DISCUSSION PAPER NO. 8

Disclaimer
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Capital Regional District

Core Area and West Shore Sewage Treatment
REI Technology Review

Issued: March 21, 2007

1 Objective

The Capital Regional District (CRD) is required by the Provincial Ministry of Environment to provide additional treatment to the municipal wastewater flows generated in the Core Area and West Shore areas. By June 2007, the CRD must define the number and location of facilities and set a time frame for the implementation of additional treatment.

While the CRD is in a unique position to evaluate many alternatives for treatment and conveyance, the choices are not unlimited and sites are constrained by the linear nature of conveyance facilities and key engineering constraints for treatment facilities. A system of treatment plants, conveyance lines and pump stations must ultimately be sited as essential public facilities to achieve the goals of the Liquid Waste Management Plan (LWMP), to protect public health and to achieve environmental standards.

The CRD issued a request for expressions of interest (REI) to solicit information regarding innovative wastewater treatment and resource recovery technologies and strategies that may be suitable for effectively and sustainably treating the District's wastewater. A total of twenty four submissions were received in response to the REI from a wide variety of organizations ranging from small firms to large multi-national corporations. This Discussion Paper presents the review of submissions.

2 Technology Review

Upon initial review, each submission was subjected to the following questions:

- What description best describes the submitting company or organization (e.g. technology vendor, service provider)? Submissions by service providers were not analyzed as they do not represent specific technology.

- Does the proposed technology(s) fit into any of the forty three generic technology categories presented previously in the Technology Assessment contained in Discussion

3, the technology was subjected to the same pass/fail and multi-criteria analyses described in Discussion Paper No. 3.

Table 1 summarizes the REI submissions, relevant information and the pass/fail analysis. Table 2 summarizes the multi-criteria analysis and ranking, as applied to each passing technology. Appendix A contains a synopsis of each submission.

3 Summary

The proposed technologies, as received in the REI submissions, span the entire range of application, from liquid stream treatment through to water reuse, biosolids management and resource recovery. Many of the technologies were assessed previously, in their "generic" form, as part of the evaluation conducted for Discussion Paper No. 3.

Several of the passing proposed technologies should be considered during subsequent implementation phases of the CRD program. However, none of these technologies change the representative technology assumptions made to facilitate the planning work required for the Decision Information Report project.

TABLE 1

CAPITAL REGIONAL DISTRICT
CORE AREA AND WEST SHORE SEWAGE TREATMENT
DECISION INFORMATION REPORT

REI TECHNOLOGY ASSESSMENT

PASS / FAIL ANALYSIS

Submission No.	Company(s)	Description	Included in Discussion Paper No. 3 Generic Technology Categories?	Application	Discussion	Pass / Fail
1	Alterna Energy Inc.	Technology Vendor	No - sludge pyrolosis	Biosolids management	Embryonic technology, not proven at required scale	Fail
2	CSO Technik Ltd.	Technology Vendor	Yes - waste sludge reduction process	--	--	--
3	H2O Logics - Solar Bee	Technology Vendor	No - pond mixing	Water reuse		Pass
4	Paradigm Environmental Technologies	Technology Vendor	Yes - waste sludge reduction process	--	--	--
5	N-Viro Systems Canada Inc.	Technology Vendor	No - sludge drying/chemical pasteurization	Biosolids management		Pass
6	Rockwell Automation	Technology Vendor, Service Provider	No - process control systems and services		Does not represent treatment technology	Fail
7	Rothwell Associates Ltd.	Technology Vendor	No - mixed liquor degassification	Liquid stream treatment	Applicable if nitrogen removal required	Pass
8	Zenon Membrane Solutions	Technology Vendor	Yes - membrane bioreactors and filtration	--	--	--
9	J.K. Engineering	Technology Vendor, Service Provider	Yes - anaerobic digestion	--	--	--
10	O2 Environmental	Technology Vendor	Yes - ultraviolet effluent disinfection	--	--	--
11	Dennis E. Bentley	Technology Vendor	Yes - membrane bioreactors and sludge drying	--	--	--
12	Enviro Energy Ltd.	Technology Vendor	No - sludge pyrolosis and drying	Biosolids management	Embryonic technology, not proven at required scale	Fail
13	Hydra Renewable Resources Inc.	Technology Vendor	No - effluent filtration with ozone disinfection	Effluent disinfection and water reuse		Pass
14	Vanport Sterilizers	Technology Vendor	No - coal bed filtration	Liquid stream treatment	Not considered technically or economically viable	Fail
15	Patrick Dunn (3C Water Systems Ltd.)	Technology Vendor	Yes - high rate primary treatment	--	--	--
16	NORAM Engineering and Constructors Ltd.	Technology Vendor	Yes - deep shaft activated sludge	--	--	--
17	Veolia Water	Technology Vendor, Service Provider	Yes, except for the following:	--	--	--
			oxidation ditch	Liquid stream treatment	Not economical at required scale	Fail
			ozone disinfection	Effluent disinfection		Pass
			woven media filters	Water reuse		Pass
			gravity filters	Water reuse		Pass
			reverse osmosis	Water reuse		Pass
			evaporation-concentration	Resource recovery (metals)	Not suitable for municipal applications	Fail
			electrodialysis	Resource recovery (metals)	Not suitable for municipal applications	Fail
18	EcoTek Ecological Technologies Inc.	Technology Vendor	No - greenhouse based wastewater treatment	Liquid stream treatment	Suitable site must be available	Pass
19	Busby Perkins & Will	Service Provider	No	--	Does not represent treatment technology	Fail
20	Ostara Nutrient Recovery Technologies Inc.	Technology Vendor	Yes - phosphorus crystallization and recovery	--	--	--
21	GTC Ventures Inc.	Technology Vendor	Yes - sludge incineration	--	--	--
22	Siemens Water Technologies	Technology Vendor	Yes, except for the following:	--	--	--
			attached growth airlift reactor	Liquid stream treatment	Not proven at required scale	Fail
			vertical loop reactor	Liquid stream treatment	Not proven at required scale	Fail
			oxidation ditch	Liquid stream treatment	Not economical at required scale	Fail
			media filters	Water reuse		Pass
			waste sludge reduction (biological)	Biosolids management		Pass
			fuel cells (digester gas)	Biosolids management	Embryonic technology, not proven at required scale	Fail
23	Terry Spragg & Associates	Technology Vendor	No - raw wastewater transport for ocean dumping	Liquid stream treatment	Does not meet project requirements	Fail
24	Dennis Paul Dorman	Technology Vendor	Yes - effluent filtration with ultra violet disinfection	--	--	--

TABLE 2

CAPITAL REGIONAL DISTRICT
CORE AREA AND WEST SHORE SEWAGE TREATMENT
DECISION INFORMATION REPORT

PASSING REI TECHNOLOGY ASSESSMENT

SUITABILITY RANKING

Submission No.	Company(s)	Technology	Application	Multi-Criteria Analysis												Total	Ranking
				Cost Effectiveness	Energy Requirements	Space Requirements	Process Reliability	Flexibility	Residuals Generation	Resource Recovery Potential	Ease of Operations & Maintenanc	Operator Environment & Safety	Impact on Local Environment	Greenhouse Gas Emissions	Chemical Demand		
			Weighting:	10	6	9	9	7	5	8	6	7	10	8	5		
3	H2O Logics - Solar Bee	Pond mixing	Water reuse	0	1	1	0	0	1	1	1	1	1	1	1	64	Very High
5	N-Viro Systems Canada Inc.	Sludge drying/chemical pasteurization	Biosolids management	0	0	0	1	0	0	-1	0	0	0	1	0	9	Low
7	Rothwell Associates Ltd.	Mixed liquor degassification	Liquid stream treatment	0	-1	0	0	0	0	0	0	0	1	1	1	17	Low
13	Hydra Renewable Resources Inc.	Effluent filtration with ozone disinfection	Effluent disinfection and water reuse	0	0	1	0	0	0	1	1	-1	1	0	0	26	Medium
17	Veolia Water	Ozone disinfection	Effluent disinfection	0	0	1	0	0	0	1	1	-1	1	0	0	26	Medium
		Woven media filters	Water reuse	0	1	-1	0	1	1	1	1	1	1	1	1	53	High
		Gravity filters	Water reuse	0	1	-1	0	1	1	1	1	1	1	1	1	53	High
		Reverse osmosis	Water reuse	-1	-1	0	0	0	-1	1	-1	1	1	1	1	11	Low
18	EcoTek Ecological Technologies Inc.	Greenhouse based wastewater treatment	Liquid stream treatment	0	1	0	0	0	-1	0	0	1	1	0	1	23	Medium
22	Siemens Water Technologies	Media filters	Water reuse	0	1	-1	0	1	1	1	1	1	1	1	1	53	High
		Waste sludge reduction (biological)	Biosolids management	0	-1	0	0	0	1	-1	0	1	1	-1	1	5	Low

Notes:
Ranking categories are based on the multi-criteria score:

- Very High - 60 points and higher
- High - 40 to 59 points
- Medium - 20 to 39 points
- Low - 0 to 19 points
- Very Low - less than 0 points

APPENDIX A - REI TECHNOLOGY SUBMISSION SYNOPSIS

Submission No. 1

Company: Alterna Energy Inc.
Technology: Enviro Carbonization
Synopsis: The Enviro Carbonization process carbonizes biomass to create green energy and carbon that can be used to make a variety of carbon products. The process is a pyrolosis process that stops the thermo-chemical reaction of the biomass entering the energy-carbon production system at a point where almost all of the volatile matter is removed as gas, but the fixed carbon remains intact.

This embryonic technology appears to be geared towards the processing of excess wood fibre biomass, and is unproven for the processing of wastewater biosolids. As a result, it is believed that the technology cannot be applied in the CRD in a practical manner at this time.

Submission No. 2

Company: CSO Technik Ltd.
Technology: Crown Sludge Disintegration System
Synopsis: The Crown Disintegration system uses a macerator, a high pressure mixer and a disintegration nozzle to pre-treat waste activated sludge prior to anaerobic digestion. The process increases the digester volatile solids reduction and the biogas production. While still in the process development phase, the Crown Disintegration system has recently been applied at full-scale in Germany, Sweden and New Zealand. In the event that the CRD builds a regional sludge handling facility that incorporates anaerobic digestion, the benefits of the Crown Disintegration system could include the following:

- Increased biogas yields in the downstream digesters
- Reduced digested sludge for disposal
- Reduced foaming and more stable digester operation

As a result of the above potential benefits, Crown Disintegration technology should be considered as a means of improving thickened waste activated sludge digestion characteristics together with other sludge pretreatment technologies.

Submission No. 3

Company: H2O Logics Inc.
Technology: Solar Bee solar powered reservoir mixer
Synopsis: H2O Logics are exclusive agents for the Solar Bee solar-powered reservoir circulator. The Solar Bee circulator consists of a pontoon-mounted vertical shaft mixer and the solar panels that provide electrical power to the mixer. Typical applications include the continuous, low intensity mixing of freshwater lakes, reservoirs and ponds, and wastewater lagoons and effluent storage basins.

While this mixing technology requires no power source and is, therefore, highly sustainable, it will have no treatment applications in the CRD given that compact wastewater treatment technologies are required. However, the system could be used to provide mixing in small effluent holding ponds that may be used in effluent reuse (irrigation) schemes.

Submission No. 4

Company: Paradigm Environmental Technologies Inc.
Technology: MicroSludge™ sludge reduction system
Synopsis: MicroSludge™ is a patented chemical and pressure pretreatment process that was developed by Paradigm Environmental Technologies Inc. of Vancouver, BC. The process liquefies waste activated sludge from a secondary treatment process to increase both the rate and extent that it is degraded in conventional mesophilic anaerobic digesters. The process uses chemical pretreatment to weaken cell membranes and a high-pressure homogenizer to provide an enormous and sudden pressure change to burst the cells. The resulting liquefied WAS is less viscous and more readily converted to biogas in an anaerobic digester.

While still in the process development phase, MicroSludge has been successfully demonstrated at full-scale at the Chilliwack WWTP in BC and at the Joint Water Pollution Control Plant in Carson, California. In the event that the CRD builds a regional sludge handling facility that incorporates anaerobic digestion, the benefits of MicroSludge could include the following:

- Improved waste activated sludge pumping characteristics
- Increased digester biogas production for energy and heat generation
- Reduced quantities of digested sludge requiring disposal
- Less odorous digested sludge
- Reduced digester sizing and over capital costs
- Reduced foaming in the digester
- Reduced exposure to rising energy prices

As a result of the above potential benefits, MicroSludge technology should be considered as a means of improving thickened waste activated sludge pumping and digestion characteristics together with other sludge pretreatment technologies.

Submission No. 5

Company: N-VIRO Systems Canada Inc.
Technology: Sludge stabilization
Synopsis: The N-Viro Soil process stabilizes and pasteurizes sludge to meet Class A requirements for biosolids under US EPA regulation 40 CFP 503. Alkaline admixtures (cement or lime klin dust, fly ash and/or steel making fines supplemented in some cases with quicklime) are mixed with the dewatered sludge cake at a rate of 30 to 45 percent of the wet-weight sludge. The mixture is then dried in a mechanical rotary drum dryer. The combination of heat from the dryer and the chemical reaction between the alkaline materials and the sludge cake moisture raises the temperature and pH of the mixture. The mixture is stored at an elevated temperature for 12 hours and an elevated pH for 72 hours, after which it is ready for storage or distribution.

In the event that the CRD builds a regional sludge handling facility, the potential benefits of the N-Viro process could include the following:

- Co-disposal of industrial waste products (e.g. cement kiln dust) and biosolids to produce an alkaline soil amendment.
- Product is a source of valuble nutrients, including nitrogen, phosphorus, potassium etc.

The principal benefit of this technology is that it converts biosolids and industrial waste products in a usable soil amendment that meets the requirements for Class A biosolids, and is therefore suitable for uncontrolled distribution or land application. Feasible application of this technology requires securing suitable land application sites.

Submission No. 6

Company: Rockwell Automation Canada Inc.
Technology: Instrumentation and controls wastewater treatment plants
Synopsis: Rockwell Automation provide instrumentation and controls services for the design and optimization of wastewater treatment plants. They do not provide any specific wastewater treatment technology, and as a result, their submission could not be evaluated using the multi-criteria analysis. However, the firm may be retained to provide instrumentation services during the implementation phases of this project.

Submission No. 7

Company: Rothwell Associates Ltd.
Technology: Biodegradex Technology for BNR Process Optimization
Synopsis: Biodegradex is a process enhancement for BNR processes in which the mixed liquor leaving the bioreactor is subjected to vacuum degasification before entering the secondary clarifiers. Degassification improves the biomass settling characteristics, thus allowing higher MLSS concentrations to be maintained in the bioreactor and return activated sludge stream.

This technology has limited application for the CRD as it is believed that biological nitrogen removal, though nitrification and denitrification, will not be required for marine disposal of effluent. However, should effluent be discharged to a freshwater system and nitrogen removal be required, this technology could be considered for application.

Submission No. 8

Company: GE Water & Process Technologies Canada
ZENON Membrane Solutions

Technology: Membrane bioreactors and ultrafiltration

Synopsis: ZENON Membrane Solutions recently became part of GE (General Electric) Water and Process Technologies. The company is one of the world's leading providers of membrane ultrafiltration systems for the treatment of both drinking water and wastewater. The company led the development of hollow fibre membrane systems that are immersed directly into the process tanks, thus significantly reducing the complexity and overall energy requirements of membrane bioreactor systems.

ZENON Membrane Solutions has provided membrane systems at over 550 installations in 45 countries. These installations have included approximately 200 small, medium and large wastewater treatment systems. The largest wastewater treatment plant will be the Brightwater WWTP in King County, Washington, with a capacity of approximately 150 ML/d. In 2003, the company won the Stockholm Industry Water Award for the development of energy efficient, innovative and forward-looking water treatment technologies that can be applied to the treatment of water at all stages of the water cycle. Other recent awards have been Canada's Top Corporate Citizen, Canada's Top Exporter, and Canadian Innovation Award for Sustainable Development.

Membrane technology has a high likelihood of being applied in the CRD in any scheme in which domestic wastewater or secondary effluent must be treated to a suitable effluent quality standard for reuse as irrigation or industrial water.

Submission No. 9

Company: J.K. Engineering Ltd.
Technology: Air aspirator-mixers, anaerobic digestion
Synopsis: J.K Engineering appear to be a consulting company that is in the process of developing an aspirating aeration system for activated sludge processes that sits outside of the aeration tanks. They also claim to have a novel anaerobic digestion system. Because details of these two systems were not provided, it is not possible to evaluate the submission.

Submission No. 10

Company: O2 Environmental
Technology: Quay Technologies UV Disinfection System
Synopsis: The Quay UV disinfection system differs from conventional effluent UV disinfection systems in that it uses an electrodeless lamp. This increases the lamp life and thereby significantly reduces the operating and life cycle costs of an effluent disinfection system.

The Quay system has been installed in 10 countries in both drinking water and treated wastewater applications. It recently received Title 22 validation for water reuse applications in the US. In the event that effluent disinfection using UV irradiation is used prior to disposal or reuse, this technology can be considered as an alternative to conventional UV disinfection systems.

Submission No. 11

Company: Dennis E. Bentley, Dehydration and Environmental Systems
Technology: Membrane bioreactors, sludge drying, gassification
Synopsis: Dennis Bentley is promoting a combination of flat panel membrane bioreactors for wastewater treatment, and low pressure, low temperature sludge drying followed by gasification for sludge treatment.

The flat panel MBRs could be considered for implementation in CRD facilities. However, sludge gasification is not considered to be a sustainable biosolids management solution for the CRD situation.

Submission No. 12

Company: Enviro Energy Ltd.
Technology: STERM Process for sludge elimination
Synopsis: The STERM Process transforms dewatered sludge (primary, secondary or digested) into a particulate fuel using a totally enclosed thermal drying process. The fuel created is used to provide energy for the system, and the end product (sterile ash) is available for off-site uses, e.g. concrete aggregate, plaster, roadfill/bitumen, etc.

It appears that this technology is still in the embryonic development stage, and no operating full-scale systems exist, which essentially eliminates it for consideration for the CRD program, at least in the foreseeable future.

Submission No. 13

Company: Hydra Renewable Resources Inc.
Technology: CleanStream continuous backwash upflow media filtration
Synopsis: CleanStream is a modular system that consists of a preliminary separator followed by a continuous backwash upflow media (CBUM) filter. Effluent from the primary separator is chemically conditioned using a coagulant and oxidant, and the final effluent is ozonated prior to discharge. It is not clear from the information provided how the soluble organics and nutrients present in the incoming wastewater are removed. The gross solids removed by the preliminary separator and the rejects from the CBUM filter are dewatered through an auger press.

The system shows promise in a small-scale effluent reuse scheme as the supplier claims that the CleanStream effluent meets the California Title 22 standard. There is a concern about the practical upper size limit for these systems given that the module size appears to be in the order of 950 m3/d. The system may be applicable in the CRD should there be any small- to medium scale effluent reuse schemes incorporated into the overall wastewater management plan. However, more technical information is required prior to recommending this technology at the implementation stage.

Submission No. 14

Company: Vanport Sterilizers Inc..
Technology: Dry pulverized coal filtration followed by pumped storage hydroelectric power generation
Synopsis: The proposed concept involves treatment of the raw wastewater in a dry pulverized coal (DPC) filter, and then pumping the “sterilized” effluent to generate power in a pumped storage hydro (PSH) plant upgrade of the “nearby” Jordan River Hydroelectric Project.

The proposed approach and technology is not considered to be either economically or technically viable. Firstly, no consideration is given to the level of treatment that would be required to produce an effluent quality suitable for storage and use in the proposed hydroelectric power generation scheme. Secondly, no attention has been paid to the capital and operating costs associated with conveying all of the CRD wastewater a distance of approximately 50 km.

Submission No. 15

Company: Patrick Dunne on behalf of 3C Water Systems Ltd.
Technology: Chemically Enhanced Primary Treatment
Synopsis: This patented process is a modified form of chemically enhanced primary treatment (CEPT). First, the wastewater is ground up using a submersible grinder pump, and then alum is added in an alum flash mix point. The supplier claims that this combination of grinding and flash mixing reduces the alum dosage, reduces the hydraulic retention required in the primary clarifiers (form approximately 2.5 hours to 30 minutes), and increases the suspended solids removal to between 80 and 90 percent. The submission did not include any reference facilities or data from laboratory-, pilot- or full-scale testing, which would be required for its consideration at the implementation stage.

Submission No. 16

Company: Noram Engineering and Constructors Ltd.
Technology: VERTREAT Effluent Treatment System
Synopsis: The VERTREAT technology is a high rate activated process using a modified Deep Shaft process. The submission states that the system uses “an in-ground vertical aerated shaft, a patented design that has proven effective through more than 2 years of commercial operation”. This implies that the VERTREAT system includes some significant modifications to the original Deep Shaft process. However, details of these modifications were not provided in submission, and consequently, the modified process could not be evaluated in further detail.

Submission No. 17

Company: Veolia Water
Technology: Various Wastewater and Biosolids Treatment Equipment and Processes
Synopsis: Veolia Water is a major supplier of equipment and process technology to the wastewater industry, and provides a broad range of innovative and conventional treatment technologies. Examples of proprietary process technology offered by Veolia that may be applicable in the CRD program include:

- Actiflow balasted flocculation/clarification process for high-rate primary treatment
- Biosep membrane bioreactors
- BioStyr biological aerated filters
- Discfilter fabric filters

It is expected that a number of the mechanical units and proprietary processes offered by Veolia will be considered during the subsequent implementation stages of the CRD program once the overall plan has been finalized.

Submission No. 18

Company: EcoTek Ecological Technologies Inc.
Technology: Solar Aquatics Systems
Synopsis: This process utilizes a combination of a controlled wetland ecosystem and solar energy in a greenhouse or shadehouse to remove organic material and nutrients from wastewater. This technology is best suited to small, decentralized community based systems. The total greenhouse area required and problems associated with the harvesting and disposal of the biomass generated in larger systems make this technology unsuitable for larger decentralized facilities. However, it could be considered for a small facility in the CRD program.

Submission No. 19

Company: Busby Perkins & Will
Technology: Not applicable - Architecture and Planning Consulting
Synopsis: Busby Perkins & Will are an architecture and planning firm who promote an integrated design approach to wastewater treatment "that considers the totality of the flows and exchanges of the urban water and energy pattern, as well as the relationship of infrastructure systems to other elements to the other elements of the city they serve".

While not promoting any particular wastewater treatment or resource recovery technology per se, Busby Perkins and Will have assembled a consulting team consisting of architects, planners, engineers and a utility for the subsequent implementation phases of the CRD program.

Submission No. 20

Company: Ostara Nutrient Technologies Inc.
Technology: Nutrient (Phosphorus) Recovery Through Struvite Formation
Synopsis: Ostara Nutrient Removal Technologies Inc. is a University of British Columbia spin-off company that uses proprietary technology to recover nitrogen and phosphorus from sludge handling return streams following anaerobic digestion at a wastewater treatment. The process consists of a unique fluidized bed reactor into which the sludge dewatering liquor is introduced and injected with magnesium chloride and caustic to initiate a crystallization reaction. This reaction results in the production of small struvite (magnesium, ammonium, phosphate) pellets which can be used as a slow release fertilizer after air drying. This fertilizer has been used in a number of applications, including turf farms, horticulture and salmon stream rehabilitation.

Application of this technology can result in a 20 to 25% reduction of the phosphorus load, as well as a reduction of up to 10% in the incoming nitrogen load, to plants designed for biological nutrient removal and having anaerobic digestion for sludge stabilization.

This technology is considered to be “embryonic”, with only a very limited number of demonstration-scale applications. Further, it is best suited to plants that are required to meet stringent effluent nitrogen and phosphorus standards, and that meet these standards by biological means. Because the future CRD plants are not likely to have effluent nitrogen and phosphorus standards in the foreseeable future, except for smaller systems that may be discharging effluent to a freshwater system, it is believed that the technology is unlikely to have a practical application in the CRD.

Submission No. 21

Company: GTC Ventures Inc.
Technology: Thermal Oxidation
Synopsis: GTC Ventures is a locally based firm that intends to bring together various partners in the event that some elements of the CRD wastewater plan are delivered as public-private partnerships (P3). The only treatment technology specifically mentioned in the submittal is the use of fluidized bed reactors for the thermal oxidation of wastewater biosolids, which has been considered previously for the CRD program in its “generic” form.

Submission No. 22

Company: Siemens Water Technologies
Technology: Various Wastewater and Biosolids Treatment Equipment and Processes
Synopsis: Siemens Water Technologies is a major supplier of equipment and process technology to the wastewater industry, and provides a broad range of innovative and conventional treatment technologies. Examples of proprietary process technology offered by Siemens that may be applicable in the CRD program include:

- Cannibal solids reduction process
- MEMCOR CS submerged membrane system
- Spider disk filter
- Siemens/Osram Ultraviolet Disinfection
- Convective thermal sludge driers

It is expected that a number of the mechanical units and proprietary processes offered by Siemens will be considered during the subsequent implementation stages of the project once the overall plan has been finalized.

Submission No. 23

Company: Terry G. Spragg & Associates
Technology: Spragg Waterbag for Wastewater Transport and Ocean Disposal
Synopsis: Waterbag technology was developed as a primarily as a means of transporting fresh water though the ocean. The proposed technology involves the filling of large synthetic floating bags with wastewater, towing the filled bags out to sea, and disposing the wastewater at a marine location where it would have minimal impact on the shoreline or the receiving environment. No wastewater treatment per se is provided with this option.

This concept does not meet the minimum requirements of treating wastewater to the effluent standard for marine discharge required under the CRD Liquid Waste Management Plan. It is recommended that no further consideration be given to this technology.

Submission No. 24

Company: Dennis Paul Dorman; Bon Bonde Environmental Solutions
Technology: PURE-O-TECH Onsite Wastewater Disinfection Systems
Synopsis: Pure-O-Tech provides small onsite wastewater disinfection systems that can include microfiltration, ozonation and UV irradiation modules. The largest available system appear to have a capacity of approximately 42 gpm (230 m3/d). These package systems appear to be highly suited to small-scale effluent reuse schemes, but whether they are suitable for the CRD will depend on the extent of effluent reuse that is feasible at the time of implementation.