
SURFACE WATER ASSESSMENT REPORT

WOOLWICH BIO-EN INC

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Project No.: 2007-0359-10

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BIO-EN INC

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DRAWINGS

1.0 INTRODUCTION

The following Surface Water Assessment Report was prepared by the Walter Fedy Partnership in support of the Woolwich Bio-En Inc. Renewable Energy Plant proposed in Elmira, Ontario. The objective of this report is to provide the design details for the proposed stormwater management system for approval by the Township of Woolwich in compliance with Section 53 of the Ontario Water Resources Act and Ontario Regulation 359/09 made under the Environmental Protection Act Renewable Energy Approvals Under Part V.0.1 of the Act.

The proposed facility is located at the Martin's Lane extension, in the Township of Woolwich, in Elmira, Ontario, as shown in Drawing C1-1. The proposed site is approximately 1.5 ha with no off site contributing drainage area. The proposed development will comprise a renewable energy facility that includes a repository tank, digester and process tanks, a loading and receiving area, support and operations buildings, bio-filters and a waste gas flare as shown on Drawing C1-2.

2.0 SITE DESCRIPTION

The site is sloped from north to south, beginning at the crest of a local high point and extending south to the Martin's Lane extension. The site is former agricultural land with topsoil over clay deposits extending to a depth in excess of 3 m.

Groundwater inflow into any excavation on site necessary in support of construction is not anticipated due to the large excavation on the neighbouring property that has effectively dewatered the immediate area.

At least 150 mm of OPSS Granular A should be used as pipe bedding for sewer and water pipes. The bedding material should extend to the spring line of the pipe and should be compacted to at least 95 percent of the standard Proctor maximum dry density using suitable vibratory compaction equipment. Cover material, from spring line of the pipe to at least 300 mm above the top of pipe, should consist of OPSS Granular A or Granular B Type I with a maximum particle size of 25 mm. It should generally be possible to re-use the glacial till, weathered silty clay and silty soils as trench backfill. Where the trench will be covered with hard surfaced areas, the type of native material placed in the frost zone (between sub-grade level and 1.8 m depth) should match the soil exposed on the trench walls for frost heave compatibility. Trench backfill should be placed in maximum 300 mm thick lifts and should be compacted to at least 95 percent Standard Proctor Maximum Dry Density (SPMDD) using suitable compaction equipment.

3.0 EXISTING CONDITIONS

The site is presently an agricultural parcel of land. The site is characterized by a local high ridge that divides flow between that area contributing to Canagagigue Creek and the area draining to Cox Creek which outlets to Canagagigue Creek. The site is entirely within the Canagagigue Creek drainage basin. The land has no existing services and Martin's Lane must be extended to provide access to the site.

Runoff from the site currently flows west along the north side of Martin's Lane to a culvert that flows under Martins Lane and under the industrial/manufacturing facility building south of Martins Lane. The culvert discharges to a municipal swale that drains directly to Canagagigue Creek. Stormwater from the site will be collected and treated on site such that the final outflow will meet Ministry of the Environment (MOE) and Grand River Conservation Authority (GRCA) requirements. An on site wet pond is proposed for quality and quantity control, in conjunction with lot level controls and best management practices to provide protection of downstream watercourses. The proposed stormwater management facility will be constructed concurrently with servicing of the development.

The property immediately adjacent on the west and across Martin's Lane to the south is industrial. The property to the north and east is undeveloped but zoned future industrial.

3.1 Surface Water Assessment

The following section is intended to provide information satisfactory to meet the requirements of Ontario Regulation 359/09.

Site drainage ultimately discharges to Canagagigue Creek which is part of the Grand River Watershed as regulated by the Grand River Conservation Authority (GRCA). Approval of the site development plan falls under the municipal authority of the Township of Woolwich and is not within the GRCA's authority for approval. The site is located greater than 300 m from Canagagigue Creek. The drainage path from the site to Canagagigue Creek is comprised of approximately 150 m of roadside swale, 130 m of culvert and 180 m of municipal swale.

The site is outside of any regulatory limits established by the GRCA. Regulatory mapping available from the GRCA website is provided in Appendix A. The figure illustrates the local regulatory limits and proximity of the site to Canagagigue Creek.

The site is not within the jurisdiction of the Niagara Escarpment Commission.

4.0 PROPOSED SERVICING

4.1 Water Distribution Design

An existing 150 mm diameter watermain is located in Martin's Lane that will be tapped into with a 100 mm diameter PVC service to provide potable water to the site.

4.2 Sanitary Design

An existing 150 mm diameter sanitary sewer is located in Martin's Lane that terminates at a manhole along the frontage of the existing industrial and commercial buildings along Martin's Lane. A 150 mm sanitary sewer service will be constructed from the site to this manhole within the traveled portion of the private road.

4.3 Storm Sewer Design

Stormwater drainage on Martin's Lane is relatively informal and is comprised of a series of swales and overland sheet flow draining to a low point on the north side of Martin's Lane. A culvert collects runoff from this location and conveys it under a building on the south side of Martin's Lane and drains to a municipal/agricultural drain discharging to Canagagigue Creek.

Stormwater from the site will be collected and treated in accordance with the Township of Woolwich requirements such that the final outflow will meet MOE, GRCA, and township requirements. A stormwater management facility will be constructed to provide end of pipe quality and quantity control. This facility, in conjunction with lot level controls, and sedimentation and erosion control practices during construction, will provide protection of downstream watercourses. Further stormwater management details are provided in Section 5 of this report.

5.0 STORMWATER MANAGEMENT

5.1 Stormwater Management Requirements

Regulatory agencies were consulted at the pre-design stage and as part of a previous site layout to determine the requirements for managing stormwater from the site. These agencies included the Township of Woolwich, GRCA and the MOE. The following list summarizes the principal stormwater issues considered in the design:

- Maintain the existing drainage characteristics;
- Minimize impacts from development on Canagagigue Creek, provide Normal protection (70% TSS removal);
- Provide site controls to ensure that no increase in peak flow results from the development;
- Address operations and maintenance issues; and
- Develop an erosion and sediment control plan for implementation during construction.

5.2 Drainage Areas

The overall drainage area is approximately 1.55 ha, as shown on Drawing C2-1. This includes the actual site property limits and grading around the site that will result in surface drainage discharging onto the site and being treated by the on site stormwater management system. No alterations to the existing drainage patterns are proposed as part of the site development activities.

5.3 Hydrologic Analysis

5.3.1 *Rainfall Data*

Synthetic rainfall hyetographs using a Chicago distribution were provided by the Township of Woolwich. The parameters used to characterize these hyetographs are summarized in Table 1.

5.3.2 *Watershed Data*

Input parameters used to characterize the site under pre and post development conditions are presented in Table 2.

5.3.3 *Hydrograph Generation*

The MIDUSS computer model was used to generate hydrographs and calculate peak flow rates and runoff volumes for 5, 25 and 100-year Chicago design storms. The site is characterized by a single catchment under both existing and proposed conditions. The calculated runoff volumes for each storm under pre and post development conditions are summarized in Table 3. The peak runoff rates from the rainfall events are summarized in Table 4. Detailed MIDUSS output files are provided in Appendix B.

5.4 Stormwater Management Controls and Best Management Practices

The site is proposed to feature a series of drainage swales draining to a stormwater management facility in accordance with the MOE Stormwater Management Planning and Design (SWMPD) Manual, 2003.

5.4.1 *Site Level and Conveyance Controls*

Site grading follows existing conditions and drains from north to south consistent with the existing topography. Surface sheet flow is proposed from all paved surfaces given the generous amount of topographic fall on the site. This runoff is captured by on site swales and directed to the on site stormwater management pond. Swales are grass lined in upland areas where limited surface runoff is conveyed by the swales. The primary swale draining to the stormwater management pond is proposed to be armoured with rock rip rap.

No infiltration measures are proposed due to the clay soils present on site.

5.4.2 *End of Pipe Facility*

An end of pipe facility in the form of a wet pond was selected for the site for the following reasons:

- a) The clayey soils will not support long term infiltration techniques including a dry pond.
- b) A fire pond is necessary to supplement municipal water supply. The permanent pool in the stormwater management pond will provide storage for water suitable for firefighting requirements.
- c) Water retained in the permanent pool of the stormwater management pond will be used to supplement on site industrial processes and captured stormwater runoff will replenish this supply.

The stormwater management wet pond was designed to provide both quality and quantity control. The pond is designed to provide Normal (70% long-term suspended solids removal) quality control, in accordance with MOE guidelines, and to reduce the peak flow rate after development to less than pre-development levels for the 5-year and 100-year rainfall events. Supporting design calculations are provided in Appendix C.

While a “normal” level of treatment is appropriate considering the length of urban swale that the discharge will be conveyed through prior to discharge to Canagagigue Creek (which will provide passive treatment also), it is noted that the proposed pond exceeds the requirements for an “Enhanced” level of protection as described in the MOE SWMPD Manual.

5.4.2.1 *Stormwater Quantity Control*

The stormwater pond is designed to provide quantity control for the 5 through 100 year storm events via a staged pond outlet structure. Low flows are released from the pond via a 200 mm diameter outlet pipe. High flows are released from the pond via a 1.4 m wide emergency overflow weir. This overflow weir will release water during the 25 year and larger storm events. This control is designed to reduce the peak flow rate from land north of Martin’s Lane (at the pond outlet) so that the peak flow combined with flow from Elmira Machine Industries, to the west at the culvert under Martins Lane and the industrial building south of Martin’s Lane, is less than the peak flow under existing conditions. A summary of the stage-storage relationship for the pond is presented in Appendix C. Discharges from the outlet structure were calculated using the algorithms in the MIDUSS model.

5.4.2.2 *Stormwater Quality Control*

Quality control is required for the proposed site. Quality treatment requirements shall be met through provision of an appropriate permanent pool volume in the wet pond sized in accordance with table 3.2 of the MOE SWM PD Manual.

The low flow pond outlet is equipped with a sluice gate that may be closed in the event of a spill on the property. In the closed position, the pond will provide a minimum capture volume of 389 cubic metres prior to discharge occurring via the emergency overflow weir.

5.4.2.3 *Pond Volumes*

The overall impervious level for the site is estimated to be 55%. The water quality storage volume requirements for a wet pond providing Normal protection is 110 m³/ha, assuming a 55% impervious level (refer to Table 3.2 of the SWMPD Manual). This represents 70 m³/ha for permanent pool and 40 m³/ha for extended detention storage. The total required storage volumes for this design, assuming 1.55 ha and 55% impervious level are approximately 108 m³ for the permanent pool and 62 m³ for extended detention.

As proposed the permanent pool provides a volume of 489 m³; the required extended detention volume is provided above the permanent pool and represents a volume of 609 m³. Supporting design calculations for the required permanent pool and extended detention volumes and the stage volume relationship for the proposed pond is provided in Appendix C. The performance of the proposed pond was evaluated using MIDUSS and the results are summarized in Table 5.

5.4.2.4 *Length to Width Ratio*

The limited size of the stormwater management pond, topographic, and spatial constraints on the site lead to a design that has a length to width ratio of approximately 2:1.

5.4.2.5 *Sediment Forebay*

No forebay is proposed since the site will have limited vegetated areas that may be subject to erosion and the relatively small size of the pond will facilitate rapid clean out of the entire pond should the need to conduct sediment removal arise.

5.4.2.6 *Outlet Design*

The release rate from the extended detention pond is controlled by the size of the outlet pipe and the overflow weir. The outlet is designed to minimize the potential for clogging and to provide attenuation of the peak flows to predevelopment levels calculated using MIDUSS and as per Township requirements.

5.5 **Site Grading and Planting Strategy**

Site grading is intended to create a manageable work area that is relatively flat on the existing hill slope. The slope of the site will remain consistent with the existing drainage direction with steeper slopes at the north and south ends of the site and a gentler slope through the middle section where the site operations will occur.

Landscaping is proposed along the frontage in accordance with township requirements as illustrated on the site plan, Drawing C2-1. Limited planting is proposed in the pond due to the potential requirement to utilize the pond for fire fighting activities and the potential for accumulated vegetative matter to clog the intake.

5.6 **Erosion and Sediment Control During Construction**

Sediment and erosion controls to be implemented during construction shall include a perimeter silt fence, coir log check dams, rock check dams, intermediate silt fence, temporary vegetation, rock rip rap channel linings and geo-textile erosion control matting in accordance with the sediment and erosion control plan. Sediment traps shall be inspected to ensure that they have been properly installed and continue to function as designed. The controls shall be maintained and accumulated sediments removed once their capture capacity has been decreased by one-third. The outlets shall also be inspected for signs of sediment migration off site. In the event that sediments have migrated off site, additional sediment controls shall be implemented as necessary to ensure that no additional sediment escapes from the site and any sediment that has migrated off site shall be removed.

The permanent sediment basin shall be constructed initially and dredged prior to commissioning of the site to ensure optimal operational efficiency.

It is proposed that during construction activities, visual monitoring will be conducted bi-weekly and within 24 hours of any rainfall event of 12 mm or greater. During the construction period, monitoring shall consist of visual observation for the effectiveness of the sediment and erosion controls and sediment migration off-site. The monitoring program conducted during construction shall consist of visual inspections and a written log. A sample inspection form is provided in Appendix D.

Construction inspections shall be conducted until such time as the construction activities are complete and vegetation has established itself to a density equivalent to 70 percent of the background native vegetation density.

5.7 Operation and Maintenance

Maintenance is an important part of any drainage system, and particularly for urban stormwater management systems. The stormwater management pond shall be inspected annually to assess the accumulation of sediment in the bottom of the pond. Sediment accumulation in excess of 0.3 m will result in decreased performance of the fire flow intake pumps should it be necessary to operate the system. All sediment shall therefore be removed from the pond once accumulation of sediment has reached 0.3 m as measured using a staff gauge installed in the bottom of the pond. A log shall be kept documenting the annual inspections and any maintenance activities.

6.0 SUMMARY OF DESIGN ELEMENTS, CONCLUSION AND RECOMMENDATIONS

Sanitary and water systems for the proposed development will be extensions of existing municipal systems, which currently have adequate capacities. The proposed work elements are as follows:

1. 100 mm diameter PVC water service - 350 m
2. 150 mm diameter PVC sanitary sewer service - 312 m

Stormwater from the site will be collected and treated in accordance with the Township of Woolwich development criteria such that the final outflow will meet MOE and GRCA requirements. The proposed work elements are as follows:

1. 210 m grassed swales
2. 45 m rip rap lined swale
3. 1 wet pond having a depth of 3.8 m and a permanent pool volume of 489 m³ and an extended detention storage volume of 609 m³ featuring a sluice gate that may be closed in the event of a spill on site.

This surface water assessment report describes how site conveyance controls are designed to minimize the impact of the proposed development on the municipal and private stormwater collection system and receiving waters. An end of pipe stormwater management wet pond complete with a sluice gate is designed to provide Normal quality control and to reduce peak flow rates after development to pre-development levels for events up to the 1:100 year event. The elements of the Stormwater Management Pond are described in Section 5.5 and are detailed on DWG. C2-1.

Sediment and erosion control methods will be implemented during construction of the site in order to minimize construction impacts on downstream watercourses. Maintenance requirements for this development will be typical of conventional storm sewer systems and wet ponds, and will consist primarily of periodic inspection, removal of sediments, and landscape maintenance.

All of which is respectfully submitted,

The Walter Fedy Partnership
ENGINEERING SERVICES GROUP
Engineers • Project Managers

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TABLES

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- Table 1 Design Storm Parameters
- Table 2 Hydrologic Model Catchment Parameters
- Table 3 Summary of Runoff Volumes
- Table 4 Summary of Runoff Peak Flows
- Table 5 Summary of Pond Performance

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TABLE 1

WOOLWICH TOWNSHIP
DESIGN STORM PARAMETERS
STORMWATER MANAGEMENT PLAN
WOOLWICH BIO-EN INC.
ELMIRA, ONTARIO

<i>Design Storm</i>	<i>Parameters</i>			<i>r</i>	<i>Duration (min)</i>
	<i>a</i>	<i>b</i>	<i>c</i>		
5	1755	12.347	0.895	0.4	180
25	3261	16.193	0.938	0.4	180
100	4692	17.437	0.956	0.4	180

TABLE 2
HYDROLOGIC MODEL CATCHMENT PARAMETERS
STORMWATER MANAGEMENT PLAN
WOOLWICH BIO-EN INC.
ELMIRA, ONTARIO

<i>Catchment</i>	<i>Description</i>	<i>Area (hectares)</i>	<i>W (metres)</i>	<i>L (metres)</i>	<i>Slope (%)</i>	<i>Pervious Manning's Number (n)</i>	<i>Impervious Manning's Number (n)</i>	<i>SCS Runoff Curve No.</i>	<i>Percent Impervious³</i>	<i>Pervious Runoff Coefficient</i>	<i>Impervious Runoff Coefficient</i>	<i>Pervious Ia/S Coefficient</i>	<i>Impervious Ia/S Coefficient</i>	<i>Pervious Initial Abstraction</i>	<i>Impervious Initial Abstraction</i>
Existing Conditions															
100		1.546	120.0	130.0	4.7	0.250	0.015	87	0	98.00	0.49	0.1	0.1	3.795	2.000
Proposed Conditions															
1		1.546	120.0	130.0	4.7	0.250	0.015	87	56	98.00	0.87	0.1	0.1	3.795	2.000

TABLE 3

SUMMARY OF RUNOFF VOLUMES
 STORMWATER MANAGEMENT PLAN
 WOOLWICH BIO-EN INC.
 ELMIRA, ONTARIO

<u>Existing Conditions</u>			
	<u>5-Year</u>	<u>25-Year</u>	<u>100-Year</u>
	(m ³)	(m ³)	(m ³)
100	362	639	924

<u>Post-Development Conditions (with detention)</u>			
	<u>5-Year</u>	<u>25-Year</u>	<u>100-Year</u>
	(m ³)	(m ³)	(m ³)
1	511	814	1111

TABLE 4

SUMMARY OF RUNOFF PEAK FLOWS
 STORMWATER MANAGEMENT PLAN
 WOOLWICH BIO-EN INC.
 ELMIRA, ONTARIO

<u>Existing Conditions</u>			
	<u>5-Year</u>	<u>25-Year</u>	<u>100-Year</u>
	(m ³ /s)	(m ³ /s)	(m ³ /s)
100	0.103	0.232	0.372
<u>Post-Development Conditions (prior to detention)</u>			
	<u>5-Year</u>	<u>25-Year</u>	<u>100-Year</u>
	(m ³ /s)	(m ³ /s)	(m ³ /s)
1	0.246	0.363	0.492
<u>Post-Development Conditions (post detention)</u>			
	<u>5-Year</u>	<u>25-Year</u>	<u>100-Year</u>
	(m ³ /s)	(m ³ /s)	(m ³ /s)
1	0.063	0.117	0.242

TABLE 5

SUMMARY OF POND PERFORMANCE
 STORMWATER MANAGEMENT PLAN
 WOOLWICH BIO-EN INC.
 ELMIRA, ONTARIO

<u>Pond</u>				
<i>Design Storm</i>	<i>Inflow (m³/s)</i>	<i>Outflow (m³/s)</i>	<i>Maximum Depth (m)</i>	<i>Storage (m³)</i>
5-Year	0.246	0.063	357.289	255
25-Year	0.363	0.117	357.556	424
100-Year	0.492	0.242	357.669	504

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APPENDIX A

GRCA Regulation Limit Mapping



bioen 2500

LEGEND

- WATERSHED MASK
- BUILDING - SYMBOLIZED (NRVIS)
- BUILDING - TO SCALE (NRVIS)
- WATERSHED BOUNDARY (GRCA)
- UTILITY LINE (NRVIS)
- ROADS-ADDRESSED (MNR)
- RAILWAY (NRVIS)
- DRAINAGE-NETWORK (GRCA)
- FLOODPLAIN (GRCA)
- ENGINEERED
- APPROXIMATE
- ESTIMATED
- PARKS (GRCA)
- REGULATION LIMIT (GRCA)
- DRAINAGE-POLY (NRVIS)
- WOODED AREA (MNR)
- HEDGEROW
- PLANTATION
- TREEED

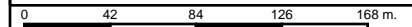


GRCA Disclaimer

This map is for illustrative purposes only. Information contained hereon is not a substitute for professional review or a site survey and is subject to change without notice. The Grand River Conservation Authority takes no responsibility for, nor guarantees, the accuracy of the information contained on this map. Any interpretations or conclusions drawn from this map are the sole responsibility of the user.

The source for each data layer is shown in parentheses in the map legend. For a complete listing of sources and citations go to:

<http://grims.grandriver.ca/docs/SourcesCitations2.htm>



NAD 1983, UTM Zone 17

Scale 1:3,699



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APPENDIX B

Hydrologic Model Output Files

```

"          MIDUSS Output ----->"
"          MIDUSS version                      Version 2.25  rev. 467"
"          MIDUSS created                      July 6, 2008"
"          10  Units used:                      ie METRIC"
"          Job folder:                          P:\2007\"
"          2007-0359-10_Bio-en_Power-
Elmira_Site\9._Engineering\26_Civil\Miduss"
"          Output filename:                      5.out"
"          Licensee name:
"          Company
"          Date & Time last used:                20/01/2010 at 11:44:57 AM"
" 31          TIME PARAMETERS"
"          5.000  Time Step"
"          180.000  Max. Storm length"
"          1500.000  Max. Hydrograph"
" 81          ADD COMMENT===== "
"          5  Lines of comment"
"          *****"
"          Job Name: Elmira Bio-en Inc."
"          Job Number: 2007-0359-10"
"          5 Year Storm"
"          *****"
" 32          STORM Chicago storm"
"          1  Chicago storm"
"          1755.000  Coefficient A"
"          12.347  Constant B"
"          0.895  Exponent C"
"          0.400  Fraction R"
"          180.000  Duration"
"          1.000  Time step multiplier"
"          Maximum intensity          136.512  mm/hr"
"          Total depth                47.549  mm"
"          4  5hyd  Hydrograph extension used in this file"
" 81          ADD COMMENT===== "
"          3  Lines of comment"
"          *****"
"          Pre-development Condition - Onsite"
"          *****"
" 33          CATCHMENT 100"
"          1  Triangular SCS"
"          1  Equal length"
"          1  SCS method"
"          100  pre-development"
"          0.000  % Impervious"
"          1.546  Total Area"
"          130.000  Flow length"
"          4.700  Overland Slope"
"          1.546  Pervious Area"
"          130.000  Pervious length"
"          4.700  Pervious slope"
"          0.000  Impervious Area"
"          130.000  Impervious length"
"          4.700  Impervious slope"
"          0.250  Pervious Manning 'n'"
"          87.000  Pervious SCS Curve No."
"          0.492  Pervious Runoff coefficient"
"          0.100  Pervious Ia/S coefficient"

```

```

"      3.795 Pervious Initial abstraction"
"      0.015 Impervious Manning 'n'"
"    98.000 Impervious SCS Curve No."
"      0.000 Impervious Runoff coefficient"
"      0.100 Impervious Ia/S coefficient"
"      0.518 Impervious Initial abstraction"
"          0.108      0.000      0.000      0.000 c.m/sec"
"      Catchment 100      Pervious      Impervious      Total Area  "
"      Surface Area      1.546      0.000      1.546      hectare"
"      Time of concentration  25.947      3.723      25.946      minutes"
"      Time to Centroid      127.297      91.261      127.297      minutes"
"      Rainfall depth      47.549      47.549      47.549      mm"
"      Rainfall volume      735.11      0.00      735.11      c.m"
"      Rainfall losses      24.137      5.993      24.137      mm"
"      Runoff depth      23.412      41.556      23.412      mm"
"      Runoff volume      361.94      0.00      361.94      c.m"
"      Runoff coefficient      0.492      0.000      0.492      "
"      Maximum flow      0.108      0.000      0.108      c.m/sec"
"  81      ADD COMMENT=====
"          3      Lines of comment"
"          *****
"          Post-development Condition - Onsite"
"          *****
"  40      HYDROGRAPH Start - New Tributary"
"          2      Start - New Tributary"
"              0.108      0.000      0.000      0.000"
"  33      CATCHMENT 1"
"          1      Triangular SCS"
"          1      Equal length"
"          1      SCS method"
"          1      post-development"
"      53.100      % Impervious"
"      1.546      Total Area"
"    130.000      Flow length"
"      4.700      Overland Slope"
"      0.725      Pervious Area"
"    130.000      Pervious length"
"      4.700      Pervious slope"
"      0.821      Impervious Area"
"    130.000      Impervious length"
"      4.700      Impervious slope"
"      0.250      Pervious Manning 'n'"
"    87.000      Pervious SCS Curve No."
"      0.492      Pervious Runoff coefficient"
"      0.100      Pervious Ia/S coefficient"
"      3.795      Pervious Initial abstraction"
"      0.015      Impervious Manning 'n'"
"    98.000      Impervious SCS Curve No."
"      0.874      Impervious Runoff coefficient"
"      0.100      Impervious Ia/S coefficient"
"      0.518      Impervious Initial abstraction"
"          0.246      0.000      0.000      0.000 c.m/sec"
"      Catchment 1      Pervious      Impervious      Total Area  "
"      Surface Area      0.725      0.821      1.546      hectare"
"      Time of concentration  25.947      3.723      11.107      minutes"
"      Time to Centroid      127.297      91.261      103.234      minutes"
"      Rainfall depth      47.549      47.549      47.549      mm"

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"          Rainfall volume          344.77      390.34      735.11      c.m"
"          Rainfall losses           24.137      5.993      14.503      mm"
"          Runoff depth              23.412      41.556      33.046      mm"
"          Runoff volume             169.75      341.15      510.90      c.m"
"          Runoff coefficient         0.492      0.874      0.695      "
"          Maximum flow              0.050      0.229      0.246      c.m/sec"
" 40      HYDROGRAPH Add Runoff "
"          4  Add Runoff "
"              0.246      0.246      0.000      0.000"
" 54      POND DESIGN"
"          0.246  Current peak flow    c.m/sec"
"          0.105  Target outflow    c.m/sec"
"          510.9  Hydrograph volume    c.m"
"          7.    Number of stages"
"          356.800  Minimum water level    metre"
"          1.500  Maximum water level    metre"
"          356.800  Starting water level    metre"
"          0      Keep Design Data: 1 = True; 0 = False"
"              Level Discharge    Volume"
"          356.800      0.000      0.000"
"          357.000      0.01808      95.400"
"          357.300      0.06436      260.700"
"          357.500      0.07615      386.500"
"          357.600      0.1505      454.400"
"          357.700      0.2852      525.700"
"          357.800      0.4625      600.400"
"          1.    WEIRS"
"              Crest    Weir    Crest    Left    Right"
"              elevation coefficie breadth sideslope sideslope"
"          357.500      0.900      1.400      0.330      0.330"
"          1.    OUTFLOW PIPE"
"              Upstream Downstr'm    Pipe    Pipe    Manning    Entry"
"              invert    invert    Length    Diameter    'n'    loss Ke"
"          356.800      356.750      6.000      0.200      0.015      0.900"
"          Peak outflow              0.063      c.m/sec"
"          Maximum level              357.289      metre"
"          Maximum storage            254.680      c.m"
"          Centroidal lag              2.973      hours"
"          0.246      0.246      0.063      0.000 c.m/sec"
" 40      HYDROGRAPH Next link "
"          5  Next link "
"              0.246      0.063      0.063      0.000"
" 52      CHANNEL DESIGN"
"          0.063  Current peak flow    c.m/sec"
"          0.040  Manning 'n'"
"          0.    Cross-section type: 0=trapezoidal; 1=general"
"          0.000  Basewidth    metre"
"          3.000  Left bank slope"
"          3.000  Right bank slope"
"          1.000  Channel depth    metre"
"          1.000  Gradient    %"
"          Depth of flow              0.201      metre"
"          Velocity                    0.521      m/sec"
"          Channel capacity            4.562      c.m/sec"
"          Critical depth              0.155      metre"
" 38      START/RE-START TOTALS 1"
"          3  Runoff Totals on EXIT"

```

"	Total Catchment area	1.546	hectare"
"	Total Impervious area	0.821	hectare"
"	Total % impervious	53.100"	
" 19	EXIT"		

```

"          MIDUSS Output ----->"
"          MIDUSS version                      Version 2.25 rev. 467"
"          MIDUSS created                      July 6, 2008"
"          10 Units used:                      ie METRIC"
"          Job folder:                        P:\2007\"
"          2007-0359-10_Bio-en_Power-
Elmira_Site\9._Engineering\26_Civil\Miduss"
"          Output filename:                    25.out"
"          Licensee name:                      "
"          Company                            "
"          Date & Time last used:             20/01/2010 at 11:56:00 AM"
" 31          TIME PARAMETERS"
"          5.000 Time Step"
"          180.000 Max. Storm length"
"          1500.000 Max. Hydrograph"
" 81          ADD COMMENT===== "
"          5 Lines of comment"
"          *****"
"          Job Name: Elmira Bio-en Inc."
"          Job Number: 2007-0359-10"
"          25 Year Storm"
"          *****"
" 32          STORM Chicago storm"
"          1 Chicago storm"
"          3261.000 Coefficient A"
"          16.193 Constant B"
"          0.938 Exponent C"
"          0.400 Fraction R"
"          180.000 Duration"
"          1.000 Time step multiplier"
"          Maximum intensity          185.944 mm/hr"
"          Total depth                69.173 mm"
"          5 25hyd Hydrograph extension used in this file"
" 81          ADD COMMENT===== "
"          3 Lines of comment"
"          *****"
"          Pre-development Condition - Onsite"
"          *****"
" 33          CATCHMENT 100"
"          1 Triangular SCS"
"          1 Equal length"
"          1 SCS method"
"          100 pre-development"
"          0.000 % Impervious"
"          1.546 Total Area"
"          130.000 Flow length"
"          4.700 Overland Slope"
"          1.546 Pervious Area"
"          130.000 Pervious length"
"          4.700 Pervious slope"
"          0.000 Impervious Area"
"          130.000 Impervious length"
"          4.700 Impervious slope"
"          0.250 Pervious Manning 'n'"
"          87.000 Pervious SCS Curve No."
"          0.598 Pervious Runoff coefficient"
"          0.100 Pervious Ia/S coefficient"

```

```

"      3.795  Pervious Initial abstraction"
"      0.015  Impervious Manning 'n'"
"     98.000  Impervious SCS Curve No."
"      0.000  Impervious Runoff coefficient"
"      0.100  Impervious Ia/S coefficient"
"      0.518  Impervious Initial abstraction"
"           0.232      0.000      0.000      0.000 c.m/sec"
"      Catchment 100      Pervious      Impervious      Total Area  "
"      Surface Area      1.546      0.000      1.546      hectare"
"      Time of concentration  20.931      3.261      20.931      minutes"
"      Time to Centroid      118.302      89.350      118.302      minutes"
"      Rainfall depth      69.173      69.173      69.173      mm"
"      Rainfall volume      1069.41      0.00      1069.41      c.m"
"      Rainfall losses      27.829      6.580      27.829      mm"
"      Runoff depth      41.344      62.593      41.344      mm"
"      Runoff volume      639.17      0.00      639.17      c.m"
"      Runoff coefficient      0.598      0.000      0.598      "
"      Maximum flow      0.232      0.000      0.232      c.m/sec"
" 81      ADD COMMENT=====
"          3  Lines of comment"
"          *****
"          Post-development Condition - Onsite"
"          *****
" 40      HYDROGRAPH Start - New Tributary"
"          2  Start - New Tributary"
"           0.232      0.000      0.000      0.000"
" 33      CATCHMENT 1"
"          1  Triangular SCS"
"          1  Equal length"
"          1  SCS method"
"          1  post-development"
"          53.100  % Impervious"
"          1.546  Total Area"
"         130.000  Flow length"
"          4.700  Overland Slope"
"          0.725  Pervious Area"
"         130.000  Pervious length"
"          4.700  Pervious slope"
"          0.821  Impervious Area"
"         130.000  Impervious length"
"          4.700  Impervious slope"
"          0.250  Pervious Manning 'n'"
"         87.000  Pervious SCS Curve No."
"          0.598  Pervious Runoff coefficient"
"          0.100  Pervious Ia/S coefficient"
"          3.795  Pervious Initial abstraction"
"          0.015  Impervious Manning 'n'"
"         98.000  Impervious SCS Curve No."
"          0.905  Impervious Runoff coefficient"
"          0.100  Impervious Ia/S coefficient"
"          0.518  Impervious Initial abstraction"
"           0.363      0.000      0.000      0.000 c.m/sec"
"      Catchment 1      Pervious      Impervious      Total Area  "
"      Surface Area      0.725      0.821      1.546      hectare"
"      Time of concentration  20.931      3.261      9.772      minutes"
"      Time to Centroid      118.302      89.350      100.017      minutes"
"      Rainfall depth      69.173      69.173      69.173      mm"

```

"		Rainfall volume	501.55	567.86	1069.41	c.m"
"		Rainfall losses	27.829	6.580	16.546	mm"
"		Runoff depth	41.344	62.593	52.627	mm"
"		Runoff volume	299.77	513.84	813.61	c.m"
"		Runoff coefficient	0.598	0.905	0.761	"
"		Maximum flow	0.109	0.322	0.363	c.m/sec"
" 40		HYDROGRAPH Add Runoff "				
"	4	Add Runoff "				
"			0.363	0.363	0.000	0.000"
" 54		POND DESIGN"				
"	0.363	Current peak flow	c.m/sec"			
"	0.105	Target outflow	c.m/sec"			
"	813.6	Hydrograph volume	c.m"			
"	7.	Number of stages"				
"	356.800	Minimum water level	metre"			
"	1.500	Maximum water level	metre"			
"	356.800	Starting water level	metre"			
"	0	Keep Design Data: 1 = True; 0 = False"				
"		Level Discharge	Volume"			
"	356.800	0.000	0.000"			
"	357.000	0.01808	95.400"			
"	357.300	0.06436	260.700"			
"	357.500	0.07615	386.500"			
"	357.600	0.1505	454.400"			
"	357.700	0.2852	525.700"			
"	357.800	0.4625	600.400"			
"	1.	WEIRS"				
"		Crest Weir	Crest	Left	Right"	
"		elevation coefficie	breadth	sideslope	sideslope"	
"		357.500 0.900	1.400	0.330	0.330"	
"	1.	OUTFLOW PIPE"				
"		Upstream Downstr'm	Pipe	Pipe	Manning	Entry"
"		invert invert	Length	Diameter	'n'	loss Ke"
"		356.800 356.750	6.000	0.200	0.015	0.900"
"		Peak outflow	0.117	c.m/sec"		
"		Maximum level	357.556	metre"		
"		Maximum storage	424.239	c.m"		
"		Centroidal lag	2.915	hours"		
"		0.363 0.363	0.117	0.000	c.m/sec"	
" 40		HYDROGRAPH Next link "				
"	5	Next link "				
"			0.363	0.117	0.117	0.000"
" 52		CHANNEL DESIGN"				
"	0.117	Current peak flow	c.m/sec"			
"	0.040	Manning 'n'"				
"	0.	Cross-section type: 0=trapezoidal; 1=general"				
"	0.000	Basewidth	metre"			
"	3.000	Left bank slope"				
"	3.000	Right bank slope"				
"	1.000	Channel depth	metre"			
"	1.000	Gradient	%"			
"		Depth of flow	0.253	metre"		
"		Velocity	0.609	m/sec"		
"		Channel capacity	4.562	c.m/sec"		
"		Critical depth	0.199	metre"		

```

"          MIDUSS Output ----->"
"          MIDUSS version                      Version 2.25 rev. 467"
"          MIDUSS created                      July 6, 2008"
"          10  Units used:                      ie METRIC"
"          Job folder:                          P:\2007\"
"          2007-0359-10_Bio-en_Power-
Elmira_Site\9._Engineering\26_Civil\Miduss"
"          Output filename:                      100.out"
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"          Company
"          Date & Time last used:                20/01/2010 at 11:57:26 AM"
" 31          TIME PARAMETERS"
"          5.000  Time Step"
"          180.000  Max. Storm length"
"          1500.000  Max. Hydrograph"
" 81          ADD COMMENT===== "
"          5  Lines of comment"
"          *****"
"          Job Name: Elmira Bio-en Inc."
"          Job Number: 2007-0359-10"
"          100 Year Storm"
"          *****"
" 32          STORM Chicago storm"
"          1  Chicago storm"
"          4692.000  Coefficient A"
"          17.437  Constant B"
"          0.956  Exponent C"
"          0.400  Fraction R"
"          180.000  Duration"
"          1.000  Time step multiplier"
"          Maximum intensity                239.793  mm/hr"
"          Total depth                      89.960  mm"
"          6  100hyd  Hydrograph extension used in this file"
" 81          ADD COMMENT===== "
"          3  Lines of comment"
"          *****"
"          Pre-development Condition - Onsite"
"          *****"
" 33          CATCHMENT 100"
"          1  Triangular SCS"
"          1  Equal length"
"          1  SCS method"
"          100  pre-development"
"          0.000  % Impervious"
"          1.546  Total Area"
"          130.000  Flow length"
"          4.700  Overland Slope"
"          1.546  Pervious Area"
"          130.000  Pervious length"
"          4.700  Pervious slope"
"          0.000  Impervious Area"
"          130.000  Impervious length"
"          4.700  Impervious slope"
"          0.250  Pervious Manning 'n'"
"          87.000  Pervious SCS Curve No."
"          0.664  Pervious Runoff coefficient"
"          0.100  Pervious Ia/S coefficient"

```

```

"      3.795  Pervious Initial abstraction"
"      0.015  Impervious Manning 'n'"
"     98.000  Impervious SCS Curve No."
"      0.000  Impervious Runoff coefficient"
"      0.100  Impervious Ia/S coefficient"
"      0.518  Impervious Initial abstraction"
"           0.372      0.000      0.000      0.000 c.m/sec"
"      Catchment 100      Pervious      Impervious      Total Area  "
"      Surface Area      1.546      0.000      1.546      hectare"
"      Time of concentration  18.013      2.935      18.013      minutes"
"      Time to Centroid      113.196      88.193      113.196      minutes"
"      Rainfall depth      89.960      89.960      89.960      mm"
"      Rainfall volume      1390.78      0.00      1390.78      c.m"
"      Rainfall losses      30.192      7.398      30.192      mm"
"      Runoff depth      59.768      82.562      59.768      mm"
"      Runoff volume      924.02      0.00      924.02      c.m"
"      Runoff coefficient      0.664      0.000      0.664      "
"      Maximum flow      0.372      0.000      0.372      c.m/sec"
" 81      ADD COMMENT=====
"          3  Lines of comment"
"          *****
"          Post-development Condition - Onsite"
"          *****
" 40      HYDROGRAPH Start - New Tributary"
"          2  Start - New Tributary"
"           0.372      0.000      0.000      0.000"
" 33      CATCHMENT 1"
"          1  Triangular SCS"
"          1  Equal length"
"          1  SCS method"
"          1  post-development"
"          53.100  % Impervious"
"          1.546  Total Area"
"         130.000  Flow length"
"          4.700  Overland Slope"
"          0.725  Pervious Area"
"         130.000  Pervious length"
"          4.700  Pervious slope"
"          0.821  Impervious Area"
"         130.000  Impervious length"
"          4.700  Impervious slope"
"          0.250  Pervious Manning 'n'"
"         87.000  Pervious SCS Curve No."
"          0.664  Pervious Runoff coefficient"
"          0.100  Pervious Ia/S coefficient"
"          3.795  Pervious Initial abstraction"
"          0.015  Impervious Manning 'n'"
"         98.000  Impervious SCS Curve No."
"          0.918  Impervious Runoff coefficient"
"          0.100  Impervious Ia/S coefficient"
"          0.518  Impervious Initial abstraction"
"           0.492      0.000      0.000      0.000 c.m/sec"
"      Catchment 1      Pervious      Impervious      Total Area  "
"      Surface Area      0.725      0.821      1.546      hectare"
"      Time of concentration  18.013      2.935      8.816      minutes"
"      Time to Centroid      113.196      88.193      97.945      minutes"
"      Rainfall depth      89.960      89.960      89.960      mm"

```

"		Rainfall volume	652.28	738.51	1390.78	c.m"
"		Rainfall losses	30.192	7.399	18.088	mm"
"		Runoff depth	59.768	82.562	71.872	mm"
"		Runoff volume	433.37	677.77	1111.13	c.m"
"		Runoff coefficient	0.664	0.918	0.799	"
"		Maximum flow	0.174	0.432	0.492	c.m/sec"
" 40		HYDROGRAPH Add Runoff "				
"	4	Add Runoff "				
"			0.492	0.492	0.000	0.000"
" 54		POND DESIGN"				
"	0.492	Current peak flow	c.m/sec"			
"	0.105	Target outflow	c.m/sec"			
"	1111.1	Hydrograph volume	c.m"			
"	7.	Number of stages"				
"	356.800	Minimum water level	metre"			
"	1.500	Maximum water level	metre"			
"	356.800	Starting water level	metre"			
"	0	Keep Design Data: 1 = True; 0 = False"				
"		Level Discharge	Volume"			
"	356.800	0.000	0.000"			
"	357.000	0.01808	95.400"			
"	357.300	0.06436	260.700"			
"	357.500	0.07615	386.500"			
"	357.600	0.1505	454.400"			
"	357.700	0.2852	525.700"			
"	357.800	0.4625	600.400"			
"	1.	WEIRS"				
"		Crest Weir	Crest	Left	Right"	
"		elevation coefficie	breadth	sideslope	sideslope"	
"		357.500 0.900	1.400	0.330	0.330"	
"	1.	OUTFLOW PIPE"				
"		Upstream Downstr'm	Pipe	Pipe	Manning	Entry"
"		invert invert	Length	Diameter	'n'	loss Ke"
"		356.800 356.750	6.000	0.200	0.015	0.900"
"		Peak outflow	0.242	c.m/sec"		
"		Maximum level	357.669	metre"		
"		Maximum storage	503.502	c.m"		
"		Centroidal lag	2.669	hours"		
"		0.492 0.492	0.242	0.000	c.m/sec"	
" 40		HYDROGRAPH Next link "				
"	5	Next link "				
"			0.492	0.242	0.242	0.000"
" 52		CHANNEL DESIGN"				
"	0.242	Current peak flow	c.m/sec"			
"	0.040	Manning 'n'"				
"	0.	Cross-section type: 0=trapezoidal; 1=general"				
"	0.000	Basewidth	metre"			
"	3.000	Left bank slope"				
"	3.000	Right bank slope"				
"	1.000	Channel depth	metre"			
"	1.000	Gradient	%"			
"		Depth of flow	0.332	metre"		
"		Velocity	0.730	m/sec"		
"		Channel capacity	4.562	c.m/sec"		
"		Critical depth	0.266	metre"		

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APPENDIX C

Design Calculations

APPENDIX C

MOE WATER QUALITY CAPACITY DESIGN CRITERIA CALCULATIONS
STORMWATER MANAGEMENT PLAN
WOOLWICH BIO-EN INC.
ELMIRA, ONTARIO

Task: Calculate Water Quality Storage Requirements

Reference: Stormwater Management Planning and Design Manual (March 2003)

Required Wet Pond Storage		
Protection Level:	Normal	
Impervious Level :	56	%
Storage Volume:	110	m ³ /ha
Contributing Drainage Area	1.55	ha
Required Water Quality Storage Volume:	170	m ³ (1.55ha×20m ³ /ha)
Required Permanent Pool Volume:	108	m ³
Required Extended Detention Storage Volume:	62	m ³
Total Storage Provided:	1097.6	m ³
Provided Permanent Pool Volume:	489	m ³
Provided Extended Detention Storage Volume:	609	m ³

APPENDIX C

IMPERVIOUS AREA CALCULATION STORMWATER MANAGEMENT PLAN WOOLWICH BIO-EN INC. ELMIRA, ONTARIO

Summarise Impervious Areas

	s.m.
Paved Areas	4767
Big Tanks	2022
Little Tanks	302.4
Big Building	1226
Little Building	408.7
Total Impervious Area	8726.1
Total Drainage Area	15458
Percent Impervious	56%

Areas taken from model space drawing.

APPENDIX C
POND DESIGN SHEET
STORMWATER MANAGEMENT PLAN
WOOLWICH BIO-EN INC.
ELMIRA, ONTARIO

Task: Design pond for the site

Stage/Storage					
Dead Storage Elevation =		356.80			
<i>Elevation</i>	<i>Area</i>	<i>Depth</i>	<i>Total Storage</i>	<i>Live Storage</i>	
<i>(m)</i>	<i>(m²)</i>	<i>(m)</i>	<i>(m³)</i>	<i>(m³)</i>	<i>(ha-m)</i>
354	8.7	0.00	0	0	0
354.5	38.3	0.50	12	0	0.0000
355	88.8	1.00	44	0	0.0000
355.5	160.6	1.50	106	0	0.0000
356	254.2	2.00	210	0	0.0000
356.5	370.3	2.50	366	0	0.0000
356.8	448.8	2.80	489	0	0.0000
357	505.5	3.00	584	95	0.0095
357.3	596.5	3.30	749	261	0.0261
357.5	695.5	3.50	878	390	0.0390
357.8	765	3.80	1098	609	0.0609

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APPENDIX D

Sample Sediment and Erosion Control Inspection Report

APPENDIX D
SAMPLE SEDIMENT AND EROSION CONTROL INSPECTION REPORT
WOOLWICH BIO-EN INC
MARTIN LANE, ELMIRA, ONTARIO

Inspector: _____ Date: _____
 Site Conditions:
 BIWEEKLY RAIN EVENT OTHER

Measures & Controls	In Conformance with Design Standards	Effective Pollutant Control Practice
Construction Entrance	YES / NO	YES / NO
Silt Fence	YES / NO	YES / NO
Soil Stabilization	YES / NO	YES / NO
Coir Logs	YES / NO	YES / NO
Solid Waste Disposal	YES / NO	YES / NO
Equipment Fueling/Storage	YES / NO	YES / NO
Hazardous Materials Storage	YES / NO	YES / NO
Hazardous Waste	YES / NO	YES / NO
Sanitary / Septic	YES / NO	YES / NO
Offsite Storage Erosion Controls	YES / NO	YES / NO

RECOMMENDED REMEDIAL ACTIONS:

Signature: _____ Telephone: _____

Printed Name: _____

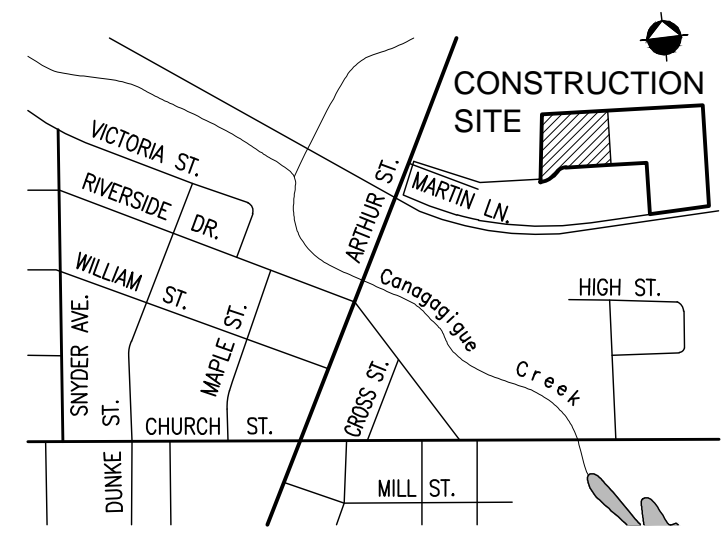
DRAFT

DRAWINGS

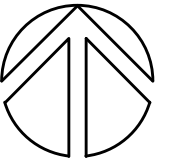
Drawings

Drawing C1-1	Existing Conditions Plan
Drawing C1-2	Site Plan
Drawing C2-1	Site Grading and SWM Plan
Drawing C3-1	Site Servicing Plan

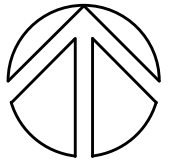
DRAFT



KEY PLAN N.T.S.



true north



project north

BENCHMARK ELEV. = 352.808m
 Geodetic elevation - GRCA monument #007
 Monument located in the southeast corner of concrete bridge on Arthur Street over the Canagagigue Creek.

date	revisions

customer
Woolwich Bio-en Inc.

project
Woolwich Bio-en Inc.
 Elmira, Ont.

title
EXISTING CONDITIONS PLAN

THE walterfedy PARTNERSHIP
 ENGINEERS | PROJECT MANAGERS
 487 Riverbend Drive, Kitchener, Ontario N2K 3S3
 tel: 519.576.2150 fax: 519.576.5499 twfp.com

The contractor shall check and verify all dimensions and report any errors or omissions to the consultant before commencing or proceeding with any work. Do not scale this drawing.

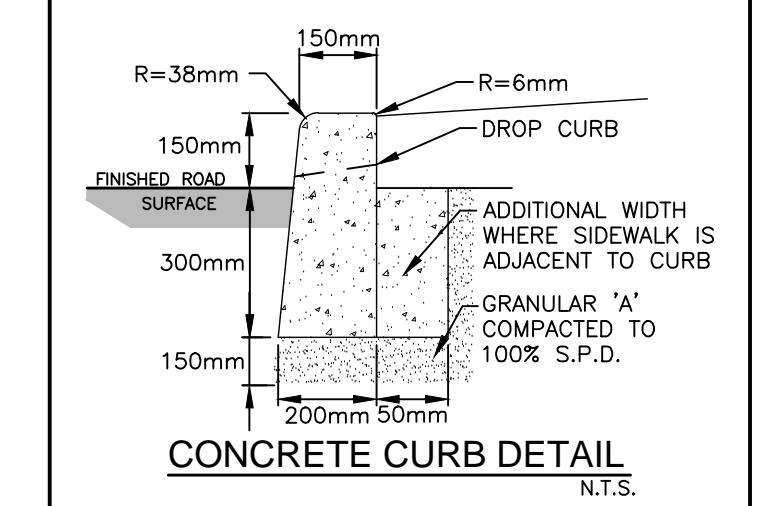
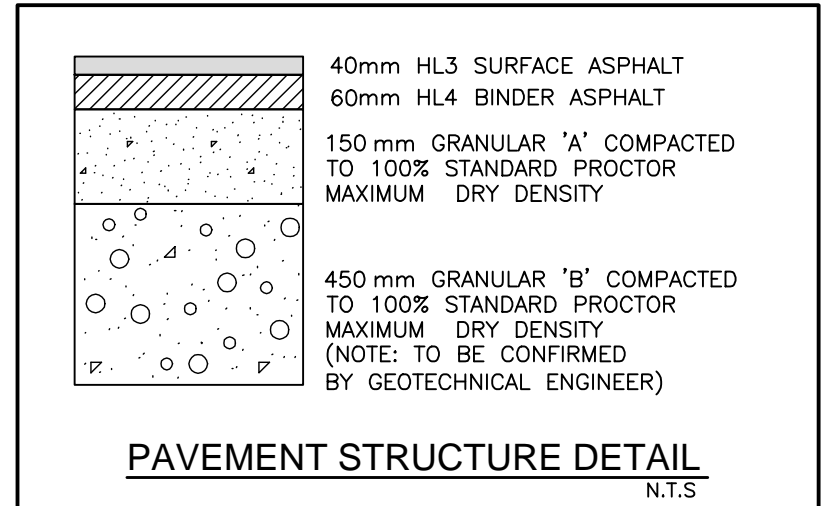
Copyright 2008 The Walter Fedy Partnership	sheet no.:
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date: 08/08/2008	
job no.: 2007-0359-10	
CAD file: 2007-0359-10.dwg	
drawn by: I.A.C.C.G.	
checked by: S.K.	



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 PLOTTDATE: Jan 21, 2010 2:10pm

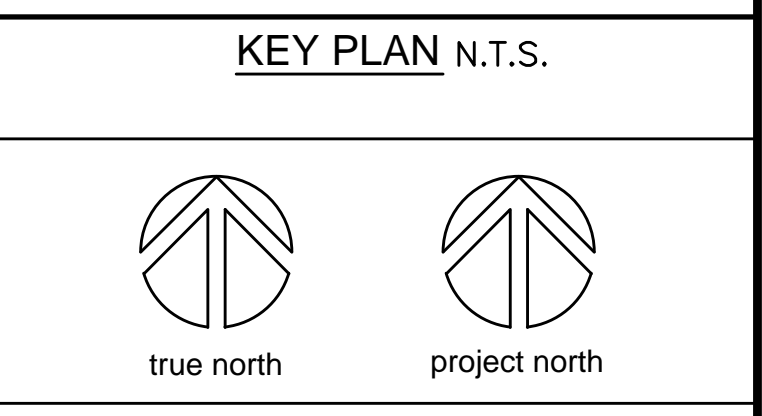
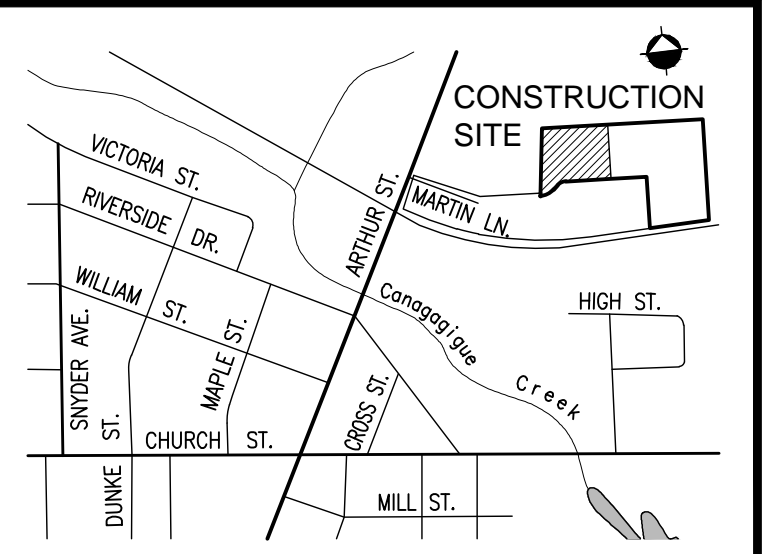
LEGEND

—	PROPERTY LINE	---	EXISTING WATERMAIN
—	EXISTING LIGHT STANDARD	---	EXISTING BELL SERVICE
—	EXISTING UTILITY POLE	---	EXISTING CABLE AND BELL SERVICE
—	EXISTING GUYWIRE	---	EXISTING GASMAIN
—	EXISTING SIGN	---	EXISTING SANITARY SEWER
—	EXISTING STANDARD IRON BAR	---	EXISTING STORM SEWER
—	EXISTING GAS VALVE	---	EXISTING OVERHEAD HYDRO SERVICE
—	EXISTING BELL BOX	---	EXISTING UNDERGROUND HYDRO SERVICE
—	EXISTING CABLE BOX	---	PROPOSED SANITARY SEWER
—	EXISTING HYDRO TRANSFORMER	---	PROPOSED WATERMAIN
—	EXISTING CATCHBASIN	---	PROPOSED SANITARY SEWER MANHOLE
—	EXISTING DOUBLE CATCHBASIN	---	PROPOSED FIRE HYDRANT
—	EXISTING STORM SEWER MANHOLE	---	PROPOSED WATER VALVE
—	EXISTING STORM SEWER CATCHBASIN MANHOLE	---	PROPOSED CURB STOP
—	EXISTING DOUBLE CATCHBASIN MANHOLE	---	PROPOSED SWALE
—	EXISTING DITCH INLET	---	PROPOSED GRADE
—	EXISTING SANITARY SEWER MANHOLE	---	EX. = MAINTAIN EXISTING
—	EXISTING FIRE HYDRANT	---	PROPOSED DRAINAGE DIRECTION WITH CORRESPONDING GRADIENT
—	EXISTING WATER VALVE	---	PROPOSED CURB
—	EXISTING CURB STOP	---	PROPOSED ASPHALT
—	EXISTING BOREHOLE LOCATION	---	PROPOSED RIP-RAP
—	EXISTING SPOT ELEVATION	---	PROPOSED CHAIN LINK FENCE
—	EXISTING CONTOUR	---	PROPOSED EMBANKMENT (3:1 MAX. UNLESS OTHERWISE NOTED)
—	EXISTING DRAINAGE DIRECTION	---	
—	EXISTING EMBANKMENT	---	
—	EXISTING DITCH	---	



GENERAL NOTES

- EXISTING TOPOGRAPHICAL INFORMATION OBTAINED FROM SURVEY BY WAYNE D. TURPEL SURVEYING LIMITED, DRAWING No. 06-3765 DATED JANUARY 11, 2008.
- ANY AREA DISTURBED DURING CONSTRUCTION SHALL BE RESTORED TO ITS EXISTING CONDITION OR BETTER TO THE SATISFACTION OF THE ENGINEER OR THE MUNICIPALITY. THIS INCLUDES ASPHALT, GRANULAR, PAVING STONE, TOPSOIL, SOD, ETC. THE CONTRACTOR IS RESPONSIBLE FOR RESTORING ALL DAMAGED AND/OR DISTURBED PROPERTY WITHIN THE MUNICIPAL RIGHT-OF-WAY TO MUNICIPAL STANDARDS.
- LOCATIONS OF ALL UNDERGROUND SERVICES SHOWN ARE APPROXIMATE ONLY. CONTRACTOR RESPONSIBLE FOR VERIFYING LOCATION OF SERVICES PRIOR TO CONSTRUCTION AND WILL BE HELD RESPONSIBLE FOR DAMAGE TO ANY SERVICES NOT LOCATED PRIOR TO CONSTRUCTION.
- MATCH EXISTING GRADES AT ALL PROPERTY LINES UNLESS WHERE PROPOSED GRADES ARE NOTED.
- ON ALL ASPHALT RECONSTRUCTION AREAS, EXISTING ASPHALT SHALL BE SAW CUT BEFORE NEW ASPHALT IS PLACED.



BENCHMARK ELEV.=352.808m
 Geodetic elevation - GRCA monument #007
 Monument located in the southeast corner of concrete bridge on Arthur Street over the Canagagigue Creek.

customer: Woolwich Bio-en Inc.

project: Woolwich Bio-en Inc.

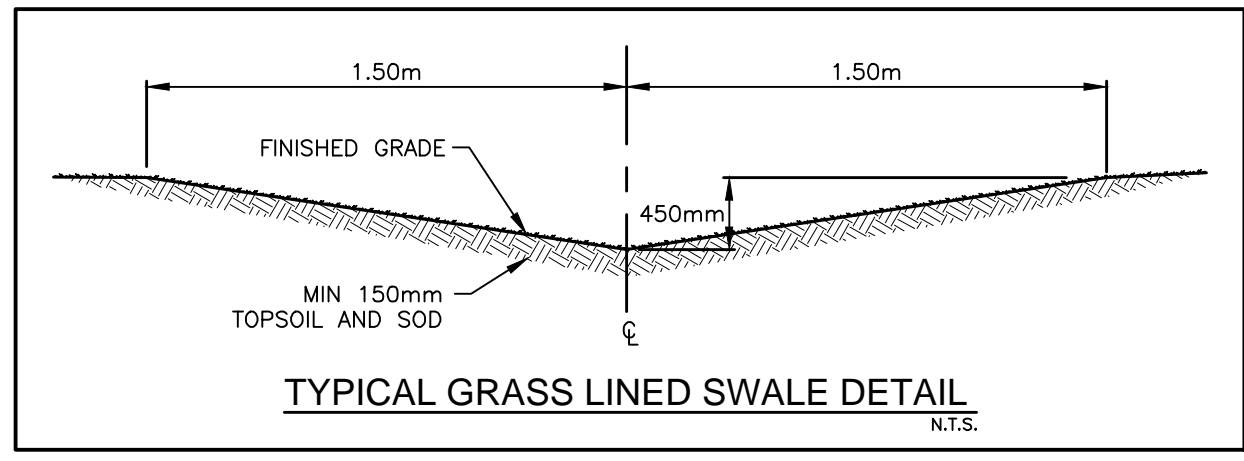
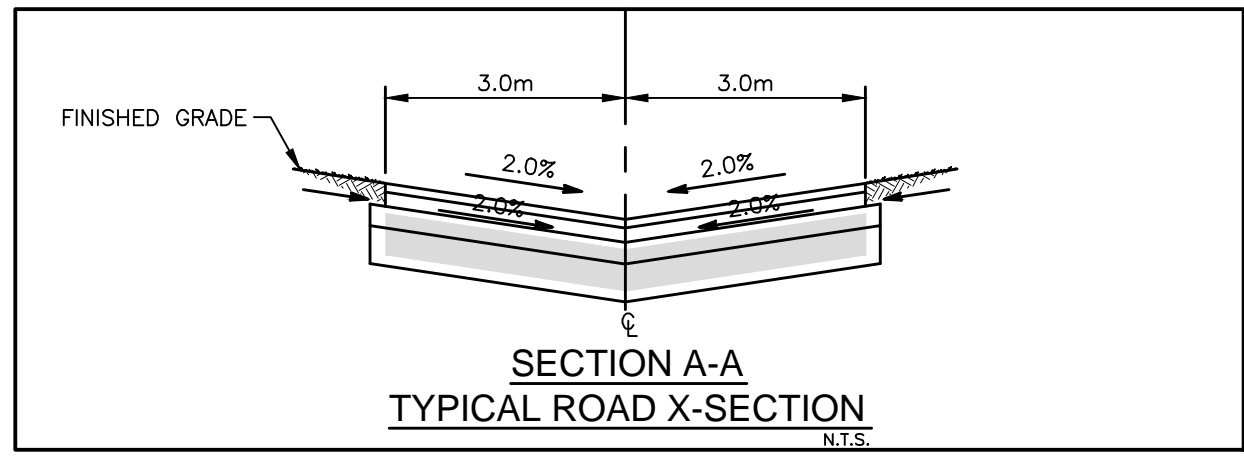
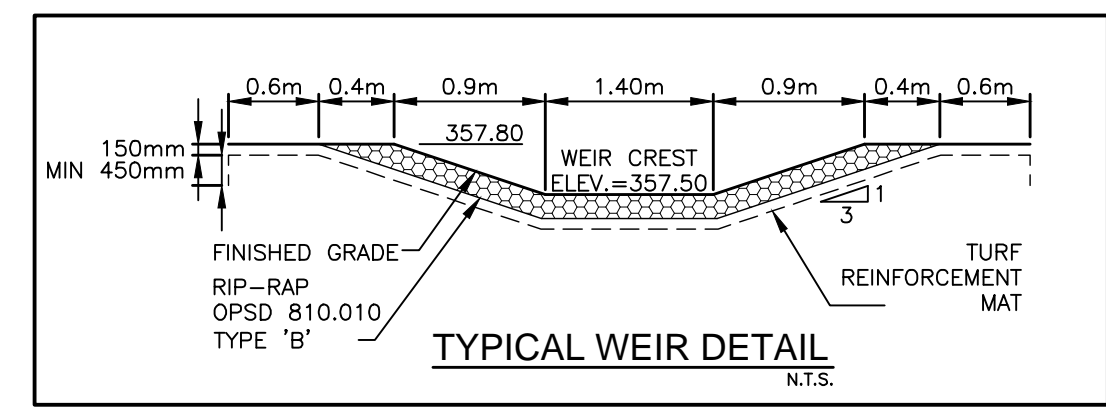
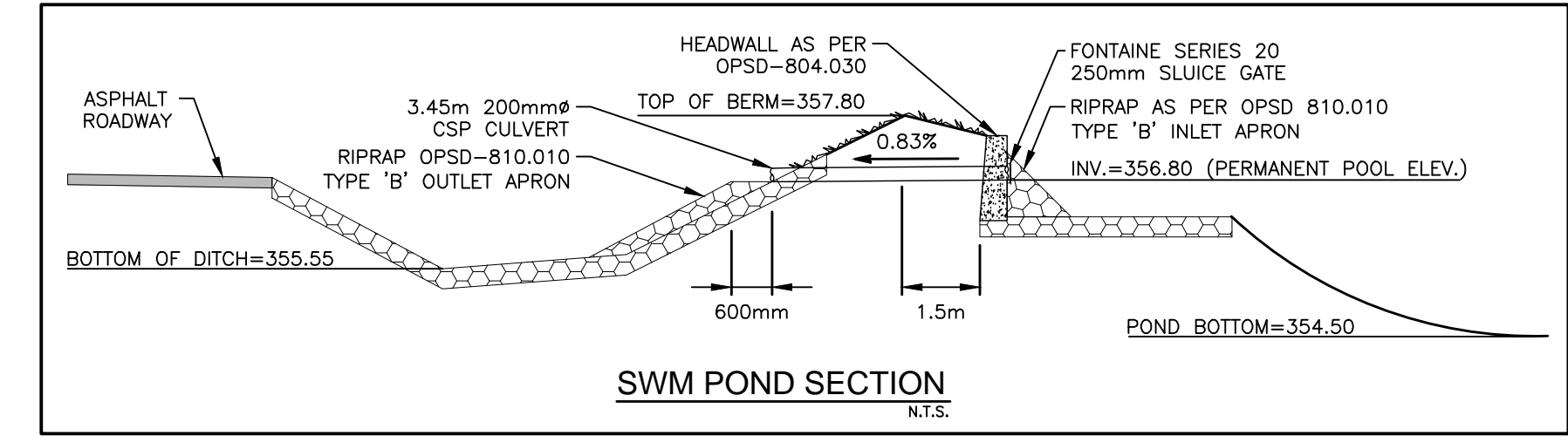
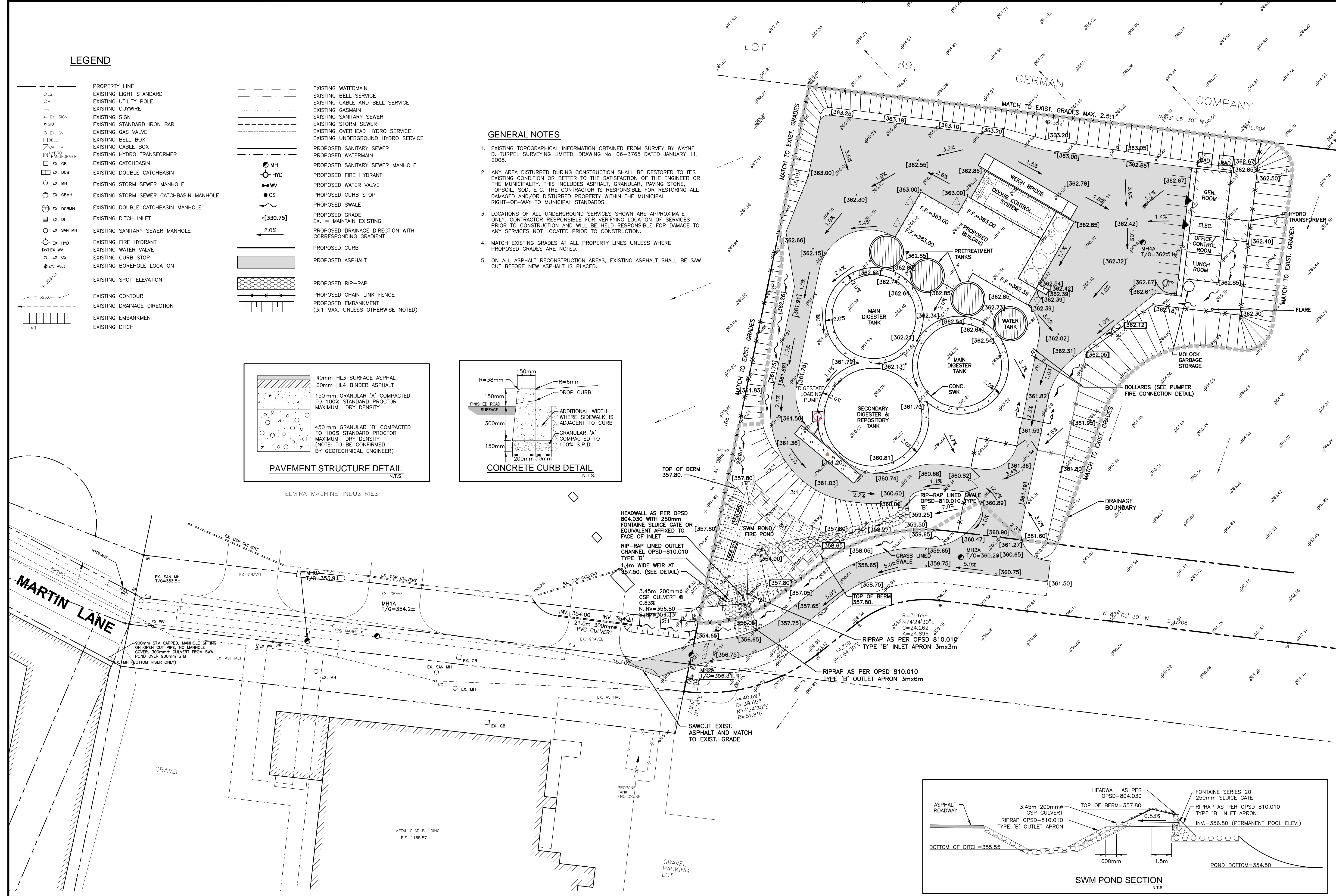
Elmira, Ont.

title: SITE GRADING AND SWM PLAN



487 Riverbend Drive, Kitchener, Ontario N2K 3S3
 tel: 519.576.2150 fax: 519.576.5499 twfp.com

The contractor shall check and verify all dimensions and report any errors or omissions to the consultant before commencing or proceeding with any work. Do not scale this drawing.
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 scale: 1:500
 date: 01/08/2010
 job no.: 2007-0359-10
 CAD file: 2007-0359-10.dwg
 drawn by: I.A.C.B.V.
 checked by: S.K.



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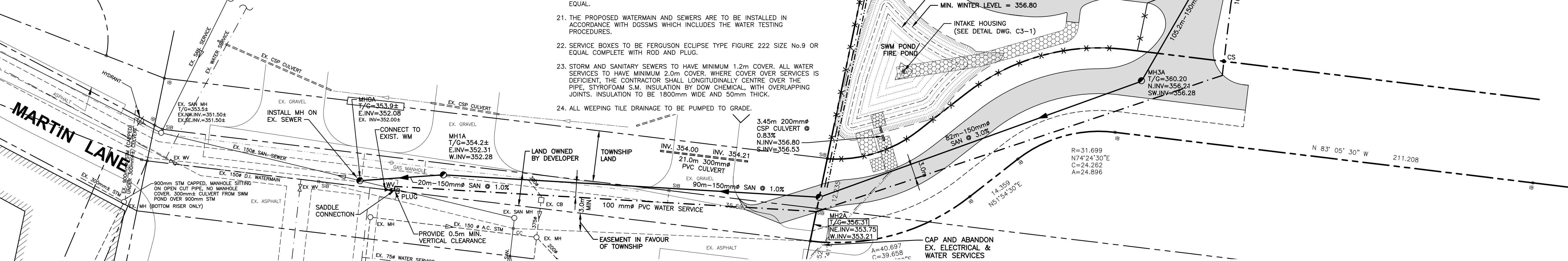
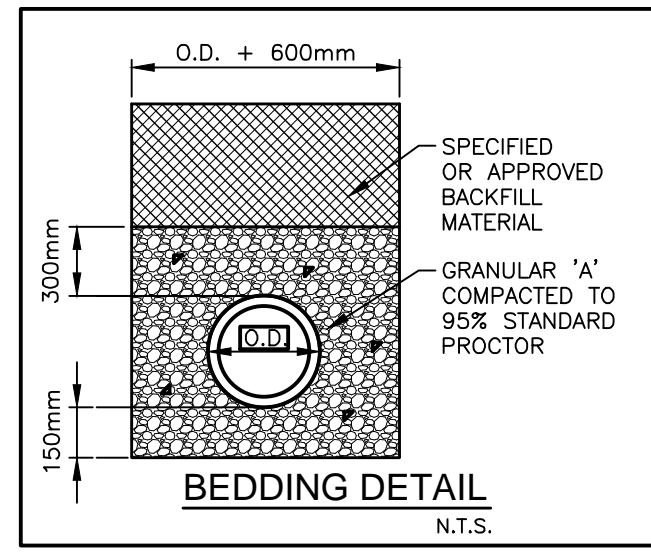
- PROPERTY LINE
- LS EXISTING LIGHT STANDARD
- OP EXISTING UTILITY POLE
- EX EXISTING CULVERT
- △ EX EXISTING SIGN
- SB EXISTING STANDARD IRON BAR
- EX EXISTING GAS VALVE
- EX EXISTING BELL BOX
- EX EXISTING CABLE BOX
- EX EXISTING HYDRO TRANSFORMER
- EX EXISTING CATCHBASIN
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- EX EXISTING SANITARY SEWER MANHOLE
- EX EXISTING FIRE HYDRANT
- EX EXISTING WATER VALVE
- EX EXISTING CURB STOP
- EX EXISTING BOREHOLE LOCATION
- EXISTING EMBANKMENT
- EXISTING DITCH
- EXISTING WATERMAIN
- EXISTING BELL SERVICE
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- EXISTING GASMAIN
- EXISTING SANITARY SEWER
- EXISTING STORM SEWER
- EXISTING OVERHEAD HYDRO SERVICE
- EXISTING UNDERGROUND HYDRO SERVICE
- PROPOSED SANITARY SEWER
- PROPOSED WATERMAIN
- MH PROPOSED SANITARY SEWER MANHOLE
- HYD PROPOSED FIRE HYDRANT
- WV PROPOSED WATER VALVE
- CS PROPOSED CURB STOP
- PROPOSED CURB
- PROPOSED ASPHALT
- PROPOSED RIP-RAP
- PROPOSED CONCRETE
- ▲ PROPOSED DOOR LOCATIONS
- PROPOSED CHAIN LINK FENCE
- PROPOSED EMBANKMENT (3:1 MAX. UNLESS OTHERWISE NOTED)

GENERAL NOTES

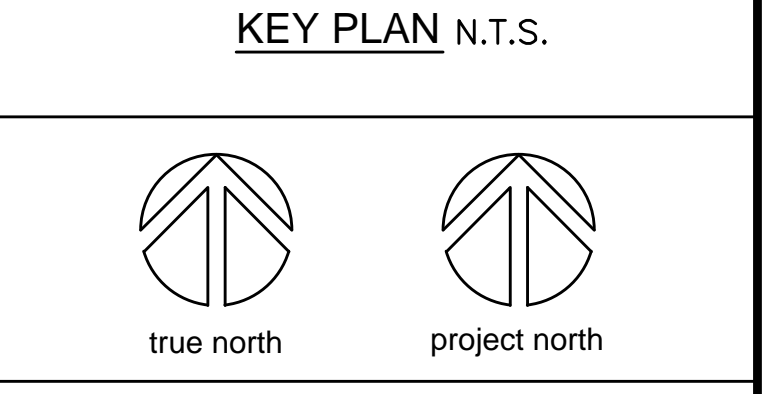
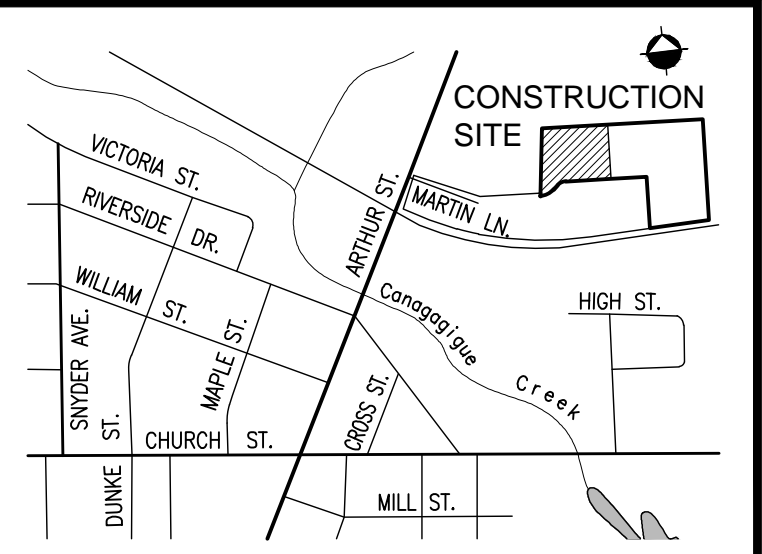
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- MATCH EXISTING GRADES AT ALL PROPERTY LINES UNLESS WHERE PROPOSED GRADES ARE NOTED.
- ON ALL ASPHALT RECONSTRUCTION AREAS, EXISTING ASPHALT SHALL BE SAW CUT BEFORE NEW ASPHALT IS PLACED.
- ALL LIGHTING IS TO BE DIRECTED DOWNWARD OR SHIELDED SO AS NOT TO PROJECT BEYOND THE OWNER'S LAND, NOR TO CAUSE A GLARE THAT WOULD IMPACT ADJACENT PROPERTIES OR PASSING TRAFFIC.
- IF THE GARBAGE FACILITY IS LOCATED OUTDOORS, IT SHALL BE INSTALLED IN ACCORDANCE WITH THE SITE PLAN, AND IF NOT SHOWN ON THE PLAN, IT WILL REQUIRE AN ADDENDUM TO PLAN PRIOR TO CONSTRUCTION. ANY GARBAGE FACILITY SHALL BE IN ACCORDANCE WITH THE FOLLOWING:
 - PLACED ON A CONCRETE PAD, ENCLOSED ON ALL SIDES, INCLUDING A GATE, WITH A SOLID WOOD MAINTENANCE FREE FENCE, AT A HEIGHT, WHICH IS GREATER THAN THE GARBAGE BIN AND IN THE LOCATION SHOWN ON THE SITE PLAN, OR
 - DECORATIVE MOLOCK(S) CONSTRUCTED IN THE LOCATION SHOWN ON THE SITE PLAN FOR THE GARBAGE BIN, BUT IN EITHER CASE SHALL NOT OCCUPY OR INTERFERE WITH A REQUIRED PARKING OR LOADING SPACE, AND TO MAINTAIN THE FACILITY IN AN ACCEPTABLE STATE FOR THE LIFE OF THE DEVELOPMENT.
- THE PROPERTY OWNER OF 30 MARTIN LANE IS TO BE NOTIFIED BY THE DEVELOPER AND THEIR CONTRACTOR PRIOR TO WORK BEING PERFORMED WITHIN THE ROAD ALLOWANCE OR IN FRONT OF THE ENTRANCES TO 30 MARTIN LANE.

CONSTRUCTION NOTES

- THIS PLAN NOT FOR CONSTRUCTION UNTIL STAMPED BY DESIGN ENGINEER AND APPROVED BY THE LOCAL MUNICIPALITY.
- THIS PLAN IS TO BE USED FOR SERVICING ONLY; ANY OTHER INFORMATION SHOWN IS FOR ILLUSTRATION PURPOSES ONLY.
- NO CHANGES ARE TO BE MADE WITHOUT THE APPROVAL OF THE DESIGN ENGINEER.
- THIS PLAN NOT TO BE REPRODUCED IN WHOLE OR IN PART WITHOUT THE PERMISSION OF THE WALTER FEDY PARTNERSHIP.
- PRIOR TO CONSTRUCTION, THE CONTRACTOR MUST:
 - CHECK AND VERIFY ALL DIMENSIONS AND EXISTING ELEVATIONS WHICH INCLUDES, BUT IS NOT LIMITED TO, THE BENCHMARK ELEVATIONS, EXISTING SERVICE CONNECTIONS AND EXISTING INVERTS.
 - OBTAIN ALL UTILITY LOCATES AND REQUIRED PERMITS AND LICENSES.
- THE CONTRACTOR SHALL ASSUME ALL LIABILITY FOR DAMAGE TO EXISTING WORKS.
- ALL UNDERGROUND SERVICES ARE TO BE CONSTRUCTED IN FULL COMPLIANCE WITH LOCAL AND PROVINCIAL APPLICABLE CODES AND REGULATIONS; WHICH CODES AND REGULATIONS SHALL SUPERCEDE ALL OTHERS.
- ALL PIPE BEDDING TO BE CLASS "B" AS PER OPSD 802.010, 802.030, 802.031, 802.032. TRENCH BACKFILL TO BE NATIVE MATERIAL PLACED IN MAXIMUM 300mm LIFTS AND COMPACTED TO 95% STANDARD PROCTOR DENSITY.
- SANITARY SEWERS 150mm AND SMALLER SHALL BE POLYVINYL CHLORIDE (PVC) PIPE DR28 TO CSA 182.1 & 182.2 WITH INTEGRAL BELL AND SPIGOT UTILIZING FLEXIBLE ELASTOMERIC SEALS. CONNECT TO MANHOLES WITH "KOR-N-SEAL" ADAPTERS OR APPROVED EQUAL.
- STORM SEWERS 200mm TO 375mm SHALL BE POLYVINYL CHLORIDE (PVC) PIPE DR35 WITH CSA STANDARD 182.1 & 182.2 OR RIBBED PVC SEWER PIPE AND FITTINGS TO CSA B182.4 WITH INTEGRAL BELL AND SPIGOT UTILIZING FLEXIBLE ELASTOMERIC SEALS. CONNECT TO MANHOLE WITH APPROVED MANHOLE ADAPTERS.
- FACTORY FABRICATED TEES SHALL BE USED FOR ALL SERVICE CONNECTIONS.
- SANITARY MANHOLES TO BE 1200mm DIAMETER PRECAST AS PER OPSD 1001.01 WITH ALUMINUM SAFETY RUNGS AT 300mm CENTRES. RUNGS AS PER OPSD 1851 & OPSD 405.01.
- MANHOLE FRAMES AND COVERS SHALL CONFORM TO OPSD 1851 AND SHALL BE AS PER OPSD 401.01 TYPE "A".
- PRECAST MANHOLE & CATCHBASIN ADJUSTER UNITS SHALL CONFORM TO ASTM C478 AND MANUFACTURED BY HANSON PIPE & PRODUCTS INC. OR APPROVED EQUAL.
- WATERMANS AND FITTINGS 100mm AND LARGER SHALL BE PVC C900 CLASS 150 DR-18 INSTALLED AT A DEPTH OF 2.0m OF COVER.
- WATERMAIN FITTINGS WHICH CHANGE DIRECTIONS VERTICALLY OR HORIZONTALLY TO BE SUPPORTED WITH THRUST BLOCKS AS PER OPSD 1103.01 AND 1103.02.
- WATERMAIN VALVES 100mm AND LARGER SHALL BE CANADA VALVE #55 OR EQUAL (OPEN LEFT) INCLUDING VALVE BOX AND 2.3kg ANODE.
- HYDRANTS SHALL BE CANADA "CENTURY" OR EQUAL WITH TWO (2) 64mm HOSE CONNECTIONS INCLUDING 5.5kg ANODE.
- WATER SERVICE CONNECTIONS 50mm AND SMALLER SHALL BE TYPE "K" SOFT COPPER TUBES WITH SERVICE SADDLES AND 5.5kg ANODE WHERE REQUIRED.
- MAIN STOPS, CURB STOPS, COUPLINGS AND TEES SHALL BE NAWWA C-800 COPPER TO COPPER FLANGED OR COMPRESSION CONNECTION BY EMCO OR EQUAL.
- THE PROPOSED WATERMAIN AND SEWERS ARE TO BE INSTALLED IN ACCORDANCE WITH DGSSMS WHICH INCLUDES THE WATER TESTING PROCEDURES.
- SERVICE BOXES TO BE FERGUSON ECLIPSE TYPE FIGURE 222 SIZE No.9 OR EQUAL COMPLETE WITH ROD AND PLUG.
- STORM AND SANITARY SEWERS TO HAVE MINIMUM 1.2m COVER. ALL WATER SERVICES TO HAVE MINIMUM 2.0m COVER. WHERE COVER OVER SERVICES IS DEFICIENT, THE CONTRACTOR SHALL LONGITUDINALLY CENTRE OVER THE PIPE, STYROFOAM S.M. INSULATION BY DOW CHEMICAL, WITH OVERLAPPING JOINTS. INSULATION TO BE 1800mm WIDE AND 50mm THICK.
- ALL WEeping TILE DRAINAGE TO BE PUMPED TO GRADE.



- NOTES**
- THE WATER SERVICE TO EACH BUILDING WILL REQUIRE AN INTERNAL DOUBLE CHECK BACKFLOW DEVICE INSIDE THE BUILDING.
 - EACH BUILDING WILL BE EQUIPPED WITH INDIVIDUAL WATER METERS.



BENCHMARK ELEV.=352.808m
 Geodetic elevation - GRCA monument #007
 Monument located in the southeast corner of concrete bridge on Arthur Street over the Canagagigue Creek.

customer: Woolwich Bio-en Inc.

project: Woolwich Bio-en Inc.

title: Elmira, Ont.

SITE SERVICING PLAN



487 Riverbend Drive, Kitchener, Ontario N2K 3S3
 tel: 519.576.2150 fax: 519.576.5499 twfp.com

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date: 08/08/2008	job no.: 2007-0359-10	C3-1
CAD file: 2007-0359-10.dwg	drawn by: I.A.C.C.G.	
checked by: S.K.		

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