VILLAGE OF HARRISON HOT SPRINGS
NOTICE OF MEETING
AND MEETING AGENDA

COMMITTEE OF THE WHOLE

DATE: Monday, October 19, 2009
TIME: 4:00 p.m.
LOCATION: Council Chambers, Harrison Hot Springs

1. CALL TO ORDER

Meeting called to order by the Mayor.

2. ITEMS FOR DISCUSSION

Sewer Line to District of Kent

McCombs Road

3. REPORTS FROM MAYOR, REPORTS FROM COUNCILLORS

4. DELEGATIONS

5. STAFF REPORTS

6. PUBLIC QUESTIONS

7. ADJOURNMENT

Larry Burk
Chief Administrative Officer

RECEIVED
OCT 0 6 2009

FILE # 5340-20-01 | DATE OCT 0 6 2009
CAO | P/R
DCAO | ADMIN
DIR F | B/L ENF
SUP P/W | MAYOR
PAYROLL/TAX | COUNCIL
ITEM A B C
COUNCIL AGENDA
DATE
INITIAL
(ITEMS: A - REQ. ACTION; B - INFO - W RESP; C - INFO ONLY)

CIVIC CONSULTANTS

Oct. 6th, 2009

Project No. HKC Sanitary Sewer

Village of Harrison Hot Springs
Box 160, 495 Hot Springs Road
Harrison Hot Springs, BC
V0M 1K0.

Attention: Larry Burk
Chief Administrative Officer

Dear Sir:

Re: Harrison Hot Springs WWTP estimate.

With regard to a new WWTP based at the existing plant site, the prices I have received from Siemens Water Technogies for the MBR equipment sized just for the Village of Harrison Hot Springs are;

MBR System to meet Harrison Hot Springs Alone Flows $1,545,000 US

We have been provided rough estimates for the civil works;

MBR System to meet Combined Flows $1,545,000 US	$1,699,500
Tankage 400 m^3 at $1500/$m^3$ of concrete.	$ 600,000
Service building (10 m x 10 m – bare bones (no lunch room etc.)	$ 150,000
Electrical	$ 400,000
Mechanical	$ 550,000
35% eng. and contingencies	$1,189,825
	$4,589,325

The equipment supplied would be for a 3,971 m^3 plant. The plant design would be for 5,503 m^3. This would basically exchange a new MBR plant for your extended aeration activated sludge system. It would leave your influent bar screen, equalization tanks, equalization tank pumping station, magnetic flow meter, disinfection, outfall and biosolids handling system as is.

From the Dayton & Knight report, the influent bar screen has just recently been upgraded.

Also from the Dayton & Knight report, the concrete equalization tank is rated at a volume of 3,884 m^3 with 30 year old blowers. An equalization tank of approximately 400 m^3 is required to take the differential between the peak flow from the lift stations and the plant capacity for 2 hours. Having a larger equalization tank does provide a better Factor of Safety but if space is important, the equalization could be reduced. However, redundancy should be built into the plant (Category 1).

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From the Dayton & Knight report, the equalization tank pumping station pumps are 26 years old.

The disinfection system is currently chlorine with sodium sulphite used for dechlorination. If this was going to be upgraded, costing should be reviewed for UV. We have also obtained a price for Phosphorus removal. An alum feed system will run about $20,000 US (not including any bulk storage).

The Dayton & Knight report also recommends replacing the discharge piping. The estimated peak design flow is 3,630 m^3/day whereas the plant design MDF is 3,971 m^3/day for 2020.

In total, the Dayton & Knight report has estimated upgrading the system to an MBR would cost approximately $18,230,000.

Yours truly,

CIVIC CONSULTANTS

Lorne Davidson, P. Eng.
General Manager

LD/jk

RECEIVED
SEP 22 2009

FILE # 5340-20-01 | DATE SEP 22 2009
CAO | ACCTS P/R | DCAO | ADMIN | DIR F | B/L ENF | SUP P/W | MAYOR | PAYROLL/TAX | COUNCIL
ITEM A B C
COUNCIL AGENDA DATE
INITIAL
(ITEMS: A - REQ, ACTION; B - INFO - W RESP; C - INFO ONLY)

CIVIC CONSULTANTS

Sept 22nd, 2009

Project No. KHC Sanitary System

Village of Harrison Hot Springs
Box 160, 495 Hot Springs Road
Harrison Hot Springs, BC
V0M 1K0.

Attention: Larry Burk
Chief Administrative Officer

Dear Sir:

Re: Kent, Harrison, Corrections Service Canada (KHC) Sewer Upgrade

As requested by you, we have read the Dayton & Knight Harrison Hot Springs Wastewater Treatment Plant Feasibility Study and have tried to provide a closer estimation of the costs for the civil portion of the report.

Route Alignment

We have based the pipe alignment on a modified Route #1. The route alignment starts at PS #1 and goes along Cedar Street to Hot Springs Road. This change avoids the lengthy section along the banks of the Miami River (which would entail an expensive environmental report). The route then follows the west side of Hot Springs Road, approximately 1 to 1.5 meter off set from the edge of pavement, to McCallum Road. The Mountain/Kent Institution portion starts at PS #1B and follows along McCallum Hot Springs Road to Hwy. 9. The two routes connect at Pump Station #2. The route continues on the west side of Hwy 9 to the Lougheed Hwy. It is jacked under Hwy 9 and goes around the gas station (avoiding the new intersection). The route then follows along the north side of Lougheed Hwy to a point north of Pixley Road. The pipe will be jacked under the Hwy and the CPR tracks, follow along Pixley to Hwy 9, jacked under Hwy 9 and follow Tranmer to the Kent WWTP.

We have increased the diameter of the pipe listed in the Dayton & Knight Study at the suggestion of Don Chin of Flygt Pumps. He felt that a 200 or 250 diameter main would require high pressures and velocities that would exceed the recommended parameters.

We have also added in some pig launching ports for use in cleaning and inspecting the pipe works.

Civil Costs for the KHC Connection

The Dayton & Knight Study provides a preliminary estimate to upgrade the Kent WWTP to accommodate Mountain Prison and Harrison Hot Springs sewage flow of $4,500,000. The Study acknowledges that the estimate is based on "…an incomplete investigation of the Agassiz WWTP upgrade requirements." However, the Study did not identify if the upgrades are 100% required to add the Village and Mountain Prison or if some of the upgrades are required even if the Village and/or Mountain Prison do not participate.

The Study provided an estimate that the total cost to provide the sewer lines, lift stations and Kent WWTP upgrades to connect the Village and Mountain Prison to the Kent WWTP would be $15,324,525.

We asked four civil contractors to provide us with the cost for the piping works. As well, we asked Flygt Pumps to provide us with prices for PS #1A and PS #2 . We estimated the cost for PS #1B ourselves. In total the average prices for the sewer lines, lift stations and Kent WWTP upgrades (using the $4,500,000 figure provided by D & K for the Kent upgrade) was $9,578,050.

Using the cost sharing assumptions in the Dayton & Knight report (50-50 for the pipe work and 89% of the plant upgrade), the cost to the Village would be $7,594,105. The cost to Mountain Prison would be $1,983,947.

The cycling path from Harrison to Kent would cost an additional $700,000. Kent has agreed to share in this cost 50-50. Therefore the total cost to the Village for the sanitary connection and cycling path would be $7,950,000.

As this figure is at the lower end of the cost estimate for a new or upgraded Village Plant (see analysis below), it is evident that the concept of connecting the three entities together is the preferable choice if an acceptable agreement can be reached regarding operating costs.

Operating fees

A new fee for the operation of the joint WWTP should be calculated for the operation of the upgraded plant. This should then be split between all of the users from Kent, Harrison and the Mountain Prison. The rates should be equal and payable to Kent. Each area should be responsible for the operations and maintenance of the sanitary collection system within their own boundary. Operating budget/fees for the internal collection systems should be set for the use of the particular municipality or Federal Agency.

DCC's

Sanitary DCC Bylaw charges are based on proposed works in the Village. The fees are determined based on specific work items that need to be done for future expansion. They are dedicated to those particular works outlined in the DCC Bylaw.

The portion of the DCC Bylaw that is calculated for the provision of future plant expansion should be provided to Kent. The remainder would provide for future expansion of the Harrison Collection System and should remain with the Village.

It would also be an opportune time to establish a capital replacement fund (both for the collection system and the WWTP). This is a fund that would be collected and set aside for future capital replacement. This would ensure that the users would pay and that the sewer system would not be the responsibility of new property purchasers in the future.

Village Alone

The cost to the Village to go alone to Kent without Mountain Prison would be $3,200,000 for the piping and lift stations. The plant upgrade would be $5,000,000 (89 % of $4,500,000 plus 25%). The total cost would be $8,200,000.

Adding in $350,000 for the cycling path from Harrison to Kent would increase the total cost to the Village of $8,550,000.

The major unknown factor in these estimates is the cost of the Agassiz WWTP upgrade and what cost sharing should apply to the three parties. As well, the Village should know;

1. what operating costs should apply;
2. the portion of the DCC's which is ear marked for Plant upgrades,
3. whether or not a capital replacement fund should be established.

Village Plant

The Dayton & Knight Study estimates upgrading the Harrison WWTP to a Membrane Batch Reactor (MBR) Plant would cost $15,758,000 for the year 2018. Stage 2 would add an additional cost of $2,472,000 to provide for the 2028 capacity. This is a total of $18,230,000. In their Conclusions and Recommendation, Dayton & Knight acknowledge that there could be some reductions in the cost of an upgraded MBR plant; but they felt that the option of participating in a joint system with Kent and Mountain Prison would still be the preferred choice.

We have obtained cost estimates for the MBR equipment sized for the design flows. For the Village of Harrison Hot Springs alone, the cost of the equipment is $1,545,000 US. For the combined flows from Mountain Prison and the Village, the cost of the equipment is $1,720,000. We have enclosed a copy of this proposal.

There is a lot of room between $1,720,000 US and $18,230,000 Canadian to build a MBR plant. We asked various manufacturers to provide us with "ball park" estimates for a MBR plant with the required capacity. The estimates that we got back ranged from $7,000,000, $10,000,000, $13,000,000 and higher. The costs all depends on the standards requested for the plant and in particular, the Category of the plant and disposal site under consideration.

We also looked at an option of building a new plant on the Village owned site off McCoombs Drive. This would change the effluent disposal to a land discharge which would trigger an Environmental Impact Study being required. These are expensive and time consuming. It would however, change the requirements of the Plant from a Category 1 Plant to a Category 2 plant. As well, the EIS may reduce the requirements for nitrate and phosphorus removal which would lower the price.

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Summary of Cost Estimate Dayton and Knight Class D Harrison, Mountain Prison, Kent

1	**Forcemains (HDPE)**				
1.1	From Harrison WWTP (PS #1a) to PS #2	m	5960	$350.00	$2,086,000.00
1.2	From Mountain Kent Institution (PS #1b) to PS #2	m	2860	$250.00	$715,000.00
1.3	From PS#2 to Agassiz WWTP	m	5890	$350.00	$2,061,500.00
					$4,862,500.00
2	**Pump Stations**				
2.1	PS #1A at Harrison WWTP	L.S.	1	$137,000.00	$137,000.00
2.2	PS #1B at Mountain/Kent Institution	L.S.	1	$121,000.00	$121,000.00
2.3	PS #2 at McCallum Road and Hot Springs Road	L.S.	1	$172,000.00	$172,000.00
2.4	Miscellaneous Piping	L.S.	1	$50,000.00	$50,000.00
2.5	Electrical and Instrumentation	Each	3	$350,000.00	$1,050,000.00
2.6	Installation	Each	30%		$459,000.00
					$1,989,000.00
3	**Kent WWTP Improvements**				
3.1		L.S.	1	$4,500,000.00	$4,500,000.00
		Sub-Total			$11,351,500.00
		Eng. and Contingencies 35%			$3,973,025.00
		Total			$15,324,525.00

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Summary of Cost Estimates - Civic Consultants - Class C Harrison, Mountain Prison, Kent

1	**Forcemains (HDPE)**					
1.1	From Harrison WWTP (PS #1a) to PS #2	m	4717		$922,459.03	300 mm diameter HDPE Pipe
1.2	From Mountain Kent Institution (PS #1b) to PS #2	m	2860	$110.00	$314,600.00	150 mm diameter C900 Pipe
1.3	From PS#2 to Agassiz WWTP	m	5685		$717,338.66	300 mm diameter HDPE Pipe
1.4	Pig access points	each	9	$4,500.00	$40,500.00	
					$1,994,897.70	
2	**Pump Stations**					
2.1	PS #1A at Harrison WWTP	L.S.	1	$151,600.00	$151,600.00	
	Kiosk	L.S.	1	$123,050.00	$123,050.00	
2.2	PS #1B at Mountain/Kent Institution	L.S.	1	$121,000.00	$121,000.00	
	Kiosk	L.S.	1	$107,000.00	$107,000.00	
2.3	PS #2 at McCallum Road and Hot Springs Road	L.S.	1	$161,600.00	$161,600.00	
	Kiosk	L.S.	1	$128,293.00	$128,293.00	
2.4	Electrical and Instrumentation	Each	3	$50,000.00	$150,000.00	
2.5	Installation	Each	3	$75,000.00	$225,000.00	
					$1,167,543.00	
3	**Kent WWTP Improvements**					
3.1		L.S.	1	$4,500,000.00	$4,500,000.00	
		Sub-Total			$7,662,440.70	
		Eng. and Contingencies 25%			$1,915,610.17	
		Total			$9,578,050.87	

Notes

Civic has assumed that the Kent WWTP Improvements would cost $4,500,000 as provided by D & K..
Dayton and Knight have provided a new pump station at the existing plant.
Civic has assumed replacing the existing pump station #1.

Dayton and Knight have provided a separate figure for miscellaneous piping (2.4)
Civic has included the miscellaneous piping in the forcemain costs of tying into the lift stations.
Civic has assumed the length of the forcemain for the Mountain Prison to be the same as provided by Dayton and Knight
Civic has assumed that there would be no dewatering for the installation of the lift stations.

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Summary of Cost Estimates - Civic Consultants - Class B Harrison, Kent

1	**Forcemains (HDPE)**					
1.1	From Harrison WWTP (PS #1a) to PS #2	m	4717		$717,338.66	300 mm diameter HDPE Pipe
1.2	From PS#2 to Agassiz WWTP	m	5685		$922,459.03	300 mm diameter HDPE Pipe
1.3	Pig access points	each	8	$4,000.00	$32,000.00	
					$1,671,797.70	
2	**Pump Stations**					
2.1	PS #1A at Harrison WWTP	L.S.	1	$151,600.00	$151,600.00	
	Kiosk	L.S.	1	$123,050.00	$123,050.00	
2.2	PS #2 at McCallum Road and Hot Springs Road	L.S.	1	$161,600.00	$161,600.00	
	Kiosk	L.S.	1	$128,293.00	$128,293.00	
2.3	Electrical and Instrumentation	Each	2	$50,000.00	$100,000.00	
2.4	Equilization Tanks	Each	2	$60,000.00	$120,000.00	
2.5	Installation	Each	2	$75,000.00	$150,000.00	
					$934,543.00	
3	**Cycling Path**					
3.1	7,356 m - 2 meters wide	L.S.	1	$486,432.00	$486,432.00	
3.2	Telephone Pole Relocation	L.S.	1	$50,000.00	$50,000.00	
3.3	Environmental Assessment	L.S.	1	$20,000.00	$20,000.00	
					$556,432.00	
		Sub-Total			$3,162,772.70	
		Eng. and Contingencies 25%			$790,693.17	
		Total			$3,953,465.87	

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Summary of Cost Estimates - Civic Consultants - Class C Mountain Prison to HHS WWTP

1	**Forcemain (150 mm C900)**				
1.1	From Mountain Prison to PS #1	m	7577	$125.00	$947,125.00
2	**Pump Station**				
2.1	At Mountain Prison	L.S.	1	$100,000.00	$100,000.00
2.3	Kiosk	Each	1	$107,000.00	$107,000.00
2.4	Electrical	L.S.	1	$50,000.00	$50,000.00
2.4	Installation	Each	2	$75,000.00	$150,000.00
2.5	Upgrade PS #1	L.S.	1	$50,000.00	$50,000.00
					$457,000.00

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Estimate for the Kent/Harrison Sanitary Sewer Works		
Pipe Work		
5685 meters of 300 mm dia. HDPE from the Kent WWTP to McCallum Road		$922,459.03
15% contingencies		$138,368.86
10% engineering		$106,082.79
		$1,166,910.68
4717 meters of 300 mm dia. HDPE from McCallum Road to PS #1 HHS		$717,338.66
15% contingencies		$107,600.80
10% engineering		$82,493.95
		$907,433.41
	Total Pipe Work	**$2,074,344.09**
Cycling Path		
7,356 meters, 2 meters wide, crushed gravel surface		$486,432.00
telephone pole relocation		$50,000.00
Environmental Assessment for ditches		$20,000.00
15% contingencies		$83,464.80
10% engineering		$63,989.68
	Total Cycling Path	**$703,886.48**
Pump Stations		
PS #1a HHS		
Pumps 2 at $34,500 each		$69,000.00
FRP Tank - 4 meter diameter		$82,600.00
Kiosk		$123,050.00
Electrical		$50,000.00
Installation - ($75,000 estimate)		$75,000.00
Equilization Tank ($60,000 estimate)		$60,000.00
		$459,650.00
15% contingencies		$68,947.50
10% engineering		$52,859.75
		$581,457.25
PS #2 McCallum Road		
Pumps 2 at $39,500 each		$79,000.00
FRP Tank - 3 meter diameter		$82,600.00
Kiosk		$161,600.00
Electrical		$50,000.00
Installation - ($75,000 estimate)		$75,000.00
Equilization Tank ($60,000 estimate)		$60,000.00
		$508,200.00
15% contingencies		$76,230.00
10% engineering		$58,443.00
		$642,873.00
	Total Pump Stations	**$1,224,330.25**
	Total	**$4,002,560.82**

Sanitary Sewer - Kent WWTP to McCallum

ITEM NO.	DESCRIPTION	PIPE	UNIT	QTY M	Timbro UNIT PRICE	Timbro AMOUNT $	Jakes UNIT PRICE	Jakes AMOUNT $	Strohmaier UNIT PRICE	Strohmaier AMOUNT $	Average
1	WWTP connection	300 HDPE	1		$20,000.00	$20,000.00	$20,000.00	$20,000.00	$20,000.00	$20,000.00	
2	WWTP to McDonald	300 HDPE		210	$140.00	$29,400.00	$88.00	$18,480.00	$106.92	$22,453.20	
	(west side shoulder in RW)										
3	McDonald crossing (open cut)	300 HDPE		15	$326.00	$4,890.00	$330.00	$4,950.00	$153.26	$2,298.90	
4	Tranmer to Hwy 9 (west shoulder)	300 HDPE		880	$110.00	$96,800.00	$88.00	$77,440.00	$107.10	$94,248.00	
5	90° sweep	300 HDPE	2		$500.00	$1,000.00	$500.00	$1,000.00	$500.00	$1,000.00	
6	open pavement cut crossings	300 HDPE		20	$316.00	$6,320.00	$250.00	$5,000.00	$152.76	$3,055.20	
7	Trans Mountain pipe line crossing	300 HDPE	1		$4,500.00	$4,500.00	$4,500.00	$4,500.00	$4,500.00	$4,500.00	
8	45° sweep	300 HDPE	1		$500.00	$500.00	$500.00	$500.00	$500.00	$500.00	
9	Lougheed Hwy crossing	300 HDPE	1		$40,000.00	$40,000.00	$40,000.00	$40,000.00	$40,000.00	$40,000.00	
10	45° sweep	300 HDPE	1		$500.00	$500.00	$500.00	$500.00	$500.00	$500.00	
11	Pixley (open cut R & R)	300 HDPE		220	$150.00	$33,000.00	$250.00	$55,000.00	$153.09	$33,679.80	
12	CNR Crossing	300 HDPE	1		$47,000.00	$47,000.00	$47,000.00	$47,000.00	$47,000.00	$47,000.00	
13	90° sweep	300 HDPE	3		$500.00	$1,500.00	$500.00	$1,500.00	$500.00	$1,500.00	
14	Main between Lougheed Hwy and CNR	300 HDPE		260	$115.00	$29,900.00	$92.00	$23,920.00	$111.56	$29,005.60	
15	Lougheed Hwy crossing	300 HDPE	1		$47,000.00	$47,000.00	$47,000.00	$47,000.00	$47,000.00	$47,000.00	
16	Lougheed Hwy north shoulder 1 m off-set	300 HDPE		1230	$146.00	$179,580.00	$108.00	$132,840.00	$111.42	$137,046.60	
17	Lougheed Hwy north shoulder	300 HDPE		670	$140.00	$93,800.00	$250.00	$167,500.00	$157.34	$105,417.80	
	(1.5 m off-set asphalt restoration)									$0.00	
18	Lougheed Hwy behind poles	300 HDPE		550	$113.00	$62,150.00	$113.00	$62,150.00	$111.55	$61,352.50	
	(from asphalt shoulder to bend in Hwy)									$0.00	
19	Lougheed Hwy shoulder of road	300 HDPE		320	$115.00	$36,800.00	$113.00	$36,160.00	$111.47	$35,670.40	
	in front of poles to gas station	300 HDPE									
20	Around the back of the gas station in a RW	300 HDPE		150	$148.00	$22,200.00	$92.00	$13,800.00	$111.57	$16,735.50	
21	Jacked crossing of Hwy 9	300 HDPE	1		$35,000.00	$35,000.00	$35,000.00	$35,000.00	$35,000.00	$35,000.00	
22	Hwy 9 west side 1 m off-set to McCallum	300 HDPE		1160	$111.00	$128,760.00	$108.00	$125,280.00	$111.46	$129,293.60	
23	Tie into Lift Station #2 at McCallum	300 HDPE	1		$20,000.00	$20,000.00	$20,000.00	$20,000.00	$20,000.00	$20,000.00	
						$940,600.00		$939,520.00		$887,257.10	$922,459.03
				5685							

The costs identified in blue were numbers that were provided to the Tenderers by Civic Consultants.

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Sanitary Sewer - McCallum to PS #1 HHS

ITEM NO.	DESCRIPTION	PIPE	UNIT	QTY M	Timbro UNIT PRICE	Timbro AMOUNT $	Jakes UNIT PRICE	Jakes AMOUNT $	Strohmaier UNIT PRICE	Strohmaier AMOUNT $	Average
24	Open pavement cut McCallum	300 HDPE		11	$466.00	$5,126.00	$330.00	$3,630.00	$158.49	$1,743.39	
25	Hwy 9 west side 1 m off-set to narrow RW	300 HDPE		1520	$111.00	$168,720.00	$115.00	$174,800.00	$114.96	$174,739.20	
26	Hwy 9 west side narrow RW	300 HDPE		300	$113.00	$33,900.00	$118.00	$35,400.00	$111.57	$33,471.00	
27	Hwy 9 west side 1 m off-set to McPherson	300 HDPE		700	$117.00	$81,900.00	$108.00	$75,600.00	$111.47	$78,029.00	
28	Hot Springs Rd from McPherson to bridge crossing 1 m off-set	300 HDPE 300 HDPE		1156	$111.00	$128,316.00	$104.00	$120,224.00	$111.50	$128,894.00	
29	Cased Bridge Crossing	300 HDPE	1		$30,000.00	$30,000.00	$30,000.00	$30,000.00	$30,000.00	$30,000.00	
30	Hot Springs Rd from bridge crossing to bridge crossing 1 m off-set	300 HDPE 300 HDPE		740	$111.00	$82,140.00	$118.00	$87,320.00	$111.40	$82,436.00	
31	Cased Bridge Crossing	300 HDPE	1		$35,000.00	$35,000.00	$35,000.00	$35,000.00	$35,000.00	$35,000.00	
32	open pavement cut Hot Springs Road	300 HDPE		110	$156.00	$17,160.00	$250.00	$27,500.00	$157.68	$17,344.80	
33	90^0 sweep	300 HDPE	1		$500.00	$500.00	$500.00	$500.00	$500.00	$500.00	
34	open pavement cut Cedar Street to PS #1	300 HDPE		180	$151.00	$27,180.00	$250.00	$45,000.00	$157.47	$28,344.60	
35	Mobilization, Bonding and insurance		1		$44,569.00	$44,569.00	$48,000.00	$48,000.00	$56,710.00	$56,710.00	
36	Cleaning, testing, material testing and survey		1		$34,713.00	$34,713.00	$85,000.00	$85,000.00	$27,606.00	$27,606.00	
				4717		$689,224.00		$767,974.00		$694,817.99	$717,338.66
					Total	**$1,629,824.00**	**Total**	**$1,707,494.00**	**Total**	**$1,582,075.09**	**$1,639,797.70**

410 – 3rd Street, New Westminster, B.C., V3L 2S2 (604) 526-2615 off. (604) 526-4194 fax
Chilliwack (604) 792-1600

Cycling Path

ITEM NO.	DESCRIPTION	UNIT	QTY M	Timbro UNIT PRICE	Timbro AMOUNT $	Span UNIT PRICE	Span AMOUNT $	Average
1	Re and Re asphalt shoulder 2 m wide for item 18		500	$55.00	$27,500.00	$98.00	$49,000.00	
2	2 m wide walkway behind poles (fill onto RW) for item 19		550	$55.00	$30,250.00	$120.00	$66,000.00	
3	2 m wide walkway in front of poles for item 20 tie to new walkway		320	$54.00	$17,280.00	$70.00	$22,400.00	
4	2 m wide walkway over pipe line for item 22		1160	$54.00	$62,640.00	$70.00	$81,200.00	
5	2 m wide walkway over pipe line for item 25, 26, 27, 28, 30 and 32		4526	$54.00	$244,404.00	$65.00	$294,190.00	
6	install Telus underground item 26		300	$170.00	$51,000.00	$90.00	$27,000.00	
7	relocate Telus poles to 2 m west of EP on Hwy 9 and Hot Springs Road c/w 5 m of 450 mm culvert and sandbag head walls	60						
	Total		7356		$433,074.00		$539,790.00	$486,432.00

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Chilliwack (604) 792-1600

The civil numbers we obtained from the four civil contractors were very close with the exception of Span Valley. We therefore did not use his tender in our averages. We also removed the high and the low prices for the cycling path. Jakes was quite a bit low and Strohmaier was quite a bit high. We therefore took the average of Timbro and Span.

With regard to the prices for a cost to upgrade the WWTP for the Village, we have not inspected the condition of the existing plant to determine what we would recommend needs replacing. The Dayton and Knight Study did conclude that "The Village of Harrison Hot Springs WWTP is now past its useful life and is not an appropriate technology for the protection of the environment and life style of the Harrison community and recreational area." The estimates of costs for a new plant range from $7,000,000 to $18,230,000. If more accurate estimates are desired, we would have to negotiate the design-build costs with at least three manufactures providing them with an array of items and parameters that are;

1. necessary to meet the MSR parameters,
2. necessary for redundancy for the Category of Plant to be built,
3. items that would be useful but not critical,
4. wish list items.

The other costs that should be determined would be the cost to upgrade the Kent WWTP just for the Village and the Mountain/Kent Institution along with the Operating Costs for the upgraded plant. A formula for sharing those costs would also have to be determined and agreed on.

I thrust that the above information is what you require. Please feel free to contact me if you need anything further.

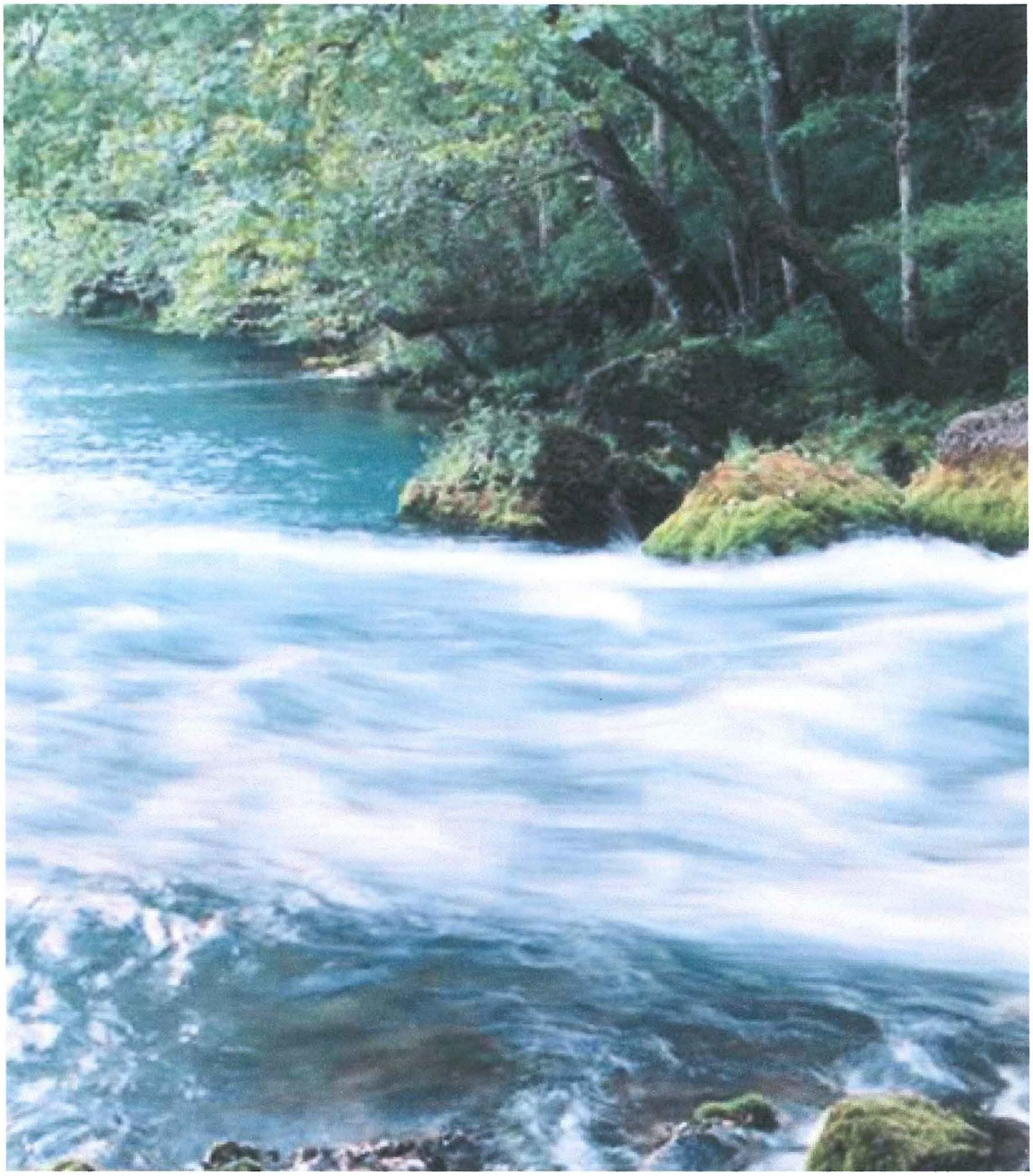
Yours truly,

CIVIC CONSULTANTS

Lorne Davidson, P. Eng.
General Manager

LD/jk

S340-20-01



MemPulse™ Membrane Bioreactor System Budgetary Proposal

Village of Harrison Hot Springs
British Columbia, Canada

September 2009

Water Technologies

SIEMENS

Siemens Water Technologies
1901 S. Prairie Ave.
Waukesha, WI 53189

Telephone: 800-524-6324
Fax: 262-547-4120

SIEMENS

September 2009

Lorne Davidson
Civic Consultants
410 3rd Street
New Westminster, BC
V3L 2S2

Subject: MemPulse™ Membrane Bioreactor System Proposal for Village of Harrison Hot Springs

Dear Lorne Davidson :

Siemens Water Technologies welcomes the opportunity to propose a membrane bioreactor (MBR) wastewater treatment system for your consideration as part of the Village of Harrison Hot Springs WWTP. The advantages of working with Siemens on your MBR project include access to our **vast experience, innovative technologies, and dependable support services**.

Siemens has over 50 years of experience in the design of wastewater treatment systems and over 25 years of experience in the design of membrane filtration systems. With this level of experience you can rely on Siemens to design and supply a reliable MBR system for your treatment plant.

Siemens is also committed to being an innovation leader, ensuring our customers get the most advanced technology available. To accomplish this Siemens has over 32,000 R&D employees in 150 locations worldwide with an annual R&D budget of over $5 billion.

Lastly, Siemens understands the importance of dependable customer support, and has developed a strategic services network that enables us to reach over 85% of the North American population within a 2 hour drive.

We appreciate your consideration and hope that in review of our proposal you find the information provided is complete and conclude that Siemens offers the best overall value and lasting partnership for your project. Should you require additional information or wish to discuss the contents of this Proposal further, please contact:

John Irwin
Telephone: 734-995-1283
E-mail: John.Irwin@Siemens.com

Regards,

John Irwin
Siemens Water Technologies

SIEMENS

WATER TECHNOLOGIES

MemPulse™ Membrane Bioreactor System Budgetary Proposal

to

Lorne Davidson

for

Village of Harrison Hot Springs

September 2009

Siemens Water Technologies Confidential Information

Table of Contents

1 Design Basis

The design basis for our solution is summarized in this section. Please review these design criteria carefully to insure they reflect your latest project needs.

Influent Flows

A summary of the design influent flow rates is presented in Table 1.

Table 1: MBR system design influent flow rates.

Parameter	Harrison Hot Springs Alone	Combined	Units
Average Daily Flow	3,050 (805,725)	3,461 (914,300)	m^3/d (gpd)
Maximum Month Flow	3,050 (805,725)	3,461 (914,300)	m^3/d (gpd)
Peak Daily Flow	4,128 (1,090,629)	4,589 (1,212,360)	m^3/d (gpd)
Peak Hourly Flow	4,128 (1,090,629)	4,589 (1,212,360)	m^3/d (gpd)

Influent Wastewater Quality

A summary of the design influent wastewater quality is presented in Table 2.

Table 2: MBR system design influent wastewater quality.

Parameter	Value[1]	Units
Biochemical Oxygen Demand (BOD_5)	250	mg/L
Chemical Oxygen Demand (COD)	500	mg/L
Total Suspended Solids (TSS)	300	mg/L
Ammonia Nitrogen (NH_3-N)	28	mg/L
Total Kjeldahl Nitrogen (TKN)	40	mg/L

1 Customer must confirm for any associated process guarantee or membrane warranty.

Parameter	Value[1]	Units
Total Phosphorus	11	mg/L
Alkalinity[2]	> 250	mg/L as $CaCO_3$
Fats, Oils & Grease (FOG)	< 100	mg/L
Maximum Influent Temperature	30	°C
Minimum Influent Temperature	10	°C

Effluent Requirements

The proposed MemPulse™ MBR system is designed to produce effluent with a quality as described in Table 3.

Table 3: MBR system effluent quality.

Parameter	Value	Units
Biochemical Oxygen Demand (BOD_5)	5	mg/L
Total Suspended Solids (TSS)	5	mg/L
Ammonia Nitrogen (NH_3-N)	10	mg/L
Total Nitrogen	20	mg/L

2 Process Flow Diagram

The proposed Membrane Bioreactor (MBR) treatment system consists of the following unit processes in series:

- Flow Equalization (by others)
- Pretreatment system including fine screening (by others)
- Biological treatment system using Siemens BioNutre™ process
- Membrane filtration using Siemens MemPulse™ Membrane System

The process flow diagram of the proposed MBR System is shown in Figure 1 below.

[2] If the wastewater alkalinity is less than the value listed, supplemental alkalinity may be required.

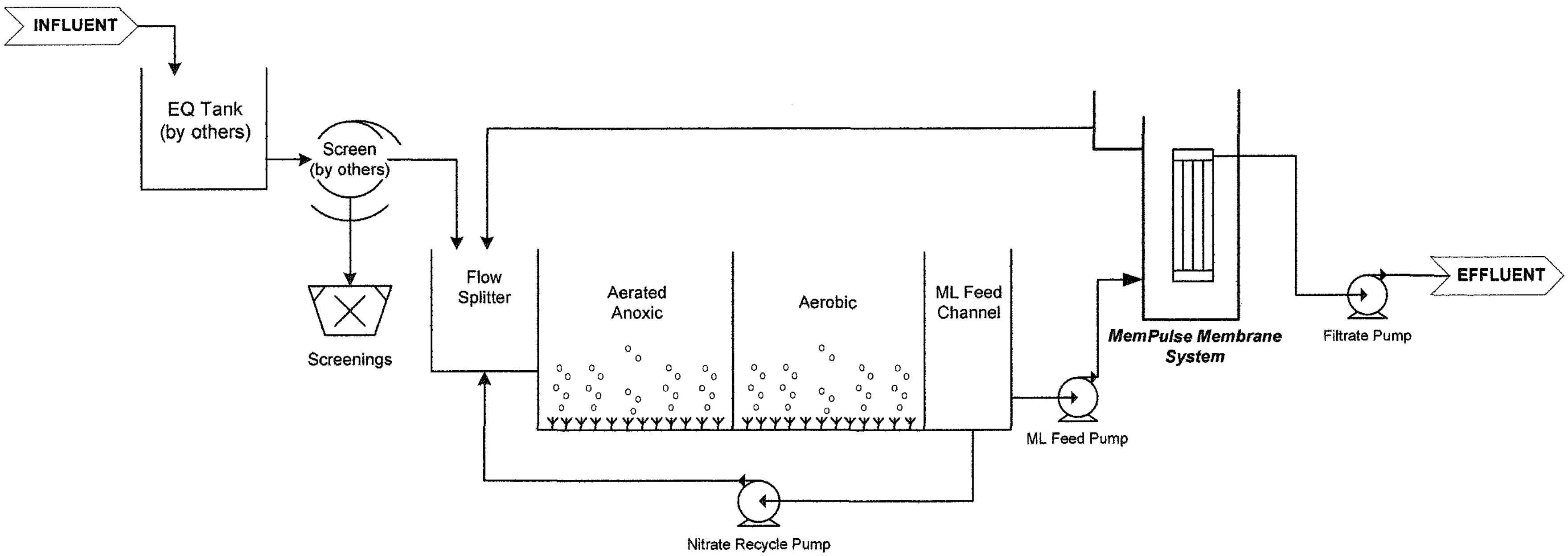


Figure 1: Process flow diagram.

3 Process Description

Flow Equalization (by others)

A flow equalization system will provided by others upstream of the membrane bioreactor system.

The proposed MBR system is designed with the assumption that any flows greater than peak day flow listed in Table 1 are equalized.

Pre-Treatment (by others)

Siemens recommends the following pre-treatment for the membrane bioreactor system.

Grit Removal

Siemens recommends grit removal prior to the MBR system. Grit generally consists of sand, gravel, cinders, shells or any other heavy materials that are not readily biodegradable.

is this done sufficiently in the equalizing tank? if not $'s, size, location?

Incomplete removal of grit will result in accumulation of grit in the process tanks and membrane tanks, as well as increased wearing of pumps, valves and other equipment. Grit can also cause wearing and abrasion of the membranes which will decrease system performance and decrease membrane life. Therefore grit removal is an important step in the MBR process.

Fats, Oil, and Grease

– we should check what we have now! – we institute a grease trap inspection process in VHHS

Fats, oils and grease (FOG) can be problematic to both the biological and membrane systems in the MBR. Excessive amounts of FOG in the wastewater will coat the outside of the membrane fibers causing a decrease in the membrane performance. Once membrane fibers become coated with FOG, it becomes extremely difficult to clean and recover the membranes to their desired performance level.

How to reduce or eliminate? $'s

Therefore FOG content entering the MBR process shall be <100 mg/L. If the influent FOG level is higher than this, pre-treatment of FOG will be required. → $'s, size, location?

Fine Screening

Fine screening of either raw sewage or mixed liquor is a vital step to membrane filtration. Fibrous material such as paper or human hair is well known to entangle around membranes and are very difficult to remove. These gross solids also act as collectors causing more solids to accumulate thus severely effecting membrane performance.

Therefore it is essential to remove fibrous materials before they get to the membrane system. Operating experience suggests that a perforated plate screen with mesh size equal to or less than 1 mm remove most fibrous materials.

$'s – what do we have now – cost to maintain? – disposal of material?

A 1 mm screening is highly recommended to provide the best operating environment for the membranes. The maximum allowable screen opening is 2 mm perforated plate. If the 2 mm screen is selected, rescreening of the mixed liquor at over 1.3 times the average daily flow or the use of a basket strainer/ static screen before the mixed liquor enters the membrane tank is required.

$'s, what we have now work? – material disposal?

BioNutre™ System Description

The proposed biological treatment process is based upon Siemens BioNutre™ biological process, which is a suspended growth activated sludge process designed for energy efficiency and biological nutrient removal (BNR) performance. The proposed BioNutre™ process is designed as two (2) parallel treatment trains, each with two (2) complete-mix reactors operated in series. The first reactor is operated as aerated anoxic reactor and the second reactor is operated as an aerobic reactor.

Siemens aerated anoxic technology promotes simultaneous nitrification/denitrification to improve total nitrogen removal efficiencies and reduce aeration energy requirements. Siemens aerated anoxic technology uses our patented Smart BNR™ control system to manage oxygen delivery to the aerated anoxic reactors. The SmartBNR™ control system uses oxidation reduction potential (ORP) measurement to monitor and control oxygen delivery to the aerated anoxic reactors to maintain an oxygen deficient environment so that denitrification occurs as well as nitrification. Operating a system with simultaneous nitrification/denitrification will conserve energy and increase operator flexibility for the following reasons:

- Greater driving force increases oxygen utilization rate by increased field correction factor.
- Simultaneous nitrification/denitrification increases the denitrification rate in the system, resulting in a greater denitrification credit which results in lower overall oxygen demand. Greater denitrification also increases the alkalinity recovery resulting in a more stable pH throughout the system and less chemical addition (if necessary).
- Increased "work" performed in anoxic reactor reduces surfactants early in the treatment process which results in higher alpha values in subsequent bioreactors.
- Increased "work" performed in anoxic reactor reduces nitrification requirement in aerobic reactors. This enables most plants to more easily cope with peak nitrogen loads as more nitrifiers are available during these peaks.

chemical = ? $'s, operation req'ts re: staff training, safety elements etc

Aeration System

The proposed BioNutre™ process is designed with Siemens DualAir® fine bubble diffusers. The DualAir® diffuser assembly includes two diffuser bases molded together with a curved saddle formed between the diffusers. The EPDM membrane media is a high pressure molded compound with superior rebound memory. The membrane includes perforated "I" slits that resist tearing and stay cleaner for longer time periods. They open when airflow is present, and close when airflow is stopped reducing the chance for backflow of solids to clog the diffuser. The photo below shows our DualAir diffuser assembly.

- cleaning frequency?
- cost
- downtime
- staff
- cleaning time

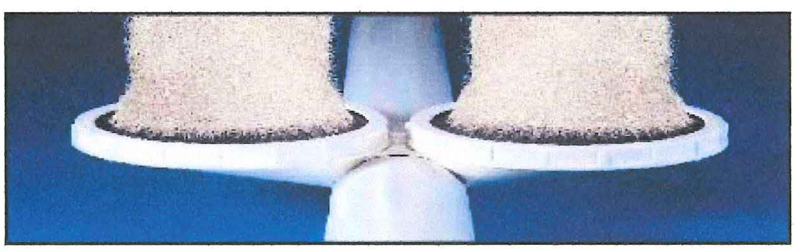


Figure 2: Siemens DualAir® fine bubble diffused air assembly.

MemPulse™ Membrane System

Siemens MemPulse™ membrane system is an advanced wastewater treatment technology which follows the biological treatment process and uses low pressure submerged membranes to extract liquid from the suspended growth activated sludge. The membrane system replaces secondary clarifiers typically used in conventional waste treatment methods for solid/liquid separation. However, unlike secondary clarifiers, the quality of solids separation is not dependent on the settling characteristics of the mixed liquor, making membrane filtration a much more reliable process.

Membrane Module

The most critical component of the membrane system are the membrane modules. Siemens hollow fiber membrane modules are made of chlorine tolerant PVdF homogeneous asymmetric ultrafiltration membranes. Each module contains thousands of fibers which are partitioned into thin fiber bundles. The fibers are sealed with polyurethane "pots" at each end of the module. The upper pot allows filtered water to pass from the hollow inner core, or lumen, of the membrane fibers into the filtrate manifold. The lower pot seals the ends of the fibers but allows the two-phase mixed liquor and air scour to pass through a series of openings to the outside surfaces of the fibers within the bundles.

Figure 3: Siemens hollow fiber membrane module.

The membrane modules are then assembled onto a rack assembly which is capable of manifolding up to sixteen (16) membrane modules. Siemens rack assemblies have two (2) integrated sub-manifolds along the top of the rack assembly which transfer air to each module and filtrate from each module. The rack sub-manifolds are then connected to the main air and filtrate tank headers. In contrast to other systems which use a steel frame to support the membranes, Siemens membrane system uses the rack assembly as the support structure for the membrane modules. The rack assemblies are then supported within the membrane tanks by fabricated steel wall supports.

steel = life span?

Figure 4: Siemens rack assembly fitted with sixteen (16) membrane modules and supported by a rack lifting beam during removal from tank.

During filtration, wastewater is drawn through the membranes modules using the vacuum developed by the suction of the filtrate pump. As water flows through the porous membrane, particulate matter is retained at the surface of the membrane.

MemPulse™ Air Scour Technology

Siemens MemPulse™ air scouring system is the latest advancement in air scour technology which offers both energy savings and operational simplicity.

The key innovation leading to Siemens MemPulse™ technology was the development of the MemPulse™ skirt assembly. The MemPulse™ skirt assembly is a non-mechanical device which is attached to the base of each membrane module. The MemPulse™ device performs two functions which contribute to more efficient performance of the membrane system: 1) converts continuous air flow into irregular bursts of air creating high turbulence scouring of the membranes, 2) provides uniform distribution of mixed liquor in the membrane tanks.

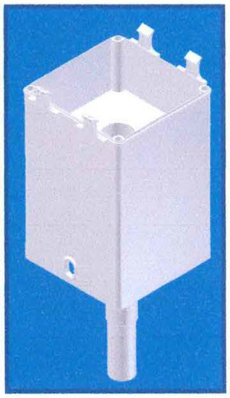


Figure 5: Siemens MemPulse™ skirt assembly.

The burst of air delivered by the MemPulse™ device creates a plug flow effect as it rises along the membrane fibers. The plug flow effect maximizes shear and turbulence for optimum scouring with minimal energy input to the system.

The MemPulse™ skirt assembly also contributes to mixed liquor distribution in the membrane tank by pulling mixed liquor up through the skirt as it releases the burst of air. This positive fluid transfer of mixed liquor results in a more uniform distribution of flow and solids within the membrane tank eliminating polarization (concentration) of suspended solids around the membrane fibers.

The **MemPulse™ design also offers maintenance advantages** compared to other air scouring technologies. The MemPulse™ system has no moving parts and does not require the use of cycling valves. This eliminates system downtime and O&M costs associated with replacement of failed cycling valves.

4 MEMBRANE SYSTEM CLEANING PROTOCOL

During the membrane filtration process, solids from the mixed liquor tend to form a compressible filter cake on the membrane surfaces. As this filter cake accumulates on the membrane surfaces it increases the headloss or pressure drop across the membrane. This pressure drop is commonly referred to as the Transmembrane Pressure (TMP). Therefore in order to maintain a reasonable pressure drop or TMP across the membranes, the filter cake or fouling layer must be controlled.
Siemens uses three membrane cleaning processes to minimize this fouling layer, namely:

- Relaxation;
- Maintenance Clean;
- Chemical Clean-in-Place (CIP).

Relaxation

Relaxation takes place when filtration through the membranes is stopped. When filtration is stopped the TMP is reduced to zero, allowing the filter cake to relax and expand. When the filter cake becomes relaxed it takes less energy to remove the filter cake from the membranes, therefore making the air scouring process more efficient.

Siemens implements the following Relaxation cycle for its membrane systems:

- Frequency: Every 12 minutes
- Duration: Filtration is stopped for 60 seconds

Maintenance Clean

Maintenance cleans are performed to provide interim disinfection of the membrane modules and filtrate pipe work to extend the interval between recovery cleans. They are less comprehensive and require less downtime than full recovery cleans, but more effective than regular relaxations and backwashes at removing particles from the membrane surface.

During a maintenance clean, filtration is paused and chlorinated filtrate is pumped backwards (inside to out) through the fibers at an average flow rate of 2.5 gpm per module and a concentration of 200-300 mg/L. The solution flows through the fiber into the mixed liquor and any residual chlorine is consumed. The mixed liquor feed pump and air scouring continue throughout the duration of the maintenance clean. Once the maintenance clean is completed the membrane tank is automatically brought back into service if needed.

Siemens membrane system is designed to perform maintenance cleans on a weekly basis. In periods of abnormally high organic loading, the maintenance clean can be conducted more frequently. The following table summarizes the maintenance clean frequency, duration, chemical consumption, and water consumption for the Santaquin membrane system.

Chemical Clean-in-Place (CIP)

Chemical clean-in-place processes are a more intensive cleaning procedure used to restore the membrane system's permeability. The membrane system is programmed to automatically detect when a CIP is required, making it easy for the operator to know when to perform a CIP. Conditions which trigger a CIP are as follows:

- Membrane permeability drops below 80 lmh/bar (3.3 gfd/psi).
- After a preset maximum time in Filtration.

Once the PLC has requested a CIP, the operator must then initiate the CIP sequence through the HMI. The operator will have the option to perform a single sodium hypochlorite CIP, a single acid CIP or a dual CIP which consists of a sodium hypochlorite CIP followed by an acid CIP. Once the operator as selected the CIP process, the PLC will automatically run through the necessary steps to complete the CIP and bring the membrane tank back into filtration mode once the CIP is finished.

The sodium hypochlorite CIP is used for removal of organic foulants and the acid CIP is used for removal of inorganic foulants. During the acid CIP procedure, a mineral acid (i.e. sulfuric acid) will be added to adjust the pH of the cleaning solution to 2. Both of these CIP procedures are performed within the membrane tanks and do not require removal of the membranes.

- environmental impacts ?
- storage & use of chemicals ?

5 CONTROL SYSTEM

The Siemens MBR system is controlled by a Siemens S7-300 Programmable Logic Controller (PLC) in combination with Siemens I/O modules. All control system components will be housed in a free standing master control panel to be located in a control room. All MBR system equipment will be wired by others, to terminal block(s) located within this panel.

The control system operates the MBR system equipment according to a preset treatment strategy that is field adjustable to meet changing conditions or requirements. Included in the control design are complete diagnostic capabilities, automated membrane maintenance sequences, and automated control of the oxygen supply to each aeration tank to optimize effluent quality and conserve energy.

staff..? technical knowledge? EOCP?

The master control panel houses the main communications interfaces, including a local human/machine interface (HMI). The HMI is based on the Siemens MP377 touch panel and provides for the ability to control and monitor all aspects of the MBR system including equipment status, alarms, set point entry and cleaning procedures. The HMI communicates directly with the PLC via a Ethernet connection.

To make operation of the MBR system easier for the plant operators, Siemens custom designs the graphical interface screens of the HMI based on a P&ID (piping and instrumentation diagram) overview that matches the specific configuration of the plant. This type of graphical interface makes the system more intuitive to operate and easier to understand. Figure 6 is an example HMI screenshot of an membrane tank. The HMI screen gives a quick overview of tank status, valve status, instrument outputs, filtrate pump status as well as a menu bar to allow quick navigation to other screens.

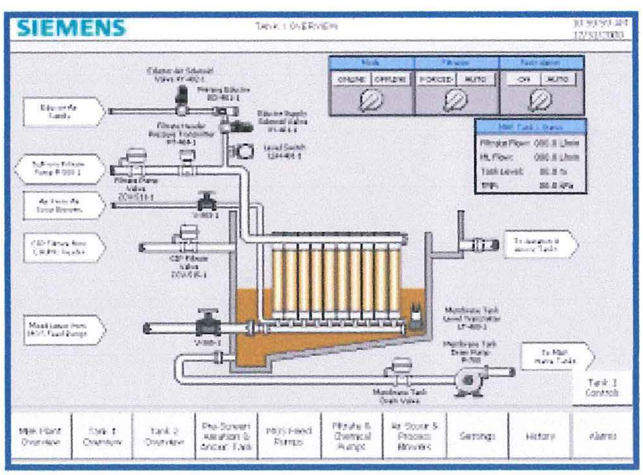


Figure 6: Typical HMI screenshot of a membrane tank.

6 Process Design Summary

This section provides a summary of the design parameters used to size the BioNutre™ biological treatment process and the MemPulse™ membrane filtration system which combined make up the proposed MBR system.

BioNutre™ Biological Design Information

Table 4 is a summary of the process parameters used to sized the BioNutre™ biological treatment system.

Table 4: BioNutre™ system process design parameters.

Parameter	Harrison Hot Springs Alone	Combined	Units
Max MLSS	10,000	10,000	mg/L
Design average MLSS	8,000	9,000	mg/L
Sludge yield	0.97	0.97	lb TSS/ lb BOD
Waste activated sludge	1,628	1,847	lb/d
Design total SRT	~17	~17	days

Table 5 is a summary of the BioNutre™ system tank dimensions and volumes.

Table 5: BioNutre™ system tank dimensions and volumes.

Parameter	Harrison Hot Springs Alone	Combined	Units
Number of parallel trains	2	2	-
Aerated anoxic tank dimensions (per train)	26' L x 32' W x 16' SWD	26' L x 32' W x 16' SWD	ft
Diffusers per aerated anoxic tank	130	130	-
Total aerated anoxic volume	199,174	199,174	gallons
Aerobic tank dimensions (per train)	26' L x 32' W x 16' SWD	26' L x 32' W x 16' SWD	ft
Diffusers per aerobic tank	130	130	
Total aerobic volume	199,174	199,174	gallons

Table 6 is a summary of the BioNutre™ system aeration system design.

Table 6: BioNutre™ aeration system design parameters.

Parameter	Harrison Hot Springs Alone	Combined	Units
Actual oxygen demand	117	132	lb/hr
Denitrification credit	22	25	lb/hr
Membrane RAS oxygen credit	4	4.5	lb/hr
Overall alpha	0.546	0.504	-
Beta	0.95	0.95	-
Design airflow at ADF (all trains)	672	862	scfm
Max total airflow (all trains)	1,040	1,040	scfm

MemPulse™ Membrane Filtration System Design

Table 7 is a summary of the process parameters for the proposed MemPulse™ membrane filtration system.

Table 7: Summary of MemPulse™ membrane filtration system process design parameters.

Parameter	Harrison Hot Springs Alone	Combined	Units
Total membrane area provided	116,560	142,461	ft
Average Day Flow Net Flux	6.9	6.4	gfd
Peak Day Flow Net Flux	9.4	8.5	gfd
Average Air Scour	830	1,294	scfm
Peak Air Scour	1,014	1,582	scfm

Table 8 is a summary of the MemPulse™ membrane filtration system configuration and tank dimensions.

Table 8: Summary of MemPulse™ membrane filtration system configuration and tank dimensions.

Parameter	Harrison Hot Springs Alone	Combined	Units
Number of membrane tanks	2	2	-
Installed membrane modules per tank	144	176	-
Max membrane modules per tank	176	176	-

Parameter	Harrison Hot Springs Alone	Combined	Units
Membrane tank width	14	14	ft
Membrane tank length	14	14	ft
Membrane tank height	11	11	ft

7 REDUNDANCY

BioNutre™ System

The BioNutre™ system is designed to handle 75% of the average day flow (ADF) with one biological reactor out of service. Under this scenario the biological system would not operate as two (2) parallel trains, but as three (3) reactors in series. The enable this type of operation, reactors of train 1 shall be capable of being hydraulically connected to reactors of train 2. Figure 7 below is a diagram of how the BioNutre™ system would be operated with a single reactor out of service.

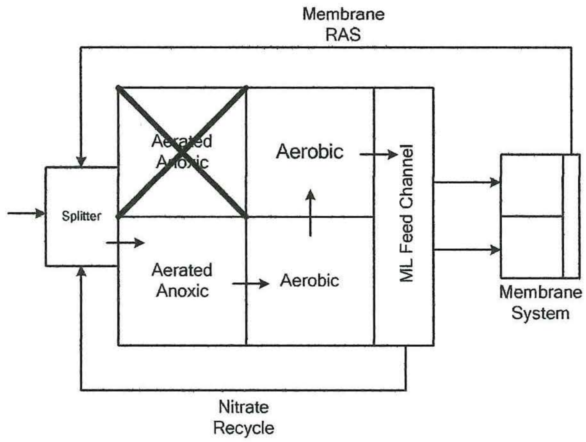


Figure 7: Diagram of BioNutre™ system redundancy.

The BioNutre™ system is designed with redundant (1 duty, 1 standby) nitrate recirculation pumps to recycle mixed liquor from the ML Feed channel back to the influent flow splitter. The system is also designed with blower redundancy such the system can meet the oxygen demand at 75% of ADF load with one blower out of service.

MemPulse™ Membrane System

The MemPulse™ membrane system is sized to handle 75% of average day flow with one (1) membrane tank out of service.

8 SIEMENS MBR SYSTEM ADVANTAGES

Siemens has a long history in the production and design of MBR systems. Our experience over the years has lead to many advancements in membrane technology which offer a number of important advantages over competitive systems. Table 9 is a review of the major advantages Siemens membrane system has over competitive systems.

Table 9: Siemens membrane system advantages

Low Maintenance Air Scour System	Siemens innovative MemPulse™ air scour reduction technology offers **low energy** air scouring with **no on/off cycling valves**, therefore eliminating O&M costs associated with maintaining and replacing cycling valves.
Process Control	As a leader in the advancement of MBR technology Siemens pioneered the concept of separating the membranes from the biological process and placing them in a separate process tank. Separating the membranes from the main biological system gives greater process control and flexibility for optimization of operation and maintenance of the membrane system.
Integrity Testing	Siemens hollow fiber membranes are ideally suited for integrity testing using a compressed air bubble test. Integrity testing is a valuable testing procedure for pinpointing membrane failure. Flat sheet membrane systems are incapable of such a precise integrity testing procedure and must therefore rely on turbidity as the sole indicator of membrane integrity.
Ease of Repair	Siemens membrane modules are easily repaired with our proven pin repair method. This method allows damaged fibers to be easily located and mechanically repaired within minutes and gives immediate confirmation of the repair. Competitive membrane systems are more difficult to repair for two reasons: Locating the damaged area of the membrane is difficult. Repairs involve the use of adhesives which are both time consuming and sometimes unsuccessful.
Homogeneous Membrane structure	Siemens membranes are manufactured from a homogeneous material. This means the membrane material is the same from the inside to the outside surface of the fiber. Competitors membranes rely on a composite structure using a thin layer of membrane cast onto a support structure for strength. The weakness of this approach is in the bond between the membrane and the support which results in delamination of the fibers.
Self Healing Fibers	Siemens has performed pilot studies on our membranes to analyze the self healing characteristics of broken fibers during normal operation. The studies showed that our small diameter fibers quickly self heal by plugging with mixed liquor suspended solids therefore maintaining effluent quality.
Filtrate Recirculation	Siemens membrane system is designed with a filtrate recirculation system to help protect effluent quality in the event of a turbidity excursion. The system is programmed to automatically kick the system into recirculation mode if high turbidity is detected, instead of sending the non-compliant water to final discharge.

9 Operational Costs

Power Requirements

The following table lists the annual power consumption of the proposed MBR system at average daily flow conditions:

Table 10: Siemens MBR system estimated power requirements.

Equipment[3]	Harrison Hot Springs Alone	Combined	Units
Nitrate Recycle Pump	63,145	71,540	kW-hr/yr
Biological Process Blower	175,200	224,840	kW-hr/yr
ML Feed Pump	39,420	57,670	kW-hr/yr
Filtration Pump	21,900	24,820	kW-hr/yr
Membrane Blower	147,095	179,580	kW-hr/yr
TOTAL	**446,760**	**558,450**	**kW-hr/yr**

Chemical Cleaning Requirements

The following table lists the estimated bulk chemical consumption associated with the proposed MBR system:

Table 11: Siemens MBR system estimated chemical consumption.

Cleaning Procedure	Harrison Hot Springs Alone	Combined
Chlorine MC[4]	750 gal	916 gal
Chlorine CIP[4]	875 gal	865 gal
Citric Acid CIP[5]	353 gal	348 gal
Sulfuric Acid CIP[6]	13 gal	11 gal

3 Equipment power consumptions based on the following assumptions: 65% pump efficiency, 70% blower efficiency, 95% motor efficiency, 98% VFD efficiency.

4 Sodium hypochlorite chemical consumption based on a bulk chemical concentration of 12.5% w/w.

5 Citric acid chemical consumption based on a bulk chemical concentration of 50% w/w.

6 Sulfuric acid chemical consumption based on a bulk chemical concentration of 98% w/w.

10 Equipment Provided by Siemens with the MBR System

When supplying a Siemens MBR System, the items noted in this section are typically provided by Siemens and are included in the budgetary pricing found in this proposal.

BioNutre™ System Equipment

The following table summarizes the BioNutre™ system equipment to be furnished by Siemens for the proposed MBR system.

Table 12: Siemens BioNutre™ system equipment scope of supply.

Harrison Hot Springs Alone	Combined	Description
2 (1 duty, 1 standby)	2 (1 duty, 1 standby)	Nitrate recycle pump controlled by VFD.
2	2	Aerated anoxic tank fine bubble diffused air system.
2	2	Aerobic tank fine bubble diffused air system.
3 (2 duty, 1 standby)	3 (2 duty, 1 standby)	Positive displacement biological process aeration blower.
1 lot	1 lot	Instrumentation integral to the biological system including level transmitters, oxidation reduction potential (ORP) sensors, dissolved oxygen (DO) sensors, and pressure gauges.
1 lot	1 lot	Valves required for equipment isolation and control of the BioNutre™ process including manual and automated valves with pneumatic actuators, and check valves.

MemPulse™ Membrane System Equipment

The following table summarizes the MemPulse™ membrane system equipment to be furnished by Siemens for the proposed MBR system.

Table 13: Siemens MemPulse™ membrane system equipment scope of supply.

Harrison Hot Springs Alone	Combined	Description
288	352	B40N membrane submodules fabricated of oxidant-resistant polyvinylidene fluoride (PVDF) membrane material.
288	352	MemPulse™ devices.
18	22	Rack assembly (16 module capacity) consisting of header assemblies, guide racks, mixing skirt, and air dropper tube.
4	4	Stainless Steel wall support guides.

2	2	Rotary lobe filtrate suction pump controlled by Variable Frequency Drive.
2	2	Submersible mixed liquor feed pump designed to feed mixed liquor to the membrane tanks.
2	2	Positive displacement membrane air scour blower designed to meet average and peak air flow requirements.
1 lot	1 lot	Instrumentation integral to monitor and control the membrane system including level transmitters, level switches, flow meters, pressure transmitters, and pressure gauges.
2	2	Turbidimeter to measure the turbidity of the filtrate from each membrane tank.
1 lot	1 lot	Valves required for equipment isolation and control of the membrane system including manual and automated valves with pneumatic actuators, check valves, and solenoid valves.
2	2	Filtrate air release systems.
1	1	Compressed air system to operate Siemens supplied valves and leak testing with one air receiver and lead/lag rotary screw compressors.

MemPulse™ Membrane System Chemical Cleaning Equipment

The following table summarizes the membrane system chemical cleaning equipment to be furnished by Siemens for the proposed MBR membrane system.

Table 14: Siemens membrane system chemical cleaning equipment scope of supply.

Qty.	Description
1	Sodium hypochlorite dosing system skid. Includes two (2) dosing pumps and valves and instruments necessary for proper operation and calibration.
1	Citric acid dosing system skid. Includes one (1) dosing pump and valves and instruments necessary for proper operation and calibration.
1	Sulfuric acid dosing system skid. Includes one (1) dosing pump and valves and instruments necessary for proper operation and calibration.

Control System Equipment

The following table summarizes the control system equipment to be furnished by Siemens for the proposed MBR membrane system.

Table 15: Siemens control system scope of supply.

Qty.	Description
1	Siemens S7-300C PLC.
1	Siemens MP 370 touch screen Human Machine Interface (HMI) with 512MB compact flash data storage card.
1	Main control panel (NEMA 12).
1 lot	Digital and analog I/O modules.
1	UPS sized for the PLC and HMI.
1	Remote monitoring system.

Field Services

A Siemens Water Technologies Field Service Technician will be on site to supervise the installation, commissioning and start up of the proposed MBR system and train operators. This would include:

Table 16: Siemens field services scope of supply.

Man-days	Trips	Description
6	2	System inspection and verification.
2	1	Membrane installation supervision.
16	4	Start-up and commissioning.
3	1	Operator training.
6	2	Process testing.

11 Items Typically Not Provided by Siemens

When supplying an MBR System, there are items associated with construction of a complete facility that are typically provided by the constructor rather than Siemens.

General Items Not Included

Compliance permitting and approval (Federal, State and/or local).
Detail shop fabrication drawings.
Electrical, hydraulic, or pneumatic controls unless specifically noted.
Engineering and supervision of all equipment and labor for civil works.
Laboratory, shop, or field testing other than supervision of start-up testing.
Taxes, bonds, fees, permits, lien waivers, licenses, etc.
Tools or spare parts.
Unloading of equipment and protected storage of equipment at jobsite.
Utilities connections.

Civil Works and Mechanical Items Not Included

Adhesives, adhesive dispensers, grout, mastic & anti-seize compounds.
Anchor bolts and/or expansion anchors unless otherwise noted.
Base slabs, equipment mounting pads, or shims.
Concrete work of any sort, grout, mastic, sealing compounds, shims.
Demolition, removal, or transfer of anything that is existing.
Engineering, permitting, and surveying.
Headworks Equipment (Grit removal and fine screen)
Effluent disinfection
Waste activated sludge (WAS) equipment or solids handling system.
Equipment lifting hoists, cranes, or other lifting devices.
Field surface preparation and/or painting.
Floor grating, stairways, ladders, platforms, handrailing unless noted.
Installation of equipment.
Interconnecting materials external to enclosures such as cable, pressure taps, tubing, etc.

Labor for field testing.

Lubricants, grease piping, grease guns.

Modifications to existing equipment or structures.

Pipe supports and hangers for piping.

Piping, pumps, valves, wall sleeves, gates, drains, weirs, baffles not mentioned.

Plumbing associated with waste disposal, floor drains, and/or emergency and safety wash stations.

PVC solvent weld materials.

Electrical Items Not Included

Conduit or wiring in the field.

Cable trays, fittings, and supports.

Influent instrumentation including, but not limited to flowmeters, pH analyzers, temperature transmitters and/or pressure transducers.

Instrumentation required for post treatment monitoring.

Power to Siemens supplied equipment.

Motor control centers.

Plant lighting.

Supply and installation of building power, lighting, main service disconnects and control panels.

Supply, installation and control of a remote telemetry system (SCADA) to monitor and control the operation of the system and overall plant operation other than SmartBNR.

Underwriters Laboratory inspection of electrical controls.

Variable frequency drives unless specifically noted.

12 BUDGETARY PRICING

In order to assist in the evaluation of this Siemens offering, budgetary pricing is provided below for the MBR System.

MBR System to meet Harrison Hot Springs Alone Flows	$1,545,000
MBR System to meet Combined Flows	$1,720,000

In the absence of detailed project specifications and a specific purchase date, this pricing is intended to be conservative in nature making the assumption that the equipment in question will be purchased approximately one year in the future. If circumstances dictate, firm pricing can readily be provided for a contemplated purchase within the next sixty (60) days.

Hi Lorne,

As promised, attached is revision one. Note the following comments:

PS # 1:
Riser pipe change to 250 mm dia instead of 300
Forcemain change to 300 mm instead of 350
Velocity is 1.2 m/s
Pump total discharge flow is limited to max 3800 l/min per pump
Pump motor is now 45 hp

Budgetary price for:
Pump $34,500.00 x 2 = $69,000.00
FRP Tank = $82,600.00

PS # 3:
Riser pipe change to 300 mm instead of 350
Forcemain change to 300 mm instead of 400
Velocity is 1.2 m/s
Pump total discharge flow is limited to max 4000 l/min per pump
Pump motor is now 60 hp.
YOU CAN USE A 10 FT DIA TANK FOR PS # 3 INSTEAD OF 12 FT.

Budgetary price for:
Pump $39,500.00 x 2 = $79,000.00
FRP Tank = $82,600.00

Total saving from REV 1 compare to original proposal = $62,000.00

Will try work out the Kiosk pricing for you later. Kindly review the above and let me know if this acceptable. I shall be in the office tomorrow and we can discuss at your convenience.

Regards

Don