



Preliminary Report on Enhanced Water Treatment Options
for the McCulloch Road Corridor

South East Kelowna Irrigation District
Internal Report
Toby Pike

March 2002

Table of Contents

Introduction.....	3
Why enhanced water treatment?	3
Service Area.....	5
Technology.....	6
Public Consultation.....	8
Three distinct groups.....	8
The residential voice	10
Making decisions.....	11
Residents outside the proposed service area	11
Financing	12
Conclusion	14
Bibliography	15
Appendix 1: SEKID's 2001 colour and turbidity	16
Appendix 2: Schematic of water treatment systems.....	17
Appendix 3: Municipal Finance Authority table.....	19
Appendix 4: Service Area.....	20

Introduction

The purpose of this report is to provide the Board of Trustees with information to assist in making decisions about providing enhanced water treatment for the residents of the McCulloch Road corridor. For the purpose of this report, ‘enhanced’ water treatment includes any water treatment process beyond chlorination. The primary goal of enhanced treatment is to provide colour and turbidity levels within the Canadian Drinking Water Guideline values of 15 TCU and 1.0 NTU respectively¹, and to ensure compliance with developing provincial water quality standards. The report is intended to provide a balanced overview of each of the fundamental issues the board must consider, including: why enhanced treatment, the service area, the technology, and public consultation and financing.

The report is also intended to provide a reference point for discussion and to provide a starting point for the consideration of what would be a significant endeavor. It does not assume that the district will proceed with enhanced water treatment in the McCulloch Road corridor, but it does provide a discussion of the key elements to consider in planning for such a project, should the decision be made to proceed.

Why enhanced water treatment?

Two key factors compel the district to examine the options for enhanced water treatment, both of which the board is familiar with: regulations and public demand.

The district could be required to provide enhanced water treatment for residents of the district due to changes in legislation. As the board is aware, the province has recently undergone a review of the new Drinking Water Protection Act. While not currently in force, the DWPA is a key piece of legislation at the centre of a number of legislative changes currently under consideration. The issue of potable water and public health has undergone considerable review and discussion over the past few years and there is

¹ TCU is an acronym for true colour units, which is the measurement of the colour of water after the turbidity (small particles in the water column) has been removed. NTU is an acronym for nephelometric turbidity units, which is a measurement of the ability of light to pass through water, which indicates how much matter is suspended in the water column.

pressure on regulators to impose stricter water quality standards on local water purveyors. These changes could come from two sources: the local health authority or the province.

The local Medical Health Officer has the power to unilaterally impose conditions for the issuance of operating permits. We have already seen an example of this with the MHO's protocol for water systems with over 300 connections. While the MHO's protocol does not require enhanced water treatment, increasing public concern both locally and nationally is pressuring health officials in this direction. The primary health concern for SEKID is *cryptosporidium*. While not a significant health threat to healthy individuals, *crypto* is a concern to those with compromised immune systems². At present it is unlikely, but not inconceivable, that the MHO would make enhanced water treatment a requirement of the district.

On the provincial scene, it is the Safe Drinking Water Regulation of the *Health Act* that is the core legislation governing water quality in B.C. While the outcome of the current legislative review is uncertain, amendments to the Safe Drinking Water Regulation would be the most likely method for the province to impose stricter water quality standards. In fact, an amendment to the SDWR in April of 2001, which has since been repealed, indicates stricter standards would likely be imposed by the amendment or addition of schedules to the regulation. The district does not currently meet the Canadian Drinking Water Guidelines for colour and turbidity (Appendix 1) and federal guidelines could well be used to develop provincial regulations.

Given the current government's 'core review' of the public service, it is very difficult to assess the approach that will be taken by government towards the regulations affecting water purveyors. The risks of being legislated to provide enhanced water treatment will, therefore, require ongoing monitoring and assessment.

Perhaps more relevant to the subject of enhanced water treatment is the issue of public demand for better water quality. The district has undergone a considerable shift in

² This includes the very old and young, AIDs patients and patients undergoing medical therapy such as chemotherapy. Those in the latter two groups are typically advised not to use the public water supply, regardless of the level of water treatment.

demographics over the past decade. The development of the Gallagher's Canyon golf course residential area, along with the extensive subdivision of lands in the adjacent McCulloch Road area has dramatically changed the face of the district. What was once predominantly rural/agricultural, now has a significant suburban component. For the most part, this population consists of affluent retirees (Gallagher's) and upper middleclass working families (McCulloch Road). The district's ongoing problems with elevated colour and turbidity would appear, for the most part, to be of concern to this group. The district receives many comments regarding water quality from the residents in this area and the manager has been invited to discuss water quality and related issues with a group of concerned residents in April. Another group that must not be overlooked are the residents of the two mobile home parks in the McCulloch Road area, Lake City with 76 units and Edelweiss with 98 units. More discussion on this will be provided under Public Consultation (page 7).

Given the possible regulatory requirements and the apparent increase in public concern about water quality, it could be appropriate at this time for the district to begin a dialogue with residents in the area to determine the willingness to pay for enhanced water treatment. Before looking at the public consultation process, however, it is appropriate to look at the potential service area and the technical aspects of water treatment.

Service Area

A map of the proposed service area is provided in Appendix 4. The Field Road reservoir site is ideally suited as the location for a water treatment plant. The Field Road reservoir was initially constructed to provide increased giardia contact time for the Gallagher's development, but it was recognized early on in the planning stage that it would also be an ideal site for a water treatment facility. The site is adequate to accommodate the additional infrastructure required for a water treatment plant and has the P4³ zoning required by the City of Kelowna

³ Public utility works and infrastructure.

As the board is aware, the district has required development driven water infrastructure to be adequately sized to provide for servicing beyond the boundaries of the respective developments. The district has, in fact, compensated developers for over-sizing pipelines where necessary to provide for this additional capacity. The result is that a limited amount of pipeline works would be required to reconfigure the distribution system to supply the area specified in Appendix 4 from the proposed Field Road location. The substantial works required would be a 300 mm main from Gallagher's Boulevard South to Jean Road, a pressure reducing station at Carter Road and several pipeline tie-ins along McCulloch Road.

There are currently over 1,100 units in the proposed service area, with the total developed capacity of the area estimated at 2,000. The current breakdown by units is as follows⁴:

Gallagher's bareland strata, single-family	464
Gallagher's multi-family strata	176
McCulloch Road corridor single-family	321
Edelweiss mobile home park	98
Lake City mobile home park	<u>76</u>
Total:	1,135

Technology

Four systems of water treatment are currently under consideration for enhanced water treatment. Schematic drawings of the four systems are provided in Appendix 2. All systems incorporate the process of adding chemicals to the water to create flocculate. The chemical additives cause the tiny particles in the water (the colour and turbidity) to bind together making larger particles that can then be filtered out of the water column.

The direct filtration treatment process filters the flocculate out of the water immediately downstream of the flocculators. The water with flocculate passes through filters, where

⁴ The figures for Gallagher's are total build-out figures. The rate of development at Gallagher's is such that the development will almost certainly be complete prior to water treatment facilities being constructed.

the flocculate is filtered out of the water. The filters are backwashed on a regular basis to ensure efficient operation. The treated water is then disinfected and stored in a reservoir for distribution. This system works well for raw water quality with relatively low particle/flocculate amounts. Higher flocculate amounts require frequent flushing and added operating costs.

The following two treatment processes incorporate an intermediate step between the flocculators and the filters. The air floatation treatment process provides a tank into which air saturated water is pumped. The air slowly rises to the top of the tank, drawing the flocculate to the surface, where most of it is skimmed off and disposed of. The water then passes through the filters to remove any remaining flocculate before being disinfected and stored for distribution.

The settling treatment process is similar to that just described. Rather than floating the flocculate out of the water column, however, the intermediate tank is equipped with settling plates that allow the flocculate to settle to the bottom of the tank, where the sludge settles and is removed. The treated water is then filtered before being disinfected and stored for distribution.

The membrane filtration treatment process is similar to the direct filtration system with the exception that the water is filtered through permeable membranes rather than through an aggregate. The membrane modules are backwashed on a regular basis and the treated water is disinfected before being stored for distribution.

The only way to determine what treatment system works best for a particular source of water is to conduct a pilot study. The purpose of the study is to determine the most effective and economical method of water treatment. A small-scale treatment plant is built on-site and a series of tests are done to determine what treatment process is most effective. The pilot identifies the right chemical coagulates and method of flocculate removal. It is important that the pilot be conducted during seasonal water quality events, such as spring runoff, to provide effective and accurate results.

A preliminary cost estimate to conduct a pilot study at Field Road reservoir:

	SEKID March 2002
1. Pilot Plant Design	\$5,000
2. Liaise with Salesman, Product Review and Discussion	2,000
3. Purchase Equipment and Construct Plant	27,000
4. Water Quality Monitoring Equipment (\$2,400 per month)	9,600
5. Water Quality Monitoring Software and Data Collection	3,900
6. Plant Delivery, Assembly and Site Preparation	4,000
7. Trials, Monitoring and Data Collection	7,000
8. Final Report, Recommendations and Cost Estimates	<u>19,500</u>
9. Total:	\$78,000

Although expensive, a well-designed pilot project is the key to technical success in developing an efficient and economical water treatment process. Water treatment is in its infancy in British Columbia and ‘off the shelf’ water treatment systems are simply not available. A concerted and comprehensive pilot project is required to provide the greatest opportunity for success for enhanced water treatment.

Public Consultation

Three distinct groups

One of the greatest challenges to be considered on this issue is public consultation. Those who will benefit from enhanced water treatment are also those who will pay for it. It follows quite naturally that they are the ones who must be consulted. There are a number of levels to this topic that should be considered. These include: demographics, the consultation process, the methods of communication, and determining the willingness to pay. A concerted effort by the district to communicate and consult with area residents will help the residents to make informed decisions about water quality and provide the district with the information needed to determine if a reasonable mandate exists to proceed with enhanced water treatment for the area.

An examination of the make up of residents in the service area shows three basic groups (see table, page 4): Gallagher’s Canyon residents numbering 640, McCulloch Road residents numbering about 321 and residents of the two mobile home parks numbering

174. While Gallagher's Canyon is now the single largest component, the development is capped at 640 units and further growth is highly unlikely. The McCulloch Road and mobile home park component, on the other hand, still have considerable growth potential. The McCulloch Road corridor could add up to another 800 homes and the Edelweiss mobile home park already has approval from the Ministry of Water, Lands and Parks to add an additional 40 pads. It is important to keep this growth potential in mind when making decisions that will affect the area for many years to come.

The majority of the residents at Gallagher's Canyon are 'affluent' retirees. The staff at Gallagher's estimate about two thirds of the residents are retired, with many having a second residence outside of the development. The remaining population would be predominantly working singles or couples with grown children, followed by families with children. It is not anticipated that there would be significant resistance to the increased water rates that would be required to pay for enhanced water treatment in the Gallagher's Canyon development, although a detailed survey of residents of price sensitivity has not been done as a part of this report. It should be noted that most of the homes in the development already have some form of in-home water treatment in place. There have been widely publicized problems with some of these treatment systems and there would appear to be considerable demand for enhanced water treatment. Additional public consultation will help to determine what the demand and willingness to pay for enhanced water treatment is.

The second group in the service area is the single-family housing in the neighborhoods along McCulloch Road. These number about 321 and there is considerable growth potential in this area, with the City of Kelowna's Official Community Plan indicating up to another 800 homes could be built. This area has relatively new homes, with most of the development occurring since the mid-eighties.

The area is made up mainly of working families and has a relatively high standard of living. It is difficult to anticipate what the demand for enhanced water treatment of this area is and what resistance to increased water rates might be. Many of the homes would have in-home water treatment systems, but not to the same degree as Gallagher's

Canyon. Again, additional public consultation will help to determine what the demand and willingness to pay for enhanced water treatment is.

The final group in the service area includes the mobile home parks. There are 176 units in the two parks and Edelweiss, with 98 units, has approval from Ministry of Water, Lands and Parks to add 40 more units to their site on McClain Road. The mobile home parks present an interesting challenge because they each have a single owner who pays the tolls on behalf of the residents of the park. From the district's viewpoint, each park represents one large account. In this case, the district would be well advised to extend the public consultation process beyond the owners of the parks to also include the residents. The owners would almost certainly pass on increased toll rates to the residents of the park.

The mobile home parks are also the group who would be most likely to resist increased water rates. Mobile home parks tend to be lower cost housing and it would follow that the residents in these groups would be less likely to be able to afford tolls increases - further evidence that a concerted effort to consult with residents of the mobile home parks is warranted.

The residential voice

The formation of a group of residents in the proposed service area would certainly help in the public consultation process. The creation of the Concerned Citizens of the Hall Road Area (CCHRA) worked well in getting public comment on the O'Reilly Road pump house automation project and a similar approach would likely work well in the McCulloch Road area. Such a group provides the basis of a dialogue between the district and residents, providing valuable guidance and information.

The make-up of the group would ideally have members from the three sub-groups of the service area discussed above. One way to form such a group would be for the board to strike a standing committee to advise the board on the issue. Such a committee would be composed of willing area residents appointed by the board with a specific mandate defining the role of the committee, reporting structure and budget.

Making decisions

If provincial or local health authorities require mandatory water treatment, the district will have little choice but to comply. In this instance, considerable effort should be made to communicate to the public why the district is pursuing a given course of action and consult with the public on how best to comply with the regulation. The main methods of communication would be informational brochures, newsletter items and public meetings. A standing committee, as mentioned above, could also be useful to facilitate the exchange of information between the district and the community.

If enhanced water treatment remains a discretionary issue, a decision will have to be made as to what degree of public support would be required for the district to proceed with the project. Because of the substantial increase in water rates required to finance enhanced water treatment, a simple majority of fifty-one percent, while a majority, is probably not significant enough to move ahead with the project. A majority in the range of two thirds in favor provides a much more convincing mandate for a project of this magnitude. As mentioned earlier, a decision on how the mobile home parks would factor into the vote will also have to be made. As mentioned earlier, each park represents only one account to the district. Given the significant impact on rates that water treatment could have, there is an obligation to include the residents of the mobile home parks in the discussion and ultimate decision.

Residents outside the proposed service area

While the focus of this report is the residents of the service area described above, considerable effort in public relations should be directed towards the residents elsewhere in the district. An effort should be made to communicate the rationale and economy of scale behind the proposal. If it were possible to economically provide treated water to the entire district, the district would do so. The more information shared with these residents, the less likely that confusion and misunderstanding about the project will arise.

If the district proceeds with enhanced water treatment for the McCulloch Road corridor, it may also be possible to provide the rest of the district for a portion of the year with the

same treated water. It might work out that the entire district could receive treated water from Field Road, outside of the irrigation season. This possibility will require further study and evaluation of the technical challenges involved. Should this be the case, however, any efforts to keep all residents of the district informed on the issue will have obvious benefits.

Financing

The critical question underlying the whole notion of enhanced water treatment for the district is how much? The short answer is we do not know. Considerably more study is required to provide an accurate cost estimate. We do know it is not going to be cheap. The district will have to conduct a pilot study to clearly identify the treatment process required to do the job. Once that is established a more accurate cost estimate can be determined.

To provide a starting point for discussion, however, I have asked Mould Engineering to provide some ballpark numbers. Mould was instructed to be conservative and provide estimates on the high side. Because there are so many unknowns at this point, the following estimate is inappropriate for public discussion.

Water Treatment Facility Cost Estimate:

1.	Excavation and backfill	100,000
2.	Front-end piping	75,000
3.	Chemical feed system	150,000
4.	Flocculators	95,000
5.	Clarification	425,000
6.	Filtration	430,000
7.	Back-wash system	125,000
8.	Sludge storage and disposal system	50,000
9.	Electrical and instrumentation	500,000
10.	Building	350,000
11.	Heating and ventilation	150,000

	SEKID March 2002
12. Yard piping	60,000
13. Compressed air and plant service water	80,000
14. Landscaping and parking	<u>25,000</u>
Sub-total	2,615,000
15. Engineering and contingencies @ 30%	<u>785,000</u>
Total:	\$3,400,000

The above estimate does not include the improvements required for the distribution system in the proposed service area, mentioned earlier in this report.

The district has a number of sources for financing the capital costs associated with the project. These include loans from commercial banks, issuing dept securities guaranteed by the province, provincial sinking funds, or, borrowing through the Municipal Finance Authority (MFA). While the later option is not currently available to improvement districts, discussions are on going to have the legislation changed to allow district access to these funds. It is likely MFA borrowing will be an option in the near future.

Appendix 3 shows an amortization schedule for a loan of \$3,400,000 over a period of 20 years at a rate of 6.5%, with a 5% capitalization rate of the principal repayments. The chart is adapted from amortization tables provided on the MFA website at www.mfa.bc.ca. The table calculates a total payable on the loan of \$6,476,496, made of \$2,056.496 in principal and \$4,420,000 in interest. The actuarial payments comprise the remaining principal amount and assume capitalization rate of 5% on the principal payments.

The monthly rate for capital costs alone, based on 1,135 connections would be calculated as follows:

$$(\$6,476,496 / 1,135 \text{ services}) / 20 \text{ years} / 12 \text{ months} = \text{monthly rate}$$

$$\$5,706 / 20 \text{ years} / 12 \text{ months} = \$23.77 \text{ per month}$$

Adding the current toll rate of \$17.50 per month, along with the \$60.00 per year tax, the total annual payment equals \$555.24, or \$46.27 per month. This does not take into

account the added operating costs of running the treatment plant, which would likely be significant, possibly about \$500.00 per day. That is the equivalent of \$13.00 per month, bringing the monthly total to around \$60.00 per month, or almost three times the current rate.

These figures provide a very general estimate of the kind of rate increase we could be looking at to provide water treatment to the proposed service area. Should it prove possible to provide treated water to the rest of the district for part of the year, rates would be revised accordingly.

The operating costs for the treatment plant will increase with the volume of water used and the district would likely look towards charging a metered domestic toll rate to encourage water conservation. This issue will be dealt with in greater detail if the board approves further study of enhanced water treatment.

Conclusion

This report is intended to provide the board with the general information needed to assist with making decisions about enhanced water treatment. Public and regulatory pressure for improved water quality compels the district to examine and evaluate the options available to do this.

Accurate costs of water treatment can only be determined once an effective method of treating the water is determined. As discussed under the technology section, the method for doing this is to conduct a comprehensive pilot program. The key decision the board has to make at this point is whether the time has come for this to be done.

Bibliography

Bish, Robert L. and Eric G. Clemmons. *Local Government in British Columbia, Third Edition*. Union of British Columbia Municipalities. Richmond. 1999.

British Columbia. *Drinking Water Protection Act*. Victoria. Queen's Printer. 2001.

British Columbia. *Local Government Act Chapter 323, Part 23-Improvement Districts*. Victoria. January 2001. (www.civicinfo.bc.ca/lga/part_23/part_23.htm)

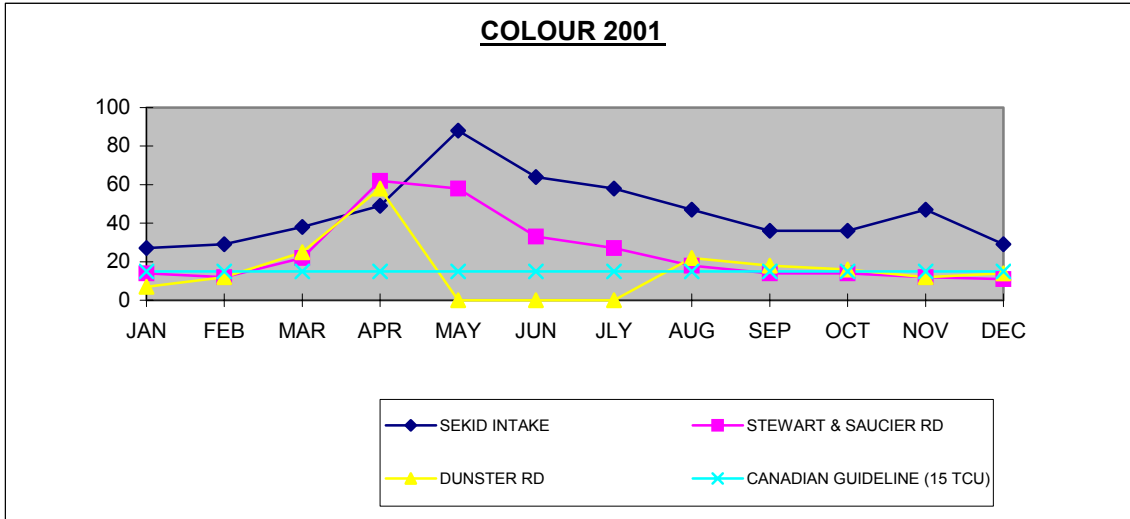
British Columbia. *Safe Drinking Water Regulation*. Victoria. Queen's Printer. 1992.

Ministry of Health Planning. *Provincial Health Officer's Annual Report 2000. Drinking Water Quality in British Columbia: The Public Health Perspective*. Victoria. Queen's Printer. 2001.

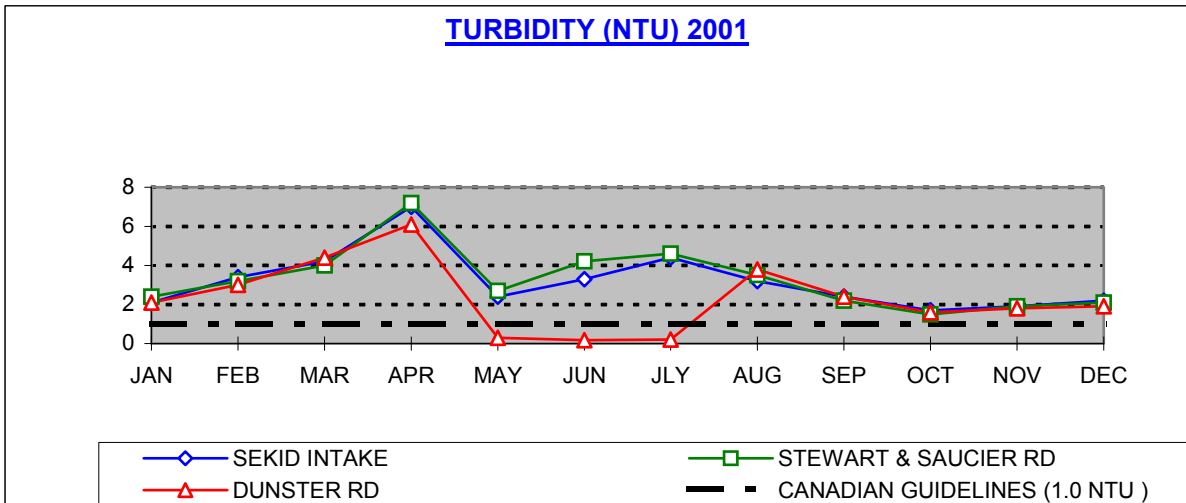
Ministry of Municipal Affairs. *Improvement District Manual*. Victoria. 1985.

Ministry of Water, Lands and Air Protection. *Drinking Water review Final Report*. Fraser Basin Council. February 14, 2002.

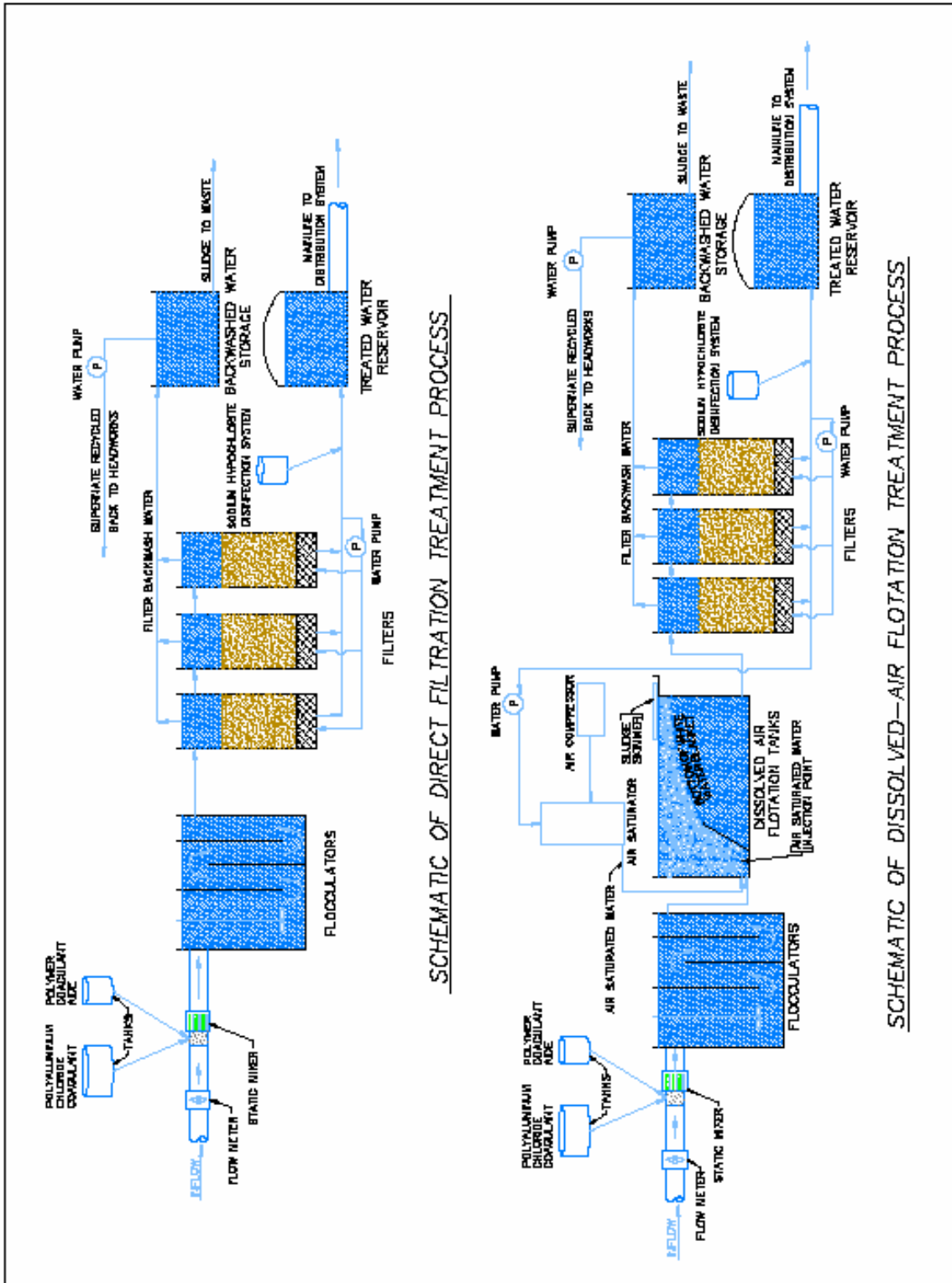
Appendix 1: SEKID's 2001 colour and turbidity

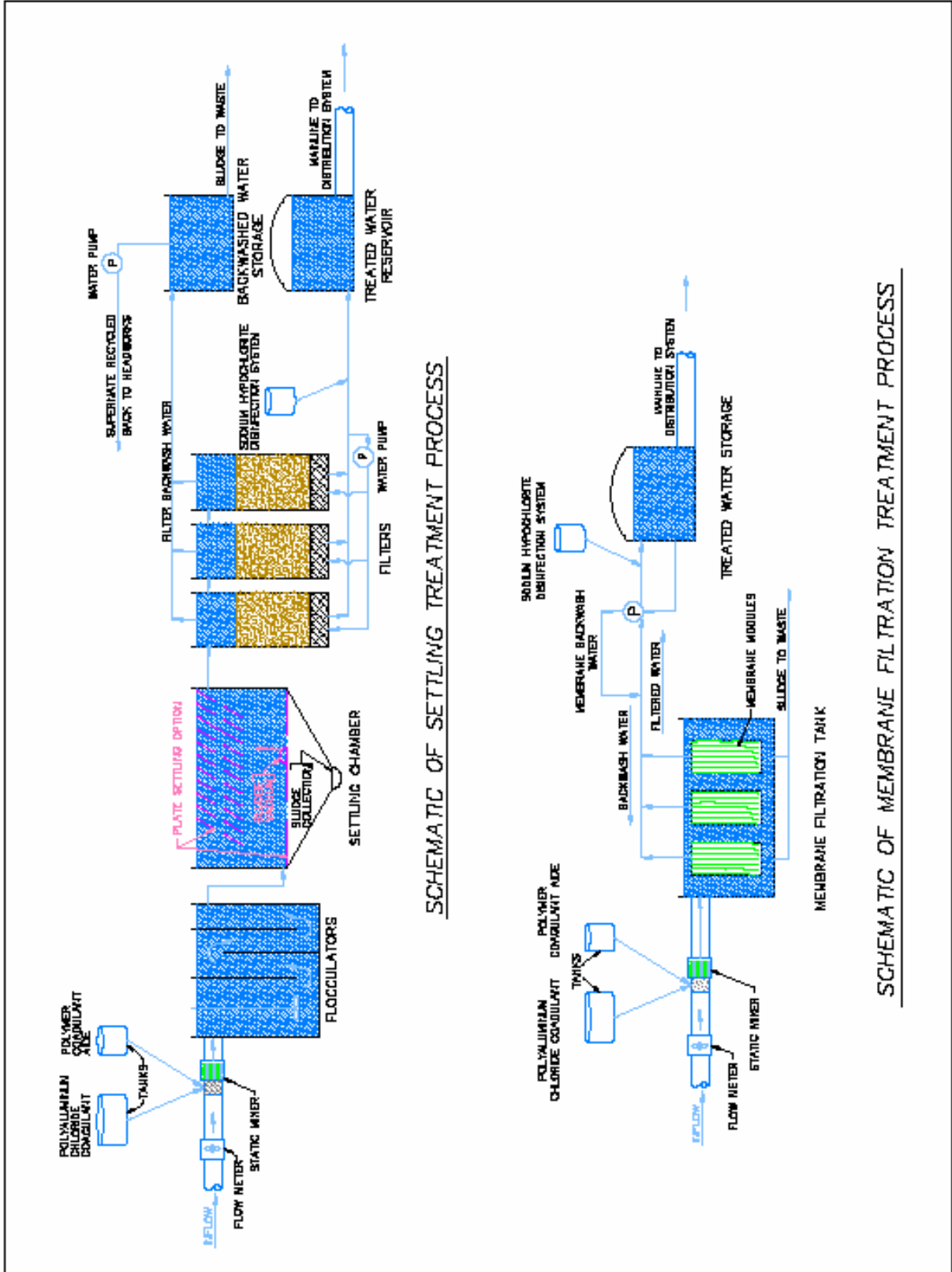


Note: Low colour and turbidity levels at Dunster Road from May to June are a result of well water use.



Appendix 2: Schematic of water treatment systems





SCHEMATIC OF SETTLING TREATMENT PROCESS

SCHEMATIC OF MEMBRANE FILTRATION TREATMENT PROCESS

Appendix 3: Municipal Finance Authority table

20 Year Term

5% Capitalization Rate

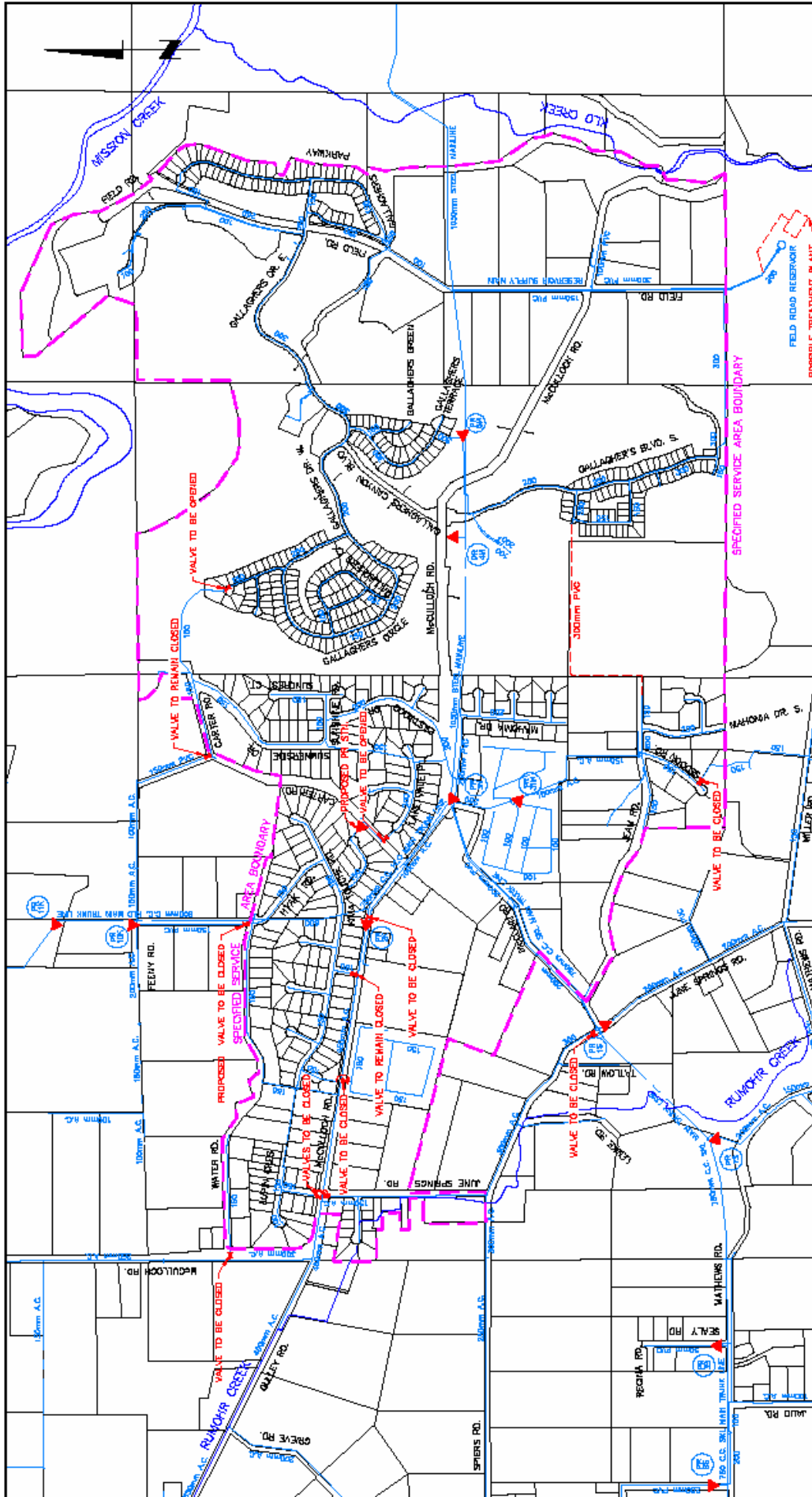
Principal: **3,400,000.00** Interest Rate: **6.50%** S/F Factor: 0.030242587


	Principal Pymnt	Interest Pymnt	Total Pymnt	Actuarial	Reducing Balance
					3,400,000.00
Yr 1 Semi Annual		110,500.00	110,500.00		3,400,000.00
Yr 1 Annual	102,824.80	110,500.00	213,324.80		3,297,175.20
Yr 2 Semi Annual		110,500.00	110,500.00		3,297,175.20
Yr 2 Annual	102,824.80	110,500.00	213,324.80	5,141.24	3,189,209.17
Yr 3 Semi Annual		110,500.00	110,500.00		3,189,209.17
Yr 3 Annual	102,824.80	110,500.00	213,324.80	10,539.54	3,075,844.83
Yr 4 Semi Annual		110,500.00	110,500.00		3,075,844.83
Yr 4 Annual	102,824.80	110,500.00	213,324.80	16,207.76	2,956,812.27
Yr 5 Semi Annual		110,500.00	110,500.00		2,956,812.27
Yr 5 Annual	102,824.80	110,500.00	213,324.80	22,159.39	2,831,828.09
Yr 6 Semi Annual		110,500.00	110,500.00		2,831,828.09
Yr 6 Annual	102,824.80	110,500.00	213,324.80	28,408.60	2,700,594.70
Yr 7 Semi Annual		110,500.00	110,500.00		2,700,594.70
Yr 7 Annual	102,824.80	110,500.00	213,324.80	34,970.27	2,562,799.64
Yr 8 Semi Annual		110,500.00	110,500.00		2,562,799.64
Yr 8 Annual	102,824.80	110,500.00	213,324.80	41,860.02	2,418,114.82
Yr 9 Semi Annual		110,500.00	110,500.00		2,418,114.82
Yr 9 Annual	102,824.80	110,500.00	213,324.80	49,094.26	2,266,195.77
Yr 10 Semi Annual		110,500.00	110,500.00		2,266,195.77
Yr 10 Annual	102,824.80	110,500.00	213,324.80	56,690.21	2,106,680.76
Yr 11 Semi Annual		110,500.00	110,500.00		2,106,680.76
Yr 11 Annual	102,824.80	110,500.00	213,324.80	64,665.96	1,939,190.00
Yr 12 Semi Annual		110,500.00	110,500.00		1,939,190.00
Yr 12 Annual	102,824.80	110,500.00	213,324.80	73,040.50	1,763,324.71
Yr 13 Semi Annual		110,500.00	110,500.00		1,763,324.71
Yr 13 Annual	102,824.80	110,500.00	213,324.80	81,833.76	1,578,666.14
Yr 14 Semi Annual		110,500.00	110,500.00		1,578,666.14
Yr 14 Annual	102,824.80	110,500.00	213,324.80	91,066.69	1,384,774.66
Yr 15 Semi Annual		110,500.00	110,500.00		1,384,774.66
Yr 15 Annual	102,824.80	110,500.00	213,324.80	100,761.27	1,181,188.59
Yr 16 Semi Annual		110,500.00	110,500.00		1,181,188.59
Yr 16 Annual	102,824.80	110,500.00	213,324.80	110,940.57	967,423.22
Yr 17 Semi Annual		110,500.00	110,500.00		967,423.22
Yr 17 Annual	102,824.80	110,500.00	213,324.80	121,628.84	742,969.59
Yr 18 Semi Annual		110,500.00	110,500.00		742,969.59
Yr 18 Annual	102,824.80	110,500.00	213,324.80	132,851.52	507,293.27
Yr 19 Semi Annual		110,500.00	110,500.00		507,293.27
Yr 19 Annual	102,824.80	110,500.00	213,324.80	144,635.34	259,833.14
Yr 20 Semi Annual		110,500.00	110,500.00		259,833.14
Yr 20 Annual	102,824.80	110,500.00	213,324.80	157,008.34	0.00
TOTALS:	2,056,495.93	4,420,000.00	6,476,495.93	1,343,504.07	

Total principal repaid plus total actuarial earnings equal amount originally borrowed

NOTE: This schedule of payments is calculated on an estimate of rates based on today's rate.

Appendix 4: Service Area



SOUTH EAST KELOWNA IRRIGATION DISTRICT		DRAWING NO. SEK-152		REV. B
PROPOSED SYSTEM TO BE SUPPLIED BY FIELD RD. RESERVOIR				
CC	C.C.	SCALE	1:10000	
DESIGN	DESIGN	DATE	OCT. 98	
APPROVED	S.M.	SCALE	1:10000	
				
CH'NO. 208-437 Bannock Road Kelowna, B.C. V1Y 1Y3 Telephone 888-2072				
A	DIST. BB	CC	1.1x17 PLAN CREATED FROM A-1 PLAN	REVISION
B	FEB. 02	CC	DISTRIBUTION SYSTEM DETAILS UPDATED	BT