Regional Municipality of Halton

Consultants Procedure Manual- Facilities

November 2011
Version 1.0

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SECTION 1 GENERAL REQUIREMENTS

1.1 Introduction

The Region has developed this Consultant Procedures Manual for use by both Consulting Engineering firms and Regional staff involved in the implementation of water, wastewater and waste management facility capital works projects.

The procedures set out in this manual cover engineering services that are to be provided by the Consultants and must be complied with subject to any other directions in the Request for Proposal (RFP). Submission of proposals by Consultants shall mean that the Consultants have read, understand and accept the conditions and procedures as stipulated in this manual.

1.2 Other Halton Reference Manuals

1.2.1 This document, the Capital Project Procedures Manual for Consultants, is one within a series of the manuals and is complemented by the other following documents:

a. Water and Wastewater Facilities Design Manual
b. SCADA Standards Manual
c. Construction Services Manual for Pre-Engineering Surveys, Construction Layout and Inspection
d. Standards for the Production of Engineering Contract Drawings (CADD Standards)
e. Sewer Use By-law
f. Water Works By-law
g. Current Water & Wastewater Master Plan
h. Halton Aquifer Management Plan
i. Urban Servicing Guidelines
j. Well Monitoring Protocol

1.3 Halton Region's Requirements and Expectation

1.3.1 It is Halton Region's requirement and expectation that the Consultants will implement all facility capital projects in accordance with the implementation procedures stipulated herein. The projects will be delivered on time and on budget. Consultants are solely responsible for conducting their own independent research, due diligence, and investigations and for seeking any other advice necessary for the preparation of their proposal.

1.3.2 The Consultants are therefore required to determine the full extent of the scope of work of the project in order to ensure that their proposals include the required

man-power to execute the project and to meet the Region's requirements and expectations.

1.3.3 The Consultants are expected during all phases of the project to submit monthly report and to facilitate monthly project meetings with Halton staff to communicate status and progress of the scope of work outlined within the RFP.

1.4 Scope of Work

1.4.1 The Consultant is required to design the project in accordance with applicable Municipal, Regional, Provincial and Federal regulations and design guidelines and/or requirements as well as all other applicable codes and /or design standards. This Manual does not purport to list all of the design standards or guidelines and the Consultants shall therefore acquaint themselves accordingly on the requirements of these standards or guidelines. Nothing in this manual shall relieve the Consultant of its obligations and responsibility to execute the project in compliance with the requirements of these standards or guidelines.

1.4.2 The project's scope of work will be defined in the RFP or other documents, which Halton Region has issued for soliciting of professional engineering services.

1.5 Engineering Agreement

1.5.1 The Region requires that each Consultant enters into a modified MEA/CEO Engineering Agreement for the provision of engineering services.

1.6 Project Software

1.6.1 The Consultant shall prepare documents using the following software:

a. Microsoft Word, current version licensed by Halton Region, for all reports, operation manuals and other such documents.
b. Microsoft Excel, current version licensed by Halton Region, for spreadsheets and data analysis.
c. Microsoft Project, current version licensed by Halton Region, for project scheduling.
d. AutoCAD, current version licensed by Halton Region, The Consultant shall use computer aided drafting (CAD) for the production of engineering drawings.

1.6.2 All reports or specifications shall be submitted electronically in original file format and Adobe Portable Document Format (PDF), plus a hard copy. See Deliverables (Table 10.3) for exact submission requirements.

1.6.3 All reports are to be printed on standard 8½x11 inch paper, double sided. Draft reports shall be printed with the word "DRAFT" screened diagonally across every page and double sided where appropriate.

1.7 Engineering Drawings

1.7.1 Base plan preparation shall be in accordance the Region's CAD Standards Manual, attached to the RFP document, and AutoCAD accepted standards.

1.7.2 Graphics, Field Survey Information, Legal and Topographical Surveys of wastewater mains and watermains, and "As-Recorded" Drawings must comply with Region's CAD Standards Manual.

1.7.3 For all preliminary engineering drawings issued for review, stamp all drawings clearly with the submission milestone as indicated in Table 10.3 Summary of Detailed Design Deliverables. Sample stamps include:

a. "PRELIMINARY – ISSUED FOR 50% REVIEW".
b. "PRELIMINARY – ISSUED FOR 90% REVIEW"
c. "PRELIMINARY – ISSUED FOR 100% REVIEW"

1.7.4 Stamp the date of issue on the drawings of every submission even if the description has not changed.

1.7.5 For drawings issued for tender call, identify all drawings with "ISSUED FOR TENDER" and Date of Issue stamped on it. The Design and Supervising Engineer is to seal all drawings.

1.7.6 The consultant shall allow for Regional Signing of Design Drawings as per Appendix 2

1.7.7 Upon award of contract, identify all drawings issued for construction with "ISSUED FOR CONSTRUCTION" with Date of Issue stamped on each. Specifications and drawings, issued for execution of contract as well as for construction, shall include all addenda issued during tender call.

1.7.8 Detailed design drawings must be submitted to the Region no later than 30 days after completion of Detailed Design. "As Recorded" drawings must be submitted no later than 90 days after issuing the Contractor the Substantial Performance Certificate. These required submissions will constitute Consultant payment milestones.

1.7.9 Final submission of both detailed design and "as recorded" drawings must be in both Native and Adobe Portable Document (PDF) formats on a DVD. All individual CAD file titles, on the DVD, must be identical to each corresponding drawing title.

1.8 Identification of Correspondence

1.8.1 All correspondence to the Region shall be identified by the Region's project number, document number and the title of the project.

1.8.2 All correspondence to shall be directed to and/or copied to the Region's Project Manager.

1.9 Coordination of Multiple Contracts and "Constructor"

1.9.1 The Consultant shall co-ordinate the works performed by several Contractors on the same project site. In all cases, the construction area of each Contractor shall be clearly delineated such that these can be classified as distinct work areas thereby eliminating the requirement that the Region be designated as the "Constructor" as defined under the Occupational Health and Safety Act (Ontario).

1.9.2 In all cases where there are multiple construction works being carried out at the same time on the same construction work site, the Consultant and or the Region must comply with the Ministry of Labour to ensure that requirements for the designation of each Contractor as the "Constructor" for their work area. During the construction period, regular site meetings shall be held for critical interface tie-in between the various Contractors and Facility Operations staff to ensure that the works will be properly coordinated between the various parties.

1.10 Abbreviations

ANSI	American National Standards Institute
CAD	Computer Aided Design
CCDC	Canadian Construction Documents Committee
CVS	Certified Value Specialist
EA	Environmental Assessment
ESA	Electrical Safety Authority
ESR	Environmental Study Report
FAT	Factory Acceptance Test
HAZOP	Hazard and Operability Review
HMI	Human Machine Interface
HVAC	Heating, Ventilation and Cooling
ISA	Instrument Society of America
JIS	Joint Industrial Standards
MCC	Motor Control Centre
MEA	Municipal Engineers Association
MNR	Ministry of Natural Resources
MOE	Ministry of the Environment
MOL	Ministry of Labour
MTO	Ontario Ministry of Transportation
NEC	Niagara Escarpment Commission
OHSA	Occupational Health and Safety Act
P&ID	Process and Instrumentation Drawing
PDR	Pre-design Report
PFD	Process Flow Diagram

PLC	Programmable Logic Controller
QA	Quality Assurance
QC	Quality Control
RFP	Request for Proposal
SAT	Site Acceptance Testing
SCADA	Supervisory Control and Data Acquisition
TSSA	Technical Standards and Safety Authority
WAN	Wide Area Network
VE	Value Engineering
WHMIS	Workplace Hazardous Material Information System

SECTION 2 PROJECT COST AND SCHEDULE CONTROL

2.1 General

2.1.1 Consultants providing engineering services to the Region are expected and required to practice effective project cost control. This includes monitoring and controlling project costs associated with both engineering and construction.

2.1.2 The Consultant is to notify the Region's Project Manager, in a timely manner, if there are any potential changes in engineering fees, construction costs or changes in project schedule. All applicable supporting documentation must also be forwarded to the Region.

2.2 Upset Limit

2.2.1 The Consultant must adhere to the Upset Limit as stipulated for each stage of the engineering assignment. Unless the Region has modified the scope of work, the Upset Limit cannot be exceeded. In all cases, timely notification by the Consultant of any impending overrun of the engineering fees or capital cost is mandatory. Claims for additional engineering fees outside the approved Scope of Work may not be approved.

2.2.2 Written authorization of the approved change in scope must be obtained from the Region's Project Manager, prior to initiation of any additional work.

2.3 Engineering Services Scope Change

2.3.1 The Consultant shall complete and submit the Engineering Services Scope Change Form (Appendix 3), and all the required supporting documentation, to the Region's Project Manager for approval for any contemplated engineering services scope change.

2.3.2 Scope Change forms must clearly identify the impact on:

a. Engineering Fees
b. Schedule
c. Construction Cost

2.4 Monthly Status Report

2.4.1 With every invoice, the Consultant shall submit Project Status Report highlighting progress and status of the project. Invoices will not be processed until the Project Status Report (Appendix 4) has been received. The following information shall be provided as a minimum:

a. Work completed for the month and to date versus planned progress as noted in work plan
b. Work planned to be completed for the following month or period
c. Gantt chart showing actual vs. planned schedule

d. Outstanding action items, either internal or external to the Region
e. Project alerts of critical issues which may delay the project
f. Status of Application for Approvals
g. Expenditure of engineering fees for the month and to date
h. Graph of earned value analysis of engineering fees, in comparison to the approved Project Work Plan

2.4.2 For projects which are behind planned schedule, the Consultant must provide the Region's Project Manager the cause of the delay and the remediation action to be undertaken. The Consultant may be required to revise the original project schedule accordingly.

2.4.3 The Consultant shall deliver to the Region a status report of all the applications for approvals required for the project. The status report shall be submitted monthly with invoice. Where there are outstanding approvals, the Consultant shall indicate the time frame, as when these approvals are expected to be in place.

2.4.4 The Consultant shall submit the status of estimated total project budget versus the Region's approved budget. Identify reasons for any budget shortfall.

2.5 Submission of Invoices

2.5.1 Invoices are to be submitted complete with the Project Status Report (Appendix 4) and Invoice Billing Details (Appendix 5)

2.5.2 Invoices are to include: The Halton Region's project title and number, Halton Region's Purchase Order number and the Region's Project Manager. All invoices are to be submitted directly to Accounts Payable:

The Regional Municipality of Halton
1151 Bronte Rd.
Oakville, ON
L6M 3L1
Attention: Accounts Payable

2.5.3 Expenses shall be submitted in accordance with the requirements of the RFP. Invoices submitted without the above information will be returned unprocessed.

2.5.4 The payment breakdown for billing purposes will be based initially on the cost breakdown provided by the Consultant in their proposal. This will be adjusted prior to the first invoice such that a dollar value will be established by the Region for final, record drawings and documentation. Then this amount will be added as a separate project cost deliverable and the other cost values adjusted downwards accordingly.

2.6 Payment for Engineering Services

2.6.1 The Region will effect payment for services rendered net 30 days from the date the invoice is received by Accounts Payable.

Invoice Inconsistent with Work Performed

2.6.2 If in the Project Manager's opinion the engineering fee invoiced is inconsistent with the work performed, payment may be reduced by the amount in dispute until the dispute has been resolved. The Consultant, by submission of a proposal, acknowledges that the Region's Project Manager is the sole judge of the actual work performed versus the fees invoiced.

2.6.3 During the course of the project the Consultant is to inform the Project Manager of changes in the hourly charge out rate of the staff who are working on the project. Existing Purchase Orders will not be adjusted to reflect changes in hourly charge out rates.

2.6.4 If the Consultant proposes to substitute their Project Manager, or key project staff as identified in the RFP, they must submit a written request along with the resume of the new Project Manager. The Region reserves the right to reject the proposed substitution if the proposed employee is deemed unsuitable for the position.

SECTION 3 QUALITY ASSURANCE AND QUALITY CONTROL

3.1 General

3.1.1 Consultants providing engineering services to the Region must institute Quality Assurance (QA) and Quality Control (QC) programs. This is to ensure that all deliverables achieve the level of quality required by Halton Region and that the completed construction project, designed by the Consultant, performs and meets the specified design criteria as specified in the RFP document.

3.1.2 The Consultant shall identify the members of there QA/QC team in their proposals. Any changes to the team must be submitted in writing to the Region for approval.

3.2 Quality Assurance

3.2.1 The goal of the QA program is to ensure quality for the life cycle of the project, including construction and operation. The QA program is expected to be implemented at the Pre-design and Detailed Design stages and must include all those planned and systematic actions required to ensure that the work will be designed in accordance with applicable codes, guidelines and standards.

3.2.2 The Consultant shall designate a QA Team for the project, whose members are not directly involved in the day-to-day project delivery operations and who shall ensure that the work has been performed in accordance with:

a. Good engineering practice
b. Constructability
c. Practical equipment layout – operation/maintenance
d. Compliance with relevant codes, design standards, etc.
e. Region's design standards
f. Other statutes and regulations and/or codes that may be applicable

3.2.3 The QA Team shall prepare a checklist which is to be used to identify conformance or non-conformance of work performed which includes the continuous review of scope, methodology, plans and recommendations and also the degree of conformance to the pre-determined standards, codes and procedures. When non-conformance issue is noted, the QA Team shall advise the Region and identify appropriate corrective and/or preventative actions.

3.2.4 At the specified project milestones, the Consultant shall submit a QA Report signed by the Consultants QA/QC team. Furthermore, as part of the QA process, a meeting with the Region and the Consultant's Design Team upon completion of the draft Pre-design Report and at 50%, 90% and 100% completion of Detailed Design must be scheduled. The Consultant shall advise the Region of any action taken to correct non-conformance issues.

3.3 Quality Control Process

3.3.1 Quality Control (QC) is the responsibility of the Consultant. QC provides a means to continuously measure and regulate the quality of the engineering services provided and work completed.

3.3.2 All deliverable must be reviewed QC team and changes made prior to submission to the Region.

3.3.3 All deliverable submitted to the Region must be signed by the QC team to confirm that they have been reviewed and accepted.

Table 3-1 Quality Control Deliverables

	Task	Deliverables
1.	QA/QC Report No. 1 – On Completion of Draft Pre-Design Report.	3 Copies
2.	QA/QC Report No. 2 – On Completion of 50% Detailed Design.	3 Copies
3.	QA/QC Report No. 3. – On Completion of 90% Detailed Design.	3 Copies
4.	QA/QC Report No. 4. – On Completion of 100% Detailed Design. Report to include Constructability and Risk Assessment.	3 Copies

SECTION 4 VALUE ENGINEERING

4.1 General

4.1.1 This section applies to the design Consultant who is required to interface with the Value Engineering (VE) Consultant at the various specified milestones of the project

4.1.2 Value Engineering (VE) is an organized and systematic technique for analyzing projects with the aim to improve functions and quality while reducing cost. It follows a proven, structured, systematic review process that identifies unnecessary and/or inefficient functions and then suggests alternative ways to perform and/or improve the required functions at a lower life cycle cost. In essence, the purpose of VE analysis is to obtain the best project at the least cost without sacrificing quality or reliability.

4.1.3 For large multi-discipline projects having construction cost greater than approximately $10M, the Region will normally retain the services of a Value Engineering Consulting Firm with Certified Value Specialist(s) (CVS) to provide VE services.

4.2 Scope of Work

Value Engineering Workshop No.1

4.2.1 This Workshop will be conducted prior to commencement of the pre-design stage of the project. Design Consultants shall incorporate Workshop attendance in developing their work plan.

4.2.2 Unless otherwise stated in the RFP, the Consultant's Project Manager and Process Specialist will be required to attend and fully participate in the workshop. Other members of the Design Consultant's staff who may have specific knowledge of pertinent aspects of the project will also be required to present this information during the workshop.

4.2.3 Workshop No.1 shall include, but not be limited to the following discussion topics:

a. Validity of construction cost estimate
b. Total life cycle cost analysis
c. Equipment life cycle costing
d. Energy cost modeling
e. Analysis of alternative treatment processes
f. Analysis of alternative odour control measures (if applicable)
g. Analysis of alternative disinfection processes (if applicable)
h. Identification of alternative methods for accomplishing the same function
i. Identification of project value enhancements

Value Engineering Workshop No.2

4.2.4 This Workshop will be conducted on completion of the pre-design stage of the project. Design Consultants will also be required to attend Workshop 2. Prior to the workshop, the Design Consultant shall provide the VE team with copies of pertinent documentation. At the beginning of the workshop, the Design Consultant shall present the Pre-design Report (approximately half-day) and participate in a tour of the existing facilities. At a minimum, the Design Consultant's Project Manager, Process Specialist, and Quantity Surveyor/Cost Estimator shall attend this presentation. Other Design Consultant's staff members with specific project information must also attend.

4.2.5 During the workshop, the Design Consultant's Project Manager and Process Specialist will meet with the VE team to review the alternatives being considered by the VE team and to discuss any relevant project issues. At the conclusion of the workshop, the Design Consultant's team members will be required to present the results of the work shop. (Approximately 2 hr meeting/presentation)

4.2.6 Following the workshop, the Design Consultant shall carefully review the draft VE report and recommend whether an alternative shall be accepted, accepted as modified, or rejected. For those alternatives that should be implemented into the design, the Consultant will provide comment on the impact to both the project schedule and budget. For those alternatives that are rejected, the Consultant will submit a memo explaining the rationale for this decision.

4.2.7 The selected members of the Design Consultant's staff will meet with the Region and VE team representatives to review each alternative developed by the VE team.

4.2.8 Workshop No.2 shall include, but not be limited to the following:

a. Cost Analysis and Modeling of the proposed project
b. Capital and Life Cycle cost optimization
c. Process Performance optimization

Value Engineering Workshop No.3 - Constructability

4.2.9 This Workshop will be conducted once the Detailed Design stage is completed. The Design Consultant shall include the specified time for attending this workshop in their work plan. The focus of the Workshop will be on the constructability and risk assessment of the proposed construction contract.

4.2.10 The Design Consultant shall assign the required specialist staff to attend a presentation at the end of VE Workshop No.3 to review the comments of the VE team. The Design Consultant shall then prepare response to the comments of the VE team and attend a meeting with the Region and VE team representatives to resolve the disposition of the comments.

4.2.11 Workshop No.3 shall include, but not be limited to the following:

a. Verification of project cost.
b. Verification that the defined sequence of construction work is reasonable and can be accomplished, in the specified time frame outlined in the tender document.

c. Verification that the contract documents clearly define contract's responsibilities regarding sequence of construction and risks involved.

d. Development recommendations that will reduce both the Region's and Contractor's risk and result in the best possible bid.

4.3 VE Recommendations and Implementation

4.3.1 At the end of Workshop No.1, 2 and 3, the Design Consultant shall review the recommendations with the Region and determine which of the recommendations are to be implemented. The Design Consultant shall:

a. Review and advise the Region of the impact of the change in scope of work on the schedule;

b. Review and advise the Region of the impact of the change in scope of work on the approved budget;

c. Provide a report to the Region of the change in cost of engineering services, whether additions or deductions, as a result of implementing the recommendations on an item by item basis. Indicate which of the VE recommendations that it will or will not include in the final design and the reasons therefore;

d. Review with the Region and VE Consultant the proposed changes to the scope of work, especially after Workshop No.2;

e. Review with Region and finalize the change in scope of engineering services.

Table 4-1 Value Engineering Service Deliverables

	Task	Deliverables
	On Completion of Workshop No. 1	
1.	Value Engineering Work Plan Impact Assessment (Draft)	6 Copies
2.	Value Engineering Work Plan Impact Assessment (Final)	6 Copies
3.	Value Engineering Work Plan Impact Assessment (Final) DVD	1 Copy
	On Completion of Workshop No. 2	
4.	Addendum to the Pre-design Report (Draft)	6 Copies
5.	Addendum to the Pre-design Report (Final)	6 Copies
6.	Addendum to the Pre-design Report (Final) DVD	1 Copy
7.	Work Plan Impact Assessment, including recommendation for the inclusion or deletion of the VE recommended list of additional works	6 Copies
	On Completion of Workshop No. 3	
8.	Constructability and Risk Assessment Report (Draft)	6 Copies
9.	Constructability and Risk Assessment Report (Final)	6 Copies
10.	Constructability and Risk Assessment Report (Final) DVD	1 Copy

SECTION 5 VALUE ENGINEERING CONSULTANT SERVICES

5.1 General

5.1.1 This section applies specifically to the requirements of the VE Consultant at the various specified milestones of the project.

5.1.2 The services of the VE Consultant will be specified in the RFP document and may include Quality Assurance as part of its service delivery program.

5.2 Familiarization of Project

5.2.1 On award of the assignment, the VE Consultant staff shall familiarize itself with the requirements of the project and shall review the following in advance of Workshop No.1:

a. All applicable Codes and/or design standard or guidelines
b. Background information provided by the Region with respect to the current operation and process limitation, if any
c. Environmental Assessment Report

5.3 Familiarization of Facility

5.3.1 The VE Consultant shall plan the tour of the facility during the course of Workshop No.1. When the date has been selected, the Region's Project Manager will make arrangement for the VE Team to tour the facility to conduct its own assessment and evaluation of the facility's current operating status.

5.4 Value Engineering Workshops

Value Engineering Workshop No.1

5.4.1 The VE Consultant shall conduct Value Engineering Workshop No.1 prior to commencement of the pre-design work by the Design Consultant, who is referred to as the Consultant in this Manual. The VE Consultant shall include the specified time to facilitate the Workshop as provided in the RFP and in their Work Plan.

5.4.2 The VE Consultant's Certified Value Specialist (CVS) shall conduct the Workshop with the following members of the VE Team in attendance at the Workshop, unless modified by the RFP requirements:

a. VE Project Manager
b. Process Specialist(s)
c. Quantity Surveyor/Cost Estimator

5.4.3 In addition to the above, the VE team should include specialists in other discipline areas that are adequately addressed in the documents being reviewed. These could include the following:

a. Odour control
b. HVAC systems
c. Mechanical/Process piping systems
d. Civil/Site engineering design
e. Structural design
f. Architectural
g. Electrical design
h. Instrumentation and Controls
i. SCADA
j. Cost estimating

5.4.4 The VE Project Manager may simultaneously be assigned one of the discipline specialist roles on the VE team.

5.4.5 Specific staff of the Consultant's Design Team members will attend the Workshop and as a minimum, the Consultant's counterpart Engineers/specialists to that of the VE Team members may also attend the Workshop. Some of them may not be on a full time basis and will attend the Workshop on an as-required basis.

5.4.6 In addition, the Region's Project Manager and the Region's Operations staff will also attend the Workshop to ensure that appropriate inputs to the project are provided.

5.4.7 On completion of the Workshop, the VE Consultant will provide a presentation on the result of Workshop No.1, which will be followed by a question and answer period and /or discussion.

5.4.8 The VE Consultant shall submit nine (9) copies of the draft and final VE report for Workshop No.1 of which the Region will retain six (6) copies and three (3) copies will be provided to the Consultant. The report shall, as a minimum, include the following information:

a. List of all alternatives considered during the Workshop and rank them in order of merit
b. List of alternatives that the VE Consultant recommends should be included as part the project
c. Description of the current designs and proposed alternatives
d. Conceptual design of proposed alternatives
e. Life cycle cost comparison of proposed alternatives
f. Descriptive evaluation of the advantages and disadvantages of the proposed alternatives
g. Value Engineering calculation worksheets
h. Sketches of the proposed alternatives, if appropriate
i. Technical information on proposed process/operation alternatives
j. Documentation of the VE process

Value Engineering Workshop No.2

5.4.9 This Workshop will be conducted on completion of the pre-design stage of the project. Representatives from the Consultant team will make a presentation of the Pre-design Report to the VE team and participate on a tour of the facilities.

5.4.10 Workshop No.2 shall include, but not be limited to the following:

a. Cost Analysis and Modeling of the proposed project
b. Optimization of capital and operating cost of the proposed project
c. Optimization of process performance of the proposed project
d. Identification of project value enhancements
e. Identification of alternative methods to achieve the functions provided
f. Review of Consultant's final recommendations for the facility design and advising the Region on how to proceed

5.4.11 The VE Consultant shall submit nine (9) copies of the draft and final VE report for Workshop No.2 of which the Region will retain six (6) copies and three (3) copies will be provided to the Consultant. The report shall, as a minimum, include the following information:

a. Cost Analysis and Modeling
b. Additional work noted in the Pre-design Report that should be considered or eliminated
c. Description of the current designs and the alternatives to be considered
d. Life cycle cost comparisons for any additional works considered after VE Workshop No.2
e. Alternatives for optimizing the capital and operating cost of the facility
f. Alternatives for optimizing process performance of the facility
g. Value Engineering calculation worksheets
h. Sketches of the proposed alternatives, if applicable
i. Technical information on proposed process/operation alternatives
j. Documentation of the VE process

5.4.12 VE Consultant to provide a peer review of the Design Consultant's final recommendations of works to be included or eliminated in the final design of the facility and recommend to the Region action(s) that it should pursue to preserve the integrity of the project. Meet with Region and Consultant Team to discuss recommendation and issue final list of work to be included in the design of the facility.

Value Engineering Workshop No.3 - Constructability

5.4.13 This Workshop will be conducted on completion of the Detailed Design stage of the project. The focus of the Workshop will be on the constructability and risk assessment of the contract. The VE Consultant shall assign the required specialist staff to attend Workshop No.3.

5.4.14 Workshop No.3 shall include, but not be limited to the following:

a. Assessment of project cost

b. Assessment to determine if the defined sequence of construction work is reasonable and can be accomplished in the specified time frame
c. Assessment to determine if the contract documents clearly define the Contractor's responsibilities regarding sequence of construction and risks involved
d. Development of recommendations that will reduce both the Region's and Contractor's risk and result in the best possible bid

5.4.15 The VE Consultant shall submit nine (9) copies of the draft and final VE report for Workshop No. 3 of which the Region will retain six (6) copies and three (3) copies will be provided to the Consultant. The report shall, as a minimum, include the following information:

a. Final Cost Analysis
b. Assessment of constructability and sequencing of the proposed works and impact on operation of the existing facility and action(s) that can be taken to mitigate the impact
c. Risk assessment of the contract to the Region based on the contract' specifications as prepared by the Consultant
d. Description of recommended changes to the drawings and specifications that will reduce both the Region's and Contractor's risk and result in the best possible bid

Table 5-1 Value Engineering Consultant Deliverables

	Task	Deliverables
	Workshop No. 1	
1.	Draft VE Workshop No. 1 Report	9 Copies
2.	Final VE Workshop No. 1 Report	9 Copies
3.	Final VE Workshop No. 1 Report – DVD	1 Copy
	Workshop No. 2	
4.	Draft VE Workshop No. 2 Report	9 Copies
5.	Final VE Workshop No. 2 Report	9 Copies
6.	Final VE Workshop No. 2 Report – DVD	1 Copy
7.	Peer Review Report	9 Copies
	Workshop No. 3	
8.	Draft VE Workshop No. 3 Report	9 Copies
9.	Final VE Workshop No. 3 Report	9 Copies
10.	Final VE Workshop No. 3 Report – DVD	1 Copy

SECTION 6 APPROVALS

6.1 General

6.1.1 It is the responsibility of the Consultant to ascertain the required approvals from Municipal, Regional, Provincial and Federal levels of government for the execution of the project and to allow appropriate time in their work plan to secure them.

6.1.2 Regarding all approvals, the Consultant is responsible for ensuring that the latest version of each document is used for each project.

6.1.3 Where additional approvals/permits are required that were not known or identified at the time when the Region was soliciting the services of Consultants, these will be considered as an addition to the scope of work.

6.1.4 Where the Region is required to execute the application form(s), complete the form(s) and forward it to the Region for execution and transmittal back to the Consultant. In all cases, include one additional set of the application form(s) for the Region's record.

6.1.5 Consultants must be prepared to meet with the appropriate governing bodies in order to secure the required approvals. This includes all of the approvals that must be submitted to the various parties.

6.1.6 Consultants must be prepared to meet with the key approval agencies for early pre-consultation meetings.

Acts, Codes, Standards and Guidelines

6.1.7 Consultants will be required to apply for all applicable approvals when undertaking projects on behalf of Halton Region. The following provides examples of relevant Acts, Codes, Standard, and Guidelines.

a. Ontario Safe Drinking Water Act
b. Clean Water Act
c. Ontario Ministry of the Environment (MOE) Design Guidelines
d. Ontario Water Resources Act
e. Ontario Environmental Assessment Act
f. Ontario Environmental Protection Act
g. National Building Code of Canada
h. National Fire Code of Canada, including NFPA 820
i. National Plumbing Code
j. Canadian Standards Association
k. Guidelines for Canadian Drinking Water Quality, Health Canada
l. Underwriter Laboratories of Canada
m. National Sanitary Foundation (NSF)
n. Applicable National Fire Protection Association (NFPA) Standards
o. American National Standards Institute (ANSI)

p. American Waterworks Association (AWWA) Standards
q. Canadian Gas Association– Digester Gas Systems
r. Canadian Environmental Assessment Act (CEAA)
s. Information to be Submitted for Approval of Stationary Sources of Sound, Publication NPC-233, latest revision (MOE)
t. Institute of Electrical and Electronic Engineers (IEEE)
u. Ontario Hydro Electrical Safety Code

Ministry of the Environment Design Guidelines

6.1.8 The Consultant will comply with the requirements of the latest version of the following Ministry of the Environment Design Guidelines, including, but not limited to the following:

a. Design Guidelines for Drinking Water Systems
b. Design Guidelines for Sewage Works
c. Guidelines for Environmental Protection Measures at Chemical Storage Facilities.
d. Diesel Generator Set, MOE Spec No. 2.
e. Information to be submitted for Approval of Stationary Sources of Sound, Publication NPC-233, latest revision (MOE).

6.2 Approvals – Federal

6.2.1 The Consultant shall comply with all relevant statutory regulations and requirements and where required, shall apply for all relevant approvals or certificates from, but not limited to the following Federal Departments or agencies:

a. Department of Fisheries and Oceans (DFO)
b. Canadian Coast Guard
c. Canadian Gas Association
d. Indian and Northern Affairs Canada

6.2.2 All fees associated with the application/approval will be borne by the Region.

6.3 Approvals – Provincial

6.3.1 Applications for Provincial approvals shall be coordinated with Halton Region's Project Manager and/or the Region's Compliance Coordinator.

6.3.2 The Consultant shall comply with all relevant statutory regulations and requirements and shall apply for all relevant approvals or certificates including, but not limited to the following Provincial Ministries or agencies:

a. Ministry of the Environment (MOE) (Effluent criteria, Certificate of Approval of Sewage, Air and Noise, Municipal Drinking Water

License/Drinking Water Works Permit, Permit to Take Water, Connections for Water Quality Testing and Acceptance)

b. Ministry of Natural Resources (MNR)
c. Ministry of Labour (MOL)
d. Ministry of Tourism and Culture – Archaeological Assessment
e. Ontario Ministry of Transportation (MTO) – Land Use and Encroachment Permits
f. Technical Standards and Safety Act (TSSA)
g. Digester Gas Code (Curent version)
h. Railway Companies
i. Conservation Authorities
j. Electrical Safety Authority (ESA)
k. Utilities such as Ontario Power Generation, Enbridge Consumers Gas, Bell Telephone, etc.

6.3.3 All fees associated with the application/approval will be borne by the Region.

6.4 Approvals – Regional

6.4.1 Application for Regional approvals shall be coordinated with the Region's Project Manager. Where required, obtain, but not limited to the following approvals:

a. Halton Region Service Permit for water connections, wastewater connections and regional road access
b. Regional Tree By-law

6.5 Approvals –Municipal

6.5.1 The Consultant shall liaise and comply with regulations and requirements of the Area Municipality and shall seek and apply for the following permits and or approvals:

a. Site Plan Approval (and all associated permits and forms) or any relevant development and zoning applications
b. Building Permit
c. Building and Mechanical Inspections (during construction)
d. Local Hydro Utility
e. Site alteration permit

Site Plan Approval

6.5.2 In order that the construction works may commence immediately upon award of the contract to the Contractor, the Consultant shall apply for Site Plan Approval on behalf of the Region during Detailed Design. Site Plan Approval is controlled

by the Area Municipality and will require detailed multiple submissions of the site plan, grading plans, and landscaping plans. The Consultant should be prepared to meet with representatives of the Area Municipality, as well as other organization and governing bodies (e.g. MOE) to review each site plan submission. Other approvals that may be required in conjunction with site plan approval are listed below:

a. Conservation Authority Approval
b. Minor Variance Certificate
c. Niagara Escarpment Commission (NEC) Development Permit
d. Noise Bylaw

Building Permit

6.5.3 In order that the construction works may commence immediately upon award of the contract to the Contractor, the Consultant shall apply for the building permit on behalf of the Region during Detailed Design. Building Permits are controlled by the Area Municipality and will require detailed multiple submissions of the site plan, architectural, structural, electrical and plumbing plans. Other approvals and permits that may be required in conjunction with building permit are listed below;

a. Site Plan Approval
b. Storm Water Management Report
c. Conservation Authority Approval
d. Occupancy Permit
e. Halton Region Service Permit for water connections, wastewater connections and regional road access

6.6 Approvals – Conservation Authority

6.6.1 Coordinate approvals with following.

a. Hamilton Region Conservation Authority (HCA)
b. Halton Region Conservation Authority (HRCA)
c. Credit Valley Conservation Authority (CVC)
d. Grand River Conservation Authority (GRC)

6.7 Canadian Registration Number (CRN) for Boilers/ Pressure Vessels

Construction and Inspection of Boilers and Pressure Vessels

6.7.1 All pipes, pipe fittings, flanges, valves, specialty items and other piping components must be registered in compliance with the Boiler and Pressure Vessels Act (BPV) of Ontario and CSA Standard B51-Code. When prescribed by the BPV, all pipe, pipe fittings, flanges, valves, specialty items and other piping components must be clearly marked (via stamped on numbers) with the appropriate Canadian Registration Number (CRN). These numbers must also appear on the shop drawings with model/serial numbers, etc. The appearance of

these numbers on the shop drawings are precedent to a product being accepted. Field verification will also be performed.

6.7.2 Coordinate the field inspection and testing of the piping systems required under the Act, including but not limited to: the high-pressure digester/methane gas piping system, the high pressure compressed air piping system and any others as required. Provide all the necessary documentation, technical data, ancillary and temporary facilities, etc. as required prior to and to carry out the testing, retesting, etc. The Contractor will provide all the final documentation and/or certification. Provide additional copies of all final certificates (clean and legible) pre-mounted in wall hanging frames with glass covers for each system tested and mount on wall as required.

6.8 Approvals – Other Authorities

6.8.1 Consultants are responsible to ensure that the facilities are designed in compliance with Statutes and Regulations, Codes, Standards and Guidelines. These Statutes and Regulations, Codes, Standards and Guidelines are intended to set the minimum acceptable standard and shall not relieve the Consultants of their responsibilities to comply with the requirements of the Region.

6.8.2 It is the Consultants' responsibility to ensure that they have fully understood the requirements of the project as detailed in the Request for Proposal as they will be required to fulfill the specified scope of work.

6.8.3 Compliance with other authorities that may be required for the project includes but not limited to:

a. Occupational Health and Safety Act (OHSA)
b. Archeological Survey Report (Ministry of Municipal Affairs and Housing)
c. The Regional Municipality of Halton's Protocol for Reviewing Development Applications with Respect to Contaminated and Potentially Contaminated Sites (Appendix 1)

SECTION 7 HEALTH & SAFETY

7.1 General

7.1.1 Various health and safety reviews are required for Halton Region projects. The consultant is responsible for determining the exact requirements for each project. As a minimum, all of the described practices are required for the following types of projects.

a. All water and wastewater treatment facilities
b. Both potable water and sewage pumping stations and reservoirs
c. Waste Management facilities

7.1.2 The Consultant shall provide details of their methodology and approach to the review program and how it will provide the Region with the assurance that the facilities have been designed and built to be safe and reliable and any failure will be contained within these facilities without causing any environmental impact.

7.1.3 For all safety related reviews, the consultant must use the Region's template report to ensure a comprehensive and accurate review.

7.2 Hazard and Operability (HAZOP) Review

7.2.1 The Consultant is required to complete the Hazard and Operability Review (HAZOP), which is the systematic, critical examination of the process and engineering design of all water and wastewater treatment facilities, and audit this review through workshops at specified stages of the project. The intent of the review is to assess the potential hazard of the failure of individual equipment and the consequential effects on the facility as a whole and its potential for negative impact on the environment. The HAZOP report will identify potential hazards associated with the plant and its operation (i.e. hydraulic overload, module by-pass, high/low nutrients load, equipment hazards, odour hazards, etc.) and will provide recommendations to be incorporated into design.

7.2.2 The Consultants shall perform the Hazard and Operability Review workshop at the following stages of the project:

a. Prior to the completion of Pre-Design
b. Prior to the completion of Detailed Design
c. Prior to Substantial Performance

7.2.3 Hazard and Operability Reports are to be included as part of the Pre-Design and Detailed Design Report. The HAZOP report at Substantial Performance shall be a stand-alone document.

7.2.4 The Consultant is to provide a table to summarize the HAZOP review deliverables.

7.3 Hazmat Report

7.3.1 The consultant will be required to undertake a HAZMAT Survey and produce a report if the proposed works involve the expansion/renovation/alteration of any existing water/wastewater facilities where the age of the structure (built prior to 1980) or other factors may indicate that hazardous material may have been utilized in construction of the facility. Report to be submitted at time of Pre-Design Report. Reference requirements under OHSA.

7.3.2 Designated Substances

7.3.3 During the early stage of Pre-design, the designers are to review the facility designated substances list and identify any project impacts.

7.3.4 If not already completed by the Region, designated substance surveys and monitoring is required during the following phases.

a. Early pre-design - overall facility review and assessment on the project scope
b. Early detailed design - more detailed assessment related specifically to the proposed area of construction/demolition including more sampling and analysis if required.
c. During construction - monitoring of the construction area and resolution of any concerns

7.4 Pre-Start Health and Safety Review

7.4.1 A Pre-Start Health and Safety Review (PHSR) is required for the construction, addition or installation or modification of the following, unless exempt.

a. New equipment, machines or devices
b. A structure, including a rack or stacking structure,
c. A shield, a guard, an operating control acting as a guard, a locking device or any other device that prevents access,
d. A process involving the risk of ignition or worker exposure to chemicals and/or designated substances.

7.4.2 A person familiar with the Regulations for Industrial Establishments must conduct an assessment to determine if an exemption applies. Refer to Pre-Start Health and Safety Review Guidelines published by the Ministry of Labour

7.4.3 Once the assessment is completed, the Consultant must prepare a PHSR report, which must include:

a. Details on the procedures that will be taken to comply with the regulations,
b. Details on the measures that will be taken to protect workers, if testing is required,
c. The structural capability of the apparatus and structure including a rack, stacking structure, lifting device, travelling crane or automobile hoist,
d. Date and signature of the person performing the review,

e. Professional engineer's stamp, or if the assessment was completed by someone other than a certified engineer, details on the person's special knowledge or qualifications must be provided.

7.4.4 Prior to operating new equipment, the Consultant must ensure that the equipment/process identified in the PHSR is in compliance with all applicable regulations and notify the Region by Letter (Appendix 6)

7.4.5 Consultants will be required to coordinate activities with the Joint Health and Safety Committee (JHSC). The JHSC must be provided with the following for review:

a. PHSR report before start-up,
b. If requested, documentations establishing exemption,
c. Written notice of the measures that will be taken if they differ from the measures required in the PHSR report.

7.4.6 Documentation used to establish an exemption must be readily available in the workplace until the protective element; rack or stacking structure or lifting device; travelling crane or automobile hoist; or the process is no longer operational.

7.4.7 A professional engineer must conduct the PHSR except for worker exposure where a knowledgeable person can also perform the review.

7.4.8 Standards used for an exemption must satisfy the requirements of the Regulations for Industrial Establishments. Standards acceptable to the MOL .

7.4.9 Other legislation that may apply must be considered.

Table 7-1 Health and Safety Deliverables

	Description	Submission Requirements
1.	HAZMAT Survey Report - Draft	4 Copies
2.	HAZMAT Survey Report – Final Report	4 Copies + 1 DVD
3.	HAZMAT Reports	4 Copies + 1 DVD
4.	Pre-Start Health & Safety Assessment Report	4 Copies + 1 DVD

SECTION 8 CLASS ENVIRONMENTAL ASSESSMENT

8.1 General

8.1.1 When Halton Region proposes an improvement, which will impact the local geographic area, the Consultant may be required to undertake a Municipal Class Environmental Assessment Study (EA) on behalf of the Region of Halton and in accordance to the Municipal Class Environment Assessment document (may be obtained from the Municipal Engineers Association).

8.1.2 A Class EA Study is a process that defines a problem, provides options for a solution and identifies a preferred solution. Because the scale of projects range from minor improvements to major new construction, the Municipal Class EA process has different levels or "schedules" that define the detail of the study depending upon the degree of potential impact to the environment. Environment is encompassed by the social, natural and economic.

Citizen Advisory Committee

8.1.3 Depending on the nature of the Class EA Study project, a Citizen Advisory Committee (CAC) ***may be formed*** according to a Council approved Terms of Reference. When the proposed water or wastewater plant site or alignment is known, the Project Manager may invite residents and Regional/Local Councillors in the immediate vicinity of the study area to participate in a CAC. The purpose of the CAC is to provide input to the Project Team in order to ensure that the proposed works are successfully integrated in to the community. It is the responsibility of the Regional Committee Clerk to advertise for study area residents and the responsibility of the PPW Interview Committee to undertake the selection of the resident members for the CAC.

8.1.4 Prior to scheduling a CAC meeting, the Project Manager will check the PPW Committee and Council calendar of the Local Municipality for available meeting dates and send an e-mail to Regional and Local Councillors to determine availability for a number of dates. CAC meetings should be arranged within or close to the study area. Once date is confirmed, the Project Manager will send a meeting invitation to all CAC members and forward any related materials at least one week in advance of the meeting date. The Consultant will prepare a draft presentation, sign-in sheet and comment sheet for each CAC meeting.

The Municipal Class Environmental Assessment Process

8.1.5 The Municipal Class Environmental Assessment Process (most recent version) establishes the minimum requirements for all Municipal Class EAs undertaken in Ontario. Where there is a conflict between the discussion in this document and the Municipal Class EA document, the Municipal Class EA document will prevail.

The Five Phases of Class EAs

8.1.6 All studies address five phases:

a. Phase 1 - Identify the Problem or Opportunity

b. Phase 2 - Identify Alternative Solutions
c. Phase 3 - Alternative Design Concepts for a Preferred Solution
d. Phase 4 - Environmental Study Report
e. Phase 5 - Implementation

Schedule Classifications

8.1.7 **Schedule A projects** have minimal environmental impact. These projects:
a. Include road maintenance and operation activities.
b. Are so minimal that public consultation is optional and the project is considered to be pre-approved.

8.1.8 **Schedule A+ projects** have minimal environmental impact. These projects:
a. Include road maintenance and operation activities
b. The public is to be advised prior to project implementation. The manner in which the public is engaged is to be determined by the proponent.

8.1.9 **Schedule B projects** have some environmental impacts which may be mitigated. These projects:
a. Include minor road expansion or reconstruction projects.
b. Must have Study Commencement, Public Consultation and Study Completion notices published in local newspapers.
c. Are required to have public consultation during Phase 2.
d. Must have a Project File available for public review for a minimum of 30 days upon study completion. The Project File contains:
e. A summary of the public consultation and how public comments were addressed.

8.1.10 **Schedule C projects** are expected to have greater degree of environmental impacts and mitigation measures identified.
a. These projects typically:
b. Include construction of a new road or widening of an existing roadway
c. Construction of water and wastewater facilities
d. Construction of trunk watermains and trunk wastewater mains
e. Must address all 5 phases of the Municipal Class EA process.
f. Must have Public Consultation and Study Completion notices published in local newspapers.
g. Are required to have public consultation during Phase 2 and Phase 3.
h. Must have an Environmental Study Report available for public review for a minimum of 30 days upon study completion. The Environmental Study Report contains:
    i. Full documentation of the Class EA process including mitigation and monitoring requirements for Phase 5.

Public Review Opportunities

8.1.11 Public consultation may take place through public meetings, known as Public Information Centres. Project details and concerns are identified and discussed. These meetings are advertised in local newspapers, as prescribed in the Municipal Class EA document.

8.1.12 Stakeholder consultation takes place through direct contact with local landowners who could potentially be impacted by the project. Stakeholder meetings provide a one-on-one opportunity to discuss project details and concerns. Stakeholders are notified directly about the meetings.

8.1.13 A 30-day public and agency review is advertised in local newspapers as part of the Notice of Study Completion. As prescribed in the Municipal Class EA. Any outstanding comments and concerns must be provided to the proponent during this time.

8.1.14 If concerns cannot be resolved through discussion any one may make a "Part II Order" request may be sent to the Minister of the Environment. This means that the Minister is requested to review the process to decide whether or not an Individual EA is required.

8.1.15 This may also be referred to as complying with Part II of the Ontario EA Act. An Individual EA is the most extensive assessment process available in Ontario. It applies to the largest scale projects including new Provincial road systems.

Class EA – Schedule 'A' and 'A+' Projects

8.1.16 For Schedule A and A+ projects, the Consultant will complete Phase 1 and Step 1 of Phase 2 of the Class EA process as specified in the RFP document. Upon completion, the Consultant will prepare a memo to the Region, identifying the requirements of the project and confirming that it is a Schedule A project. No public consultation is required and the Consultant will proceed to Phase 5 of the Class EA process upon completion of Phase 1 and Step 1 of Phase 2 of the Class EA process.

8.1.17 When proceeding with a Schedule A and A+ project, the proponent may be required to follow a Schedule B due to environmental concerns. When this occurs, the Consultant shall proceed to the Schedule B process and the Region will authorize, if appropriate, an increase in the engineering fee Upset Limit to allow for the change in scope of work.

Class EA Process – Schedule 'B' Projects

8.1.18 Schedule B projects are those that are approved subject to the screening process. The Consultant shall comply with the requirements of Schedule B of the Municipal Class Environmental Assessment. The Consultant shall ensure that the screening process and the First and Second Mandatory Point of Contact, as detailed in the Municipal Class Environment Assessment have been fully completed.

Initial Contact

8.1.19 Consultants shall prepare contact list for review by the Region. For the initial mandatory contacts with government agencies and the public, the Consultant shall provide the following information on handout leaflets that comply with relevant Region standards:

a. Outline of the problem
b. Planning done to date
c. Alternative solutions being considered
d. Proceeding under Schedule B of the MEA Class Environmental Assessment
e. Consult review agencies and the public to solicit comments and input
f. How to stay involved in the planning process

Impact of Alternatives

8.1.20 The Consultant shall define the service area(s) including alternative servicing methods evaluated as well as evaluation of the extent of the impact of the alternatives on the natural, social and economic environment. Furthermore, additional information and data identify the impact of the alternatives on the environment must be presented, in order to adequately evaluate the alternatives. Each solution must be submitted with a work schedule and budget.

8.1.21 On completion of the acquisition of all necessary information, data and input from the mandatory contacts, government agencies and the public, the Consultant shall evaluate the identified alternatives including the impact of the alternatives on the environment.

8.1.22 The Consultant shall review alternatives with the Region to ensure completeness of Phase 1 and 2 of the MEA Class Environmental Assessment process.

Public Information Centre / Open House

8.1.23 The Region in conjunction with the Consultant may hold a Public Information Centre and/or Open House to present the following:

a. Service area information
b. Alternatives investigated and evaluated
c. Environmental impact of alternative solutions

8.1.24 Advertisement for the Public Information Centre (PIC) Notification (for a typical sample, refer to Appendix 7) shall be arranged with the Region's Project Manager. The Consultant shall prepare the advertisement similar to the sample provided within the templates

8.1.25 The Consultant shall also prepare and provide the following information for public display and/or communication. The quality of the displays shall be to a level expected and required for public display in an EA process. As a minimum, the Consultant shall prepare and provide the following:

a. A display showing the servicing area.
b. A display showing the alternative solutions considered.

c. Prepare and provide 100 copies of the Public Notification/Advertisement (for a typical sample, refer to Appendix 7) for distribution to attendees at the Mandatory Point of Contact including the subsequent Notice of Completion outlining the rights of the public with regard to the provisions to request an order at the second Mandatory Point of Contact.

8.1.26 The Consultant shall prepare responses to all comments received at the PIC and submit to the Region for review before responding.

8.1.27 The Consultant shall solicit feedback from all interested parties and select a preferred solution. Review and confirm that the project is a Schedule B project and prepare the Notice of Completion (for a typical sample, refer to Appendix 7) and submit the Notice to review agencies and the public for the mandatory 30-day period. At the end of the mandatory review period and if no request is received, the Consultant shall proceed to implementation of the Class EA process when authorized by the Region.

8.2 Class EA Process – Schedule 'C' Projects

8.2.1 Schedule C projects are those that are subject to the full planning process of the Class EA process. The Consultant shall comply with the requirements of Schedule C of the Municipal Class Environmental Assessment Act and complete steps 1 to 7 of Phase 3 of the Class EA process. Furthermore, the Consultant will prepare and complete the Environmental Study Report. The Consultant shall also ensure that the requirements of the Third Mandatory Point of Contact, as detailed in the MEA Class Environment Assessment have been fully completed. The Consultant shall prepare a contact list and conduct an Open House and notify all review agencies, Government agencies, new mandatory contacts and public previously involved in public information meeting(s) or Open House(s) of the preferred solution. An advertisement for the Public Information Centre notification shall be arranged with the Project Manager. The Consultant shall prepare the advertisement similarly to the sample provided in Appendix 7. The Consultant shall prepare and provide the following minimum information for the public displays, with the quality of the displays to a level expected for public display in an EA process, which will included at a minimum:

a. A display showing the service area.
b. A display showing the alternative solutions considered.
c. A display showing the conceptual layout of the preferred solution (if it is an expansion of a facility, show existing facility).
d. A coloured display showing the landscaping of the facility of the preferred solution.
e. A coloured display of the architecture of the proposed facility for the preferred solution.

8.2.2 The Consultant will be required to prepare and provide one hundred (100) copies of folded handout information sheets of the preferred solution. In addition, the Consultant shall prepare 100 handout leaflets for distribution to the public at the Third Mandatory Point of Contact, as well as the Notice of Completion of the Environmental Study Report,, the rights of the public with regard to requesting

an Order, and clearly stating the review period and the date by which submissions and/or requests are to be received by the Minister.

8.2.3 The Consultant shall evaluate feedback from the Open House. Where reviewing and/or approving agencies or interested public have not responded, follow up with written documentation requesting their input, if any. Upon completion, the Consultant shall finalize the preliminary design for the preferred solution and complete the Environmental Study Report.

8.2.4 The Consultant shall prepare responses to all comments received at the PIC and submit to the Region for review before responding.

8.2.5 The following are to be included in the report as a minimum.

a. Documentation of the problem.
b. Alternative solutions to the problem.
c. Environmental impacts of alternative solutions.
d. Evaluation of alternative solutions.
e. Recommendations for the preferred solution.

Environmental Study Report

8.2.6 The Consultant will be responsible for preparing fifteen (15) draft copies of the Environmental Study Report and submit ten (10) copies to the Region. Note, that depending on the interest expressed in the project, the requirement of the number of draft copies may be increased. Of the remaining five (5) copies, provide one copy of the draft report to Government agencies and local libraries for public viewing. Advise in writing special interest groups who have requested further involvement or information on the project and members of the public who have requested further involvement, where a copy of the draft report can be viewed.

8.2.7 The Consultant will be required to review the draft ESR and the feedback received from all reviewing and approval agencies, including the public. Once this stage is complete, the Consultant will prepare final ESR and submit fifteen (15) copies, including two (2) CD-ROMs, to the Region.

8.2.8 At the end of the mandatory review period of 30 calendar days and if the Minister does not receive any objections, the Consultant shall submit the ESR with the required application form to the Ministry of the Environment for a Certificate of Approval of the preferred solution.

8.2.9 The Consultant shall proceed to Phase 5 of the Class EA process when authorized by the Region's Project Manager.

Implementation (Detailed Design & Construction)

8.2.10 The Consultant shall comply with all mitigating measures as defined in the ESR, and in accordance with the requirement of the latest version of the Municipal Class Environmental Assessment procedure prepared by the Municipal Engineers Association.

8.2.11 The Consultant shall identify all mitigating measures, if any, that must be taken to eliminate or minimize the effect of the project on the environment. They shall also define the objectives of the monitoring program required for the construction, documenting specific requirements for monitoring that are appropriate to the particular circumstances and conditions in which the project will be constructed.

8.2.12 For the operation of Regional facilities, the Consultant shall define the objectives of the monitoring program required for the day-to-day operation. Ongoing monitoring of the facility's operation may be a permanent feature of the operating procedures throughout the lifetime of the facility.

8.3 Canadian Environmental Assessment Act

8.3.1 The Consultant shall be familiar with the requirement of Canadian Environmental Assessment Act (CEAA) so that if applicable, the project may be implemented in compliance with the Act. The Act and its Regulations set out the responsibilities and procedures for carrying out environmental assessments for projects, which involve Federal Government decision making. Consultants should refer to the CEAA website to verify that the Act applies to the project in question.

8.4 Other Class EA Requirements

8.4.1 The Consultant shall follow the procedures, as detailed in the MEA Class Environmental Assessment for Schedules A, B or C, whether or not these have been specifically enunciated in the RFP document. In addition, the Consultant shall evaluate the complexities and needs of the project and ensure that the work plan meets the requirements of the Class EA process; it being a self-assessment i.e. by the proponent, process.

Archaeological Study

8.4.2 Where required the consultant will carry out a Stage 1 and Stage 2 Archaeological Study Investigation to facilitate completion of the EA process and include within the ESR file. It should be assumed that at a minimum the consultant will be required to carry out a Stage 1 Archaeological Study.

Environmental Site Assessment

8.4.3 Where required the consultant will carry out an Environmental Site Assessment to identify the nature and extent of contaminants on the specified site. A site

assessment will be required for any project that requires the purchase of lands to facilitate the construction of the proposed works and will be carried by the consultant or his sub-consultant.

First Nations and Aboriginal People Consultation

8.4.4 Where required the consultant will carry out a First Nations and Aboriginal People Consultation to identify the nature and interest in the specified site.

Table 8-1 EA Assessment Deliverables

	Task	Submittal Requirements
	Schedule A and A+	
1.	Environmental Statement	
	Schedule B	
	For First and Second Mandatory Contacts	
1.	Contact List	
2.	Handout Leaflets	100 Copies
3.	Display showing Service Area	1
4.	Display showing Alternative Solutions considered	1
5.	Display showing Preferred Solution	1
	Schedule C	
	For Third Mandatory Contact	
1.	Contact List	
2.	Handout Leaflets	100 Copies
3.	Display showing Service Area	1
4.	Displays showing Alternative Solutions considered	1
5.	Displays showing Preferred Solution	1
6.	Displays of Preferred Solution Landscaping	1
7.	Displays of Architectural Perspective of the Facility	1
	Report	
7.	Environmental Study Report – Draft	6 Copies
8.	Environmental Study Report – Final	6 Copies
9.	Environmental Study Report – Final – DVD	1
	Additional Studies	
1.	Archaeological Study Report – Draft	3
2.	Archaeological Study Report – Final	3
3.	Archaeological Study Report – Final – DVD	1
4.	Environmental Site Assessment – Draft	3
5.	Environmental Site Assessment – Final	3
6.	Environmental Site Assessment – Final – DVD	1

SECTION 9 PRELIMINARY DESIGN

9.1 General

9.1.1 The preliminary design is an expansion of the conceptual design, which may have been completed as part of a Class EA study or as a separate study and included in the RFP document for the information of the Consultant. The intent of the Pre-design Report (PDR) is to provide full details of the proposed work with input from the Region's Team.

9.1.2 In designing a facility, the Consultant shall comply with all applicable statutes and regulations, design standards, regulations, guidelines, etc. Failure to comply with these requirements shall be corrected by the Consultant at no additional cost to the Region.

9.1.3 Where Value Engineering has been included as part of the scope of work, ensure that the schedule for the preparation of the PDR includes attendance at workshops and the resulting modification to the scope of work and schedule, where required, particularly with respect to key critical milestones.

9.1.4 The Consultant will be required to attend, prepare and distribute agendas and meeting minutes for all required pre-design or associated meetings. Note meeting minutes are to be completed no later than five working days following the meeting.

9.1.5 Consultants must be prepared to meet with the appropriate governing bodies in order to secure the required approvals.

9.2 Design Guidelines and Standards

9.2.1 The Consultants must comply with the latest edition of the following Design Standards and or guidelines, which is not purported to be an exhaustive list. Consultants shall ascertain for themselves the Design Standards or guidelines, which are applicable to the specific project.

9.2.2 Consultants must comply with the Halton Region's design guidelines. When Halton Region's are in more stringent than the MOE requirements, the Consultant will be required to adhere to the more stringent requirements.

9.2.3 In situations where the designer has determined that it's in the Regions best interest to deviate from Halton Region current standards, the consultant must submit a Deviation Memo (Appendix 8) requesting approval from the Region for the proposed change. The requirement to submit a Deviation Memo applies throughout the life of the project.

Region Design Standards and Guidelines

a. Consultant Procedures Manual for Facility Capital Projects.
b. Facilities Design Manual
c. Linear Design Manual

d. SCADA Standards Manual
e. Construction Services Manual for Pre-Engineering Surveys, Construction Layout and Inspection
f. Standards for the Production of Engineering Contract Drawings

Ministry of the Environment Design Guidelines and Standards

a. Design Guidelines for Drinking Water Systems
b. Design Guidelines for Sewage Works
c. Guidelines for Environmental Protection Measures at Chemical Storage Facilities.
d. Diesel Generator Set, MOE Spec No. 2.
e. Information to be submitted for Approval of Stationary Sources of Sound, Publication NPC-233, latest revision (MOE).Guidelines for the Design of Water Treatment Works
f. Guidelines for the Design of Sewage Treatment Works
g. Guidelines for the Design of Sanitary Sewage Systems
h. Guidelines for the Design of Storm Sewers
i. Guidelines for the Design of Water Distribution Systems
j. Guidelines for the Design of Water Storage Facilities
k. Noise and Air Emission Guidelines
l. Guide for Applying for Approval of Municipal and Private Water and Sewage Works

Building and Fire Codes

a. Ontario Building Code
b. National Building Code of Canada
c. National Fire Code of Canada
d. Plumbing Code
e. Electrical Code

Other Design Standards or Guidelines

a. Designs are to conform to Ontarians with Disabilities Act (ODA).
b. Joint Industrial Standards (JIS), Mass Production Equipment EMP-1-67
c. Instrumentation and Symbols and Identification – ANSI/ISA-S5.1-1984 (R1992), latest version
d. Erosion and sediment control guidelines

Other Applicable Statutes or Regulations

a. Regulations for Construction Projects
b. Occupational Health and Safety Act (OHSA)
c. Workplace Hazardous Material Information System (WHMIS)
d. Technical Standards and Safety Act

9.3 Project Chartering Workshop

9.3.1 The Consultant will be required to hold a 1 day Project Chartering Workshop with key project Stakeholders and consider the following

a. Review Understanding of the Project
b. Establish how the Project is to be delivered i.e. roles and responsibilities of all parties, vision, success factors, risks, constraints, etc.
c. Establish a Project Definition as outlined in Section 9.3.3
d. Develop a Project Management Plan including communication protocols internal and external.
e. Confirm budget and schedule including milestones.

9.3.2 The project definition is to identify overall project goals, objectives, constraints, and further specifies the preferred technical approach. It should establish a capital scope consistent with the Region's needs and budget constraints and defines the project to be designed and establishes a common understanding between the Region and the Consultants design team

9.3.3 Key Tasks establishing the Project Definition include the following:

a. Further development of the overall project work plan
b. Review background information
c. Establish overall project goals and objectives
d. Develop design standards according to the Region's specifications
e. Perform a condition assessment of process areas in the expansion
f. Define external constraints such as funding, storm water management, construction in a flood plain, building codes, etc.
g. Document requirements for sub-consultants including surveying, geotechnical and archeology
h. Document regulatory approvals/permitting requirements
i. Define requirements as they relate to building expansions
j. Define approach for design and construction packaging, and pre-selection/pre-purchase of equipment
k. Develop preliminary process models, layouts and major equipment
l. Develop engineering design concepts
m. Revise capital and project cost estimate

9.3.4 The results of the Project Definition tasks should be documented in the following deliverables:

a. Technical Memoranda (TMs)
b. Terms of Reference for required sub-consultants
c. Project Definition Report
d. Project Charter

9.4 Engineering Reports from the Region

9.4.1 The Region will provide the Consultant with a copy of all pertinent reports that are applicable to the projects. This would normally include:

a. Development Reports related to the project
b. Engineering reports related to the project, such as previous Pre-design and or Detailed Design report, “As-Constructed” drawings, etc.
c. MEA Class Environmental Study Report
d. Geotechnical reports

9.5 Addendum to ESR and MOE Approval (Schedule C Projects)

9.5.1 The Consultant may be required to prepare an Addendum to the Environmental Study Report as a result of changed conditions and/or requirements. The Consultant shall prepare the Addendum and submit it to the MOE for approval.

9.5.2 As part of the preparation of the Addendum, the Consultant shall include:

a. Public notification through a Public Information Centre (if necessary)
b. Prepare Handout Information brochure
c. Advise all interested parties by mail, as identified in the ESR, of the proposed changes and include a copy of the Information brochure
d. Prepare an advertisement for publication in the newspaper of the proposed Addenda
e. Conduct the Public Information Centre meeting for the review of the preliminary layout/design with interested ratepayer groups (if required)
f. Prepare report on the Public Information Centre meeting including all comments received from all interested groups. Allow 30 days for interested parties to respond
g. Respond to all comments received

9.5.3 On approval of the Addendum by the MOE, proceed with the execution of the project. In the event that the Addendum is not approved by the MOE, proceed with the project as directed by the Region’s Project Manager.

9.6 Geotechnical Investigation

9.6.1 Consultant shall retain a Geotechnical Consultant as a Sub-Consultant to initiate the geotechnical investigation program to determine soil conditions required for the design of foundations and the evaluation and disposal of excavated material off-site as required by the Environmental Protection Act. Direct and co-ordinate the Geotechnical Consultant’s work to provide the required data for foundation design. On completion of the geotechnical investigation, provide two hard copies and one CD-ROM of the report to the Region. The cost of this work shall be carried by the Consultant, and be included in the lump sum price as a disbursement.

9.7 Electrical Studies

9.7.1 Complete a facility power study as described in the Region's Water, Wastewater, and Waste Management Design Manual

9.7.2 Complete a standby power study as described in the Region's Water, Wastewater, and Waste Management Design Manual

9.8 Pre-Design Report

9.8.1 Prepare the Pre-design Report (PDR) in accordance with the requirements as specified below. The PDR, when completed and signed-off by all parties will be the basis on which the Consultant shall prepare the detailed design. Sign-off must be obtained from the Region.

9.8.2 Depending upon the scope of the water, wastewater, waste management, or waste management project, the PDR shall include the following:

a. Plans and sections of the proposed facility and/or equipment
b. Site survey and geotechnical investigations, delineating all site issues and construction requirements
c. Stormwater management
d. Detailed design and sizing calculations for all works
e. Process and Instrumentation Drawings (P&ID)
f. Process Narratives and operating philosophy
g. SCADA system for proposed facility and integration with existing system, including the existing and proposed network architecture which is to be built upon the existing Network Architecture drawing that will be supplied to the Consultant by the Region. The Network Architecture drawing is to show the network of the entire plant or facility and not just of the project. Changes to the network are to be highlighted on the drawing through the use of line weights and or text.
h. Equipment data base
i. Schematic of mechanical systems
j. Heating, ventilation and air conditioning systems
k. Phone, paging, security, and fire alarm systems
l. Single line diagram of electrical system
m. Implementation strategy and scheduling of construction works to minimize impact on the operation of the existing facility
n. Provide contingency plans narratives for unplanned shutdown or failure of equipment, chemical system or treatment process which have impact on the plant treatment process or environment and for which, mandatory containment and or remediation is a statutory requirement
o. Prepare cost estimate of the proposed construction works including all engineering costs, permits, etc. Provide detailed breakdown of estimates, which shall be accurate to -15% to +25%

p. Prepare operation and maintenance cost estimate of the expanded facility including detailed breakdown of estimates
q. Identify all anticipated noise and odour pollution sources together with distances from the points of emission to the property lines and the nearest private residence
r. Environmental and social considerations
s. Impact on adjacent lands or businesses
t. Recommendations for energy conservation
u. Expected life cycle performance
v. As a minimum, the following drawings are required to be submitted with the PDR:
    i. Site Plan layout drawings including General, Piping, Electrical and Grading
    ii. Layout of all process and non-process facilities
    iii. Site grading and landscaping
    iv. Site and building architectural renderings
    v. Layout of all buildings and structures
    vi. Hydraulic profiles
    vii. Process tankage details
    viii. Building Architectural Elevations
    ix. Building Floor Plans
    x. HVAC Systems
    xi. Network architectural drawings (see item g) above for details).
    xii. Campus Layout Drawing of the SCADA network.
    xiii. Process and Instrumentation Diagrams (P&ID) – see Section 1 General Requirements of the SCADA Standards Manual for sample P&ID drawings that are to be used as a template.

Process Design Elements

9.8.3 The process design elements include the following which are to be submitted as part of the PDR.

a. Process & Instrumentation (P&ID) showing the flow, schematic depiction of equipment, piping, valves, in-line measurement devices etc. Include all ancillary systems such as process air, etc.
b. Hydraulic profile and identify all major units operating liquid levels. All assumptions used in the calculations of the hydraulic profile must be included
c. Equipment list and data sheet including design sizing calculations, production information, etc.
d. Process flow worksheets showing design sizing calculations for piping, control valves, tankages, process air requirements, etc.

Conceptual Design Drawings

9.8.4 As part of the PDR, Consultant shall submit the following drawings, as applicable.

a. Submit preliminary layout plans using 1:100 scale
b. Equipment location and orientation including HVAC system, electrical transformer, switchgear and motor control centre
c. Show all piping greater than 150 mm and proposed routing
d. Show all in-line measuring devices on the Process and Instrumentation Drawings (P&ID's)
e. See item 9.7.3v above for further drawing requirements

Building Design

9.8.5 The Consultant shall submit the following architectural drawings in the PDR, as applicable.

a. Standard Architectural elevations of proposed facility
b. Details of all internal and external architectural finishes including special finishes e.g. water proofing, etc.
c. Description and locations of any specialties
d. Area Classifications to be provided in a schedule of the designated use of each area of the facility
e. Identify all hazardous and confined area/space

Electrical System

9.8.6 Provide the following details for the electrical system, as applicable.

a. Source of electrical power supply and connection to the facility on the Site Plan drawing. Include site power distribution routing and show whether these are through conduits, trays or duct banks etc. Locate all transformers and switchgear
b. Complete motor list including description of equipment, power requirement, phases, cycle, type, location and direction of rotation. Co-ordinate list with equipment list above and cross-reference the two schedules
c. Provide single-line diagram showing proposed electrical power supply to all equipment. Create single-line Motor Control Centre (MCC) drawings incorporating all motors integrated with the various MCC's, including elevations showing arrangements of each unit
d. Detailed lighting schedule including areas with multiple lighting levels and control system. Include description of emergency and exit lighting equipment and locations

9.8.7 Include in the PDR report all electrical power supply and equipment power demand requirement calculations performed in the preparation of the PDR

9.8.8 Identify frequency and the time of power outages from local power supply system and determine if emergency standby power should be provided. If required, determine size and installation cost. In all cases, compare diesel to

natural gas powered standby generator and recommend accordingly with respect to project requirements such as noise, exhaust air emissions, etc.

9.8.9 Detailed description of fire alarm system and its integration to the SCADA system

Process Narratives

9.8.10 Provide process narratives for each water and wastewater process unit in accordance with Region's SCADA Design Manual, latest version. The Process Narratives will be used as the starting point for the development of the Control Narratives. The Process Narratives as a minimum should include all the pieces of equipment, all the on-line instrumentation, all the hardwired interlocks, the process or control set points that the operator is required to enter, all the hardwired interlocks required to protect personnel, equipment or the process. It should describe how the process is to function under normal conditions in automatic mode of control. It should include a simple block diagram of the process. A preliminary submission of the process narrative is to be submitted for review prior to submission of draft PDR.

Heating and Ventilation System

9.8.11 Where applicable, provide details of the heating, ventilation and air conditioning system and as a minimum, the following are required in the PDR.

a. Room schedule, seasonal temperature objectives, minimum ventilation requirements, heat dispersion ventilation requirements, pressurization (negative or positive) and special classifications
b. Fan schedule, including equipment listing of all units, throughput capacity, static pressure and electrical motor sizing
c. Control schematics for each fan
d. Duct and louvre schedule to be completed for each area including calculations of duct and ventilation equipment sizing

9.8.12 For any odour reduction treatment system, show capacity, type, location and performance parameters

9.8.13 The heating system shall include description and sizing of the entire heating system. For hot water heating system, include boiler sizing, re-circulation and booster pump capacities, unit heaters, etc.

Ancillary System

9.8.14 The following ancillary systems are to be included as part of the PDR, where applicable.

9.8.15 Provide facility water demand and usage, flows and pressure

9.8.16 Facility potable water requirements, frequency of use, flows, pressure and temperature. Provide a schematic flow diagram of facility water supply system. Wherever possible water conservation must be practiced.

9.8.17 Provide details of fire protection system, including areas with fire doors, fire dampers, sprinklers system, fire hose cabinets, etc.

Reduced Drawings Requirement

9.8.18 Include all drawings listed in section 9.7 on reduced size A2 drawings.

Cost Estimate

9.8.19 Provide cost estimate of the project, which includes the following:

a. Construction cost estimate
b. Final updated Consultant's Engineering cost
c. Approvals/Fees and Permits
d. Include all quantity take-off worksheets
e. Identify any impact on project cost as a result of changes in legislation or codes
f. GST

9.8.20 Construction cost estimates shall be prepared to -15% and +25% accuracy.

Project Work Plan

9.8.21 Review Project work plan schedule and update Gantt chart, including predicted construction schedule. Highlight critical milestones.

Impact of Construction Works

9.8.22 The Consultant shall identify the impact of construction works on the operation of the roadway or facility, specifically as it relates to:

a. Critical shut-down requirements of various roads or facility treatment processes
b. Length of required shut-down period
c. Impact on process
d. Impact of Contractor's failure to complete work within the approved shut-down period
e. Contingency plan
f. Watermain/Wastewater connections etc.

Operation and Maintenance Cost

9.8.23 The Consultant shall identify the cost of operating the expanded transportation system or facility with respect to:

a. Increase in operating staff complement
b. Increase in maintenance staff complement including SCADA staff.
c. Increase in chemical cost
d. Increase in energy cost and any off-set as a result of the inclusion of energy efficient equipment in the expansion works
e. Increase in maintenance cost of equipment and facility

9.9 Presentation of Pre-Design Report

9.9.1 The Consultant shall present the report to the Region and the VE Consultant (if applicable), along the following lines:

a. Project requirements
b. Reasons for expansion of road/facility
    i. Development driven
    ii. Process upgrading
    iii. Meet more stringent code requirements

9.9.2 Rationale of Proposed Design as presented in the PDR:

a. Facility layout including both existing and proposed expansion of the process units, connecting conduit, roads and parking facilities, operation and maintenance facilities
b. Site work and foundation including any constraint/limitation of site condition, which may be caused by contaminated or unusual soil condition including the grading plan and flood protection and control for the facility
c. Existing facility/process constraint on proposed expansion works
d. Impact of the requirements of the Ministry of the Environment with respect to facility process requirements, outfalls non-toxicity criteria, air and noise abatement measures

9.9.3 Facility aesthetics in compliance with the Area Municipality Site Plan Approval requirements for architectural treatment, odour control and noise control. Provide details of any odour control/reduction treatment included in the expansion works and cross reference this to any odour evaluation study that the Region has commissioned

9.9.4 Operation of the facility and any special process constraints that must be observed by Operation staff

9.9.5 Details of all process automatic control systems and the facility SCADA system.

9.9.6 Any innovative approaches included in the design

9.9.7 Project detailed cost estimate

9.10 Provincial Ministry Approvals

9.10.1 For water facilities, once the PDR has been completed, prepare the water system design and pipe submission sheet for submission to the Region for approval. Ensure that the PDR meets MOE design requirements. Consultants are to ensure that designs are to incorporate Element 13 (Essential Services and Supplies) of MOE Drinking Water Quality Management Standard

9.10.2 For wastewater and waste management facilities, once the PDR have been completed, commence pre-submission consultation with the MOE for the Application for a Certificate of Approval for the project. Ensure that the PDR meets the MOE design criteria requirements and where necessary, revise PDR to address MOE requirements/concerns.

9.11 Acceptance of Pre-Design Report

9.11.1 Once the region has approved the PDR document, the design will be considered final and no further changes may be made to the design without the expressed approval of the Region's Project Manager. The Region assumes no responsibility or liability for any changes or modifications to the design or PDR made by the Consultant on their own volition.

Table 9-1 Pre-design Phase Deliverables

	Description	Submission Requirements
1.	Technical Memorandums	4 Copies
2.	Preliminary Process Narratives and P&ID Drawings	4 Copies (Drawings to be A2 size)
3.	Pre-Design Report – First Draft	4 Copies (Drawings to be A2 size)
4.	Pre-Design – Final Report	4 Copies (Drawings to be A2 size)
5.	Final Pre-Design Report – Project Manager's Copy to include: All Design calculations All Drawing and Sketches VE Report, where applicable Geotechnical Report(s) Pre-design project estimate details	4 Copies (Drawings to be A2 size) + 1 DVD

SECTION 10 DETAILED DESIGN

10.1 General

10.1.1 The Consultant shall conduct project site visits of the existing facilities and be fully familiar with the operational requirements/procedures and any process requirements or limitations that will impact on the design of the proposed expansion or upgrade works.

10.1.2 Any re-design work that is required, as a result of the Consultant's lack of familiarity with an existing facility, shall be at the Consultant's own cost.

10.1.3 For specific projects, if required, the Consultant will initiate a well monitoring program for the project in accordance with the Region's well monitoring protocol. The well monitoring program is to include, but not limited to the following:

a. Conduct a background review and obtain current water well records on file with the MOE and provide a summary of well types, use and capacities;
b. Conduct door-to-door survey of all wells with the zone of influence, including pumping test, measurement and recording of water levels;
c. Collect water quality sampling for analysis against the Ontario Drinking Water Standards (ODWS) on each accessible well;
d. Notify resident and the Halton Region's Health Department, by telephone and in writing, if any parameters exceed the ODWS limits;
e. Provide a preliminary report following the completion of the door-to-door survey and sampling and testing exercise with recommendations of the wells to be included in well monitoring program;
f. Monitor water quality and quantity for at least one year prior to the start of construction and following construction completion, and during the full duration of construction and six months after substantial performance;
g. Determine the extent and confines of the exiting aquifers, if any, and identify the associated risks and mitigating measures for the construction phase;
h. Provide monthly updates during construction;
i. Provide responses to well interference claims by property owner; and
j. Provide a final report after the completion of the monitoring program.

10.1.4 The Consultant will be required to attend, prepare and distribute agendas and meeting minutes for all required Detailed Design or associated meetings. Note meeting minutes are to be completed no later than five working days following the meeting.

10.2 Work Plan Update

10.2.1 The Consultant's Project Manager shall review the work plan with the Region's Project Manager and if required, submit an updated work plan to address any

changes in the scope of work. The Consultant shall also revise the Gantt chart to reflect any changes to the work plan schedule. Once approved by the Region's Project Manager, the revised schedule must be submitted to the Region within seven working days.

10.2.2 The Consultant's and the Region's Project Managers shall review the work plan on a monthly basis to ensure that the scheduled milestones, budget and deliverables have been achieved as planned. If the progress of the work fails to meet the planned schedule, the Consultant must advise the Region what remedial steps should be taken ensure the project is back on schedule.

10.2.3 As a minimum, the work plan shall include the following elements:

a. Project Description
b. Detailed Scope of Work
c. Staff assigned to the Project
d. List of Milestone and Completion date(s)
e. List of Deliverables
f. Organization structure and responsibilities of each key member
g. Project Schedule procedures
h. Project budget
i. Budget control procedure
j. Quality Control
k. Quality Assurance
l. Reporting and Communication Procedures
m. Design and Drafting standards

10.3 Detailed Design

Preliminary Tasks

10.3.1 The Consultant is to review all "As-Recorded" drawings, carry out field investigations to confirm the location of all above and below grade utilities including the water and wastewater mains which may be impacted by the proposed work. Furthermore, Consultant will be required to identify all existing utilities on plans and profiles, and where necessary, arrange for the field investigation including exposing the utilities to confirm actual locations. Where potential conflict(s) are identified, carry out field surveys to obtain accurate field data to resolve the conflicts(s).

10.3.2 For work at existing facilities, verify that there is a current (within 12 months) designated substance survey available. This must be included as an appendix to the tender package. Forward a copy of the report to the Region's Project Manager, who will forward it to the Manager of Occupational Health & Safety prior to tendering.

10.3.3 If the design requires that utilities are to be relocated, the consultant must submit the appropriate application forms, complete with plans to the utilities concerned. Also, the consultant will develop relocation cost estimates and

schedules. The Consultant will be required to co-ordinate work with the appropriate utility company.

10.3.4 The Consultant will obtain a quotation from the utility to the Region which will be issued to generate the required purchase order to the utility to cover the Utilities' costs.

10.3.5 The Consultant will confirm that the work has been completed by the Utility and submit the approved invoices to the Region for payment.

10.4 Project Monthly Status Report

10.4.1 Consultants will submit Project Monthly Status Report with the monthly invoice for engineering services. Include the following in the report:

a. Progress of Project achieved to date
b. Review of work planned to be completed for the month
c. Work completed for the month and to date versus planned progress as noted in work plan
d. Work planned to be completed for the following month or period
e. Gantt chart showing actual vs. planned schedule
f. Outstanding Action Items, either internal or external to the Region
g. Project alerts of critical Issues which may delay the project
h. Status of Application for Approvals
i. Expenditure of engineering fees for the month and to date
j. Graph of planned vs. actual expenditure of engineering fees
k. If project is behind planned schedule, the Region's Project Manager must be apprised of the situation; the Consultant will develop a recommended course of action.

10.5 Approval to Enter Private Lands

10.5.1 Consultants shall not enter any private property whatsoever without the Region's approval and without first obtaining approval from the owner of the private property. The Consultant shall assume all responsibility for trespassing on private land.

10.6 Project Co-ordination

10.6.1 The Consultant's and Region's Project Managers shall meet on a monthly basis to review the progress of the project including the following as a minimum:

a. Project Monthly Status Report
b. Consultant's staff assigned to the project
c. Work progressed to date and any anticipated roadblocks
d. Consultants budget and any expected deviation

e. Project budget and any anticipated deviation
f. Any instructions from the Region that will result in scope change

10.7 Architectural Design of Regional Facilities

10.7.1 The architectural design of the facility should be carried out in consultation with the Region's Engineering Staff and in accordance with the Halton Region Design Standards for Facilities and Local Municipalities site plan approval process.

10.7.2 The Consultant shall design all Regional facilities to be aesthetically complementary with its surrounding environment. When possible, facility exteriors which require minimal maintenance shall be selected. Landscaping shall be designed with water efficiency considerations. Permanent signage and logos shall be pre-approved by the Region.

10.8 Instrumentation and Control

10.8.1 The Consultant shall conform to the Instrument Society of America Standards ANSI/ISA-S5.1-1992 and ANSI/ISA-S5.4-1991 when preparing process and instrumentation diagrams, particularly with respect to the instrumentation symbols and control and instrumentation loop diagrams.

10.8.2 The development of all instrumentation and control systems is the sole responsibility of the Consultant, regardless of the operating voltage chosen for the control system. This includes the control system for the fan and damper motor of the HVAC system.

10.8.3 Consultant shall be fully familiar with the Region’s instrumentation and control design standards as detailed in the SCADA Design Manual as they may be required to modify all work that does not comply with this requirement at their own cost.

10.9 Control Narratives

10.9.1 The purpose of the Control Narrative is to capture all of the SCADA and control aspects of the process including, hardwired and virtual alarms, alarm response, operational set points, control modes, alarm management and annunciation, virtual points, abnormal operations, fault response, historical trending and trend groupings.

10.9.2 The Control Narrative is to be written by the programmer(s) that will do the programming. It is to be written to a level of detail that a junior programmer who is new to the project but familiar with the Region’s SCADA standards could write the program with little direction.

10.9.3 The Control Narratives are to comply with the template in the Region’s SCADA Design Manual, latest version. The Control Narrative is written by starting with the Process Narrative. More detailed is added as the Control Narrative is

developed through detailed design. Mid-way through the detailed design phase, the first draft of the Control Narrative should be submitted to the Region for review a minimum of 10 business days prior to a dedicated review meeting/workshop. At the review meeting/workshop the document will be reviewed page by page and discussion held on the document. Follow up submissions and meeting/workshops will be required before the Control Narrative can be finalized. Changes to the Detailed Design that may come as a result of these meetings/workshops must be captured in the Design Drawings and Contract Specifications prior to the project going to Tender. Therefore it is imperative that the Final Control Narrative be completed before the project is Tendered.

10.9.4 Included in the body of the Control Narrative will be the proposed static HMI graphics including the overall process screens and any set point or selection screens. The Region's standard HMI Pop-up windows do not need to be included with the Control Narrative.

10.9.5 A separate Control Narrative as a separate Word Document is to be developed for each process area and where possible for each PLC. This is to allow for easier maintenance of the documents by the Region after the project is complete.

10.10 SCADA System

10.10.1 The design of the facility's SCADA system's architecture shall be carried out in consultation with the Region's engineering staff. Integration of new SCADA systems to existing systems shall be the responsibility of the Consultant. The Consultant shall maintain existing graphic standards and mode of operation of equipment for any new SCADA system, unless this requirement has been waived by the Region at the commencement of the project. Consultant will be required to make all required changes/modifications to the SCADA system as outlined in the Scope of Work.

10.11 Equipment Tag Number

10.11.1 All equipment tagging must be done in accordance to the Region's SCADA Standards Manual. The tag numbers shall be used on all Process and Instrumentation Drawings (P&ID) to identify equipment. Upon completion of detailed design, the Consultant will submit a list of the equipment tag numbers and when once approved, submit two (2) hard copies and two (2) electronic copies in the format requested by the Region at the time of submission.

10.12 Drawing Numbering System

10.12.1 The Consultants shall comply with the following drawing numbering system to be used for all water and wastewater projects.

Facility Process Area Designation

10.12.2 The facilities are separated into various process or operating areas and these have been given specific designated numbers. The following numbering system shall be adhered to by all Consultants:

Table 10-1 Numbering System

	Wastewater Treatment	Water Treatment
X0Y	Plant Site	Plant Site
X1Y	Inlet, Screen & Grit Facilities	Intake
X2Y	Primary Treatment	Low Lift Pumping & Screen
X3Y	Secondary Treatment	Flocculation Tank
X4Y	Aeration	Sedimentation Tank
X5Y	Chemical	Filtration
X6Y	Disinfection System	Chemical
X7Y	Primary/Secondary Digester & Control Building	Disinfection System
X8Y	Thickening/Dewatering/Sludge Storage	Reservoir
X9Y	Pumping Station	High Lift Pumping Station
X10Y	Tertiary Treatment	Residual Management System
X11Y	Miscellaneous	Well Pump house
X12Y		Booster Station
X13Y		Elevated Tank
X14Y	Administration Building	Administration Building
X15Y	Miscellaneous	Miscellaneous

Classification of Engineering Disciplines

10.12.3 In the table below, the first alphabet stands for the engineering discipline; the following designations shall be used:

Table 10-2 Drawings Designation

X (Designation)	Engineering Discipline
A	Architecture
S	Structural
G	General, Site Work (Including Yard Piping)
P	Process
I	Instrumentation & Control (Including SCADA)
E	Electrical
L	Landscaping
M	Mechanical/HVAC
C	Structured Cabling and Networking

Y is the three digit drawing numbers, starting from 001.
Example of a structural drawing for a pumping station is:
S-9- 001 Structural Pumping Station Y

10.13 Regional Signing of Design Drawings

10.13.1 The Consultant will add the regional signing title block in the bottom right hand corner of each design drawing as per Appendix 2 and submit to the Region for the appropriate signature.

10.14 Design Calculations

10.14.1 Upon completion of the detailed design, the Consultant shall submit the following as an addendum to the PDR:

a. Key design calculations relating to major components of the project for the roadway, linear, or facilities
b. Process calculation for all components of the facility
c. Facility hydraulics
d. Structural design
e. Foundation design
f. Electrical power supply
g. Heating, ventilation and air conditioning system

10.15 Review of Drawing and Specifications

10.15.1 Six (6) sets of drawings and six sets of the specifications are to be provided for review at the 50%, 90% and 100% design stage. Additional sets may be required if Value Engineering is part of the design review. Drawing sets are to be printed single sided.

10.15.2 Six sets of drawings comprised of one (1) sets of A1 and five (5) sets of 11x17 size drawings. Costing estimate accurate to ± 10% shall be included with each submission.

10.15.3 Following review of the drawings and specifications, the Consultant shall produce the Minutes of the Meeting, which shall include an action item list. The action item shall include the name or names of the Project Team member(s) responsible for the follow up.

10.16 Application for Approvals

10.16.1 The Consultant shall ensure that all approvals, permits and agreements for the project have been received or secured or will be secured or in place between the time when the tender closes and prior to the award of the contract. The Consultant shall prepare a list of the status of all required approvals, permits or agreements, including those, which must be received before the contract can be awarded.

10.16.2 Ministry of the Environment Approvals

10.16.3 Where applicable, application for the final Certificate of Approval shall be made as soon as the detailed design has been completed. The Consultant will prepare application forms for execution by the Region and forward the documents to the MOE for review and approval.

10.16.4 The Consultant shall also complete the application for Certificate of Approval (AIR & Noise) for execution by the Region and for MOE approval. Where necessary, meet with MOE staff to ensure that all issues have been addressed and all information required by the MOE has been submitted.

10.16.5 Fees for the application of the MOE Certificate of Approvals will be borne by the Region.

10.16.6 If applicable, Consultants are to obtain the required approvals indicated in MOE Drinking Water Quality Management Standard

Area Municipality

10.16.7 The Consultant will secure Site Plan Approval for the project as soon as the landscaping and architectural design drawings have been completed.

10.16.8 The Consultant will complete application form, have it executed by the Region, and forward the completed document to the Area Municipality for approval.

10.16.9 Meet with the Planner to ensure that the requirements of the Area Municipality have been met or satisfied.

10.16.10 Attend Site Plan Approval Committee meeting. The Region will bear the cost of the fees for the application for Site Plan Approval.

10.16.11 Complete the application for Site Plan Undertaking Agreement and forward it to the Region's Project Manager for execution and transmittal to the Area Municipality.

10.16.12 When the design of the project has been completed, apply and secure the required Building Permit.

10.16.13 Meet with the Building Department staff to ensure that their requirements have been met or satisfied.

10.16.14 The Region will bear the cost of the fees for the application of the Building Permit, which may be adjusted when the actual tender price has been received.

Conservation Authority

10.16.15 Where the project is within the jurisdiction of the Conservation Authority, apply and secure the necessary approval(s). Complete the required application forms and prepare all reports as required by the authority and forward it to the Region's Project Manager for execution and transmittal to the Authority.

10.16.16 Attend the Authority's Committee meeting when the Region's application is being considered.

Ministry of Natural Resources and Department of Fisheries and Oceans

10.16.17 Where the project falls within the jurisdiction of the Ministry of Natural Resources (MNR) or Department of Fisheries and Oceans (DFO), complete the required application forms, including all required reports and submit it to the Region's Project Manager for execution and subsequent transmittal to MNR or DFO. Where the required information or reports are of a specialized nature, the Region may retain the services of a separate Consultant for the preparation of reports specifically for the MNR or DFO. All others will be considered to be within the scope and responsibility of the Consultant.

10.16.18 Attend MNR Committee meeting when the Committee considers the application.

10.16.19 Note that the Ministry of Natural Resources (MNR) issues approval on behalf of the Department of Fisheries and Oceans (DFO).

10.16.20 Liaise with MNR to determine DFO requirements.

10.16.21 Niagara Escarpment Commission approvals are required for new road construction, new land developments and constructing a pond, or altering a watercourse. For specific details go to www.escarpment.org

10.17 Pre-Tender Estimate

10.17.1 The Consultant shall prepare and submit the pre-tender estimate on completion of detailed design. The pre-tender estimate shall be based on a detailed take-off of the proposed construction works. Estimates shall be made based on the current market unit rate for each trade of the construction works.

10.17.2 Pre-tender estimates shall be prepared to achieve accuracy within ±5% of the lowest bona-fide tender received by the Region. The estimates are to be formatted in a divisional detailed breakdown based take-offs for each division.

10.18 Tender Documents

10.18.1 After the final review of the tender documents has been completed, revise and submit the tender documents as specified in Table 10.3 – Deliverables.

10.18.2 Two (2) electronic copies of Tender Submission drawings and specifications must be forwarded to the Region at time of Tender: One (1) the original Microsoft Word (specifications) and in CAD (drawings) format, and One (1) copy of both documents in Portable Document Format (PDF).

10.19 Asset Management

10.19.1 The Region maintains an inventory of the replacement value of all Regional facilities as well as a detailed equipment inventory. Once construction has commenced, the Consultant will prepare a draft 'Plant Equipment Data Collection Form'. Upon conclusion of construction, the Consultant will complete the final 'Plant Equipment Data Collection Form' (Appendix 9) for all equipment installed under the project and submit the completed forms, along with the O & M Manuals, to the Region's Project Manager.

10.19.2 The Plan Equipment Data Collection Form will be provided to the Consultant in an electronic format.

Table 10-3 Summary of Detailed Design Deliverables

Item	Description	Submission Requirements		
		Specifications	Drawings	DVD
1.	For Review - Drawings and technical Specifications at 50% Complete	6 Copies	2 Sets – A1 5 Sets – 11x17	n/a
2.	For Review - Drawings and technical Specifications at 90% Complete	6 Copies	2 Sets – A1 5 Sets – 11x17	n/a
3.	For Review - Drawings and Specifications and Bid Document at 100% Complete	6 Copies	2 Sets – A1 5 Sets – 11x17	1 Set of DVD
4.	Bid Document to be issued for Tender.	50 Sets (Confirm with Region before printing)	50 Sets (Confirm with Region before printing) 5 Sets – 11x17 for internal staff use	2 sets of DVD 1 original format & 1 PDF format
5.	Addenda During Tendering	As Required	As Required	n/a
6.	Contract Document for execution by Contractor and Region, incorporating all Addenda	3 Copies	3 Sets	1 Set of DVD
7.	Issue for construction drawings and Specifications incorporating all Addenda to be free issue for construction	10 Copies	11 Sets – A1 4 Sets – A2 1 Set – A2 drawings for “As-Constructed” record.	1 set of DVD
8.	Draft Operation Manual	6 Copies		1 Set of DVD
9.	Equipment Tag Number Listing	2 Copies		2
10.	Asset Management Report	1 Copy		1 Set of DVD
11.	Permits and Approvals	1 Copy each		1 Set of DVD
12.	Application of Permits and Approvals Status Report	1 Copy		1 Set of DVD

SECTION 11 TECHNICAL SPECIFICATIONS

11.1 Overview

11.1.1 The following requirements, as specified in the following Division, are to be included in the relevant sections of the 16 Division Specifications. These are not intended to replace the Specifications that are normally prepared by the Consultant for the contract documents. Rather, these are to enhance the Region requirements and shall be included as part of the Specifications that the Consultant prepare for the Technical Specifications.

11.2 Division 1 – General Requirements

11.2.1 The Consultant is to include the following in the appropriate section of the Specifications.

Site Specific Health and Safety Plan

11.2.2 Contractor shall submit a site specific Health and Safety Plan within five (5) working days after date of Notice to Proceed and prior to mobilization on site. The site-specific Health and Safety Plan must address the requirements of the Acts.

Health & Safety

11.2.3 The Contractor shall meet the requirements of the following:

a. Occupational Health and Safety Act, Regulations for construction projects, Part II General Construction, latest edition.

b. Occupational Health and Safety Act, Industrial Establishments Regulation, Part I Safety Regulations, latest edition.

c. Canada Labour Code, Canada Occupational Health and Safety Regulations, Part XI – Confined Spaces.

Work in Hazardous Locations/Confined Spaces

11.2.4 Comply with the requirements of CAN/CGA B-105-M-93 when working in and around hazardous locations/confined spaces.

11.2.5 Conform to Ministry of Labour requirements for work in hazardous locations. Establish and implement written procedures to assure compliance.

11.2.6 Construction activities, except wire pulling and cleaning, that occur in hazardous locations require continuous combustible gas monitoring, by the Contractor.

11.2.7 Provide documentation of tests for gas and oxygen deficiency prior to starting work in hazardous locations.

11.2.8 Ensure that all personnel engaged in confined space work or work in hazardous locations that require the use of respiratory equipment, comply with the requirements of the Ministry of Labour and must be clean shaven.

11.2.9 It is the Contractor's responsibility to provide all necessary gas detector equipment, ventilation, other safety devices required by law.

11.2.10 Smoking is not permitted in hazardous areas or other areas as designated by the Region. Post "No Smoking" signs as required.

Site Occupation/Mobilization and Demobilization – General Requirements

11.2.11 The Contractor and sub-contractors to observe and ensure the following:

a. Set up offices in neat and orderly fashion where noted on drawings.
b. Shall not occupy any areas outside those described on the contract document and not in the way of operational requirements.
c. Areas occupied by the Contractor and sub-contractors to be kept neat and tidy – garbage not to be stored.

Contamination Protection

11.2.12 The Contractor and sub-contractors shall not contaminate the site and comply with the following:

a. Dispose of materials as required by law.
b. Protection to existing services, land, watercourses.

Parking Facilities

11.2.13 Contractor to build and maintain temporary roads and parking areas. Where the site has insufficient parking area, Contractor is required to obtain temporary parking facilities.

Environmental Protection

11.2.14 The requirements for environmental controls including:

a. Control of noise from construction equipment.
b. Dust control and approved methods.
c. Surface water control and erosion.

d. Pollution control methods.
e. Handling of designated substances.
f. Sensitive Areas.
g. Removal and disposal of hazardous material from site.
h. Compliance with the Occupational Health and Safety Act and site safety including Contractor being deemed as "Constructor" under the Act.

Salvaged Equipment

11.2.15 Equipment and materials removed during the construction work shall be protected from damages so that it may be reused. Any equipment so removed shall be subjected to the following:
a. Region's first right of refusal for salvaged equipment.
b. No equipment may be removed off-site without the written authority of the Contract Administrator/Resident Engineer.
c. Contractor to dispose of surplus or equipment not required by the Region and shall keep site in a neat and tidy manner.

Temporary Facilities

11.2.16 Contractor to provide all temporary utilities and controls to execute work expeditiously including:
a. Provision of all temporary telephone, water, wastewater, power and light required during construction.
b. Temporary heating and ventilation.
c. Dewatering to keep site and excavations from standing water.
d. Provide and maintain fire protection equipment.

Consultant Review of Construction Schedule

11.2.17 The Contractor shall submit a construction schedule based on the tender and all required schedules, to the Engineer for review and co-ordination prior to the first payment certificate. The submission shall include three (3) hard copies and 1 electronic copy in latest version of Microsoft Project, Primavera, or other Project Scheduling Software acceptable to the Region.

11.2.18 The Consultant shall review the construction schedule and comment on the budget and scheduling of the works as proposed by the Contractor.

11.2.19 The Consultant shall ensure that during the construction of the works, the Contractor shall provide a two-week (for regular two-week interval site meeting) rolling window schedule of the work planned to be completed the following two-week at each site meeting. At the next site meeting, a review of the Contractor's progress will be reviewed by comparing activities actually completed the previous two week versus the planned activities. Submission shall be provided to the Region no later than 1:00 p.m. of each Friday. If the progress of the construction work is falling behind schedule as noted from the results of the site meeting's rolling schedule, take appropriate action or actions to correct

construction method(s) and bring the schedule back to the tendered construction schedule.

Shop Drawings

11.2.20 Provide 2 copies of all equipment shop drawings depicting material, equipment, erection diagrams and all other items to be incorporated into the work for the Region review and records.

11.2.21 The Contractor shall number and identify all shop drawing as per the standards in the Water & Wastewater Facility Design Manual.

Project Sign Board

11.2.22 Region will provide the required project signboards free of charge to the Contractor and the Contractor shall pick the sign up, install, remove and dispose of at project end. If the signboard is not returned to the Region at the end of construction, the Consultant and Contractor will each be charged an administration fee of $300.

11.3 Equipment Status and Testing

11.3.1 Specify the equipment status and testing as per Section 16, including the following.

a. Equipment installation status tags
b. Rotating equipment check out/verification requirements
c. Mechanical system checkout
d. Electrical system checkout
e. Instrumentation installation and calibration
f. Instrumentation and control system checkout
g. HVAC checkout
h. Commissioning

11.4 Pre-packaged Equipment

11.4.1 Specify the pre-packaged equipment that conforms to the Region of Halton's standards.

11.5 Performance and Operational Testing

11.5.1 Specify the equipment and system performance and operational testing as per Section 17.

11.6 Commissioning of Systems

11.6.1 Specify the commissioning of systems as per Section 17

11.7 Manuals and Training

11.7.1 Specify the contractor manuals and training requirements as per Section 18

11.8 Assumption of Facilities

11.8.1 Specify the contractor's requirements for the assumption of facilities as per Section 20.

11.9 Warranty Period

11.9.1 Specify the contractor's requirements during the warranty period as per Section 21.

SECTION 12 PREPACKAGED EQUIPMENT WITH A PLC

12.1 Compliance with Halton SCADA Standards

12.1.1 The Region has very detailed and specific standards for PLC and HMI programming and configuration and SCADA system design. The purpose of this section is a quick summary of the items that the Region will expect adherence to. This document is meant as the initial point of review and to compliment to the Region's SCADA Standards Manual. It is not an exception nor does it imply that the standards not be followed in any way.

12.1.2 All consultants and contractors doing work within the Region adhere to these standards. One of the main purposes of having these standards is to provide operational and maintenance consistency across the hundreds of facilities and processes that the Region operates and maintains. The objective is that a pump or valve in one water plant look and behave the same as a pump or valve in another wastewater plant

12.1.3 The Region recognizes that when vendors supply packaged process equipment the vendor have developed and tested programs and algorithms specific to their own equipment and that significant deviation from the vendor's standards may cause difficulties. The purpose of this document is to provide some guidelines for discussion on the parts of the standards that the Region is not willing to compromise and those that it may consider. Listed out below are the minimum standard requirements that must be adhered to.

a. Documentation - Every aspect of the PLC program and HMI configuration including any InTouch scripts must be fully documented.

b. Processor Name - Comply with the Regions standards. It would be acceptable that a standard company name be used during development but the name should be changed to the Region's name once commissioning is complete. Please contact the Region's Engineer if assistance is required in determining the Region's required name.

c. Project File Name - Comply with the Regions standards. It would be acceptable that a standard company name be used during development but the name should be changed to the Region's name once commissioning is complete. Please contact the Region's Engineer if assistance is required in determining the Region's required name.

d. Control Mode Hierarchy- This must be complied to as closely as possible. The only exception is equipment that does not have any hardwired control or equipment that requires it's respective PLC to be operational for safety or process reasons. An example is an ozone generator. It requires that its PLC be fully functional for protection of both equipment and personnel. If the PLC is not healthy then the equipment will not run which means it does not comply with the Region's definition and requirement for a Local Control Mode.

e. Programming Language- The main program is to be written in ladder logic. In certain circumstances the Region would consider the use of structured text for large and complex mathematical calculations. Before

completing any programming in structured text contact the Region's Engineer and request that the use of structured text be reviewed.

f. When programming with RSLogix 5000 for the Logix family of processors, the Region does allow the use Function Blocks for a few specific tasks. Those tasks are;
   i. Flow totalization,
   ii. Moving average calculation, and
   iii. PID Control.

g. PLC Program Organization and Order of Ladder Files- Although the exact order may not be followed nor all the same ladder files exist as the base load as they may not be relevant, it is required that the ladder files be ordered in a neat logical format and fully documented.

h. Analog input PLC and HMI code- Comply with this requirement fully ensuring that all 5 of the alarms (LoLo, Low, High, HiHi and Signal Error) and the enable/disable functions exist and the Analog Device Control and Advanced Analog InTouch pop-up are fully functional. Be aware that the operator can change the threshold setpoint value for any of the alarms. If these alarms need to initiate further action with the PLC code that is critical, it may be advisable to use a separate hard coded value that the operator cannot change.

i. Motor Driven Device (pumps) Driver and Alarms- Comply with this requirement fully ensuring that in addition to any hardwired alarms, that the 4 virtual alarms exist as well. Use the standard InTouch Pump Control pop-up.

j. Discrete Valve Driver and Alarms- Comply with this requirement fully ensuring that in addition to any hardwired alarms, that the 4 virtual alarms exist as well. Use the standard InTouch Valve Control pop-up.

k. Analog Valve Driver and Alarms- Comply with this requirement fully.

l. Mapping in of inputs - Comply with this requirement fully.

m. Alarm Enabling/Disabling – Comply with this requirement fully.

n. Communications Monitoring - Comply with this requirement fully.

12.2 SCADA Roles & Responsibilities

Control Narrative

12.2.1 The Consultant is responsible to provide one complete control narrative for each of the plant/processes on a PLC by PLC basis. The vendor will supply a control narrative for their equipment. The consultant along with the Region will review the control narrative. Once the control narrative is complete to the satisfaction of the Region and the consultant, the consultant will take the vendor control narrative and integrate it into the plant control narrative covering of the aspects of data passing, permissive and interlocks so that it reads as one uniform narrative. The consultant is also responsible to ensure that the integration of the vendors Control Narrative is brought up to the Region's standards for Control Narratives.

Vendor Supplied PLC Software

12.2.2 The vendor will develop the PLC software for their respective equipment. The consultant will be required to review the PLC code for completeness, compliance with Region Standards, documentation and good programming practices.

12.2.3 Alarms on the Vendor Supplied Package

12.2.4 Each individual alarm in the package equipments PLC should be read directly into the plants InTouch application. No general or grouped alarms are to be read by the plant InTouch application. Each alarm must have enable/disable capabilities and each alarm must be available to be made into a call in alarm through the plant's auto dialer system. It is the consultants responsibility to work with the vendor to ensure this functionality is incorporated into the HMI application.

Vendor Supplied HMI Windows

12.2.5 When package equipment is installed in the Region it is the responsibility of the supplier of the equipment to develop the required InTouch HMI windows for their particular equipment. These windows are to be devolved using a Regional base InTouch application and must adhere to Regional standards. These windows include InTouch windows and any scripting required to use the Region's standard pop-up windows such as the pump control or analog device control pop-up. A base application which includes all the required pop-up windows and button bars will be supplied to the vendor. The consultant is responsible to review the HMI windows to ensure they comply to Regional standards. The consultant will be responsible for the integration of the HMI windows into the plant InTouch application. The consultant will be responsible for modifications to any HMI windows that are required as a result of the addition of the package system including but not limited to trending, navigation, alarming and auto dialer configuration, PLC health monitoring windows, polling health windows and system architecture drawings windows. It is the consultant's responsibility to fully familiar with the InTouch application and the impacts of adding the packaged process.

Control Panel FAT

12.2.6 The consultant will be responsible for attending the vendor's control panel FAT and acting on the Regions behalf to ensure the control panel is compliant with the design drawings and the approved shop drawings.

Software FAT

12.2.7 Data will need to be passed back and forth between plant PLC(s) and the vendor supplied PLC(s). This includes any process data as well as permissive and interlocks. This data passing needs to be tested as part of a coordinated software FAT.

12.2.8 Prior to conducting the software FAT the consultant will have completed their PLC code that relates to the package equipment. They will have received the HMI screens from the vendor and will have integrated them into the existing InTouch application. They will have completed the navigation, alarming and call-outs section, historical trending, PLC communication and status screens, setpoint screens, and any reporting requirements. The Consultant will be responsible to organize and facilitate the FAT. The vendor's PLC(s) will need to be connected to the plant PLC(s) and all tested as one uniform system.

I/O Loop Checks

12.2.9 The Consultant with the Region will be responsible for witnessing the I/O Loop Checks of the vendors equipment.

Local OITs

12.2.10 It is the Consultant's responsibility to make sure the Local OIT is an Allen-Bradley PanelView+. The exact model should be confirmed with the Region at the time of the design. The Consultant is also to make sure the programming and screens are compliant with the Region's SCADA Standards Manual. The consultant is also to make sure that all alarms, parameters and set points that are available to the operator on the Local OIT are also available on the plants InTouch application. The operator should not have to go the Local OIT on a normal regular basis.

Software SAT

12.2.11 The Consultant will be responsible to organize and facilitate the Software SAT. Both the vendor's system and the related plant systems will be tested together at the same time in the same manner that the Software SAT was conducted.

12.3 Detailed Design Deliverables

12.3.1 The detailed design submissions should follow the same requirements and milestones as those outlined in Section 10.13, Review of Drawing and Specifications and the quantities outlined in Table 10-3 of this manual.

SECTION 13 PRE-SELECTION OR PRE-PURCHASE OF EQUIPMENT

13.1 General

13.1.1 The purpose of pre-selection or pre-purchasing of equipment is to obtain the required equipment in a timely manner and include it as part of the contract to be carried by the General Contractor. It also enables the Consultant to make suitable provisions for the specific equipment i.e. foundation power supply, wiring piping, etc.

13.2 Bid Document

13.2.1 The Consultant shall prepare and submit draft copies of the pre-purchase or pre-selection bid documents for review by the Region. All specific spare parts or required special maintenance tools must be determined during the proposal stage and specified in the pre-selection or pre-purchase bid documents. The clause requiring the Supplier/Contractor to provide spare parts or special maintenance tools must specify the actual spare parts or maintenance tools required. A general clause requiring the Supplier/Contractor to supply spare parts and tools is not acceptable.

13.2.2 The Consultant shall meet with Region's Project Manager and Regional purchasing staff to review the draft pre-selection documents and to ensure that they adhere to the Region's standards.

13.2.3 An electronic version of final draft of bid documents is to be forwarded to Region's Project Manager for review and final editing.

13.3 Compliance with Halton Region Design Standards

13.3.1 One of the major design issues is to ensure that all prepackaged equipment adheres to the Region's design standards in a cost effective manner.

13.3.2 During the design phase, the Consultant must review the proposed prepackaged systems and prepare a Design Deviation memo indicating where the vendor's prepackaged system does not meet the Region's standards for review by Regional staff. It will then be determined what deviations are acceptable, and which must be changed.

13.4 Detailed Design Deliverables

13.4.1 The detailed design submissions should follow the same requirements and milestones as those outlined in Section 10.13, Review of Drawing and Specifications and the quantities outlined in Table 10-3 of this manual.

13.5 Evaluation of Submitted Proposals

13.5.1 The Consultant shall evaluate, along with the Region staff, the proposal document received and submit a report and recommendation to the Region's Project Manager in accordance with the schedule established by the Project Manager (with the Consultant), or no later than ten working days after bid closing.

13.6 Incorporation of Pre-Purchased or Pre-Selected Equipment Document into General Contractor Specifications

13.6.1 The Consultant shall include the following requirements in the bid documents i.e. the construction and the equipment bid documents:

a. A copy of the Novation Agreement and specifications of the Pre-Selected/Pre-Purchased equipment
b. General Contractor responsibility for the assumption of new equipment
c. General Contractor responsibility for the co-ordination with supplier(s) and sub-trades
d. Payment to supplier(s) for pre-purchased equipment only, will be made by the Region directly

13.6.2 A Novation Agreement executed by all parties

Table 13-1 Pre-Selection Deliverables

	Task	Submission Requirements
1.	Draft Pre-Selection or Pre-Purchase Bid Documents	2 Copies
2.	Final Draft of Pre-Selection or Pre-Purchase Bid Documents, including any technical appendices or drawings not included in bid document. Note: Final Draft to include all changes in red ink.	6 Copies
3.	Pre-Selection or Pre-Purchase RFP issued by Region's Purchasing staff	1 Copy on DVD

SECTION 14 PRE-QUALIFICATION OF CONTRACTORS

14.1 General

14.1.1 The Region may have an existing Pre-Qualified List of General Contractors, Electrical and Mechanical Sub-Contractors that have the necessary experience and qualifications to undertake the construction of water and wastewater facility on behalf of the Region. If the Request for Proposal included the requirement to pre-qualify contractors, the consultant will follow the Pre-Qualification procedure outlined in this section

14.2 Pre-Qualification Procedure

Advertisement

14.2.1 The Contractor must prepare and submit one copy of the Pre-Qualification advertisement to the Region's Project Manager for the General Contractors, and the Electrical and Mechanical Sub-Contractors. The Region's Project Manager will review the advertisement with the Region's Purchasing staff and when approved, it will be advertised in the Daily Commercial News for a minimum of two consecutive days on two separate occasions.

Pre-Qualification Process

14.2.2 The pre-qualification process shall include the following:

a. Preparing Prequalification document including:
   i. Introduction
   ii. Inquiries
   iii. Submission response
   iv. Experience, Qualification and associated criteria
   v. Detailed scope of work
   vi. Additional or Supplementary Terms and Conditions
b. Reviewing, evaluating and scoring responses according to an established and defensible criteria

14.3 Reference Check

14.3.1 The Consultant shall undertake reference checks with contact persons provided by the Contractor/Sub-Contractor.

14.3.2 The Consultant shall obtain information on the Contractor's performance on the reference project, concerning such items as project understanding, communication, claims, change orders, scheduling, co-ordination, documentation submittals, response time, and warranty work, as well as comfort level with the Contractor on a repeat project.

14.4 Interviews

14.4.1 All Contractors who have submitted documents for consideration may be invited to attend an interview. The Consultant shall prepare a set of questions, reviewed with the Region's Project Manager, designed to elicit information from the contractors on their approach to project scheduling and coordination, understanding of project issues specific to the project.

14.5 Evaluation and Ranking of Contractors

14.5.1 Submissions are to be reviewed for completeness and compliance with the terms of the request. Items to be reviewed include:

a. Identification of Outstanding Claims or Legal actions against Halton Region
b. Previous Experience working on Halton Region projects
c. Conflict of Interest Declaration
d. Workplace Safety & Insurance Board Certificate of Clearance
e. QA/QC Procedures
f. Company Safety Policy
g. Canadian Construction Document Committee, Standard Construction Document CCDC-11, including Relevant Projects with Project References
h. Staff Resumes
i. CAD-7 Rates
j. General Lien or Litigation Information

14.5.2 The Consultant and the Region's Pre-qualification Committee shall score each interviewed Contractor using a prepared scoring system established specifically for the project.

14.5.3 Prequalification scoring is to conform to the following categories:

a. Assessment of the suitability and experience of project staff
b. Ability to adhere to schedules and delivery dates
c. History of liens and litigation
d. Workplace Safety and Insurance Board Rating and Health and Safety record
e. Contractor's experience and capabilities e.g. relevant knowledge to specific work
f. Overall project performance rating based on discussions with identified references including: workmanship, deficiency correction and Owner/Consultant Satisfaction
g. Workmanship

14.6 Pre-Qualification Report

14.6.1 Upon completion of the Pre-Qualification process, the Consultant shall prepare a report to the Region covering all the above points and recommend the General, Electrical and Mechanical Contractors to be invited to submit bids for the project.

Table 14-1 Pre-qualifications of Contractors Deliverables

	Task	Submission Requirements
1.	Summary of Desktop Review	1 Copy
2.	Questionnaire for Interview of Contractors	As Required
3.	Summary of Interview	1 Copy
4.	Final Evaluation and Ranking Report	1 Copy 1 DVD

SECTION 15 TENDER PROCEDURE

15.1 General

15.1.1 The Regional Municipality of Halton Purchasing By-law governs the purchase of all goods and services. Consultants must familiarize themselves with this policy. The following outlines some of the more rudimentary points.

15.1.2 The front end of the Tender Documents has been prepared by the Region and will be issued free of charge to the Consultants for the preparation of all contract documents and no deviation will be permitted without the express approval of the Purchasing Department except for the Special Provisions.

15.1.3 The Uniform 16 Divisions shall conform to the Construction Specifications Institute Master format – Master List of Sections, Titles and Numbers. The Region has also added a Division 17- Structured Cabling.

15.1.4 OPS specification should not be used in tender technical specifications unless approved by the Region's Project Manager.

15.1.5 The Consultant is required to provide the final complete tender documents including the standard sixteen divisions of the technical specifications.

15.2 Tender Closing Time and Day

15.2.1 All tenders close on a Tuesday on or before 2:00 pm local time.

15.3 Pre-Tender Site Meeting

15.3.1 One week after the calling for tenders, the Consultant shall arrange and chair the Pre-Tender Site Meeting with Contractors to review the tender specifications and drawings and to clarify any issues.

15.3.2 Arrange with the Region's Project Manager for the meeting to be held at an appropriate Regional Facility to be followed by a site visit. In accordance with the provisions of the bid document, attendance of the Pre-tender Site Meeting is usually mandatory and failure by Contractors to attend the meeting will result in their tender(s) being returned to them unopened.

15.3.3 The Consultant shall take the attendance record of all Contractors present and record all questions/issues raised and answers provided at the meeting. Subsequently, the Consultant will provide the Region's Project Manager with a copy of the minutes of the meeting, together with questions and answers in order to provide a basis for the issuance of an addendum if required.

15.3.4 Where a test dig is required, the Consultant shall arrange with Region's Project Manager to have appropriate equipment to be on site to perform the test dig.

15.4 Addendum to Tender Documents

15.4.1 All addenda shall be prepared and emailed to the Region's Project Manager by the Consultant. The Region's Project Manager will review the addendum and forward it to the Region's purchasing staff for issuance.

15.5 Tender Opening

15.5.1 Tenders are opened in public on the closing date at 2:15 p.m. local time.

15.6 Evaluation of Tenders

15.6.1 The Consultant shall evaluate the tenders received and submit a report and recommendation to the Region's Project Manager in accordance with the schedule established by the Project Manager (with the Consultant) or no later than five consecutive working days after the close of tender.

SECTION 16 CONTRACT ADMINISTRATION

16.1 General

16.1.1 The Consultant's Resident Engineers and/or Inspectors will provide a review of the work during construction. The performance of the contract is not the Consultant's responsibility, nor is his review services rendered for the Contractor's benefit, as the Contractor is fully responsible for discharging his obligations under the terms and conditions of the contract. Notwithstanding, it is still the Consultant's responsibility to determine that the Contractor discharges his obligations faithfully under the terms and conditions of the construction contract and executes the work as designed. It is also the Consultant's responsibility to confirm that the facility, when constructed, will perform and function as intended through site inspection, verification reports, etc.

16.1.2 The Consultant will be required to attend, prepare and distribute agendas and meeting minutes for all required bi weekly Construction or associated meetings. Note meeting minutes are to be completed no later than five working days following the meeting.

16.1.3 The Contractor is responsible for the quality of his work, but it is the Consultant's responsibility to verify, through his Quality Assurance during the construction phase, that it is executed in accordance with the contract documents.

16.1.4 If the Contractor is not fulfilling his/her contractual obligations then Consultant is responsible for notifying the Contractor in writing in a timely manner.

16.2 Partnering Workshops

General

16.2.1 Major construction involving water and wastewater facilities in the Region involves a large number of stakeholders including the Region, Consultants, the Operator and the Contractor. Therefore in an effort to enhance the project's chances for success, the Region encourages Contract Team Building.

16.2.2 Contract Team Building is a process through which participants meet as equals, test assumptions, manage expectations, gain mutual understanding of roles and responsibilities, buy-in to common goals, identify, examine and prioritize potential challenges, jointly develop an effective dispute resolution mechanism and evaluation system, and create a team. By having an early Contract Team Building meeting, all the critical stakeholders can air their perspectives and objectives and seek to align goals for fast, cost-effective and co-operative project delivery. In order to ensure the success of the Contract Team Building process, the Consultant shall include the Project Director, Project Manager, Resident Engineer and Inspector in the Contract Team Building session. The Contractor will be required to include the Company's Project Director, Project Manager, Site Superintendents and the Electrical and Mechanical Sub-Contractors Project Manager.

16.2.3 The Consultant should plan for at least two Partnering Workshops with the Contractor, plus other stakeholders, during the initial construction activities.

16.3 Pre-Construction Meeting

Attendees

16.3.1 After award of the contract to the successful General Contractor, the Consultant shall arrange for the Pre-Construction Meeting to be held within ten working days. Attendees at the meeting shall include:

a. Region's Project Manager
b. Facility Operations Supervisor and Operator
c. Consultant's Project Manager
d. Consultant's Resident Engineer
e. General Contractor
f. Electrical Sub-Contractor
g. Mechanical Sub-Contractor
h. Inspection Services Supervisor

Pre-Construction Meeting Agenda

16.3.2 The Pre-Construction Meeting Agenda shall include the following:

a. Review of Contract Document Status (Insurance, Bonds) and execution of Contract Document
b. Official Commencement Date
c. Required Completion Date
d. Stakeholders contact information

e. Status of Approvals
    i. MOE
    ii. Building Permits
f. Notification to Concerned Bodies
    i. Contractor to Notify Ministry of Labour
    ii. Contractor designated as Constructor
    iii. Region will notify Utilities, Police, and Fire Department
g. Construction Schedule
    i. Construction Schedule and submission date
    ii. Two week Rolling Schedule at Site Meeting
    iii. Hours of work
h. Site Supervisory Staff
    i. Contractor
    ii. Contractor Emergency Contact Names & Phone numbers (7 days – 24 hours) of site and project management staff.
    iii. Consultant
i. Designated Halton Region Operations Contact
j. Documents
    i. Number of Specs and Drawings required
    ii. Maintain Separate set of drawings at Consultant Engineer's site office, marking all changes for Record Drawing preparation
k. Timing for purchase orders to Pre-selected Equipment Suppliers
    i. Name and address of Equipment Supplier
    ii. Equipment to be ordered.
l. Project Signboard
m. Temporary Buildings (Site Offices) – submit 3 copies of drawings of proposed location for review prior to moving on site
n. Shop Drawings – submittal log (Spec Section 01300)
o. Request for Substitution
    i. Review process for substituting materials and/or equipment that deviate from specifications
    ii. Refer to Request for Substitution (Appendix 10)
p. On site Health & Safety
    i. Safety – Occupational Health and Safety Act, Contractor designated as the Constructor
    ii. WHMIS
q. Site Work

i. On-site parking
ii. Environmental issues - silt fences, sediment control, trees protection
iii. Site Fencing
iv. Co-operation with other Contractors
v. Surplus Material Disposal
vi. Traffic Control
vii. The Consultant will emphasize that by MOE regulations, at no time can the Contractor, or sub, operate any working, or connected process equipment.

r. Public Relations
   i. Notice to property owners (work on property, etc.)
   ii. Pre-construction survey – Photos
   iii. Building inspection survey
   iv. Procedure on recording and handling complaints
   v. Cleanup of access road, etc.
s. Progress Payment
   i. Contractor's electronic copy of request for progress payment breakdown to be submitted monthly
   ii. Payment Certificate to be issued by Consultant to the Region
   iii. Date of submission to Region
   iv. Payment date and time with respect to the Construction Lien Act
t. Partnering Workshop #1 – Date (if required)
u. Constructability Workshop (Two-day) Date (if required)
v. Site Meetings
w. Other Business

16.4 Quality Assurance During Construction

16.4.1 The Quality Assurance (QA) program to be provided by the Consultant at the construction phase, including the planned and systematic actions to verify that the works are constructed in accordance with applicable codes, guidelines, standards and as specified by the contract.

16.4.2 The Consultant is required to implement the following Quality Assurance program during the construction of the facility:

a. Check all layouts to verify conformance with design drawings.
b. Inspect all construction work and installation of equipment.
c. Keep proper records of the progress of the construction work, noting unusual or unforeseen events that may have delayed the progress of work.
d. Review shop drawings to verify that contractual requirements are met for materials and equipment.
e. Issue clarification drawings to meet intent of contract requirements.
f. Provide technical specialists to carry out inspection of work constructed or installed to verify its compliance with contractual requirement and codes, regulations, etc.

g. Arrange for external specialist testing firms to verify work that is beyond the expertise of the Consultant.
h. Perform check-out/verification of all equipment, process and/or mechanical system, instrumentation & control system and SCADA system.
i. Verify that the Contractor performs all instrumentation calibration as specified.
j. Inspect and ensure that the Contractor executes the work with skilled craftsman and that the works are completed in a good workmanlike manner.
k. Verify that the Contractor observes the Occupational Health and Safety Act, and all applicable Regulations for Construction Projects.
l. Ensure that all spills are contained and cleaned up by the Contractor immediately when found. Contact the MOE local office and advise them of the spill and action taken, if any, to contain and mitigate its impact on the environment.
m. Ensure that the Contractor institutes environmental protection measures prior to commencing any construction works on the site as specified in the contract.
n. Ensure that all regulatory agencies have been notified of completed work and that the required inspections have been carried out.
o. Verify and ensure that the Contractor observes and complies with all Environmental Protection Statutes and Regulations during the construction of the facility.

16.5 Concurrent Shop Drawing Review

16.5.1 The Region wishes to concurrently review certain shop drawing submissions along with the Consultant and have one consolidated set of comments sent back to the Contractor. The procedure will be conducted as follows are as follows:

a. At the start of the construction period the Consultant will submit a list of all the shop drawings submittals to the Region's Project Manager. The project manager will then have Regional staff indicate who wishes to review what shop drawings submittals. The list will then returned to the Consultant
b. When a shop drawing is submitted that the Region wishes to complete a concurrent review, the Consultant shall distribute a copy of the shop drawing to the appropriate Regional staff via the Region's Project Manager and the required deadline to have comments back to the consultant.
c. The Consultant will complete their regular required review. Region staff will complete their review and send their comments to the Consultant.
d. The Consultant will combine their comments with the Region's comments into one set of concise and consistent comments. Any discrepancies or contradictions between the 2 sets of comments are to be clarified by the Consultant through discussions with Regional staff

e. A copy of the consolidated comments or marked up set of shop drawings are to be sent to the Regional staff that review the shop drawings for record keeping.

f. Subsequent resubmission of the shop drawings are to be handled in the same manner.

16.6 Contract Administration – Consultant's Engineering Services

16.6.1 It is not the intent of this Manual to apportion work between the Consultant's Project Manager and that of the Resident Engineering / Inspection staff.

Consultant's Project Manager

16.6.2 In general, it is normally expected that the Consultant's Project Manager will perform the following functions:

a. Review the construction schedule proposed by the Contractor. Comment on the procedures, methods and sequence of work.

b. Consult with Operation Staff to determine potential impact on the operation of the facility as a result of the construction work and develop contingency plans for construction activities which affect facility operations. Resolve any conflicts between facility operations and Contractor's construction schedule to minimize any problems between the two parties.

c. Maintain the Schedule and submit electronic updates to the Region's Project Manager on a weekly basis via email.

d. Instruct the Contractor to provide a rolling schedule of the construction work to be carried out for the next two-week period i.e. to the next site meeting.

e. Have the Contractor update the construction schedule when the rolling schedules are out of sequence and falling behind the tendered construction schedule.

f. Request the Contractor to modify the construction schedule to recover slippage of the construction schedule when it occurs.

g. Review shop drawings submitted for general compliance with the design requirements. The Consultant shall return all shop drawings to the Contractor no later than ten working days after having received them. Where additional information is required, return drawings to Contractor with the notation that the submission is incomplete and provide details of the additional information required for the review of the shop drawings.

h. Advise on the validity of charges for additions or deletions to the contract and issue change orders upon the approval of the Region's Project Manager.

i. Review all proposed change orders with the Region's Project Manager prior to issuing them to the Contractor. Refer to the Region's template for Contract Change Orders (Appendix 11).

j. Maintain a log of all Contemplated Change Order (Appendix 12) received, Change Orders received; the date received and the date returned to the Contractor and the value of the change orders and whether approved by the Region or not. Log shall be maintained in Microsoft Excel.

k. Log and track all approved Change Orders cost and the remaining contingency/provision funds available as provided under the contract. The Consultant shall provide weekly updates to the Region's Project Manager via email. Refer to the Region's template for the –Contract Change Order Record (Appendix 13).

l. Review and process Contractor's requisitions for payment and issue payment certificates to the Region in accordance with, and within the timelines specified by, the terms of the contract between the Owner and the GC.

m. Issue Substantial Performance Certificate in accordance with Construction Lien Act and the requirements as specified in this Manual.

16.6.3 The Consultant shall not review any shop drawings that have not been reviewed by the Contractor and certified by him to conform to the contract documents. Drawings received from the Contractor without the review stamp will be returned to the Contractor. Refer to Appendix 14 – Contractor's Shop Drawing Review Stamp.

16.6.4 The Consultant will maintain a log of all shop drawings received for review, the date received and the date returned to the Contractor. The updated log shall be reviewed at each site meeting and included with each site meeting minutes until all the required shop drawings have been submitted, reviewed and returned to the Contractor.

16.6.5 The Consultant with Consider and advise on alternative methods, equipment and materials proposed by the Contractor as permitted by the terms and conditions of the contract. Under no circumstances will alternatives be considered without the Contractor advising the amount of credit first and acceptance of all associated engineering review cost.

Consultant's Resident Engineer / Inspector

16.6.6 The responsibilities of the Consultant's Resident Engineer and/or Inspectors include the following field engineering services:

a. The Consultant's Resident Engineer shall advise the General Contractor on the interpretation of the drawings and specifications and issue supplementary details and instructions during the construction period as required clarifying intent of the design.

b. Requirements for Resident Staff services during the construction phase will be specified in the Request for Proposal.

c. Provide reference line and elevation to the General Contractor and check the line and grade as work progresses but at least weekly. Document these checks in the job diary.

d. Advise the Region's Project Manager if it has been determined that the General Contractor has not been executing the works in accordance with the contract documents or that the General Contractor's work does not

satisfy the intent of the design or does not substantially conform with plans and specifications. Issue to the General Contractor appropriate field instructions or stop work orders in respect of the deficiencies.

e. Arrange for all necessary field testing, inspections or verification by specialist consulting or inspection firms to determine that work conforms with intent of design requirements i.e. geotechnical investigations etc. Carry out site inspection to verify that the construction works and installation of equipment are in accordance with the contract document.

f. For facilities, ensure that all reports for all field testing, calibration reports, air balancing reports, all manufacturers' start-up report, electrical co-ordination study report, etc. are properly bound together in the Maintenance Manual prior to the start up of the facility.

g. Investigate, report and advise on unforeseen circumstances that come to the Consultant's attention during construction such as differing underground soil conditions, claims from the General Contractor for whatever reasons in a timely manner so that appropriate actions may be taken to mitigate damages or claims by the General Contractor.

16.6.7 Use a job diary with a consistent daily reporting format. Submit job diary to the Region's Project Manager on completion of the construction work. Maintain adequate data and records in the job diary related to the daily status and progress of the construction work. The diary must include the following minimum information:

a. Weather conditions
b. Temperature – maximum and minimum
c. Number of workers – by company and trades
d. Work performed – by company and trades
e. Unusual and/or significant events
f. Safety violations
g. Visitors
h. Testing
i. Delivery of major equipment
j. Others

16.6.8 Review General Contractor's request for payments as to progress, quantities of work completed and materials delivered to the site and advise on validity prior to issuing payment certificates.

16.6.9 Review General Contractor's request for final payment and its compliance with the Construction Lien Act. Also, review the payment to the General Contractor with respect to the releases in accordance with the General Condition at the end of the warranty period.

16.6.10 The production and maintenance of the Master Deficiency List, including incomplete work, shall be as follows:

a. Prior to issuance of the Certificate of Substantial Performance, carry out an inspection of the facility with the General Contractor and Facility Operation Supervisor and Region's Project Manager. The Consultant shall produce a Master Deficiency List, including incomplete work, within

three working days after the date of the inspection and shall issue it to the General Contractor, Region's Project Manager, and for Water and Wastewater Facilities, to the Operation Supervisor. The Master Deficiency List, including incomplete work, shall clearly stipulate the dates as to when the deficiencies or incomplete work will be remedied or completed by the General Contractor, as agreed to by the General Contractor, at the inspection meeting. The Master Deficiency List, including incomplete work, must be issued to the General Contractor prior to issuance of the Substantial Performance Certificate.

b. Where the General Contractor fails to remedy the deficiencies or incomplete works in accordance with the stipulated deadline, the Consultant shall issue appropriate notice or notices of default to the General Contractor.

c. The Master Deficiency List, including incomplete work, shall be updated and/or expanded to include new deficiencies, as these become known, on a weekly basis for the first six weeks. On expiry of the sixth week, if the General Contractor has not reached completion as specified in the contract, notify General Contractor to perform rectification of deficiencies with a stipulated deadline of two weeks. If General Contractor completes the rectification of deficiencies, issue Completion Certificate for commencement of the Warranty Period. Thereafter, the Master Deficiency List, refer to Appendix 15 including incomplete work, shall be updated once a month until one month from the end of the warranty period.

d. If the General Contractor defaults on the rectification of the deficiencies, take appropriate action to remedy the situation.

e. If the General Contractor fails to rectify the deficiencies, notify the General Contractor that the deficiencies are being corrected by others as provided under the terms and conditions of the contract. Assist the Region's Project Manager to retain the services of another Contractor to have the deficiencies corrected. Separately document engineering services to retain the new Contractor and to verify deficiency rectification. On completion of the rectification works, advise the General Contractor of deduction amount withheld for work performed by Region, including all engineering services for both field and head office staff. Issue Completion Certification for commencement of the Warranty Period.

f. One month prior to the end of the Warranty Period, arrange for inspection with the General Contractor and Facility Operation Supervisor and issue the updated Master Deficiency List, including incomplete work. One week from the expiry of the warranty period, carry out final inspection.

g. Once an item has been entered into the Master Deficiency List, including incomplete work, removal of items from the list is not permitted. The only changes permitted to the list will be in the second and last column where the status of the item is to be updated. All deficiencies corrected by the General Contractor shall be shown shaded on the Master Deficiency List, including incomplete work. A separate column indicating completion date by the General Contractor shall be maintained by the Consultant.

16.6.11 For water and wastewater facility projects, ensure that the General Contractor does not injure, jeopardize or upset the operation of the facility during the course of the construction works. Co-ordinate the General Contractor's requests for working in areas that will impact or interfere with the operation of the facility with Facility Operation Supervisor. The General Contractor shall prepare and submit contingency plans for the proposed work, which shall be reviewed with the Consultant's Resident Engineer and Facility Operation Supervisor. If the contingency plans are agreed to by the Consultant's Resident Engineer and Facility Operation Supervisor, the General Contractor shall complete, signed and distribute it to all. On approval from Facility Operation Supervisor, issue "Shutdown Permit to Work" (Appendix 16) to General Contractor for the work to be carried out and have the notice displayed in a prominent area. Refer to Appendix 13 – Shutdown Permit to Work.

16.6.12 Verify that the General Contractor carries out his work in compliance with the Occupational Health and Safety Act, and safe work procedures. Issue written notification to the Contractor on all instances whenever it is determined that the General Contractor has breached safety procedure and notify the Ministry of Labour.

16.6.13 All enquiries received from the General Contractor shall be promptly responded to in writing, delivered by hand or faxed to the General Contractor, within three consecutive working days after receipt. All field memos must be identified in an appropriate manner in order to be able to verify the history of any field instructions.

16.6.14 Prepare an inventory list of special tools, spare parts and equipment specified to be supplied by the General Contractor for Facility Operation use, two months after award of contract to the General Contractor. Issue inventory list to General Contractor, Facility Operation Supervisor and Project Manager. Refer to Appendix 17 – Inventory of Spare Parts and Tools.

16.6.15 Accept spare parts on behalf of Region and issue same to Facility Operation Supervisor. Ensure that Facility Operation Supervisor signs for all equipment using the Inventory List form.

16.6.16 Ensure that the General Contractor submits all the required "final" shop drawings.

16.6.17 In particular, for facility projects ensure that the General Contractor prepares and submits the Maintenance Manual a month prior to Substantial Performance.

16.6.18 Review and discuss weekly with the Project Manager the progress of the construction works and advise/update Project Manager, noting any contractual problems, schedules or claims and strategy for resolving these issues.

16.6.19 Provide effective communication through field memos or discussions with Facility Operation Supervisor to ensure that the General Contractors and Facility Operation Supervisor requirements are properly co-ordinated. Any actions resulting from the discussion with Facility Operation Supervisor shall be confirmed in writing by a field memo.

16.6.20 Maintain a "marked-up" set of drawings to show "As-Recorded" works. The "As-Recorded" drawings shall be updated weekly. Ensure that the General Contractor submits the "As-Recorded" drawings in a timely fashion.

16.6.21 Ensure that Facility Operation Supervisor is fully advised of the operating characteristics and maintenance requirement of ALL equipment at the commissioning performed by the General Contractor and/or equipment Suppliers. Confirm that all special requirements are noted and the details included in the Maintenance Manual prepared by the General Contractor.

16.6.22 Attend job meetings as deemed necessary for proper co-ordination of work by the General Contractor, the Sub-Contractors, Suppliers or testing firms. Site meeting will be conducted every two week and where the progress of work is deemed to be unacceptable, hold site meeting every week.

Contract Completion Milestone

16.6.23 The Consultant is required to retain and release all holdbacks required pursuant to the provisions of the Construction Lien Act and pursuant to the contract between the Owner and the Contractor, and to administer all warranty provisions, including any applicable warranty holdbacks, in accordance with the contract between the Owner and the Contractor.

16.7 Consultant Engineering Fee Cost Control During Construction

Consultant's Obligations

16.7.1 The Consultant is fully responsible for cost control of the project with respect to engineering consulting fees and the Region's contractual obligations to the Contractor and is required to provide timely reports to the Region of the impending overrun of consulting engineering fees or its contractual obligations to the Contractor.

Timely Report

16.7.2 Timely reporting is defined as being a reasonable period which will permit the Region's Project Manager to report to Council prior to the actual overrun of either engineering fees or contract cost. Where the Consultant does not exercise proper cost control and thereby exceeds the approved upset limit, payment for such services may not be honoured by the Region.

Monthly Cost Control Report

16.7.3 The Consultant shall submit a Monthly Cost Control Report to the Region's Project Manager with respect to the following:

a. Approved Engineering Fees.
b. Expenditures to-date.
c. Balance of Fees.
d. Projection of engineering fees required to complete the contract to the Substantial Performance stage versus balance of approved fees available.

e. Recommend course of action to the Region's Project Manager to mitigate any cost overrun in the event that the approved engineering fees will not be able to sustain the project to the Substantial Performance stage.
f. Value of Contract amount.
g. Payment to Contractor to-date.
h. Approved Change Orders issued to-date.
i. Value of Contract plus all Change Orders approved to date.
j. Include or identify any potential additional costs for work that is outside the contract, which may be required to complete the construction works.
k. Description of work performed to-date and advise on progress to-date versus tender schedule submitted by Contractor.
l. Recommend any action to be taken by the Region to mitigate cost overruns for the project as a whole.

16.7.4 Refer to the Region's template for the Monthly Cost Control Report (Appendix 18).

Issuance of Change Order(s)

16.7.5 Any changes to the contract must be made by the issuance of Change Order(s) to the Contractor. This includes changes to the contract even where this does not have any change to the contract value i.e. extension of time to the contract.

16.7.6 Consultant to issue Change Orders when required to meet the intent of the contract so that the work may be completed in a fully functional manner. Issue change orders for additional work that deviates from the intent or requirement of the contract only when approved by the Region's Project Manager. The Region accepts no responsibility for any change orders that are issued by the Consultant without the approval of the Region's Project Manager.

16.7.7 Issue Contractor Change Orders.

16.8 "As-Recorded" Record Information

16.8.1 The Consultant shall prepare and submit the following "As-Recorded" information to the Region:

a. Complete "As-Recorded" drawings ninety (90) days after the date that the Consultant has issued the Substantial Performance Certificate to the Contractor. Note this will constitute a payment milestone.
b. All "As-Recorded" survey information.
c. One set of full size "As-Recorded" Stamped hard copy drawings.
d. "As-Recorded" in digital format on DVD. Drawings shall be in the required format. All CD-ROM shall be properly labeled and dated.
e. At the end of the warranty period, re-issue any "As-Recorded" drawings and DVD disk to reflect changes made during the warranty period.
f. For the Region's Tangible Capital Asset (TCA) program, also provide the required, key details on each new asset in an Excel spreadsheet. The

spreadsheet content and layout will be defined and provided by the Region (Appendix 34).

16.9 Final Regulatory Agencies Approvals

16.9.1 Confirm that all required inspections by regulatory agencies have been performed prior to issuance of Substantial Performance Certificate.

16.9.2 Verify that the Contractor has provided a copy of all approvals, from these regulatory agencies, in each set of the Maintenance Manual.

16.9.3 It is the consultant's responsibility to arrange for and conduct inspection required by regulatory agencies and local municipalities.

16.9.4 Depending on the project, inspection of the constructed facility or facilities may be required by some or all of the following regulatory agencies prior to operation and/or occupancy as known to the Region:

a. Technical Standards and Safety Authority
b. Building Occupancy Permit
c. Fire Department Approval for occupancy
d. Ontario/Local Hydro Inspection / Electrical Safety Authority
e. Ministry of Consumer and Corporate Affairs
f. Ministry of Labour

Table 16-1 Contract Administration Deliverables

	Construction Phase	Copies
1.	Listing of all Sub-Contractors, name of contact person, telephone and fax numbers	1 Copy
2.	Listing of all Suppliers, equipment supplied, name of contact person, telephone and fax numbers	1 Copy
3.	Construction photographs at all key stages of the works and suitably filed and titled	1 DVD
4.	Issuance of payment certificates on a monthly basis to final completion. One copy signed by both Consultant and Contractor (electronic copy is acceptable)	1 Copies
5.	Issuance of change orders within ten (10) consecutive working days from the date of acceptance of the Contemplated Change Order.	3 Copies
6.	Issuance of the spare part lists to the Region 2 months after award of contract	2 Copies
	Prior To Substantial Performance	
7.	Rotating equipment verification report	5 Copies
8.	Mechanical system verification report	5 Copies
9.	Instrumentation and control loops verification	5 Copies
10.	Calibration report	5 Copies
11.	SCADA system verification report	5 Copies
12.	Air balancing report and HVAC verification report	5 Copies
13.	At Substantial Performance	
14.	Final Equipment Maintenance Manual	5 Copies 1 DVD
15.	Final Facility Operation Manuals	5 Copies

	1 DVD
16. All Warranty Certificates included in each set of Maintenance Manual	5 Copies
17. "As-Recorded" drawings within 90 days of Substantial Performance	1 Copy 1 DVD
18. HMI and PLC software	2 Copies via email
19. Master Deficiency list	1 Copy
20. All approvals and permits filed in maintenance manual	5 Copies
21. Co-ordination study of protective devices	2 Copies 1 DVD
22. Certificate of Substantial Performance	2 Copies
23. Contract Release (Appendix 19)	2 Copies
24. Payment Certificate for Lien Holdback Release	2 Copies
25. Contract Completion	
26. Total Completion Certificate	2 Copies
27. Updated Deficiency List	1 Copy
Prior To End Of Warranty Period	
28. Final inspection and re-issue Deficiency List six (6) weeks prior to end of Warranty Period	
29. At the end of the Warranty period, inspect facility with Region's Project manager and Facility Supervisor to verify all deficiencies have been rectified	
30. If all deficiencies have been corrected by the Contractor, issue Payment Certificate for release of Warranty Holdback	2 Copies
31. Issue Contract Release Certificate	2 Copies

SECTION 17 FACILITY START-UP & COMMISSIONING

17.1 General

17.1.1 The Consultant is responsible for ensuring that the Contractors commissioning plan has been reviewed and approved by the Region three months prior to Substantial Performance.

17.1.2 The start-up of equipment, control system, facility processes and the commissioning of the processes or facility for operation is an important aspect of the construction phase. It is mandatory that the Consultant's Head Office staff and Resident Engineering staff exercise QA and ensure that the verification of all equipment, system and sub-systems processes and the like have been fully tested, documented and verified for proper operation.

17.1.3 Regardless of whether these have been specifically indicated herein or not, all start-up reports must be documented and submitted at the end of the verification process.

17.1.4 The Consultant is not permitted to commence commissioning of the facility until the start-up phase has been completed and the reports including the Tangible Capital Asset (TCA) Valuation Report delivered to and approved by the Region's Project Manager. Electronic spreadsheet provided (Appendix 34)

17.1.5 Also, prior to training and commissioning the consultant is to compile the Operations and Maintenance Manuals (O & M) with assistance from the contractor. Training and/or commissioning will not commence until the O&M manual has been approved and accepted by the Project Manager.

17.2 Equipment Installation Status Tags

17.2.1 All equipment that is being installed by the Contractor will be tagged with a red tag, which is an indication that the equipment is in the process of being installed and is under the direct control of the Contractor. In no case shall the Region Operating staff operate the equipment until it has been verified that it has been installed in accordance with the manufacturer's instructions and has passed the equipment start-up protocol. The Consultant Resident Engineer shall ensure that this requirement is complied with at all times to avoid any potential disruptions to the plant's treatment process. When the equipment has passed the start-up procedure, it is ready to be placed on-line. At this time, the equipment will be tagged with a green tag to indicate that it is fully operable and can be operated by the Region's Operating staff.

17.2.2 Refer to Equipment Red/Green Tag (Appendix 20)

17.3 Rotating Equipment Check-Out/Verification Requirements

Rotating Equipment Check-out List

17.3.1 The Consultant/Resident Engineer shall prepare and provide the Region's Project Manager with a listing of all rotating equipment to be checked-out by the Contractor no later than four month after the date of award of contract. Submit five draft copies of equipment listing for review and on approval, provide two final copies to the Contractor and two copies to Facility Operation Supervisory Staff and one copy to the Region's Project Manager.

Equipment Check-out Requirements

17.3.2 Without exception, all rotating equipment shall be checked and tested for:

a. Vibration level to be within specified limit. Generally, the peak vibration velocity shall not exceed 1 mm/sec (0.04 inches/sec) measured in the filter-in mode. Measurement shall be carried out with a Real Time analyzer, Nicolet 100A or equal. Provide hard copy Vibration Signature Spectrum showing vibration velocities over a frequency range of 0 to 2000 Hz, measured in a filter-in mode. Include this in each set of the Maintenance Manual.
b. Equipment base is to be true and leveled
c. Alignment of shafts, soft foot of motor and couplings shall be performed by reverse dial, rim to rim and face to face. Soft foot will be rim to rim vertical and horizontal mode. Refer to Appendix 21 – Alignment Data Record Form.
d. Soft foot of motor shall be checked and demonstrated by the Contractor to be within a tolerance of ±0.0015"
e. Shaft to be aligned within a tolerance of ±0.001" to 0.003"
f. Piping strains to pump shall be within a tolerance of ±0.001" to 0.003"
g. Direct the Contractor to include alignment data for each piece of rotating equipment in the Maintenance Manual.

17.3.3 Region may retain the services of mechanical contractor to verify the alignment and vibration results. Verification of alignment and vibration results shall be carried out in the presence of the General Contractor.

Organizing and Scheduling of Contractor's Request for Equipment Check-out

17.3.4 When requested by Contractors for the check-out/verification of mechanical/electrical/process system, the Consultant/Resident Engineer and or the Region shall arrange with Facility Operation Supervisory Staff for a suitable time and date to attend and witness the check out/verification of the mechanical/process system as provided under the terms and condition of the contract.

17.3.5 The Contractor shall arrange for the appropriate Sub-Contractor and Supplier's. The region shall arrange for Facility Operation Supervisory Staff to witness check-out/verification procedure. The consultant shall execute the check-

out/verification procedure and note whether the mechanical/process system has passed or failed the test.

17.3.6 Complete the System Verification Forms for each system and/or sub-system and after each verification test provide a copy to:

a. Facility Operation Supervisory staff
b. Contractor/Sub-Contractors/Supplier
c. Region's Project Manager

17.3.7 For each process system or sub-system, the contractor shall arrange for the Electrical, Mechanical, Instrumentation and Control Sub-Contractors. The Consultant and or Region will arrange for Facility Operation Supervisory Staff to be present for verification of its proper operation.

17.3.8 If the mechanical/process system fails to perform in the manner as designed and called for in the contract specifications, re-schedule another date for verification of the proper operation of the process system.

17.3.9 The Consultant will follow-up with the Contractor to ensure that the required remedial work has been successfully performed and to confirm the re-scheduled verification date. If the Contractor failed to remedy the problem, cancel the scheduled verification date. Re-schedule another date only when the remedial work has been completed by the Contractor.

17.3.10 Give timely notice to Facility Operation Supervisory Staff and the Region's Project Manager to attend the verification process. On completion, re-issue the Form.

17.3.11 In general, refer to the Appendices for various Equipment Check List and Inspection Report forms.

17.4 Mechanical/Process System Check-Out/Verification Requirements

17.4.1 The Consultant/Resident Engineer shall prepare and provide the Region's Project Manager with a listing of all mechanical/process system to be checked-out by the Contractor no later than four months after the date of award of contract. Submit five draft copies of equipment listing for review and on approval, provide two final copies to the Contractor and two copies to Facility Operation Supervisory Staff and one copy to the Region's Project Manager.

17.4.2 Refer to Mechanical Equipment Installation/Start-up Checklist (Appendix 22), Valve Installation Checklist (Appendix 23), and Pressure/Hydrostatic Test (Appendix 24)

17.5 Electrical Equipment Check-Out / Verification Requirements

17.5.1 The Consultant/Resident Engineer shall prepare and provide the Region's Project Manager with a listing of all electrical equipment to be checked-out by the Contractor no later than four months after the date of award of contract. Submit four draft copies of all electrical equipment listing for review and on

approval, provide two final copies to the Contractor and two copies to Facility Operation Supervisory Staff and one copy to the Region's Project Manager.

17.5.2 Refer to Electrical Equipment Installation/Start-up Checklist (Appendix 25) and Variable Speed Drives Installation/Start-up Checklist.(Appendix 26)

17.6 Instrumentation Installation and Calibration

17.6.1 The Consultant/Resident Engineer shall prepare and provide the Region's Project Manager with a listing of all instrument to be checked-out by the Contractor no later than four months after the date of award of contract. Submit four draft copies of the instrumentation listing for review and on approval, provide two final copies to the Contractor and two copies to Facility Operation Supervisory Staff and one copy to the Region's Project Manager.

17.6.2 The Consultant/Resident Engineer shall ensure that the Contractor/Sub-Contractors/Suppliers have installed all instrumentation as specified and have carried out the proper calibration of each field instrument or devices to verify that it will function in the manner intended and as specified in the contract.

17.6.3 Ensure that all parties sign the Form at the conclusion of each test.

17.6.4 Complete Instrumentation Installation Checklist and Instrumentation Calibration Form for each instrument or field device on completion of installation and calibration test and provide a copy to:

a. Facility Operation's Supervisory Staff
b. Contractor/sub-Contractors/Supplier
c. Resident Engineer

17.6.5 For the calibration of each field device, arrange for the Contractor and appropriate electrical, mechanical, instrumentation and control Sub-Contractors and Facility Operation Supervisor to be present for the calibration tests.

17.6.6 Refer to Instrumentation Installation Checklist (Appendix 27) and to the Instrumentation Calibration Form.(Appendix 28)

17.7 Instrumentation and Control System Check-Out / Verification

Instrumentation Panel/PLC Installation

17.7.1 The Consultant/Resident Engineer shall prepare and provide the Region's Project Manager with a complete list of all instrumentation panel/PLC to be checked-out by the Contractor no later than four months after the date of award of contract. Submit four draft copies of Instrumentation and Control System Loop Check-out List (Appendix 29) for review and on approval provide two final copies to the Contractor, two copies to Facility Operation Supervisory Staff and one copy to the Region's Project Manager.

17.7.2 Complete Instrumentation Panel/PLC Installation Checklist Form (Appendix 30) for each instrument or field device on completion of installation and provide a copy to:

a. Facility Operation's Supervisory Staff

b. Contractor/sub-Contractors/Supplier
c. Resident Engineer

Instrumentation and Control System Loops Check-out List

17.7.3 The Consultant/Resident Engineer shall prepare and provide the Region's Project Manager with a complete list of all loop wiring between instrument and field devices, complete with its identification tag and all instrumentation to be checked-out by the Contractor no later than four months after the date of award of contract. Submit four draft copies of instrumentation and control system loop listing for review and on approval provide two final copies to the Contractor, two copies to Facility Operation Supervisory Staff and one copy to the Region's Project Manager.

17.7.4 The Consultant/Resident Engineer shall provide the Contractor and Facility Operation Supervisory Staff with two sets of test procedures for all instrumentation and control loops for testing/verification that these have been wired properly for operation through the SCADA system. Arrange for the Contractor, Electrical, Instrumentation and Control Sub-Contractors to be present for testing of loop wiring between instrument and field devices and advise Facility Operation Supervisory Staff to be present for the procedure. Verify that the Contractor has executed the work in accordance with contract specifications and/or current industrial practice. Permit no splicing of any loop wires between instrument and field devices and reject any connection not in compliance with manufacturers' recommendations or industry practice or specification.

17.7.5 When testing instrumentation loops, ensure that the Contractor performs the testing of each loop in sequence. One PLC panel should be done as a complete group. The testing of an instrument loop will be graded on a pass/fail basis. If more than ten instrument loops within a panel failed the loop checkout, the entire panel of loops will be deemed to have failed the checkout. When the failed loops have been corrected, the entire panel must be tested again.

17.7.6 Once the Consultant has verified that all of the loops have passed an I/O loop proofing demonstration will be arranged for Regional personal to attend. These personal must consist of at least one Regional SCADA representative. Other Regional personal may attend but the proofing demonstration cannot occur without one Regional SCADA representative present.

17.7.7 Ensure that all parties sign the Form at the conclusion of each test.

17.7.8 Complete Control Loop Checkout Verification Form (Appendix 31) for each PLC panel of instrument loop test and provided a copy to:
a. Facility Operation's Supervisory Staff
b. Regional SCADA representative
c. Contractor/Sub-Contractors/Supplier
d. Region's Project Manager

17.8 PLC And SCADA Programming By Consultant

Consultant's Responsibility for SCADA Programming

17.8.1 Before the Consultant is to start any programming a meeting between the Regional SCADA representative on the job, the Region's Project Manager, the consultants programmer(s) and the Consultant Project Manager is to be held. The intent of the is to review any changes to the PLC and HMI programming standards that were in existence when the job started and those in existence at the time of the meeting. The Region will identify the changes and request that the consultant comply with the latest standards. Discussion will be held on the impact to the programming assignment. If it is the position of the Consultant the scope of work has increased as a direct result of the changes to the standards, the consultant will be asked to quantify the impact in the terms of money and schedule and submit a proposal to the Region. The Region will review the proposal and then make final a decision on whether the consultant is to comply with the current standards or the older standards.

17.8.2 The programming of PLC and Human Machine Interface (HMI) is the responsibility of the Consultant and details of the programming standard for PLC and HMI can be found in the Region's SCADA Standards Manual.

17.8.3 In general, the Consultant shall complete software programming required for:

a. PLC control software programming
b. SCADA system HMI configuration and programming.

Software Submission During Development

17.8.4 Both the PLC code and HMI applications are to be submitted to the Region for review at 50% complete, 90% complete and 100% complete. The Region will review the code for compliance with the standards as well as documentation, neatness etc. Both the PLC code and HMI can be submitted on PLC by PLC bases. For example, one PLC may be a 50% and at the same time another PLC submission maybe at 100%. The consultant must anticipate 10 business day review time for each submission.

Testing of Software

17.8.5 At the conclusion of the PLC and HMI programming, the Consultant shall conduct testing of the software to ensure that it meets the requirements of the approved process control narrative. Following internal testing, the Region will attend a Factory Acceptance Test (FAT) at the Consultant's office, and upon approval by the Region the software shall be installed on site for final Site Acceptance Testing (SAT) and commissioning.

Peer Review for Quality Assurance

17.8.6 The Region may retain the services of an external Consultant to provide peer review of the PLC/HMI programs prepared by the Consultant to ensure consistency and conformance of PLC/HMI programs with Region's standard. The external Consultant will attend all project meetings on an as-required basis,

including FAT's and SAT's and will advise the Region on the design and implementation of the SCADA system. Where required, a listing of all non-compliance items will be issued to the Consultant for remedial/rectification.

Non Performance

17.8.7 The Consultant will be required to rectify works that are not in compliance with the Region's standard at their own cost.

17.9 SCADA System Verification by Consultant

Testing Procedure

17.9.1 The Consultant shall prepare and issue to the Contractor and Facility Operation Supervisory Staff a complete detailed testing procedure for the SCADA system.

17.9.2 Testing procedure is to be completed and submitted to the Project Manager four month after award of contract to the Contractor. When approved, provide two final copies to the Contractor and two copies to Facility Operation Supervisory Staff.

17.9.3 The testing procedure may commence only after the Contractor has successfully completed the Instrumentation Calibration and Instrumentation & Control Loop Check-Out/Verification and proofing demonstration to the Regional SCADA representative. When the Region has approval FAT at the Consultant's offices, install the SCADA HMI program on site. Commence with SAT to demonstrate the complete operation of the SCADA system under normal and failure operating conditions to the Regional SCADA representative, Facility Operation Staff and Region's Project Manager. The Consultant shall test each control function and note the result. Ensure that all safety and fail-safe interlocks are in place and that each has been verified for correctness of operation in the manner as designed and intended.

17.9.4 Included in the testing the Consultant must demonstrate that the plant's alarms and auto dialer are functioning as required.

17.9.5 On the successful demonstration of the SCADA system functionality, demonstrate also that all the required reports, trending, and associated operation data as called for in the RFP have been provided.

17.9.6 Complete SCADA System Checkout/Verification Form and provide a copy to Facility Operation Supervisory Staff and the Region's Project manager. If the SCADA system fails to perform in the manner as designed and as called for in the process control narratives and the Region's SCADA Standards, arrange a new date for checkout and verification. On completion, re-issue the Form again.

17.9.7 On successful completion of the testing procedure, the Regional SCADA representative shall sign-off for the proper operation of the SCADA system.

17.9.8 Ensure that all parties sign-off at the conclusion of each test that the system is performing as specified in the in the RFP document and Pre-design Report.

17.9.9 On completion of the demonstrations, submit two sets of all software programming to the Project Manager via email. All attached files shall be

properly identified by date of issue, version number, specific programs and Region's project number.

17.10 HVAC Checkout / Verification Requirements

Air Balancing of HVAC System

17.10.1 The Consultant/Resident Engineer shall direct the Contractor to perform the air balancing of the HVAC system when the entire system has been completed and has been in operation for a minimum of seven consecutive days prior to system verification checkout. The Contractor shall balance the HVAC system until it meets the specified operating requirements. When the air balancing has been completed, the Contractor shall submit the specified "Air Balance Report" and HVAC Checklist\Verification Form (Appendix 32). Submit five draft copies of HVAC forms for review and on approval, provide two final copies to the Contractor and two copies to Facility Operation Supervisory Staff and one copy to the Region's Project Manager.

17.10.2 Where the HVAC system is an all-electronic system, direct the Contractor to perform loop checkout, zone control checkout and finally the system checkout as specified in the specifications in its entirety.

Demonstration of HVAC Compliance with Contract Requirements

17.10.3 Upon successful completion of the testing of the HVAC system, arrange with the Contractor, Mechanical Sub-Contractor, system integrators and Facility Operation Supervisory Staff for demonstration of the proper operation of HVAC system on a zone-by-zone basis. Failure of any one zone will require the re-testing of the entire HVAC system from beginning again.

17.10.4 Ensure that all parties sign the Form at the conclusion of each test.

External HVAC Specialist

17.10.5 For complex HVAC system, the Region may retain the services of an external HVAC specialist for QA and to confirm that the HVAC system has been installed in compliance with the contract specifications and it is operating as specified. The Consultant/Resident Engineer shall direct the external HVAC specialist to verify that the installation and operation of the HVAC system has been executed in conformance with the contract specifications.

17.10.6 Where the HVAC system, installed by the Contractor or his Mechanical Sub-Contractor does not perform as specified, issue a Field Instruction to Contractor to remedy deficiencies. On completion of remedy work, re-test HVAC system for compliance with the contract. Cost for re-testing shall be deducted from the Contractor's payment certificate.

17.11 Equipment and System Performance and Operational Testing

Performance-Testing Documentation

17.11.1 Contractor is required to provide performance-testing documentation for all mechanical, electrical, instrumentation and HVAC equipment and systems, including structures for watertight integrity. Submission of the following performance-testing documentation is required and shall be submitted by the Contractor no later than four months (or as specified by the Consultant) after award of Contract.

17.11.2 Provide three copies of all performance-testing documentation to the Region.

17.11.3 Sequence of performance testing shall be as follows:

a. Calibration of instrumentation
b. Instrument loop checks
c. Equipment and system performance test
d. Operational testing and start up of equipment and system
e. System commissioning
f. Each step of the above sequence must be completed to the satisfaction of the Region/Engineer prior to proceeding to the next step in the sequence

Appointment of Testing Manager

17.11.4 The Contractor shall appoint an engineer or equally qualified operations specialist as Testing Manager to manage, co-ordinate and supervise the Contractor's Quality Assurance Program. The Testing Manager shall have at least 5 years experience in managing start-up and commissioning of mechanical, electrical, instrumentation, HVAC and piping systems. The Contractor shall forward a copy of the Testing Manager's resume to the Engineer prior to the commencement of the testing program.

Quality Assurance Testing Program

17.11.5 The Quality Assurance Testing Program shall include:

a. A calibration program for all instruments, gauges, meters and thermometers used for determining the performance of equipment and systems installed under the contract.
b. A calibration program for all instruments, gauges, meters and thermometers installed under the contract.
c. A testing program for all mechanical, electrical, instrumentation and HVAC equipment and process systems installed under the contract. The testing program will be divided into two phases: performance testing and operational testing.
d. A comprehensive testing plan detailing the procedure of the testing program of all works required under this Quality Assurance Testing Program. The test plan shall include all equipment and process system i.e. air blower, aeration system, etc.

e. The test plan shall include procedures for the evaluation of the performance of the equipment and process system, including the required specified performance criteria.

f. A schedule providing date, time, sequence and duration of performance and operational testing for each equipment and process system. The Critical Path Method (CPM) shall be used for the scheduling of the test plan and shall be updated as required to reflect changes.

g. A documentation program to record the results of all equipment and system tests.

17.11.6 A process system shall mean any physical, chemical or biological process, which will include all equipment, devices and appurtenances to form a complete process system in order to achieve the specified performance criteria. The Testing Manager shall co-ordinate the activities of all subcontractors and suppliers to implement the requirements of the Quality Assurance Program.

17.11.7 All test equipment gauges, thermometers, meters, analysis instruments and other equipment used for calibrating or verifying the performance of equipment installed under the contract shall be calibrated to within plus or minus 2 percent of actual value at full scale. Test equipment employed for individual test runs shall be selected so that expected values as indicated by the detailed performance specifications will fall between 60 and 85 percent full scale.

17.11.8 Pressure gauges shall be calibrated in accordance with ANSI/ASME B40.1. Thermometers shall be calibrated in accordance with ASTM E77 and shall be furnished with a certified calibration curve.

17.11.9 Liquid flowmeter, including all open channel flowmeter installed in pipelines with diameters greater than 50 mm shall be calibrated in-situ using the pitot tube velocity averaging method. Flowmeter calibration work shall be performed by individuals skilled in the techniques to be employed. Calibration tests for flow metering systems shall be performed over a range of not less than 10 percent to at least 75 percent of system full scale. At least five confirmed valid data points shall be obtained within this range. Confirmed data points shall be validated by not less than three test runs with results which are in agreement within plus or minus 2 percent.

17.11.10 The following documents referred to in this Quality Assurance Program take precedent over requirements as may be listed in other parts of the contract. In case of a conflict between the requirements of this Quality Assurance Program and that of the contract document, the Quality Assurance Program shall take precedent:

a. ANSI/ASME B40.1 Gauges Pressure Indicating Dial Type-Elastic Element.

b. ASTM E77 Method for Verification and Calibration of Liquid-in-Glass Thermometers.

c. ASHRAE 41.8 Standard Methods of Measurement of Flow of Gas.

d. Flow Measurement in Sewer Lines by the Dye Dilution Method, Journal of the Water Pollution Control Federation, Vol. 55, Number 5, May, 1983, pg. 531.

e. Flow Measurement in Open Channels and Closed Conduits, Vol. 1, U.S. Department of Commerce, National Bureau of Standards, pg. 361.

f. Techniques of Water-Resources Investigations of the United States Geological Survey, Chapter 16, Measurements of Discharge Using Tracers.

Testing Plan Documentation

17.11.11 Testing Plans to be submitted by the Contractor under the Quality Assurance Program shall consist of the following:

a. Detailed testing plans, setting forth step-by-step descriptions of the procedures proposed by the Contractor for the systematic testing of all equipment and systems installed under the contract. Test Plans shall be submitted within 90 calendar days from date of award of contract.

b. Sample forms for documenting the results of field performance tests and operational tests shall be submitted within 90 calendar days from date of award of contract.

c. A description of the Contractor's plan for documenting the calibration of all test instruments shall be submitted within 90 calendar days from the date of award of contract.

d. A description of the Contractor's plan for calibration of all instrument systems, including flowmeters and all temperature, pressure, weight and analysis systems shall be submitted within 90 calendar days from date of award of contract.

e. The credentials and certification of the testing laboratory proposed by the Contractor for calibration of all test equipment shall be submitted within 120 calendar days from date of award of contract.

f. A schedule, updated weekly establishing the expected time period and calendar dates when the Contractor plans to commence field performance testing and operational testing of the completed systems, along with a description of the temporary systems and installations planned to allow operation testing to take place.

g. Performance test results of equipment or system prior to commencement of the operational test.

h. Operational test results of equipment or system prior to commissioning.

17.11.12 The Contractor shall prepare and submit test plans and documentation plans as specified. The Region and the Engineer will not witness any testing for the purpose of acceptance until all test documentation and calibration plans and the specific system test plans have been submitted and accepted.

17.11.13 The Contractor shall develop and implement a record keeping system to document compliance with the requirements of this section. Calibration documentation shall include identification (by make, manufacturer, model and serial number) of all test equipment, date of original calibration, subsequent calibrations, calibration method and test laboratory.

17.11.14 Equipment and system documentation as a minimum shall include date of test, equipment number or system name, nature of test (performance or operational),

test objectives, tests results, test instruments employed for the test and signature space for the engineer's witness and the Contractor's Testing Manager. A file shall be established for each system and item of equipment,. It is suggested that files be maintained separately for pipe pressure testing, mechanical equipment performance testing, instrumentation equipment performance testing (loops), and electrical equipment. These files shall include the following information as a minimum:

a. Metallurgical tests (where required)
b. Factory performance tests (where required)
c. Field performance tests
d. Operational tests

17.11.15 The Contractor shall provide appropriate test documentation forms specific to each system and associated equipment installed under this contract and submit it to the Engineer a minimum of 4 weeks for review prior to any performance testing. After the Engineer has reviewed and has taken no exception to the forms, the Contractor shall produce sufficient quantities of the form, at his expense, for use for all performance testing conducted under the contract.

Test Plan Details

17.11.16 The Contractor shall develop test plans detailing the co-ordination and sequential testing of each item of equipment and system installed under the contract. Each test plan shall be specific to the equipment or system to be tested. Test plan shall be identified by the equipment or tag number and shall include all field devices and or control that are to be tested simultaneously, where applicable. The test plan shall identify the required or specified test result that must be achieved by the equipment or system versus the actual results achieved and recorded during the testing procedure. Test plans shall also identify requirements for any supporting system or equipment, temporary system or work and the presence of the subcontractors' and manufacturers' representatives. As a minimum, the test plan shall include the following:

a. Step-by-step proving procedure for all control and control loops and electrical circuits by imposing low voltage or current and using appropriate indicators to affirm that the circuit has been properly identified, installed and connected to the required device or devices.
b. Calibration of all analysis instruments and control sensors.
c. Performance testing of each individual item of mechanical, electrical, and instrumentation equipment associated with a system. Performance tests shall be selected to duplicate the operating conditions.
d. Operational system tests designated to duplicate, as closely as possible, operating conditions.
e. Test plan shall include a complete description of the procedure to be employed to ensure that the result may be achieved without being influenced by improper operation of the equipment or system.

17.11.17 The Contractor shall submit 90 calendar days prior to equipment testing, all the specified test plans required for the systematic field performance testing of the equipment or system installed under the contract. Contractor shall submit six (6)

copies of test plans for review. Once the test plans have been reviewed without exception taken by the Engineer, the Contractor shall provide sufficient quantities of the plans and provide six (6) copies to the Engineer. No test work for the equipment, system or facility shall begin until the Contractor has delivered the test plans to the Engineer. A sum of $[_____] (to be determined by the Consultant and to be inserted into the Form of Tender) will be identified in the Tender Form to be paid only when the Contractor delivers an approved test plan procedure.

17.11.18 The Contractor shall produce a schedule setting forth the sequence contemplated for performing the testing program. The schedule shall be in the form of a bar chart, with each test plan noted with the required time line to perform the tests. The schedule shall show the contemplated start date, duration and completion date of each test plan. The test plan schedule shall be submitted no later than four (4) weeks in advance of the date that the Contractor proposes to commence testing. The Engineer will not witness any testing for the purpose of acceptance of the work until the Contractor has submitted a schedule and that the Engineer has not taken any exception. The test schedule shall be updated weekly, showing actual commencement and completion dates of test plans, indicating whether the system and or equipment being tested have been completed satisfactorily.

17.11.19 For all equipment and system performance tests, each item of mechanical, electrical, instrumentation and HVAC equipment installed under this contract shall be tested to demonstrate compliance with the performance requirements of the contract. Each item of mechanical, electrical, instrumentation and HVAC system installed or modified under the contract shall be tested in accordance with the specified performance requirements. Submit all test results to the Engineer within fifteen (15) calendar days of completion of the tests. The Contractor shall not commence operational tests until this has been completed.

Testing with Process Fluid

17.11.20 When the equipment and/or systems have been tested, the Contractor shall fill each system with the intended process fluids – except for wastewater, sludge and other wastewater systems. All potable water, oil, air, and chemical systems shall be filled with the specified fluid. Wastewater process systems shall be filled with water for testing purposes. The Contractor shall install temporary connections, bulkheads and make other provisions to re-circulate process fluids or otherwise simulate anticipated operating conditions for a continuous seven (7) day period. During the operational testing period, the Contractor's Testing Manager and testing team shall monitor the characteristics of each machine according to manufacturer information and specifications and report any unusual conditions to the Engineer. If any equipment and/or systems fails, and there is repair problem, restart operational test and continuously for another seven (7) days. All tests shall commence only on a Monday or Tuesday. Submit operational test results to the Engineer within fifteen (15) calendar days from the end date of the successful test.

Procedure for the Execution of the Performance and Operational Tests

17.11.21 The procedure for the execution of the Performance and Operational Tests shall be carried as follows:

a. The Contractor's Testing Manager shall organize teams made up of qualified representatives of equipment suppliers, subcontractors, the Contractor's independent testing laboratory and others, as appropriate, to efficiency and expeditiously calibrate and test the equipment and systems installed and constructed under the contract. The objective of the testing program shall be to demonstrate to the Engineer's complete satisfaction that the structures, systems, and equipment constructed and installed under the contract meet all performance requirements and that the facility is ready to commence the commissioning process. In addition, the testing program shall produce a record of baseline operating conditions for the Region to use for its preventative maintenance program.

b. The Region will provide all power, fuel, compressed air supplies, potable water and chemicals and the Contractor will be required to provide all labour, temporary piping, heating, ventilating, air conditioning and all other items and work required to complete the tests. Temporary systems and or facilities shall be maintained until permanent systems are in service. In the event that the test failed the first time, the cost of retesting shall be borne by the Contractor for all subsequent testing(s) including all power, fuel, compressed air supplies, potable water and chemicals.

c. Calibration of analytical instruments, sensors, gauges and meters installed under the contract shall proceed on a system-by-system basis. No equipment or system performance acceptance tests shall be performed until instruments, gauges and meters installed have been calibrated and the calibration has been witness by the Engineer and the reports have been submitted to the Engineer. All analytical instruments, sensors, gauges and meters used for performance testing shall be recalibrated after completion of each performance test or prior to commissioning, prior to acceptance.

d. Performance tests shall include the following:

e. Pressure and/or leakage tests shall be conducted in accordance with applicable portions of the technical specifications. The Engineer shall witness all acceptance tests. Evidence of successful completion of the pressure and leakage tests shall be the Engineer's signature on the tests forms prepared by the Contractor.

f. Functional checkout of all electrical systems, prior to energization, (in the case of electrical systems and equipment) of all circuits shall be tested for continuity and shielding including resistance and grounding tests. All electrical equipment, all circuits, including grounding circuit, shall be subjected to testing in accordance with the requirement of Division 16.

g. Component calibration, loop test, loop commissioning and tuning, prior to energization, (in the case of instrumentation system and equipment) of all loops and associated instruments will be calibrated and tested in accordance with the procedures specified in Division 13.

h. Checkout of HVAC system and all of its associated mechanical and electrical equipment shall be in accordance with Divisions 15 and 16.

i. Checkout for all mechanical equipment including but not limited to the following:
j. Alignment of equipment using the reverse dial indicator method.
k. Pre-operation lubrication.
l. Manufacturer's recommendations for start-up preparation.
m. Functional tests of all mechanical, electrical, HVAC and instrumentation equipment and systems to demonstrate compliance with the performance requirements.

17.11.22 In general, performance tests for any individual system shall be performed in the order listed above. The order may be altered as authorized by the Engineer in writing after receipt of a written request, complete with justification of the need for the change in sequence.

17.11.23 Performance testing will be permitted to starts once all affected equipment has been subjected to the required check-out procedures and the Engineer has witnessed and has not found deficiencies in that portion of the work and individual equipment and systems may be started and operated under simulated conditions to determine as nearly as possible whether the equipment and systems meet the requirements of the technical specifications. If available, potable water may be employed for the testing of all liquid systems except gaseous, oil or chemical systems. Test media for these shall either be the intended fluid or a compatible substitute. The equipment shall be operated for a sufficient period of time to determine its operating characteristics, including noise, temperatures and vibration; to observe and document performance characteristics; and to permit initial adjustment of operating controls. When testing requires the availability of auxiliary systems such as looped piping, electrical power, compressed air, control air, or instrumentation which have not yet been placed in service, the Contractor shall provide acceptable substitute sources, capable of meeting the requirements of the machine, device or system at no additional cost to the Region. Disposal methods for tests media shall be subject to review by the Engineer. During the performance test period, the Contractor shall obtain baseline operating data on all equipment with motor greater than 0.75 kW to include amperage, bearing temperatures and vibration as required. This baseline data will be collected for the Region to enter into a preventive maintenance system.

System Performance Testing

17.11.24 The Contractor shall perform system operation testing after completion of all installed testing and certification by the Engineer that all equipment complies with the requirements of the specifications. The Contractor shall fill all process units and process systems, except those employing potable water, oil, air or chemicals, with plant water. All potable water, oil, air and chemical systems shall be filled with the specified fluid. Upon completion of the filling operations, the Contractor shall circulate water through the completed facility for a period of not less than 48 hours, during which all parts of the system shall be operated as a complete facility at various loading conditions, as directed by the Engineer. The operational testing period shall be 24 hours per day for seven (7) continuous

days starting on a Monday. If the operational testing is terminated for whatever reason, as related to the facilities constructed or the equipment furnished under the contract, or the Contractor's temporary systems, the operational testing program shall be repeated until the specified continuous period has been accomplished without interruption. Cost for subsequent operation retesting shall be completely borne by the Contractor. All process units shall be brought to full operating conditions, including temperature, pressure and flow. The operational test period can be changed as directed by the Region in writing. However, the Contractor shall demonstration proper installation of the equipment by operating it successfully for the specified continuous period, which shall be repeated until successful operation of the equipment has been demonstrated.

17.11.25 Record documents of facilities involved shall be accepted and ready for turnover to the Region at the time of operational testing.

17.11.26 For the purpose of the Construction Lien Act, the definition of "can be used for the purposes intended" is defined as compliance of the works in accordance with the requirements as specified under this section "EQUIPMENT AND SYSTEM PERFORMANCE OPERATIONAL TESTS". No deviation to this requirement will be permitted.

Performance Conformance with Specifications

17.11.27 Test results shall be within the tolerances set forth in the detailed specifications sections. If tolerances have not been specified, test results shall conform to tolerances established by recognized industry practice. Where in the case of an otherwise satisfactory installed tests, any doubt, dispute or difference should arise between the Engineer and Contractor regarding the tests results or the methods or equipment used in the performance of such test, the Engineer may order the test to be repeated at no additional cost to the Region.

17.11.28 Retesting will be required if under test, any portion of the work should fail to fulfill the contract requirements and is adjusted, altered, renewed or replaced, tests on that portion when so adjusted, altered, removed, or replaced together with all other portions of the work as are affected thereby, shall, unless otherwise directed by the Engineer, be repeated within reasonable time and in accordance with the specified conditions. The Contractor shall reimburse the Region all reasonable expenses incurred by the Region, as a result of repeating such tests. Such reasonable expenses include staff time, equipment standby time, fuel, chemicals, etc. and the amount shall be deducted from the Contractor's payment certificate.

Post Performance-Test Inspection

17.11.29 Post Performance-test inspection shall be carried out once it has been completed. All rotating machines shall be rechecked for proper alignment. If equipment does not meet the specified alignment requirement, realignment equipment and resubmit final alignment report. All equipment shall be checked for loose connections, unusual movement, or other indications of improper operating characteristics. Any deficiencies shall be corrected to the satisfaction of the Engineer. All machines or devices, which exhibit unusual or unacceptable operating characteristics, shall be disassembled and inspected. Any defects

found during the course of the inspection shall be repaired or the specified part or entire equipment item shall be replaced to the complete satisfaction of the Engineer at no cost to the Region.

17.12 Commissioning

Commissioning Process

17.12.1 The Quality Assurance program for the commissioning of process system(s) installed by the Contractor shall be carried out in the following approved manner.

17.12.2 On completion of operational testing period, the Contractor shall remove, clean and replace all permanent and temporary filters and strainers in all pipeline systems; replace all HVAC filters; dewater and clean all sumps; and dewater all process units for final inspection as a condition precedent to commissioning. Areas to be commissioned shall be completely cleaned prior to turning over to the Region.

Commissioning Procedure

17.12.3 The commissioning plan shall be prepared by the Contractor and submitted to the Consultant for review within 150 calendar days from the date of award of the contract.

17.12.4 The Contractor shall provide the following submittals/information:

a. Detailed commissioning plan for each process unit or system constructed or modified as a part of the work performed under the contract.

b. The Contractor's 24-hour emergency response plan during the commissioning period. The plan shall be completed with a daytime staffing plan and names, qualifications and telephone numbers of those assigned to off-hour standby duty.

17.12.5 The Contractor, working with representatives from the Region and the Consultant, shall develop and produce a detailed, written commissioning plan for the start-up and commissioning procedure, under actual operating conditions, of the system. The Contractor shall submit four draft copies of the commissioning plan to the Region and Consultant for review. When the Engineer accepts the plan, submit four final approved commissioning plan for use by the Region and the Consultant. The Contractor shall comply with the requirements of the plan during the commissioning process.

17.12.6 On successful completion of the equipment and system performance and operational testing, the Contractor may request the commencement of the commissioning of the facility. The commissioning period shall commence on a Monday or Tuesday and be carried out for a period of fourteen (14) continuous days. The Contractor shall remove all temporary piping, bulkheads, controls and other alterations to the permanent systems that may have been needed during the performance and operational testing and shall perform the task necessary to make the improvements constructed under the contract fully operational. All Testing and Maintenance Manuals must be submitted to the Engineer and to the Region prior to the commencement of the commissioning of the process system.

17.12.7 The Contractor shall assemble a commissioning team under the direction of the Testing Manager who is authorized to commit the Contractor's personnel and resources to respond to the Region or the Consultant for assistance during the commissioning period. The commissioning team shall consist of representatives from the Contractor's mechanical, electrical, and instrumentation sub-contractors, and others as appropriate. The commissioning team shall be available at the site during normal working hours (8 hours a day, 5 days a week, Saturdays, Sundays and legal holidays excepted) and shall be available within 2 hours' notice at any other time by telephone. The commissioning team shall at all times be equipped and ready to provide emergency service such as repairs, adjustments, and corrections to the equipment and systems installed and modified as a part of the contract.

Region's Responsibilities during Commissioning

17.12.8 The Region's operation and maintenance personnel will be responsible for operation of the systems to be commissioned. The portion of the work to be commissioned shall be fully operational, performing all the required operational functions for which it was designed.

17.12.9 The Contractor shall be available at all times during commissioning period to provide immediate assistance in case of failure of any portion of the system or equipment being operated. The Contractor shall be prepared to make modifications to the system or individual components thereof as a change to the contract. At the end of the commissioning period and when all corrections required by the Consultant have been completed, the Contractor may apply for the Substantial Performance Certificate for the Contract. The Contractor shall bear the costs of all necessary repairs or replacement, including labour and materials, required to keep the plant being commissioned, fully operational.

Table 17-1 Facility Start-up and Commissioning Deliverables

	Task	Submission Requirements
1.	Operations Manual – Draft	5 Copies
2.	Operations Manual – Final	5 Copies & 1 DVD
3.	Equipment Maintenance Manual – Draft	5 Copies
4.	Equipment Maintenace Manual – Final	5 Copies & 1 DVD
5.	Inspection Reports	5 Copies
6.	Start-up and Commissioning Report	5 Copies
7.	Consultant's Report on Operation of Facility	2 Copies

SECTION 18 MANUALS AND TRAINING

18.1 Operation Manual (by Consultant)

18.1.1 The Consultant is responsible for providing an Operations Manual in compliance with the Provincial regulations.

18.2 Overall Requirements

18.2.1 The following two (2) types of documents are required:

a. Facility Manual (by Consultant)
b. Operational Work Instructions (by Consultant)

18.3 Water Facility Manual

18.3.1 The facility manual relates to the particular facility. It provides a functional overview of the treatment processes and describes how the treatment plant is intended to operate. It also provides an overview of utilities within the plant.

18.3.2 The following is a typical Table of Contents for a Water Facility Manual:

INTRODUCTION
- Record of Revision
- Title Page
- Acknowledgement
- Table of Contents

PLANT OVERVIEW
- Plant Layout
- Plant History
- Plant and Distribution Classification
- Water Quality

FUNCTIONAL OVERVIEW

Raw Water Handling
- Intake
- Intake Pipe
- Screening
- Low Lift Pumping
- Pipeline

Particulate Removal
- Flash Mixing
- Flocculation
- Clarification
- Filtration
- Filter Backwash System
- Sludge Handling

Chlorination (Primary Disinfection and/or Secondary Disinfection)
- Pre-Chlorination
- Post Chlorination

Chemical Systems and Other Processes
- Ozonation
- Coagulant
- Coagulant or Filter aid
- pH Control
- UV
- Fluoridation
- Iron and Manganese Control

Storage and Transmission
- Clearwell
- Reservoir
- High Lift Pumping
- Elevated Tanks
- Pumping Stations
- Pressure Zones

Plant Utilities
- Heating, Ventilating, Air Conditioning
- Plant Service Water
- Plant Instrumentation/Air
- Power Supply and Distribution
- Security/Alarm System
- Communications
- Supervisory Control and Data Acquisition
- Plant Laboratory

18.4 Wastewater Facility Manual

18.4.1 The facility manual relates to the particular facility. It provides a functional overview of the treatment processes and describes how the treatment plant is intended to operate. It also provides an overview of utilities within the plant.

18.4.2 The following is a typical Table of Contents for a Wastewater Facility Manual:

INTRODUCTION
- Record of Revision
- Title Page
- Acknowledgement
- Table of Contents

PLANT OVERVIEW
- Plant Layout
- Plant History
- Plant and Distribution Classification
- Water Quality

FUNCTIONAL OVERVIEW

Pretreatment
- Inlet

- Fine Screening
- Screenings Compactor
- Grit Removal

Raw Sewage Pumping

Primary Clarification

- Primary Clarifiers
- Primary Sludge Pumping
- Primary Scum Pumping

Aeration

- Aeration Tank
- Air Blower
- Fine Bubble Diffuser Systems

Secondary Clarification

- Secondary Clarifier
- Return Activated Sludge
- Secondary Scum

Tertiary Treatment

Digesters

Biosolids Dewatering

- Sludge Loading

Chemical Systems and Other Processes

- Coagulant
  - Coagulant Aids
  - UV Disinfection
- Odour Control

Plant Utilities

- Heating, Ventilating, Air Conditioning
- Plant Service Water
- Plant Instrumentation/Air
- Power Supply and Distribution
- Security/Alarm System
- Communications
- Supervisory Control and Data Acquisition
- Plant Laboratory

18.5 Waste Management Facility Manual

18.5.1 The Waste Management facility manual relates to the particular facility. It provides a functional overview of the and describes how the facility is intended to operate. It also provides an overview of utilities within the plant.

18.6 Operational Work Instructions

18.6.1 Operational Work Instructions shall be provided for all processes that impact drinking water quality, employee safety or the environment. Work Instructions should be provided for each of the areas identified under "Functional Overview" in the Facility Manual, as appropriate.

18.7 Equipment Testing and Maintenance Manual (by Contractor)

18.7.1 This content is to be included in the tender documents, by the Consultant.

Submission Requirements

18.7.2 The submission of the Testing and Maintenance Manual by the General Contractor, amongst other requirements, is a prerequisite for the issuance of the Substantial Performance Certificate by the Engineer. This requirement is specified in the Region's General Condition of Contract.

18.7.3 It is the responsibility of the Consultant to ensure that the requirement of this Section be complied with in all respect at the time of the submission of the Testing and Maintenance Manual by the General Contractor.

18.7.4 The General Contractor shall be required to prepare and submit four (4) copies of documentation, including "As-Constructed" shop drawings, for the operation and associated maintenance of each piece of equipment and system as supplied and installed.

18.7.5 The General Contractor shall be required to submit the documentation in 210 x 280 mm BLACK binders ACCO #05426, hot stamped in white lettering on front and spine to accommodate the documentation in accordance with the following division:

VOLUME 1 TESTING MANUAL
VOLUME 2 ARCHITECTURAL/STRUCTURAL
VOLUME 3 MECHANICAL OPERATIONS AND MAINTENANCE
VOLUME 4 ELECTRICAL AND INSTRUMENTATION OPERATIONS

18.7.6 The number of volumes shall be increased and renumbered as necessary to accommodate all the equipment operation and maintenance information/manuals. Each copy shall be permanently numbered 1 to 4.

18.7.7 The spine of the binder shall be printed with the Facility's name and the project number and the following is a typical example:

WASTEWATER TREATMENT PLANT (*Name of Facility)*

PROJECT # *(Project Number)*

The cover of the binder shall be printed with the following identification:

TESTING AND MAINTENANCE MANUAL

VOLUME 1 ***(etc)***

WASTEWATER TREATMENT PLANT ***(Name of Facility)***

PROJECT # ***(Project Number)***

CONSULTANT: ***(Name of Consultant)***

18.7.8 The binder shall be arranged in accordance with the Construction Specifications Institute Masterformat – Master List of Sections, Titles and Numbers utilizing laminating plastic divider tabs and colour coded accordance to Chapter. Colour shall be as follows:

a.	Division	White
b.	Systems	Orange
c.	Certification & Testing	Green
d.	Shop Drawings and Maintenance Bulletins	Yellow
e.	Safety & Maintenance	Red

Volume 1 Index

LIST OF SUB-CONTRACTORS
LIST OF SUPPLIERS
LIST OF MAINTENANCE MATERIALS
WARRANTIES
EQUIPMENT OPERATIONAL TEST REPORTS
PROCESS/SYSTEM PERFORMANCE TEST REPORTS
MANUFACTURER'S INSTALLATION AND STARTUP REPORTS
CERTIFICATES

Volumes 2, 3 and 4 Indexes

DETAILED TECHNICAL INFORMATION OF EQUIPMENT
TESTING AND MAINTENANCE OF EQUIPMENT

Shop Drawing of Equipment

18.7.9 For each system and/or equipment, each piece of equipment shall be referred by its tag number and where manufacturer's literature covers several models or options, the applicable information shall be highlighted with the redundant information crossed out and the information shall be submitted as follows:

a. Index of information in that Chapter in order of appearance.

b. Description of system, components and technical data. Include interfaces, sequences, and operational characteristic as a result of seasonal changes.

c. Maintenance and operating instructions.
d. Recommended spare parts list.
e. Schematics, single line, and wiring diagram.
f. Service representatives – names, address, telephone and fax number.
g. Suppliers for replacement parts – name, address, telephone and fax number.
h. Test results and witness testing commissioning test results.
i. Certification, guarantee and warranty.
j. Trouble shooting data.
k. Preventative maintenance program complete with suggested checklist sheets.
l. Test data of degreasing and flushing of piping.
m. Hydrostatic or air tests performance.
n. Equipment alignment certificates.
o. Balancing data for air and water system.
p. Equipment tag list.
q. Inspection approval certificates for all types of systems i.e. plumbing and piping, heating and ventilation, electrical, building, etc.

18.7.10 Each binder shall be made up as follows:

a. Tab: Table of Contents – details the titles of various divisions of the included divider tabs.
b. Tab: Introduction to Manual – provide written explanation of the layout of the manual and intended use. Include separately the name, address, telephone and fax number of the following:
    i. Consultant
    ii. General Contractor
    iii. Sub-Contractors
    iv. Distributors
    v. Manufacturers

18.7.11 The General Contractor is required to submit the Testing and Maintenance Manual two weeks from the date of the proposed start-up of the first piece of equipment or system installed by him.

18.7.12 The Consultant shall not schedule equipment or system start-up with Regional staff unless the Contractor has complied with the submission of the required documents or manual.

18.8 Training by the Consultant

Preliminary Training during Construction

18.8.1 As the construction of each process module and installation of equipment is completed and placed on line, the Consultant shall assist the Operating staff in the operation of the newly constructed works using the draft copy of the Operation Manual. This procedure shall be followed until construction works have been completed.

18.8.2 The Consultant shall prepare the Facility Operation Manual and submit the first draft of the Manual prior to the completion of the Detailed Design Phase of the project. On completion of the Manual, the Consultant shall submit three draft copies to the Project Manager for review by the Region's Operating staff. On completion of the internal review, a review meeting will be held with the Consultant. The Consultant shall revise and re-submit three draft copies of the Manual for Operating staff use during construction.

Training on Consultant's Operation Manual

18.8.3 When the construction works have been completed, the Consultant shall revise the draft Facility Operation Manual and submit the six hard copies and two CD-ROM copies of the final version of the Facility Operation Manual and submit it to the Region's Project Manager. The Consultant shall allow adequate time for the training of the Regional Operating staff on the operation of the facility. As a minimum, training will be required for two - five separate groups of Operating staff and shall be conducted in the facility's meeting room. The Consultant shall provide all classroom material, information, etc. for the training session.

a. As a minimum, the training shall include the following:
b. Operation of the facility before expansion works
c. Operation of the facility after expansion works
d. Description and function of newly constructed treatment process
e. Treatment process and effluent criteria
f. Identification of critical process "bottleneck"
g. Process upset and rectifications
h. Sampling and monitoring
i. Safety procedures
j. Handling of alarms
k. On-line Operation of the facility and SCADA System
l. Using the Manual as an on-line tool
m. Procedures for Regional Operating staff to update the Manual

18.9 Training by the Contractor

18.9.1 This content is to be included in the tender documents, by the Consultant.

18.9.2 The Contractor shall provide training to the Region's personnel/operators by skilled trainers retained by the Contractor specifically for the purpose, in the

proper operation and maintenance of the equipment and systems provided and installed under this contract.

Qualified Trainer

18.9.3 The Contractor shall provide the specified on-the-job training of the Region's operating or maintenance staff for the maintenance of equipment. The training sessions shall be conducted by qualified experienced (2 years minimum) factory-trained representatives from the various equipment manufacturers. Training shall include instruction of operation personnel in equipment operation and preventative maintenance and instruct plant mechanics, electricians and electronics technicians in normal maintenance up to major repair.

18.9.4 The following information shall be submitted to the Engineer. Due to phased testing and start-up activities, separate submittals can be prepared for equipment items or systems. The material shall be reviewed and accepted by the Engineer no later than 3 weeks prior to delivery of the training sessions.

a. Lesson planned for each training session by the manufacturer's representatives.
b. All training manuals, handouts, visual aids and other reference materials shall be provided to attendees.
c. Date, time, and subject of each training session and identity and qualifications of individuals to be conducting the training.
d. Concurrent classes will not be allowed in training schedule.

Training Requirements

18.9.5 The requirements of the training to be provided by the Contractor shall be as follows:

a. The Contractor shall conduct training sessions for the Region's operating staff to instruct on the proper operation, care and maintenance of the equipment and systems installed under this contract. Training shall take place at the site of the work and under the conditions as specified. Manufacturers' operation and maintenance manuals shall be available to Region's personnel at least 30 days prior to the date scheduled for the individual training session.
b. Field training session shall take place at the site of the equipment.
c. Formal written lesson plans shall be prepared for each training session. Lesson plans shall contain an outline of the material to be presented along with a description of visual aids to be utilized during the session. Each plan shall contain a time allocation for each subject. One complete set of the originals of the lesson plans; training manuals, handouts, visual aids and reference material shall be the property of the Region and shall be properly bound and organized for easy reproduction of any section as required. The Contractor shall furnish ten (10) copies of training manuals, handouts, visual aids and reference materials at least one week prior for each training session.

d. Each training session shall be comprised of time spent both in the classroom and training session shall cover the following topics for each item of equipment or system:
   i. Familiarization
   ii. Safety
   iii. Operation
   iv. Troubleshooting
   v. Preventive maintenance
   vi. Corrective maintenance
   vii. Parts
   viii. Local representatives
   ix. Operation and maintenance manuals

18.9.6 The Region may video tape the training session or retain the services of a commercial video recorded service provider to record the training session. After completion of the videotaping, the material may be edited and supplemented with professionally produced graphics to provide a permanent record. The Contractor shall advise all manufacturers or suppliers who are providing training sessions that the training sessions may be video recorded by the Region.

18.9.7 The Consultant shall specify the time required for the proper training of Regional Operating and Maintenance staff that is required for each equipment or process system. To permit shift Operators to attend training sessions, the Contractor shall provide for off-hours and multiple sessions. A minimum of four (4) sessions will be required, which shall be scheduled to suit the Region's operators shift schedule.

18.9.8 Training shall be conducted in conjunction with the operational testing and commissioning periods. Classes shall be scheduled such that classroom sessions are interspersed with field instruction in logical sequence. The Contractor shall arrange to have the training conducted on consecutive days, with no more than 4 hours of training scheduled to suit the Region's operators shift schedule.

Classroom Equipment Training – Operating Staff

18.9.9 As a minimum, the Contractor shall provide classroom equipment training for operating staff and shall include the following:
   a. Videos, slides and or drawings, for discussion of the specific equipment, its location in the plant and an operation overview.
   b. Purpose and function of the equipment.
   c. A working knowledge of the operating theory of the equipment.
   d. Start-up, shutdown, normal operation, and emergency operation procedures, including a discussion on system integration and electrical interlocks, if any.
   e. Identify and discuss safety items and procedures.
   f. Routine preventative maintenance, including specific details on lubrications and maintenance of corrosive protection of the equipment and ancillary components.

g. Operator detection, without test instruments, of specific equipment trouble symptoms.
h. Required equipment exercise procedures and intervals.
i. Routine disassembly and assembly of equipment, if applicable, (as judged by the Region on a case-by-case basis) for purposes such as operator inspection of equipment.

Hands on Training for Operating Staff

18.9.10 Hands-on training of equipment shall include:

a. Location of the equipment in the facility and review its function.
b. Identify piping and flow options.
c. Identify valves and its function.
d. Identify field instrumentation, particularly with respect to:
e. Location of primary element.
f. Location of instrument readout.
g. Discuss purpose, basic operation and interpretation of operating data.
h. Discuss, demonstrate, and perform standard operating procedures and routine checks.
i. Discuss and perform the preventative maintenance activities.
j. Discuss and perform start-up and shutdown procedure.
k. Perform routine equipment exercise procedure.
l. Perform disassembly and assembly of equipment if applicable.
m. Identify and review hazardous operation and demonstrate safety procedures, where applicable.

Classroom Equipment Training – Maintenance Staff

18.9.11 Classroom equipment training for the maintenance and repair personnel will include:

a. Theory of operation.
b. Description and function of equipment.
c. Start-up and shutdown procedures.
d. Normal and major repair procedures.
e. Equipment inspection and trouble shooting procedure including the use of applicable test instruments and the “pass” and “no pass” test instrument readings.
f. Routine and long-term calibration procedures.
g. Safety procedures.
h. Preventative maintenance such as lubrication; normal maintenance such as belt, seal, and bearing replacement; and up to major repairs such as replacement of major equipment part(s) with the use of special tools, welding jigs, etc.

Hands on Training for Maintenance Staff

18.9.12 Hands-on equipment maintenance and repair training for Maintenance staff shall include:

a. Locate and identify equipment components.
b. Review the equipment function and theory of operation.
c. Review normal repair procedures.
d. Perform start-up and shutdown procedures.
e. Review and perform the safety procedures.
f. Perform Region's-approved practice maintenance and repair job(s), including mechanical and electrical adjustments and calibration and trouble shooting equipment problems.

Table 18-1 Manuals Deliverables

	Manuals	Copies
1.	Final Equipment Maintenance Manual	5 Copies 1 DVD
2.	Final Facility Operation Manuals	5 Copies 1 DVD

SECTION 19 ASSUMPTION OF FACILITIES

19.1 General

19.1.1 *Acceptance and assumption of the new facility by the Region will be made on a formal basis as detailed after verification that the upgraded or expanded facility performs as required by the Terms and Conditions of the RFP and/or the Pre-design Report for engineering services as detailed under Section 16 – Start-up and Commissioning.*

19.1.2 *The procedure for the assumption of new facility, prior to the issuance of Substantial Performance Certificate under the Construction Lien Act, as detailed in this section, must be followed and complied with in all respects.*

19.1.3 *Prior to training and commissioning the consultant is to compile the Operations and Maintenance Manual (O & M) with assistance from the contractor. Training and/or commissioning will not commence until the O&M manual has been approved and accepted by the Project Manager.*

19.2 Assumption of Facility Procedure

19.2.1 The Consultant shall adhere to the following procedure for the assumption of a facility from the General Contractor and it shall be strictly complied with, unless otherwise pre-approved by the Regions Project manager. No deviation will be permitted.

Assumption of Facility Procedure

1. Completion of Equipment Inspection, Supply of Final O & M manual, Start-up and Commissioning – refer to Section 15
2. Training of Regional Operating Staff by Equipment Supplier(s)
3. Commissioning of individual process system(s)
4. Training of Regional Operating Staff by Consultant on operation of upgrade or expanded facility
5. Commissioning of the facility by Regional Operating Staff and Consultant
6. Verification of Facility operation in conformance with the RFP or Pre-Design Manual
7. Assumption of Facility by Region upon successful completion of commissioning

19.3 Verification of Consultant's Design

Performance Requirements

19.3.1 The Consultant shall verify and ensure that the upgraded or expansion works operates in the manner, as required by the Terms of Reference of the RFP and/or the final Pre-design Report. In the event that it fails to meet the specified performance requirements, the Consultant shall provide engineering services at their own cost to correct non-performance requirements in equipment or process as specified in the RFP and/or the Pre-design Report.

Verification Procedure

19.3.2 The verification process procedure shall be carried as follows:

a. Prior to commencement of the verification of the facility operation capability or capacity as required in the RFP document and/or the Pre-design Report, the Consultant shall submit to the Region's Project Manager three draft copies of the testing protocol. When approved, re-submit three final copies of the verification/testing protocol.

b. Schedule the demonstration and verification of the proper operation of the works.

c. The testing protocol shall include the following:

i. Goals/targets of the proposed upgrade or expansion works. Consultant shall provide complete detail of the systems/sub-systems and expected operational performance target as designed and as intended by the contract document.

ii. Testing protocol to determine if the goals/targets have been achieved.

iii. Testing parameters/criteria.

iv. Table showing required performance level vs. actual.

v. Optimization of process to ensure maximum performance of upgraded or expansion work.

19.3.3 The cost for chemicals, external specialist to assist the verification process etc will be borne by the Region.

19.3.4 If the upgraded or expanded facility fails to meet the required performance as specified in the RFP and/or the Pre-design Report, the Consultant shall determine the reason or reasons for the failure of the upgraded or expanded facility to meet the specified performance at their own cost. Depending on the nature of the cause, the Consultant may be required to assume part or all of the cost to remedy the problem. Consultant shall submit a report documenting the reasons for the failure of the upgraded or expanded facility to meet the specified performance and the remedial work that are required to be carried out to correct the problem or problems.

19.3.5 Review problem with Region's Project Manager and determine proper course of action to remedy the situation and execute remedial work when authorized by the Region's Project Manager.

19.3.6 On completion of remedial work, re-schedule a date for the performance verification.

19.3.7 All subsequent cost for chemicals, external specialist to assists the re-verification process etc shall be borne by the Consultant.

19.3.8 If the remedial work failed to perform as required, repeat the process until the upgraded or expanded facility performs in the manner as required. Submit required report as the case may be.

19.4 Acceptance by The Region

Date of Acceptance

19.4.1 The formal handing over of the facility to the Region by the Contractor shall coincide with the date of the issuance of the Certificate of Total Performance of the Work after all deficiencies have been remedied by the Contractor.

19.4.2 On that date, the Consultant/Resident Engineer will convene a meeting with the Contractor, Facility Operation and Maintenance Supervisory Staff and the Region's Project Manager. If the Contractor has performed as required by the contract, the Certificate of Total Work Performance of the Work will be issued and the facility shall be turned over to the Region's Facility Operation Supervisory Staff.

SECTION 20 CONSULTANT'S PERFORMANCE APPRAISAL

20.1 General

20.1.1 The Region's Project Manager will carry out an appraisal of the performance of the Consultant for both the design and contract administration engineering services provided to the Region. The Consultant is also afforded the opportunity to provide input on the assessment made by the Project Manager. The intend of the appraisal is to provide the Consultant of the Region's evaluation of where their strength and weaknesses are so that they may be better able to address this in future assignments, when executing projects for the Region.

20.1.2 Refer to Consultant Appraisal review (Appendix 33)

SECTION 21 WARRANTY PERIOD

21.1 Deficiencies Found During Warranty Period

21.1.1 The Consultant/Resident Engineer shall follow-up with the Contractor to ensure that all deficiencies have been corrected to the extent that it satisfies the Terms and Conditions of the Contract such that the Substantial Performance Certificate can be issued for the commencement of the Warranty period. Notwithstanding that Facility Operating staff will be operating the facility during the one-year Warranty period; all operating deficiencies will be forwarded to the Consultant for resolution by the Contractor.

21.2 Failure to Respond During Warranty Period

21.2.1 If the Contractor fails to respond to the problem as specified in the General Conditions of the Contract, the Consultant/Resident Engineer and/or the Region shall take appropriate action to correct the deficiencies. For all deficiencies that are of an emergency nature, the Region will respond to it immediately but the Consultant/Resident Engineer is required to contact the Contractor to request that they take steps to remedy the situation as provided under the Terms and Conditions of the Contract.

21.3 Final Inspection Prior To Expiration of Warranty Period

Final Inspection

21.3.1 One month prior to the expiration of the Warranty Period, the Consultants shall assemble a team to inspect the facility to determine if there are any outstanding deficiencies where remedial work is still outstanding or has been performed unsatisfactorily which must be rectified.

21.3.2 The inspection shall be carried out jointly with the Contractor, the Facility Operation and Maintenance Supervisory staff together with the Region's Project Manager.

21.3.3 The inspection shall include but not be limited to the following:

a. Field devices
b. Equipment and performance
c. Process performance
d. Building envelope

21.3.4 Life safety deficiencies

21.3.5 The Consultant shall update the master deficiency list of all the noted deficiencies and provide a copy to all parties. The Consultant shall notify the Contractor of the required completion date for the performance of the remedial work, which shall not be later than the end of the Warranty period.

21.3.6 The Consultant shall advise the Contractor that the cost of the Consultant's final inspection and the subsequent inspection will be borne by the Region and any further inspections after that, which are required as a result of the Contractor's failure to complete the remedial work on time, will be deducted from the Warranty Holdback.

21.4 Release of Warranty Holdback

21.4.1 At the end of the Warranty period, the Consultant shall schedule the final inspection with Facility Operation and Maintenance Supervisory staff and the Region's Project Manager and review the status of each item on the deficiency list.

21.4.2 If the Contractor has completed the rectification of all the deficiencies satisfactorily, the Consultant will prepare and submit payment certificate for the release of the Warranty Holdback to the Region's Project Manager.

21.4.3 Where the deficiencies are still outstanding, the Region's Project Manager will be consulted and the remedial work will be performed by a third party. The Contractor shall be advised that they are in default of the contractual requirements as per General Conditions of the contract and that the Region is proceeding with the remedial work of the outstanding deficiencies independently. When the remedial work has been completed, the cost of the remedial work will be deducted including all associated engineering fees and a payment certificate will be prepared and submitted to the Region's Project Manager for the release of the outstanding balance of the Warranty Holdback monies.

SECTION 22 LIST OF APPENDICES

Appendix No	Name of Form
1	The Regional Municipality of Halton's Protocol for Reviewing Development Applications with Respect to Contaminated and Potentially Contaminated Sites
2	Regional Signing of Design Drawings
3	Engineering Service Scope Change
4	Project Status Record
5	Invoice Billing Sheet
6	Pre-Start Health and Safety Reviews (PHSR) Letter Template
7	Public Information Centre Notification, Public Notification/Advertisement, Notice of Completion
8	Deviation Memo Template
9	Plant Equipment Data Collection Forms
10	Request for Substitution
11	Contractor Change Orders
12	Contemplated Change Order
13	Contract Change Order Record
14	Contractors Shop Drawing Review Stamp
15	Master Deficiency List
16	Shutdown Permit to Work
17	Inventory of Spare Parts and Tools
18	Monthly Cost Control Report Form
19	Contract Release Form
20	Equipment Red/Green Tags
21	Alignment Data Record Form
22	Mechanical Equipment Installation/Start-up Checklist
23	Valve Installation Checklist
24	Pressure /Hydrostatic Test
25	Electrical Equipment Installation/Start-up Checklist
26	Variable Speed Drives Installation/Start-up Checklist
27	Instrumentation Installation Checklist
28	Instrumentation Calibration Form
29	Instrumentation and Control System Loops Check-out List
30	Panel/PLC Installation Checklist Form
31	Control Loop Checkout/Verification Form
32	HVAC Checkout/Verification Form
33	Consultant Appraisal Review
34	Tangible Capital Assets Valuation Report