Flamborough Quarry

Haul Route Study

Agricultural Report

Prepared by:

Conna Consulting Inc.

Prepared for:

St. Marys CBM

September 8, 2008

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Appendix A - Cross Section Design and Analysis

1 Introduction

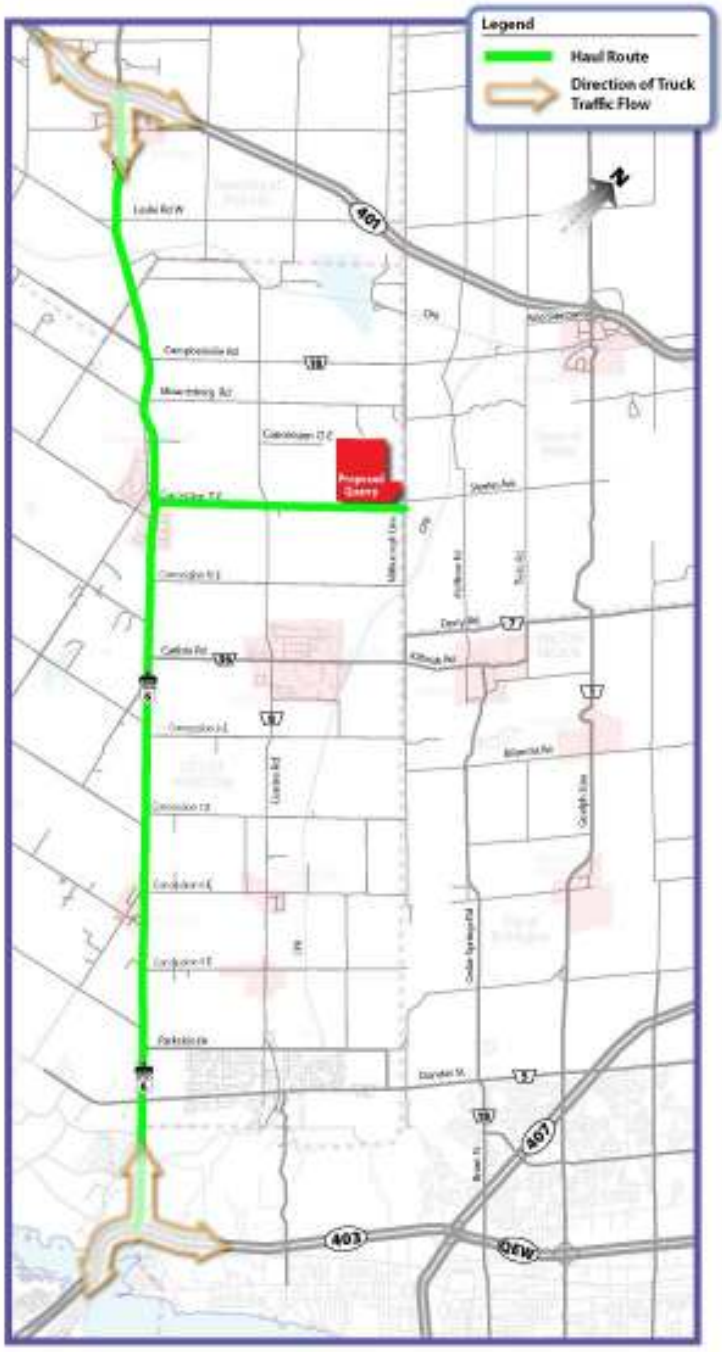
St. Marys Cement (Canada) Inc. has proposed to develop a Dolostone Quarry on Part of Lots 1, 2 and 3, Concession 11, Geographic Township of East Flamborough, in the City of Hamilton. The property is located on the north side of 11th Concession, just west of Milburough Line.

In April 2006 Dillon Consulting Limited prepared Terms of Reference for the Quarry Haul Route Evaluation on behalf of the City of Hamilton. Components of the Terms of Reference require that Alternative Haul Routes are identified, the existing baseline conditions of each alternative route are described, and a comparative analysis and evaluation is carried out. iTRANS Consulting Inc. have identified five Alternative Haul Routes, that are described and analyzed in the following report in the context of agriculture.

This report documents the consultant team, describes the environment, defines the analysis criteria and indicators, reports the analysis and results, and offers recommendations and mitigating measures.

2 Description of Alternative Haul Routes

Alternative Haul Route 1



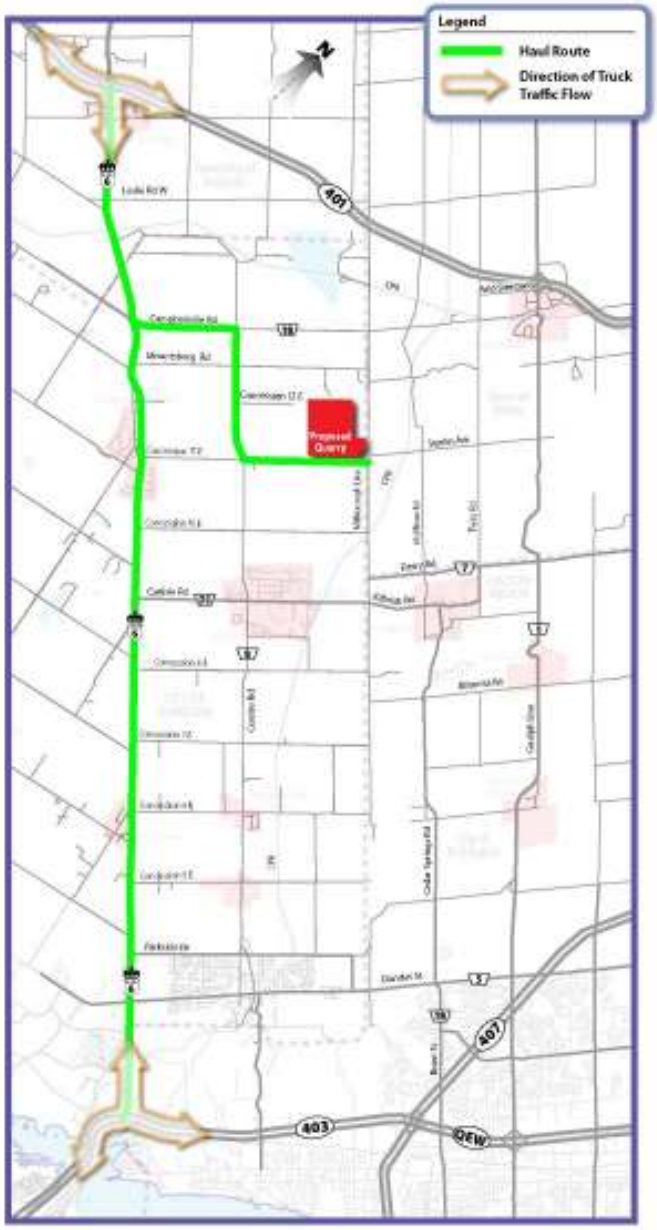
In the case of Alternative Haul Route 1, truck traffic destined for Highway 401 east would travel west on Concession 11 E, and then north on Highway 6 to the Highway 401 eastbound on-ramp.

Truck traffic destined for Highway 401 west would travel west on Concession 11 E, and then north on Highway 6 to the Highway 401 westbound on-ramp.

Truck traffic destined for Highway 403 east would travel west on Concession 11 E, and then south on Highway 6 to the Highway 403/QEW eastbound on-ramp.

Finally, truck traffic destined for Highway 403 west would travel west on Concession 11 E, and then south on Highway 6 to the Highway 403/QEW westbound on-ramp.

Alternative Haul Route 2



In the case of Alternative Haul Route 2 truck traffic destined for Highway 401 east would travel west on Concession 11 E, then north on Centre Road, west on Campbellville, and north on Highway 6 to the Highway 401 eastbound on-ramp.

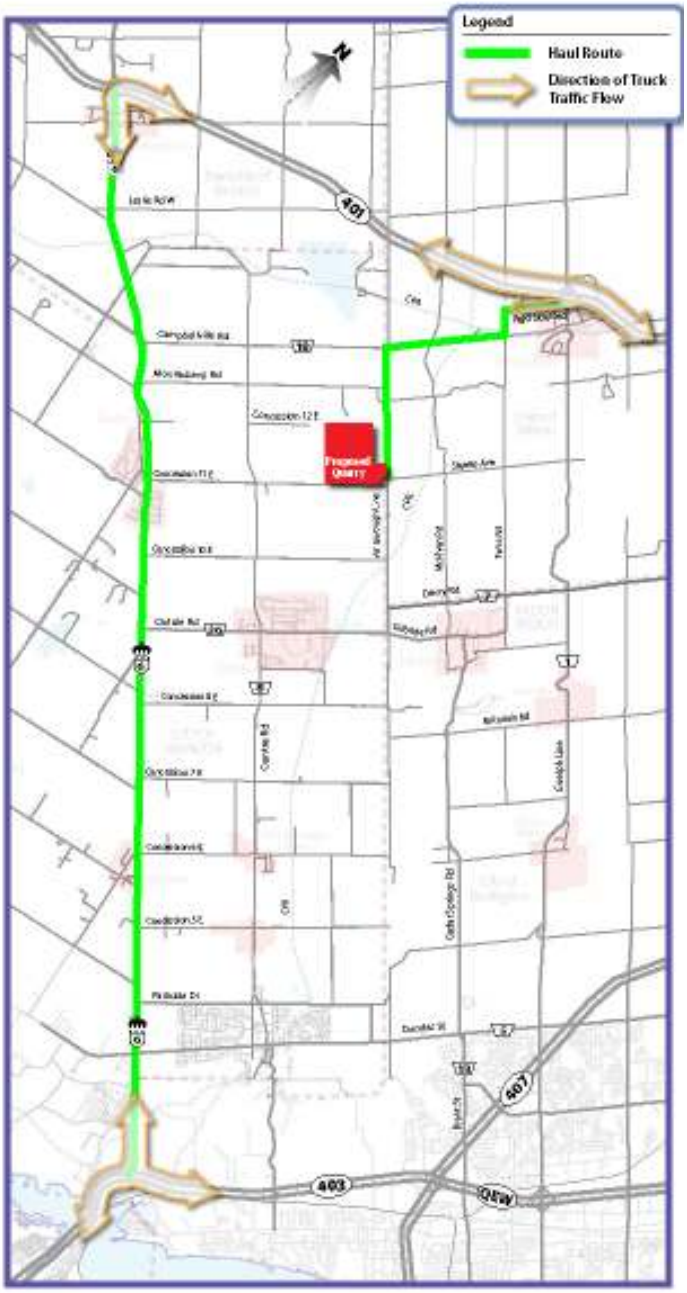
Truck traffic destined for Highway 401 west would travel west on Concession 11 E, then north on Centre Road, west on Campbellville, and north on Highway 6 to the Highway 401 westbound on-ramp.

Truck traffic destined for Highway 403 east would travel west on Concession 11 E, then north on Centre Road, west on Campbellville, and south on Highway 6 to the Highway 403/QEW eastbound on-ramp.

Finally, truck traffic destined for Highway 403 west would travel west on Concession 11 E, north on Centre Road, west on Campbellville, and south on Highway 6 to the Highway 403 /QEW westbound on-ramp.

Alternative Haul Route 3

In the case of Alternative Haul Route 3, truck traffic destined for Highway 401 east would travel north on Milburough Line, then east on Campbellville Road, north on Twiss Road, and east on Reid Sideroad to the Highway 401 eastbound on-ramp.

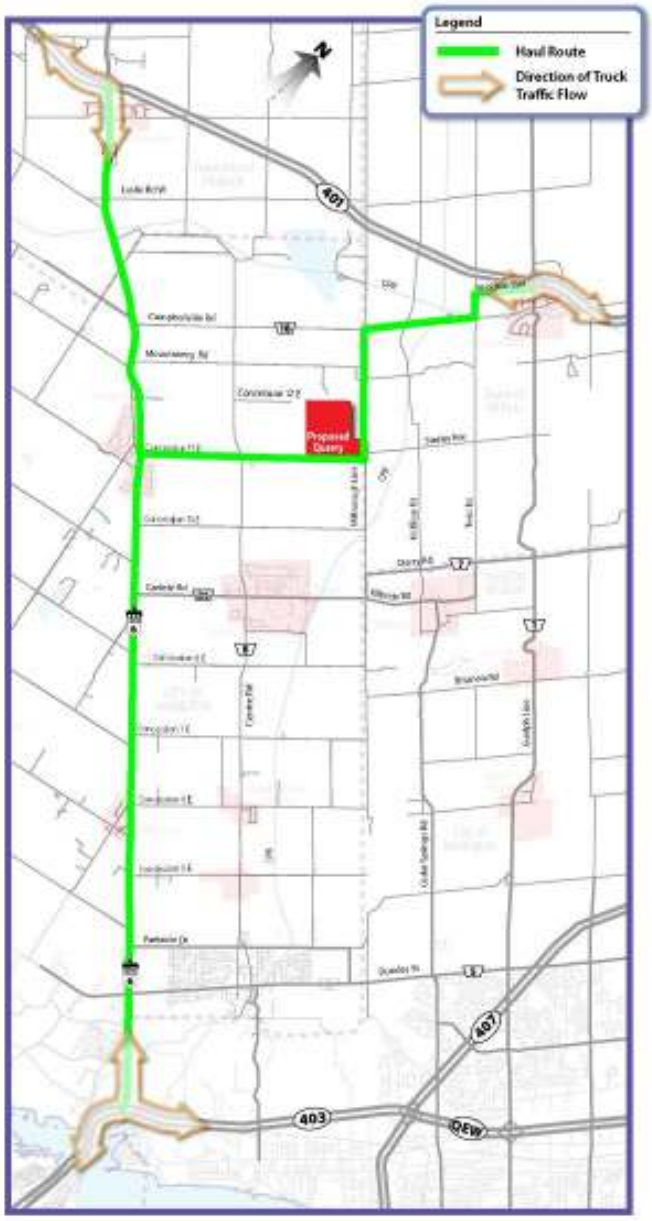


Truck traffic destined for Highway 401 west would travel north on Milburough Line, then east on Campbellville Road, north on Twiss Road, east on Reid Sideroad and north on Guelph Line to the Highway 401 westbound on-ramp

Truck traffic destined for Highway 403/QEW east would travel north on Milburough Line, then east on Campbellville Road, north on Twiss Road, and east on Reid Sideroad to the Highway 401 eastbound on-ramp. From here, there are several alternatives to reach the destination including taking the 407 ETR south to Highway 403.

Finally, truck traffic destined for Highway 403 west would travel north on Milburough Line, east on Campbellville Road, north on Twiss Road, and east on Reid Sideroad to the Highway 401. From here, there are several alternatives to reach the destination including taking the 407 ETR southwest or Highway 6 south to the 403/QEW.

Alternative Haul Route 4



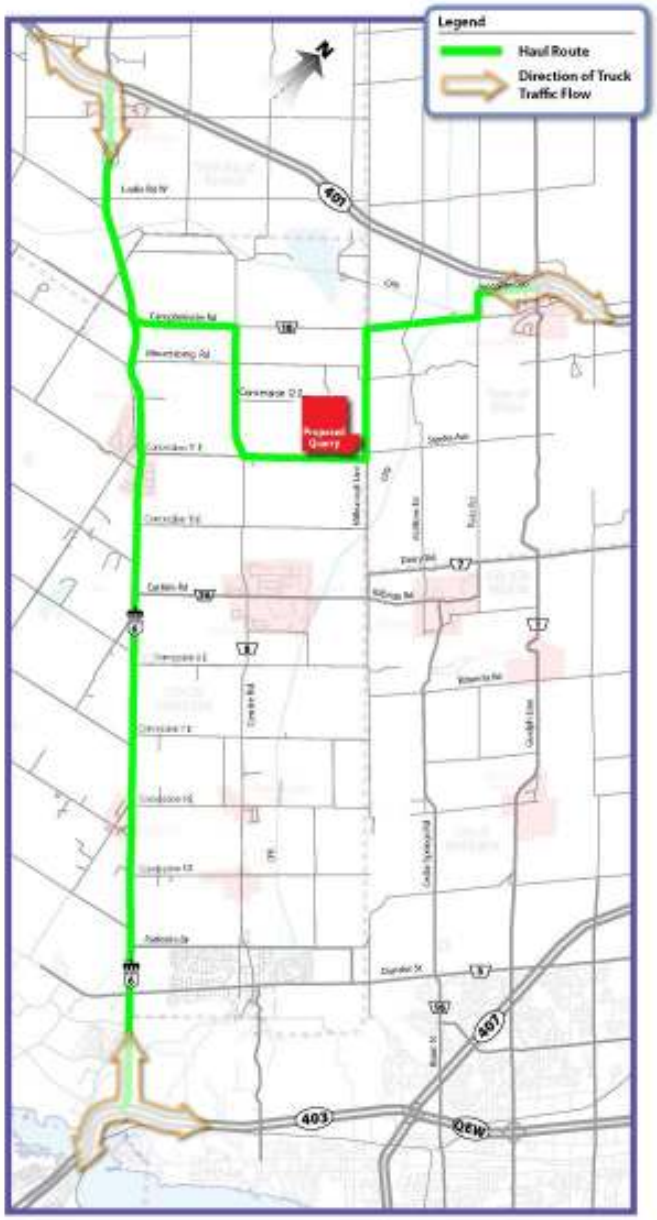
In the case of Alternative Haul Route 4, truck traffic destined for Highway 401 east would travel north on Milburough Line, then east on Campbellville Road, north on Twiss Road, and east on Reid Sideroad to the Highway 401 eastbound on-ramp.

Truck traffic destined for Highway 401 west would travel west on Concession 11 E, and then north on Highway 6 to the Highway 401 westbound on-ramp.

Truck traffic destined for Highway 403 east would travel west on Concession 11 E, and then south on Highway 6 to the Highway 403 eastbound on-ramp.

Finally, truck traffic destined for Highway 403 west would travel west on Concession 11 E, and then south on Highway 6 to the Highway 403 westbound on-ramp.

Alternative Haul Route 5



In the case of Alternative Haul Route 5, truck traffic destined for Highway 401 east would travel north on Milburough Line, then east on Campbellville Road, north on Twiss Road, and east on Reid Sideroad to the Highway 401 eastbound on-ramp.

Truck traffic destined for Highway 401 west would travel west on Concession 11 E, then north on Centre Road, then west on Campbellville, and then north on Highway 6 to the Highway 401 westbound on-ramp.

Truck traffic destined for Highway 403 east would travel west on Concession 11 E, then north on Centre Road, west on Campbellville, and south on Highway 6 to the Highway 403/QEW eastbound on-ramp.

Finally, truck traffic destined for Highway 403 west would travel west on Concession 11 E, then north on Centre Road, west on Campbellville, and south on Highway 6 to the Highway 403 /QEW westbound on-ramp.

3 Description of the Consulting Team

This agricultural impact assessment was conducted by J.M.Hagarty, P.Ag. of Conna Consulting Inc. Mr. Hagarty is the author of this report.

Mr. Hagarty is a Professional Agrologist with 35 years of consulting experience in agricultural and environmental impact assessment. He has had extensive involvement in agricultural research and rural land use planning. His experience includes the interpretation of agricultural impacts and farm damage assessments relating to a wide variety of site and linear facility development. This work has involved soil and agricultural land use surveys and interpretation of soil and climatic capability for common field crop and specialty crop production and analysis of farm operational impacts associated with transportation and other power and pipeline corridor developments.

4 Description of the Environment

Maps 1, 2 and 3 illustrate soil capability for agriculture, croplands, farm facilities and farm properties that occur along the alternative haul routes.

Most of the Study Area east of Freelton, along Campbellville Road, Concession Road 11E, Centre Road, Milburough Line, Twiss Road and Reid Sideroad is characterized by rough, hilly and swampy till moraine deposits with stony, bouldery and shallow soils occurring over limestone bedrock. Peat and muck organic soils and associated wetlands are common to this area. These conditions are typical of the Horseshoe Moraine and Flamborough Plain physiographic areas which dominate the Study Area.

Gravelly Burford, stony Dumfries, shallow Farmington and poorly drained organic soils are common, with low agricultural capability Class 5 and 6 soils predominant in this area. The Campbellville Road haul route segments, for example, exhibit an average of less than 16% Prime Agricultural Land; Concession Road 11E averages around 15%; and Milburough Line, 18% .

The relatively low level of agricultural productivity within the Study Area is reflected by the general absence of Agricultural designations within the Milton, Hamilton and Wellington County Official Plan portions of the Study Area. For the most part, the Study Area is designated Rural, rather than Agriculture, in recognition of the lower capability lands and lesser concentration of agricultural land use within this area.

The level of observed annual cropping along the various haul route segments also reflects the underlying agricultural soil capability. Campbellville Road segments average about 34% cropping, Concession 11E averages around 32%, while the swampy and shallow soils along Milburough Line only result in about 5% land utilization in crop production. Centre Road occurs along a dryer and deeper soil ridge with a pocket of better soils (54% Prime Agricultural Land) resulting in an increased level of occurrence of cropland (56%).

Highway 6, North of Campbellville Road, has relatively high soil capability for agriculture (67% Prime Agricultural Land) and a resulting greater level of occurrence of cultivated lands (51%). Despite relatively high soil capability for agriculture (78% Prime Agricultural Land), however, that portion of Highway 6 extending south of Freelton has only 21% cropped land along its length. This is largely due to the transfer of farmland to nonagricultural commercial, industrial and residential uses.

The soil capability constraints affecting crop production along the Campbellville, Concession Road 11E and Milburough haul route segments does, however, still allow the occurrence of pasture and grazing lands well-suited to livestock, and in particular horses. Equestrian facilities, both large and small, are very common along all haul route alternatives in this area, including the Campbellville Training Center on Campbellville Road and the Baycairn Training Center on Concession Road 11E. The Cherry Lane Farms equestrian operation is found along Highway 6 to the north of Campbellville Road. In addition, there are many smaller stables and equestrian facilities situated throughout the study area.

A limited number of other commercial farming facilities including cattle (dairy and beef) and cash crop facilities occur mainly along Highway 6, north of Campbellville Road. A large poultry facility is located on the east side of Highway 6 between Carlisle and Safari Roads and some sheep and

cattle production facilities are found on the north side of Campbellville Road and along Centre Road.

Agricultural market facilities include the Woodland Farm Market, Imperial Mushroom Co., Terra Nursery and Elliott Tree Farm located along Highway 6 south of Freelton and a large tree nursery production area situated along the east side of Centre Road. The reconnaissance survey did not observe any pick-your-own or fresh produce market signage that would indicate established fresh market outlets along the various haul route alternatives.

5 Analysis Criteria and Indicators

The criterion and associated indicators for the evaluation of haul route agricultural impacts are described below.

Criterion:

Potential for Effect on Agricultural Operations.

This criterion is contained within the Economic Environment and Business Impact component of the evaluation framework and is defined as follows:

> *Potential for haul route traffic to restrict or compromise crop or livestock production, agricultural field or facility access, farm linkages among operationally related or associated land parcels or the safety of farm machinery movement along the proposed route.*

Each of the three indicators for this criterion is defined and discussed below:

Indicator 1:

Number and Type of Farms along the Haul Route Potentially Disrupted by Truck Traffic

This indicator is defined as follows:

> *Number of individual farm properties involved in livestock, cash crop or specialty crop operations located along the proposed route alternatives.*

This indicator involves a characterization of the type of different agricultural operations occurring along the proposed haul routes. It provides for the identification of the potential for farm operational linkages involving livestock or machinery movement between or among properties located across or along proposed routes. These linkages are normally limited, due to the existing levels of traffic, along major high-volume highways like Highway 6. They can occur, however, along lesser traveled, rural roadways.

The higher the concentration of active farm operations, the higher will be the probability of occurrence of potential farm operational interference. Linkages between and among cash crop operations are common and often dynamic, varying from year-to-year in the type and frequency of machinery movement. These linkages are not generally tied to land ownership since they are often based on land rental or lease arrangements that can change from year to year.

Indicator 2:

Area and Productivity/Value of Cropland Removed for Road Improvements

This indicator is defined as follows:

> *The area and relative productivity of cropland removed from production due to road improvements. The relative productivity of affected lands is determined through the application of the Canada Land Inventory7-Class system of classification of soil capability for agriculture.*

This indicator addresses the relative potential for loss of agricultural land associated with possible roadway improvements occurring along the haul route. This impact will vary according to the amount of annually cropped land occurring along the haul route alternatives and according to the soil capability of those lands.

Indicator 3:

Number and Area of Farm Properties Required for Road Improvements

This indicator is defined as follows:

> *The number and area of farm properties required for proposed road improvements including the identification of specific farm facilities or land/operational improvements and related agricultural investment potentially retired as a consequence of the improvements.*

This indicator addresses the potential for farm operational impacts associated with the loss or damage of farm properties, facilities or improvements such as land drainage that might result from required road improvements along the haul route. Impacts will vary according to the number and area of farm properties and facilities affected by road improvements.

Areas requiring road improvements can be characterized in terms of the number and type of agricultural operations that are potentially affected and the potential for unmitigated removal or disruption of agricultural facilities, land improvements or other forms of agricultural investment.

6 Analysis

6.1 Data Sources

The data sources supporting these analyses were derived from published mapping supplemented by field reconnaissance surveys conducted on February 13 and 23, 2008. Published data sources include:

- Soils of Wentworth County-Report Number 32 of the Ontario Soil Survey, Canada/Ontario Department of Agriculture, 1965;

- Soil Survey of Wellington County-Report Number 35 of the Ontario Soil Survey, Canada/Ontario Department of Agriculture, 1963;

- Soils of Halton County- Report Number 43 of the Ontario Soil Survey, Canada/Ontario Department of Agriculture, 1971;

- Soil Capability for Agriculture manuscript mapping (1:50,000 scale) Canada Land Inventory Sheets 40P/8 and 30M/5;
- The Assessment of Soil Productivity for Agriculture. ARDA Report No. 4. D.W. Hoffman, November, 1971

- Agricultural Land Use Systems Mapping – Puslinch, Flamborough East and Milton West. Ontario Ministry of Agriculture and Food;

- Google Earth Satellite Imagery-2008. Europa Technologies;

- NTS Topographic Series, 1: 50,000 scale mapping;

- OBM 1:10,000 scale topographic mapping;

- City of Hamilton Official Plan-Schedule D- Rural Land Use Designation, September, 2006;

- Town of Milton Official Plan-Schedule A-Land Use, December 2000; and

- County of Wellington Official Plan – Schedule A7 – Puslinch, February 2008.

- Property Boundary Mapping (1:50,000 scale), April 28, 2008 as compiled by iTrans Consulting Inc.

Agricultural productivity mapping, in the form of 1:50,000 scale Soil Capability for Agriculture (Canada Land Inventory) manuscript mapping, was prepared for all haul route segments within an area extending approximately 100 m from the road centerline. Cropland mapping was also

conducted within this 100 m area on either side of the roadway utilizing a combination of field reconnaissance observations and interpretation of existing satellite imagery. The soil capability for agriculture and cropland information is contained within Map 1 of this report.

The area reconnaissance land use surveys conducted on February 13 and 23, 2008 supported the mapping of croplands and agricultural buildings and facilities along the haul route alternatives. This information is contained within Map 2 of this report. Facility waypoint locations were approximated utilizing GPS.

Existing farm buildings and facilities were mapped through the use of existing topographic mapping, interpretation of satellite imagery and field reconnaissance observations. The probable type and level of apparent use was assigned, based upon field reconnaissance and airphoto observations. This use characterization was directed at profiling the overall agricultural land use patterns found within the Study Area. It includes identification of the overall level and intensity of livestock, cropping, and farm marketing uses found along the potential haul routes. Individual farm use may vary from that recorded on the mapping contained herein.

Retired, inactive or abandoned farm buildings, as noted in the reporting, did not appear to be involved in commercial agricultural production. However, some of these buildings may still be used for hobby farming or for farm or non-farm related storage or they may house a small number of livestock. They may also be associated with cash cropping operations occurring on adjacent lands.

Input from the various Public Information Centers and Workshops conducted as part of the public consultation process was also utilized to identify the occurrence of any critical farm operational linkages across or along the proposed haul route.

The actual area of land required for possible road improvements along the proposed haul road segments was calculated by iTrans Consulting Inc. For this calculation iTrans applied the recommended haul route cross sections and measured the area of farmland and cropland potentially affected by the roadway alterations. All properties exceeding 4 ha, as identified on existing

assessment roll mapping, were considered to be potential farm properties, (See Map 3)

6.2 Assumptions

The haul route agricultural impact analyses involve a number of assumptions, as follows:

- Prime Agricultural Land comprises Canada Land Inventory soil capability for agriculture Classes 1, 2, and 3 as defined by Provincial Policy;

- As per standard practice, common field crop soil productivity indices developed by ARDA (November, 1971),were utilized to determine the relative Canada Land Inventory ratings for complex soil units found within the study area;

- Productivity index values exceeding 0.8 (equivalent to Class 2 or higher) are considered High capability. Index values in the range of 0.49-0.79 (equivalent to Class 3 and 4) were considered Medium capability and index values of less than 0.49 were considered to be Low in productivity;

- Combined overall productivity ratings for each haul route alternative were qualitatively derived based on the relative occurrence of High, Medium and Low index values within the component road segments comprising the haul route;

- Croplands comprise annually cropped fields including improved pasture and forage (hay) production and exclude built-up areas, forested lands and idle lands characterized by old field vegetative growth. The latter areas can sometimes be used for rough grazing of cattle, sheep or horses.

- To equate distances and balance the analysis in terms of the overall occurrence of agricultural activity along the proposed haul routes,

Highway 6 data regarding the number and type of farms was included within all alternatives, including Haul Route 3.

- In the characterization of agricultural land use, inactive or abandoned facilities tallied within the Existing Conditions Report were classified as cash crop facilities within the impact analysis because of their potential association with adjacent cropped lands;

- Residential severances and estate lots were generally not considered as farms in the tabulation of the number of farm properties potentially affected by recommended road improvements. Land holdings were considered as farm properties if they exceeded 4 ha (10 acres) in size;

- 'Other Livestock' include cattle, sheep and poultry as observed during the field reconnaissance. Equestrian livestock facilities were tallied separately; and

- Market facilities include tree nurseries as well as farm or fresh food produce outlets.

6.3 Methods

Indicator 1:

For the first indicator, the characterization of the type and number of farms was based on the mapped data derived from airphoto interpretation and field reconnaissance. To this data a Truck Exposure Index was applied to derive a relative indication of the potential traffic effect. Each farm along a haul route will be exposed to quarry truck traffic; however, the degree of the exposure varies by alternative. In order to account for this, a truck exposure index was calculated for comparative evaluation. For example, the number of trucks that would travel along Highway 6 in Alternative 1 is very different from the number of trucks that would re-enter the study area and travel Highway 6 via Highway 401 in Alternative 3.

The truck exposure index for farms was calculated using the number of farms on each link and the daily number of one-directional quarry trucks on the matching link. The number of farms located on each link and each Alternative Haul Route is shown in **Table 1**.

Table 1: Number of farms located on each link and for each Alternative Haul Route

	No. of Farms	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Highway 6 (Campbellville to Hwy 401)	9	9	9	9	9	9
Highway 6 (Conc. 11E to Campbellville)	2	2	2	2	2	2
Highway 6 (Conc. 11E to Hwy 403)	21	21	21	21	21	21
Conc. 11E (Hwy 6 to Centre)	6	6			6	
Conc. 11E (Centre to Milburough)	4	4	4		4	4
Centre Rd	7		7			7
Campbellville (Hwy 6 to Centre)	6		6			6
Campbellville (Milburough to Twiss)	2			2	2	2
Milburough Line	1			1	1	1
Twiss Rd	1			1	1	1
Reid Sdrd	1			1	1	1
Total No. of Farms		42	49	37	47	54

Table 2 shows the daily number of quarry trucks that are estimated to travel each link in one direction for each Alternative Haul Route.

Table 2: Number of daily quarry trucks in one direction on each link for each Alternative Haul Route

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Highway 6 (Campbellville to Hwy 401)	485	485	30	55	55
Highway 6 (Conc. 11E to Campbellville)	485	85	30	55	60
Highway 6 (Conc. 11E to Hwy 403)	85	85	30	60	60
Conc. 11E (Hwy 6 to Centre)	570			115	
Conc. 11E (Centre to Milburough)	570	570		115	115
Centre		570			115
Campbellville (Hwy 6 to Centre)		570			115
Campbellville (Milburough to Twiss)			570	455	455
Milburough			570	455	455
Twiss			570	455	455
Reid			570	455	455

To achieve a truck exposure index the following equation was applied.

Truck Exposure Index = $\sum_{Link}$ No. Farms X No. Quarry Trucks

The calculated truck exposure indices are shown in Table 3.

Table 3: Farm truck exposure index for each Alternative Haul Route

Alternative 1	12,820
Alternative 2	16,010
Alternative 3	3,810
Alternative 4	5,290
Alternative 5	6,105

Indicator 2:

For the second indicator, the relative soil productivity of component segments of each haul route alternative was qualitatively assessed based on the relative occurrence of High, Medium and Low capability lands lying

adjacent to road segments where recommended road alterations involved the use of some adjacent lands. Since no road improvements are planned for Highway 6, this indicator compares the alternative route segments located on the local road network situated to the east of Highway 6. Canada Land Inventory soil capability for agriculture mapping along the various haul route alternatives is set out in Map 1.

For Haul Route 1 (ranked Low), all of Concession 11E is associated with low capability land. Haul Route 2 is partially low capability along west Cambellville Road and 11E, but higher capability along Center road, resulting in an overall Medium characterization.

Haul Route 3 is also characterized by a combination of low capability (Milburough) and higher capability (east Campbellville Road through Twiss Road) and was therefore characterized as Medium.

Haul Route 4 has low capability land along most of its length (Concession 11 and Milburough) with a small amount of better lands situated along east Campbellville Road, Twiss Road and Reid Sideroad. It was therefore given a Low-Medium ranking.

Like Haul Routes 2 and 3, Haul Route 5 has a combination of higher capable lands along Center Road and East Campbellville road, Twiss Road and Reid Sideroad and lower capability lands situated along the west Campbellville Road and the Milburough Road segments. It was therefore given an overall Medium productivity status.

To determine the amount of cropland affected by each alternative, iTrans Consulting Inc. applied their recommended road alteration cross-sections (See Appendix A) to the haul route segments and calculated the area of actual cropland, as set out in Map 2.

Indicator 3:

For Indicator 3, the number of potential farm properties (with area exceeding 4 ha, as identified on Map 3) was tallied for each haul route alternative. To avoid double counting, only those farm properties not already classified as business or woodlot / conservation area property acquisitions were included in the tabulation of farmland affected. The area of property potentially

affected by road improvements was calculated by iTrans Consulting Inc. by overlying the recommended road cross-sections (See Appendix A).

6.4 Results

Indicator 1:

Number and Type of Farms along the Haul Route Potentially Disrupted by Truck Traffic

The data pertinent to this indicator is included in Table 4.

Table 4: Number and Type of Farms

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Equestrian	12	12	10	15	15
Other Livestock	3	5	3	3	5
Cash Crop	22	27	20	24	29
Agricultural Market/Nursery	5	5	4	5	5
Total	**42**	**49**	**37**	**47**	**54**
Truck Exposure Index	**12820**	**16010**	**3810**	**5290**	**6105**

The number of farm facilities occurring along the haul route alternatives ranges from a low of 37 (Haul Route 3) to a high of 54 (Haul Route 5). Within those totals, equestrian facilities range from low of 10 facilities (Haul Route 3) to a high of 15 along haul route options 4 and 5. There is little variability in the number of Other Livestock facilities (3-5) among the five alternatives. The overall Truck Exposure Index calculation ranges from a low of 3,810 for Haul Route 3 to a high of 16,010 for Haul Route 2. Generally speaking, the Truck Exposure Index is relatively high for alternatives 1 and 2 (12,820-16,010) and relatively low for alternatives 3, 4, and 5 (3,810 to 6,105).

Indicator 2:

Area and Productivity/Value of Cropland Removed for Road Improvements

The data pertinent to this indicator is included in Table 5.

Table 5: Cropland Required for Improvements

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Overall Productivity	Low	Medium	Medium	Low-Medium	Medium
Crop Area - SqM	3670	8105	2612	5175	7375
-Ha	0.37	0.81	0.26	0.52	0.74

For areas requiring potential road alterations affecting agricultural land, haul route alternatives 1 and 4 have the least overall productivity rating while alternatives 2, 3 and 5 have more moderate productivity. None of the haul route alternatives have a high level of productivity.

The amount of actual cropland required for recommended road alterations is least for Haul Route 3 (2,612 sq m (0.26 ha)) and most for Haul Routes 2 and 5 (8,105 sq m (0.81 ha) and 7,375 sq m (0.74 ha) respectively

Indicator 3:

Number and Area of Farm Properties Required for Road Improvements

The data pertinent to this indicator is included in Table 6.

Table 6: Farm Properties (>4 ha) Required for Improvements

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Properties	29	48	33	62	81
Property Area - Sq M	11727	14373	19305	25140	25903
- Ha	1.17	1.44	1.93	2.51	2.59

The number of actual farm properties affected by the various haul route alternatives ranges from a low of 29 in Haul Route 1, to a high of 81 with Haul Route 5.

The area of property affected varies from a low of 11,727 sq m (1.17 ha) for Haul Route 1 to a high of 25,903 sq m (2.59 ha) for Haul Route 5.

7 Recommendations

Despite the relatively lower level of agricultural productivity within large portions of the Study Area, there remains a moderate level of agricultural activity along the proposed haul route alternatives.

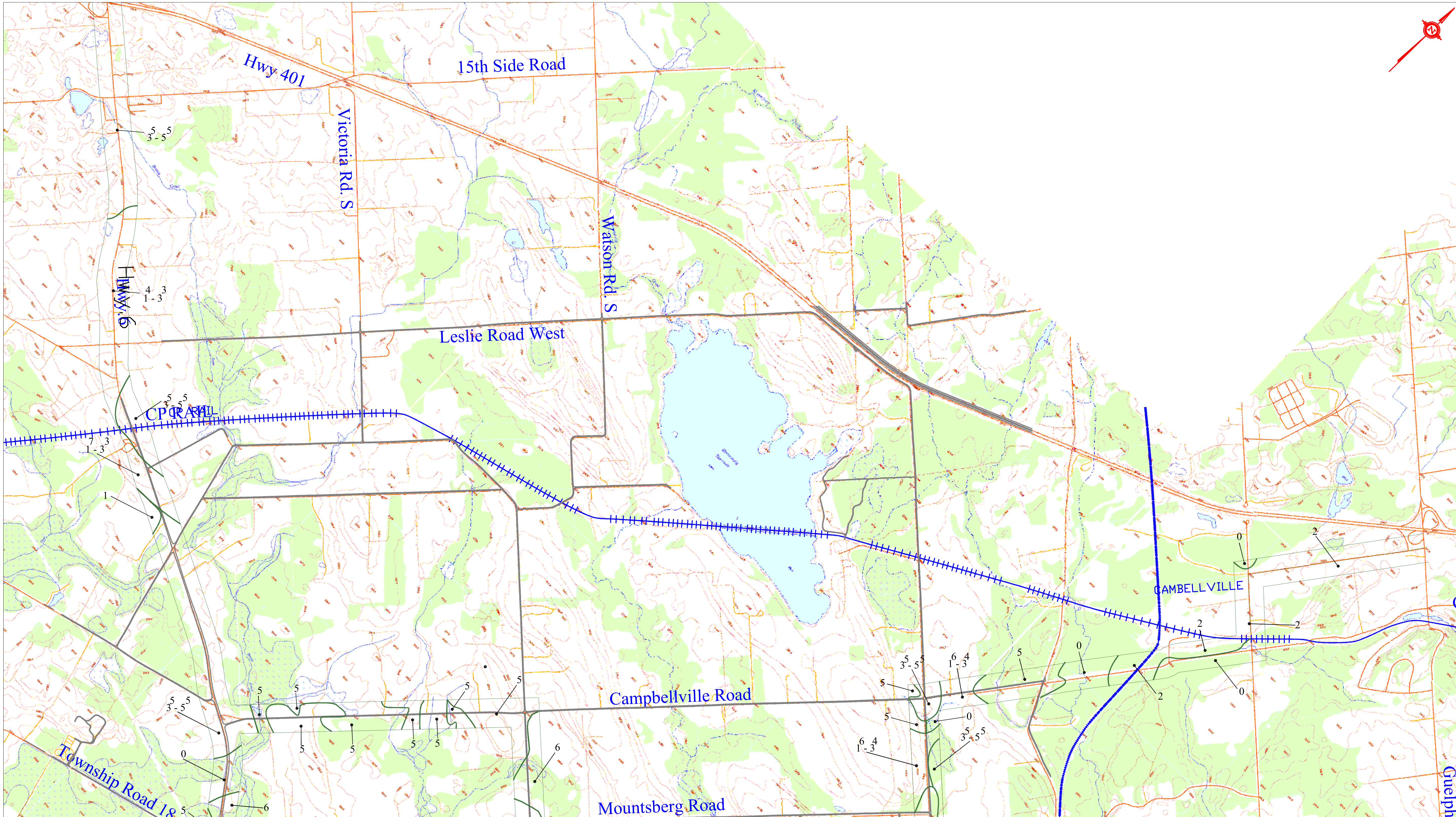
To minimize impacts on agricultural land and agricultural operations along the proposed alternatives, there are a number of recommended mitigation measures that should be considered in the design and operation of the haul route, as follows:

- The design of the haul route should maintain all existing farm field and facility laneway access to prevent impacts on efficiency of agricultural operations along the route; and

- At the time of construction of the haul route, any farm tile drainage or tile drainage outlet disruption or damage should be rectified immediately. Surface drainage following road construction should be

designed to ensure that there is no flooding or deterioration in soil drainage that might affect crop productivity within neighboring farm land.

MAPS

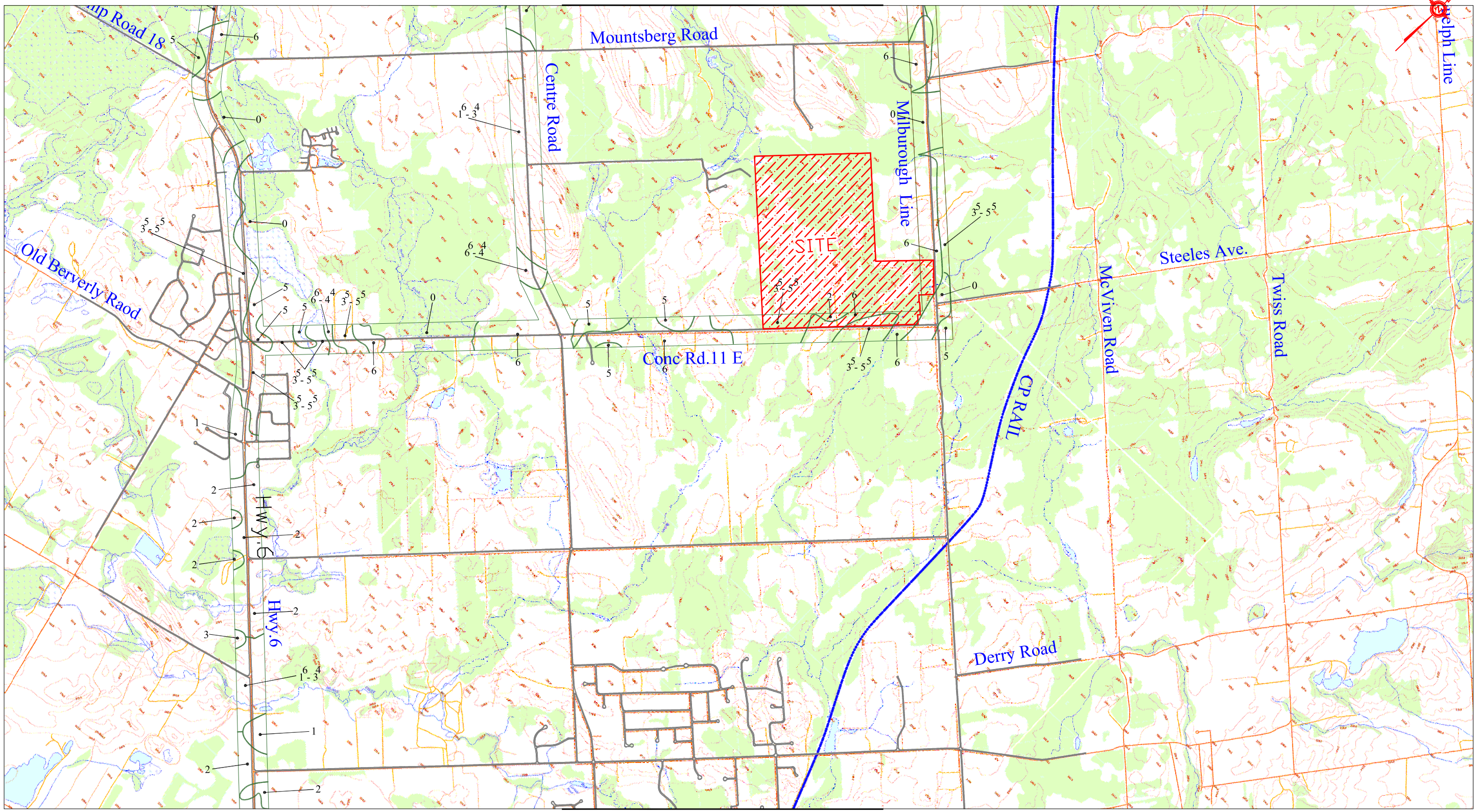


Match Line Sheet 2

Scale 1:30,000

Sheet 1
Map 1 Soil Capability for Agriculture Along Haul Route Alternatives Flamborough Quarry Expansion

Match Line Sheet 1



Match Line Sheet 3

LEGEND
6 4 / 1 - 3 — PROPORTION
CAPABILITY CLASS
ORGANIC SOIL
* CANADA LAND INVENTORY

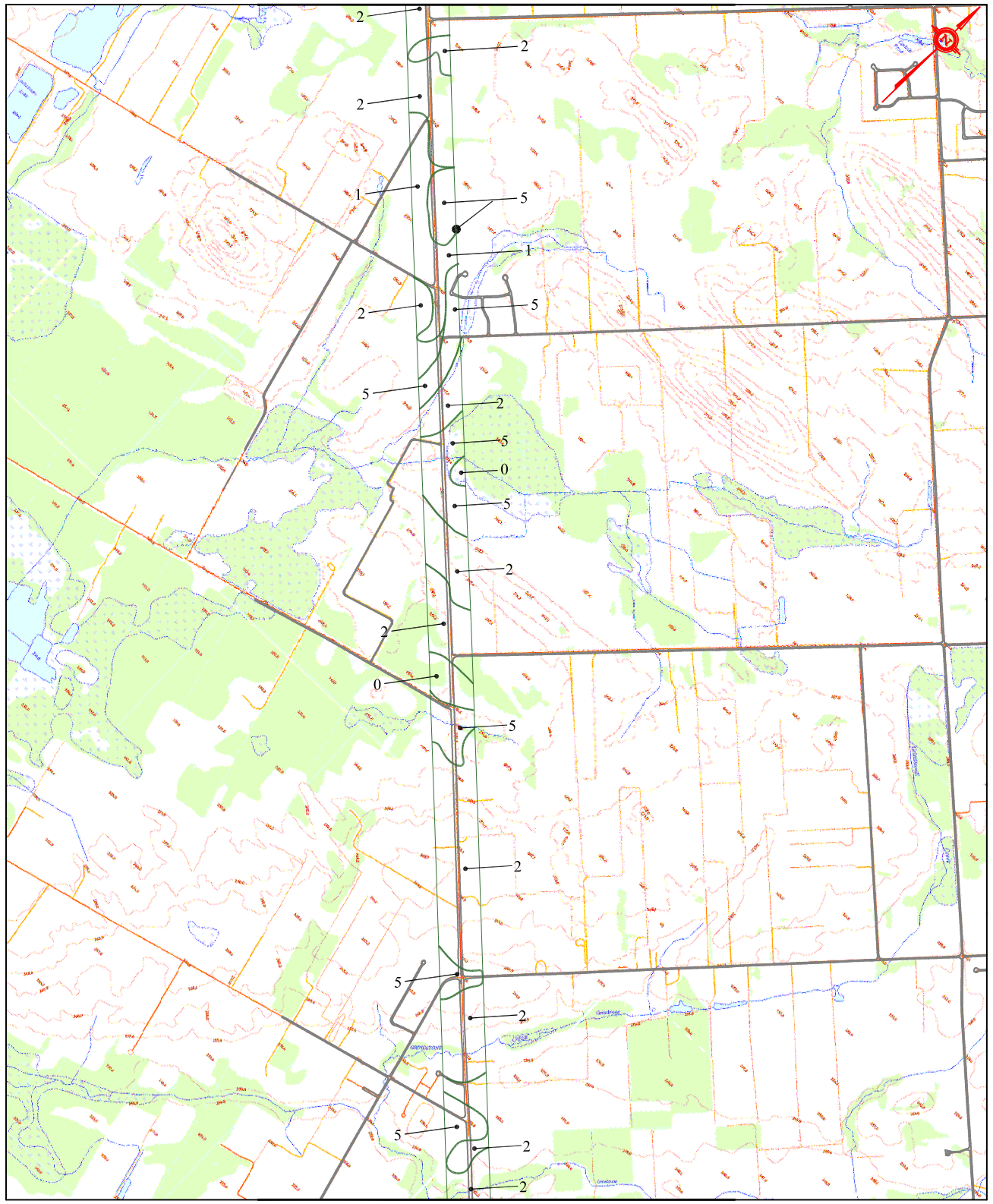
Sheet 2
Map 1 Soil Capability for Agriculture
Along Haul Route Alternatives
Flamborough Quarry Expansion

Scale 1:30,000

August 2008

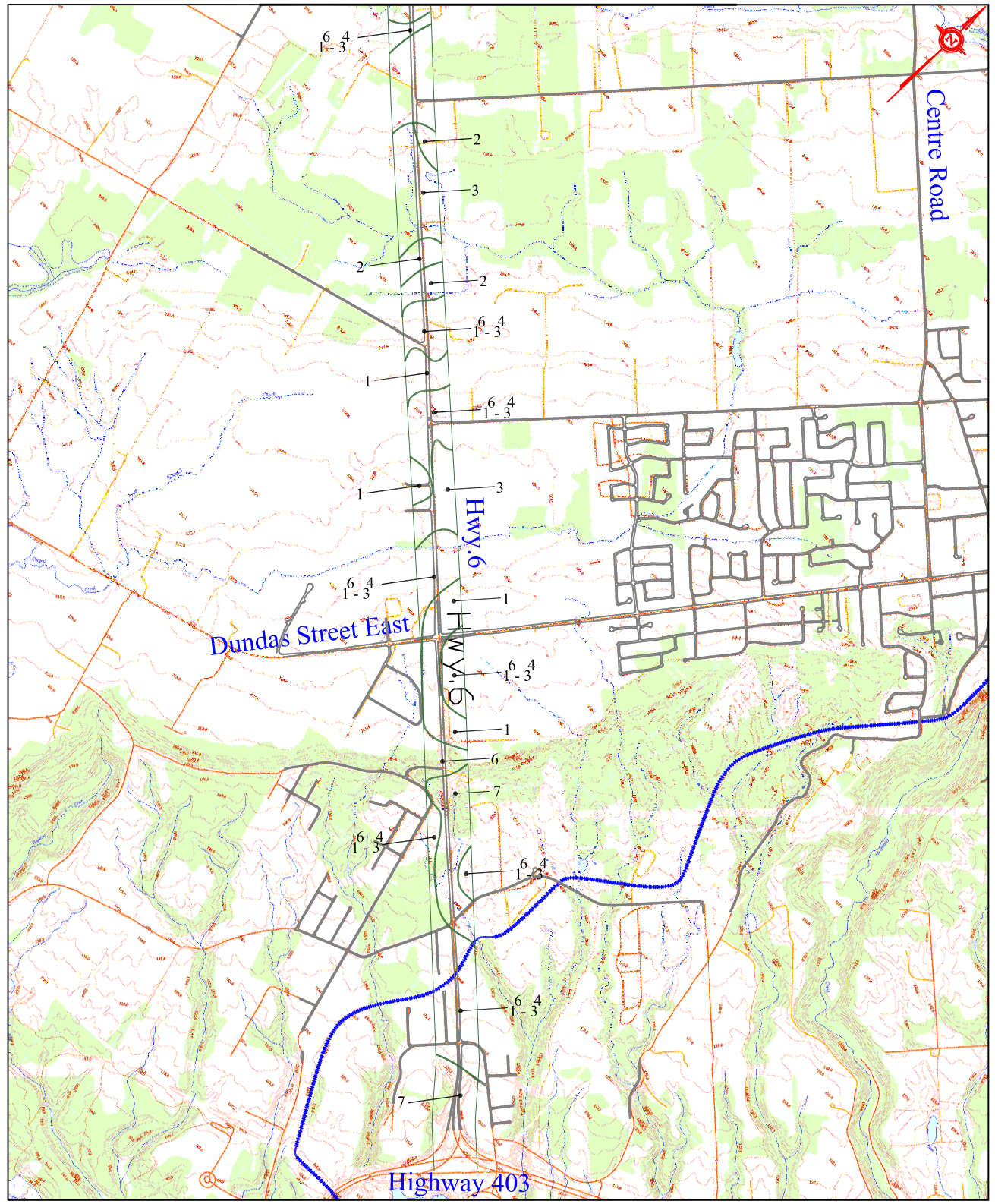
iTRANS

Match Line Sheet 2



Match Line Sheet 3B

Match Line Sheet 3A

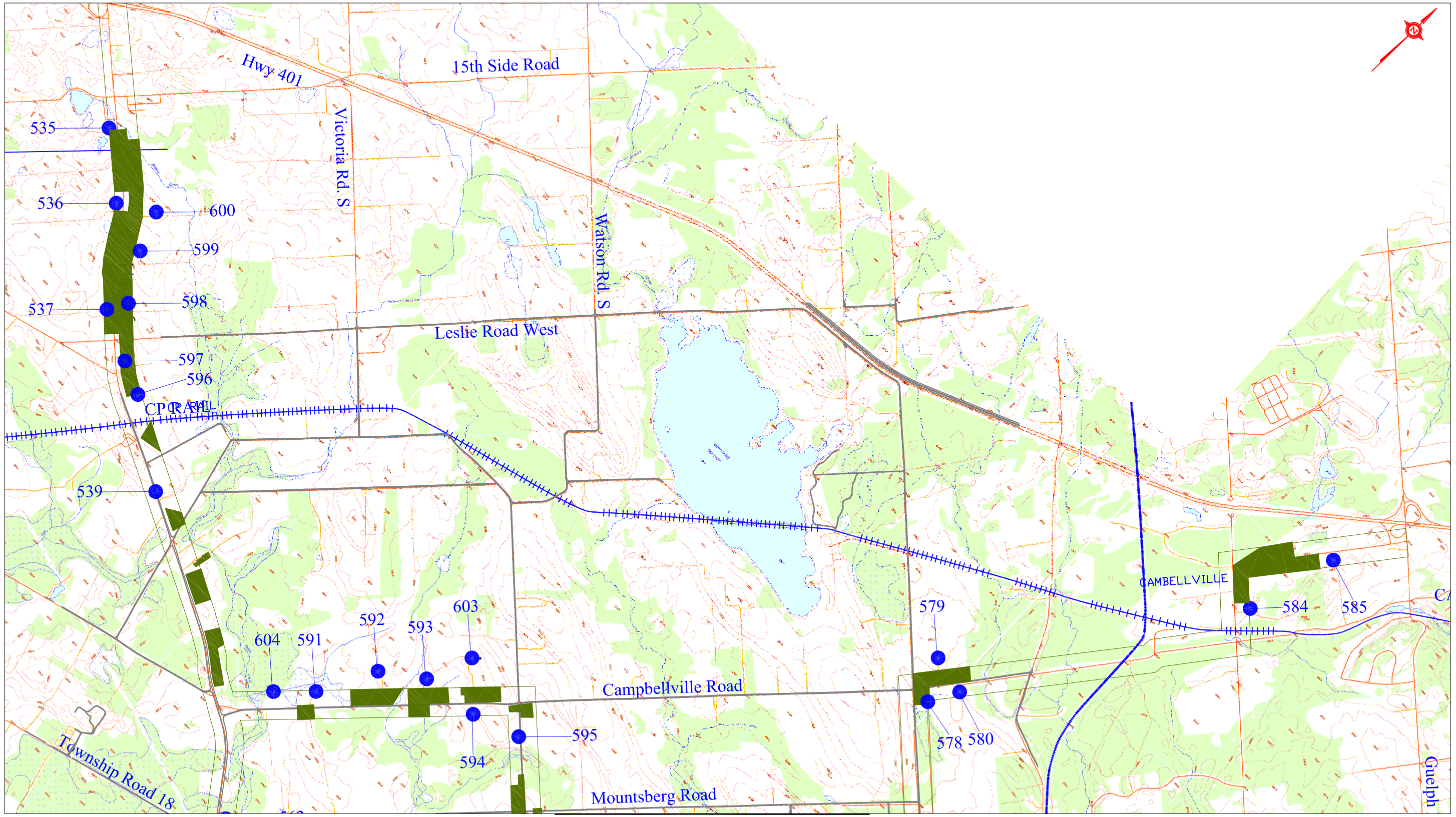


LEGEND
- PROPORTION
- CAPABILITY CLASS
- ORGANIC SOIL
- CANADA LAND INVENTORY

Sheet 3
Map 1 Soil Capability for Agriculture
Along Haul Route Alternatives
Flamborough Quarry Expansion

Scale 1:30,000

August 2008



Match Line Sheet 2

LEGEND
535 AGRICULTURAL FACILITY
CROPLANDS

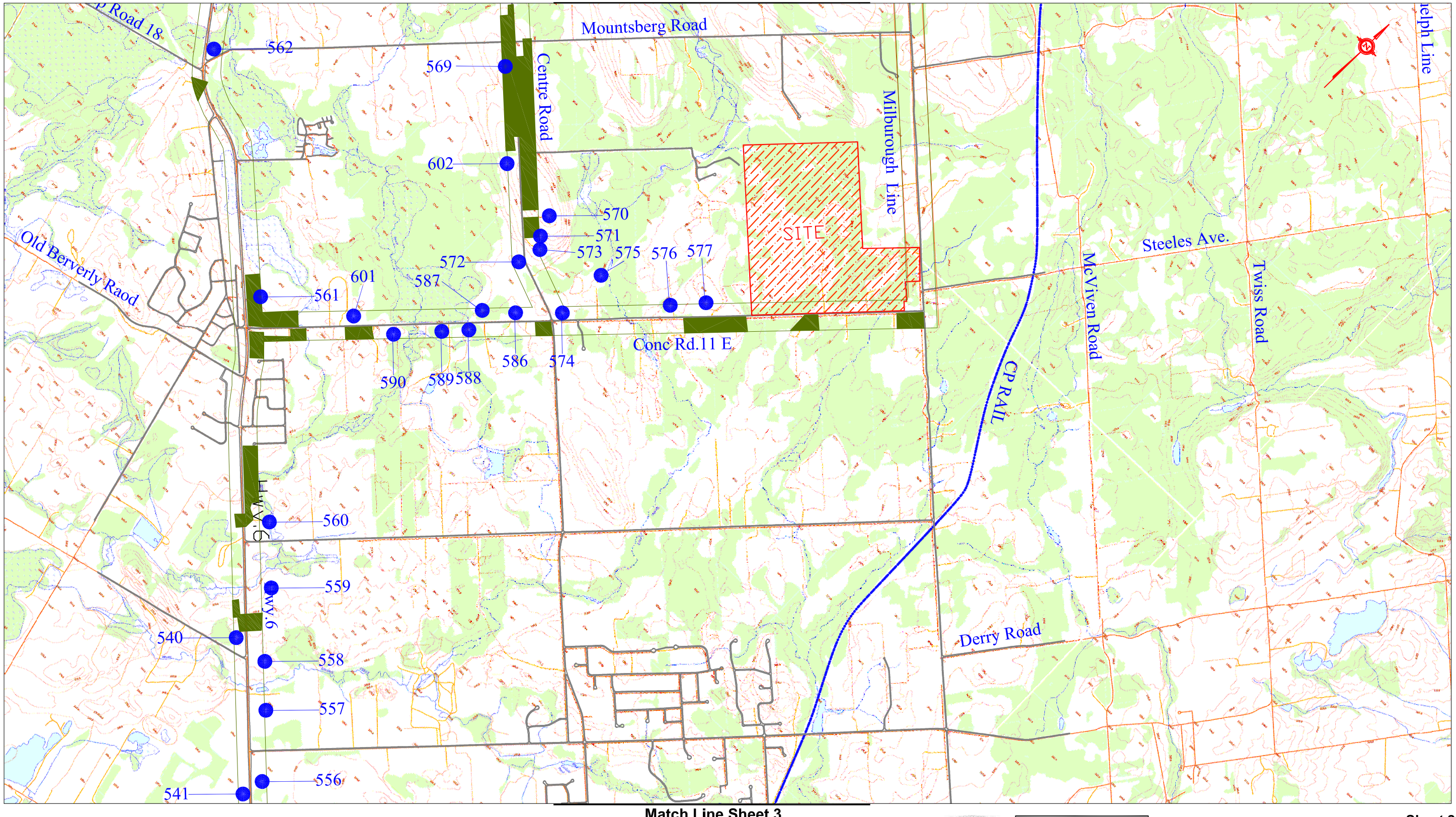
Sheet 1
Map 2 Agricultural Facilities and Croplands
Along Haul Route Alternatives
Flamborough Quarry Expansion

Scale 1:30,000

August 2008

iTRANS

Match Line Sheet 1



Match Line Sheet 3

LEGEND
535 AGRICULTURAL FACILITY
CROPLANDS

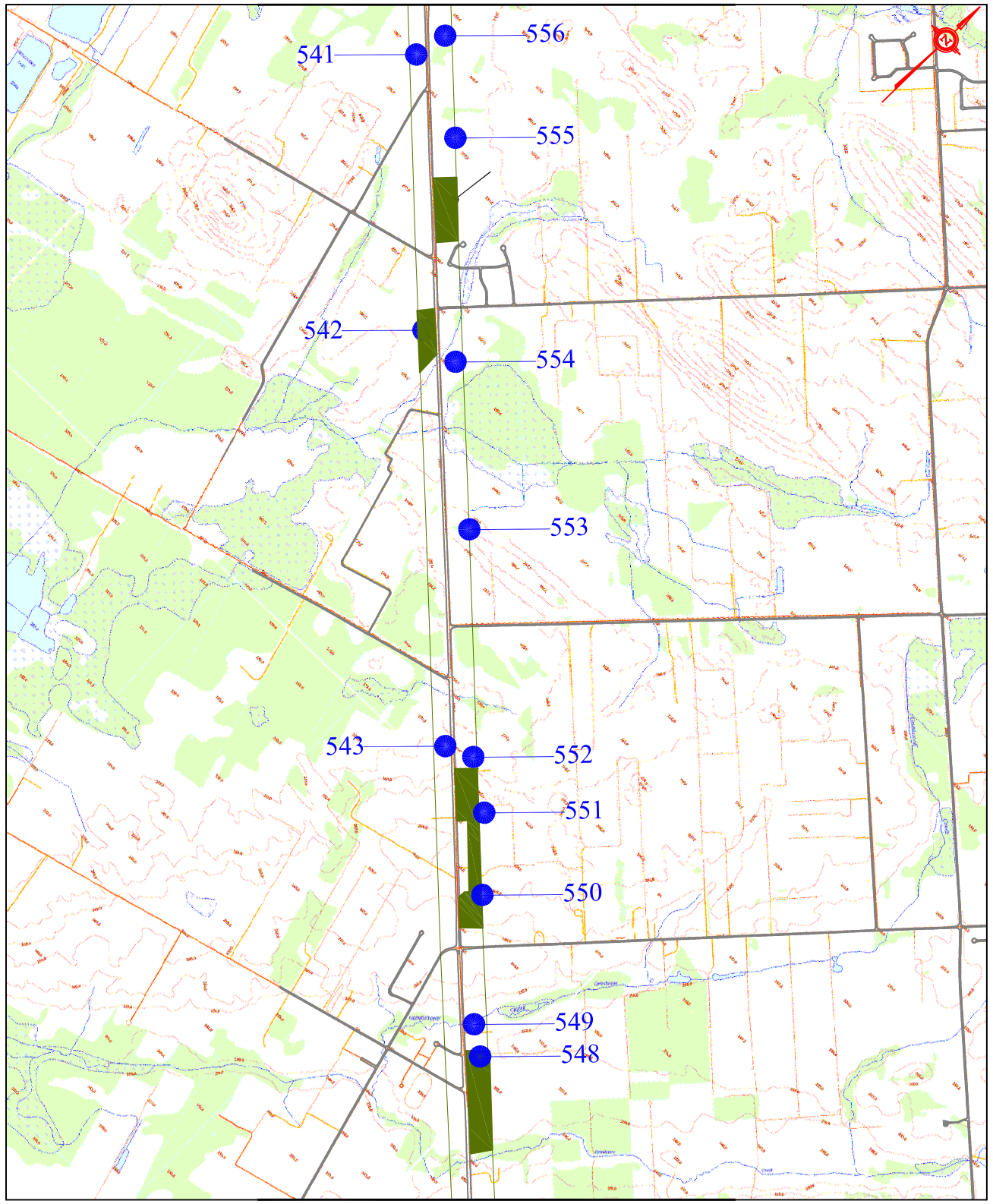
Sheet 2
Map 2 Agricultural Facilities and Croplands
Along Haul Route Alternatives
Flamborough Quarry Expansion

Scale 1:30,000

August 2008

iTRANS

Match Line Sheet 2



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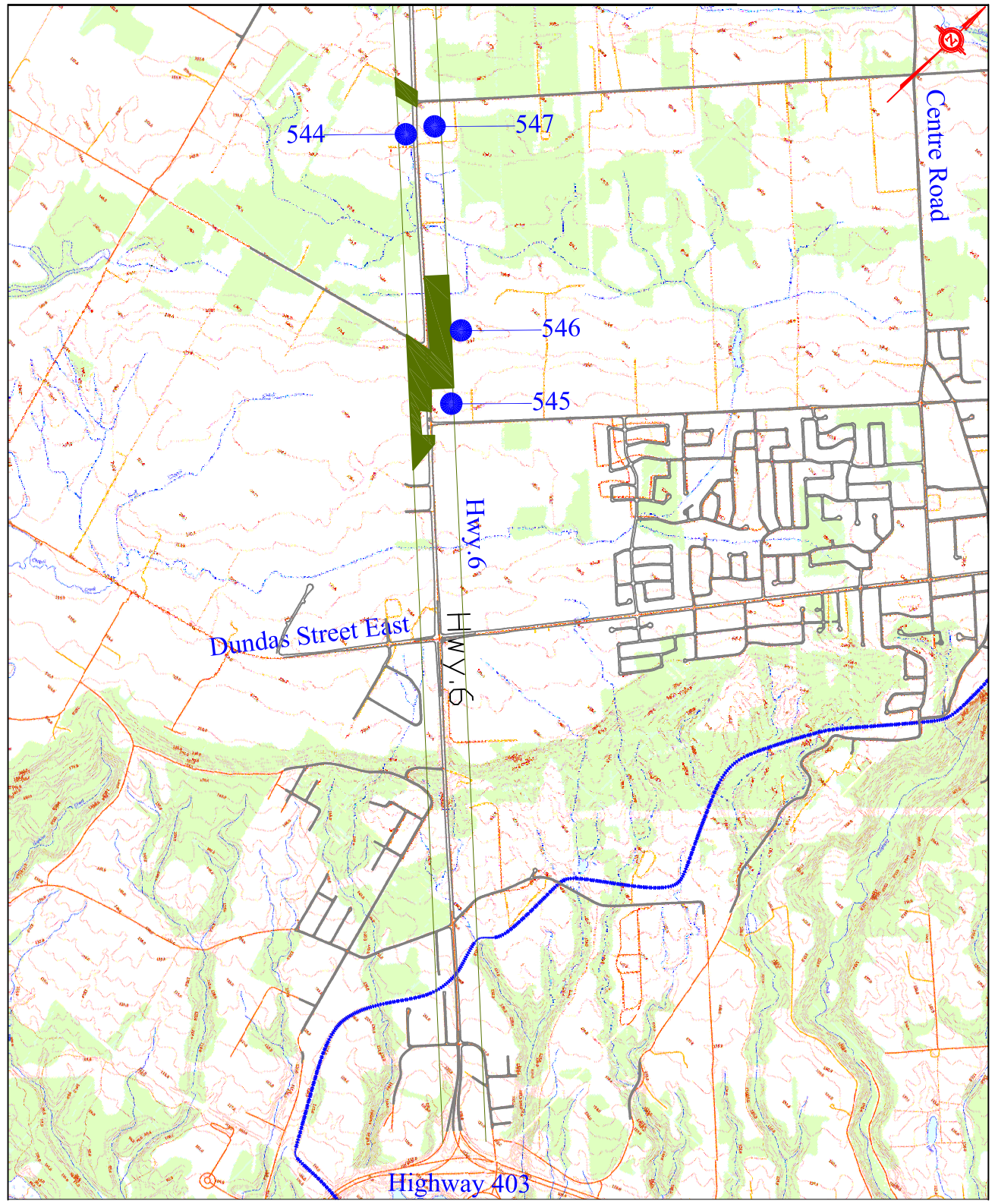

LEGEND

535 AGRICULTURAL FACILITY

CROPLANDS

Sheet 3

Map 2 Agricultural Facilities and Croplands

Along Haul Route Alternatives

Flamborough Quarry Expansion

Scale 1:30,000

August 2008

iTRANS

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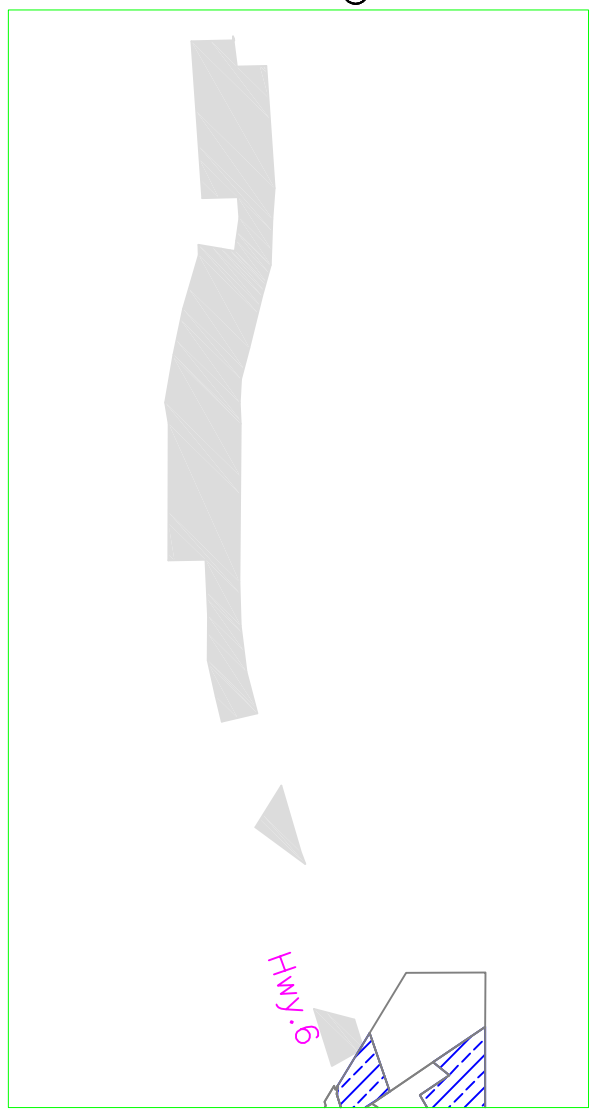

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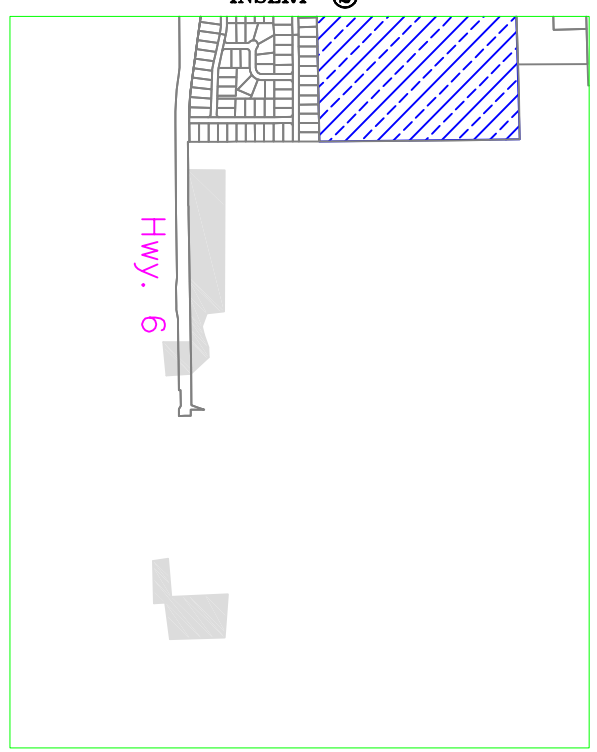

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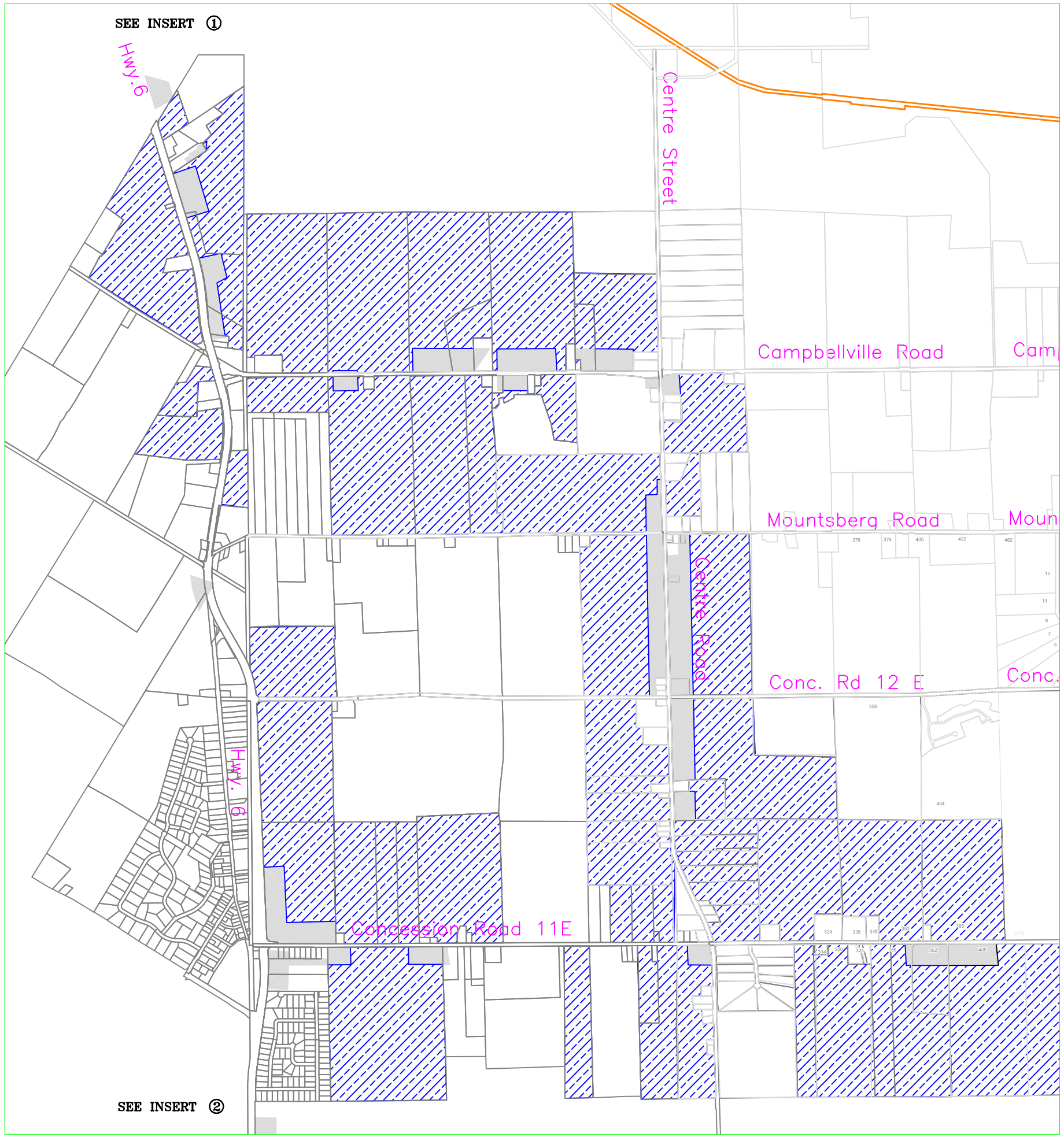


LEGEND

Farmland

Cropland

TITLE

MAP 3 : Farmland and Cropland Adjacent to Haul Routes

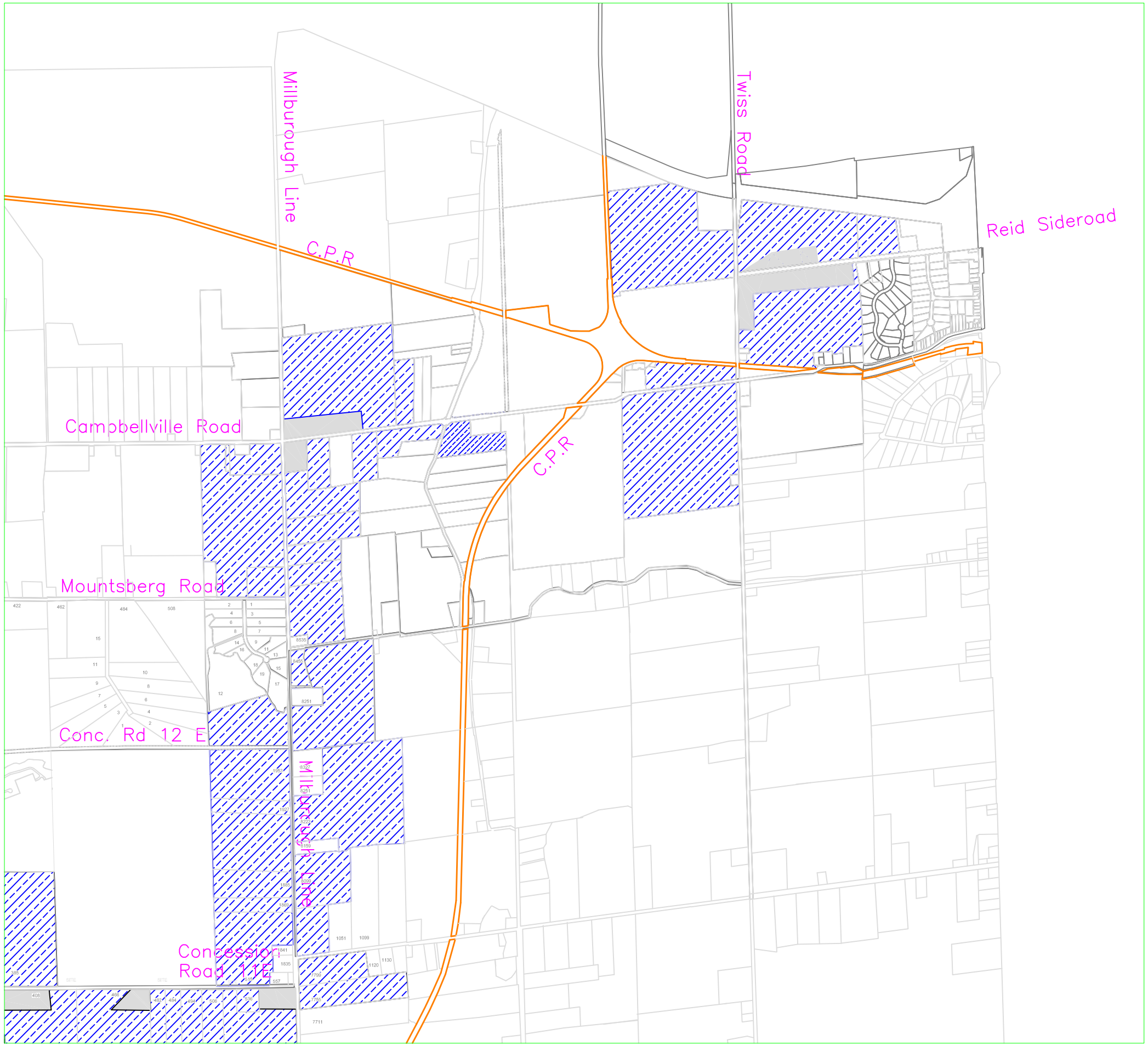
PROJECT

St Marys Cement
Flamborough Quarry
Haul Route Study

SCALE 1:5000

DATE August 21 2008

SHEET No. 1



LEGEND

Farmland

Cropland

TITLE

MAP 3 : Farm and Crop Land Adjacent to Haul Routes

PROJECT

St Marys Cement
Flamborough Quarry
Haul Route Study

SCALE 1:5000

DATE: August 21 2008

SHEET No. 2

Appendix A

Cross Section Design and Analysis

Cross-section Design and Analysis

For this study two types of cross-sections are proposed: rural (requires property acquisition) and urban (within the existing right-of-way). For the purpose of the analysis the rural cross-section was applied as it has the most significant impacts due to property acquisition and was therefore deemed more conservative. However, given the challenges that can be associated with land acquisition, the urban design that fits the existing right-of-way was also given consideration. It was concluded that this design would not require land acquisition however it would have a more significant impact on the existing character of the road and has a higher associated cost of construction.

Figure 1, Figure 2, Figure 3, and Figure 4 illustrate the proposed road bed design and shows rural and urban alternative cross-sections for both Type 1 and Type 3 sections.

Type 1

With the rural cross-section the proposed right-of-way is 2.0m greater than the existing 20m right of way. This cross-section allows for 3.75m travel lanes, 1.0m paved shoulder, 0.5m gravel shoulder, 0.5m rounding, and a drainage ditch.

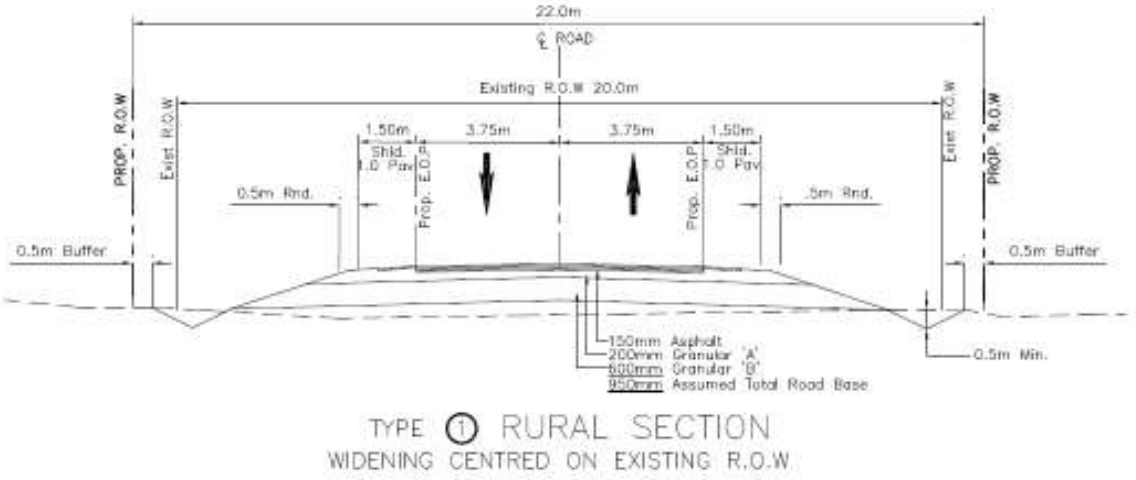


Figure 1: Type 1 Rural Cross-Section

With the urban cross-section the proposed right-of-way fits into the existing 20m right-of-way. The cross-section allows for 3.75m travel lanes, and a 1.5m paved shoulder with curb and gutter.

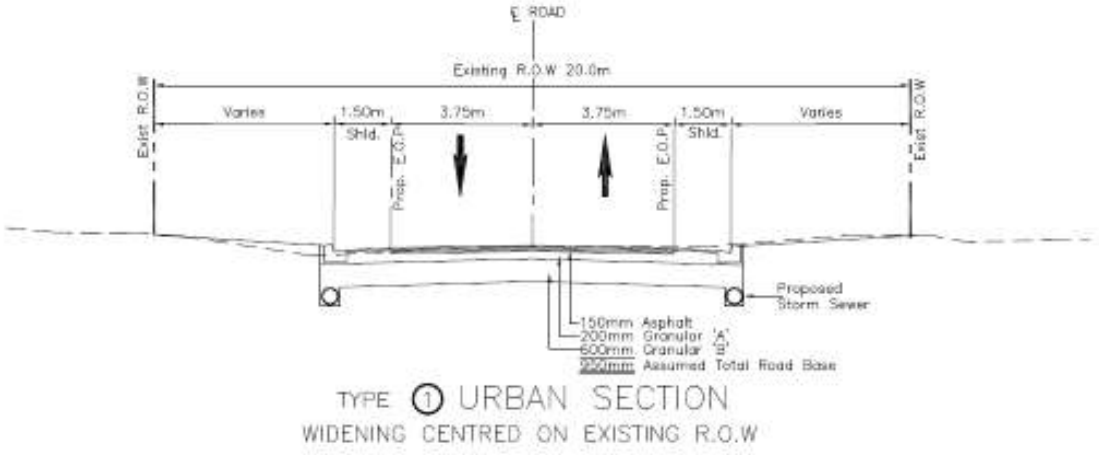


Figure 2: Type 1 Urban Cross-Section

Type 3

With the rural cross-section the proposed right-of-way is 3m to 7.5m greater than the existing right-of-way depending on the varying existing cross-section. This cross-section allows for 3.75m travel lanes, 1.0m paved buffer, 1.5m paved bike lane, 1.0m gravel shoulder, 0.5m rounding, a drainage ditch and a 0.5m buffer.

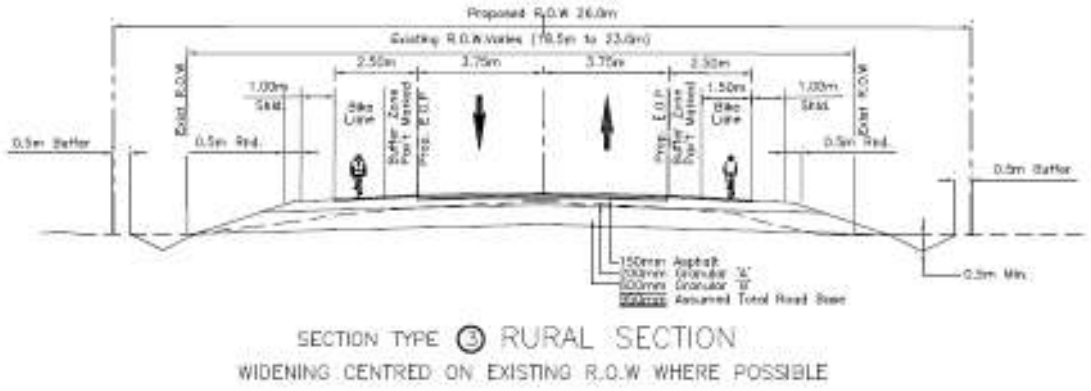


Figure 3: Type 3 Rural Cross-Section

With the urban cross-section the proposed right-of-way can be fit into the existing right-of-way that varies from 18.5m to 23m. The cross-section allows for 3.75m travel lanes, a 1.0m paved buffer, a 1.5m paved bike lake, and curb and gutter with a minimum boulevard of 3m.

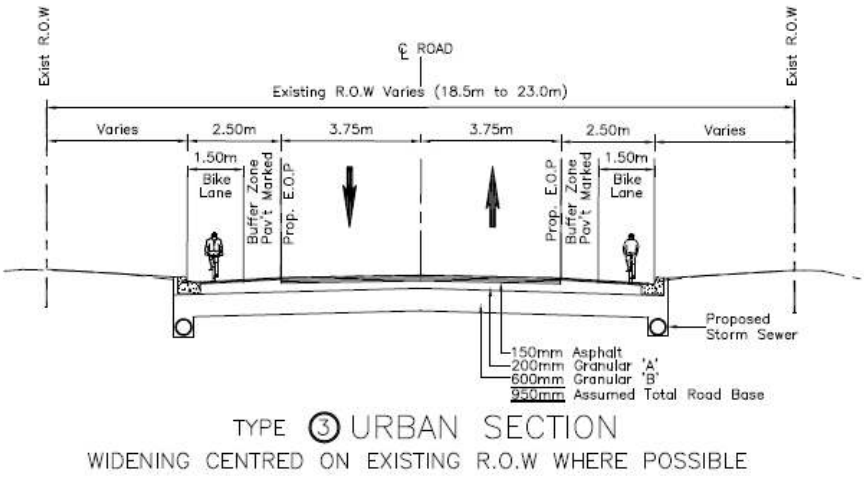


Figure 4: Type 3 Urban Cross-Section

It is important to note that both Type 1 and Type 3 section designs do not account for any changes in the existing profile and assume that widening is at existing profile grade.

While the urban cross-section fits into the existing right-of-ways, the storm sewer infrastructure and appurtenances increase the construction costs approximately 50 percent over the rural design. It is a trade off between the cost (and challenge) of purchasing land and constructing a more expensive infrastructure.

Applying the rural cross-section that would require land acquisition is a conservative approach for haul route comparative evaluation purposes. The decision on which cross-section to move forward with would be decided at the detailed design stage of an Environmental Assessment when pavement recommendations are finalized. Typically, resolution of the design details would occur during the subsequent Municipal Class EA process.