



## **Evaluating an Alternative Location for the Future Sechelt Sewage Treatment System.**

This is an analysis of an alternative location for the new sewage treatment and disposal systems to be built by the District of Sechelt. This analysis is restricted to the location of treatment facilities only, and the pros and cons of such. These are the same regardless of the treatment technology employed, and future expansions to the collection system.

In effect, this study looks at “what do we gain and/or lose by moving the new facilities up the hill, to a site near the SCR D Landfill?”

### **1. The Current Situation**

Presently, Sechelt has two sewage treatment plants, at Ebbtide St and Dusty Rd.

The Ebbtide plant consists of primary and secondary treatment, but does not have (adequate) sludge digesting capacity. This plant routinely operates at its design limit, and excess sewage is pumped to the Dusty Rd plant for treatment. Secondary sludge (actually 99% water) is also pumped up to the Dusty Rd plant for treatment.

The Dusty Rd plant, on land leased from Construction Aggregates Limited (CAL) receives the excess raw sewage, and secondary sludge, from Ebbtide, and also all septic haulage.

Final treated effluent from both plants is discharged into Trail Bay, via a pipeline and ocean outfall.

Because of the high biological loading from all the sludge and septage, the Dusty Rd plant is at its biological load limit.

So between the two plants, there is very little spare capacity, and expansions are needed.

### **2. Proposed Changes**

#### **2.1. Short Term**

The District intends to build a sludge treatment facility at the new site. This will take the secondary sludge from both Ebbtide and Dusty Rd. The sludge goes through an additional aerobic treatment stage, called “digestion”, and can then be thickened and dewatered.

Dewatered sludge is about 20% solids (80% water!) and can then be used for composting with wood chips/yard waste. The finished product can then be sold as a soil amendment.

By taking the sludge treatment away from Dusty Rd, it frees up capacity for raw sewage treatment, and it is expected that the two plants will have capacity to serve the District for the next five to seven years.

#### **2.2. Long Term**

Within ten years, the Ebbtide plant will require a major overhaul, at significant expense.

Within the same time period CAL wants to extract gravel from under the Dusty Rd plant location.

With this scenario, the District’s consultants have recommended that a new plant be built at the new site, where the sludge processing will already exist. This new plant will be sized for Sechelt’s ultimate demand, and then both Ebbtide and Dusty Rd can be decommissioned.

At that time, a capacity expansion will be required for the effluent discharge pipeline and the ocean outfall.



Table 1 Summary of Approximate Planned Expansion Costs

Item	Present Capacity (cu.m/day)	Future Capacity (cu.m/day)	Cost
Ebbtide	2500		
Dusty Rd	1500		
Sludge plant		All sludge	\$2m
New treatment plant	0	7000	\$6m
Ocean outfall and pipeline	4000	7000	\$1.6m
Total Treatment expansions			\$10m

### 3. The Anderchek Site

This new site has been purchased by the District for the purpose of building the new sludge treatment facilities, and ultimately, the new sewage treatment plant. It is of sufficient size to accommodate these functions, is already serviced and accessible, and only requires a short pipeline from the Dusty Rd plant.

In short, it is a good fit and is ready to go.

There are two drawbacks to this site:

1. It is very close to the Bayside Campground and numerous private residences. It is anticipated that the East Porpoise Bay area will gradually transform from industrial to residential use over the next decade or two. There may be issues with odour, noise, vehicles etc. When the Ebbtide plant was first constructed, it was deemed to be away from the village, which subsequently grew around it. This will probably happen at the new site too, as the area is sunny and has good water views – both desirable for residential development.
2. If land application of the sewage effluent is desired, it will need to be pumped up the hill to the irrigation area.

### 4. What is the alternative, and why go there?

The question posed was “can an alternative site be found, away from current and future residential areas, that is as good as, or better than, the Anderchek site?”

Simply put, the only realistic alternative area is up Dusty Rd, near the SCRD landfill, on either the south or north side of Dusty Rd. A large portion of this land area is currently controlled (though not necessarily owned) by CAL. Some of this land is privately owned, but much of it is Crown land currently leased to CAL and subject to Sechelt Indian Band land claims.

Two candidate sites have been identified, but CAL may propose others:

- 1) To the west of the SCRD landfill – that is the area currently planted to poplars by Dusty Rd, before you arrive at the landfill. This is a readily accessible, flat area and would be a very easy site to build on. This area is planted as a tree farm, and is not scheduled for extraction for another 20yrs.
- 2) On the north side of Dusty Rd, and Irgin’s Creek, opposite the landfill. This is a cleared area, which is slightly sloping, though no more so than the Anderchek site. This is still part of CAL’s available area, though the depth of gravel here is much less than the south side of the road.



CAL may have other areas, such as the eastern side of their site, that are already mined out and may be suitable.

As always, there are some pros and cons to a different site.

## **5. Advantages to the Upper Site**

### **5.1.1. Freeing up the lower site**

Since this site is no longer needed, this gives the District several options:

- a) To sell the Anderchek site, or;
- b) To relocate the public works yard from Ebbtide, and then sell the Ebbtide site.

### **5.1.2. No impact on adjacent sites**

By not placing the biosolids and future plants near Sechelt Inlet Road, there is no impact on neighbouring properties, or their future use. Given that this is the sunny side of the inlet, with sweeping water views, and already developed services, it is a prime candidate for redevelopment as a residential area, a waterfront village. This has been the case for the east side of many north-south water bodies in BC (e.g. Okanagan Lake, Revelstoke, Lake Windermere, etc). A sewage plant in close proximity will become as big a negative as the current one at Ebbtide. When built, this was away from houses but eventually they grew around it.

### **5.1.3. Lesser requirements for odour and noise control**

The upper site does not eliminate these requirements, but it does reduce them. This would be a minor cost saving.

### **5.1.4. Keeping Sanitary Operations Together**

By placing the treatment plant next to the landfill, both “sanitary operations” are grouped. There may be potential for some joint benefits from shared infrastructure between the two operations. Even if there is marginal economic value from this, it does convey a sense of order and planning to have them together. The current arrangement with Ebbtide is the exact opposite.

### **5.1.5. Potential for a Wetland**

There are extensive flat areas around these sites (either side of the road) for doing a constructed wetland. As the Mayor has pointed out, these are typically for final treatment, rather than main treatment. In the industry they are often called “polishing ponds”. There would be lots of scope to put some or all of the effluent through a wetland. If designed properly (i.e. involving horticulturalists, landscape architects and engineers), the wetland could easily become an award-winning feature, and a tourist attraction in its own right. The lower location is not large enough for this, so the effluent would have to be pumped up the hill to do it. Butchart Gardens shows what can be done with a lot of creativity. This would not try to compete with that, but it need not be an industrial looking pond either. Properly done, polishing wetlands can support an amazing variety of flora and fauna, particularly birds.

If large enough, the wetland can provide a significant volume of effluent storage for balancing peak load periods.

### **5.1.6. Proximity to Effluent Irrigation Sites**

Land disposal of final effluent, by irrigation of forest land, is a viable option for small systems such as Sechelt. Irrigation of forest with effluent is widely practiced around the world. The City of Vernon uses all of its effluent for agricultural irrigation, supporting a thriving dairy industry and the world class Predator Ridge golf course. When irrigating forest, the growth rates of trees double or even treble, depending upon how dry the area is naturally. Studies done by UBC on northern Vancouver Island showed a doubling in the growth rate (cu.m wood per ha) after application of biosolids (without irrigation). With our dry



summers, there is no question there would be a significant increase in growth rates of trees. Properly done, effluent irrigation provides excellent natural filtering of nitrogen and phosphorous, which becomes fertilizer for the trees.

The main motivation for effluent irrigation is to keep effluent flow to Trail Bay under the 4000 cu.m/day limit of the existing facilities, and avoid a \$1.6 to \$2m upgrade of these.

There are three potential places for land disposal of effluent. These are:

- 1) The existing CAL minesite (south of Dusty Rd)
- 2) The north side of Dusty Rd and Irgin's Creek, also controlled by CAL
- 3) The Sechelt Community Forest, on the north side of the CAL north block

As the Urban Systems report notes, further investigative work will be needed to assess the land disposal options.

With the ultimate expected flow of 7000 cu.m/day, and the outfall taking 4000, then, at the peak flow, 3000 cu.m/day must be irrigated. At the equivalent of one inch per week of rain, this would require an irrigated area of 100 hectares (one square kilometer, or 250 acres). If more land is available, a lower irrigation rate can be used, or (ideally) more water can be diverted from the ocean outfall for irrigation.

Irrigating the forest then opens up the question of what to do with all the trees. Since Sechelt already has a community forest in operation, this area could be managed by the SCCF, even if it is on CAL land, a management agreement could be put in place. Because of the fast growth of the trees, they may not be suitable for prime sawlogs, but are fine for pulpwood, or as firewood or feedstock for a wood pellet operation, or biomass electrical operation. Irrigated forest with high productivity species (poplar, blue gum) can yield up to 25 tons (50 cu.m.) per hectare per year. Even as pulpwood, the 100 hectares could produce a value of \$75k/yr, as wood pellets, the wholesale value would be \$375k/yr. There are many options available for tree type and use.

It is important to note that the use of the lower site does not preclude land based irrigation of effluent. BUT, doing this would require a lift station and high pressure pipelines to get it up the hill to where it can be used. If the majority of the water goes out to the ocean, the pumps and pipes would be small, but if it were desired to irrigate all of it, the pumps and pipes would be close to the same as for the sewage lift station.

### **5.1.7. Potential for effluent return to Chapman Creek**

Another option that becomes available with the upper site is that of returning the effluent, or a portion thereof, to Chapman Creek.

In the late summer/early fall period, the water flows in the lower reaches of Chapman Creek reach their minimum, which coincides with the annual salmon run. Most of the SCRDR drinking water is sourced from the upper reaches of Chapman Creek, which further reduces flows in the lower portion. The SCRDR's goal is to maintain a minimum flow in Chapman Creek, below their intake, of 300L/s. In some very dry summers, this has not been possible.

One option is to supplement these flows by returning some or all of the water to the creek.

There are three ways this can be done, in order of increasing water volumes returned to the creek:

- a) By doing effluent irrigation within the Chapman Creek watershed, downstream of the point of the SCRDR drinking water intake. The water that is not taken up by the trees goes into the groundwater and eventually makes its way into the creek.
- b) By doing "land application" through drain fields or infiltration basins, located in the watershed, downstream of the SCRDR intake. This is commonly done for many inland sewer systems, including Sun Peaks Resort, near Kamloops, which Urban Systems has designed.



- c) By piping the final treated effluent directly into Chapman Creek, downstream of the SCRDR intake. While this may seem counter intuitive, there is nothing wrong or unusual about doing this, it is fairly standard for almost any city on a river. The City of Calgary discharges into the Bow River, just downstream of the downtown core, and the lower Bow River is a popular watersport and world-class trout fishing stream. The effluent treatment is equally world class, and there are no adverse effects on the river or the fishery. The Province has well established regulations pertaining to stream discharge, which Urban Systems are well familiar with.

As the water demand for the District grows, so do the water withdrawals from Chapman Creek, exacerbating the low flow in early fall, the time of the salmon run. Returning some of this water to the creek would help when it is needed most. At the ultimate size of the treatment plant, 7000 cu.m/day, there is up to 80L/s available for return to Chapman Creek, 27% of the minimum flow requirement. In really dry years, this would be a significant addition during the low flow periods.

If the system can meet the water quality requirements for stream return in the summer, then it meets them for any time of the year. This would allow for year round return of the reclaimed water to Chapman Creek (which is, after all, where the water came from) and then decommission the Trail Bay outfall.

### **5.1.8. Proximity to landfill**

There are four benefits of being next to the landfill:

1. The supply of woodchips for composting is right there, so there is no need to road transport sludge (a minor cost saving). If composting is done, the compost could be “sold” by the SCRDR landfill, as they are already set up with a weighbridge, cashier, etc etc.
2. The SCRDR is about to implement a methane collection system, and then burn this for electricity generation. Such a system would then make anaerobic digestion of a sludge a viable option (even at the small scale), as there would be a facility to take the methane. The remaining solids after anaerobic digestion are then composted.
3. By being adjacent to the power generation site, the waste heat from the engine can be put into the sewage treatment and anaerobic digestion processes, which helps speed them up. If the energy forest concept is used, doing a power station at the site, there is a serious amount of heat available.
4. The SCRDR may, in the future, do leachate collection from the landfill. This could then be sent to the treatment plant, making the SCRDR a customer.

### **5.1.9. Potential for Energy Recovery on Effluent**

If final effluent is flowing back down the hill, it is possible to recover the energy from it using a small hydro-electric system. Theoretically, the energy available is the same as the energy needed to pump it up there in the first place. In reality, you lose energy each way, but it would be possible to recover 50% of the energy used to pump the effluent up the hill. This would require the increased cost of a high pressure return line, and the hydro equipment. Given that it is recovering a product (electricity) that will only keep increasing in value with time, it is probably worth doing. At 4000 cu.m/day and 200m head, and 80% system efficiency, the available power is about 80kW, worth about \$60k/yr at current rates, about 1/3 of the uphill pumping cost. (Interestingly, BC Hydro will pay about 15% more for this renewable electricity than what it charges for the use of it by the lift station).

Energy recovery from high pressure water is now standard practice in reverse osmosis desalination plants, and the equipment is readily available.

## **6. Disadvantages to the upper site**

And there are three major hurdles to overcome for the upper site to be viable.



### **6.1.1. The Lift Station**

A new forcemain and pump station (or series of stations) would be needed to lift the sewage and sludge up from Porpoise Bay Rd. There is a 200m elevation gain and an almost 2km long pipe run.

To initially just build the sludge facilities, a small, high head lift station and small pipeline would be needed, for several hundreds of cu.m/day of sludge.

When the full size plant is built, a full sized lift station will be needed, with a high capacity, high pressure forcemain. This would be a substantial lift station, and may be even split into two, one part way up the hill, to limit operating pressure to 150psi.

At full capacity, of 7000 cu.m/day, the pumping power would be in the order of 200kW, and the energy required for pumping would be approximately 5000kWh/day, or about \$400/day, or \$160k/yr.

Urban Systems would be able to give a meaningful estimate of the lift station costs.

### **6.1.2. The Return Line**

An effluent return line would be needed to take the final effluent back down to Sechelt Inlet Rd, to connect with the existing line to Trail Bay. This could be either a gravity or pressure line. If an energy recovery system is to be used, it will need to be a pressure line. This line would be built in conjunction with the forcemain.

### **6.1.3. The Land**

Naturally, land will need to be made available somewhere. Acquiring a suitable site on Crown land would involve complex negotiations considering the SIB claims and CAL leases. These complexities might make the private land immediately south of the landfill a more attractive option.

### **6.1.4. Site Servicing**

There is currently no BC Hydro service on Dusty Rd past the existing treatment plant. The SCR D plans to bring it up the hill, to the landfill, eventually, but this will not happen before the sludge plant is to be built.

There is also no mainline fresh water at the top, but this could be handled by rainwater collection for drinking water, and the re-use of final effluent for plant operations like screen washing.

## **7. Timeline**

The District's immediate priority is to build a sludge treatment facility. The future plant expansion may be 5-10 yrs away, but it will be built at the same location as the sludge plant. This site selection is critical as it must accommodate all the facilities, and must be independent of CAL's operations. That is, if the CAL operation closes down, is sold, etc, the plant must carry on regardless.

In order to build the sludge plant at the upper site, the additional works required (compared to the Andrechek site) are:

- a) Secure the land
- b) Construction of a new, small, lift station and pipeline to take the sludge up the hill
- c) Servicing of the upper site with BC Hydro power

There is plenty of time for planning the future plant, and any effluent irrigation or stream supplementation programs.



## 8. A new option – the Ledcor process

The District is about to commence (February 2010), a trial of the Ledcor electro-coagulation system. This is a non-biological treatment process that separates the most of the solids by electrolysis. The process has several advantages over conventional treatment:

- It produces a highly dewatered sludge that can be burned as fuel for energy recovery
- The system has no aeration ponds, and a much smaller land requirement
- The system can treat secondary sludge, in addition to raw sewage

These features open up several new options that do not exist with conventional treatment:

Firstly, the sludge treatment for the existing plants can be done at either of the existing sites, using the Ledcor process. One of their treatment cells, and the dewatering equipment, can be set up, similar to the trial equipment, to treat and dewater the sludge. For example, if the cell was located at the existing Dusty Road site, the existing sludge lagoons could be decommissioned, and the space used to site the Ledcor cell. The dewatered sludge can be stored on site prior to transport to Port Mellon. Finally, the decanted water from the process can be recycled into the treatment plant, so no additional treatment equipment is needed. When the new plant is built at the new site, the Ledcor cell, and the sludge press, can then be relocated to the new site.

Secondly, the small footprint and absence of open aeration ponds for a full size plant *may* allow the new plant to be located on top of finished landfill at the SCRCD's site. The modular construction of the Ledcor plant, along with flexible piping connections, can accommodate minor ground settlement that would preclude building concrete tanks. Some extra engineering would be required to this, such as pre-loading the site for several years before construction, to force ground settlement, but this is standard practice when building on filled land. This is a possibility, but will need extensive investigation, and co-operation from the SCRCD, to evaluate it as an option.

If the plant can be built on the SCRCD landfill site, *then the District will no longer require any of the Anderchek, Dusty Road and Ebbtide St sites*, and these can be sold off when the new plant is constructed. The resale of the Anderchek site would go a long way to covering the cost of the additional lift station and pipelines needed to access the SCRCD site. The final polishing of the effluent from the Ledcor process can still be by a wetland, and the full range of disposal options (irrigation, Trail Bay outfall, Chapman Creek) will remain.

To locate an advanced treatment plant on a landfill site, and then make good use of the effluent, by either irrigation and/or stream augmentation, would likely be an award winning system.

## 9. Conclusion

Locating the new sewage and sludge treatment facilities at the top of Dusty Road has several advantages, and captures several synergies, compared to the lower site. Prominent among these are:

- The new plant is located away from any current and future residential development.
- It is located adjacent to the existing landfill, putting these two sanitary operations together is orderly planning.
- The increased potential for doing effluent irrigation or stream supplementation (Chapman Creek).
- By doing either irrigation/supplementation, the need to expand the capacity of the Trail Bay outfall is eliminated, and there is the potential to decommission it entirely.



- By freeing up the Anderchek site, the public works yard can be relocated to here, and the Ebbtide site can be decommissioned and sold for redevelopment. This would fund a substantial portion of the new plant.
- The new Leducor electro-coagulation system, if the trial is deemed successful, opens up two new options:
  1. Locating the interim sludge treatment facility at the Dusty Road site, and, potentially,
  2. To place the future treatment plant on the SCRD landfill site itself, freeing up all the existing landholdings.

The main disadvantage of the upper site is the requirement to build a high-pressure lift station and pipeline to pump the raw sewage up the hill. The cost of doing this will probably equal the avoided cost from not expanding the ocean outfall.

Overall, there are some definite benefits to the upper site, which may outweigh the costs. The Leducor process has the potential to make the upper site even more attractive, and there is a possibility of locating this plant within the SCRD landfill.

Assuming that land can be made available, this option is a credible alternative to the Anderchek site and is worthy of further investigation.

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Since 2002, Paul has specialized in the field of water conservation, doing water audits, water supply forecasting and managing conservation projects.

Paul has lived on the Sunshine Coast for four years, managing, amongst other things, the SCRD's Bathroom Fixture Replacement Program, the largest water conservation project of its kind to be implemented in western Canada.

Paul is currently employed with Burnaby based Sustainable Solutions International as their in-house water efficiency specialist, and does consulting on water conservation and planning for a select group of clients.