

5.8.2 Schreiber BioReel

The other sewage treatment system that Hydro-Logic has proposed is the BioReel, a fixed film biological reactor, that is manufactured by Schreiber. This sewage treatment plant is able to handle flows from 2000 – 150,000 gallons/day. The BioReel operates as follows:

The proposed treatment consists of a four stage BioReel system made up of four 7.5 ft. diameter 9 coil reels. This reel-like rotary cage, containing corrugated tubular spirals, is rotated by air. This feature makes it unique to most fixed film treatment methods and requires less power. However, two DR 623 7.5 Hp blowers are required for the process which increases the power required. As the BioReel rotates, air bubbles become trapped in the tubes and provides oxygen to the biomass as the wastewater circulates through the tubes. As the biomass growth occurs it adheres to the tube walls allowing BOD reduction and ammonia ($\text{NH}_3 - \text{N}$) nitrification.

To meet the TKN specifications Hydro-Logic proposes that a denite filter be used after the BioReel. Also, to achieve the NH_3 limit requires the wastewater temperature to be above 16 deg C and Hydro-logic suggests a building be used if this temperature cannot be reached. The BioReel itself is also unable to meet phosphorus limit. It is capable of getting an uptake of about 40%, but the rest would have to be taken out by chemical addition and filtration.

The budget estimate supplied by Hydro-logic includes the cost of any miscellaneous piping required and the cost of an electrical control panel. A UV disinfection unit would be used to provide tertiary treatment.

5.9 P. J. Hannah Equipment Sales Corp.

P. J. Hannah Equipment Sales Corp. is located in B.C. and has submitted proposals on both RBC and SBR sewage treatment systems for the purpose of this study. The RBC proposed is the Klargester Biodisc and two budget estimates for this system were received – one is designed to be installed in a cast-in-place concrete tank and the other is a complete FRP package plant and does not require any field poured concrete tankage. The SBR system proposed is an Advanced Fluid System product.

5.9.1 Klargester Biodisc RBC

5.9.1.1 BF10BFP Model (Complete Fiberglass Package)

This fiberglass packaged plant comes complete with a primary clarifier, rotor treatment zone, a final clarifier, and a tank cover. This BF series can be installed in a small excavation on a base or concrete slab.

The RBC stage of the Biodisc is housed in a semi-circle trough called a biozone and is suspended within the primary chamber of the main casing. Settled sewage in contact with the RBC is separated from the bulk contents of the primary settlement tank by the biozone.

The RBC rotor consists of a central shaft fabricated using a steel circular hollow section and two machined stub ends that are welded into it. The main shaft has a media

support frame built around it which is fabricated from galvanized mild steel. The media is made from vacuum molded, corrugated polypropylene copolymer or high density polypropylene sheets. The sheets of media are mounted on the shaft within the steel support framework and form a circular rotor once they are all in place. The total media area is 1256 m². Rotating baffles attached to the rotor divide this area into stages along its length to provide more efficient treatment. For disinfection, a small tablet chlorinator would be used.

5.9.1.2 BC10BFP Model (Concrete Tank Required)

The BC10BFP Model is similar to the BF10BFP except that it is installed in concrete tankage.

5.9.2 Advanced Fluid Systems SBR

The AFS system proposed is a single train SBR. A single train system simplifies the control scheme and no automated valves are required.

The steel tank reactor has been sized at 32 m³ and will decant each day within the significant delivery period and one lesser decant during low flow period.

In addition to the reactor, an aerated waste sludge holding tank that is 23 m³ and a chlorine contact chamber will be included. The approximate size of the plant proposed is 3.65m wide x 3.65m high x 5.2m. Also included in the system is dual blower-motor sets and all internals as required. A PLC based control panel will be used for operation of the system.

The only pump required is a chlorine solution feed pump. Waste sludge will be transferred via an airlift. The sludge holding tank (SHT) would be capable of approximately a 120 day storage capacity.

5.10 ABYDOZ Environmental Incorporated – Kickuth BioReactor

ABYDOZ, is a Newfoundland company that is located in Portugal Cove and has submitted a proposal for a sewage treatment plant know as the Kickuth Bio Reactor. The budget estimate ABYDOZ has provided does not include collection and delivery of the effluent to the treatment system. Also, ABYDOZ will supply complete operation and maintenance to the system for the initial two years of operation for a predetermined cost as outlined in the budget estimate.

The method of treatment is purification of wastewater by means of a sub-surface flow engineered wetland. The system uses specialty soils and plants capable of purifying a wide variety of domestic, municipal and industrial waste.

The technology is based on microbial processes that simulate the natural breakdown of contaminants in wastewater. Once the effluent leaves a primary settling tank (ie: septic tank) it flows through the “root zone” of special reed type plants where oxygen is transferred to the root system. Microorganisms then use the transported oxygen to flourish in the soil while creating a treatment area containing thousands of species of contaminant-eating “bugs”. While the organic contaminants are broken down, other pollutants such as heavy metals and PCB’s are bound within the soil matrix. Performance of the system improves as the system ages. A UV disinfection unit is provided for tertiary treatment.

The structure is built on a man-made impermeable layer, so that the groundwater layer is not affected and wastewater flows are controlled through the root-permeated soil. The total footprint area for the proposed plant, based on the specifications given, was 450m². The system can easily be expanded when necessary as population and flows increase.

5.11 BAE◆NEWPLAN GROUP LIMITED

The BAE◆Newplan Group Ltd. (BNG) is an engineering consulting firm located in Mount Pearl, NF. Our firm presently employs over 100 people including over 20 professional engineers. We have extensive experience in municipal water, sewer and roads design with over \$2,500,000 in annual revenues generated from this sector alone.

In 1994 the BAE◆Newplan Group Ltd. Successfully completed a \$6,600,000 sewage lagoon project in the Town of Grand Falls-Windsor. Lagoons and Oxidation ditches are not specialized processes, and therefore will be included into this investigation by BNG.

5.11.1 Oxidation Ditch

Oxidation ditches have been used for secondary treatment for decades across Canada with a local installation in the Town of Holyrood. The process is generally aerobic as the influent is circulated through a shallow, oval shaped ditch. The motion and aeration is provided by a constantly rotating shaft which surface aerates the liquid.

Suspended solids levels are typically high from this process and settling is required prior to disinfection. Retention times are generally in the range of 6 – 10 days which permits some nitrification and phosphorus removal.

Construction of an oxidation ditch is relatively simple with the majority of the effort going into the construction of the concrete liner. This system may require over 600 square metres of land and should ideally be located over 300 meters from a residential development. The exposed sewage, the large land area required and the separation

needed from residential development limit the applications where oxidation ditches are a practical alternative.

5.11.2 Sewage Lagoons

An aerated lagoon is proposed for this application to increase sludge reduction and reduce odour. In general three ponds would be constructed, each having an eight day retention time.

At least two of the three ponds would be aerated with the third pond providing the necessary settling prior to decanting to disinfection. The third pond may have to be aerated during the winter months to prevent freezing.

The three ponds are aligned in series and due to the long retention time a large footprint of approximately 1200 square meters may be required. Lagoons are typically one of the most economic methods of secondary treatment but this application may be approaching the smallest practical application. The volume of earth berm required to construct the stabilization ponds far exceeds the volume of liquid being stored in this design. When the volume of liquid being stored approaches the volume of the berms then sewage lagoons are very economical.

The exposed sewage, the minimum recommended distance from any residential development and the large area of land required limit this process in its practical applications.

6.0 INFRASTRUCTURE DEVELOPMENT COSTS

6.1 Land Costs

For the purpose of this study land costs have not been included. It is assumed that local residents will bargain in good faith and provide the necessary land for \$1.0 in lieu of a sanitary sewer treatment system.

6.2 Collection System

Drawing DW1-XX-CV-XX-001 in Appendix A outlines 3 main clusters of homes namely areas 1, 2 and 3. Areas 1 and 2 are separated by approximately 400 meters of vacant land and Areas 2 and 3 are separated by approximately 300 meters of vacant land.

The cost to service these areas excluding the sewage treatment systems and including HST and Engineering are indicated in Table 2.

TABLE 2 Infrastructure Development Costs

AREA	LENGTH (m)	COST
1	320	\$ 105,600
Vacant Land	400	\$110,000
2	280	\$ 92,400
Vacant Land	300	\$ 82,500
3	280	\$ 92,400
TOTAL	1580 m	\$482,900

If three separate treatment systems are utilized so that the vacant land does not have to be serviced then \$192,500 can be saved on the infrastructure costs reducing the collection system cost to \$290,400. This \$290,400 cost is applicable to the single treatment plant scenario as well as the three treatment plant scenario and thus is not included in the equivalent present worth evaluation.

7.0 ECONOMIC ANALYSIS OF EACH INDIVIDUAL PROCESS

Once the capital, operational and maintenance costs for each process were obtained the equivalent annual cost of each system was analysed. The useful life of all projects was assumed to be 20 years although several systems may far exceed this expectation. The interest rate and inflation rate for the life of the project were assumed to be 10% and 2% respectively. All capital costs were amortized over 10 years while all operation and maintenance costs were distributed over 20 years. Some processes also have repair and upgrading costs after 10, 15 or 20 years. These costs were entered during the anticipated year for the particular repair or upgrade.

The detailed economic analysis of each system is provided on the individual spread sheets in Appendix "B". Table 3 summarizes the system Capital Cost, Total Present Worth and Equivalent Annual Costs over a 20 year life.

The "Capital Costs" includes the cost of each system as quoted plus the cost of the additional infrastructure or collection system such as the \$175,000.00 required for the servicing of vacant land between the 3 main clusters of homes. The "Total Present Worth" is the total cost of each system including all operation, maintenance, repairs, upgrading and capital costs over the 20 year life cycle expressed in present day dollars. The "Annual Cost Over 20 Year Life" is the Total Present Worth expressed as an equivalent 20 year payment plan.

Company	System	Capital Cost	Total Present Worth	Annual Costs over 20 Years
ABYDOZ	3 Separate Kickuth Bioreactors	\$283,159.00	\$402,072.00	\$47,227.00
ABYDOZ	Kickuth Bioreactor	\$347,305.00	\$465,517.00	\$54,680.00
BAE-Newplan	Oxidation Ditch	\$381,280.00	\$474,393.00	\$55,722.00
BAE-Newplan	Lagoon	\$327,342.00	\$500,040.00	\$58,735.00
Premier Tech	3 Separate EcoFlo Biofilters	\$361,849.00	\$518,625.00	\$60,918.00
ABL	3 Separate Sand Filtration Systems	\$311,485.00	\$519,135.00	\$60,978.00
ABL	Sand Filtration	\$339,480.00	\$549,516.00	\$64,546.00
CMS	ROTORDISK	\$350,720.00	\$579,888.00	\$68,114.00
P.J. Hannah	RBC - Concrete Tank Option	\$395,775.00	\$604,788.00	\$71,038.00
P.J. Hannah	RBC - FRP Option	\$396,449.00	\$605,520.00	\$71,124.00
Premier Tech	EcoFlo Biofilter	\$449,307.00	\$613,543.00	\$72,067.00
CMT (BMS)	Blivet	\$387,125.00	\$614,197.00	\$72,144.00
BioFlo	BioFosse - Fiberglass Tankage	\$384,702.00	\$623,983.00	\$73,293.00
BioFlo	BioFosse - Concrete Tankage	\$388,393.00	\$627,988.00	\$73,763.00
Premier Tech	RotoFix	\$427,092.00	\$638,031.00	\$74,943.00
P.J. Hannah (AFS)	SBR	\$381,279.00	\$642,090.00	\$75,420.00
Eco Process & Equipment	Oxisequencer	\$457,060.00	\$679,025.00	\$79,758.00
ABL	SBR	\$427,800.00	\$689,184.00	\$80,952.00
Hydro Logic (CASS)	SBR	\$489,123.00	\$720,733.00	\$84,657.00
Hydro Logic (Schreiber)	BioReel	\$428,960.00	\$746,641.00	\$87,700.00

TABLE 3: Summary Sheet for Individual System Costs.

8.0 DISCUSSION

The research conducted for this study was both educational and enlightening. Some processes were mechanical and required the addition of chemicals while others were purely natural processes requiring minimal electricity and no chemicals. Mechanical processes require higher operator attention, more maintenance and they cost more to operate than natural processes. Natural processes typically require more land and are more susceptible to climatic conditions and ground water levels than mechanical processes. The thirteen processes addressed in this study all have merit and have proven themselves on various installations in the past. Each process has applications for which they are ideally suited and others for which they may not be recommended.

Several manufacturers have put a considerable effort into the preparation of their proposals for this study which have been attached in Appendix D. The recommendations made by this report is not meant to downplay or degrade the legitimacy or ability of any of the processes studied but merely reflects BAE♦Newplan's recommendation of the process interpreted to be most ideally suited for this specific application.

Some process criteria used in making the final recommendations are as follows:

1. Complete system "Equivalent Annual Cost".
2. Operator attention.
3. The level of automation.
4. Whether or not up-front septic tank was required.
5. Whether or not on site cast-in-place concrete work was required.
6. Local representation and service.
7. Operation and maintenance contracts.
8. Footprint of system.
9. Existence of filters and other maintenance items.

10. Possibility of odour from anaerobic sludge retention chamber.
11. Chlorination versus U.V. disinfection.
12. Quality of proposal .
13. Possibility of system by-pass during peak flows.
14. Redundancy for mechanical equipment.
15. Design accommodation for future expansion.

In conjunction with the above noted criteria several site specific limitations and conditions had to be considered before making the recommendations namely:

1. Power is available on site
2. Existing development is in clusters of homes that can be treated by one treatment plant or three smaller treatment plants.
3. One possible location for the sewage treatment plant is only 50 metres away from North Arm River while others are as much as 200 meters away from the river.
4. Two of the three possible locations for the sewage treatment plant have large flat wet lands well suited for the discharge of the treated effluent.
5. The three clusters of homes are separated by two stretches of vacant land 300 metres and 400 meters long totalling 700 meters.
6. High water table in the study area.
7. Bedrock is present at several locations along the study area.
8. The treatment plant(s) will be close to and visual from local residences.
9. Municipal operating budgets for small municipalities cannot accommodate extensive operator attention or operator training.

These criteria have been summarized and tabulated for all processes in Appendix C.

9.0 CONCLUSIONS

ABYDOZ – Kickuth Bioreactor

This process presently has three small installations locally which are meeting the environmental guidelines and the package proposed in this report is expected to meet the proposed, more stringent guidelines expected to be adopted in the near future by the local Department of Environment and as required by this study. The company has local representation and expertise. The equivalent annual cost of their system is the lowest process studied and one of the least complicated and least expensive to expand upon. The process can be installed as three separate systems one for each cluster of homes for a total capital cost of \$283,159 which is \$128,365 higher than the \$154,793 capital cost of the single system. The three separate system scenario eliminates \$192,500 of infrastructure costs for a net savings using the three system scenario of $\$192,500 - \$128,365 = \$64,135$.

The reed beds are aesthetically pleasing and near odourless. Although the above ground growth lies dormant during the winter months the root system thrives and provides the media and insulation to support the biomass. This process requires electricity only to operate the UV system and is very environmentally pleasing and friendly.

The greatest unknown with this technology is that local installations have not been subject to a winter with no ground snow cover and deep frost penetration. ABYDOZ are willing to operate and maintain the systems for the first 2 years at a cost of \$6000 per year which is included in the equivalent annual cost provided. If this type of arrangement can be extended for 5, 10 or even 20 years with ABYDOZ responsible to upgrade the system as required to ensure effluent quality under all conditions then this would alleviate the concerns BAE♦Newplan and the Town of Holyrood would have regarding consistent performance.

The Sewage Lagoon and the Oxidation Ditch processes which can be designed and tendered by the BAE◆Newplan Group Ltd. can function efficiently but are not appealing for a project of this nature due to their large foot print and exposed bodies of sewage.

10.0 RECOMMENDATIONS

The Town of Marystown and ABYDOZ entered in an agreement to construct an ABYDOZ Kickuth BioReactor pilot plant in 2000 at a cost of \$460,000. The project was funded by the Department of Municipal and Provincial Affairs and the BAE♦Newplan Group Ltd. were engaged by the Town of Marystown to complete the project on a project management basis. This project is the first ABYDOZ project in Canada of this nature and magnitude.



The performance of the reed beds will be monitored for two years after installation. The quality of effluent will be monitored over a wide range of flows to a rate in excess of the design flow. The impacts of seasonal changes, significant rainfall events and so on will be correlated with effluent quality to determine the validity of the process.

The investigation type approach is both environmentally and economically conscientious but the Marystown pilot project is over 300 km from the Department of Municipal and Provincial Affairs, the Department of Environment and ABYDOZ Environmental's head offices. The BAE♦Newplan Group Ltd. recommends that the Town of Holyrood arrange a meeting with the representatives of the government

departments and ABYDOZ and table this extensive report, which the Town of Holyrood has taken the initiative to fund, and request that the Country Path Road study area be used as an eastern Avalon pilot project.

This report indicates that a single ABYDOZ Kickuth BioReactor can be installed to service the existing 20 homes on Country Path road including 1580 metres of sanitary sewer for a total cost of \$637,693 which may be broken down as follows:

- 1580 meters of convention sanitary sewer	\$482,900
- ABYDOZ Kickuth BioReactor	<u>\$154,793</u>
Total including HST & Engineering	\$637,693

This pilot project will take treatment beyond the levels proposed in the Marystown project with the addition of UV disinfection for tertiary treatment. In general this project can be realized for approximately \$32,000 per household with a quality of effluent intended to match proposed, more stringent environmental guidelines in an area that has extensive bedrock and a high water table. If the BioReactor is successful in meeting the effluent guidelines then the Town of Holyrood will have found a cost effective, cutting edge solution to a problem that plagues the majority of the municipalities in the province of Newfoundland and Labrador.

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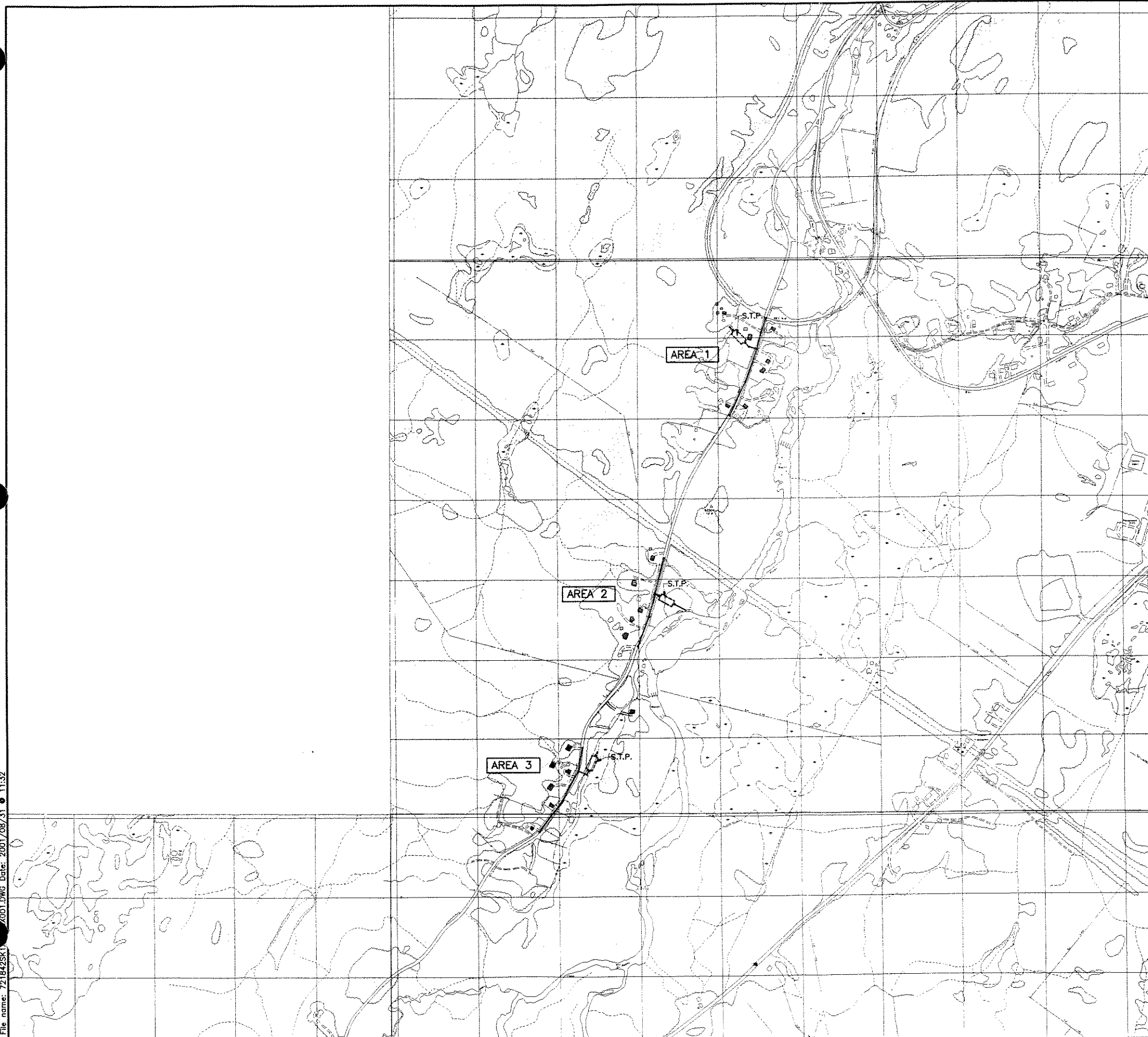
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APPENDIX A


DW1-XX-CV-XX-001

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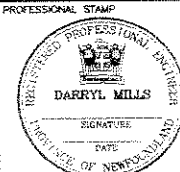
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Permit No. as issued by APEGM 20142
which is valid for the year 2001.

CLIENT
**TOWN OF HOLYROOD
NEWFOUNDLAND & LABRADOR**

PROJECT
**SANITARY SEWER STUDY
AREAS 1 - 3**

TITLE
PLAN

DESIGNED BY	D.M.	DATE	CHECKED BY	DATE
DRAWN BY	B.M.	DATE	APPROVED BY	DATE
SCALE	AS NOTED		PROJECT No.	7211842
CADD No.	721842DW1XXCVXX001		DRAWING No.	7211842
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APPENDIX B
ECONOMIC ANALYSIS SPREAD SHEETS

ABYDOZ - Kickuth BioReactor (3 System Alternative)

Interest Rate = 10%
Inflation Rate = 2%

Year	Capital Cost (for each system)	Operation and Maintenance Costs				Repairs and	Total
		Chlorination	U.V.	Electrical	Sludge Removal included in operator cost		
2001	\$11,392.50	N/A	\$150.00	\$0.00	\$2,000.00		\$13,542.50
2002	\$11,392.50	N/A	\$153.00	\$0.00	\$2,040.00		\$13,585.50
2003	\$11,392.50	N/A	\$156.06	\$0.00	\$2,080.80		\$13,629.36
2004	\$11,392.50	N/A	\$159.18	\$0.00	\$2,122.42		\$13,674.10
2005	\$11,392.50	N/A	\$162.36	\$0.00	\$2,164.86		\$13,719.73
2006	\$11,392.50	N/A	\$165.61	\$0.00	\$2,208.16		\$13,766.27
2007	\$11,392.50	N/A	\$168.92	\$0.00	\$2,252.32		\$13,813.75
2008	\$11,392.50	N/A	\$172.30	\$0.00	\$2,297.37		\$13,862.17
2009	\$11,392.50	N/A	\$175.75	\$0.00	\$2,343.32		\$13,911.57
2010	\$11,392.50	N/A	\$179.26	\$0.00	\$2,390.19		\$13,961.95
2011		N/A	\$182.85	\$0.00	\$2,437.99		\$2,620.84
2012		N/A	\$186.51	\$0.00	\$2,486.75		\$2,673.25
2013		N/A	\$190.24	\$0.00	\$2,536.48		\$2,726.72
2014		N/A	\$194.04	\$0.00	\$2,587.21		\$2,781.25
2015		N/A	\$197.92	\$0.00	\$2,638.96		\$2,836.88
2016		N/A	\$201.88	\$0.00	\$2,691.74	\$2,691.74	\$2,893.62
2017		N/A	\$205.92	\$0.00	\$2,745.57		\$2,951.49
2018		N/A	\$210.04	\$0.00	\$2,800.48		\$3,010.52
2019		N/A	\$214.24	\$0.00	\$2,856.49		\$3,070.73
2020		N/A	\$218.52	\$0.00	\$2,913.62		\$3,132.14
Present Worth	\$70,002.36	\$0.00	\$1,460.85	\$0.00	\$19,478.03	\$644.37	\$91,585.61

Summary

Total Present Worth	\$91,585.61
Total PW for 3 Systems	\$274,756.84
Total Present Worth with Taxes	\$315,970.36
Engineering	\$54,504.89
Contingency	\$31,597.04
Total	\$402,072.29
Annual Costs Over 20 Year Life	\$47,227.41

ABYDOZ - Kickuth BioReactor

Interest Rate = 10%
 Inflation Rate = 2%

Year	Capital Cost	Operation and Maintenance Costs					Repairs and Upgrading	Total
		Chlorination	U.V.	Electrical	Sludge Removal Included in operator cost	Operator		
2001	\$41,918.54	N/A	\$150.00	\$0.00		\$6,000.00	\$48,068.54	
2002	\$41,918.54	N/A	\$153.00	\$0.00		\$6,120.00	\$48,191.54	
2003	\$41,918.54	N/A	\$156.06	\$0.00		\$6,242.40	\$48,317.00	
2004	\$41,918.54	N/A	\$159.18	\$0.00		\$6,367.25	\$48,444.97	
2005	\$41,918.54	N/A	\$162.36	\$0.00		\$6,494.59	\$48,575.50	
2006	\$41,918.54	N/A	\$165.61	\$0.00		\$6,624.48	\$48,708.64	
2007	\$41,918.54	N/A	\$168.92	\$0.00		\$6,756.97	\$48,844.44	
2008	\$41,918.54	N/A	\$172.30	\$0.00		\$6,892.11	\$48,982.96	
2009	\$41,918.54	N/A	\$175.75	\$0.00		\$7,029.96	\$49,124.25	
2010	\$41,918.54	N/A	\$179.26	\$0.00		\$7,170.56	\$49,268.36	
2011		N/A	\$182.85	\$0.00		\$7,313.97	\$7,496.82	
2012		N/A	\$186.51	\$0.00		\$7,460.25	\$7,646.75	
2013		N/A	\$190.24	\$0.00		\$7,609.45	\$7,799.69	
2014		N/A	\$194.04	\$0.00		\$7,761.64	\$7,955.68	
2015		N/A	\$197.92	\$0.00		\$7,916.87	\$8,114.79	
2016		N/A	\$201.88	\$0.00		\$8,075.21	\$8,277.09	
2017		N/A	\$205.92	\$0.00		\$8,236.71	\$8,442.63	
2018		N/A	\$210.04	\$0.00		\$8,401.45	\$8,611.48	
2019		N/A	\$214.24	\$0.00		\$8,569.48	\$8,783.71	
2020		N/A	\$218.52	\$0.00		\$8,740.87	\$8,959.39	
Present Worth	\$257,572.67	\$0.00	\$1,460.85	\$0.00	See Right	\$58,434.08	\$318,111.97	

Summary

Total Present Worth	\$318,111.97
Total Present Worth with Taxes	\$365,828.77
Engineering	\$63,105.46
Contingency	\$36,582.88
Total	\$465,517.11
Annual Costs Over 20 Year Life	\$54,679.64

BAE-Newplan - Oxidation Ditch

Interest Rate = 10%
 Inflation Rate = 2%

Year	Capital Cost	Operation and Maintenance Costs						Repairs and Upgrading	Total
		Chlorination	U.V.	Electrical	Sludge Removal	Operator			
2001	\$46,019.19	N/A	\$600.00	\$2,000.00	\$500.00	\$1,000.00		\$50,119.19	
2002	\$46,019.19	N/A	\$612.00	\$2,040.00	\$510.00	\$1,020.00		\$50,201.19	
2003	\$46,019.19	N/A	\$624.24	\$2,080.80	\$520.20	\$1,040.40		\$50,284.83	
2004	\$46,019.19	N/A	\$636.72	\$2,122.42	\$530.60	\$1,061.21		\$50,370.14	
2005	\$46,019.19	N/A	\$649.46	\$2,164.86	\$541.22	\$1,082.43		\$50,457.16	
2006	\$46,019.19	N/A	\$662.45	\$2,208.16	\$552.04	\$1,104.08	\$1,104.08	\$50,545.92	
2007	\$46,019.19	N/A	\$675.70	\$2,252.32	\$563.08	\$1,126.16		\$50,636.46	
2008	\$46,019.19	N/A	\$689.21	\$2,297.37	\$574.34	\$1,148.69		\$50,728.80	
2009	\$46,019.19	N/A	\$703.00	\$2,343.32	\$585.83	\$1,171.66		\$50,822.99	
2010	\$46,019.19	N/A	\$717.06	\$2,390.19	\$597.55	\$1,195.09		\$50,919.07	
2011		N/A	\$731.40	\$2,437.99	\$609.50	\$1,218.99	\$1,218.99	\$4,997.88	
2012		N/A	\$746.02	\$2,486.75	\$621.69	\$1,243.37		\$5,097.83	
2013		N/A	\$760.95	\$2,536.48	\$634.12	\$1,268.24		\$5,199.79	
2014		N/A	\$776.16	\$2,587.21	\$646.80	\$1,293.61		\$5,303.79	
2015		N/A	\$791.69	\$2,638.96	\$659.74	\$1,319.48		\$5,409.86	
2016		N/A	\$807.52	\$2,691.74	\$672.93	\$1,345.87	\$1,345.87	\$5,518.06	
2017		N/A	\$823.67	\$2,745.57	\$686.39	\$1,372.79		\$5,628.42	
2018		N/A	\$840.14	\$2,800.48	\$700.12	\$1,400.24		\$5,740.99	
2019		N/A	\$856.95	\$2,856.49	\$714.12	\$1,428.25		\$5,855.81	
2020		N/A	\$874.09	\$2,913.62	\$728.41	\$1,456.81		\$5,972.93	
Present Worth	\$282,769.51	\$0.00	\$5,843.41	\$19,478.03	\$4,869.51	\$9,739.01	\$1,477.70	\$324,177.17	

Summary

Total Present Worth	\$324,177.17
Total Present Worth with Taxes	\$372,803.75
Engineering	\$64,308.65
Contingency	\$37,280.37
Total	\$474,392.77
Annual Costs Over 20 Year Life	\$55,722.17

BAE-Newplan - Lagoon

Interest Rate = 10%
 Inflation Rate = 2%

Year	Capital Cost	Operation and Maintenance Costs						Repairs and Upgrading	Total
		Chlorination	U.V.	Electrical	Sludge Removal	Operator	Operator		
2001	\$39,509.19	N/A	\$600.00	\$7,800.00	\$0.00	\$1,000.00		\$48,909.19	
2002	\$39,509.19	N/A	\$612.00	\$7,956.00	\$0.00	\$1,020.00		\$49,097.19	
2003	\$39,509.19	N/A	\$624.24	\$8,115.12	\$0.00	\$1,040.40		\$49,288.95	
2004	\$39,509.19	N/A	\$636.72	\$8,277.42	\$0.00	\$1,061.21		\$49,484.55	
2005	\$39,509.19	N/A	\$649.46	\$8,442.97	\$0.00	\$1,082.43		\$49,684.05	
2006	\$39,509.19	N/A	\$662.45	\$8,611.83	\$0.00	\$1,104.08	\$5,520.40	\$49,887.55	
2007	\$39,509.19	N/A	\$675.70	\$8,784.07	\$0.00	\$1,126.16		\$50,095.12	
2008	\$39,509.19	N/A	\$689.21	\$8,959.75	\$0.00	\$1,148.69		\$50,306.84	
2009	\$39,509.19	N/A	\$703.00	\$9,138.94	\$0.00	\$1,171.66		\$50,522.79	
2010	\$39,509.19	N/A	\$717.06	\$9,321.72	\$0.00	\$1,195.09		\$50,743.06	
2011		N/A	\$731.40	\$9,508.16	\$0.00	\$1,218.99	\$6,094.97	\$11,458.55	
2012		N/A	\$746.02	\$9,698.32	\$0.00	\$1,243.37		\$11,687.72	
2013		N/A	\$760.95	\$9,892.29	\$0.00	\$1,268.24		\$11,921.47	
2014		N/A	\$776.16	\$10,090.13	\$0.00	\$1,293.61		\$12,159.90	
2015		N/A	\$791.69	\$10,291.93	\$0.00	\$1,319.48		\$12,403.10	
2016		N/A	\$807.52	\$10,497.77	\$0.00	\$1,345.87	\$6,729.34	\$12,651.16	
2017		N/A	\$823.67	\$10,707.73	\$0.00	\$1,372.79		\$12,904.19	
2018		N/A	\$840.14	\$10,921.88	\$0.00	\$1,400.24		\$13,162.27	
2019		N/A	\$856.95	\$11,140.32	\$0.00	\$1,428.25		\$13,425.51	
2020		N/A	\$874.09	\$11,363.13	\$0.00	\$1,456.81		\$13,694.03	
Present Worth	\$242,768.17	\$0.00	\$5,843.41	\$75,964.30	\$0.00	\$9,739.01	\$7,388.52	\$341,703.41	

Summary

Total Present Worth	\$341,703.41
Total Present Worth with Taxes	\$392,958.93
Engineering	\$67,785.41
Contingency	\$39,295.89
Total	\$500,040.23
Annual Costs Over 20 Year Life	\$58,734.73

Premier Tech - EcoFlo Biofilter

Interest Rate = 10%
 Inflation Rate = 2%

Year	Capital Cost	Operation and Maintenance Costs					Repairs and Upgrading	Total
		Chlorination	U.V.	Electrical	Sludge Removal	Operator		
2001	\$43,673.96	N/A	\$150.00	\$60.00	\$500.00	\$6,000.00	\$2,125.00	\$52,508.96
2002	\$43,673.96	N/A	\$153.00	\$61.20	\$510.00	\$6,120.00	\$2,167.50	\$52,685.66
2003	\$43,673.96	N/A	\$156.06	\$62.42	\$520.20	\$6,242.40	\$2,210.85	\$50,655.05
2004	\$43,673.96	N/A	\$159.18	\$63.67	\$530.60	\$6,367.25	\$2,255.07	\$50,794.67
2005	\$43,673.96	N/A	\$162.36	\$64.95	\$541.22	\$6,494.59	\$2,300.17	\$50,937.08
2006	\$43,673.96	N/A	\$165.61	\$66.24	\$552.04	\$6,624.48	\$2,346.17	\$51,082.34
2007	\$43,673.96	N/A	\$168.92	\$67.57	\$563.08	\$6,756.97	\$2,393.10	\$51,230.51
2008	\$43,673.96	N/A	\$172.30	\$68.92	\$574.34	\$6,892.11	\$2,440.96	\$51,381.64
2009	\$43,673.96	N/A	\$175.75	\$70.30	\$585.83	\$7,029.96	\$2,489.78	\$51,535.80
2010	\$43,673.96	N/A	\$179.26	\$71.71	\$597.55	\$7,170.56	\$2,539.57	\$51,693.03
2011		N/A	\$182.85	\$73.14	\$609.50	\$7,313.97	\$2,590.36	\$8,179.45
2012		N/A	\$186.51	\$74.60	\$621.69	\$7,460.25	\$2,642.17	\$8,343.04
2013		N/A	\$190.24	\$76.09	\$634.12	\$7,609.45	\$2,695.01	\$8,509.90
2014		N/A	\$194.04	\$77.62	\$646.80	\$7,761.64	\$2,748.91	\$8,680.10
2015		N/A	\$197.92	\$79.17	\$659.74	\$7,916.87	\$2,803.89	\$8,853.70
2016		N/A	\$201.88	\$80.75	\$672.93	\$8,075.21	\$2,859.97	\$9,030.78
2017		N/A	\$205.92	\$82.37	\$686.39	\$8,236.71	\$2,917.17	\$9,211.39
2018		N/A	\$210.04	\$84.01	\$700.12	\$8,401.45	\$2,975.51	\$9,395.62
2019		N/A	\$214.24	\$85.69	\$714.12	\$8,569.48	\$3,035.02	\$9,583.53
2020		N/A	\$218.52	\$87.41	\$728.41	\$8,740.87	\$3,095.72	\$9,775.20
Present Worth	\$268,359.03	N/A	\$1,460.85	\$584.34	\$4,869.51	\$58,434.08	\$20,695.40	\$354,403.21

Summary

Total PW for 3 systems	\$354,403.21
Total Present Worth with Taxes	\$407,563.69
Engineering	\$70,304.74
Contingency	\$40,756.37
Total	\$518,624.80
Annual Costs Over 20 Year Life	\$60,917.67

ABL - Sand Filtration (3 System Alternative)

Interest Rate = 10%

Inflation Rate = 2%

Year	Capital Cost (for 3 systems)	Operation and Maintenance Costs				Repairs and Upgrading	Total
		Chlorination	U.V.	Electrical	Sludge Removal		
2001	\$37,595.25	\$1,000.00	N/A	\$73.93	\$1,000.00	\$10,000.00	\$49,669.18
2002	\$37,595.25	\$1,020.00	N/A	\$75.41	\$1,020.00	\$10,200.00	\$49,910.66
2003	\$37,595.25	\$1,040.40	N/A	\$76.92	\$1,040.40	\$10,404.00	\$50,156.97
2004	\$37,595.25	\$1,061.21	N/A	\$78.46	\$1,061.21	\$10,612.08	\$50,408.20
2005	\$37,595.25	\$1,082.43	N/A	\$80.02	\$1,082.43	\$10,824.32	\$50,664.46
2006	\$37,595.25	\$1,104.08	N/A	\$81.62	\$1,104.08	\$11,040.81	\$50,985.46
2007	\$37,595.25	\$1,126.16	N/A	\$83.26	\$1,126.16	\$11,261.62	\$51,192.46
2008	\$37,595.25	\$1,148.69	N/A	\$84.92	\$1,148.69	\$11,486.86	\$51,464.40
2009	\$37,595.25	\$1,171.66	N/A	\$86.62	\$1,171.66	\$11,716.59	\$51,741.78
2010	\$37,595.25	\$1,195.09	N/A	\$88.35	\$1,195.09	\$11,950.93	\$52,024.71
2011		\$1,218.99	N/A	\$90.12	\$1,218.99	\$12,189.94	\$3,291.28
2012		\$1,243.37	N/A	\$91.92	\$1,243.37	\$12,433.74	\$15,012.41
2013		\$1,268.24	N/A	\$93.76	\$1,268.24	\$12,682.42	\$15,312.66
2014		\$1,293.61	N/A	\$95.64	\$1,293.61	\$12,936.07	\$15,618.92
2015		\$1,319.48	N/A	\$97.55	\$1,319.48	\$13,194.79	\$15,931.29
2016		\$1,345.87	N/A	\$99.50	\$1,345.87	\$13,458.68	\$16,249.92
2017		\$1,372.79	N/A	\$101.49	\$1,372.79	\$13,727.86	\$16,574.92
2018		\$1,400.24	N/A	\$103.52	\$1,400.24	\$14,002.41	\$16,906.42
2019		\$1,428.25	N/A	\$105.59	\$1,428.25	\$14,282.46	\$17,244.55
2020		\$1,456.81	N/A	\$107.70	\$1,456.81	\$14,568.11	\$17,589.44
Present Worth	\$231,007.77	\$9,739.01	\$0.00	\$720.01	\$9,739.01	\$97,390.13	\$6,156.15

Summary

Total PW for 3 systems	\$354,752.09
Total Present Worth with Taxes	\$407,964.90
Engineering	\$70,373.95
Contingency	\$40,796.49
Total	\$519,135.34
Annual Costs Over 20 Year Life	\$60,977.64

ABL - Sand Filtration

Interest Rate = 10%

Inflation Rate = 2%

Year	Capital Cost	Operation and Maintenance Costs					Repairs and Upgrading	Total
		Chlorination	U.V.	Electrical	Sludge Removal	Operator		
2001	\$40,973.94	\$1,000.00	N/A	\$73.93	\$1,000.00	\$10,000.00		\$53,047.87
2002	\$40,973.94	\$1,020.00	N/A	\$75.41	\$1,020.00	\$10,200.00		\$53,289.35
2003	\$40,973.94	\$1,040.40	N/A	\$76.92	\$1,040.40	\$10,404.00		\$53,535.66
2004	\$40,973.94	\$1,061.21	N/A	\$78.46	\$1,061.21	\$10,612.08		\$53,786.89
2005	\$40,973.94	\$1,082.43	N/A	\$80.02	\$1,082.43	\$10,824.32		\$54,043.15
2006	\$40,973.94	\$1,104.08	N/A	\$81.62	\$1,104.08	\$11,040.81	\$59.62	\$54,364.15
2007	\$40,973.94	\$1,126.16	N/A	\$83.26	\$1,126.16	\$11,261.62		\$54,571.15
2008	\$40,973.94	\$1,148.69	N/A	\$84.92	\$1,148.69	\$11,486.86		\$54,843.09
2009	\$40,973.94	\$1,171.66	N/A	\$86.62	\$1,171.66	\$11,716.59		\$55,120.47
2010	\$40,973.94	\$1,195.09	N/A	\$88.35	\$1,195.09	\$11,950.93		\$55,403.40
2011		\$1,218.99	N/A	\$90.12	\$1,218.99	\$12,189.94	\$3,291.28	\$14,718.05
2012		\$1,243.37	N/A	\$91.92	\$1,243.37	\$12,433.74		\$15,012.41
2013		\$1,268.24	N/A	\$93.76	\$1,268.24	\$12,682.42		\$15,312.66
2014		\$1,293.61	N/A	\$95.64	\$1,293.61	\$12,936.07		\$15,618.92
2015		\$1,319.48	N/A	\$97.55	\$1,319.48	\$13,194.79		\$15,931.29
2016		\$1,345.87	N/A	\$99.50	\$1,345.87	\$13,458.68	\$20,260.70	\$16,249.92
2017		\$1,372.79	N/A	\$101.49	\$1,372.79	\$13,727.86		\$16,574.92
2018		\$1,400.24	N/A	\$103.52	\$1,400.24	\$14,002.41		\$16,906.42
2019		\$1,428.25	N/A	\$105.59	\$1,428.25	\$14,282.46		\$17,244.55
2020		\$1,456.81	N/A	\$107.70	\$1,456.81	\$14,568.11		\$17,589.44
Present Worth	\$251,768.47	\$9,739.01	\$0.00	\$720.01	\$9,739.01	\$97,390.13	\$6,156.15	\$375,512.79

Summary

Total Present Worth	\$375,512.79
Total Present Worth with Taxes	\$431,839.70
Engineering	\$74,492.35
Contingency	\$43,183.97
Total	\$549,516.02
Annual Costs Over 20 Year Life	\$64,546.15

CMS - ROTORDISK

Interest Rate = 10%
Inflation Rate = 2%

Year	Capital Cost	Operation and Maintenance Costs						Repairs and Upgrading	Total
		Chlorination	U.V.	Electrical	Sludge Removal	Operator			
2001	\$42,330.79	\$1,000.00	N/A	\$843.15	\$2,000.00	\$10,000.00		\$56,173.94	
2002	\$42,330.79	\$1,020.00	N/A	\$860.01	\$2,040.00	\$10,200.00		\$56,450.80	
2003	\$42,330.79	\$1,040.40	N/A	\$877.21	\$2,080.80	\$10,404.00		\$56,733.20	
2004	\$42,330.79	\$1,061.21	N/A	\$894.76	\$2,122.42	\$10,612.08		\$57,021.25	
2005	\$42,330.79	\$1,082.43	N/A	\$912.65	\$2,164.86	\$10,824.32		\$57,315.06	
2006	\$42,330.79	\$1,104.08	N/A	\$930.91	\$2,208.16	\$11,040.81	\$441.63	\$57,614.74	
2007	\$42,330.79	\$1,126.16	N/A	\$949.52	\$2,252.32	\$11,261.62		\$57,920.42	
2008	\$42,330.79	\$1,148.69	N/A	\$968.51	\$2,297.37	\$11,486.86		\$58,232.21	
2009	\$42,330.79	\$1,171.66	N/A	\$987.88	\$2,343.32	\$11,716.59		\$58,550.24	
2010	\$42,330.79	\$1,195.09	N/A	\$1,007.64	\$2,390.19	\$11,950.93		\$58,874.63	
2011		\$1,218.99	N/A	\$1,027.80	\$2,437.99	\$12,189.94	\$2,437.99	\$16,874.72	
2012		\$1,243.37	N/A	\$1,048.35	\$2,486.75	\$12,433.74		\$17,212.22	
2013		\$1,268.24	N/A	\$1,069.32	\$2,536.48	\$12,682.42		\$17,556.46	
2014		\$1,293.61	N/A	\$1,090.70	\$2,587.21	\$12,936.07		\$17,907.59	
2015		\$1,319.48	N/A	\$1,112.52	\$2,638.96	\$13,194.79		\$18,265.74	
2016		\$1,345.87	N/A	\$1,134.77	\$2,691.74	\$13,458.68	\$538.35	\$18,631.06	
2017		\$1,372.79	N/A	\$1,157.46	\$2,745.57	\$13,727.86		\$19,003.68	
2018		\$1,400.24	N/A	\$1,180.61	\$2,800.48	\$14,002.41		\$19,383.75	
2019		\$1,428.25	N/A	\$1,204.23	\$2,856.49	\$14,282.46		\$19,771.43	
2020		\$1,456.81	N/A	\$1,228.31	\$2,913.62	\$14,568.11		\$20,166.86	
Present Worth	\$260,105.75	\$9,739.01	\$0.00	\$8,211.45	\$19,478.03	\$97,390.13	\$1,343.04	\$396,267.41	

Summary

Total Present Worth	\$396,267.41
Total Present Worth with Taxes	\$455,707.52
Engineering	\$78,609.55
Contingency	\$45,570.75
Total	\$579,887.82
Annual Costs Over 20 Year Life	\$68,113.62

P. J. Hannah - RBC

Interest Rate = 10%
 Inflation Rate = 2%

Year	Capital Cost	Operation and Maintenance Costs					Repairs and Upgrading	Total
		Chlorination	U.V.	Electrical	Sludge Removal	Operator		
2001	\$47,768.75	\$1,000.00	N/A	\$262.80	\$1,000.00	\$10,000.00		\$60,031.55
2002	\$47,768.75	\$1,020.00	N/A	\$268.06	\$1,020.00	\$10,200.00		\$60,276.81
2003	\$47,768.75	\$1,040.40	N/A	\$273.42	\$1,040.40	\$10,404.00		\$60,526.97
2004	\$47,768.75	\$1,061.21	N/A	\$278.89	\$1,061.21	\$10,612.08		\$60,782.13
2005	\$47,768.75	\$1,082.43	N/A	\$284.46	\$1,082.43	\$10,824.32		\$61,042.40
2006	\$47,768.75	\$1,104.08	N/A	\$290.15	\$1,104.08	\$11,040.81	\$110.41	\$61,307.87
2007	\$47,768.75	\$1,126.16	N/A	\$295.96	\$1,126.16	\$11,261.62		\$61,578.66
2008	\$47,768.75	\$1,148.69	N/A	\$301.87	\$1,148.69	\$11,486.86		\$61,854.86
2009	\$47,768.75	\$1,171.66	N/A	\$307.91	\$1,171.66	\$11,716.59		\$62,136.58
2010	\$47,768.75	\$1,195.09	N/A	\$314.07	\$1,195.09	\$11,950.93		\$62,423.93
2011		\$1,218.99	N/A	\$320.35	\$1,218.99	\$12,189.94	\$609.50	\$14,948.28
2012		\$1,243.37	N/A	\$326.76	\$1,243.37	\$12,433.74		\$15,247.25
2013		\$1,268.24	N/A	\$333.29	\$1,268.24	\$12,682.42		\$15,552.20
2014		\$1,293.61	N/A	\$339.96	\$1,293.61	\$12,936.07		\$15,863.24
2015		\$1,319.48	N/A	\$346.76	\$1,319.48	\$13,194.79		\$16,180.50
2016		\$1,345.87	N/A	\$353.69	\$1,345.87	\$13,458.68	\$134.59	\$16,504.11
2017		\$1,372.79	N/A	\$360.77	\$1,372.79	\$13,727.86		\$16,834.20
2018		\$1,400.24	N/A	\$367.98	\$1,400.24	\$14,002.41		\$17,170.88
2019		\$1,428.25	N/A	\$375.34	\$1,428.25	\$14,282.46		\$17,514.30
2020		\$1,456.81	N/A	\$382.85	\$1,456.81	\$14,568.11		\$17,864.58
Present Worth	\$293,519.88	\$9,739.01	\$0.00	\$2,559.41	\$9,739.01	\$97,390.13	\$335.76	\$413,283.21

Summary

Total Present Worth	\$413,283.21
Total Present Worth with Taxes	\$475,275.69
Engineering	\$81,985.06
Contingency	\$47,527.57
Total	\$604,788.31
Annual Costs Over 20 Year Life	\$71,038.44

P.J. Hannah - RBC (FRP)

Interest Rate = 10%
 Inflation Rate = 2%

Year	Capital Cost	Operation and Maintenance Costs						Repairs and Upgrading	Total
		Chlorination	U.V.	Electrical	Sludge Removal	Operator			
2001	\$47,850.13	\$1,000.00	N/A	\$262.80	\$1,000.00	\$10,000.00		\$60,112.93	
2002	\$47,850.13	\$1,020.00	N/A	\$268.06	\$1,020.00	\$10,200.00		\$60,358.18	
2003	\$47,850.13	\$1,040.40	N/A	\$273.42	\$1,040.40	\$10,404.00		\$60,608.34	
2004	\$47,850.13	\$1,061.21	N/A	\$278.89	\$1,061.21	\$10,612.08		\$60,863.51	
2005	\$47,850.13	\$1,082.43	N/A	\$284.46	\$1,082.43	\$10,824.32		\$61,123.78	
2006	\$47,850.13	\$1,104.08	N/A	\$290.15	\$1,104.08	\$11,040.81	\$110.41	\$61,389.25	
2007	\$47,850.13	\$1,126.16	N/A	\$295.96	\$1,126.16	\$11,261.62		\$61,660.03	
2008	\$47,850.13	\$1,148.69	N/A	\$301.87	\$1,148.69	\$11,486.86		\$61,936.23	
2009	\$47,850.13	\$1,171.66	N/A	\$307.91	\$1,171.66	\$11,716.59		\$62,217.95	
2010	\$47,850.13	\$1,195.09	N/A	\$314.07	\$1,195.09	\$11,950.93		\$62,505.31	
2011		\$1,218.99	N/A	\$320.35	\$1,218.99	\$12,189.94	\$609.50	\$14,948.28	
2012		\$1,243.37	N/A	\$326.76	\$1,243.37	\$12,433.74		\$15,247.25	
2013		\$1,268.24	N/A	\$333.29	\$1,268.24	\$12,682.42		\$15,552.20	
2014		\$1,293.61	N/A	\$339.96	\$1,293.61	\$12,936.07		\$15,863.24	
2015		\$1,319.48	N/A	\$346.76	\$1,319.48	\$13,194.79		\$16,180.50	
2016		\$1,345.87	N/A	\$353.69	\$1,345.87	\$13,458.68	\$134.59	\$16,504.11	
2017		\$1,372.79	N/A	\$360.77	\$1,372.79	\$13,727.86		\$16,834.20	
2018		\$1,400.24	N/A	\$367.98	\$1,400.24	\$14,002.41		\$17,170.88	
2019		\$1,428.25	N/A	\$375.34	\$1,428.25	\$14,282.46		\$17,514.30	
2020		\$1,456.81	N/A	\$382.85	\$1,456.81	\$14,568.11		\$17,864.58	
Present Worth	\$294,019.89	\$9,739.01	\$0.00	\$2,559.41	\$9,739.01	\$97,390.13	\$335.76	\$413,783.22	

Summary

Total Present Worth	\$413,783.22
Total Present Worth with Taxes	\$475,850.71
Engineering	\$82,084.25
Contingency	\$47,585.07
Total	\$605,520.02
Annual Costs Over 20 Year Life	\$71,124.38

Premier Tech - EcoFlo Biofilter

Interest Rate = 10%
 Inflation Rate = 2%

Year	Capital Cost	Operation and Maintenance Costs						Repairs and Upgrading	Total
		Chlorination	U.V.	Electrical	Sludge Removal	Operator			
2001	\$54,229.93	N/A	\$150.00	\$60.00	\$500.00	\$6,000.00	\$2,125.00	\$60,939.93	
2002	\$54,229.93	N/A	\$153.00	\$61.20	\$510.00	\$6,120.00	\$2,167.50	\$63,241.63	
2003	\$54,229.93	N/A	\$156.06	\$62.42	\$520.20	\$6,242.40	\$2,210.85	\$61,211.01	
2004	\$54,229.93	N/A	\$159.18	\$63.67	\$530.60	\$6,367.25	\$2,255.07	\$61,350.63	
2005	\$54,229.93	N/A	\$162.36	\$64.95	\$541.22	\$6,494.59	\$2,300.17	\$61,493.05	
2006	\$54,229.93	N/A	\$165.61	\$66.24	\$552.04	\$6,624.48	\$2,346.17	\$61,638.31	
2007	\$54,229.93	N/A	\$168.92	\$67.57	\$563.08	\$6,756.97	\$2,393.10	\$61,786.48	
2008	\$54,229.93	N/A	\$172.30	\$68.92	\$574.34	\$6,892.11	\$2,440.96	\$61,937.61	
2009	\$54,229.93	N/A	\$175.75	\$70.30	\$585.83	\$7,029.96	\$2,489.78	\$62,091.76	
2010	\$54,229.93	N/A	\$179.26	\$71.71	\$597.55	\$7,170.56	\$2,539.57	\$62,249.00	
2011		N/A	\$182.85	\$73.14	\$609.50	\$7,313.97	\$2,590.36	\$8,179.45	
2012		N/A	\$186.51	\$74.60	\$621.69	\$7,460.25	\$2,642.17	\$8,343.04	
2013		N/A	\$190.24	\$76.09	\$634.12	\$7,609.45	\$2,695.01	\$8,509.90	
2014		N/A	\$194.04	\$77.62	\$646.80	\$7,761.64	\$2,748.91	\$8,680.10	
2015		N/A	\$197.92	\$79.17	\$659.74	\$7,916.87	\$2,803.89	\$8,853.70	
2016		N/A	\$201.88	\$80.75	\$672.93	\$8,075.21	\$2,859.97	\$9,030.78	
2017		N/A	\$205.92	\$82.37	\$686.39	\$8,236.71	\$2,917.17	\$9,211.39	
2018		N/A	\$210.04	\$84.01	\$700.12	\$8,401.45	\$2,975.51	\$9,395.62	
2019		N/A	\$214.24	\$85.69	\$714.12	\$8,569.48	\$3,035.02	\$9,583.53	
2020		N/A	\$218.52	\$87.41	\$728.41	\$8,740.87	\$3,095.72	\$9,775.20	
Present Worth	\$333,221.21	N/A	\$1,460.85	\$584.34	\$4,869.51	\$58,434.08	\$20,695.40	\$419,265.39	

Summary

Total Present Worth	\$419,265.39
Total Present Worth with Taxes	\$482,155.20
Engineering	\$83,171.77
Contingency	\$48,215.52
Total	\$613,542.50
Annual Costs Over 20 Year Life	\$72,066.70

CMT (BMS) - Blivet

Interest Rate = 10%
Inflation Rate = 2%

Year	Capital Cost	Operation and Maintenance Costs						Repairs and Upgrading	Total
		Chlorination	U.V.	Electrical	Sludge Removal	Operator			
2001	\$46,724.71	N/A	\$150.00	\$390.30	\$3,000.00	\$10,000.00		\$60,265.01	
2002	\$46,724.71	N/A	\$153.00	\$398.11	\$3,060.00	\$10,200.00		\$60,535.82	
2003	\$46,724.71	N/A	\$156.06	\$406.07	\$3,121.20	\$10,404.00		\$60,812.04	
2004	\$46,724.71	N/A	\$159.18	\$414.19	\$3,183.62	\$10,612.08		\$61,093.79	
2005	\$46,724.71	N/A	\$162.36	\$422.47	\$3,247.30	\$10,824.32		\$61,381.17	
2006	\$46,724.71	N/A	\$165.61	\$430.92	\$3,312.24	\$11,040.81	\$242.90	\$61,674.30	
2007	\$46,724.71	N/A	\$168.92	\$439.54	\$3,378.49	\$11,261.62		\$61,973.29	
2008	\$46,724.71	N/A	\$172.30	\$448.33	\$3,446.06	\$11,486.86		\$62,278.26	
2009	\$46,724.71	N/A	\$175.75	\$457.30	\$3,514.98	\$11,716.59		\$62,589.33	
2010	\$46,724.71	N/A	\$179.26	\$466.44	\$3,585.28	\$11,950.93		\$62,906.62	
2011		N/A	\$182.85	\$475.77	\$3,656.98	\$12,189.94	\$1,340.89	\$16,505.55	
2012		N/A	\$186.51	\$485.29	\$3,730.12	\$12,433.74		\$16,835.66	
2013		N/A	\$190.24	\$494.99	\$3,804.73	\$12,682.42		\$17,172.37	
2014		N/A	\$194.04	\$504.89	\$3,880.82	\$12,936.07		\$17,515.82	
2015		N/A	\$197.92	\$514.99	\$3,958.44	\$13,194.79		\$17,866.14	
2016		N/A	\$201.88	\$525.29	\$4,037.61	\$13,458.68	\$296.09	\$18,223.46	
2017		N/A	\$205.92	\$535.80	\$4,118.36	\$13,727.86		\$18,587.93	
2018		N/A	\$210.04	\$546.51	\$4,200.72	\$14,002.41		\$18,959.69	
2019		N/A	\$214.24	\$557.44	\$4,284.74	\$14,282.46		\$19,338.88	
2020		N/A	\$218.52	\$568.59	\$4,370.43	\$14,568.11		\$19,725.66	
Present Worth	\$287,104.66	N/A	\$1,460.85	\$3,801.14	\$29,217.04	\$97,390.13	\$738.67	\$419,712.49	

Summary

Total Present Worth	\$419,712.49
Total Present Worth with Taxes	\$482,669.36
Engineering	\$83,260.47
Contingency	\$48,266.94
Total	\$614,196.77
Annual Costs Over 20 Year Life	\$72,143.55

BioFlo - BioFosse (Fiberglass Tankage System)

Interest Rate = 10%
Inflation Rate = 2%

Year	Capital Cost	Operation and Maintenance Costs						Repairs and Upgrading	Total
		Chlorination	U.V.	Electrical	Sludge Removal	Operator	Operator		
2001	\$46,432.25	N/A	\$150.00	\$2,290.30	\$1,000.00	\$10,000.00		\$59,872.55	
2002	\$46,432.25	N/A	\$153.00	\$2,336.11	\$1,020.00	\$10,200.00		\$60,141.36	
2003	\$46,432.25	N/A	\$156.06	\$2,382.83	\$1,040.40	\$10,404.00		\$60,415.54	
2004	\$46,432.25	N/A	\$159.18	\$2,430.48	\$1,061.21	\$10,612.08		\$60,695.20	
2005	\$46,432.25	N/A	\$162.36	\$2,479.09	\$1,082.43	\$10,824.32		\$60,980.46	
2006	\$46,432.25	N/A	\$165.61	\$2,528.68	\$1,104.08	\$11,040.81	\$1,795.24	\$61,271.43	
2007	\$46,432.25	N/A	\$168.92	\$2,579.25	\$1,126.16	\$11,261.62		\$61,568.21	
2008	\$46,432.25	N/A	\$172.30	\$2,630.83	\$1,148.69	\$11,486.86		\$61,870.93	
2009	\$46,432.25	N/A	\$175.75	\$2,683.45	\$1,171.66	\$11,716.59		\$62,179.70	
2010	\$46,432.25	N/A	\$179.26	\$2,737.12	\$1,195.09	\$11,950.93		\$62,494.65	
2011		N/A	\$182.85	\$2,791.86	\$1,218.99	\$12,189.94	\$22,197.88	\$16,383.65	
2012		N/A	\$186.51	\$2,847.70	\$1,243.37	\$12,433.74		\$16,711.32	
2013		N/A	\$190.24	\$2,904.65	\$1,268.24	\$12,682.42		\$17,045.55	
2014		N/A	\$194.04	\$2,962.75	\$1,293.61	\$12,936.07		\$17,386.46	
2015		N/A	\$197.92	\$3,022.00	\$1,319.48	\$13,194.79		\$17,734.19	
2016		N/A	\$201.88	\$3,082.44	\$1,345.87	\$13,458.68	\$2,188.38	\$18,088.87	
2017		N/A	\$205.92	\$3,144.09	\$1,372.79	\$13,727.86		\$18,450.65	
2018		N/A	\$210.04	\$3,206.97	\$1,400.24	\$14,002.41		\$18,819.66	
2019		N/A	\$214.24	\$3,271.11	\$1,428.25	\$14,282.46		\$19,196.06	
2020		N/A	\$218.52	\$3,336.53	\$1,456.81	\$14,568.11		\$19,579.98	
Present Worth	\$285,307.60		\$1,460.85	\$22,305.26	\$9,739.01	\$97,390.13	\$10,196.75	\$426,399.61	

Summary

Total Present Worth	\$426,399.61
Total Present Worth with Taxes	\$490,359.55
Engineering	\$84,587.02
Contingency	\$49,035.95
Total	\$623,982.52
Annual Costs Over 20 Year Life	\$73,292.99

BioFlo - BioFosse (Concrete Tankage System)

Interest Rate = 10%
 Inflation Rate = 2%

Year	Capital Cost	Operation and Maintenance Costs						Repairs and Upgrading	Total
		Chlorination	U.V.	Electrical	Sludge Removal	Operator	Operator		
2001	\$46,877.70	N/A	\$150.00	\$2,290.30	\$1,000.00	\$10,000.00		\$60,318.00	
2002	\$46,877.70	N/A	\$153.00	\$2,336.11	\$1,020.00	\$10,200.00		\$60,586.80	
2003	\$46,877.70	N/A	\$156.06	\$2,382.83	\$1,040.40	\$10,404.00		\$60,860.98	
2004	\$46,877.70	N/A	\$159.18	\$2,430.48	\$1,061.21	\$10,612.08		\$61,140.65	
2005	\$46,877.70	N/A	\$162.36	\$2,479.09	\$1,082.43	\$10,824.32		\$61,425.91	
2006	\$46,877.70	N/A	\$165.61	\$2,528.68	\$1,104.08	\$11,040.81	\$1,795.24	\$61,716.87	
2007	\$46,877.70	N/A	\$168.92	\$2,579.25	\$1,126.16	\$11,261.62		\$62,013.66	
2008	\$46,877.70	N/A	\$172.30	\$2,630.83	\$1,148.69	\$11,486.86		\$62,316.38	
2009	\$46,877.70	N/A	\$175.75	\$2,683.45	\$1,171.66	\$11,716.59		\$62,625.15	
2010	\$46,877.70	N/A	\$179.26	\$2,737.12	\$1,195.09	\$11,950.93		\$62,940.10	
2011		N/A	\$182.85	\$2,791.86	\$1,218.99	\$12,189.94	\$22,197.88	\$16,383.65	
2012		N/A	\$186.51	\$2,847.70	\$1,243.37	\$12,433.74		\$16,711.32	
2013		N/A	\$190.24	\$2,904.65	\$1,268.24	\$12,682.42		\$17,045.55	
2014		N/A	\$194.04	\$2,962.75	\$1,293.61	\$12,936.07		\$17,386.46	
2015		N/A	\$197.92	\$3,022.00	\$1,319.48	\$13,194.79		\$17,734.19	
2016		N/A	\$201.88	\$3,082.44	\$1,345.87	\$13,458.68	\$2,188.38	\$18,088.87	
2017		N/A	\$205.92	\$3,144.09	\$1,372.79	\$13,727.86		\$18,450.65	
2018		N/A	\$210.04	\$3,206.97	\$1,400.24	\$14,002.41		\$18,819.66	
2019		N/A	\$214.24	\$3,271.11	\$1,428.25	\$14,282.46		\$19,196.06	
2020		N/A	\$218.52	\$3,336.53	\$1,456.81	\$14,568.11		\$19,579.98	
Present Worth	\$288,044.69	\$0.00	\$1,460.85	\$22,305.26	\$9,739.01	\$97,390.13	\$10,196.75	\$429,136.70	

Summary

Total Present Worth	\$429,136.70
Total Present Worth with Taxes	\$493,507.20
Engineering	\$85,129.99
Contingency	\$49,350.72
Total	\$627,987.91
Annual Costs Over 20 Year Life	\$73,763.46

Premier Tech - RotoFix

Interest Rate = 10%

Inflation Rate = 2%

Year	Capital Cost	Operation and Maintenance Costs						Repairs and Upgrading	Total
		Chlorination	U.V.	Electrical	Sludge Removal	Operator	Operator		
2001	\$51,548.62	N/A	\$150.00	\$780.00	\$1,000.00	\$10,000.00	\$315.00	\$53,478.62	
2002	\$51,548.62	N/A	\$153.00	\$795.60	\$1,020.00	\$10,200.00	\$321.30	\$53,517.22	
2003	\$51,548.62	N/A	\$156.06	\$811.51	\$1,040.40	\$10,404.00	\$327.73	\$53,556.59	
2004	\$51,548.62	N/A	\$159.18	\$827.74	\$1,061.21	\$10,612.08	\$334.28	\$53,596.75	
2005	\$51,548.62	N/A	\$162.36	\$844.30	\$1,082.43	\$10,824.32	\$340.97	\$53,637.72	
2006	\$51,548.62	N/A	\$165.61	\$861.18	\$1,104.08	\$11,040.81	\$347.79	\$53,679.50	
2007	\$51,548.62	N/A	\$168.92	\$878.41	\$1,126.16	\$11,261.62	\$354.74	\$53,722.11	
2008	\$51,548.62	N/A	\$172.30	\$895.97	\$1,148.69	\$11,486.86	\$361.84	\$53,765.58	
2009	\$51,548.62	N/A	\$175.75	\$913.89	\$1,171.66	\$11,716.59	\$369.07	\$53,809.92	
2010	\$51,548.62	N/A	\$179.26	\$932.17	\$1,195.09	\$11,950.93	\$376.45	\$53,855.15	
2011		N/A	\$182.85	\$950.82	\$1,218.99	\$12,189.94	\$383.98	\$2,352.66	
2012		N/A	\$186.51	\$969.83	\$1,243.37	\$12,433.74	\$391.66	\$2,399.71	
2013		N/A	\$190.24	\$989.23	\$1,268.24	\$12,682.42	\$399.50	\$2,447.71	
2014		N/A	\$194.04	\$1,009.01	\$1,293.61	\$12,936.07	\$407.49	\$2,496.66	
2015		N/A	\$197.92	\$1,029.19	\$1,319.48	\$13,194.79	\$415.64	\$2,546.59	
2016		N/A	\$201.88	\$1,049.78	\$1,345.87	\$13,458.68	\$423.95	\$2,597.53	
2017		N/A	\$205.92	\$1,070.77	\$1,372.79	\$13,727.86	\$432.43	\$2,649.48	
2018		N/A	\$210.04	\$1,092.19	\$1,400.24	\$14,002.41	\$441.08	\$2,702.47	
2019		N/A	\$214.24	\$1,114.03	\$1,428.25	\$14,282.46	\$449.90	\$2,756.52	
2020		N/A	\$218.52	\$1,136.31	\$1,456.81	\$14,568.11	\$458.90	\$2,811.65	
Present Worth	\$316,745.66	N/A	\$1,460.85	\$7,596.43	\$9,739.01	\$97,390.13	\$3,067.79	\$435,999.87	

Summary

Total Present Worth	\$435,999.87
Total Present Worth with Taxes	\$501,399.86
Engineering	\$86,491.48
Contingency	\$50,139.99
Total	\$638,031.32
Annual Costs Over 20 Year Life	\$74,943.16

P. J. Hannah (AFS) - SBR

Interest Rate = 10%
 Inflation Rate = 2%

Year	Capital Cost	Operation and Maintenance Costs						Repairs and	Total
		Chlorination	U.V.	Electrical	Sludge Removal	Operator			
2001	\$46,019.19	\$1,000.00	N/A	\$1,384.08	\$3,000.00	\$10,000.00	\$1,300.00	\$61,403.27	
2002	\$46,019.19	\$1,020.00	N/A	\$1,411.76	\$3,060.00	\$10,200.00		\$61,710.95	
2003	\$46,019.19	\$1,040.40	N/A	\$1,440.00	\$3,121.20	\$10,404.00		\$62,024.79	
2004	\$46,019.19	\$1,061.21	N/A	\$1,468.80	\$3,183.62	\$10,612.08		\$62,344.90	
2005	\$46,019.19	\$1,082.43	N/A	\$1,498.17	\$3,247.30	\$10,824.32		\$62,671.41	
2006	\$46,019.19	\$1,104.08	N/A	\$1,528.14	\$3,312.24	\$11,040.81	\$2,031.51	\$63,004.46	
2007	\$46,019.19	\$1,126.16	N/A	\$1,558.70	\$3,378.49	\$11,261.62		\$63,344.16	
2008	\$46,019.19	\$1,148.69	N/A	\$1,589.87	\$3,446.06	\$11,486.86		\$63,690.66	
2009	\$46,019.19	\$1,171.66	N/A	\$1,621.67	\$3,514.98	\$11,716.59		\$64,044.09	
2010	\$46,019.19	\$1,195.09	N/A	\$1,654.10	\$3,585.28	\$11,950.93		\$64,404.59	
2011		\$1,218.99	N/A	\$1,687.19	\$3,656.98	\$12,189.94	\$11,214.75	\$18,753.11	
2012		\$1,243.37	N/A	\$1,720.93	\$3,730.12	\$12,433.74		\$19,128.17	
2013		\$1,268.24	N/A	\$1,755.35	\$3,804.73	\$12,682.42		\$19,510.73	
2014		\$1,293.61	N/A	\$1,790.46	\$3,880.82	\$12,936.07		\$19,900.95	
2015		\$1,319.48	N/A	\$1,826.26	\$3,958.44	\$13,194.79		\$20,298.97	
2016		\$1,345.87	N/A	\$1,862.79	\$4,037.61	\$13,458.68	\$2,476.40	\$20,704.95	
2017		\$1,372.79	N/A	\$1,900.05	\$4,118.36	\$13,727.86		\$21,119.05	
2018		\$1,400.24	N/A	\$1,938.05	\$4,200.72	\$14,002.41		\$21,541.43	
2019		\$1,428.25	N/A	\$1,976.81	\$4,284.74	\$14,282.46		\$21,972.25	
2020		\$1,456.81	N/A	\$2,016.34	\$4,370.43	\$14,568.11		\$22,411.70	
Present Worth	\$282,769.51	\$9,739.01	\$0.00	\$13,479.57	\$29,217.04	\$97,390.13	\$6,177.97	\$438,773.24	

Summary

Total Present Worth	\$438,773.24
Total Present Worth with Taxes	\$504,589.22
Engineering	\$87,041.64
Contingency	\$50,458.92
Total	\$642,089.79
Annual Costs Over 20 Year Life	\$75,419.87

Eco Process & Equipment - OxiSequencer

Interest Rate = 10%
Inflation Rate = 2%

Year	Capital Cost	Operation and Maintenance Costs						Repairs and Upgrading	Total
		Chlorination	U.V.	Electrical	Sludge Removal	Operator			
2001	\$55,165.74	N/A	\$150.00	\$1,179.02	\$1,000.00	\$10,000.00		\$67,494.76	
2002	\$55,165.74	N/A	\$153.00	\$1,202.60	\$1,020.00	\$10,200.00		\$67,741.34	
2003	\$55,165.74	N/A	\$156.06	\$1,226.65	\$1,040.40	\$10,404.00		\$67,992.85	
2004	\$55,165.74	N/A	\$159.18	\$1,251.19	\$1,061.21	\$10,612.08		\$68,249.39	
2005	\$55,165.74	N/A	\$162.36	\$1,276.21	\$1,082.43	\$10,824.32		\$68,511.07	
2006	\$55,165.74	N/A	\$165.61	\$1,301.73	\$1,104.08	\$11,040.81	\$1,634.04	\$68,777.97	
2007	\$55,165.74	N/A	\$168.92	\$1,327.77	\$1,126.16	\$11,261.62		\$69,050.22	
2008	\$55,165.74	N/A	\$172.30	\$1,354.32	\$1,148.69	\$11,486.86		\$69,327.91	
2009	\$55,165.74	N/A	\$175.75	\$1,381.41	\$1,171.66	\$11,716.59		\$69,611.15	
2010	\$55,165.74	N/A	\$179.26	\$1,409.04	\$1,195.09	\$11,950.93		\$69,900.06	
2011		N/A	\$182.85	\$1,437.22	\$1,218.99	\$12,189.94	\$9,020.56	\$15,029.01	
2012		N/A	\$186.51	\$1,465.96	\$1,243.37	\$12,433.74		\$15,329.59	
2013		N/A	\$190.24	\$1,495.28	\$1,268.24	\$12,682.42		\$15,636.18	
2014		N/A	\$194.04	\$1,525.19	\$1,293.61	\$12,936.07		\$15,948.90	
2015		N/A	\$197.92	\$1,555.69	\$1,319.48	\$13,194.79		\$16,267.88	
2016		N/A	\$201.88	\$1,586.81	\$1,345.87	\$13,458.68	\$1,991.89	\$16,593.24	
2017		N/A	\$205.92	\$1,618.54	\$1,372.79	\$13,727.86		\$16,925.10	
2018		N/A	\$210.04	\$1,650.91	\$1,400.24	\$14,002.41		\$17,263.60	
2019		N/A	\$214.24	\$1,683.93	\$1,428.25	\$14,282.46		\$17,608.88	
2020		N/A	\$218.52	\$1,717.61	\$1,456.81	\$14,568.11		\$17,961.05	
Present Worth	\$338,971.41	\$0.00	\$1,460.85	\$11,482.49	\$9,739.01	\$97,390.13	\$4,969.23	\$464,013.13	

Summary

Total Present Worth	\$464,013.13
Total Present Worth with Taxes	\$533,615.09
Engineering	\$92,048.60
Contingency	\$53,361.51
Total	\$679,025.21
Annual Costs Over 20 Year Life	\$79,758.30