
**CORNWALL WASTEWATER TREATMENT PLANT
CLASS EA ADDENDA**

**AGENDA FOR VALUE ENGINEERING WORKSHOP
9:00 a.m. to 4:00 p.m. November 5, 2009**

Room A (Downstairs) at Cornwall Civic Complex, 100 Water Street East

Invited to Attend: City of Cornwall (various staff)
OCWA
St. Lawrence Testing & Inspection Co. Ltd. (Gib McIntee)
XCG Consultants Ltd. (Cameron Smith)
CH2MHill Canada (various staff)
J.L. Richards & Associates Limited (various staff)

1.0 Introduction (9:00 to 9:10)

2.0 Project Overview (9:10 to 9:30)

- Existing Plant
- Proposed Effluent Requirements
- Proposed Hydraulic and Organic Loading

3.0 Geotechnical and Hydrogeological Conditions – (Gib McIntee) (9:30 to 9:45)

4.0 Pumping Station (Proposed Upgrades and Opinion of Probable Cost) (9:45 to 10:15)

Break (10:15 to 10:30)

5.0 Liquid Train (10:30 to 12:30)

- Ranking of alternatives (BAF versus CAS)
- Preliminary Concept Layouts
- Preliminary Costing
- Operator Input based on visit to Ravensview and Cataraqui Bay WWTP's
- Confirm Secondary Treatment Technology and Disinfection Process
- VE items to consider (assumes that BAF is re-confirmed):
 - Number of BAF cells (N or N+1) – current concept and costing based on N +1 Savings of approx. \$2.0M for 7 BIOSTYR BAF Cells instead of 8.
 - Hydraulic Loading versus Organic Loading and impact on number of BAF Cells

7 BIOSTYR Cells (JMI) for 65,318 m³/d ADF and 160,000 m³/d Peak Day
6 BIOSTYR Cells (JMI) for 65,318 m³/d ADF and 135,000 m³/d Peak Day

- Screening (12 mm recommended for BIOSTYR BAF)
- Screening and Degritting implemented separately or at the same time

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- Tunnels or not
- Tunnel to BAF through CCT (temporary construction impact)
- Elevator for BAF
- Separation from CCT and temporary sheet pile
- Allowance for Rock Anchors or Groundwater Drainage of Backwash Tanks
- High-Efficiency Turbo Blowers
- BAF Cell Flow Metering (metering of 2 Cells included in JMI proposal)
- Layout – Move BAF south to reduce excavation and reduce perimeter concrete wall versus longer tunnel
- Others

Lunch (12:30 to 13:00)

6.0 Solids Train (13:00 to 2:30)

- Additional Digester (Primary versus Secondary?)
- Separate Thickening Process Before Digestion
- Sludge Storage Tanks c/w mixing upstream of Dewatering
- Additional Digester (Mesophilic only versus Temperature-Phased)
- Centrifuges - 2 units @ 60% (6 hours/day, 5 days/week) versus 2 units @ 100%; Redundancy through longer hours of operation
- Layout and Tunnel arrangement
- Others

7.0 Other VE Items (2:30 to 3:00)

- Replace all MCC's and associated wiring
- Upgrade all I&C to achieve fully automated plant on SCADA
- Back-up Generators (indoor vs outdoor)
- Cogeneration

Break (3:00 to 3:15)



**J.L. Richards
& Associates Limited**
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Kingston, ON Canada
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Fax: 613 544 5679

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- 8.0 Other Business (3:15 to 3:45)
- Confirm Phase 1 and Phase 2 Works
 - Confirm Budgeting Summary (with or without HST?)
- 9.0 Summary, Actions Items and Next Steps (3:45 to 4:00)

MEMORANDUM

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TO: File

DATE: November 6, 2009;
Revised: December 2, 2009

FROM: Michael Troop

JOB NO.: 23695

RE: Cornwall WWTP EA Update – VE Session Notes

CC:

The purpose of this memorandum is to summarize the key decisions reached during a Value Engineering workshop held as part of the ongoing Cornwall Wastewater Treatment Plant (WWTP) Environmental Assessment (EA) update. The VE workshop was held between 09:00 and 16:00 on Thursday November 5, 2009 in Room A of the Cornwall Civic Complex, 100 Water Street East, Cornwall, ON. Meeting attendees were as follows:

Name	Company
David Brownlee	City of Cornwall
David McKiver	City of Cornwall
Dennis Graham	City of Cornwall
Garry Wheeler	City of Cornwall
Hal Cote	City of Cornwall
Mike Campbell	City of Cornwall
Morris McCormick	City of Cornwall
Norm Levac	City of Cornwall
Patrick Carrière	City of Cornwall
René A. J. Piette	City of Cornwall
Richard Marleau	City of Cornwall
Asim Masaud	OCWA
Zbigniew Bukala	OCWA
Brian Hein	J. L. Richards & Associates Limited
Dan Lalande	J. L. Richards & Associates Limited
Louis Fournier	J. L. Richards & Associates Limited
Michael Troop	J. L. Richards & Associates Limited
Mike Duivenvoorden	J. L. Richards & Associates Limited
Clare Humphrey	CH2M HILL Canada Limited
Marcy Jordan	CH2M HILL Canada Limited
Mark Montgomery	CH2M HILL Canada Limited
Cameron Smith	XCG Consultants Limited
Gib McIntee	St. Lawrence Testing & Inspection Company Limited

1. OCWA suggested that consideration be given to using yearly average vs monthly average effluent quality parameters in the application for C of A (Sewage) with the Ministry of the Environment. It was noted that although negotiations have already determined what the concentration of effluent characteristics are to be, there can be an attempt to have the averages calculated on a yearly rather than monthly basis. This will be reviewed further during the detailed design phase.

2. Driving sheet piling at the site to prevent undermining of the existing chlorine contact tank if necessary will prove to be very difficult due to the coarse nature of sub-soils (i.e. cobbles and boulders). An allowance for stabilizing existing structures of \$100 000 is more appropriate and would likely be in the form of a shallow pile complete with underpinning rather than sheet piling, if necessary.
3. The City of Cornwall will consider doing some of the capital upgrades outside the main plant expansion. Some of this work might include upgrades to the pumping station, or parts thereof, as a stand-alone project. This may tie into work being completed on Combined Sewer Overflow (CSO) management and control strategies.
4. An allowance of \$350 000 must be added to the Opinion of Probable Cost (OPC) to upgrade/replace the transformer at the pumping station.
5. Based on the criteria and evaluation in the EA, both Biological Aerated Filters (BAF) and Conventional Activated Sludge (CAS) secondary treatment processes were ranked as tied for most preferred treatment technology. The suitability of both technologies was compared and discussed in detail during the VE session. It was determined that because of similar life cycle costing, comparable capital costs, and a more automated system and significantly smaller footprint for BAF, that the BAF technology best addresses the needs of the City of Cornwall. It was recognized that the CAS process may offer more operational parameters that are adjustable for operators, but this, in the opinion of operators and management for the City of Cornwall, is outweighed by the automated and efficient operation of the BAF process. It was also noted that the BAF process may be more "robust" than CAS during hydraulic loading fluctuations.
6. Maximum Daily Flow is to be reduced from 160,000 to 135 000 m³/d, which will require a BAF with N cells (i.e no redundant cell). Actual number of cells will depend on the supplier of the BAF process (John Meunier Inc. or Degremont). Cornwall may upgrade the process in the future to have a Maximum Daily Flow of 160 000m³/d. If JMI's BIOSTYR BAF process is selected, the installation would involve 6 cells. Number of cells for a Degremont system is still to be determined.

Post VE note: the preliminary design by Degremont for the BIOFOR BAF process would involve 6 Biofor C cells followed by 9 Biofor N cells operated in series during average day flow conditions. These cells would then operate in parallel during peak design flow conditions. Degremont has advised that the number of cells remains the same (i.e. 6 C cells + 9 N cells) even if the Maximum Day Flow is reduced from the 160,000 to 135 000 m³/d.

The BAF supplier, Maximum Daily Flow design capacity and number of cells required should be reviewed and confirmed during design while considering life-cycle costs and other implementation, operational and maintenance considerations.

7. A new on-site screening facility is proposed with odour capture and control as part of Phase 1 to improve the preliminary treatment process. Space will be provided for the future installation of automatic grit removal equipment (Grit pumps and classifiers) as part of Phase 2. Necessary space for all electrical equipment will be included, and the Odour Control system will be sized for the future system. The new screening equipment and building will be moved to Phase 1.
8. Consensus was attained to implement a tunnel from the primary treatment to the BAF being located as close as possible to the primary treatment in order to minimize the length of this tunnel. This will require a phased installation because the new tunnel will require demolition and removal of the existing chlorine contact tank after the new disinfection process has been completed and commissioned.

9. There is to be no elevator in the BAF. Efforts are to be made to ensure the stairs are not steep.
10. The allowance for high-efficiency turbo blowers is to be left in the OPC.
11. Consensus was attained to implement UV disinfection, consistent with the original Environmental Study Report.
12. Additional assessments are required to optimize the solids train and digestion process. These could be undertaken as stand-alone assignments or included as part of the design phase.

Post VE note: The implementation of additional digestion capacity could be deferred several years and moved into Phase 2. Based on theoretical analyses, the existing primary digestion capacity should be adequate up to an average day flow of approximately 59,500 m³/d.

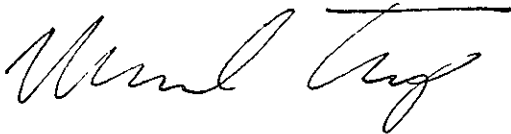
Moving the implementation of a third digester and associated tunnel, etc., from Phase 1 to Phase 2, reduces the Opinion of Probable Cost for Phase 1 by \$4,325,000 plus contractor mark-up, engineering, and contingency.

13. Consensus was attained to include a budget allowance for two new centrifuges, each sized to provide 60% of the necessary dewatering capacity at the design flow, based on 40 hours dewatering operation per week. This should be reviewed further during the design phase.
14. Centrate drain in the dewatering building is to be managed by the City of Cornwall outside the scope of the current EA study and proposed upgrades. The possibility of a direct gravity outlet for centrate to the East Trunk sewer should be explored.
15. Dewatering technologies other than centrifugation will be considered during the design phase.
16. All electrical, instrumentation, and control upgrades shown in the OPC are to be maintained. The City prefers 100% automation of the upgraded plant, for both new and existing.
17. The Opinion of Probable Cost was developed based on backup generators being installed outdoor with an appropriate enclosure (i.e. no building or budget allocated for an indoor installation). Two back-up generators are required – one for the pumping station and one for the plant. Sizing of these units will be optimized during the design phase.
18. Cogeneration is not to be pursued. A cogeneration system would use digester gas to generate electrical power and heat for the plant. Currently, the plant utilizes as much digester gas as possible in the boilers, which provides the necessary process heat for both the digestion system and the plant heating during cold weather. These boilers can be supplemented with natural gas when there is insufficient digester gas. A detailed study was not undertaken, but it is expected that the payback period for cogeneration equipment at a plant this size would be on the order of 20 years, based on a study recently conducted in Brockville. Given the poor business case for cogeneration and the fact that a significant portion of digester gas is already being utilized by the boilers for on-site process needs, the addition of a cogeneration system as part of the proposed upgrades will not be pursued.
19. An allowance of \$300 000 (plus contractor mark-ups) is to be carried to cover the cost of new ferric chloride tanks to be located outside in a suitable location. This allowance will include the necessary containment, either in the form of double-walled tanks, or a concrete containment enclosure. This will be included in Phase 2 of the upgrades' program.

20. Upgrades to the flare and the boilers will be moved from Phase 1 to Phase 2 of the project.
21. A Leadership in Energy and Environmental Design (LEED) rating will not be pursued for this project because a framework for wastewater treatment plants is not available (and significant upgrades to the administration facilities onsite are not planned),.
22. Taxes, including HST are to be left out of the OPC presented in the Environmental Study Report (ESR) Addenda. The City of Cornwall will determine the appropriate amount of tax to be applied to the final cost estimate (full HST minus municipal rebates) after submission and acceptance of the ESR.

Prepared by:

J.L. RICHARDS & ASSOCIATES LIMITED

A handwritten signature in black ink, appearing to read "Michael Troop". The signature is written in a cursive style with a horizontal line above the name.

Michael Troop, P.Eng.

Client: City of Cornwall
 Project: Cornwall Wastewater Treatment Plant
 Location: Cornwall, Ontario
 Date prepared: 5-Nov-09

ELEMENT	DESCRIPTION	BAF (based on BIOSTYR + 1 redundant cell)	CAS
PUMPING STATION IMPROVEMENTS		\$2,322,000	\$2,322,000
GENERAL WORKS		\$988,000	\$1,240,000
SERVICES & YARD PIPING		\$200,000	\$300,000
GRIT REMOVAL AND CHEMICAL SYSTEMS - IMPROVEMENTS		\$601,000	\$601,000
PRIMARY CLARIFIERS - IMPROVEMENTS		\$546,000	\$546,000
SECONDARY TREATMENT		\$26,500,000	\$25,553,000
ULTRAVIOLET DISINFECTION		\$3,490,000	\$3,490,000
NEW DIGESTER AND GALLERY		\$4,325,000	\$4,325,000
EXISTING DIGESTER IMPROVEMENTS		\$644,000	\$644,000
EXISTING DEWATERING FACILITY IMPROVEMENTS		\$1,546,000	\$1,546,000
ELECTRICAL SERVICE AND EMERGENCY POWER		\$1,305,000	\$1,305,000
FLARE STACK		\$150,000	\$150,000
NEW SERVICE TUNNELS (including process piping & electrical)		\$1,500,000	\$1,250,000
OTHER		\$300,000	\$300,000
SUB TOTAL		\$44,417,000	\$43,572,000
GENERAL			
	Construction Phasing & Commissioning	1.0%	\$436,000
	Permits	1.0%	\$436,000
	General Contractor's Fees	10.0%	\$4,357,000
TOTAL - OPINION OF PROBABLE COST (CONSTRUCTION)		\$49,747,000	\$48,801,000
ALLOWANCE FOR SYSTEM INTEGRATION			
PROJECT MANAGEMENT, ENGINEERING AND CONTINGENCY (25%)		included above with I&C Costing	included above with I&C Costing
TOTAL PHASE 1 (excl. HST)		\$12,437,000	\$12,200,000
TOTAL PHASE 2 (excl. HST)		\$62,184,000	\$61,001,000
TOTAL PHASES 1 & 2 (excl. HST)		\$6,846,000	\$6,846,000
TOTAL PHASES 1 & 2 (incl. HST)		\$69,030,000	\$67,847,000

Client: City of Cornwall
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 Date prepared: 5-Nov-09

ELEMENT	DESCRIPTION	QUANTITY	UNIT	RATE	TOTALS	EXTENDED
PUMPING STATION IMPROVEMENTS						
	Demolition - E, I&C incl. Patching	1	allowance	\$ 50,000		
	New Pumps - Supply and Install (two 250 hp and two 300 hp)	1	lot	\$ 1,350,000	\$50,000	
	Electrical (MCC)	1	lot	\$ 225,000	\$1,350,000	
	Electrical (Wiring)	1	lot	\$ 150,000	\$225,000	
	Instrumentation and Controls	1	lot	\$ 187,000	\$150,000	
	Back-up Generator (outdoor installation)	1	ea	\$ 300,000	\$187,000	
	Fencing around Generator	1	allowance	\$ 10,000	\$300,000	
	Transfer Switch for Back-up Generator	1	ea	\$ 50,000	\$10,000	\$2,322,000
GENERAL WORKS						
	Demolition - general	1	allowance	\$ 150,000	\$150,000	
	Demolition - CCT and Associated Systems	1	allowance	\$ 100,000	\$100,000	
	Site Clearing, Topsoil Stripping & Stockpiling	1	allowance	\$ 75,000	\$75,000	
	Temporary Works					
	Erosion and Sediment Control	1	allowance	\$ 50,000	\$50,000	
	Construction Trailer Complex	1	allowance	\$ 100,000	\$100,000	
	Temporary Power Fit-ups	1	allowance	\$ 100,000	\$100,000	
	Tower Crane Rentals	1	allowance	\$ 250,000	\$250,000	
	Landscaping					
	Perimeter Fence	380	m	\$ 100	\$38,000	
	New Gate	1	ea	\$ 15,000	\$15,000	
	Topsoil & Seed Reinstatement	1	allowance	\$ 25,000	\$25,000	
	New Roads - including granular & H.D. asphalt paving	500	sm	\$ 70	\$35,000	
	Site Lighting	1	lot	\$ 50,000	\$50,000	\$988,000
SERVICES & YARD PIPING						
	Watermain & Hydrant Modifications	1	allowance	\$ 100,000	\$100,000	
	Storm and Sanitary Sewers	1	allowance	\$ 100,000	\$100,000	\$200,000
GRIT REMOVAL AND CHEMICAL SYSTEMS - IMPROVEMENTS						
	Demolition - E, I&C incl. Patching	1	allowance	\$ 50,000	\$50,000	
	Electrical (MCC)	1	lot	\$ 75,000	\$75,000	
	Electrical (Wiring)	1	lot	\$ 50,000	\$50,000	
	Instrumentation and Controls	1	lot	\$ 426,000	\$426,000	\$601,000
PRIMARY CLARIFIERS - IMPROVEMENTS						
	Replace Existing Sludge Pumps	1	allowance	\$ 125,000	\$125,000	
	Demolition - E, I&C incl. Patching	1	allowance	\$ 50,000	\$50,000	
	Electrical (MCC)	1	lot	\$ 75,000	\$75,000	
	Electrical (Wiring)	1	lot	\$ 100,000	\$100,000	
	Instrumentation and Controls	1	lot	\$ 196,000	\$196,000	\$546,000

Client: City of Cornwall
 Project: Cornwall Wastewater Treatment Plant
 Location: Cornwall, Ontario
 Date prepared: 5-Nov-09

ELEMENT	DESCRIPTION	QUANTITY	UNIT	RATE	TOTALS	EXTENDED
BIOLOGICAL AERATED FILTERS - SECONDARY TREATMENT						
	BAF Building incl. Blower/Mechanical/MCC/SCADA Rooms (2 storeys)	800	sm	\$ 4,000	\$3,200,000	
	Stairwell for Exiting from BAF Gallery per Code	1	ea	\$ 100,000	\$ 100,000	
	Excavation	60000	cu.m.	\$ 10	\$600,000	
	To be discussed Temporary Shoring (between BAF and ex. CCT)	1	allowance	\$ 100,000	\$100,000	
	To be discussed Lifting Devices - Elevator, Manual Bridge Crane	1	allowance	\$ 250,000	\$250,000	
	Concrete for Lower Gallery, Influent & Effluent Channels	1	lot	\$ 2,250,000	\$2,250,000	
	Concrete for BAF Cells (based on BIOS TYR + 1 redundant cell)	8	ea	\$ 350,000	\$2,800,000	
	Backwash Residual Storage Tanks	2	ea	\$ 500,000	\$1,000,000	
	To be discussed Rock Anchors/Groundwater Drainage for Backwash Tanks	1	allowance	\$ 400,000	\$400,000	
	Exterior Concrete - Stairs, ramps, retaining walls, etc.	1	allowance	\$ 100,000	\$100,000	
	Mechanical Process Systems					
	Biofilters & Blowers (pre-selected package)	1	lot	\$ 9,500,000	\$9,500,000	
	Labour for pre-selected Biofilter/Blower Package	1	lot	\$ 1,900,000	\$1,900,000	
	Net Incremental Cost for High-Efficiency Turbo Blowers	1	lot	\$ 300,000	\$300,000	
	BAF Cell Effluent Manual Gates (4 per cell)		included in BAF Package			
	Flow Metering at 2 BAF Cells		included in BAF Package			
	Backwash Residual Pumping/Piping		included in BAF Package			
	Miscellaneous Piping/Manual (Supply & Install)	1	lot	\$ 2,600,000	\$2,600,000	
	Electrical (MCC)	1	lot	\$ 250,000	\$250,000	
	Electrical (Wiring)	1	lot	\$ 600,000	\$600,000	
	Instrumentation and Controls - Materials		included in BAF Package			
	Instrumentation and Controls - Installation	1	lot	\$ 75,000	\$75,000	
	Miscellaneous Metals	1	lot	\$ 250,000	\$250,000	
	Primary Effluent Channel (from Primary Clarifiers to BAF)	65	m	\$ 2,500	\$162,500	
	Secondary Effluent Channel (from BAF to UV)	25	m	\$ 2,500	\$62,500	\$26,500,000

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ELEMENT	DESCRIPTION	QUANTITY	UNIT	RATE	TOTALS	EXTENDED
ULTRAVIOLET DISINFECTION						
	New UV Building (15 m x 25 m)	375	sm	\$ 4,000	\$1,500,000	
	Excavation	3000	cu.m.	\$ 10	\$30,000	
	Process Mechanical					
	UV System (pre-selected package)	1	lot	\$ 1,000,000	\$1,000,000	
	Labour for pre-selected UV Package	1	lot	\$ 300,000	\$300,000	
	Electrical (MCC)	1	lot	\$ 75,000	\$75,000	
	Electrical (Wiring)	1	lot	\$ 100,000	\$100,000	
	Instrumentation and Controls	1	lot	\$ 25,000	\$25,000	
	Effluent Serpentine Weir & Metering	1	lot	\$ 150,000	\$150,000	
	Effluent Pumping Upgrades	1	lot	\$ 250,000	\$250,000	
	Secondary Effluent Pipe (from UV to Ex.)	40	m	\$ 1,500	\$60,000	\$3,490,000
NEW DIGESTER & GALLERY						
	New Digester Tank incl. gas proofing	1	ea	\$ 1,800,000	\$1,800,000	
	Digester Complex Building at New Digester	250	sm	\$ 4,000	\$1,000,000	
	Pre Selected Equipment (supply and install)					
	New Sludge Heat Exchanger (for Mesophilic)	1	ea	\$ 250,000	\$250,000	
	New Heat Recovery Heat Exchanger (for Thermophilic)	nil	nil	nil	nil	
	Mixing System for New Digester (supply and install)	1	ea	\$ 450,000	\$450,000	
	Process Mechanical					
	Digester Liquid Train	1	allowance	\$ 400,000	\$400,000	
	Digester Gas Train	1	allowance	\$ 200,000	\$200,000	
	Electrical (MCC)	1	lot	\$ 75,000	\$75,000	
	Electrical (Wiring)	1	lot	\$ 75,000	\$75,000	
	Instrumentation and Controls	1	lot	\$ 75,000	\$75,000	\$4,325,000
EXISTING DIGESTER IMPROVEMENTS						
	Demolition - E, I&C incl. Patching	1	allowance	\$ 50,000	\$50,000	
	Electrical (MCC)	1	lot	\$ 125,000	\$125,000	
	Electrical (Wiring)	1	lot	\$ 200,000	\$200,000	
	Instrumentation and Controls	1	lot	\$ 269,000	\$269,000	\$644,000

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ELEMENT	DESCRIPTION	QUANTITY	UNIT	RATE	TOTALS	EXTENDED
EXISTING DEWATERING FACILITY IMPROVEMENTS						
	New Centrifuges	2	ea	\$ 375,000	\$750,000	
	Replace Existing Polymer System	nil	nil	nil	nil	
	Automatic Cake Conveyor	1	ea	\$ 125,000	\$125,000	
	Re-Convert Centrate Holding Tanks to Sludge Holding Tanks	2	ea	\$ 25,000	\$50,000	
	Pipe Centrate directly to East trunk Sewer	1	allowance	\$ 50,000	\$50,000	
	Demolition - E. I&C incl. Patching	1	allowance	\$ 50,000	\$50,000	
	Electrical (MCC)	1	lot	\$ 175,000	\$175,000	
	Electrical (Wiring)	1	lot	\$ 100,000	\$100,000	
	Instrumentation and Controls	1	lot	\$ 246,000	\$246,000	\$1,546,000
ELECTRICAL SERVICE AND EMERGENCY POWER						
	New Transformer for Plant	1	ea	\$ 300,000	\$300,000	
	Service Entrance Duct Bank	1	ea	\$ 120,000	\$120,000	
	Grounding Modifications	1	ea	\$ 30,000	\$30,000	
	Hydro Metering Modifications	1	ea	\$ 10,000	\$10,000	
	Back-up Generator (outdoor installation)	1	ea	\$ 300,000	\$300,000	
	Transfer Switch for Back-up Generator	1	ea	\$ 75,000	\$75,000	
	Power factor Correction	1	ea	\$ 50,000	\$50,000	
	Electrical (Installation and Wiring)	1	lot	\$ 250,000	\$250,000	
	System Integrator (included in I&C items)	1	lot	\$ -	\$0	
	SCADA hardware and software	1	lot	\$ 120,000	\$120,000	
	Vibration Analysis	1	allowance	\$ 50,000	\$50,000	\$1,305,000
FLARE STACK						
	Replace Flare Stack (allowance)	1	allowance	\$ 150,000	\$150,000	\$150,000
NEW SERVICE TUNNELS (including process piping & electrical)						
	Tunnel from Primary Clarifiers to BAF	100	m	\$ 10,000	\$1,000,000	
	Tunnel from Ex. Tunnel to New Digester Complex	50	m	\$ 10,000	\$500,000	
	Tunnel from BAF to UV	nil	nil	nil	nil	\$1,500,000
OTHER						
	New Boilers to address increased Heat Load	1	allowance	\$ 300,000	\$300,000	
	Renovate existing Admin. Bldg.	nil	nil	nil	nil	
	LEED Initiatives		No allowance carried			\$300,000
SUB TOTAL					\$44,417,000	\$44,417,000
GENERAL						
	Construction Phasing & Commissioning	1.0%		\$ 44,417,000	\$444,000	
	Permits	1.0%		\$ 44,417,000	\$444,000	
	General Contractor's Fees	10.0%		\$ 44,417,000	\$4,442,000	\$5,330,000
TOTAL - OPINION OF PROBABLE COST (CONSTRUCTION) - excl. HST						\$49,747,000

Client: City of Cornwall
 Project: Cornwall Wastewater Treatment Plant
 Location: Cornwall, Ontario
 Date prepared: 5-Nov-09

ELEMENT	DESCRIPTION	QUANTITY	UNIT	RATE	TOTALS	EXTENDED
PUMPING STATION IMPROVEMENTS						
	Demolition - E, I&C incl. Patching	1	allowance	\$ 50,000	\$50,000	
	New Pumps - Supply and Install (two 250 hp and two 300 hp)	1	lot	\$ 1,350,000	\$1,350,000	
	Electrical (MCC)	1	lot	\$ 225,000	\$225,000	
	Electrical (Wiring)	1	lot	\$ 150,000	\$150,000	
	Instrumentation and Controls	1	ea	\$ 187,000	\$187,000	
	Back-up Generator (outdoor installation)	1	ea	\$ 300,000	\$300,000	
	Fencing around Generator	1	allowance	\$ 10,000	\$10,000	
	Transfer Switch for Back-up Generator	1	ea	\$ 50,000	\$50,000	\$2,322,000
GENERAL WORKS						
	Demolition - general	1	allowance	\$ 150,000	\$150,000	
	Demolition - CCT and Associated Systems	1	allowance	\$ 100,000	\$100,000	
	Site Clearing, Topsoil Stripping & Stockpiling	1	allowance	\$ 150,000	\$150,000	
	Temporary Works					
	Erosion and Sediment Control	1	allowance	\$ 75,000	\$75,000	
	Construction Trailer Complex	1	allowance	\$ 100,000	\$100,000	
	Temporary Power Fit-ups	1	allowance	\$ 125,000	\$125,000	
	Tower Crane Rentals	1	allowance	\$ 325,000	\$325,000	
	Landscaping					
	Perimeter Fence	550	m	\$ 100	\$55,000	
	New Gate	1	ea	\$ 15,000	\$15,000	
	Topsoil & Seed Reinstatement	1	allowance	\$ 35,000	\$35,000	
	New Roads - including granular & H.D. asphalt paving	500	sm	\$ 70	\$35,000	
	Site Lighting	1	lot	\$ 75,000	\$75,000	\$1,240,000
SERVICES & YARD PIPING						
	Watermain & Hydrant Modifications	1	allowance	\$ 200,000	\$200,000	
	Storm and Sanitary Sewers	1	allowance	\$ 100,000	\$100,000	\$300,000
GRIT REMOVAL AND CHEMICAL SYSTEMS - IMPROVEMENTS						
	Demolition - E, I&C incl. Patching	1	allowance	\$ 50,000	\$50,000	
	Electrical (MCC)	1	lot	\$ 75,000	\$75,000	
	Electrical (Wiring)	1	lot	\$ 50,000	\$50,000	
	Instrumentation and Controls	1	lot	\$ 426,000	\$426,000	\$601,000
PRIMARY CLARIFIERS - IMPROVEMENTS						
	Replace Existing Sludge Pumps	1	allowance	\$ 125,000	\$125,000	
	Demolition - E, I&C incl. Patching	1	allowance	\$ 50,000	\$50,000	
	Electrical (MCC)	1	lot	\$ 75,000	\$75,000	
	Electrical (Wiring)	1	lot	\$ 100,000	\$100,000	
	Instrumentation and Controls	1	lot	\$ 196,000	\$196,000	\$546,000

Client: City of Cornwall
 Project: Cornwall Wastewater Treatment Plant
 Location: Cornwall, Ontario
 Date prepared: 5-Nov-09

ELEMENT	DESCRIPTION	QUANTITY	UNIT	RATE	TOTALS	EXTENDED
CONVENTIONAL ACTIVATED SLUDGE - SECONDARY TREATMENT						
	Blower Building	150	sm	\$ 4,000	\$600,000	
	Stairwell for Exiting from Gallery per Code	1	ea	\$ 100,000	\$100,000	
	Excavation	50000	cu.m.	\$ 10	\$500,000	
	Temporary Shoring (between CAS and ex. CCT)		Not likely required			
	Lifting Device - Monorail in Blower Room	1	ea	\$ 50,000	\$50,000	
	Exterior Concrete - Stairs, ramps, retaining walls, etc.	1	lot	\$ 100,000	\$100,000	
	Aeration Tanks					
	Concrete Tanks	4	ea	\$ 750,000	\$3,000,000	
	High-Efficiency Turbo Blowers (supply and install)	4	ea	\$ 250,000	\$1,000,000	
	Aeration Diffusers, Piping and Valves	4	ea	\$ 750,000	\$3,000,000	
	Catwalks & Handrails	1	lot	\$ 300,000	\$300,000	
	Secondary Clarifiers					
	Concrete Tanks	4	ea	\$ 1,650,000	\$6,600,000	
	Chain and Flight Sludge Collectors	4	ea	\$ 1,250,000	\$5,000,000	
	Manual Scum Removal System	4	ea	\$ 125,000	\$500,000	
	Scum Pumping & Piping	1	lot	\$ 200,000	\$200,000	
	Effluent Launderers	4	ea	\$ 200,000	\$800,000	
	RAS Pumping & Piping	4	ea	\$ 500,000	\$2,000,000	
	Catwalks & Handrails	1	lot	\$ 600,000	\$600,000	
	Electrical (MCC)	1	lot	\$ 350,000	\$350,000	
	Electrical (Wiring)	1	lot	\$ 350,000	\$350,000	
	Instrumentation and Controls	1	lot	\$ 203,000	\$203,000	
	Miscellaneous Metals	1	lot	\$ 250,000	\$250,000	
	Primary Effluent Channel (from Primary Clarifiers to CAS)	15	m	\$ 2,500	\$37,500	
	Secondary Effluent Channel (to UV)	5	m	\$ 2,500	\$12,500	\$25,553,000

Client: City of Cornwall
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ELEMENT	DESCRIPTION	QUANTITY	UNIT	RATE	TOTALS	EXTENDED
ULTRAVIOLET DISINFECTION						
	New UV Building (15 m x 25 m)	375	sm	\$ 4,000	\$1,500,000	
	Excavation	3000	cu.m.	\$ 10	\$30,000	
	Process Mechanical					
	UV System (pre-selected package)	1	lot	\$ 1,000,000	\$1,000,000	
	Labour for pre-selected UV Package	1	lot	\$ 300,000	\$300,000	
	Electrical (MCC)	1	lot	\$ 75,000	\$75,000	
	Electrical (Wiring)	1	lot	\$ 100,000	\$100,000	
	Instrumentation and Controls	1	lot	\$ 25,000	\$25,000	
	Effluent Serpentine Weir & Metering	1	lot	\$ 150,000	\$150,000	
	Effluent Pumping Upgrades	1	lot	\$ 250,000	\$250,000	
	Secondary Effluent Pipe (from UV to Ex.)	40	m	\$ 1,500	\$60,000	\$3,490,000
NEW DIGESTER & GALLERY						
	New Digester Tank incl. gas proofing	1	ea	\$ 1,800,000	\$1,800,000	
	Digester Complex Building at New Digester	250	sm	\$ 4,000	\$1,000,000	
	Pre Selected Equipment (supply and install)					
	New Sludge Heat Exchanger (for Mesophilic)	1	ea	\$ 250,000	\$250,000	
	New Heat Recovery Heat Exchanger (for Thermophilic)	nil	nil	nil	nil	
	Mixing System for New Digester (supply and install)	1	ea	\$ 450,000	\$450,000	
	Process Mechanical					
	Digester Liquid Train	1	allowance	\$ 400,000	\$400,000	
	Digester Gas Train	1	allowance	\$ 200,000	\$200,000	
	Electrical (MCC)	1	lot	\$ 75,000	\$75,000	
	Electrical (Wiring)	1	lot	\$ 75,000	\$75,000	
	Instrumentation and Controls	1	lot	\$ 75,000	\$75,000	\$4,325,000
EXISTING DIGESTER IMPROVEMENTS						
	Demolition - E, I&C incl. Patching	1	allowance	\$ 50,000	\$50,000	
	Electrical (MCC)	1	lot	\$ 125,000	\$125,000	
	Electrical (Wiring)	1	lot	\$ 200,000	\$200,000	
	Instrumentation and Controls	1	lot	\$ 269,000	\$269,000	\$644,000

Client: City of Cornwall
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 Date prepared: 5-Nov-09

ELEMENT	DESCRIPTION	QUANTITY	UNIT	RATE	TOTALS	EXTENDED
EXISTING DEWATERING FACILITY IMPROVEMENTS						
	New Centrifuges	2	ea	\$ 375,000	\$750,000	
	Replace Existing Polymer System	nil	nil	nil		
	Automatic Cake Conveyor	1	ea	\$ 125,000	\$125,000	
	Re-Convert Centrate Holding Tanks to Sludge Holding Tanks	2	ea	\$ 25,000	\$50,000	
	Pipe Centrate directly to East trunk Sewer	1	allowance	\$ 50,000	\$50,000	
	Demolition - E, I&C incl. Patching	1	allowance	\$ 50,000	\$50,000	
	Electrical (MCC)	1	lot	\$ 175,000	\$175,000	
	Electrical (Wiring)	1	lot	\$ 100,000	\$100,000	
	Instrumentation and Controls	1	lot	\$ 246,000	\$246,000	\$1,546,000
ELECTRICAL SERVICE AND EMERGENCY POWER						
	New Transformer for Plant	1	ea	\$ 300,000	\$300,000	
	Service Entrance Duct Bank	1	ea	\$ 120,000	\$120,000	
	Grounding Modifications	1	ea	\$ 30,000	\$30,000	
	Hydro Metering Modifications	1	ea	\$ 10,000	\$10,000	
	Back-up Generator (outdoor installation)	1	ea	\$ 300,000	\$300,000	
	Transfer Switch for Back-up Generator	1	ea	\$ 75,000	\$75,000	
	Power factor Correction	1	ea	\$ 50,000	\$50,000	
	Electrical (Installation and Wiring)	1	lot	\$ 250,000	\$250,000	
	System Integrator (included in Consulting Budget)	1	lot	\$ -	\$0	
	SCADA hardware and software	1	lot	\$ 120,000	\$120,000	\$1,305,000
	Vibration Analysis	1	allowance	\$ 50,000	\$50,000	
FLARE STACK						
	Replace Flare Stack (allowance)	1	allowance	\$ 150,000	\$150,000	
NEW SERVICE TUNNELS (including process piping & electrical)						
	Tunnel from Primary Clarifiers to CAS	75	m	\$ 10,000	\$750,000	
	Tunnel from Ex. Tunnel to New Digester Complex	50	m	\$ 10,000	\$500,000	
	Tunnel from CAS to UV	nil	nil	nil		\$1,250,000
OTHER						
	New Boilers to address increased Heat Load	1	allowance	\$ 300,000	\$300,000	
	Renovate existing Admin. Bldg.	nil	nil	nil		
	LEED Initiatives		No allowance carried			\$300,000
SUB TOTAL					\$43,572,000	\$43,572,000
GENERAL						
	Construction Phasing & Commissioning	1.0%		\$ 43,572,000	\$436,000	
	Permits	1.0%		\$ 43,572,000	\$436,000	
	General Contractor's Fees	10.0%		\$ 43,572,000	\$4,357,000	\$5,229,000
TOTAL - OPINION OF PROBABLE COST (CONSTRUCTION) - excl. HST						\$48,801,000

Opinion of Probable Costs - PHASE 2 (Common to Both Options)
Pre Value Engineering Workshop (ADF: 65,318 m3/d; PDF: 160,000 m3/d)

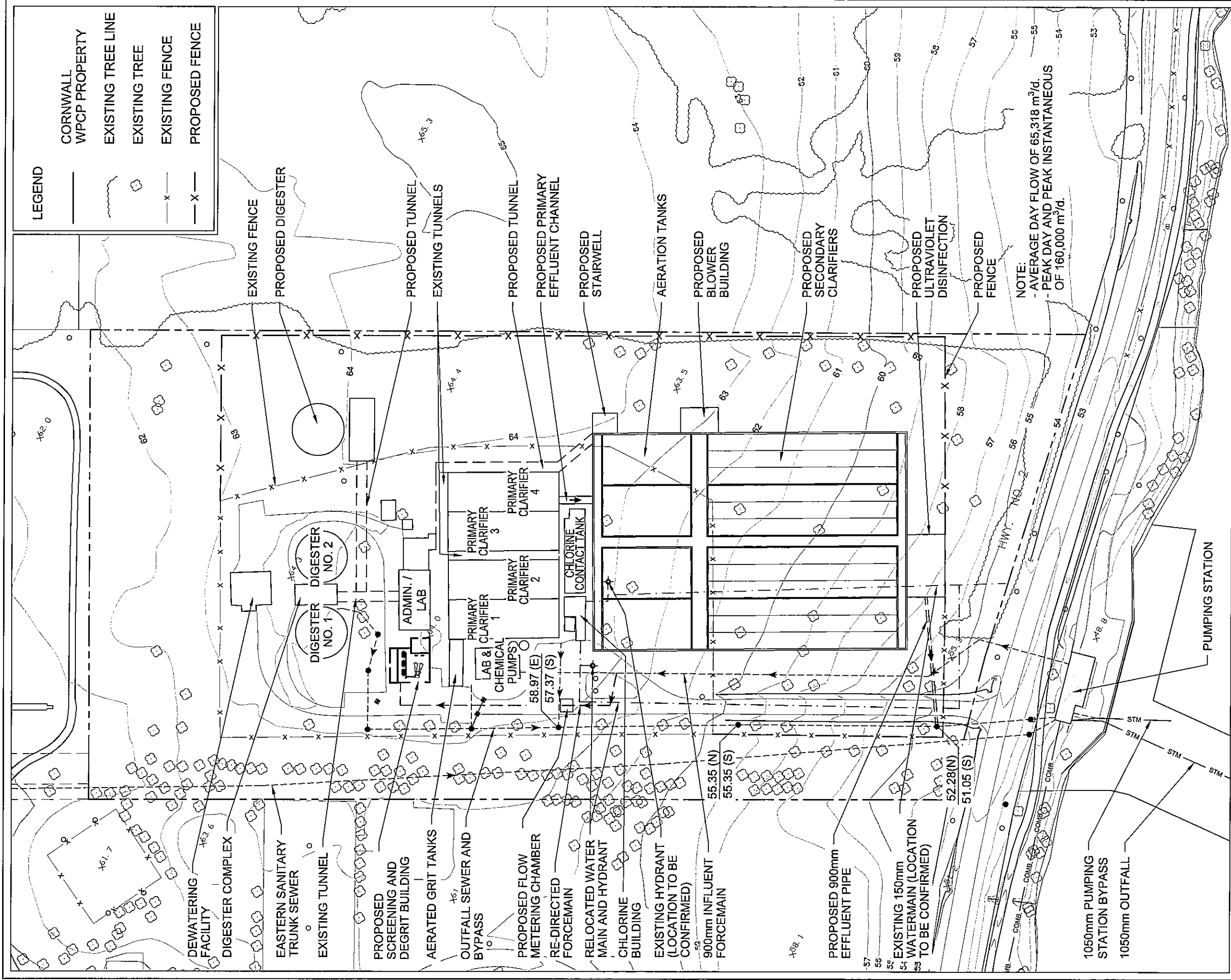
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Client: City of Cornwall
 Project: Cornwall Wastewater Treatment Plant
 Location: Cornwall, Ontario
 Date prepared: 5-Nov-09

ELEMENT	DESCRIPTION	QUANTITY	UNIT	RATE	TOTALS	EXTENDED
GENERAL WORKS						
	Demolition - general	1	ea	\$ 20,000		\$20,000
	Site Clearing	1	ea	\$ 5,000		\$5,000
	Temporary Works					
	Erosion and Sediment Control	1	ea	\$ 10,000		\$10,000
	Construction Trailer Complex	1	allowance	\$ 50,000		\$50,000
	Temporary Power Fit-ups	1	allowance	\$ 10,000		\$10,000
	Landscaping					
	Topsoil & Seed Reinstatement	1	allowance	\$ 10,000		\$10,000
	New Roads - including granular & asphalt paving	200	sm	\$ 100		\$20,000
	New Influent Channel and Parshall Flume	1	ea	\$ 150,000		\$150,000
						\$275,000
PUMPING STATION IMPROVEMENTS						
	Replace Ex. Screen	1	ea	\$ 350,000		\$350,000
	Replace Ex. Sluice Gate	1	ea	\$ 40,000		\$40,000
						\$390,000
NEW SCREENINGS/DEGRITTING BUILDING c/w ODOUR TREATMENT						
	New Building	255	sm	\$ 4,000		\$1,020,000
	Mechanical Process - two mechanical bar screens, screenings conveyor & compactor	1	ea	\$ 850,000		\$850,000
	Electrical (MCC)	1	ea	\$ 75,000		\$75,000
	Electrical (Wiring)	1	ea	\$ 125,000		\$125,000
	Instrumentation and Controls	1	lot	\$ 125,000		\$125,000
	Miscellaneous Metals (checker plates, hand gates, etc.)	1	ea	\$ 200,000		\$200,000
						\$2,395,000
NEW DEGRITTING BUILDING AND GRIT TANK IMPROVEMENTS						
	New Building					
	Remove clam bucket system, improved channel accessibility, modify grit tanks to suit new conveyors					
	Mechanical Process Improvements - New grit classifiers, new grit screw conveyors, new grit pumps, new slide gates	1	ea	\$ 150,000		\$150,000
	Electrical (MCC)	1	ea	\$ 600,000		\$600,000
	Electrical (Wiring)	1	ea	\$ 75,000		\$75,000
	Instrumentation and Controls	1	ea	\$ 125,000		\$125,000
	Miscellaneous Metals (checker plates, hand gates, etc.)	1	ea	\$ 125,000		\$125,000
	New Blower for Grit Tanks & Influent Channels	1	ea	\$ 200,000		\$200,000
		1	ea	\$ 100,000		\$100,000
						\$1,375,000

Client: City of Cornwall
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 Location: Cornwall, Ontario
 Date prepared: 5-Nov-09

ELEMENT	DESCRIPTION	QUANTITY	UNIT	RATE	TOTALS	EXTENDED
NEW ODOUR TREATMENT FOR SCREENING AND DEGRITTING						
	New Building					
	Mechanical Process - Odour Control System	1	ea	\$ 125,000	\$125,000	
	Electrical (MCC)	1	ea	\$ 25,000	\$25,000	
	Electrical (Wiring)	1	ea	\$ 15,000	\$15,000	
	Instrumentation and Controls	1	ea	\$ 15,000	\$15,000	
	Miscellaneous Metals	1	ea	\$ 25,000	\$25,000	\$205,000
PRIMARY CLARIFIERS - IMPROVEMENTS						
	New Drives for Existing Chain and Flight Sludge Collectors	1	ea	\$ 250,000	\$250,000	\$250,000
SUB TOTAL						
					\$4,890,000	
GENERAL						
	Construction Phasing & Commissioning	1.0%		\$ 4,890,000	\$49,000	
	Permits	1.0%		\$ 4,890,000	\$49,000	
	General Contractor's Fees	10.0%		\$ 4,890,000	\$489,000	\$587,000
TOTAL - OPINION OF PROBABLE COST (CONSTRUCTION)						
						\$5,477,000
ALLOWANCE FOR SYSTEM INTEGRATION						
						incl.
PROJECT MANAGEMENT, ENGINEERING AND CONTINGENCY (25%)						
						1,369,000
TOTAL (excl. HST)						
						6,846,000



1 **SITE PLAN**

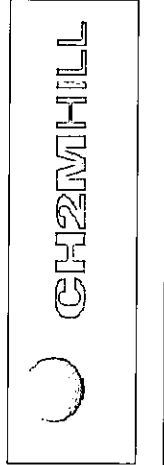


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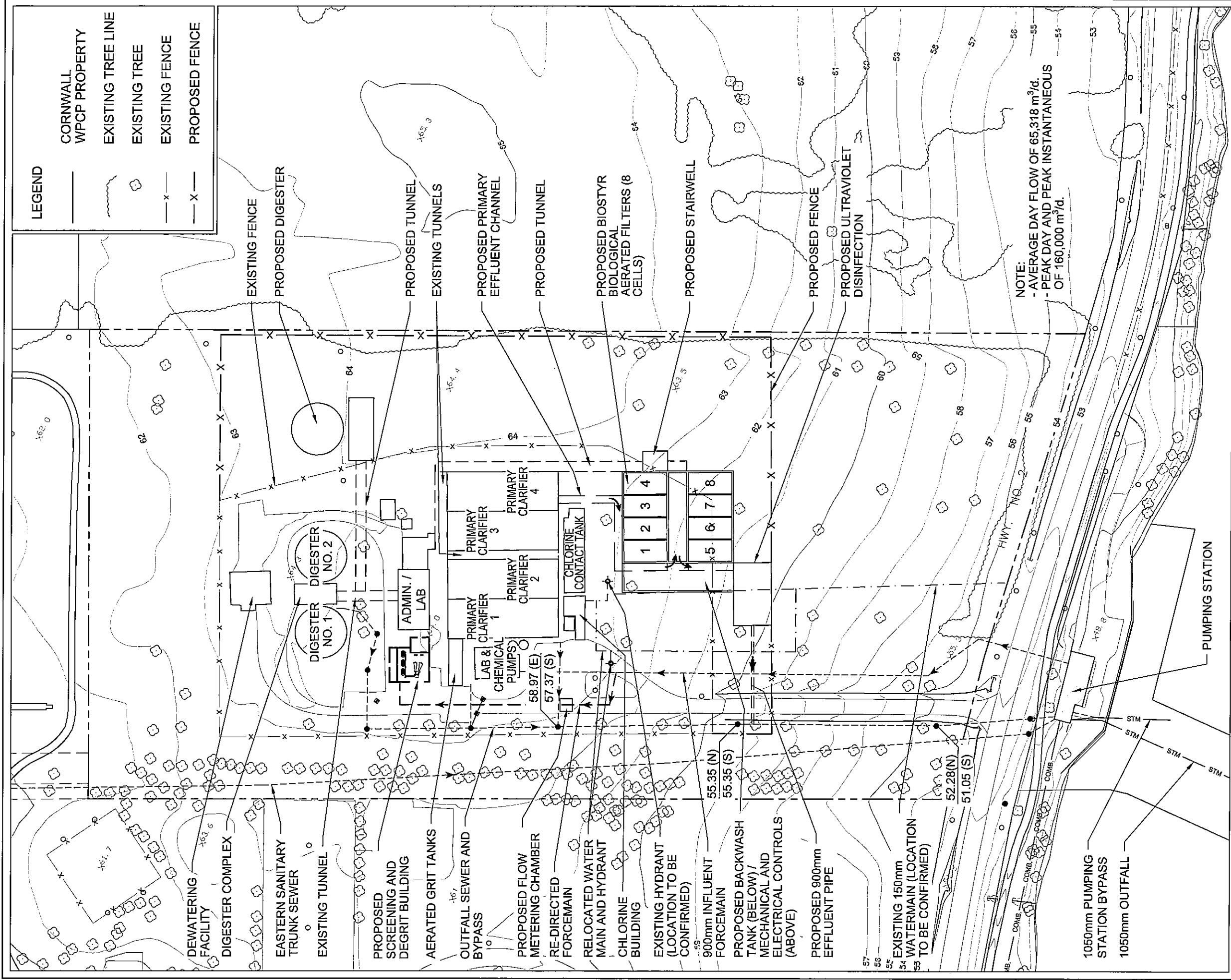
PROJECT:
CORNWALL W.W.T.P.
ENVIRONMENTAL
ASSESSMENT UPDATE
CORNWALL, ONTARIO

DRAWING:
CONVENTIONAL ACTIVATED
SLUDGE
PRELIMINARY SITE PLAN
PRE VALUE ENGINEERING

DESIGN: DYL
DRAWN: JGBS
CHECKED:
PLOTTED: 2009/11/03

DRAWING NO.: **CAS**
JLR NO.: 23695





SITE PLAN

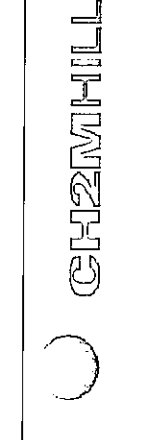
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BIOSTYR BAF

SCALE: 1:1500 0 10 30 50 100m

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PROJECT:
CORNWALL W.W.T.P.
ENVIRONMENTAL
ASSESSMENT UPDATE
CORNWALL, ONTARIO

DRAWING:
BIOSTYR
BIOLOGICAL AERATED FILTERS
PRELIMINARY SITE PLAN
PRE VALUE ENGINEERING

DESIGN: DYL
DRAWN: JGBS
CHECKED:
PLOTTED: 2009/11/03
DRAWING NO.: **BIOSTYR BAF**
JLR NO.: 23695

