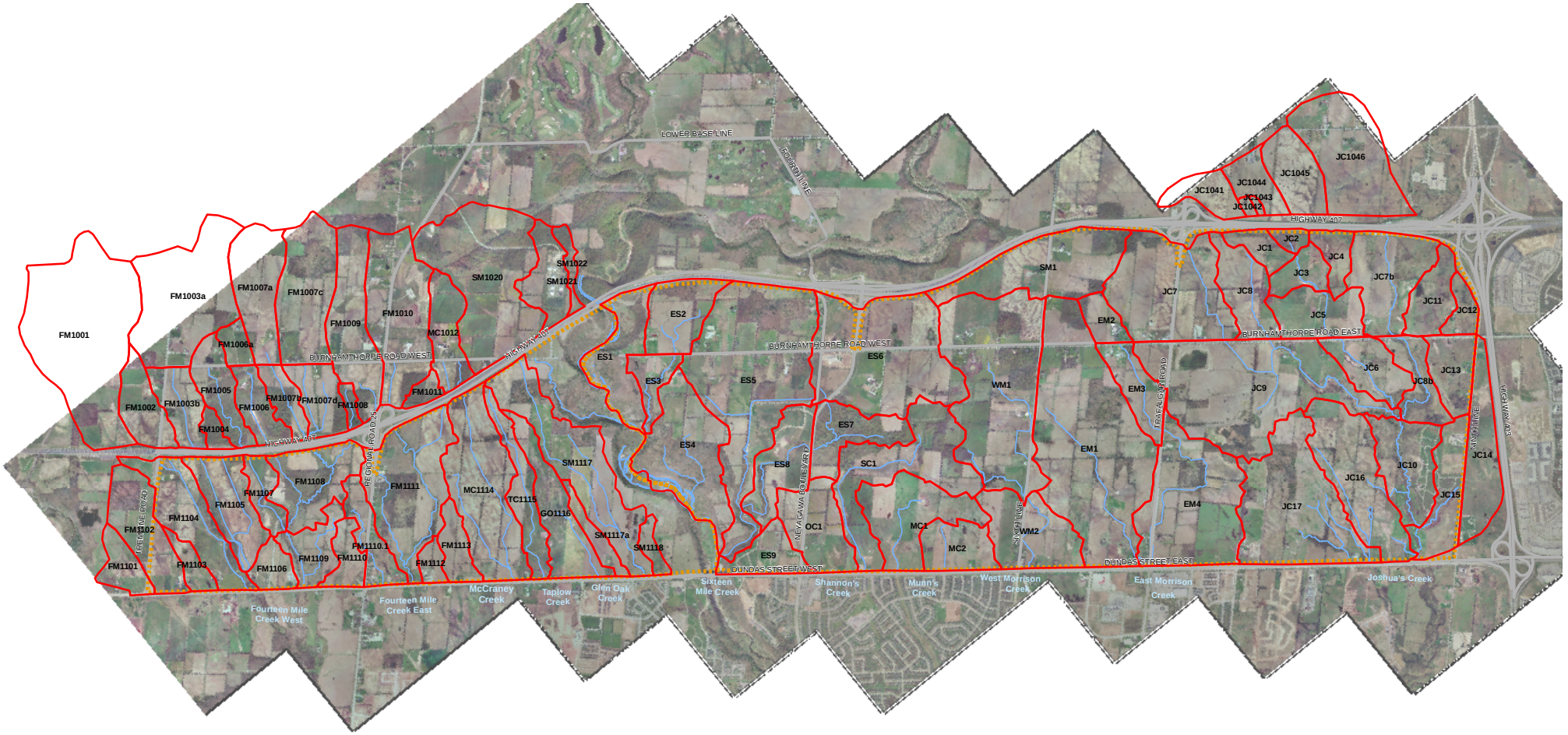
**Legend**

- Road
- Watercourse
- East Study Area
- Watershed

East Study Area

Watershed Boundaries

Figure 4E.1.1




NORTH OAKVILLE CREEKS SUBWATERSHED STUDY

TSH engineers architects planners
PARISH geomorphic
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Donald G. Weatherbe Associates
Morrison Environmental Limited
Environmental Water Resources Group Ltd.
OAKVILLE

August 2006

0 500 1,000
Meters

**Legend**

- Study Area
- Road
- Watercourse
- Subcatchments
- **OC1** Subcatchment Identification

# Subcatchment Boundaries

Figure 5.1.1

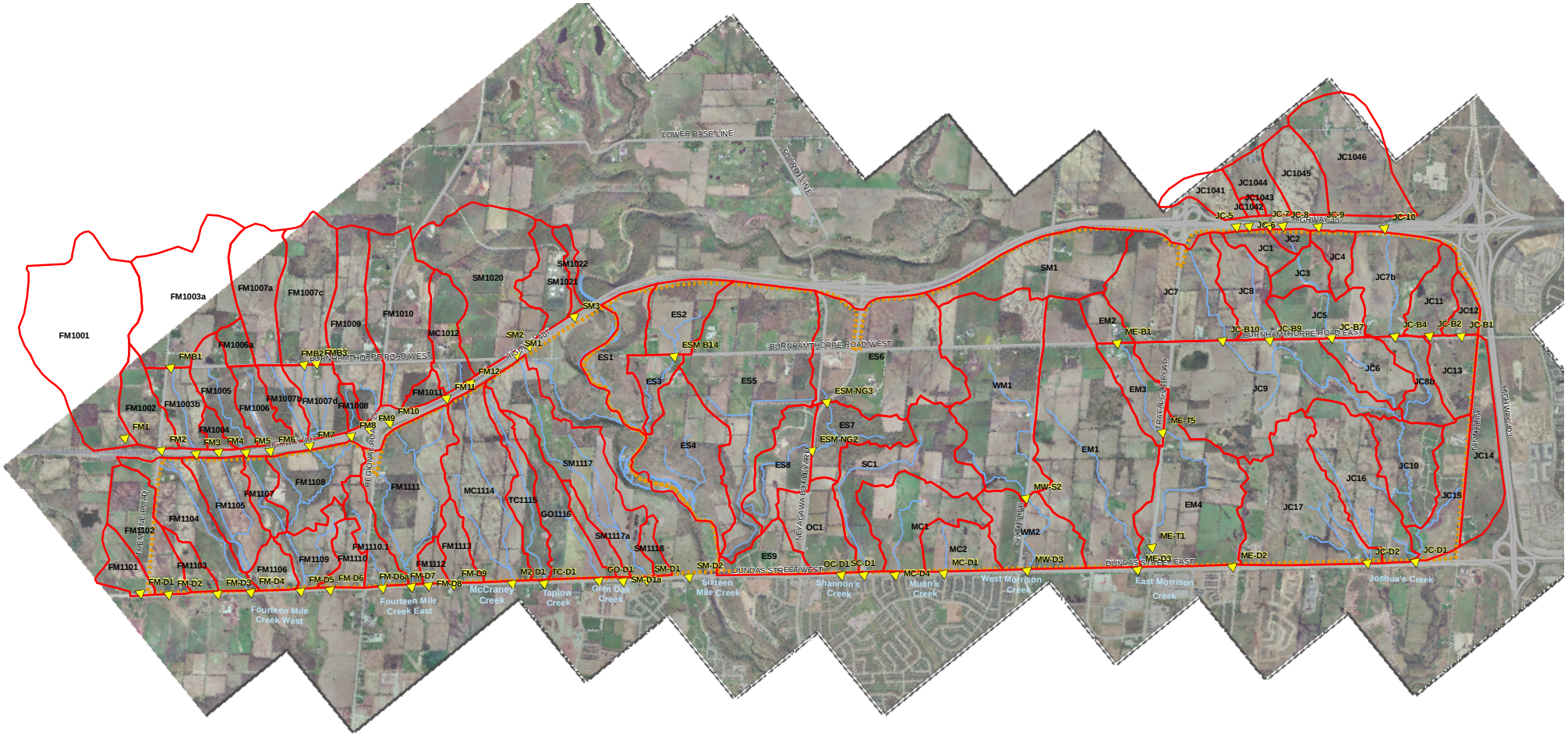
## TABLE 7.4.1 TARGET UNIT AREA PEAK FLOW RATES
## EXISTING LAND USE

| Location | Culvert No. | Drainage Area | Regional Storm | 100 year storm | 50 year storm | 25 year storm | 10 year storm | 5 year storm | 2 year storm |
|---|---|---|---|---|---|---|---|---|---|
| | | ha. | $m^3/s$ | $m^3/s$ | $m^3/s$ | $m^3/s$ | $m^3/s$ | $m^3/s$ | $m^3/s$ |
| **14 Mile Creek** | | | | | | | | | |
| Dundas St. W. | FM-D2 | 45.56 | 2.50 | 1.04 | 0.92 | 0.80 | 0.62 | 0.51 | 0.31 |
| | Flow rate / Area ($m^3/s/ha$) | | 0.054 | 0.022 | 0.020 | 0.017 | 0.013 | 0.011 | 0.007 |
| | FM-D3 | 11.7. | 0.75 | 0.36 | 0.32 | 0.28 | 0.23 | 0.19 | 0.12 |
| | Flow rate / Area ($m^3/s/ha$) | | 0.065 | 0.031 | 0.027 | 0.024 | 0.020 | 0.016 | 0.010 |
| | FM-D4 | 423.70 | 30.96 | 8.39 | 7.42 | 6.49 | 5.09 | 4.17 | 2.62 |
| | Flow rate / Area ($m^3/s/ha$) | | 0.049 | 0.020 | 0.018 | 0.015 | 0.012 | 0.010 | 0.006 |
| | FM-D5 | 339.99 | 18.73 | 7.56 | 6.60 | 5.68 | 4.35 | 3.43 | 2.01 |
| | Flow rate / Area ($m^3/s/ha$) | | 0.055 | 0.022 | 0.019 | 0.017 | 0.013 | 0.010 | 0.006 |
| | FM-D6 | 16.91 | 0.88 | 0.36 | 0.32 | 0.28 | 0.23 | 0.19 | 0.12 |
| | Flow rate / Area ($m^3/s/ha$) | | 0.052 | 0.021 | 0.019 | 0.017 | 0.014 | 0.011 | 0.007 |
| | FM-D6a | 26.23 | 1.38 | 0.57 | 0.50 | 0.44 | 0.34 | 0.28 | 0.18 |
| | Flow rate / Area ($m^3/s/ha$) | | 0.053 | 0.022 | 0.019 | 0.017 | 0.013 | 0.011 | 0.007 |
| | FM-D7 | 247.92 | 11.96 | 4.63 | 4.07 | 3.54 | 2.75 | 2.23 | 1.36 |
| | Flow rate / Area ($m^3/s/ha$) | | 0.048 | 0.019 | 0.016 | 0.014 | 0.011 | 0.009 | 0.005 |
| | FM-D8 | 8.45 | 0.66 | 0.37 | 0.33 | 0.29 | 0.23 | 0.19 | 0.12 |
| | Flow rate / Area ($m^3/s/ha$) | | 0.078 | 0.044 | 0.039 | 0.034 | 0.027 | 0.022 | 0.014 |
| | FM-D9 | 18.53 | 1.47 | 0.86 | 0.76 | 0.67 | 0.54 | 0.44 | 0.28 |
| | Flow rate / Area ($m^3/s/ha$) | | 0.079 | 0.046 | 0.041 | 0.036 | 0.029 | 0.024 | 0.015 |
| **McCraney Creek** | | | | | | | | | |
| Dundas St. W. | MC-D1 | 126.46 | 6.43 | 2.60 | 2.31 | 2.02 | 1.59 | 1.31 | 0.83 |
| | Flow rate / Area ($m^3/s/ha$) | | 0.051 | 0.021 | 0.018 | 0.016 | 0.013 | 0.010 | 0.007 |
| **Taplow Creek** | | | | | | | | | |
| Dundas St. W. | TC-D1 | 33.61 | 1.64 | 0.64 | 0.57 | 0.50 | 0.39 | 0.32 | 0.21 |
| | Flow rate / Area ($m^3/s/ha$) | | 0.049 | 0.019 | 0.017 | 0.015 | 0.012 | 0.010 | 0.006 |
| **Glen Oak Creek** | | | | | | | | | |
| Dundas St. W. | GO-D1 | 47.16 | 2.34 | 0.93 | 0.83 | 0.73 | 0.58 | 0.48 | 0.31 |
| | Flow rate / Area ($m^3/s/ha$) | | 0.050 | 0.020 | 0.018 | 0.015 | 0.012 | 0.010 | 0.007 |
| **West 16 Mile Creek Tribs.** | | | | | | | | | |
| Dundas St. W. | SM-D1 | 87.97 | 3.58 | 1.24 | 1.09 | 0.95 | 0.73 | 0.59 | 0.36 |
| | Flow rate / Area ($m^3/s/ha$) | | 0.041 | 0.014 | 0.012 | 0.011 | 0.008 | 0.007 | 0.004 |
| | SM-D1a | 12.53 | 0.81 | 0.38 | 0.34 | 0.30 | 0.24 | 0.20 | 0.13 |
| | Flow rate / Area ($m^3/s/ha$) | | 0.065 | 0.030 | 0.027 | 0.024 | 0.019 | 0.016 | 0.010 |
| | SM-D2 | 8.0. | 0.52 | 0.24 | 0.22 | 0.19 | 0.15 | 0.13 | 0.08 |
| | Flow rate / Area ($m^3/s/ha$) | | 0.065 | 0.030 | 0.027 | 0.024 | 0.019 | 0.016 | 0.010 |
| **East 16 Mile Creek Tribs.** | | | | | | | | | |
| Sixteen Mile Creek | ---- | 383.10 | 16.86 | 6.28 | 5.48 | 4.70 | 3.58 | 2.82 | 1.64 |
| | Flow rate / Area ($m^3/s/ha$) | | 0.044 | 0.016 | 0.014 | 0.012 | 0.009 | 0.007 | 0.004 |
| **Osenego Creek** | | | | | | | | | |
| Dundas St. W. | OC-D1 | 43.93 | 2.63 | 1.20 | 1.06 | 0.94 | 0.74 | 0.62 | 0.40 |
| | Flow rate / Area ($m^3/s/ha$) | | 0.060 | 0.027 | 0.024 | 0.021 | 0.017 | 0.014 | 0.009 |
| **Shannon's Creek** | | | | | | | | | |
| Dundas St. W. | SC-D1 | 84.37 | 3.81 | 1.39 | 1.23 | 1.06 | 0.82 | 0.66 | 0.40 |
| | Flow rate / Area ($m^3/s/ha$) | | 0.045 | 0.016 | 0.015 | 0.013 | 0.010 | 0.008 | 0.005 |


## TABLE 7.4.1 TARGET UNIT AREA PEAK FLOW RATES
## EXISTING LAND USE


| Location | Culvert No. | Drainage Area | Regional Storm | 100 year storm | 50 year storm | 25 year storm | 10 year storm | 5 year storm | 2 year storm |
|---|---|---|---|---|---|---|---|---|---|
| | | ha. | $m^3/s$ | $m^3/s$ | $m^3/s$ | $m^3/s$ | $m^3/s$ | $m^3/s$ | $m^3/s$ |
| **Munn's Creek** | | | | | | | | | |
| Dundas St. W. | MC-D1 | 29.99 | 2.01 | 0.99 | 0.88 | 0.77 | 0.62 | 0.51 | 0.33 |
| | Flow rate / Area ($m^3/s/ha$) | | 0.067 | 0.033 | 0.029 | 0.026 | 0.021 | 0.017 | 0.011 |
| | MC-D4 | 59.61 | 3.19 | 1.31 | 1.16 | 1.02 | 0.80 | 0.67 | 0.43 |
| | Flow rate / Area ($m^3/s/ha$) | | 0.054 | 0.022 | 0.019 | 0.017 | 0.013 | 0.011 | 0.007 |
| **West Morrison Creek** | | | | | | | | | |
| Dundas St. E. | MW-D1 | 226.38 | 10.93 | 4.26 | 3.77 | 3.30 | 2.59 | 2.13 | 1.35 |
| | Flow rate / Area ($m^3/s/ha$) | | 0.048 | 0.019 | 0.017 | 0.015 | 0.011 | 0.009 | 0.006 |
| **East Morrison Creek** | | | | | | | | | |
| Dundas St. E. | ME-D2 | 313.94 | 13.67 | 5.18 | 4.58 | 4.00 | 3.14 | 2.57 | 1.62 |
| | Flow rate / Area ($m^3/s/ha$) | | 0.044 | 0.016 | 0.015 | 0.013 | 0.010 | 0.008 | 0.005 |
| **Joshua's Creek** | | | | | | | | | |
| Dundas St. E. | JC-D1 | 962.74 | 50.06 | 20.58 | 18.18 | 16.02 | 12.57 | 10.35 | 6.53 |
| | Flow rate / Area ($m^3/s/ha$) | | 0.052 | 0.021 | 0.019 | 0.017 | 0.013 | 0.011 | 0.007 |
| | JC D2 | 111.80 | 5.68 | 2.21 | 1.95 | 1.69 | 1.31 | 1.07 | 0.65 |
| | Flow rate / Area ($m^3/s/ha$) | | 0.051 | 0.020 | 0.017 | 0.015 | 0.012 | 0.010 | 0.006 |

| | A | B | C | D | E | F | G | H | I | J | K |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | TABLE 6.3.6 TARGET UNIT AREA PEAK FLOW RATES | | | | | | | | | | |
| 2 | EXISTING LAND USE | | | | | | | | | | |
| 3 | | | | | Reg. | 100 year | 50 year | 25 year | 10 year | 5 year | 2 year |
| 4 | Location | Culvert No. | GAWSER Hyd. No. | Land Use | $m^3/s$ | $m^3/s$ | $m^3/s$ | $m^3/s$ | $m^3/s$ | $m^3/s$ | $m^3/s$ |
| 5 | | | | | | | | | | | |
| 133 | Burnhamthorpe Rd. E. | JC-B7 | 2215 | Existing | 11.33 | 5.50 | 4.90 | 4.30 | 3.40 | 2.83 | 1.81 |
| 134 | | | | | | | | | | | |
| 135 | Burnhamthorpe Rd. E. | JC-B9 | 2225 | Existing | 1.96 | 0.82 | 0.72 | 0.63 | 0.50 | 0.42 | 0.26 |
| 136 | | | | | | | | | | | |
| 137 | Burnhamthorpe Rd. E. | JC-B10 | 2222 | Existing | 5.33 | 2.24 | 1.99 | 1.75 | 1.38 | 1.15 | 0.73 |
| 138 | | | | | | | | | | | |
| 139 | Dundas St. E. | JC-D1 | 2275 | Existing | 50.06 | 20.58 | 18.18 | 16.02 | 12.57 | 10.35 | 6.53 |
| 140 | | | | | | | | | | | |
| 141 | Dundas St. E. | JC-D2 | 2278 | Existing | 5.68 | 2.21 | 1.95 | 1.69 | 1.31 | 1.07 | 0.65 |




NORTH OAKVILLE CREEKS SUBWATERSHED STUDY

engineers architects planners
PARISH geomorphic
Natural Resource Solutions Inc.
Aquatic, Terrestrial and Wetland Biologists
Donald G. Weatherbe Associates
Morrison Environmental Limited Groundwater Consultants
Environmental Water Resources Group Ltd.
OAKVILLE

August 2006

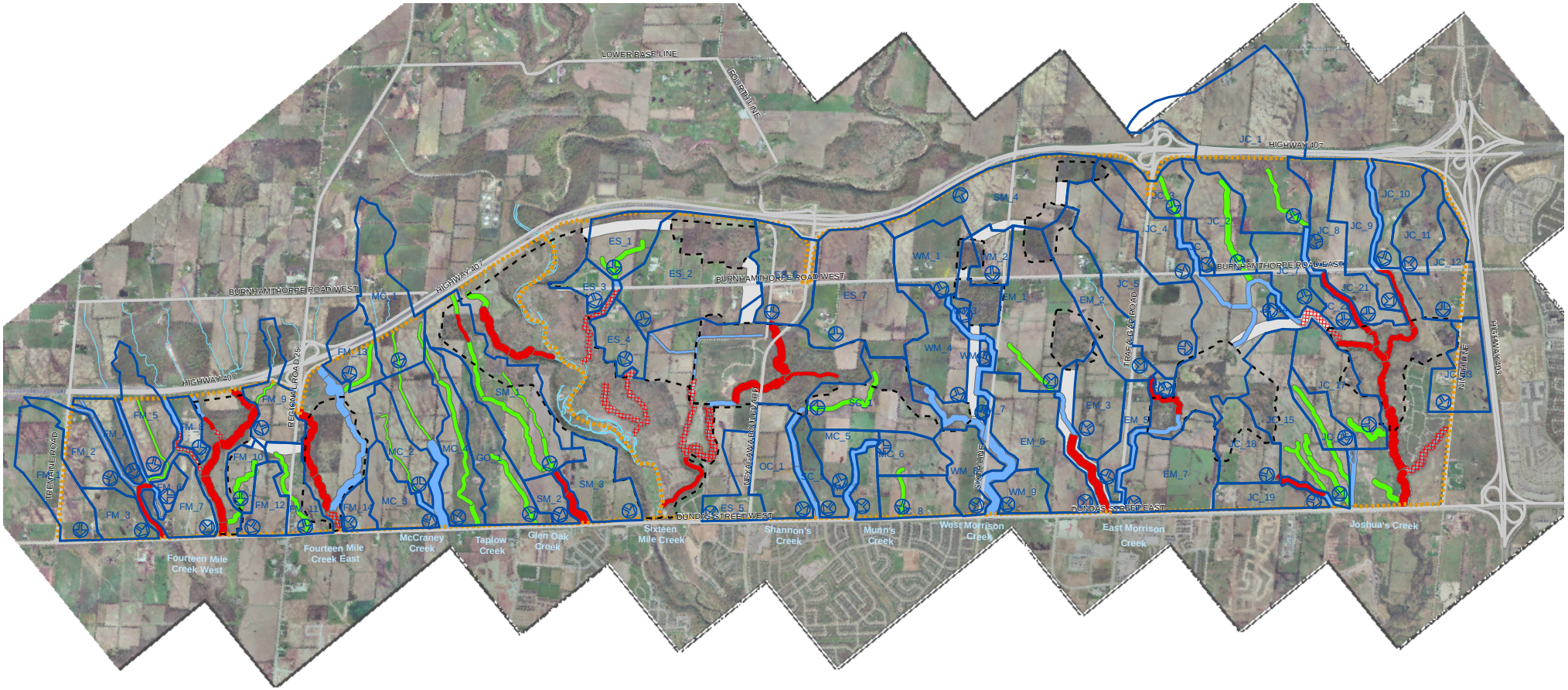
0 500 1,000
Meters

**Legend**

- Study Area
- Road
- Watercourse
- Subcatchments
- Culvert

# Unit Flow Rate Target Locations

Figure 7.4.7




NORTH OAKVILLE CREEKS SUBWATERSHED STUDY

August 2006

0 500 1,000
Meters

**Legend**

- Secondary Plan Boundary
- Road
- Watercourse
- SWM Pond (Approximate Location)
- SWM Pond Drainage Area

- Core
- Linkage

**Stream Corridor**

- High Constraint
- High Constraint - Requiring Rehabilitation
- Medium Constraint
- Low Constraint
- SWM Pond Drainage Area
- Approximate SWM Pond Locations

# Approximate Stormwater Facility Locations

Figure 7.4.6