McCleary City Council

PROPOSED AGENDA

March 10th, 2010

7:00 Council Meeting

Flag Salute
Roll Call
Minutes
Public Comment
Mayor's Report — Budget Status
USDA Loan

Staff Reports: Dan Glenn, City Attorney
Nick Bird, Director of Public Works
George Crumb, Chief of Police
Department Heads

Ordinances:

Old Business: Variance – 2nd and Pine Street
WWTP - Biosolids

New Business:

Resolutions:

Vouchers
Mayor/Council Comments
Public Comment
Executive Session
Adjournment

Americans with Disabilities Act (ADA)
Accommodation is Provided Upon Request

Please Turn Off Cell Phones – Thank You

STAFF REPORT

To: City Council
From: Nick Bird, Director of Public Works
Date: March 10, 2010
Re: Current Non-Agenda Activity

2nd and Pine – Infill Residential Construction

Last Council meeting (2/24/10), you requested that I wait to make a determination on the Variance submitted by the property owner. The following day, I learned that the previous administration allowed a residence to be constructed in the 4th quarter of 2009 without constructing half street improvements, including curb, gutter, and sidewalk. Based on this fact, it was my opinion that the determination and precedence for residential infill lots had been previously set. Knowing this information, I authorized the Building Official to notify the applicant that half street improvements are not required for residential infill construction.

The current Development Standards and Municipal Code are vague when it comes to defining the requirements of residential infill construction and can be interpreted differently daily. I plan to work with the planning commission, revise the Development Standards and associated Municipal Code Sections to rectify this issue by providing clear and definite requirements for all types of residential construction.

Council of Governments Meeting

2010 is the 50th Anniversary of the Council of Governments! The COG staff would like to put together a timeline of community milestones. If there is anything you can think of, let me know, and I will be able to pass it on to the COG staff.

I learned quite a bit about what the COG staff is capable of doing at this meeting (by the staff reports). The staff will assist with grant writing (and education of City employees), GIS mapping (currently working with McCleary creating a map/database of the Light and Power utility), Capital Facility Planning (although not required in Grays Harbor County, it helps secure grants), and many other miscellaneous tasks most agencies complete through consultants.

COG Area Planners Forum

This meeting was intended to bring all the agencies together to discuss planning activities. The main topic of the meeting was the County discussing the status of the Critical Area Ordinance (CAO) update, which will likely be complete in mid 2010. There was also a round table discussion on current planning activities in process by the agencies in attendance.

Planning Documents

The City has, or is in the process of obtaining planning documents relating to the infrastructure of the City (Water 2008, Sewer 2001, Stormwater in process, Light and Power in process). One topic that came up at the COG Area Planners Forum was sidewalk planning. This is a topic that had been previously discussed by the prior Council and administration, but no action was taken. I anticipate beginning the sidewalk plan in the near future, with the assistance of the Planning Commission, in conjunction with revising the development standards. I believe Hoquiam recently completed a sidewalk plan, which could be used as a great starting point.

STP Committee

The STP Committee will meet March 10, to determine the distribution of the $1.7 million that has been allocated to Grays Harbor County under the Jobs Bill (ARRA2). The current proposal is to conduct a county wide overlay program (new asphalt). The dilemma is that this money can only be used on functionally classified roads, and not state highways, leaving only 3rd Street, in our jurisdiction. The other catch is that due to the federal source of funds, if a paving project is conducted, sidewalk and ramps must be reconstructed to meet ADA standards, if not in compliance. The committee elected to require "no sidewalks" in the paving program.

Then to top all of this off, the stimulus funds were distributed based on "Roadway Mileage" and "Population". You and I both know that McCleary is a small community, with only Oakville having a smaller population, which means we get the short end of the stick using this method. Additionally, when you remove SR 108 from the calculation, we have the second lowest total of Roadway Miles as well.

The current proposal is to allocate $25,000 to McCleary for paving, which translates to approximately 750 lineal feet of roadway. As I just described, using the criteria set forth by the Committee, the City will not be able to use any of the stimulus funding. I will continue to negotiate for completing the sidewalk project, but getting additional "free" money does not look good at this point in time.

Simpson Ave. Sidewalk Project

As you may have noticed, ground breaking for this project was on March 1. The Contractor started work on the North Side, between 10th Street and 7th Street. Catch basins and storm piping was/is the first activity, which will be followed by clearing and grubbing, sidewalk subgrade preparation, forming the sidewalks, then finally pouring the sidewalks. The pouring of concrete will likely occur at the end of this week or early next week. I plan to distribute fliers to the residents on the South Side this week relating to parking.

It is really unfortunate that the removal of the trees along Simpson is occurring while they are in bloom, but allowing them to remain without root barriers in place creates a probable scenario that the existing asphalt, existing stormwater conveyance piping, and new sidewalks will be damaged by the root growth.

STAFF REPORT

To: Mayor Dent and Council
From: George M. Crumb, Chief of Police
Date: March 8, 2010
RE: Report for March 10, 2010 Council Meeting

SUMMARY OF POLICE INCIDENTS / ACTIVITIES:
*00513 Incidents reported as of 1425 today's date and this year.
* Continued Investigation with Multi Agency Task Force for Missing Baum Child.

Discussion: Open

Council Members Present: ALL.... Mr. Ator, Mr. Boling, Mr. Geer, Mr. Lant, Mr.Shiller.

Mayor Dent: Present / Not Present _____

Officer Reporting: Chief Crumb _____ _____

STAFF REPORT

To: Mayor Dent
From: Colin Mercer Webmaster
Date: March 1, 2010
RE: February Website & Help Desk

RE-OCCURING WEBSITE ACTIVITY
Council Agenda/ Packet .
Previous Council meeting approved minutes.
Planning Commission Agenda.
Previous Planning Commission approved minutes.

NEW WEBSITE ACTIVITY
Removed Open Positions Notice from Main Page and from Council Page.
Posted Power Outage Public notice on the main page, the calendar and L&P pages of the site.
Posted Hydrant Flushing Notice for the month of March.
Upload Council Members email address to the Mayor and Council Page.
Added newly appointed Council Member Jeff Geer to the Mayor and Council Page.

ADDITIONAL TASKS
Create new City Organization Chart.
Uploaded Resolutions 606 – 610 to the city data base.
Create log for 2010 Professional Services Roster on the intranet.
Input all Professional Services brochures onto log.
Continue work on Cemetery Plot identifying and logging names.
Assist front office staff with customers during busy utility bill payment days.
Work on creating a new form to summarize and streamline the application processes.
Create a new Pre-SEPA form to assist is determining when and for which projects a SEPA review will be required.
Created a new file on the intranet to track and manage the WSDOT Simpson sidewalk project.

HELP DESK ACTIVITY

Month	Number of Incidents reported	Staff Reported / Closed / Open	Citizens Reported / Closed / Open
AUGUST	28	2 / 2 / 0	26 / 19 / 7
SEPTEMBER	32	13 / 4 / 9	19 / 23 / 3
OCTOBER	22	12 / 5 / 16	10/ 6 / 7
NOVEMBER	14	6 / 5 / 17	8 / 4 / 11
DECEMBER	19	5 / 5 / 17	14 / 9 / 16
JANUARY	18	7 / 6 / 18	11 / 9 / 18
FEBRUARY	6	2 / 12 / 8	4 / 7 / 15

WEBSITE TRAFFIC 2-1-10 through 2-28-10

Page Views by Section

Section	Page Views	Percent of Total
Default Page	1744	28.27%
Events Calendar	739	11.98%
Agendas and Minutes	515	8.35%
City Departments	347	5.62%
City Jobs	262	4.25%
City Staff	234	3.79%
Home Page	207	3.36%
Light & Power	205	3.32%
Search Results	202	3.27%
Code, Ordinances & Standards	173	2.8%
Mayor and Council	168	2.72%
Police	145	2.35%
City Photos	109	1.77%
Public Facilities	98	1.59%
Water / Wastewater	96	1.56%
Bear Festival	87	1.41%
Helpful Links	84	1.36%
Chamber of Commerce	74	1.2%
Fire	74	1.2%
FAQ's Page	71	1.15%
Administration	66	1.07%
Community Center	66	1.07%
Development Services / Building	61	0.99%
Municipal Court	55	0.89%
Planning Department	42	0.68%
2008-10 Budget	38	0.62%
Christmas Photos 2007	36	0.58%
Flood Photos 2009	36	0.58%
65th Anniversary Photos	34	0.55%
Tell Us What You Think!	30	0.49%
Interlocal Agreements	30	0.49%
Park Project Photos	30	0.49%
Surveys & Questionnaires	11	0.18%
TOTAL	6169	100%

STAFF REPORT

To: Mayor Dent
From: Colin Mercer Fleet Manager
Date: March 1, 2010
RE: February Fleet

No accidents to report.

Regular Maintenance

Lube oil and filter :
1999 Crown Victoria Police Car (Chief Crumb)

Repairs
1990 Chevy Dump Truck (Streets) Running rough repairs to be determined.

1999 Crown Victoria Reserve Police Car took in to have rough idle and missing looked at, determined there was a major problem with the #2 cylinder, received quote of $1827.40 estimate for repairs from J&F. Chief Crumb agrees not to spend the money at this time and look at possible surplus of vehicle.

1990 Chevy Dump Truck (Streets) Belt squeel.

STAFF REPORT

To: Mayor Dent
From: John Allardin, Maintenance Crew Foreman
Date: February 26, 2010
RE: February Status Report

TASK	DESCRIPTION	MONTH		YEAR TO DATE	
		NO.	HOURS	NO.	HOURS
Building maintenance	Park, transit station restrooms, city compound, library, float shed & museum.		28		101
Meetings and appointments	Safety meeting, interviews, public works meetings, outside agencies and contractors.				8
Training	First aid class		8		10
Water leaks	water leaks	3	6	8	21
Water complaints	Dirty, smelly or low water pressure.			4	4
Garbage collection	Down town, park, cemetery, city compound and city park trash cans.		6		14
Grounds maintenance	Gardening, hanging baskets, mowing, raking, baseball field maintenance and pressure washing		34		64
Pot hole program	Patching potholes and grading.		21		31
Utilities locates	Locating underground utilities	3	9	4	10
Meter reading	Three people task includes meter reading, shut off list and re-reads		48		96
Flagging traffic	Flagging for Light and Power crew				
Citizen requests	Forms generated by requests from citizens	7	8	27	28
Valve exercising program	Checking for valve operation, location, and maintaining proper valve operation		20		20
Sanding streets and street sweeping	sweeping streets				
Hydrant flushing program	Maintenance, flushing and exercising hydrants		2		3

STAFF REPORT

To: Mayor Gary Dent
From: Mick Schlenker Building Official
Date: March 5, 2010
Ref: February Staff Report

Building Permit Activity

	February		Total 2010	
	Current	Fees	YTD	Fees
Customer Service	122		224	
Building Permits Issued	3		4	
Nuisance Letters	4		5	
Inspections Performed	28		65	
Plan Reviews	3	Inc in Permit	4	
Stop Work Issued	1		1	
City Projects	0		0	
Complaints	5		9	
Demo Permits	0		0	
Court Issues	0		0	
Fire Projects	0		0	
Cars	0		1	
Abatements	0		0	
Elma Inspections	0		0	
Montesano	0		0	
Total	**166**	**$366.00**	**313**	**$1,323.00**

Summit II

A final walk through has been done for the performance bond and corrections where noted.
People present were, Nick, Todd, Colin, Vern, Mayor Dent and building department.

Cedar Heights

Lots #25 & #26 had inspections for framing, plumbing, mechanical and corrections were so noted.
They did not pass their dry in inspection.
Storm, sewer, water lines are in place and have passed the testing. They have been advised to keep .
side walks and road way clean of dirt and debris.

2 new homes are in insulation stgage

McCleary School
City is waiting on corrections to be completed, then we will do a final walk through for C.O.

Nuisance

The building department has been working hard at clearing up several new nuisance's.
Some of the citizens follow through with the letter (after a clean up letter is sent), and others take a bit more time
If you should notice junky yards or unsightly places, please fill out a
request form so I can follow up on those address's

Again this has been a big month for nusiances. Four new nusiances are in the paper work stage and homeowners taking care of their junk problems.

The Building Department has been working closely with our new Public Works Director Nick Bird P. E.. I'm very excited to work with Nick and have no problems in getting direct tion; to help move the city ay and citizens towards a better future.

STAFF REPORT

To: Mayor and City Council
From: Paul Nott, Light & Power
Date: 3/8/2010
Re:

	Monthly statistics;	YTD Totals
New Services;	**4**	**4**
System Outages;	**3**	**3**
Pole Replacements;	**4**	**4**
Maintenance Work Orders;	**9**	**9**
Billable Work Orders;	**4**	**4**

Report;
Since the beginning of the year we have had two outages that were weather related and one scheduled outage. The weather outages were due to wind and were simple fixes. The BPA scheduled outage went relatively smooth. As you all know we requested a substation crew from GHPUD to come and do some scheduled maintenance on our 12 kv. substation. The sub got a clean bill of health. One thing that I would like to explore is coming to some type of agreement to have the PUD do our substation maintenance. We do have an issue with some of the by-pass switches that will need to be addressed and I am getting prices on replacing some of the switches. We also took advantage of the outage and completed some work that was easier to do under the outage. Fortunately, the BPA crew, the PUD crew, and our crew all completed all of our work quicker than expected and we had the lights back on 4 hours earlier than expected.

The section of cable on the prairie that was faulted has been repaired. Once again we had to rely on Mason Co. PUD to come locate the fault since we have no underground fault locating equipment.

We have changed out about 650 meters to the new automated meter readers. Apparently there is an issue with the information loading from the computer to the handhelds though so we haven't been able to use the new readers as of yet. Ardyce is working on that end of it.

We've installed 4 new services and that is encouraging...

We have been working on trying to get started on the high line re-route project. We would like to at least get the poles in the ground prior to the replacement of the new sidewalk on Simpson Ave. Hopefully; a final plan will be completed shortly so we can get started on it.

That's all folks...

Gray & Osborne, Inc.
CONSULTING ENGINEERS
701 DEXTER AVENUE NORTH SUITE 200
SEATTLE, WASHINGTON 98109 • (206) 284–0860

MEMORANDUM

TO:	Mayor Dent, City of McCleary
FROM:	Nick Bird, P.E. John Wilson, P.E.
DATE:	February 11, 2010
SUBJECT:	Wastewater Treatment Plant Solids Handling

INTRODUCTION

In June of 2004 the City began the upgrade and conversion of the existing trickling filter wastewater treatment plant (WWTP) to an activated sludge process using sequencing batch reactors. The project was funded by a grant/loan combination from USDA Rural Development.

The original design of the upgrade included a Class A biosolids dehydration system to thermally treat and reduce the weight and volume of waste solids produced while meeting biosolids disposal regulations. When the project was awarded, as a result of funding limitations, the City elected not to install the biosolids dehydration system that was included in the contract plans and provisions. As a result, the plant, in its current state, is only capable of producing unclassified sludge. The sludge is currently dewatered in a belt filter press and then hauled off site by a contractor for further treatment and land application. This fact has not impacted the City to date, however, it is possible that the current disposal facility will require classified sludge to continue disposal at the facility.

This memorandum summarizes current federal and state biosolids regulations and evaluates potential disposal alternatives available to the City of McCleary for future disposal of biosolids. The alternatives that are considered most feasible for the City and that are evaluated for the disposal of future biosolids in this memorandum include:

- Purchase a used sludge dryer to produce Class A biosolids,
- Modify the abandoned anaerobic digester tank to convert it to additional aerobic digester volume to produce Class B biosolids,
- Install a membrane thickening unit in the existing waste sludge digester tanks to produce Class B biosolids,
- Add dry lime to dewatered sludge at the discharge of the existing belt filter press to produce Class B biosolids, and
- Haul unclassified sludge to a treatment and disposal facility by contract.

Each alternative evaluation includes an economic analysis that addresses capital, operation and maintenance costs.

Ancillary issues that affect each alternative include social impacts, operator concerns, and public opinion. The amount of vehicle traffic created, odor, and noise control are also important considerations.

BIOSOLIDS REGULATIONS

Regulations pertaining to biosolids management include 40 CFR Part 503, WAC 173-308, and WAC 173-200, all of which are summarized in Appendix A. For the purpose of this evaluation, the McCleary WWTP must be modified to meet the criteria identified in WAC 173-308, specifically the pathogen and vector attraction reduction measures, as land application is currently contracted to an outside agency.

SLUDGE PRODUCTION

The evaluation of sludge production in this section establishes estimates of existing and future sludge production. Due to the various process improvements identified as alternatives, production information must be estimated at various points within the treatment process. Existing and design sludge production data is shown in Table 1 for the following process solids:

- Waste Activated Sludge (WAS); from the sequencing batch reactors,
- Partially Digested Sludge (DS); from the aerobic sludge holding tanks, and
- Thickened Sludge (TS); from the belt filter press.

Existing sludge volumes and amounts shown below are based on the 2004 Wastewater Treatment Plant Upgrade/Expansion design criteria in conjunction with the production rates and concentrations currently seen at the WWTP. A copy of the calculations is included in Appendix B of this memorandum.

Table 1

Alternative 1 – Sludge Dryer Capital Cost Estimate

Process	Solids	Existing	Plant Design (Future)
Waste Activated Sludge	Volume (gpd)	9,384	16,321
	Conc. (mg/L)	5,980	8,500
	Mass (dry lb/day)	300	1157
Digested Sludge	Volume (gpd)	3,571	7,175
	Conc. (mg/L)	6,314	15,000
	Mass (dry lb/day)	188	905
Thickened Sludge	Volume (gpd)	173	678
	Conc. (% Solids)	13%	16%
	Mass (dry lb/day)	188	905

gpd = gallons per day
mg/L = Milligrams per Liter
Conc. = Concentration

SOLIDS HANDLING ALTERNATIVES

This section describes the various alternatives that are considered feasible for the treatment and disposal of the City's biosolids. The presentation of each alternative includes a description of the proposed improvement as well as cost estimates and a discussion of non-cost factors.

Alternative 1 – Sludge Dryer

The sludge drying alternative was included as an additive item in the 2004 Upgrade / Expansion of the City's WWTP. This option was omitted from the construction project due to funding constraints at the time; however, below grade process piping was installed during the upgrade to facilitate the installation of a sludge dryer at a later time. For this process, the dryer would receive dewatered sludge from the existing belt filter press, similar to the original design.

This process involves the application of heat to evaporate water and reduce the moisture content and volume of biosolids below that achievable by conventional dewatering methods. The advantages of heat drying include reduced product transportation costs, further pathogen reduction, improved storage capability, and marketability. This process is classified by WAC 173-308 as a Process to Further Reduce Pathogens (PFRP), which

has the capability to produce Class A biosolids that allow essentially unregulated disposal.

In an effort to reduce the cost of this alternative, use of used drying equipment was evaluated. Venders were contacted to locate used drying equipment. Only one used dryer was found to be currently available at the time this report was written. The unit is a Fenton Model 24/5 dryer, which is capable of three times the production capacity needed at McCleary and has a substantially larger footprint than the dryer included in the 2004 project. The purchase cost of that used dryer was approximately $700,000. This cost does not include installation, startup, manufacturer services, or a waranty. The existing sludge handling building was designed and constructed around a Fenton Model 8/2 dryer, which is significantly smaller than the used Fenton Model 24/5 dryer, meaning that structural modifications to the sludge handling building would also be necessary. For the purpose of this evaluation, it has been assumed that locating a used Fenton Model 8/2 dryer is unlikely, and a new dryer would need to be purchased.

For this alternative, a rotary indirect dehydration system consisting of an eight (8) cubic yard feed hopper with an automated batch volume of 1.1 cubic yards would be installed capable of processing 6 to 8 tons per day. The unit would be skid mounted and would not require any modifications to the process piping or solids handling building configuration. Natural gas piping required for the dryer was installed with the plant upgrade, but has not been set with a meter. Cascade Natural Gas was contacted to determine additional costs and fees associated with providing service at the WWTP. Based on their preliminary evaluation, it appears that a sizable portion of the natural gas infrastructure would need to be upgraded to handle the load required for the dryer. Estimated capital costs for upgrading the natural gas infrastructure was not provided by Cascade Natural Gas. Estimated capital costs for this alternative, not including upgrading the natural gas infrastructure are shown in Table 2.

Table 2

Alternative 1 – Sludge Dryer Capital Cost Estimate

Item No.	Description	Quantity		Unit Price	Amount
1	Mobilization	1	LS	$50,000	$50,000
2	Dehydration System Equipment and Startup	1	LS	$800,000	$800,000
3	Dry Solids Bagger	1	LS	$13,000	$13,000
4	Dryer Installation and Contractor Services	1	LS	$50,000	$50,000
5	Bagger Installation and Contractor Services	1	LS	$2,000	$2,000
6	Mechanical and Electrical Installation	1	LS	$112,000	$112,000

Subtotal $1,027,000
Contingency (20%) $206,000
Subtotal $1,233,000
Sales Tax (8.3%) $103,000
Estimated Construction Cost $1,336,000
Engineering, Permitting, and Construction Management (25%) $334,000
Estimated Project Cost $1,670,000

Estimated annual costs for this alternative are based on power and gas consumption, additional labor required for use of the new process equipment, and a cost savings for disposal of the biosolids. As this alternative gives the City the ability to produce Class A biosolids, which can be given away as mulch or soil amendments. The disposal costs have been removed from the annual cost increase. It is possible that the City will still need to pay to dispose of these biosolids, but for the purpose of this evaluation, this cost has been assumed to be zero. The annual costs associated with this alternative are shown in Table 3.

Table 3

Alternative 1 – Sludge Dryer Annual Cost Estimate

Item No.	Description	Quantity		Unit Price	Amount
1	Gas Consumption(1)	1	LS	$25,000	$25,000
2	Power Consumption(2)	96000	kw-hr	$0.07	$6,720
3	Biosolids Disposal	0	TN	$0	$0
4	Labor	0.5	FTE	$50,000	$25,000
5	Repair / Replacement	1	LS	$25,000	$25,000
6	Miscellaneous, incl. Testing	1	LS	$10,000	$10,000
				Annual Total =	**$91,720**

(1) – Gas consumption costs shown as a placeholder. Actual cost not determined due to large capital investment to upgrade the natural gas infrastructure.
(2) – Power consumption based on Fenton Model 8/2 (40 hp) running 8 hours a day.

Alternative 2 – Aerobic Digestion

Aerobic digestion is one of the processes defined in WAC 173-308 to meet PSRP requirements and capable of producing Class B biosolids, which are typically suitable for contracted land application. To meet Class B requirements for pathogen reduction using aerobic digestion, the regulations state that the solids retention times must be at least 40 days at 20° C or 60 days at 15° C. As the McCleary WWTP was designed around heat drying, which is a Class A (PSFP) process, the design solids retention time in the existing sludge holding tanks was limited to 20 days in an effort to minimize the digester basin size. There are two ways to modify the McCleary WWTP to provide adequate aerobic digestion to meet the Class B pathogen reduction requirements; add additional digestion volume or thicken the waste sludge that is treated in the existing tanks.

The intent of this alternative is to increase the solids retention time (SRT) to achieve the minimum residence time of 60 days, which can be provided by increasing the digester volume. The *2001 Wastewater Facility Plan* recommended converting the existing anaerobic digester into an aerated sludge holding tank, however the design documents for the WWTP upgrade did not include this improvement, and the construction project removed the existing anaerobic digester from service. In order to increase the SRT, the digestion volume must be increased. By converting the 73,700 gallon off-line anaerobic digester into an aerobic digester, the SRT is increased to 60 days, at a sludge concentration of 0.5% using current loadings and 1.25% using the design loadings.

Work that would be completed as part of this alternative includes removal of the existing digested sludge in the abandoned anaerobic digester and installation of new coarse bubble air diffusers, a new blower, and a new sludge transfer pump, as well as miscellaneous piping modifications. The new blower and sludge transfer pump would be installed in the old office building adjacent to the abandoned anaerobic digester. Digested sludge would continue to be dewatered by the existing belt filter press and land applied by contract.

Estimated capital costs for this alternative are shown in Table 4.

Table 4

Alternative 2 – Aerobic Digestion Capital Cost Estimate

Item No.	Description	Quantity		Unit Price	Amount
1	Mobilization	1	LS	$35,000	$35,000
2	Sludge Removal from Existing Anaerobic Digester	1	LS	$15,500	$15,500
3	Miscellanious Piping and Tank Modifications	1	LS	$100,000	$100,000
4	Digested Sludge Pump	1	EA	$25,000	$25,000
5	Positive Displacement Blowers	2	EA	$20,000	$40,000
6	Diffuser System	1	LS	$19,500	$19,500
7	Electrical	1	LS	$120,000	$120,000

Subtotal $355,000
Contingency (20%) $71,000
Subtotal $426,000
Sales Tax (8.3%) $36,000
Estimated Construction Cost $462,000
Engineering, Permitting, and Construction Management (25%) $116,000
Estimated Project Cost $578,000

Estimated annual costs for this alternative include power consumption, biosolids disposal and additional labor required for managing this process improvement. Power consumption is based on one blower running 24 hours per day and the digested sludge pump being used when the belt filter press is in use. Biosolids disposal costs contract hauling and land application at the application site. Estimated annual costs for this alternative are shown in Table 5.

Table 5

Alternative 2 – Aerobic Digestion Annual Cost Estimate

Item No.	Description	Quantity		Unit Price	Amount
1	Power Consumption[(1)]	121000	kw-hr	$0.07	$8,470
2	Biosolids Disposal	1180	Wet TN	$60	$70,800
3	Labor	0.15	FTE	$50,000	$7,500
4	Repair / Replacement	1	LS	$5,000	$5,000
5	Miscellaneous, incl. Testing	1	LS	$5,000	$5,000
				Annual Total =	**$96,770**

(1) – Power consumption is based on running one blower 24 hours per day 7 days per week, and the digested sludge pump 8 hours per day.

Alternative 3 – Membrane Thickening

For this alternative a flat plate membrane system would be installed in the existing Aerobic Digester Cell No. 1. Using this process, the solids can be thickened to 3.5% while digestion is occurring. All existing blower equipment will be utilized as applicable. Permeate pumps, chemical cleaning equipment and instrumentation are included in the membrane process package supplied by the manufacturer.

Waste activated sludge is wasted directly from the SBR into Digester No. 1. Sludge will be thickened to 2.5% by extracting water through the membrane while leaving the solids behind in the tank. Because of the high level of filtration, the permeate may be combined with the SBR effluent that is sent to the equalization basin. The partially digested sludge from Digester No. 1 will be transferred via pump or telescoping valve into Digester No. 2.

Cleaning of the membrane cassette will occur semi-automatically in place by injecting a dilute solution of sodium hypochlorite into the permeate lines and into the membranes.

Additional details relating to this alternative can be found in the Enviroquip proposal in Appendix C.

The existing rotary lobe pump, based on the service information provided in the WWTP operations and maintenance manual can pump liquids with a solids content up to 2%.

The local pump manufacturer's representative, John Simon with Global Sampson, was contacted to verify the functional capacity of this pump in its current configuration. Based on discussions with Mr. Simon, it appears that the pump is capable of pumping up to 4% solids, but the inlet/outlet configuration may need to be rotated from horizontal to vertical to assist passing solids through the pump throat.

New equipment for this alternative includes (one) membrane unit, (one) permeate collection system, including flowmeter, (two) 1.0 hp permeate pumps (one duty, one standby), (two) 10 hp positive displacement blowers (one duty, one standby) with variable frequency drives supplying air to the membrane unit, and miscellaneous piping, valves, and appurtenances. The existing (two) 15 hp digester blowers would be replaced with (two) 20 hp positive displacement blowers (one duty, one standby) with variable frequency drives.

Electrical modifications will include installing new variable frequency drive starters, programmable logic controller improvement, HMI programming, and control and power wiring associated with the new equipment.

Digested sludge will continue to be dewatered by the belt filter press and land applied by contract. Estimated capital costs for the membrane thickening alternative are shown in Table 6.

Table 6

Alternative 3 – Membrane Thickening Capital Cost Estimate

Item No.	Description	Quantity		Unit Price	Amount
1	Mobilization	1	LS	$45,000	$45,000
2	Membrane Unit	1	LS	$120,000	$120,000
3	Permeat Collection System	1	LS	$13,000	$13,000
4	Membrane Cleaning Equipment	1	EA	$8,000	$8,000
5	20 hp Positive Displacement Blowers	2	EA	$37,500	$75,000
6	10 hp Positive Displacement Blowers	2	EA	$18,000	$36,000
7	1.0 hp Permiate Pump	2	EA	$15,000	$30,000
8	Misc. Piping, Valves & Appurtannces	1	LS	$50,000	$50,000
9	Electrical Improvements	1	LS	$125,000	$125,000

Subtotal $502,000
Contingency (20%) $101,000
Subtotal $603,000
Sales Tax (8.3%) $51,000
Estimated Construction Cost $654,000
Engineering, Permitting, and Construction Management (25%) $164,000
Estimated Project Cost $818,000

Estimated annual costs for this alternative include power consumption, biosolids disposal, additional labor required for managing this process improvement, and cleaning solution for the membrane filters. Power consumption is based on one 20 hp blower and one 10 hp blower running 24 hours per day as well as the permeate pump. Biosolids disposal costs include contracted hauling and land application at the application site. Sodium hypochlorite will need to be purchased on a regular basis for the cleaning solution. It is assumed that $3,000 annually would supply a sufficient amount of cleaning solution. Estimated annual costs for Alternative 3 are shown in Table 7.

Table 7

Alternative 3 – Membrane Thickening Annual Cost Estimate

Item No.	Description	Quantity		Unit Price	Amount
1	Power Consumption	225000	kw-hr	$0.07	$15,750
2	Biosolids Disposal	1180	Wet TN	$60	$70,800
3	Labor	0.25	FTE	$50,000	$12,500
4	Cleaning Solution	1	LS	$3,000	$3,000
5	Repair / Replacement	1	LS	$15,000	$15,000
6	Miscellaneous	1	LS	$5,000	$5,000
				Annual Total =	**$122,050**

Alternative 4 – Lime Addition

The process of lime addition is a method of alkaline stabilization that is used to meet the Class B PSRP requirements set forth in WAC 173-308-170. This requirement states that sufficient lime must be added to the biosolids to raise the pH of the biosolids to twelve after two hours of contact. Three methods of alkaline stabilization are commonly used: (1) addition of lime prior to dewatering, (2) addition of lime after dewatering, and (3) advanced alkaline stabilization technologies. Either hydrated lime or quicklime is most commonly used for lime stabilization.

Bench testing was completed in September 2009 by Gray & Osborne, Inc. as part of this evaluation. This testing evaluated the required lime dosage for the first two methods of alkaline stabilization. The third method, advanced alkaline stabilization, was determined to not be a cost effective solution for the City of McCleary, and therefore was not evaluated.

Ten samples were taken from the belt filter press discharge and twelve samples were taken from the existing digesters to evaluate the effectiveness of quicklime and hydrated lime after dewatering and prior to dewatering, respectively. Approximately 50% of each sample set was tested with quicklime and the other half of the samples with hydrated lime. The results of the analysis are shown in Appendix D.

Based on the results of the analysis dry quicklime or hydrated lime may be used to meet the minimum requirements set forth in WAC 173-308-170, however, quicklime is the recommended material to minimize pH decay and the potential for odor generation in the stabilized sludge. The addition of lime prior to dewatering results in significantly more

lime consumption than lime stabilization after dewatering, due to the greater lime demand of the additional water. In an effort to minimize lime consumption and potential pipe and equipment scaling problems with lime addition prior to dewatering, the recommended method for this alternative is lime addition after dewatering.

Consiquently, for this alternative, quicklime will be mixed with the dewatered sludge. A new lime addition system would be installed to feed and mix dry quicklime in the dewatered sludge cake discharged from the belt filter press. The system would consist of a lime bag emptying station with a cylindrical hopper and mechanical agitator; screw feeders to convey the lime from the hopper to the injection box; and a new sludge mixer. The existing Moyno cake pump would need to be moved approximately 2-feet to accommodate the sludge mixer, thus the existing concrete equipment pad would need to be lengthened as necessary. The screw feeders and sludge mixer would be provided with variable frequency drives to flow pace the lime feed according to the production speed of the belt filter press. The cake pump would discharge the high pH sludge to the existing dumpster.

Estimated capital costs for the lime addition alternative are shown in Table 8.

Table 8

Alternative 4 – Lime Stabilization Capital Cost Estimate

Item No.	Description	Quantity		Unit Price	Amount
1	Mobilization	1	LS	$30,000	$30,000
2	Lime Mix/Feed System	1	LS	$150,000	$150,000
3	Relocate Moyno Cake Pump	1	LS	$5,000	$5,000
4	Electrical Improvements	1	LS	$110,000	$110,000

Subtotal	$295,000
Contingency (20%)	$59,000
Subtotal	$354,000
Sales Tax (8.3%)	$30,000
Estimated Construction Cost	**$384,000**
Engineering, Permitting, and Construction Management (25%)	$96,000
Estimated Project Cost	**$480,000**

Estimated annual costs for this alternative include power consumption, biosolids disposal, additional labor required for managing this process improvement, additional polymer for the cake discharge piping, and lime for the treatment process. Power consumption is based on small electric motors for the screw conveyers, which will only be run when the belt filter press is in operation. Biosolids disposal costs include contract hauling and land application at the application site. Additional polymer will need to be purchased on a regular basis to lubricate the cake mixed with the lime to reduce friction in the cake pipe. The injection point will remain at the same location and the existing pump will accommodate the existing demand. It was assumed that $6,000 annually would supply a sufficient amount of polymer. Lime will be purchased in 1 Ton bags and delivered to the WWTP. Estimated annual costs for Alternative 4 are shown in Table 9.

Table 9

Alternative 4 – Lime Stabilization Annual Cost Estimate

Item No.	Description	Quantity		Unit Price	Amount
1	Power Consumption	15000	kw-hr	$0.07	$1,050
2	Biosolids Disposal(1)	1205	TN	$60	$72,300
3	Labor	0.3	FTE	$50,000	$15,000
4	Polymer	1	LS	$6,000	$6,000
5	Lime	25	TN	$600	$15,000
6	Repair / Replacement	1	LS	$10,000	$10,000
7	Miscellaneous, incl. testing	1	LS	$5,000	$5,000
				Annual Total =	**$124,350**

(1) – Disposal includes dewatered sludge plus the added lime.

Alternative 5 – Unclassified Sludge Hauling

This alternative is essentially the "do nothing" alternative. With this alternative, no process improvements will be made, and unclassified sludge will continue to be discharged into the storage containers in the old drying bed location. These storage containers will be hauled off to a transfer station, and would ultimately be disposed of in a landfill. Based on various discussions with Kyle Dorsey, Department of Ecology, disposal of sludge in a landfill does not meet the beneficial use requirement defined in WAC 173-308. By proceeding with an alternative of this nature, the City risks enforcement action by the Department of Ecology.

The Lacey, Olympia, Tumwater, and Thurston County (LOTT) wastewater treatment plant and the City of Tacoma Wastewater Division was contacted to determine if either of these facilities can assist the City with treatment of the sludge generated at the City's WWTP. Both facilities stated that they are not currently accepting outside sludge, and do not anticipate accepting sludge in the future. Both facilities may be used in the event of an emergency, but a permanent sludge disposal solution is not an option.

Based on the discussions with the Department of Ecology and various treatment facilities, a cost has not been provided for this alternative.

Solids Handling Alternative Evaluation

Selecting a biosolids management alternative is based on factors that include regulatory compliance, capital and operating costs, non-cost factors and operational preference. A summary of the cost estimates provided in Table 2 through Table 10 is summarized in Table 11.

Table 11

Summary of Biosolids Management Alternatives

Process	Estimated Capital Cost	Estimated Annual O&M Cost	Net Present Worth[(1)]
Alt. 1 - Sludge Dryer	$ 1,670,000	$ 91,720	$ 3,344,300
Alt. 2 - Aerobic Digestion	$ 578,000	$ 96,770	$ 2,344,500
Alt. 3 - Membrane Thickening	$ 818,000	$ 122,050	$ 3,045,900
Alt. 4 - Lime Addition	$ 480,000	$ 124,350	$ 2,750,000

(1) – Net Present Worth is based on a 20 year life cycle, with an inflation rate of 3.5% and a discount rate of 5%.

To evaluate the biosolids management alternatives in terms of all relevant criteria, including non-cost criteria such as regulatory compliance, reliability, and operator preference, a decision matrix was developed. The decision matrix is shown in Table 12. Each criterion was assigned an importance factor to weight its value. Each alternative was then rated from one to ten for each criterion. The importance factor was multiplied by the rating for each criterion and then summed for each alternative.

Table 12

Biosolids Management Decision Matrix

Criteria	Relative Importance Factor	Alt. 1 - Sludge Dryer		Alt. 2 - Aerobic Digestion		Alt. 3 - Membrane Thickening		Alt. 4 – Lime Addition	
Regulatory Compliance	10	10	100	8	80	8	80	8	80
Capital Cost	20	2	40	7	140	5	100	9	180
Annual O&M Cost	20	9	180	8	160	6	120	5	100
Net Present Value	15	4	60	10	150	5	75	8	120
Reliability	15	10	150	4	60	6	90	8	120
Operator Preference	20	10	200	8	160	4	80	6	120
Score	**100**	**730**		**750**		**545**		**720**	

Recommended Alternative

Based on the decision matrix shown above in Table 12, Alternative 2 – Aerobic Digestion, appears to be the most appropriate solids handling alternative for the City of McCleary. Design criteria for increasing the aerobic digestion capacity of the existing WWTP is shown in Table 13.

Table 13

Aerobic Digestion Design Criteria

Aerobic Digester (Convert Ex. Anaerobic Digester)	
Digester No. 3 (Converted Anaerobic Digester)	
Diameter	28 Feet
Max SWD	16 Feet
Volume	73,700 Gallons
Aeration	
Type	Coarse Bubble Diffusers
Blowers	
Quantity	2 (One Duty, One Standby)
Type	Positive Displacement
Capacity	170 scfm @ 8 psig
Motor Size	10 hp
Drive	Variable Speed
Digested Sludge Feed Pump	
Quantity	1
Type	Rotary Lobe
Capacity	60 gpm @ 25 psi
Motor Size	5 hp

Appendix A

Biosolids Regulation Summary

BIOSOLIDS REGULATIONS

Regulations pertaining to biosolids include 40 CFR Part 503, WAC 173-308, and WAC 173-200, all of which are addressed in detail below.

40 CFR PART 503

The 1977 amendments to the Clean Water Act required the EPA to develop regulations governing the disposition of municipal sewage sludge. On February 19, 1993 this mandate was met with the promulgation of final rules governing the use or disposal of sewage sludge. Although these rules are commonly referred to as "the 503 regulations", there were actually several regulations affected. 40 CFR Part 257, the then existing Federal regulation on solid waste, was amended to reclassify treated municipal sewage sludge and domestic septage as a special type of solid waste (biosolids) to be regulated primarily by the 503 rules. 40 CFR Part 403 was also amended to allow removal credits for the pollutants regulated in Part 503 when these pollutants have been identified as part of a pre-treatment program at a publicly owned treatment works (POTW).

The 503 rules only apply to the sewage sludge generated from municipal wastewater systems, i.e., municipal wastewater treatment systems, and domestic septic tanks. The 503 rules do not apply to wastes that are solely from commercial chemical toilets or industrial processes. However, if such wastes are commingled with municipal wastewater sludge (biosolids) or domestic septage, they become subject to the 503 rules.

The current 503 regulations are broken into five subparts:

General Provisions

Land Application

Surface Disposal

Pathogens and Vector Attraction Reduction

Incineration

A summary of key provisions of each of the subparts is provided below. (The regulations address both biosolids and domestic septage; however, only the regulations addressing biosolids are discussed here.)

Subpart A - General Provisions

This subpart identifies the compliance deadlines for the 503 regulations. A general deadline was set for February 19, 1994, unless compliance will require construction of new pollution control facilities. A final deadline of February 19, 1995 was established for those cases where construction of new facilities was needed to comply.

A list of definitions is also provided in Subpart A.

Subpart B - Land Application

This subpart applies to treated municipal sewage sludge (biosolids) and septage that is utilized in a land application program where the objective is to condition the soil or fertilize the

crops/vegetation grown on the soil. This subpart, therefore, is the key to understanding beneficial use of biosolids or septage under the 503 regulations.

There are three fundamental elements of the 503 regulations that establish minimum criteria for beneficial use of biosolids:

- pollutant concentrations and application rates
- pathogen reduction measures
- vector attraction reduction measures

Trace Pollutant Concentrations and Application Rates

Maximum allowable concentrations in biosolids are established for nine (9) heavy metals. If a biosolids sample exceeds the ceiling concentration of any of these metals, it cannot be land applied. A second pollutant threshold concentration is identified for Exceptional Quality (EQ) biosolids. If biosolids are shown to be below these concentrations they may be considered EQ, and thus be eligible for relatively unrestricted land application, provided they meet other EQ requirements. To be considered "EQ", biosolids must not only meet the EQ pollutant requirement, but also meet Class A pathogen reduction requirements and vector attraction reduction requirements (see below).

Cumulative trace pollutant loading rates for biosolids are designated for nine heavy metals. These rates cannot be exceeded during the life of an application site. Once a cumulative loading limit is reached for a particular limiting pollutant, the land can no longer receive biosolids containing any level of the limiting pollutant. Annual trace pollutant loading rates are also set for the same nine heavy metals.

Pathogen Reduction Requirements

In order for biosolids to be land applied, they must meet specific criteria demonstrating a minimum level of treatment to reduce the density or limit growth of pathogenic bacteria. By meeting these minimum criteria, a biosolids sample is referred to as meeting Class B pathogen reduction requirements. The term "Class B biosolids" is sometimes erroneously referred to as any biosolids meeting all minimum criteria that allow the biosolids to be land applied, which is not the case. Biosolids must meet vector attraction reduction requirements and minimum pollutant concentration standards as well as Class B pathogen reduction requirements (at minimum) in order to be acceptable for land application.

Class B biosolids must meet one or more of three alternative criteria for pathogen reduction described in 40 CFR 503. A higher level of treatment known as a Process to Further Reduce Pathogens (PFRP) will permit biosolids to meet Class A pathogen reduction requirements. 40 CFR 503 provides six alternative PFRP standards for Class A biosolids. When biosolids meet the Class A standard they are subject to fewer restrictions for land application as long as they also meet the lower (WAC-173-308) Table 3 pollutant concentration thresholds and vector attraction reduction standards.

Vector Attraction Reduction Requirements

The third minimum requirement for biosolids to be land applied is the vector attraction requirement. This measure is designed to make the biosolids less attractive to disease-carrying pests such as rodents and insects. These measures typically reduce the liquid content and/or volatile solids content of the biosolids or they make the biosolids relatively inaccessible to vector

contact by soil injection or tilling. 40 CFR 503 lists seven alternative treatment techniques and/or laboratory tests that would qualify a sludge as meeting vector attraction reduction requirements. If a biosolids is not treated by one of the listed treatment techniques to provide vector attraction reduction, and if it does not pass the laboratory tests for vector attraction reduction, then it can only be land applied by subsurface injection or immediate tilling into the ground.

Management Practices

Once the three basic criteria discussed above have been met, the 503 regulations identify specific management practices, which must be followed during land application of biosolids. The biosolids must be applied at a rate that is equal to or less than the agronomic rate. The placement of biosolids on land cannot adversely affect a threatened or endangered species. Biosolids cannot be applied to ground in a manner that would cause it to enter wetlands or a surface water body (e.g. on frozen ground or snow-covered ground) nor can it be applied within 10 meters or less of a surface water. (Local requirements for additional buffer distances may be more stringent in the State of Washington depending on how each jurisdiction deals with critical areas pursuant to the Growth Management Act). Biosolids applied to a lawn or garden must meet Class A standards for pathogen reduction under the 503 regulations.

If biosolids meet lower pollutant threshold limits, Class A pathogen reduction requirements and vector attraction reduction requirements, they are eligible for relatively unrestricted application. Biosolids in this category are referred to as "Exceptional Quality" (EQ). EQ biosolids can be containerized and sold or given away in quantities up to one metric ton provided a label or information sheet is provided with:

- the biosolids preparer's name and address,
- the annual whole sludge application rate that does not cause any of the annual pollutant loading rates to be exceeded and,
- a statement that application is prohibited except in accordance with instructions provided with the container.

Monitoring Requirements

Monitoring frequencies are based on quantities of biosolids produced. (It is not generally necessary to verify that pathogen and vector attraction reduction measures are met for each individual load of biosolids that is land applied, per WAC 173-308-150 (3)). The actual monitoring frequencies will depend on the frequency of applications.

Record-keeping, Reporting and Certifications

The 503 regulations have specific record-keeping, reporting and certification requirements for land application of domestic septage and biosolids. Records must be kept for meeting all pathogen reduction and vector attraction reduction requirements for biosolids and domestic septage. For biosolids, records must be kept of analyses performed for meeting trace pollutant criteria. The 503 regulations dictate that publicly owned treatment works with design flow rates greater than 1.0 million gallons per day (MGD), or serving more than 10,000 persons, or that have been designated as Class I facilities must make annual reports to the EPA. The McCleary WWTP does not meet these criteria, and is therefore exempt from EPA reporting requirements. However, Ecology requires that *all* facilities, including those with design flows *less* than 1 MGD, serving *less* than 10,000 persons or *not* designated Class I facilities, make annual reports

to both Ecology's headquarters and the appropriate regional office, by March 1 of each year.

Specific certifications are required for meeting pathogen and vector attraction reduction requirements for biosolids. For biosolids, these certifications must be provided by the individual(s) who both prepare and land apply the biosolids. The language in the certifications stress the individual accountability associated with meeting the pathogen/vector attraction reduction provisions of the 503 regulations.

Subpart C - Surface Disposal

Surface disposal is not regarded as beneficial use and hence is not a preferred alternative. However, it is still allowable under the 503 regulations and, if disposal is to be considered an alternative, it is important to understand the 503 regulations as they pertain to this practice.

The receptacle for land-disposed sewage is termed an "active sewage unit". To operate an active sewage unit, it must first be demonstrated that the unit is not located in a seismically unstable geology. Written closure and post-closure plans must be provided describing, among other things, how the leachate collection system will be operated after closure, how methane gas emissions from the site will be monitored, and how public access to the site will be restricted after closure.

Only three pollutants, arsenic, chromium and nickel, are monitored with a surface disposal system. However, allowable levels for these pollutants are based on proximity to property line boundaries and in some cases are considerably less than those allowed as ceiling concentrations for land application.

Biosolids placed in an active sewage unit must still meet minimum vector attraction and pathogen reduction requirements established for land-applied biosolids. However, there is one additional option available for vector attraction reduction with sludge disposal. This option is to cover the biosolids with soil or other material at the end of each operating day.

Subpart D - Pathogen and Vector Attraction Reduction

Subpart D contains important information regarding site restrictions and food crop consumption when Class B biosolids are land applied. The restrictions are listed below:

1. Food crops cannot be harvested for up to 14 months after application when the harvested parts touch the soil/biosolids mixture and are totally above the land surface.

2. Food crops cannot be harvested for up to 20 months after application when the biosolids remain on the land surface for four months or longer prior to being incorporated into the soil

3. Food crops with harvested parts below the surface of the land shall not be harvested for 38 months after the application of biosolids when the biosolids remain on the land surface for less than four months prior to incorporation into the soil

4. Food crops, livestock feed crops and fiber crops shall not be harvested for 30 days after biosolids application

5. Animals shall not be allowed to graze on the land for 30 days after application of biosolids

6. Turf grown on land where biosolids are applied shall not be harvested for one year after application if the turf is to be placed in an area with high potential for public contact

7. Public access to land with a high potential for public exposure shall be restricted for one year after biosolids application

8. Public access to land with a low potential for public exposure shall be restricted for 30 days after biosolids application

Subpart E - Incineration

This subpart provides requirements for operating and monitoring a sludge incinerator. The City of McCleary does not have a sludge incinerator, and the likelihood of this technology being introduced in this area appears very low at this time, primarily due to high capital and operating costs and air emission concerns.

70.95J/70.95 RCW

This chapter of the Revised Code of Washington provides authority for the beneficial use of biosolids, including septage. Specifically, this chapter establishes the authority for the legislature to adopt rules regarding biosolids transportation, beneficial reuse and disposal.

WAC-173-200 Groundwater Quality Standards

WAC 173-200, Water Quality Standards for Ground Waters of the State of Washington, establishes specific water quality for groundwater in the State of Washington.

Nitrate is likely to be the key groundwater parameter in the land application of biosolids because it is an oxidation breakdown product of organic nitrogen and ammonia nitrogen, both of which are contained in biosolids. In excessive amounts, nitrate contributes to the illness known as methemoglobinemia in infants; thus, the concentration of nitrate (as nitrogen) in groundwater is limited to 10 mg/L. Nitrate is more soluble than many other groundwater contaminants, and it can become highly mobile in the soil column. Therefore, its potential as a groundwater contaminant is significant.

WAC 173-200 establishes specific procedures for determining whether an activity such as biosolids application will impact groundwater quality. Ecology's guidance document for WAC 173-200 is very specific regarding agronomic application of nutrients. The guidance states that an exemption to the groundwater standards is allowed only within the root zone. The practical effect of this guidance is that biosolids applications must be performed in such a way that all potential plant available nitrogen is applied at agronomic uptake rates.

Current guidance from the Washington State Department of Ecology (Ecology) indicates that as long as biosolids applications are managed to provide agronomic uptake of nutrients, it will not be necessary to perform any groundwater monitoring (reference: Kyle Dorsey, State Biosolids Coordinator, July 1999). Ecology considers the *Biosolids Management Guidelines* and the *Managing Nitrogen from Biosolids* manual (both published in 2000) for Washington State to be the technical basis for establishing agronomic application rates for biosolids and domestic septage.

WAC-173-308 Biosolids Management

EPA allows states the ability to enforce their own version of biosolids regulations. Under 40 CFR 503, these state biosolids regulations must be at least as stringent as the federal 503 regulations. The State of Washington has adopted the 503 requirements in its own regulations governing the use or disposal of biosolids, WAC 173-308. These regulations became effective in March 1998 and are enforced by the State Department of Ecology (Ecology). In addition, the State of Washington Department of Ecology has been granted the authority to issue permits under permitting requirements resulting from revisions to 40 CFR 122, 123, and 501. The requirements in WAC 173-308 pertaining to pollutant limits, vector attraction reduction, pathogen reduction, operational standards and management practices are very similar to the requirements of the federal 503 regulations and will not be repeated in this section.

The stated purpose of these regulations is to encourage the maximum beneficial use of biosolids, while protecting human health and the environment when biosolids are applied to land. EPA and Ecology support for beneficial use of biosolids is evident in the preamble to the regulations as well as the regulations themselves. A considerable amount of the research and risk assessment performed in support of these regulations utilized land application for beneficial use as a likely scenario for ultimate sludge use. These efforts reflect the stated policies of EPA and Ecology for preference for beneficial reuse of solid wastes, and sewage sludge in particular.

Permitting

WAC-173-308-310 lists permitting requirements for municipalities managing biosolids. The primary permit required for biosolids management activities is *the State General Permit for Biosolids Management*. Treatment works treating domestic sewage that apply for coverage under this permit must submit either a complete permit application, or a notice of intent which is followed at a later date by complete permit information. The contents of a complete permit application are described in WAC 173-308-310(5), and in summary include the following:

- A statement of the applicable activity(ies) for which coverage under the permit is sought.
- The name of the general permit (Biosolids Management).
- Basic facility information including name, name of contacts, location, and relevant jurisdictions.
- Information on other environment permits.
- Maps showing the location of the facility.
- Biosolids data, including pollutant and nitrogen concentrations, and data from existing land application sites.
- A basic description of the applicant's biosolids management practice.
- Information regarding the specific vector attraction reduction and pathogen reduction methods employed.
- Land application plans, as required.
- Information on past, current, and future biosolids production and use.
- Other information the applicant deems helpful or that is required by the department.

- Proof of public notice, as required under proposed WAC 173-308-310(11)(a)(v). Substantiation of public notice is required for the initial application for coverage under the general permit as well as for subsequent site-specific land application plans submitted for approval.

The permittee must carry out public notice as required under WAC 173-308-310(11), and public hearings if required, in accordance with WAC 173-308-310(12), and comply with requirements of the State Environmental Policy Act (SEPA) as stipulated under WAC 173-308-310(030).

Provisional *coverage* under the general permit is effective on receipt of a complete permit application or notice of intent. Provisional coverage allows a permit holder to continue existing practices in compliance with the basic requirements of the rule and permit. Formal coverage is obtained after review and approval of the permit application, including any plans submitted with the application, by Ecology. Review of specific sites proposed at a later date may lead to additional conditions in site specific land application plans, which become fully enforceable elements of a facility's permit coverage on approval by the department.

Provisional *approval* can be granted under WAC 173-308-310(17). Provisional approval is essentially permission to carry on an existing practice or to engage in a new or altered practice if certain conditions are met. Facilities operating under provisional approval have standing under the permit but are subject to further review and approval at a later time. They must comply with all applicable standards of the rule and permit, including timely submittal of an application or notice of intent. They must comply with requirements of the local health department, and may not obtain provisional approval if Ecology objects. They are not accountable under provisional approval, however, for compliance with additional or more stringent requirements that may eventually be imposed after final review. Provisional approval for new operations or for significant changes to existing operations operates similar to that for existing operations, except that public notice must be carried out and there must be no sustainable objections to a proposal.

Compliance with the State Environmental Policy Act

Treatment works treating domestic sewage that come under the State general permit must also comply with requirements of the State Environmental Policy Act (SEPA) per WAC 173-308-030. Generally, compliance involves completing an environmental checklist to be reviewed by the lead SEPA agency, which makes a threshold determination of environmental impacts and carries out a public notice of the determination. Potential outcomes are a Determination of Nonsignificance (DNS), Mitigated Determination of Nonsignificance, or Determination of Significance. The latter leads to preparation of an environmental impact statement (EIS). If an EIS must be prepared, approval for the activity in question cannot be obtained under this permit until the EIS is completed. It is expected that most biosolids related proposals will not result in significant adverse environmental impacts, and in most cases a DNS will probably be issued (this has been the bulk of past experience). Mitigation may be appropriate in some cases, but alternatively can probably be addressed as a condition of permit coverage or approval of a general or site specific land application plan.

When the proponent is a governmental agency (e.g. a municipality operating a wastewater treatment plant) it is expected that lead agency status will fall to the proponent agency in accordance with WAC 197-11-926.

Public Notice

The Department of Ecology carries out public notice as a part of the process of issuing a general permit. Public notice requirements for facilities subject to this permit vary depending on the purpose the notice is serving and the quality of biosolids being managed. When a facility applies

for initial coverage under the general permit it must carry out public notice for that purpose as specified in WAC 173-308-310(11). Notification must be made to the general public, affected local health departments, and interested parties. Generally, publication in a newspaper is required for initial pubic notice. Notification of affected local health jurisdictions and interested parties is by direct mail. When biosolids that do not meet the most stringent standards of the rule will be applied to the land, posting of sites is also required. Some facilities may add new sites in accordance with an approved general land application plan after they have received initial approval of coverage under the general permit. If public notice has not been previously carried out for those new sites, it must be done before biosolids can be applied. For sites added at a later date, required notice is limited to posting of the site, notification to Ecology and/or the local health department, and persons on an interested party list maintained by the permit holder. Public notice may also be necessary if a hearing or meeting is required under WAC 173-308-310(12), and to comply with requirements of the State Environmental Policy Act under Chapter 197-11 WAC.

Monitoring

Section 7 of the general permit implements biosolids monitoring requirements in accordance with Chapter 173-308 WAC. The state rule and general permit are generally consistent with federal requirements.

Landfill Disposal of Biosolids

Ecology recognizes that at times circumstances may require that sewage sludge be disposed of in a landfill. Disposal in a sewage sludge landfill, or "monofill", what the federal program calls "placing" of sewage sludge, will remain under the jurisdiction of the state solid waste program and the separate federal sewage sludge program. This permit provides for disposal of sewage sludge in a municipal solid waste landfill as a management option on an emergency, temporary, or long-term basis as defined in WAC 173-308-080 and implemented in WAC 173-308-300. Uses of biosolids as a component of final or intermediate covers where vegetation will be established is considered a beneficial use. Use of sewage sludge in daily cover is considered disposal, the same as disposal directly in the landfill cell.

A need to dispose on an emergency basis is generally expected to occur as a result of circumstances largely beyond the control of an operator, and is defined as having duration of less than one year. Disposal on an emergency basis is automatically approved under this permit if certain conditions are met. Disposal as a temporary management option may occur for reasons similar to those for an emergency basis, but is expected to require at least one but not more than five years to resolve. In these cases an approved plan is required to demonstrate that disposal is not being sought as a long-term management option. When disposal is contemplated as a management option with no intent to pursue other alternatives, or for a period of more than five years, it is considered to be a long-term management option. This option will only be approved if a facility can demonstrate that other management options are economically infeasible. It is important to note that the demonstration must be one of infeasibility, and not simply greater expense.

Sewage sludge that is disposed of in a municipal solid waste landfill must pass a free liquids test – the "paint filter test" and not be hazardous waste in accordance with WAC 173-308-300(4) and (5). This approach is also consistent with regulations for municipal solid waste landfill management found in WAC 173-351-200(9) and 220(10), and also the requirements of 40 CFR Part 258 for municipal solid waste landfills. Part 503.4 and WAC 173-308-300(3) also require that any landfill receiving sewage sludge be in compliance with the requirements of Part 258.

Incineration

Ecology discourages incineration of biosolids, which is a solid waste disposal practice and has a lower priority under state statutes than biosolids recycling. Presently, the nearest sewage sludge incinerator to McCleary is located in Vancouver, Washington.

Record Keeping and Reporting

The general permit implements requirements for record keeping and reporting in accordance with proposed WAC 173-308-290 and –295. Permit holders must keep records of the information used to develop applications for coverage under this permit, and must also keep records, including signed certification statements, regarding on-going biosolids management practices. Annual reports are required of all permit holders. In accordance with requirements of federal rules, annual reports from the larger, what are sometimes called "major" facilities, are required to be more comprehensive. The record keeping requirement allows for periodic inspection and verification of a facility's performance. The annual reporting function also supports verification of facility practices and allows the collection of information necessary to efficient management of the overall state biosolids program.

Fees

The permit fee system multiplies a basic cost per residential equivalent (the rate) times the number of residential equivalents (the base). WAC 173-308-320 indicates five basic rates for coverage under this permit, dependent on the biosolids management options chosen.

Appendix B

Design Calculations

Gray & Osborne, Inc.
CONSULTING ENGINEERS

JOB # 09257
Rev. DATE 2/10/20 9
COMP. BY NDB
CK'D BY
PAGE 1 OF 10

OWNER City of McCleary
PROJECT Solids Handling Eval
SUBJECT

Find:
- WAS Q&C
- Digested Sludge Q&C (DS)
- Thickened Sludge (Ths) Q&C

Known:

	Design (Pg. 6 of Record Dwgs)	Current (07-08)
Max Month BOD_5	742 LB/Day	300 LB/Day
Max Month TSS	1251 LB/Day	800 LB/Day

Digester Total Solids Production: 787 LB/Day
Digester Biological Production: 483 LB/Day
VSS Destruction: 35%
} Design Parameters Pg. 6 of the Record Dwgs.

Total Solids from SBR: (897 - 483) + 483/(1 - 0.35) =
= 414 (Inert) + 743 (Volatile/Biological)
= 1157 LB/Day (TS)

Volatile Fraction: Biological / Total = 743 / 1157 = 0.64 LB VSS/LB TS
Note: current VF = 0.99 per operator

Yield: TS/BOD_5: 1157/742 = 1.56 LB TS / LB BOD_5
VSS/BOD_5: 743/742 = 1.0 LB VSS / LB BOD_5

Concentrations:

	Design (Pg. 6 of Rec. Dwgs)	Current
WAS	0.85% VSS/0.64 = 1.33% TS = 13,300 mg/L TS	5780 mg/L TS (Off. Ver. Hd.)
DS	1.5% TS = 15,000 mg/L TS	6314 mg/L TS (Q&O
Ths	16% TS = 160,000 mg/L TS	13.02% = 130,239 mg/L TS (Q&O Ver. Hd.)

Gray & Osborne, Inc.
CONSULTING ENGINEERS

JOB #
DATE 20
COMP. BY
CK'D BY
PAGE 2 OF 10

OWNER
PROJECT
SUBJECT

WAS (Design)

WAS Production: 7412 lb/day × 1.56 lbTS/lb VS = 1157 lb TS/Day

C = 8500 mg/L

∴ Q = (1157 / 8500 × 8.34) × 1,000,000 = 16321 gpd

Check Run Time / cycle; say 108 gpm/pump, 2 pumps, 12 cycles/day

T = 16321 / 108 × 2 × 12 = 6.3 min / cycle ∴ OK

WAS (Ex)

Production: 300 lb/day × 1.56 = 468 lb TS/Day

C = 5980 mg/L

∴ Q = (468 / 5980 × 8.34) × 1,000,000 = 9384 gpd.

Check pump Run / cycle; 108 gpm/pump, 2 pumps, 12 cycles/day

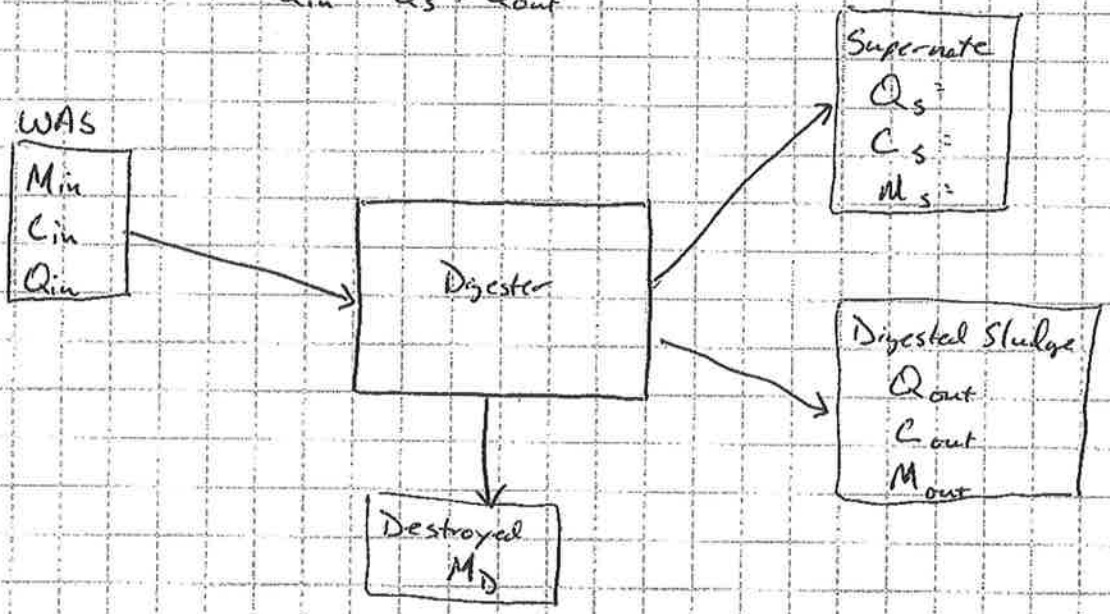
T = 9384 / 108 × 2 × 12 = 3.6 min

Currently operating @ ± 4 min / cycle ∴ OK

Mass Balance

Known: $M_{in} = M_D + M_s + M_{out}$

$Q_{in} = Q_s + Q_{out}$



Find Q_{out}:

$$M_{in} = M_D + (Q_s C_s \times 8.34) + (Q_{out} C_{out} 8.34)$$

$$= M_D + (Q_{in} - Q_{out})(C_s)(8.34) + (Q_{out})(C_{out})(8.34)$$

$$M_{in} - M_D = (Q_{in} - Q_{out})(C_s)(8.34) + (Q_{out})(C_{out})(8.34)$$

$$(M_{in} - M_D)/8.34 = (Q_{in} - Q_{out})(C_s) + (Q_{out})(C_{out})$$

$$= (Q_{in} C_s) - (Q_{out} C_s) + (Q_{out} C_{out})$$

$$\frac{(M_{in} - M_D)}{8.34} - (Q_{in} C_s) = -Q_{out} C_s + Q_{out} C_{out}$$

$$= Q_{out}(-C_s + C_{out})$$

$$\therefore Q_{out} = \left(\frac{\frac{(M_{in} - M_D)}{8.34} - (Q_{in} C_s)}{C_{out} - C_s} \right)$$

Base (Current)

4/10

qin	9,384	gpd
cin	5,980	mg/l
min	468	lb TS / day

Note: min = BODin in current scenario

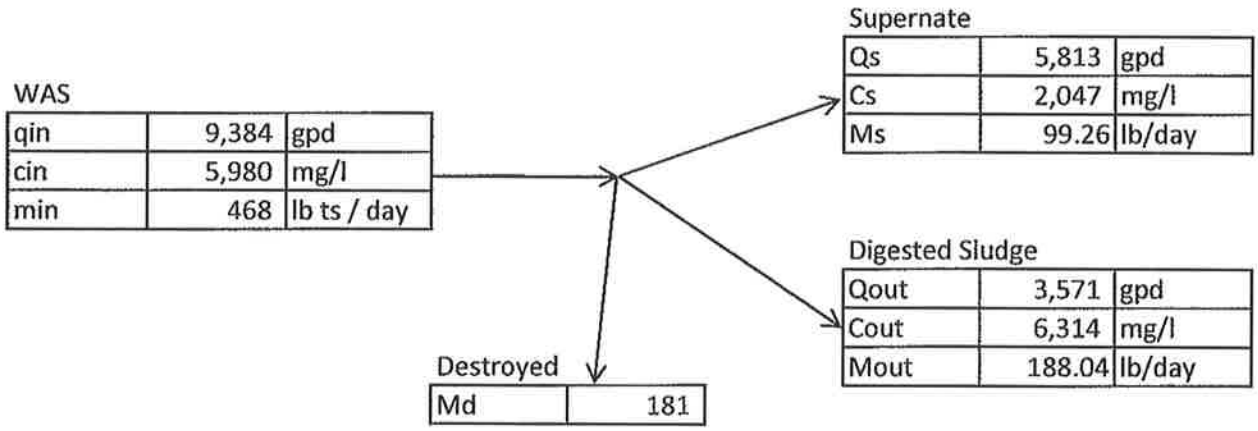
Assume

cout	6,314	mg/l
qout	3571	gpd

cout from bench testing
qout from annual reports

MM BOD5	300	lb/day
VSS Fraction	0.99	lb vss / lb TS (See Pg. 1 of Calculations)
Volatile Solids	463.32	lb vss / day
Yield	1.54	lb vss / lb BOD (See Pg. 1 of Calculations)

VSS Red 39.00% M&E 4th Ed. Figure 14-31 (based on TxSA = 490)



Digester Volume =	98750	gal
SRT =	32.68	Day (M&E 4th Ed., 14-22)
Say Temp =	15	deg. C
TxSA =	490.18	

Note:
Results seem skewed as supernate concentration is much higher than is actually occuring

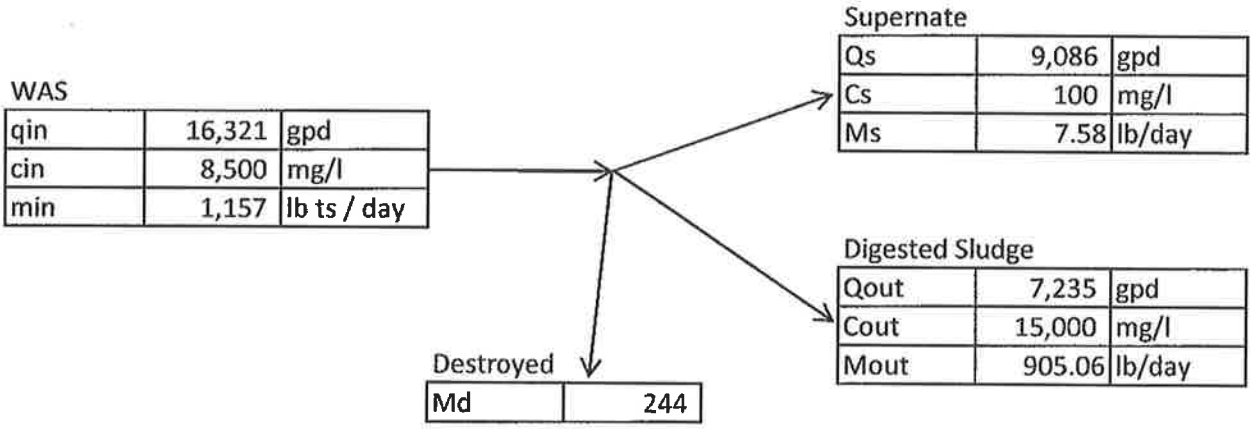
Base (Design)

5/10

qin	16,321	gpd	Assume		
cin	8,500	mg/l	cs	100	mg/l
min	1,157	lb ts / day	cout	15,000	mg/l

MM BOD5	742	lb/day
VSS Fraction	0.64	lb vss / lb TS (See Pg. 1 of Calculations)
Volatile Solids	740.48	lb vss / day
Yield	1.00	lb vss / lb BOD (See Pg. 1 of Calculations)

VSS Red 33.00% M&E 4th Ed. Figure 14-31 (based on TxSA = 270)



Digester Volume = 98750 gal

SRT =	18.10	Day (M&E 4th Ed., 14-22)
Say Temp =	15	deg. C
TxSA =	271.46	

Aerobic Digestion

6/10

			Qi		Xi
Design SBR Sludge Production:	1157 Lb TS/Day	@	16321.06 gpd	&	0.85% TS
Existing SBR Sludge Production:	468 Lb TS/Day	@	9384 gpd	&	0.50% TS

Digester Liquid Temp: 15 deg. C

Volume Basin 1	98750 gal	Liquid Level Basin 1	20.5
Volume Basin 2	73700 gal	Liquid Level Basin 2	16
Total	172450		

First Stage

SRT

$$V = (Qi)(Xi) / (X)(Kd*Pv+1/SRT)$$

Where:
- Qi = Influent Flow Rate, gal/d
- Xi = influent suspended solids, mg/L
- V = Basin Volume, gal
- X = digester suspended solids, mg/L
- Kd = reaction rate constant, 0.06 / d
- Pv = Volatile Fraction of digester SS, (0.80)

			SRTreq	Assume X =
Design	Vreq=	171623.5 gal	60 days	12500 mg/L
Existing	Vreq=	98716.6 gal	60 days	7350 mg/L

VSS Destruction

Assume VSS Fraction = 0.8

Design Temp x Days = 900 --> 45%
VSSm = 925.6 lb/d
Sludge Destroyed = 925.6 x 45% = 417 lb/day
Sludge Destroyed (Basin 1 Vol. / Total Vol.) = 239 lb/day
Sludge Destroyed (Basin 2 Vol. / Total Vol.) = 178 lb/day

Existing Temp x Days = 900 --> 45%
VSSm = 374.4 lb/d
Sludge Destroyed = 374.4 x 45% = 168 lb/day

Membrane Thickening

7/10

			Qi		Xi
Design SBR Sludge Production:	1157 Lb TS/Day	@	16321.06 gpd	&	0.85% TS
Existing SBR Sludge Production:	468 Lb TS/Day	@	9384 gpd	&	0.50% TS

Digester Liquid Temp: 15 deg. C

Volume Basin 1	98750 gal	Liquid Level Basin 1	20.5
Volume Basin 2	73700 gal	Liquid Level Basin 2	16
Total	172450		

First Stage

SRT

$$V = (Qi)(Xi) / (X)(Kd*Pv+1/SRT)$$

Where:
- Qi = Influent Flow Rate, gal/d
- Xi = influent suspended solids, mg/L
- V = Basin Volume, gal
- X = digester suspended solids, mg/L
- Kd = reaction rate constant, 0.06 / d
- Pv = Volatile Fraction of digester SS, (0.80)

			SRTreq	Assume X =
Design	Vreq=	97513.4 gal	60 days	22000 mg/L
Existing	Vreq=	98716.6 gal	60 days	7350 mg/L

VSS Destruction

Assume VSS Fraction = 0.8

Design Temp x Days = 900 --> 45%
- VSSm = 925.6 lb/d
- Sludge Destroyed = 925.6 x 45% = 417 lb/day
- Sludge Destroyed (Basin 1 Vol. / Total Vol.) = 239 lb/day
- Sludge Destroyed (Basin 2 Vol. / Total Vol.) = 178 lb/day

Existing Temp x Days = 900 --> 45%
- VSSm = 374.4 lb/d
- Sludge Destroyed = 374.4 x 45% = 168 lb/day

Lime

Design SBR Sludge Production:	1157	Lb TS/Day	@	16321.06	gpd	& 0.85%
Existing SBR Sludge Production:	468	Lb TS/Day	@	9384	gpd	& 0.50%

Digester Liquid Temp: 15 deg. C

V 1 98750 gal LL1 20.5

Digestion

SRT

$$V = (Qi)(Xi) / (X)(Kd*Pv+1/SRT)$$

Where:
- Qi = Influent Flow Rate, gal/d
- Xi = influent suspended solids, mg/L
- V = Basin Volume, gal
- X = digester suspended solids, mg/L
- Kd = reaction rate constant, 0.06 / d
- Pv = Volitile Fraction of digester SS, (0.80)

			SRTreq	Assume X =
Design	Vreq=	94373.5 gal	20 days	15000 mg/L
Existing	Vreq=	63836.7 gal	20 days	7500 mg/L

VSS Destruction

Assume VSS Fraction = 0.64

Design Temp x Days = 300 --> 34%
- VSSm = 740.48 lb/d
- Sludge Destroyed = 740.48 x 34% = 252 lb/day
- VSSm to BFP = 489 lb/day
- TS to BFP = 905 lb/day
- Gal to BFP = 7236 gpd

Existing Temp x Days = 300 --> 34%
- VSSm = 299.52 lb/d
- Sludge Destroyed = 299.52 x 34% = 102 lb/day
- VSSm to BFP = 198 lb/day
- TS to BFP = 366 lb/day
- Gal to BFP = 5854 gpd

Lime

9/10

Lime Addition

Assume Dry Feed to avoid fouling resulting from liquid feed in digesters

Testing Results 0.13 kg lime / kg dry solid = lb lime / lb dry solid

From the BFP O&M Manual:

BFP Design Capacity = 2400 gph @ 15000 mg/L

Assume Run Time = 7 hours / Day

BFP Solids Capacity = 2101.68 lb / day

Design	Design	Capacity
TS to BFP =	905 lb/day	2102 lb/day
Gal to BFP =	7236 gpd	16800 gpd

Run BFP every : 2.32 days ~ 2-3 times per week

Say 7.00 run days / 2 weeks

Lime consumption: 273 lb / run day

1913 lb / 2 weeks 24.9 tn/yr

1 ton bag lasts: 7.32 run days ~ 2 weeks

Feed Rate: 39.0 lb/hr

Existing	Design		Capacity
TS to BFP =	366	lb/day	1751 lb/day
Gal to BFP =	5854	gpd	28000 gpd (Based on Op. disc.)

Run BFP every : 4.78 days ~ 1-2 times per week

Say 3.50 run days / 2 weeks

Lime consumption: 228 lb / run day

797 lb / 2 weeks

1 ton bag lasts: 8.78 run days ~ 5 weeks

Feed Rate: 31.1 lb/hr

10/10

From Base

Design			lb/2 wks	Dry TN / yr
TS to BFP =	905	lb/day	12671	165
Gal to BFP =	7235	gpd		
Concentration =	15000	mg/L		

Existing			lb/2 wks	Dry TN / yr
TS to BFP =	188	lb/day	2632.6	34.2
Gal to BFP =	3571	gpd		
Concentration =	6314	mg/L		

Assumptions

Design Dewatered Conc. =	160000	mg/L TS
Current Dewatered Conc. =	130000	mg/L TS

Design			Existing	
Dewatered Gallons =	678	gpd	173	gpd
Density of DW Sludge =	9.57	lb/gal	9.57	lb/gal
Wt. of DW Sludge =	6491	lb/day	1660	lb/day
	3.25	TN/Day	0.83	TN/Day

Wt. of DW Sludge =	45.4	TN / 2 Weeks
Wt. of DW Sludge =	1181.3	TN / Year

Dry Sludge	120 lb /cf	0.16	19.2
Water	62.4 lb /cf	0.84	52.4
			71.6 lb/cf
			9.57 lb/gal

Appendix C

Enviroquip Proposal

Enviroquip

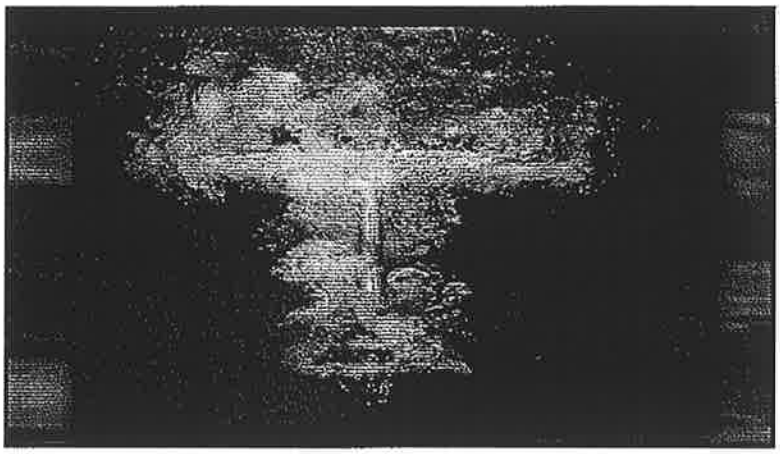
a division of Eimco Water Technologies

PRELIMINARY DESIGN SUMMARY
P.A.D.®-K PROCESS

For

McCleary WWTP
McCleary, WA.

July 8, 2009



Order information is available from our local sales representative:

Dennis Gleason
Treatment Equipment Company
14400 Bel-Red Rd. #101-C
Bellevue WA 98007
Office: 425-641-4306
Fax: 425-641-9270
Dennis @tec-nw.com

Enviroquip

a division of Eimco Water Technologies

INTRODUCTION

The McCleary WWTP is currently considering different options to improve the performance of the existing aerobic digestion system at the facility in order to ensure compliance with Class B biosolids regulations.

One of the solutions proposed for this plant is to install a Pre-Thickened Aerobic Digester using a Kubota membrane thickener (P.A.D. ®–K). The PAD-K process will provide thickening and digestion of the sludge while reducing hauling costs and operator time requirements.

Based on the needs of the McCleary facility, Enviroquip has developed a design which is outlined in this document.

BASIS OF DESIGN

The information used for design is as follows:

Current Loading Criteria:

- 3,500 gpd of sludge to the digesters
- 146 ppd Total Suspended Solids
- 85% Volatile Solids concentration
- Waste Activated Sludge concentration 5,000 mg/L

Future Loading Criteria:

- 7,857 gpd of sludge to the digesters
- 655 ppd Total Suspended Solids
- 85% Volatile Solids Concentration
- Waste Activated Sludge concentration 10,000 mg/L

Digested Sludge Requirements:

- Class B Biosolids
- Digested Sludge concentration 20,000 mg/L

P.A.D.®-K GENERAL OPERATION

Overview

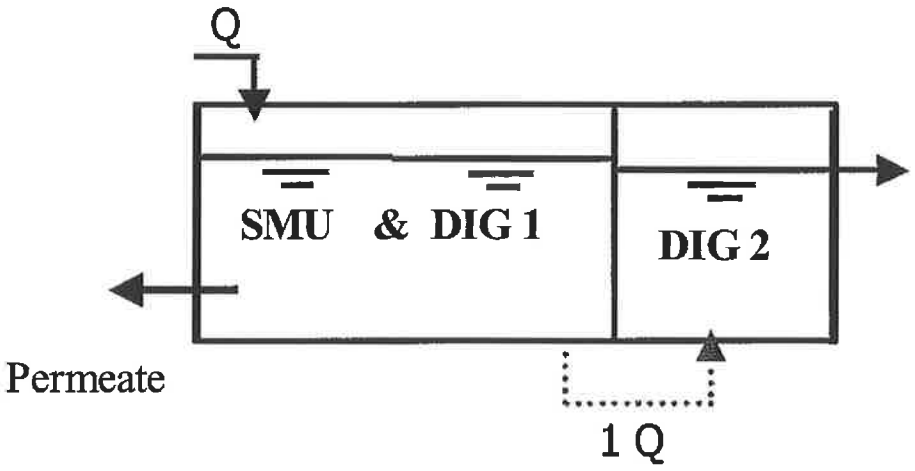
The PAD-K process normally consists of a membrane thickener (MBT) tank, and two aerobic digesters. For the McCleary facility the Submerged Membrane Units (SMUs) will be placed directly into Digester #1 removing the MBT from the design. All existing blower equipment will be utilized where appropriate and applicable. Permeate pumps, chemical cleaning equipment and instrumentation are included in the process package to ensure one source of responsibility.

Waste activated sludge is wasted directly from the liquid treatment process through a fine screen and emptied into the in-loop digester (Digester #1). Sludge is thickened to 2.0% solids by the SMUs pulling clean water through the membrane while leaving the solids behind. Because of the quality of filtration by the membrane, the permeate from the SMU may be combined with the treated effluent flow that is to be sent to disinfection instead of being recycled back to the headworks of the treatment facility. A portion of the partially digested flow from the in-loop cycle is transferred via pump or telescoping valve to the isolation digester (Digester #2) for second stage digestion.

During digestion, the aerobic nature of the process provides nitrification and volatile solids reduction, while series operation of the system insures pathogen destruction.

A hydraulic profile is shown in Figure 1 for clarification of the looping cycle and flow split.

Figure 1. Hydraulic Profile



DIG: Digester
SMU: Submerged Membrane Unit

Note: Flows neglect volatile solids reduction

The following is a description of the primary unit operations that comprise the PAD-K process and a brief explanation of SMU operations. More details will be provided with the equipment.

The Fine Screen
Sludge must pass through a fine screen to remove large particles prior to entering the digester system. The screen is mechanized to reduce maintenance. Screenings are disposed of separately.

The Submerged Membrane Unit
The SMU is essentially a high MLSS membrane bioreactor with an integral solid-liquid separation mechanism, the membrane cassette. Each standard membrane cassette is comprised of two separate sections, a membrane case and a diffuser case. The membrane case contains a number of manifold flat-panel membrane cartridges with an average porosity of 0.4 microns and an effective porosity of 0.1 microns. The bottom diffuser case supports the membrane case and houses a coarse-bubble diffuser.

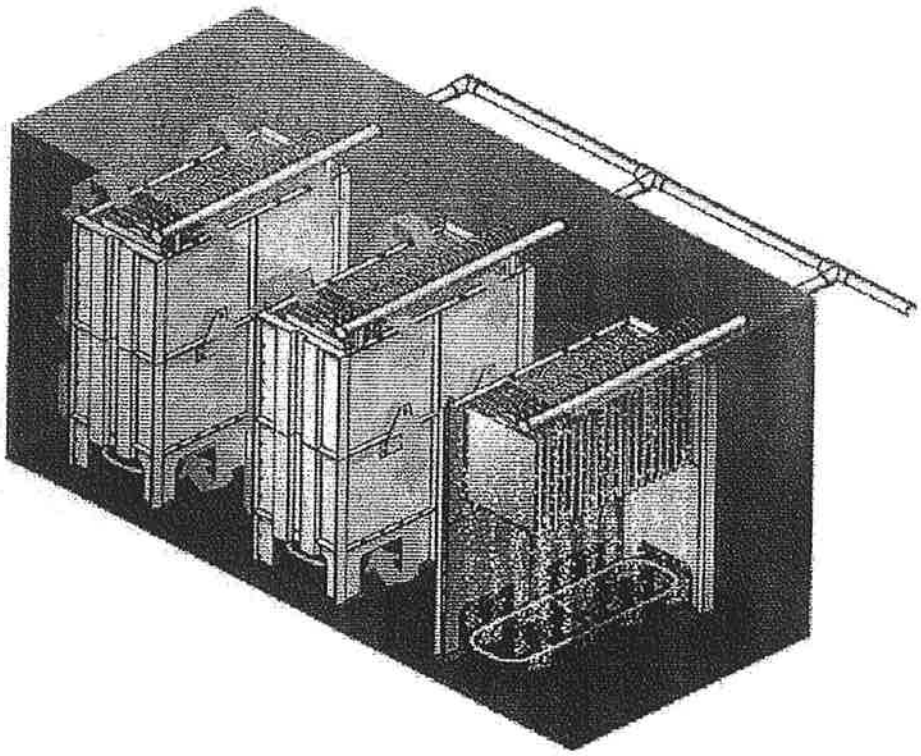
As shown in Figure 2, air bubbles are emitted at the diffuser and channeled between each of the membrane cartridges as they rise to the surface. The channeled bubbles accomplish three important objectives: (1) provide oxygen to continue cell destruction, (2) scour the membranes to prevent fouling, and

(3) create a pressure gradient between the top and bottom of the membrane cassette.

As uniform airflow is critical to the operation of the membranes, the diffuser assembly must be periodically cleaned. A cleaning procedure is generally conducted once a day and is completed in 30 minutes. The diffuser assembly is cleaned by suspending permeate flow and opening a valve on the diffuser-cleaning header (not shown below). Once the cleaning valve is opened, educted mixed liquor scours the diffuser assembly clean. This process is automated and is operator adjustable.

The pressure gradient created by the rising bubbles induces an upward cross-flow of mixed liquor over the membranes. The liquor is filtered as it flows across the membrane due to the trans-membrane pressure gradient created by the hydrostatic head of the water above the membrane cassettes. The flux, or filter flowrate per area, is directly proportional to the trans-membrane pressure gradient induced by the head of the overly water (i.e. by the water level in the tank) and is roughly 0.7 psig during normal operation and 3 psig at peak flow conditions or prior to cleaning.

Figure 2: The scouring effect of recirculating flow



Flow through the SMU is regulated either by throttling a manual valve on the permeate lines or adjusting a permeate pump VFD and verifying flow at the

permeate line flow meter. The resultant flow rate should be checked daily to insure consistent thickening results and prevent over-thickening.

Another maintenance procedure is the *relax* mode. An SMU is said to be in relax mode when the SMU permeate flow is ceased and the cleaning air is left on. Typically, the SMU is relaxed for 1-3 minutes out of 10 minutes. This procedure is automated and operator adjustable. The purpose of the relax mode is to keep the biofilm at an optimum thickness and to minimize the transmembrane pressure required to generate a given flow. At some point, relaxing the SMU will not recover the design flow at a reasonable transmembrane pressure and a recovery cleaning must be performed.

The Cleaning System

On average, it is necessary to chemically treat an Enviroquip membrane cassette in a thickening application every three to four months. The membrane cassettes are *cleaned in place* quickly and efficiently by simply injecting, or pouring, a dilute solution of bleach or oxalic acid into an accessible tee on the permeate suction line. Typically this process takes less than two hours and is carried out manually.

The chemical used to clean the membranes depends on the substrate treated in the SMU. For organic substrates, sodium hypochlorite is recommended and for inorganic substrates oxalic acid is used.

To perform a cleaning, proper amounts of concentrated sodium hypochlorite solution and dilution water are combined to produce an approximate 0.5% solution. The solution is then sent back into the permeate lines and into the membranes. The solution is allowed to sit within the membranes for about an hour, during which a portion of the solution passes back through the membranes and cleaning them. The cassettes are then put back online.

Recovery cleanings are generally scheduled events however an operator can quickly assess the status of the membranes by observing the change in transmembrane pressure over time. An alarm will sound and the permeate pumps will be disabled should the TMP reach levels above the acceptable set point to prevent overstressing the membranes. A recovery cleaning should be done at this time before restarting the thickening process.

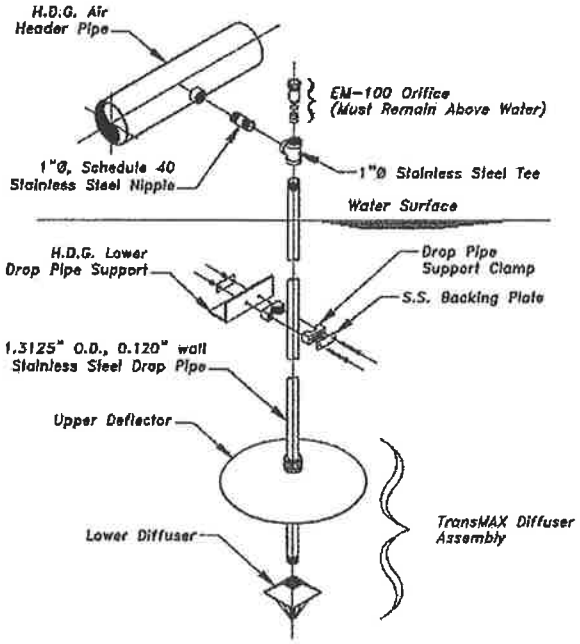
The Aeration Equipment

Enviroquip's aeration equipment consists of coarse and medium bubble diffusers designed to operate without the need for maintenance. The equipment is especially suited for digesters and sludge holding tanks which typically see a range of materials and handle thicker solids concentrations.

The TransMAX diffuser is a single drop diffuser with upper deflector and an above-water orifice. This diffuser achieves medium bubble oxygen transfer rates of up to 14%. A figure of this diffuser is shown in Figure 3.

Both the TransMAX and its larger diameter counterpart, the MS diffuser, offer excellent mixing and aerating abilities by establishing a clear roll pattern within the basins. These diffusers are recognized as being truly non-clog diffusers. The air metering orifices are located above water level and can be accessed without draining the tank if the system is to be cleaned or altered. However, because the orifice is above water, the need for cleaning is eliminated, even if the air is turned off. This is a guarantee no other diffuser can make.

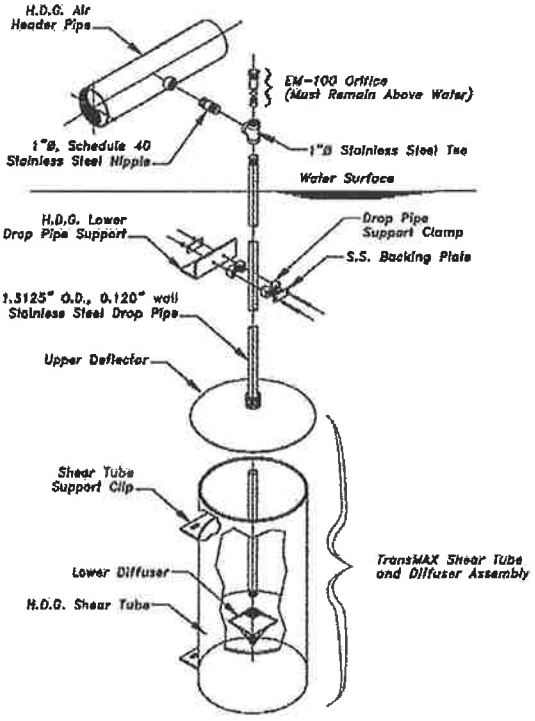
Figure 3. TransMAX Diffuser



TransMAX Diffuser Assembly – Typical Detail

In addition to the benefits of the diffuser assembly itself, the TransMAX and MS diffusers are frequently combined with shear tubes or draft tubes for the aeration and mixing of thickened sludge up to 6.0% solids. Shear tubes and draft tubes are both successful in high solids operations because they have the advantage of bringing the sludge to a high velocity between 4 to 6 fps within the tube and thereby reducing the viscosity of the thickened sludge. An additional benefit of these systems is that the diffuser heads are mounted only higher in the tank and thus they save blower horsepower compared to aerating a floor mounted system. A shear tube assembly is shown in Figure 4.

Figure 4. Shear Tube Assembly



TransMAX Shear Tube Assembly – Typical Detail

MCCLEARY PAD®-K PROCESS

Summary of the McCleary PAD-K® Process

The PAD®-K process for the McCleary facility is similar to the general process described above. The main differences are related to the current loadings and design loadings at full build out. At the current loading rates it will be possible to utilize a gravity permeate system to remove the permeate from the sludge while utilizing one SMU. At full build out the system will need a pump system and an additional SMU to bring the concentration up to 2.5% in order to meet the time and temperature requirement of the Class B regulations. An evaluation will also need to be made in order to determine whether the current aeration equipment will be able to suitably mix and aerate the tank contents at the higher concentrations created by the SMU. A summary of the design is shown in Table 1 and 2 below.

Table 1. PAD®-K Process Design Results at Current Loadings			
Mass Flow	PPD	146	Total Suspended Solids
Dilute WAS Flow	GPD	3,500	.5% Solids
Thickened Sludge Concentration	% Solids	2.0%	Max. Concentration, Normal is 3.0%
Thickened Sludge Flow	GPD	875	Neglects volatile solids reduction
Permeate Flow	GPD	2,950	With volatile solids reduction
Design SRT	Days	176	
Total Provided Process Volume	Gallons	96,761	Two digesters

Table 2. PAD®-K Process Design Results at Full Build Out			
Mass Flow	PPD	655	Total Suspended Solids
Dilute WAS Flow	GPD	7,854	1.0% Solids
Thickened Sludge Concentration	% Solids	2.5%	Max. Concentration, Normal is 3.0%
Thickened Sludge Flow	GPD	3,141	Neglects volatile solids reduction
Permeate Flow	GPD	5,512	With volatile solids reduction
Design SRT	Days	42	
Total Provided Process Volume	Gallons	96,761	MBT tank, and Two digesters

Aeration Design

Aeration is required for membrane thickener scouring air and for process air in the aerobic digesters. The process air requirements are shown in Table 3 and 4, below.

Table 3. Aeration Requirements at Current Loadings				
Tank	Mixing Air	Scouring Air	Winter Process Air	Summer Process Air
MBT	34 scfm	53scfm	11 scfm	12 scfm
In-Loop Digester 1	164 scfm	N/A	7 scfm	10 scfm
Isolated Digester 2	198 scfm	N/A	42 scfm	42 scfm

Table 4. Aeration Requirements at Full Build Out Loadings				
Tank	Mixing Air	Scouring Air	Winter Process Air	Summer Process Air
MBT	34 scfm	106 scfm	37 scfm	46scfm
In-Loop Digester 1	164 scfm	N/A	86 scfm	128scfm
Isolated Digester 2	198 scfm	N/A	163 scfm	189 scfm

Note: Underlined airflows are the design values

The maximum mixing airflows are based on 30 scfm per 1,000 cubic feet multiplied by the appropriate viscosity correction factor. The process air requirement is based on 2 lbs O_2/lb Volatile Solids destruction.

If it is determined that the current diffusers will not be suitable for this application shear tubes as shown in Figure 4, would be used in Digester 1 and Digester 2 to handle the higher solids concentration and tank depth. The diffusers and shear tubes would be arranged in one row along the wall in each digester and would be fed air from an air header.

Equipment Requirements

Of high importance is the size of the mechanical equipment including pumps and blowers. The provided capacities are shown in Table 5. VFD's will allow turn-down to reduce the equipment to the size needed only for its particular service.

Table 5 Equipment Capacities

Equipment	Number	Motor HP	Unit Capacity	Notes
Membrane Units	1 2	N/A	3,789 gpd	ES 100 at 4.4 gfd flux
Permeate Pump	1	1.0	3.8 gpm at 15 psig	One duty, One standby, VFD's
MBT Blower	1	7.5 10	53 scfm at 9.9 psig 106 scfm at 9.9 scfm	PD blower, One duty, VFD
Digester Blowers	2	20	362 scfm at 9.9 psig	PD blower, One duty, One standby, VFD

The blowers would be arranged such that one blower feeds both digesters, one smaller blower feeds the membrane thickener, and a common standby blower may deliver air to any of the three aerated tanks.

Materials of Construction

Table 6 lists the proposed construction materials for the elements proposed by Enviroquip, Inc.

Table 6. Materials of Construction

Item	Material
Drop Pipes	Type 304 Stainless Steel
TransMAX® Diffusers	ABS Plastic
Shear Tubes	Polyethylene
Air Supply Piping	Hot Dipped Galvanized Steel
Butterfly Valves	Cast Iron
Floor and Wall Supports	Hot Dipped Galvanized Steel
Mixer Guide Rails	Type 304 Stainless Steel
Fasteners	Type 304 Stainless Steel
MBT Air Pipe	Type 304 Stainless Steel
MBT Diffuser Clean Pipe	Schedule 80 PVC
Permeate Pipe	PVC

ENVIROQUIP SCOPE OF SUPPLY

At this early stage of the project, the scope of supply is very dependent upon the availability and applicability of existing equipment to this application. Below is a "bare bones" scope which can be considered the baseline for supply purposes.

McCleary WWTP
PAD-K Preliminary Scope of Supply

MBT

Equipment	Manufacturer	Unit Capacity		Electrical Demand (HP)	Control Notes	Qty
Submerged Membrane Units	Kubota	ES	100	N/A	N/A	1
Diffuser Cleaning Control Valve	Pratt/Bettis	3	INCH	N/A	PLC	1
Level Switch	Conery	N/A	N/A	N/A	PLC	2
Air Inlet Isolation Valve	Keystone	2	INCH	N/A	N/A	1
Air Outlet Isolation Valve	Pratt	2	INCH	N/A	N/A	1
Expansion Joint	API International	2	INCH	N/A	N/A	2
Chemical Cleaning Valve	Asahi	2.0	INCH	N/A	N/A	2
Lot of Piping	Enviroquip	N/A	N/A	N/A	N/A	1
Screen	Enviroquip	5	GPM	.25	PLC	1

Permeate Collection System

Equipment	Manufacturer	Unit Capacity		Electrical Demand (HP)	Control Method	Qty
Pressure Gauges	McDaniel	N/A	N/A	N/A	N/A	1
TMP Pressure Transmitter	Endress Hauser	N/A	N/A	N/A	PLC	1
Flowmeter	Endress Hauser	N/A	N/A	N/A	PLC	1
Bleed Protection Valve	Magnatrol	0.5	INCH	N/A	PLC	1

MBT Plant Controls

Equipment	Manufacturer	Unit Capacity		Electrical Demand (HP)	Control Method	Qty
Panel Mount	Enviroquip	N/A	N/A	N/A	N/A	1

MBT Chemical Cleaning Equipment

Equipment	Manufacturer	Unit Capacity		Electrical Demand (HP)	Control Method	Qty
Chemical Holding Tank	Enviroquip	80	GALLONS	N/A	N/A	1
Chemical Transfer Pump	Enviroquip	16	GPM	N/A	N/A	1

Contract Execution						
Services	Manufacturer	Unit Capacity		Electrical Demand (HP)	Control Method	Qty
Start-up and Operator Training	Enviroquip	3 DAYS	2 TRIPS	N/A	N/A	1
Freight	Enviroquip	N/A	N/A	N/A	N/A	1
Operation & Maintenance Manuals	Enviroquip	N/A	N/A	N/A	N/A	5

The following items are not provided in Enviroquip's scope of supply:

- Influent and Effluent Sludge Piping
- Air Supply Piping between tank walls and blowers
- Permeate Piping past MBT tank wall
- Wall sleeves or link seals
- Installation
- Concrete Work
- Electrical Wiring
- Motor Starters and VFD's

Some of these items are available to be added into Enviroquip's scope as requested.

ATTACHMENTS

Design Calculations

Appendix D

Lime Bench Testing Results

City of McCleary
Lime Stabilization Study

Sample name	% Solids Test: Evaporation Dish	Wet Sample + Dish	Dry Sample + Dish	% Total Solids	Initial pH
Belt Press	34.815	59.967	38.091	13.02	6.736
Digestor	40.330	59.194	40.449	0.63	6.623

Sample name	Lime Container Label	Wet Weight of solids (g)	% Total Solids	Dry Weight of solids (g)	Lime added (g)	Lime Dosage (kg lime/kg dry solids) CaO	$Ca(OH)_2$	pH Readings after Lime Addition 0 - Hours	2 - Hours	24 - Hours
Belt Press 1	Fines 1/8"	300.10	13.02	39.08	2.50	0.06		11.20	11.53	10.07
Belt Press 2	Fines 1/8"	300.04	13.02	39.08	5.00	0.13		12.24	12.44	12.27
Belt Press 3	Fines 1/8"	300.02	13.02	39.07	10.00	0.26		12.55	12.57	12.58
Belt Press 4	Fines 1/8"	299.90	13.02	39.06	15.00	0.38		12.59	12.61	12.61
Belt Press 5	Fines 1/8"	300.11	13.02	39.09	20.00	0.51		12.59	12.65	12.60
Belt Press 6	Fines 1/8"	300.05	13.02	39.08	25.00	0.64		12.60	12.66	12.60
Belt Press 7	Hyd	300.02	13.02	39.07	2.50		0.06	11.44	NA	NA
Belt Press 8	Hyd	300.00	13.02	39.07	5.00		0.13	12.37	12.26	11.94
Belt Press 9	Hyd	300.05	13.02	39.08	10.00		0.26	12.57	12.54	12.50
Belt Press 10	Hyd	300.00	13.02	39.07	15.00		0.38	12.60	12.55	12.52
		mL of Digestor								
Digestor 11	Fines 1/8"	400	0.63	2.53	0.50	0.20		11.90	NA	NA
Digestor 12	Fines 1/8"	400	0.63	2.53	0.75	0.30		12.24	12.37	12.44
Digestor 13	Fines 1/8"	400	0.63	2.53	1.00	0.40		12.41	12.49	12.52
Digestor 14	Fines 1/8"	400	0.63	2.53	1.25	0.50		12.42	12.50	12.54
Digestor 15	Fines 1/8"	400	0.63	2.53	1.50	0.59		12.53	12.57	12.57
Digestor 16	Fines 1/8"	400	0.63	2.53	1.75	0.69		12.54	12.58	12.58
Digestor 17	Hyd	400	0.63	2.53	0.50		0.20	12.02	12.00	11.80
Digestor 18	Hyd	400	0.63	2.53	0.75		0.30	12.28	12.31	12.25
Digestor 19	Hyd	400	0.63	2.53	1.00		0.40	12.48	12.45	12.43
Digestor20	Hyd	400	0.63	2.53	1.25		0.50	12.52	12.53	12.51
Digestor 21	Hyd	400	0.63	2.53	1.50		0.59	12.55	12.56	12.51
Digestor 22	Hyd	400	0.63	2.53	1.75		0.69	12.56	12.56	12.56