

## Alistair MacDonald

---

**From:** Wilson, Anne [Yel] [Anne.Wilson@EC.GC.CA]  
**Sent:** July 6, 2007 9:45 AM  
**To:** David Swisher  
**Cc:** Rick Hoos; Alistair MacDonald; David Swisher; Nathen Richea; Catherine Mallet; MarcinkoskiL@inac-ainc.gc.ca; Joel Holder  
**Subject:** RE: Tamerlane WTP

Good morning David,  
Thanks for forwarding this. I couldn't see any numbers on end of pipe water quality - do you have performance specs?  
Also, I'm wondering if there is a need for chlorination - although discharge to the infiltration basis doesn't cause concern with chloramine formation, if it isn't strictly necessary it is preferable not to discharge chlorinated effluent.  
Thanks,  
Anne

-----Original Message-----

From: David Swisher [mailto:dswisher@centurymining.com]  
Sent: July 6, 2007 9:32 AM  
To: Wilson, Anne [Yel]  
Cc: 'Rick Hoos'; 'Alistair MacDonald'; David Swisher  
Subject: FW: Tamerlane WTP

Anne,

As per our discussion yesterday, please see the attached water treatment plant that we will utilize for sump cleanup in both the processing facility and the concentrate facility.

Please let me know if you have any questions.

Thank you,

David Swisher

Tamerlane Ventures Inc.  
Vice President/Senior Project Manager  
441 Peace Portal Drive  
Blaine, WA 98230  
Ph: 360.332.4653  
Fax: 360.332.4652  
Cell: 360.927.6103  
dswisher@tamerlaneventures.com

>From: <Terry.Bourassa@wolseleyinc.ca>  
>To: <justinsmoak86@hotmail.com>  
>Subject: Tamerlane WTP  
>Date: Fri, 25 May 2007 17:28:06 -0400

>

>Hi Justin,

>

>

>

>Please find attached our proposal for Water treatment for Tamerlane.

>

>

>

>Please call me if you have any questions.

>

>

>

>Regards

>

>  
>  
>Terry Bourassa  
>Environmental Sales  
>Century Environmental Services  
>A Wolseley Company  
>34 Roy Roche Drive  
>Winnipeg, MB R3C 2E6  
>Ph (204) 633-7213  
>Cell (204) 792-9766  
>Fax (204) 694-7228  
>  
>terry.bourassa@wolseleyinc.ca  
>  
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n\\_HM\\_mini\\_pcmag\\_0507](http://imagine-windowslive.com/hotmail/?locale=en-us&ocid=TXT_TAGHM_migratio<br/>n_HM_mini_pcmag_0507)

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TamerlaneWTP.pdf  
(1 MB)

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May 25, 2007

Justin Smook  
Mining Engineer  
Tamerlane Ventures  
(360) 332-4653

APPLICATION: Packaged Nanofiltration Water Treatment Plant No. 914

PARAMETERS:

Client supplied information:

- Pilot plant test data and water analysis
- Requirements for a 5 cubic meters/hour permeate flow rate now
- Greensand Filter 1. M Diameter for 5 cubic meters/hour
- Duplex Chemical Feed Systems for pH adjustment
- Tank and Duplex Chlorination Pumps
- Minimum water temperature for plant design = 5 degrees C.

OPERATION:

A modular, multi-barrier, nanofiltration water treatment plant has been designed to produce 5m<sup>3</sup>/h (22) USGPM of potable water at a minimum water temperature of 5 degrees C and a minimum of 75 percent conversion to permeate water.

The chemical conditioned water is pumped by feed pumps into the membranes. The unit consists of one stages with a total of six pressure vessels, each suitable for holding four membrane elements. While passing through the membranes, water divides into two streams – product/permeate and reject. A minimum of 75% of the water entering the membranes is converted into product/permeate water.

A CIP system is provided for cleaning and flushing of the membranes as required. The tank chosen for this application is polyethylene tank compatible with all the chemicals to be used for cleaning of the membranes. Heating system is provided inside this tank for heating the cleaning solution to the required temperature. A CIP pump, complete with piping and valves, is provided for the flushing and cleaning operation.

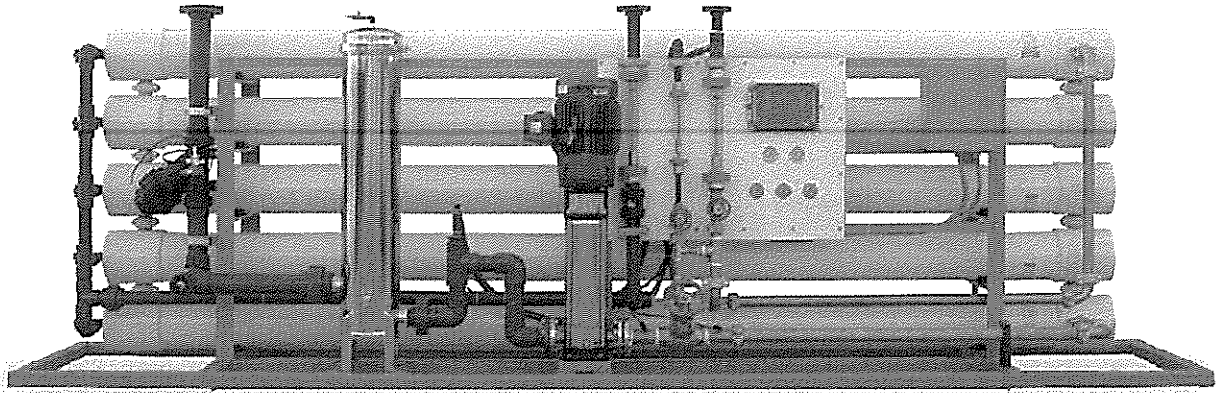
The product water coming out of the membranes is, dosed with pH correction chemicals for adjusting the pH, dosed with chlorine using bleach and then directed to the treated water storage tank. Instrumentation is provided for monitoring the control of all the operation parameters of the plant. Monitoring instruments are provided for flow, pressure and conductivity etc. A low pressure switch is provided to protect the RO feed pump and a high pressure switch is provided to protect the membranes.

# Tamerlane Water Treatment Plant

## DESCRIPTION:

### R48 Series Commercial RO Systems

Four models for flow rates up to 100<sup>l</sup> GPM.



#### Standard features

- Powder coated steel frame
- FRP multi-port pressure vessels
- Stainless steel pre-filter and cartridges
- Webtrol<sup>®</sup> multi-stage centrifugal pump
- Automatic inlet valve
- Low-pressure shut-off with auto restart
- Tank level input
- Pretreatment interlock input
- Adjustable recycle line
- Pre-filter pressure gauges
- Pump discharge pressure gauge
- Flow meter for product water
- Flow meter for reject water
- Flow meter for recycle water
- Check valve for product water
- Sample valves for product water
- On / off switch

#### Specifications

Feed water connection	See below
Product water connection (40 & 60 GPM)	2" Flange
Product water connection (80 & 100 GPM)	2.5" Flange
Reject water connection	1.5" Flange
Feed water pressure requirement (min.)	20 PSIG
Drain requirement (maximum)	See below
Electrical requirement	460VAC/60hz
Phase	3
Amps (based on model)	25,30,35,40

#### Additional features included R48 systems

- CI-2000 electronic controller with feed and product water conductivity meter with percent rejection
- Programmable concentrate auto flush

The scope of this estimate is for the supply, manufacture, programming, preinstallation testing and commissioning of a six bank water treatment plant for Tamerlane Mine

Water Treatment Plant consisting of:

# Tamerlane Water Treatment Plant

1. One FRP filter housings 125 psi operating pressure to hold Manganese green Sand one meter diameter with automatic back flushing and regenerating head.
2. One FRP filter housings 150 psi operating pressure to hold one large one micron cartridge each, 26.25 inch 1 filter cartridges 5 micron are supplied. (1 set of spare filter cartridges included). There is a concern with the very low inlet water pressure provided (31.3 psi). An advantage of 6 housings is that 1 cartridge can be changed at a time with both RO units operating.
3. Single-stage 5/m3 (22) USGPM Product Water Nanofiltration trains consisting of:
  - Two (2) nanofiltration pressure vessel housings, each 19 feet long by 10 inch diameter. 4 foot long membranes
  - One (1) pressure feed pump at 300psig – 20 HP 208/460/600 VAC 60 Hz 3 Ph.
  - Interconnecting RO piping and fittings of 316 Stainless Steel.
  - Premium (high efficiency) motors.
4. Clean-In-Place (CIP) system complete with tank, pump, filter vessel, cartridges, piping, controls and instruments.
5. Post (pH correction) treatment chemical dosing systems with dual pumps.
6. One Sodium Hypochlorite Tank with dual dosing pumps.
7. One (1) NEMA 4 Control panel certified to CSA standards with 10 inch HMI touch screen, Koyo PLC , instrumentation for control and monitoring of the system,
8. One (1) 208 VAC 3 phase electrical sub-panel with equipment breakers. The 600 VAC 3 phase main breaker is provided with transformer to 110 VAC.
9. All control and electrical wiring within the skid for simple connection on site.
10. All interconnecting piping, valves and fittings of Schedule 80 PVC.
11. Three (3) sets of Operating and Maintenance Manuals in English plus MS Word file on a CD.
12. Shipping to site, unloading, installation, commissioning and training.

## BREAKDOWN

NOTE: Price info omitted  
by Review Board  
staff

PRICE: (2. Membrane Treatment Unit and Piping on skid) 5m3/d

PRICE: (2. Membrane Treatment Unit and Piping on skid) 10m3/d

PRICE: (3. 1. M Dia Green Sand Filter and Piping) 5m3/d

PRICE: (3. 1. M Dia Green Sand Filter and Piping) 10m3/d

## Tamerlane Water Treatment Plant

PRICE: (6. Sodium Hypochlorite per Kg)

PRICE: (6. Potassium permanganate per Kg)

PRICE: (7. Pre-Filters Each)

PRICE: (8. Commissioning per Day with Expenses Included)

PRICE: (Extra labour as may be required per Day)

### **Optional Extra – BIP SP04-30L Ultraviolet Disinfection Unit**

Supply and install in the water treatment plant an Ultraviolet Disinfection System as described in Appendix C.

PRICE: 5m3/d

PRICE: 10m3/d

**Extra – Not included in the above prices:**

- Operational consumables
- Equipment and component spares
  
- Electrical connection to the RO plant power panel

### **Commercial Terms:**

**Delivery:** The system can be shipped within ten (10) weeks from the date of the deposit and either a technical commercially clear PO or signed contract.

**Validity:** Our offer is valid for a period of 150 days from the date of this quotation.

**Warranty:** All workmanship and equipment supplied carries a warranty for a period of one year from the date of supply or fourteen months from date of shipment (except for the membranes which are warranted for two years), provided they are operated as per our operation and maintenance instructions supplied in the Operation and Maintenance Manual. The warranty covers shipping costs for parts.

**Performance Guarantee:** The water treatment plant will meet the operational specification if the plant is operated as per the instructions presented in the Operation and Maintenance Manual. The membranes are guaranteed for a minimum period of two years if operated as per said instructions.



## *Tamerlane Water Treatment Plant*

We follow the Hydraulic Institute guidelines for minimizing life cycle costs:

- Consider all relevant costs to determine the Life Cycle Cost
- Procure pumps and systems using LCC considerations
- Optimize total cost by considering operational costs and procurement costs
- Consider the duration of the individual pump duty points
- Match the equipment to the system needs for maximum benefit
- Match the pump type to the intended duty
- Don't oversize the pump (by using a reasonable minimum temperature of raw water)
- Match the driver type to the intended duty
- Specify motors to be high efficiency
- Match the power transmission equipment to the intended duty
- Evaluate system effectiveness
- Monitor and sustain the pump and system to maximize benefit
- Consider the energy wasted using control valves

BI Pure Water (Canada) Inc. and project partner Century Environmental of Saskatoon guarantee our work. Following installation of our systems and products, we will regularly check with the client to ensure customer satisfaction. .

Prepared by,

Scott Foster, P.Eng.  
Account Manager  
BI Pure Water (Canada) Inc.

Venkat Raman, P.Eng.  
Senior Process Engineer

### **APPENDICES:**

**APPENDIX A. – Water Treatment Plant Technical Specifications**

**APPENDIX B. – Control System HMI Screens**

**APPENDIX C. – Equipment Details**

**APPENDIX D. – Operational Quality Assurance and Control**

**APPENDIX E. – Operation and Maintenance Costs**

**APPENDIX F. – Training Program**

# *Tamerlane Water Treatment Plant*

## **APPENDIX A. – Water Treatment Plant Technical Specifications**

### Pre-filter unit

Quantity:	0n4
Flow through each unit:	40 gpm
Material of construction:	FRP
Filter model:	BBC
Filter manufacturer:	Flowmatic or its equivalent
Type of cartridge:	40" long wound polypropylene
Accessories:	1. Vent valve 2. Drain valve

### Reverse osmosis units

#### Overall system information

Number of trains:	one
Feed flow :	30 gpm
Feed water conductivity:	~1200 mg/l
Design feed water temperature:	5 – 15 degree C
Product flow:	22 gpm
Reject flow:	6 gpm

### Membrane skid

Quantity:	one
Skid size:	6.5M x 1.95m x 2.5M
Material of construction:	Powder coated Coated carbon steel

### RO feed pump

Quantity:	one
Pump flow rate :	30 gpm

## ***Tamerlane Water Treatment Plant***

Pump discharge pressure:	300 psi
Pump type:	Booster module
Pump material construction:	Stainless steel 316
Pump model #:	BM 60-18N
Motor HP:	20
Pump voltage:	208/ 460/5753phase/60 Hz
Pump Manufacturer:	Grundfos or equivalent

### Membrane train

Type of membrane:	Spiral wound
Quantity of membranes / train:	8
Membrane model:	TWLE440 or equivalent
Membrane manufacturer:	Filmtec or its equivalent
Membrane housing material:	Fiber glass pressure vessel 450 psi rated
Membrane housing type	Pressure vessel with end caps and side ports for feed and concentrate and capable of holding four membranes
Membrane housing manufacturer:	Protec or its equivalent

### CIP system (one)

CIP skid size:	1.30M x 1.50M x 1.5M
Application:	For flushing and chemical cleaning of the Membranes
Tank material of construction:	Polyethylene
Tank volume:	0.2 CUM
Accessories:	<ol style="list-style-type: none"><li>1. Heater inside the tank (capable of increasing the cleaning solution temperature to 35 degree C in two hours)</li><li>2. Vent, lid and connections for inlet and outlet etc.</li><li>3. Level switches for protection of the pump and initiating alarm</li></ol>

## ***Tamerlane Water Treatment Plant***

4. Cartridge filter unit for cleaning the solution (Cartridge filter model S6EF7-4-2P-VB)

5. PVC piping connecting the CIP tank to the system

Pump type:	Centrifugal multistage
Pump wetted parts:	Stainless steel 316
Pump flow rate:	28 gpm
Pump discharge pressure:	45 psi
Motor type:	TEFC
Motor HP:	2
Motor voltage:	208V/460/575 / 3phase/60 Hz
Pump manufacturer:	Grundfoss Goulds or its equivalent

### Interconnecting pipe work

Type of piping & valves:	<p>1. CPVC sch 80 for low pressure piping. Fittings and butterfly valves connecting the pretreatment filter and RO feed pump, and permeate lines with sampling valves and CIP system.</p> <p>2. SS 316 piping, fitting and valves (Actuator operated control valves) for connecting the RO feed pump to the membrane vessels and high pressure pump and concentrate lines.</p>
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### Electrical & controls

Type of control panel:	NEMA 4X
Components to be used:	Breakers, fuses, contactors and overloads Cutler Hammer or equivalent
Accessories:	Visual and audible alarms to announce any fault in the system

# *Tamerlane Water Treatment Plant*

## Instrumentation

### Pressure gauges

Type: Bourdon pressure gauges  
Wetted part material: Stainless steel  
Location: At different locations  
Manufacturer: Wika or its equivalent

### Pressure transmitters

Type: Digital  
Wetted part material: Stainless steel  
Location: At RO 1<sup>st</sup> stage feed, and concentrate Lines  
Manufacturer: Burkert or equivalent

### Flow meters

Type: Flow transmitter with digital display with 4-20MA signal output and totalizer  
Location: At the Product and Reject of the RO unit  
Model #: 8025  
Manufacturer: Burkert or equivalent

### Conductivity monitor

Conductivity probe Location: At the outlet of RO unit inlet and outlet  
Model #: 8225  
Manufacturer: Burkert or equivalent  
Manufacturer: ATI Quantum

## ***Tamerlane Water Treatment Plant***

### PLC controls

PLC manufacturer:	Automation direct
Model #	Direct Logic DL-06

### Post treatment – pH correction

Quantity :	one
Application:	pH adjustment
Type of dosing pump:	Diaphragm metering
Pump capacity:	0.1 Litres/hr
Material used for chlorination:	Sodium hydroxide
Accessories:	1. 100 L dosing media container for storing the chemical solution 2. Electric mixer for mixing the solution 3. PE tubing, suction and discharge valves
Power supply for the pump:	110V / 1phase / 60 Hz
Pump manufacturer:	Pulsatron or its equivalent

### Post treatment – Chlorine Disinfection )

Quantity:	two pumps
Application:	Disinfection of treated water using bleach

### Operation and cleaning chemicals

BIP will supply following the following with the treatment plant:

1. Cleaning chemicals required for one cleaning
2. One set of spare cartridge elements

### Testing, Commissioning and Training

BIPW will thoroughly test the plant at its production facility to minimize onsite startup problems. A BIP rep will be available five working days at site during the commissioning of the plant. Training of the operators will be carried out during this period. Subsequently two more visits will be made by our technical rep during the one year period to follow up and support the system during the one year general warranty period.

### APPENDIX B. – Control System HMI Screens

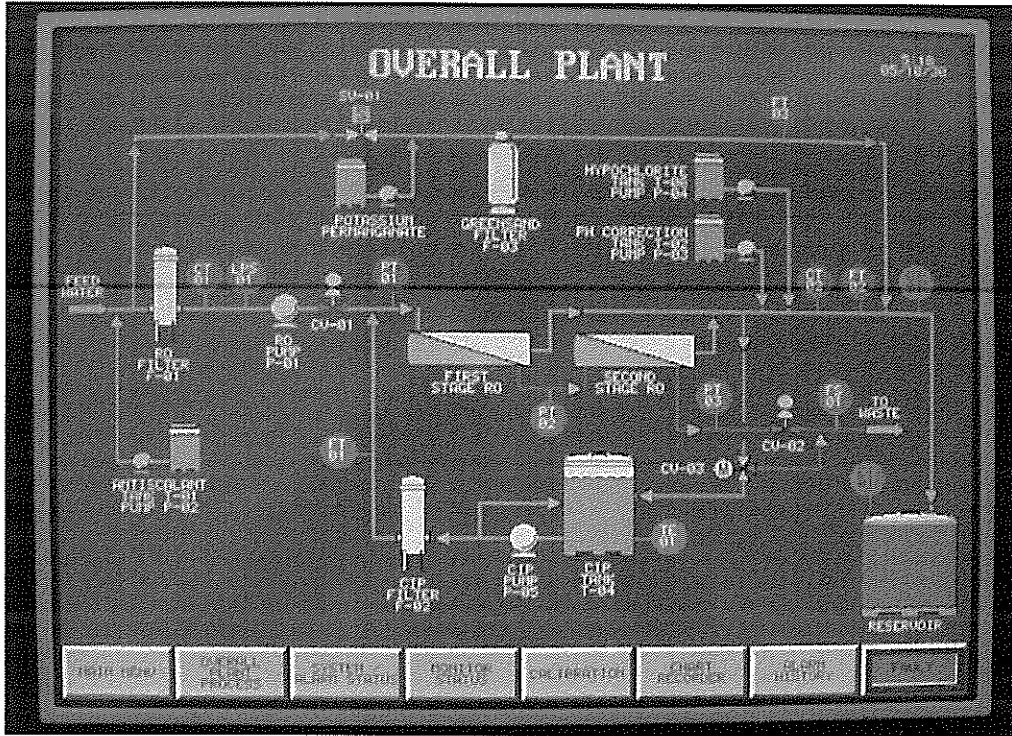


Figure 1 – Screen shows the equipment with a red alarm fault at the reservoir

**SYSTEM/ALARM**

ALARMS

RO FILTER F-01	RO FILTER F-02	RO FILTER F-03	RO FILTER F-04	RO FILTER F-05
RO FILTER F-06	RO FILTER F-07	RO FILTER F-08	RO FILTER F-09	RO FILTER F-10
RO FILTER F-11	RO FILTER F-12	RO FILTER F-13	RO FILTER F-14	RO FILTER F-15
RO FILTER F-16	RO FILTER F-17	RO FILTER F-18	RO FILTER F-19	RO FILTER F-20

COMPONENT STATUS

RO FILTER F-01	RO FILTER F-02	RO FILTER F-03	RO FILTER F-04	RO FILTER F-05
RO FILTER F-06	RO FILTER F-07	RO FILTER F-08	RO FILTER F-09	RO FILTER F-10
RO FILTER F-11	RO FILTER F-12	RO FILTER F-13	RO FILTER F-14	RO FILTER F-15
RO FILTER F-16	RO FILTER F-17	RO FILTER F-18	RO FILTER F-19	RO FILTER F-20

Figure 2 – Screen shows the alarms of a low reservoir and low chlorine dosage

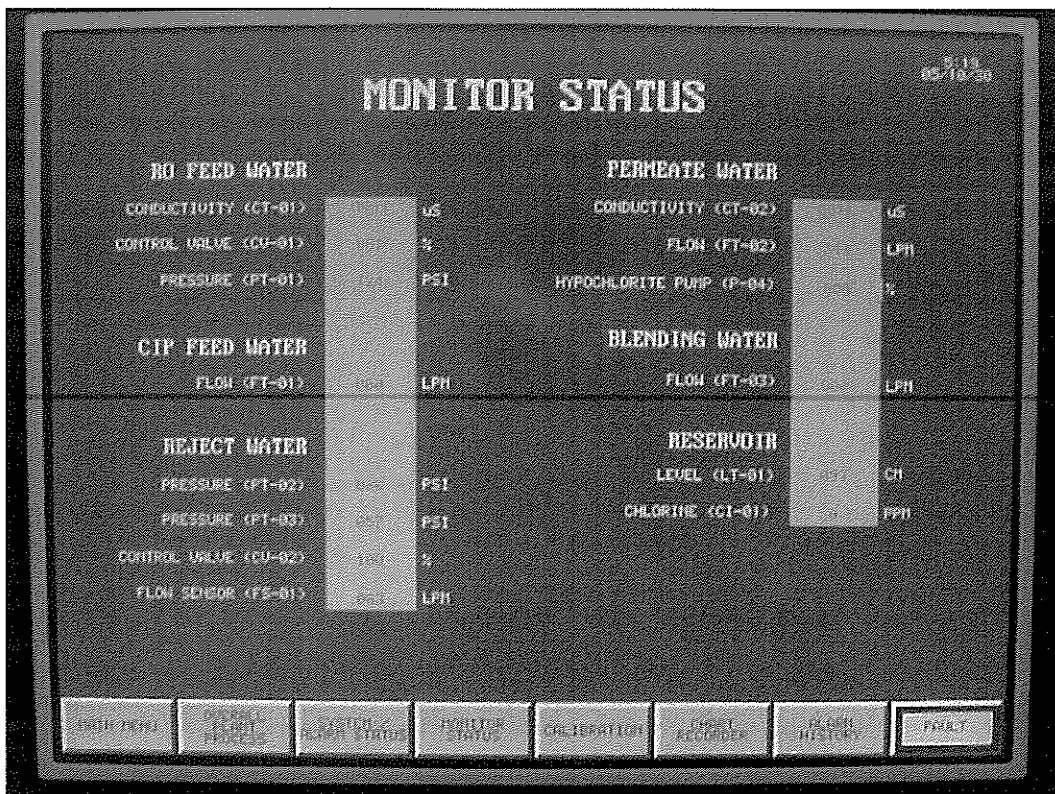


Figure 3 – The status of the water treatment plant is monitored at all times

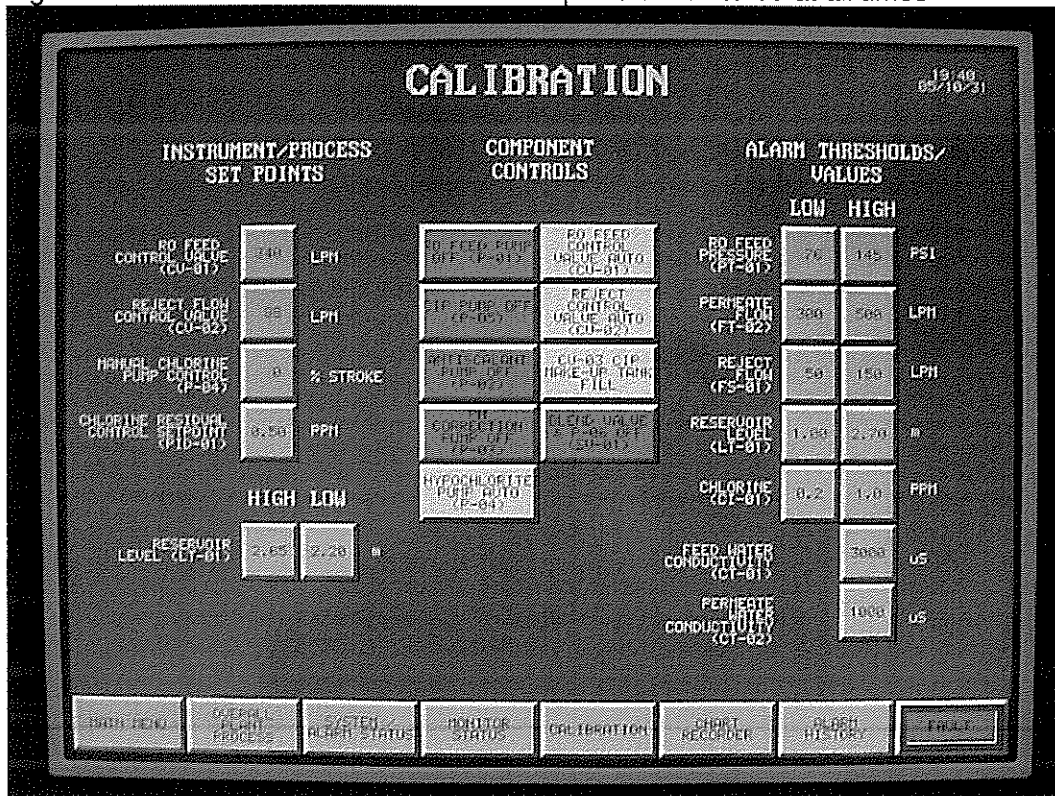


Figure 4 – The Calibration screen allows control of the processes



## **APPENDIX D. – Operational Quality Assurance and Control**

### **1.1 Introduction**

Quality assurance and quality control of the operation of the membrane equipment and the measured water quality parameters shall be maintained during the life of the water treatment plant.

### **1.2 Experimental Objectives**

The objective of this policy is to maintain strict QA/QC methods and procedures during the Equipment Commissioning and on-going operation. When specific items of equipment or instruments are used, the objective is to maintain the operation of the equipment or instructions within the ranges specified by the Manufacturer or by *Standard Methods*. Maintenance of strict QA/QC procedures is important, in that if a question arises when analyzing or interpreting data collected for a given experiment, it will be possible to verify exact conditions.

### **1.3 Work Plan**

Equipment flow rates and associated signals should be documented and recorded on a routine basis. A routine daily walk through shall be established to verify that each piece of equipment or instrumentation is operating properly. Particular care shall be taken to confirm that any chemicals are being fed at the defined flowrate into a flowstream that is operating at the expected flowrate, such that the chemical concentrations are correct. In-line monitoring equipment such as flowmeters, etc. shall be checked to confirm that the readout matches with the actual measurement (i.e. flowrate) and that the signal being recorded is correct. The items listed are in addition to any specified checks outlined in the analytical methods.

### **1.4 Daily QA/QC Verifications:**

- Chemical feed pump flowrates (verified volumetrically over a specific time period)
- Manual Chlorine level check against the Chlorine Analyzer.

### **1.5 QA/QC Verifications Performed Every Two Weeks:**

- In-line flowmeters/rotameters (clean equipment to remove any debris or biological buildup).
- Verify flow volumetrically to avoid erroneous readings.

### **1.6 QA/QC Verifications Performed Each Quarter of a Year Period:**

- Differential pressure transmitters (verify gauge readings and electrical signal using a pressure meter)
- Tubing (verify good condition of all tubing and connections, replace if necessary)
- Particle Counters (perform microsphere calibration verification)

### **1.7 On-Site Analytical Methods**

The analytical methods utilized in this study for on-site monitoring of raw water and filtered water quality are described in the section below. In-line equipment is recommended for its ease of operation and because it limits the introduction of error

and the variability of analytical results generated by inconsistent sampling techniques. In-line equipment is recommended for measurement of turbidity and for particle counting for feed water and is required for measurement of turbidity and for particle counting for filtered water.

### **1.7.1 pH**

Analyses for pH shall be performed according to Standard Method 4500-H+. A three-point calibration of the pH meter used in this study shall be performed once per day when the instrument is in use. Certified pH buffers in the expected range shall be used. The pH probe shall be stored in the appropriate solution defined in the instrument manual. Transport of carbon dioxide across the air-water interface can confound pH measurement in poorly buffered waters. If this is a problem, measurement of pH in a confined vessel is recommended to minimize the effects of carbon dioxide loss to the atmosphere.

### **1.7.2 Temperature**

Readings for temperature shall be conducted in accordance with Standard Method 2550. Raw water temperatures shall be obtained at least once daily. The thermometer shall have a scale marked for every 0.1 °C, as a minimum, and should be calibrated weekly against a precision thermometer certified by the National Institute of Standards and Technology (NIST). (A thermometer having a range of -1 °C to +51 °C, subdivided in 0.1 °C increments, would be appropriate for this work.)

### **1.10 Inorganic Samples**

Inorganic chemical samples, including, alkalinity, hardness, aluminum, iron, and manganese, shall be collected and preserved in accordance with Standard Method 3010B, paying particular attention to the sources of contamination as outlined in Standard Method 3010C. The samples shall be refrigerated at approximately 4 °C immediately upon collection, shipped in a cooler, and maintained at a temperature of approximately 4 °C during shipment. Samples shall be processed for analysis by a state-certified or third party- or EPA-accredited laboratory within 24 hours of collection. The laboratory shall keep the samples at approximately 4 °C until initiation of analysis.

### **1.11 Simulated Distribution System (SDS) Test Protocol**

The simulated distribution system (SDS) disinfection by-products (DBP) test simulates full-scale disinfection by spiking a water sample with a disinfectant and holding the spiked sample in the dark at a designated temperature and contact time. For this testing, one of two SDS approaches may be employed. The conditions selected for SDS evaluation may be those that most closely approximate the detention time and chlorine residual found in the distribution system at the location of testing. Alternatively, the uniform formation conditions (UFC) specified by the ICR may be adopted. The UFC, as specified under the ICR stipulate that the following set of conditions will be employed:

- incubation period of 24 +/- 1 hours,
- incubation temperature of 20 +/- 1.0 °C,
- buffered pH of 8.0 +/- 0.2,
- 24-hour chlorine residual of 1.0 +/- 0.4 mg Cl<sub>2</sub>/L.

For each SDS sample, three incubation bottles will be set up. At the end of the incubation period, each sample will be analyzed for the final disinfectant residual and the sample with the residual closest to the 1.0 +/- 0.4 mg/L range will be used for specified DBP analyses. One liter, amber coloured bottles with Teflon lined caps will be used to store the SDS samples during incubation. These bottles will be stored in a temperature-controlled incubator at the specified temperature.

All glassware used for preparation of the reagents will be chlorine demand free. Chlorine demand free glassware will be prepared by soaking glassware in a 50 mg/L chlorine bath for a period of 24 hours. At the end of this time, all glassware will be rinsed three times with organic -free water that has a TOC concentration of less than 0.2 mg/L. Glassware will then be dried at room temperature for a period of 24 hours. During the drying process, bottle openings will be covered with aluminum foil to prevent contamination. Reagents will be prepared as follows.

#### **1.11.1 Chlorine Sample Solution Preparation**

The stock solution is prepared by adding an estimated volume of 6% reagent-grade NaOCl into a 500-mL, chlorine demand free, bottle containing an estimated amount of organic -free water. To minimize the dilution error, the chlorine stock solution is required to be at least 50 times stronger than the chlorine dose required.

#### **1.11.2 Preparation of Additional Chemicals**

Refer to Standard Method 4500-CI F for the preparation method of DPD indicator, FAS standard and buffer solution. The phosphate buffer solution should be prepared as instructed in Standard Method 4500-CI F.

#### **1.11.3 Sample Collection and Incubation**

The samples will be collected in a 1-L amber bottle and stored in the dark at the predetermined temperature. Samples will be adjusted to the designated pH and chlorine residual for the distribution system at the chosen site. In the case that the UFC are adopted for SDS testing, the samples will be adjusted to pH 8.0 +/- 0.2 using 1M HCl or NaOH and will then be dosed with the appropriate dosage of chlorine to yield a chlorine residual of 1.0 +/- 0.4 mg Cl<sub>2</sub>/L after the specified 24-hour storage period. The samples will be capped head-space free and stored for the appropriate time (24 hours for UFC) in the dark at the appropriate incubation temperature.

#### **1.11.4 Analytical Measurements**

Residual free chlorine measurements will be conducted according to *Standard Methods* 4500-CI G. DPD Colorimetric Method. Specific parameters to be measured and recorded are outlined in the specific task descriptions.

**APPENDIX E. – Operation and Maintenance Costs**

(1) Estimated Yearly Costs

A. Chemical and consumables cost: (Based on 16 hrs of operation per day)  
Can \$

- 1. Sodium Hydroxide: @ 10 ppm and .....\$ 0.80/Kg
- 2. Sodium Hypochlorite: @ 2 ppm and .....\$ 0.75 /Kg
- 3. Cleaning chemicals .....(Average cleaning once a month)
- 4. Cartridge filters ..... (Average replacement once every three weeks for 400.00 process filter and once a month for CIP filter)
- 5. Membrane replacement (Based on 5 years operation life) ..... \$ 1,500.00

B. Operation and Maintenance cost

- 1. Spare parts (Seals, bearings, Lubrication & Misc. items) ..... \$ 300.00
- 2. Operator cost (Assuming 8 hrs/week at plant) @ \$12 /hr + burden.. \$15,000.00
- 3. Laboratory services (\$200 /month sample testing) ..... \$ 2,400.00

C. Electricity cost:

- 1. 30,000 KwHr @ \$ 0.09/KW hr average ..... \$ 2,000.00  
(Power cost can range between 0.08/KW hr and 0.10/KW hr)

Total annual operation cost .....	\$22,160.00
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**APPENDIX F. – Training Program**

- a) The Contractor shall provide designated Owner personnel training on the control system and equipment in this facility. The intent is to clearly and completely instruct the Owner on all the capabilities of the control system.
- b) Training manuals: The standard operating manual for the system and any special training manuals will be provided for each trainee, with three extra copies left for the O&M manuals in both electronic format (.PDF) and hard copy. In addition, copies of the system technical manual will be demonstrated during training and three copies submitted with the O&M manuals. Manuals shall include detailed description of the subject matter for each session. The manuals will cover all control sequences and have a definitions section that fully describes all relevant words used in the manuals and in all software displays. Manuals will be approved by the CE.
- c) The trainings will be tailored to the needs and skill-level of the trainees.
- d) The trainers will be knowledgeable on the system and its use. For the on-site sessions, the most qualified trainer(s) will be used. The Owner/CE shall approve the instructor prior to scheduling the training.
- e) During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system will be repaired or adjusted as necessary and the demonstration repeated.
- f) Provide services of controls Contractor's qualified technical personnel for contract required time to instruct Owner's personnel in operation and maintenance of WTP system. CE shall witness selected sessions if required. Instruction shall be in classroom setting at the project site for appropriate portions of the training. Training may be in non-contiguous days at the request of the CE or Owner.
- g) There shall be two training sessions:
  - 1. Training I. Control System. This training may be held on-site or in combination with training at the supplier's facility. If held off-site, the training may occur prior to final completion of the system installation. It shall include at a minimum:
    - Warning of the dangers of electrical shock.
    - Knowledge of the internal components of the control panel(s) and replacement thereof.
    - Limitations of use – some items should not be adjusted or repaired.
    - Use of the control switches on the face of the control panel.
    - Plant startup and operation.
    - Emergency and normal plant shut-down.
    - Manual startup and operation of the powered equipment.
    - Alarm simulation and actions to rectify the alarm.

- Plant troubleshooting.
- Optional control strategies that can be considered.
- All trending and monitoring features (values, change of state, totalization, etc.), including setting up, executing, downloading, viewing both tabular and graphically and printing trends. Trainees will actually set-up trends in the presence of the trainer.
- Every screen shall be completely discussed, allowing time for questions.
- Upon completion, each operator, using appropriate documentation, should be able to perform elementary operations and describe general hardware and functionality of the system.

2. Training III. Equipment Operation and Maintenance. This shall include the following items, at a minimum:

- Review of the process diagram.
- Review of all equipment as shown on the process diagram.
- Recognizing filter fouling.
- Removal and replacement of filter cartridges.
- Setting differential pressure gauges (if installed).
- Pump/motor lubrication (if required).
- RO membrane cleaning.
- Draining and cleaning of tanks.
- Filling tanks with appropriate chemicals.
- Level sensor/transmitter operation.
- Maintenance of the Ultraviolet disinfection equipment
- Removal and replacement of the UV lamp.
- Removal, cleaning and replacement of the UV quartz sleeve.
- Operation of the chlorination system
- Filling of chlorination tablets into holder.
- Taking water samples for analysis.

**ABOVE PRICES ARE:**

1. All applicable taxes extra.
2. **F.O.B. Jobsite.**
3. Terms net 30 days, subject to credit approval.
4. These prices hold good for 30 days from date of this quotation.

Yours truly,

**CENTURY ENVIRONMENTAL**



Terry Bourassa,  
Sales Representative

TB:sb/l:Century Environmental:Terry Bourassa:Quotes:2007



# FAX TRANSMISSION

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<b>TO:</b>	<b>DATE:</b> May 25, 2007
<b>COMPANY:</b>	<b>PAGES:</b> (Including Cover Page)
<b>FAX:</b>	<b>FROM:</b> Terry Bourassa, Sales Representative
<b>SUBJECT:</b>	<b>E-MAIL:</b> terry.bourassa@wolseleyinc.ca

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Regards,

**CENTURY ENVIRONMENTAL**

A handwritten signature in cursive script that reads "Terry Bourassa".

Terry Bourassa  
Sales Representative

TB:sb/l:Century Environmental:Terry Bourassa:Quotes:2007

