CAPITAL REGIONAL DISTRICT

CORE AREA WASTEWATER MANAGEMENT PROGRAM

DISCUSSION PAPER 036-DP-2

APPENDIX B

CARBON FOOTPRINT AND LIFE CYCLE ANALYSIS WORKSHEETS

MARCH 10, 2009

Associated Engineering | GLOBAL PERSPECTIVE. LOCAL FOCUS.

In partnership with: CH2MHILL kwl

OPTION 1

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 17, 2009
Last Revision By: D. Shiskowski

Subject: Option 1

Generic Assumptions
For Life Cycle and Carbon
Footprint Analyses

Yellow-shaded cell denotes assumed/input value

GENERIC ASSUMPTIONS

NPV Analysis:					
first year in analysis =			2008		
investment rate of return =			7.0%	/yr	**Note:** Values for Discount Rate Base scenario.
capital works / land lease inflation rate =			3.0%	/yr	
labour inflation rate =			3.0%	/yr	
electricity inflation rate =			3.0%	/yr	
natural gas/biomethane inflation rate =			3.0%	/yr	
diesel fuel inflation rate =			3.0%	/yr	
effluent heat inflation rate =			3.0%	/yr	
chemicals inflation rate =			3.0%	/yr	
reclaimed water inflation rate =			3.0%	/yr	
dried WW sludges / woodchip inflation rate =			3.0%	yr	
maintenance inflation rate =			3.0%	/yr	
administration inflation rate =			3.0%	/yr	
GHG CO2e price inflation rate =			3.0%	/yr	**Note / Ref:** Year 2065 CO2e cost assumed to vary between US$15 and US$155 t / CO2e, as per 032-DP-1 and based on Tirpak (2008).
	2065	$	81	/tonne CO2e	
Labour:					
annual average staff cost =		$	75,000	per year	
Energy and Carbon Equivalents:					
unit electrical price =		$	0.07	/kWh	
unit diesel fuel price =		$	1.50	/L	
unit CO2e price =		$	15	/t CO2e	**Ref:** Based on a 2009 value of $15 t / CO2e per the Province of British Columbia Carbon Tax (2008).
unit natural gas / biomethane price =		$	10.00	/GJ	
Chemical Phosphorus Removal Chemicals:					
liquid-stream alum requirement =			110	mg/L of alum product	**Ref:** Medicine Hat WWTF.
alum product specification =			638	mg alum/mL product	
unit alum product cost =		$	0.40	per L of alum product	**Ref:** Based on General Chemical information in Feb 4/09 e-mail from T. Znajewski. Includes allowance for polymer.
Wet-Weather CEPT Chemicals:					
liquid-stream alum requirement =			80	mg/L of alum product	
alum product specification =			638	mg alum/mL product	
unit alum product cost =		$	0.40	per L of alum product	**Ref:** Based on General Chemical information in Feb 4/09 e-mail from T. Znajewski. Includes allowance for polymer.
Raw Sludge Thickening and Truck Transport:					
unit wastewater BOD generation rate =			0.070	kg BOD/d - pe	
combined PS + WBS production rate =			0.85	kg TSS/kg BOD removed	
solids content of thickened sludge =			6.0%		
specific gravity of thickened sludge =			1.02		
thickening polymer requirement =			8	kg polymer/dry tonne	
thickening polymer unit cost =		$	10.00	/kg polymer	
transport truck volume =			22	m3/truck	
truck diesel fuel consumption =			1.6	km/L	
Odour Control Chemicals:					
unit scrubber chemical cost =		$	0.0053	/d per m3/d of ADWF treated wastewater	**Ref:** Based on Jan 15/09 TM from T. Dokken.
Membrane Cleaning Chemicals:					
unit chemical cost =		$	0.0020	/d per m3/d of ADWF treated wastewater	**Ref:** Based on Jan 19/09 e-mail from T. Dokken.
Maintenance:					
unit allowance (new treatment facilities) =			1.0%	of capital works	
unit allowance (new interceptors, pump stations, forcemains, outfalls) =			0.25%	of capital works	
Administration:					
lump sum annual allowance (treatment facilities) =		$	100,000	/yr	
Saleable Wastewater/Effluent Heat:					
unit natural gas / power utility energy price =		$	16.10	/GJ	**Ref:** This is the typical price (i.e. "market price") of energy available from the power and natural gas utilities, based on a variety of assumptions on energy used in existing areas/redevelopment and new development. See notes in file based on information provided in M. Homenuke Feb 10/09 e-mail.
profit and overhead allowance for third-party energy utility =			15.0%		
maximum unit price paid for heat energy by third-party utility =		$	14.00		**Note:** The actual price that the CRD could sell the heat energy to the third party "heat recovery" utility depends on the cost of the utilities infrastructure. See the LCA sheets for WWTF-specific assumptions.
Saleable Reclaimed Water:					
unit CRD potable water supply price (2008) =		$	0.90	/m3	**Ref:** Average 2008 consumption charge across the CRD, per the CRD web-site.

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Generic Assumptions
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value of reclaimed water relative to CRD potable water =		80%		**Note:** Assumes use of same supply infrastructure for effluent heat. The "value" adjustment considers public perception of relaimed water relative to CRD potable water.
unit reclaimed water price =	$	0.72	/m3	**Note:** For both irrigation and toilet flushing.
GHG Sources:				
BC Hydro-supplied electricity (average annual) =		72	g CO2e/kWh	**Ref: Average value -** BC Hydro's (2005) prediction for 2010 was 72 t/ GWh, which is a large increase from the 33 value predicted for 2005 and actual values of 46 and 22 for 2000 and 2003, respectively. No other future projections were found. Heating Season value based on KWL (2008), West Shore C WWTP Concept Review Final Report.
BC Hydro-supplied electricity (average heating season) =		100	g CO2e/kWh	
diesel fuel combustion (mobile truck) =		2,757	g CO2e/L	**Ref:** Table A13-5, EC (2006). Moderately controlled HDDV.
production of sludge thickening polymer =		1.2	kg CO2e/kg product	**Ref:** de Haas et al (2008)
GHG Off-sets (heat recovery):				
effluent heat recovery coefficient of performance (COP) =		4.0		**Ref:** Heat recovery off-set information and calculations provided by W. Wong (KWL) in Dec 9/08 e-mail.
natural gas furnace / boiler efficiency (n) =		0.95		
energy extracted from effluent heat (x) =		1.00	GJ	
energy for heating delivered by heat pump =		0.75	GJ	
electrical energy required by heat pump =		**0.33**	**GJ elected power /GJ effluent heat**	
energy required for heating from natural gas combustion, equivalent to units of energy replaced via effluent heat =		1.40	GJ	
natural gas off-set via using effluent heat =		1.07	GJ	
therefore, unitless equivalence factor =		**1.07**	**GJ of natural gas off-set by GJ of effluent heat**	
natural gas combustion (stationary) =		0.0562	g CO2e/kJ	**Ref:** Table 2.5, IPCC (2006). Tier 1 Value is for residential category and commercial/institutional category.
1 J =		0.0002778	Wh	
BC Hydro-supplied electricity (average heating season) =		0.0278	g CO2e/kJ	
fraction of effluent heat off-setting "natural gas heat" =		60%		**Ref:** Based on information in Feb 10/ 9 e-mail from M. Homenuke.
fraction of effluent heat off-setting "electric heat" =		40%		

Existing CRD Trunk Sewer System

annual operations and maintenance cost (2008) =	$	4,600,000	/yr	**Ref:** The Path Forward work. ADWF Macaulay and Clover pumping energy and costs are small, therefore did not remove from annual cost value.
annual average increase in operations and maintenance expenditures =		0.5%	/yr	**Note:** Accounts for potential future increases in maintenance costs as system ages.

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Subject: Marigold Pump Station

Option 1
Material Flows
and Carbon Footprint Analysis

Yellow-shaded cell denotes assumed/input values

Year	Wastewater ADWF		ADWF Friction Losses		TDH	Velocity	Pump Energy	Materials	GHG Sources	Total GHG Emissions
			Unit	Total				Electricity	Electricity Purchased	
	(m3/d)	(L/s)	(m/m)	(m)	(m)	(m/s)	(kW)	(kWh/yr)	(t CO2e/yr)	(t CO2e/yr)
2008										
2009										
2010										
2011										
2012										
2013										
2014										
2015	17,437	202	0.000943	3.49	33.5	0.71	94.7	829,693	60	60
2016	17,441	202	0.000943	3.49	33.5	0.71	94.7	829,912	60	60
2017	17,445	202	0.000943	3.49	33.5	0.71	94.8	830,132	60	60
2018	17,449	202	0.000944	3.49	33.5	0.71	94.8	830,351	60	60
2019	17,452	202	0.000944	3.49	33.5	0.71	94.8	830,571	60	60
2020	17,456	202	0.000945	3.49	33.5	0.71	94.8	830,790	60	60
2021	17,460	202	0.000945	3.50	33.5	0.71	94.9	831,010	60	60
2022	17,464	202	0.000945	3.50	33.5	0.71	94.9	831,229	60	60
2023	17,468	202	0.000946	3.50	33.5	0.72	94.9	831,449	60	60
2024	17,472	202	0.000946	3.50	33.5	0.72	94.9	831,668	60	60
2025	17,476	202	0.000946	3.50	33.5	0.72	95.0	831,888	60	60
2026	17,480	202	0.000947	3.50	33.5	0.72	95.0	832,108	60	60
2027	17,483	202	0.000947	3.50	33.5	0.72	95.0	832,327	60	60
2028	17,487	202	0.000948	3.51	33.5	0.72	95.0	832,547	60	60
2029	17,491	202	0.000948	3.51	33.5	0.72	95.1	832,767	60	60
2030	17,495	202	0.000948	3.51	33.5	0.72	95.1	832,987	60	60
2031	17,517	203	0.000951	3.52	33.5	0.72	95.2	834,249	60	60
2032	17,539	203	0.000953	3.53	33.5	0.72	95.4	835,512	60	60
2033	17,562	203	0.000955	3.53	33.5	0.72	95.5	836,775	60	60
2034	17,584	204	0.000957	3.54	33.5	0.72	95.7	838,040	60	60
2035	17,606	204	0.000960	3.55	33.6	0.72	95.8	839,305	60	60
2036	17,628	204	0.000962	3.56	33.6	0.72	96.0	840,571	61	61
2037	17,650	204	0.000964	3.57	33.6	0.72	96.1	841,837	61	61
2038	17,673	205	0.000966	3.58	33.6	0.72	96.2	843,105	61	61
2039	17,695	205	0.000969	3.58	33.6	0.72	96.4	844,373	61	61
2040	17,717	205	0.000971	3.59	33.6	0.73	96.5	845,642	61	61
2041	17,739	205	0.000973	3.60	33.6	0.73	96.7	846,911	61	61
2042	17,761	206	0.000975	3.61	33.6	0.73	96.8	848,182	61	61
2043	17,784	206	0.000978	3.62	33.6	0.73	97.0	849,453	61	61
2044	17,806	206	0.000980	3.63	33.6	0.73	97.1	850,725	61	61
2045	17,828	206	0.000982	3.63	33.6	0.73	97.3	851,997	61	61
2046	17,800	206	0.000979	3.62	33.6	0.73	97.1	850,384	61	61
2047	17,772	206	0.000976	3.61	33.6	0.73	96.9	848,771	61	61
2048	17,744	205	0.000973	3.60	33.6	0.73	96.7	847,160	61	61
2049	17,715	205	0.000971	3.59	33.6	0.73	96.5	845,550	61	61
2050	17,687	205	0.000968	3.58	33.6	0.72	96.3	843,941	61	61
2051	17,659	204	0.000965	3.57	33.6	0.72	96.2	842,334	61	61
2052	17,631	204	0.000962	3.56	33.6	0.72	96.0	840,728	61	61
2053	17,603	204	0.000959	3.55	33.5	0.72	95.8	839,122	60	60
2054	17,575	203	0.000956	3.54	33.5	0.72	95.6	837,519	60	60
2055	17,547	203	0.000954	3.53	33.5	0.72	95.4	835,916	60	60
2056	17,518	203	0.000951	3.52	33.5	0.72	95.2	834,314	60	60
2057	17,490	202	0.000948	3.51	33.5	0.72	95.1	832,714	60	60
2058	17,462	202	0.000945	3.50	33.5	0.71	94.9	831,115	60	60
2059	17,434	202	0.000942	3.49	33.5	0.71	94.7	829,517	60	60
2060	17,406	201	0.000939	3.48	33.5	0.71	94.5	827,920	60	60
2061	17,378	201	0.000937	3.47	33.5	0.71	94.3	826,324	59	59
2062	17,349	201	0.000934	3.46	33.5	0.71	94.1	824,730	59	59
2063	17,321	200	0.000931	3.44	33.4	0.71	94.0	823,137	59	59
2064	17,293	200	0.000928	3.43	33.4	0.71	93.8	821,545	59	59
2065	17,265	200	0.000925	3.42	33.4	0.71	93.6	819,954	59	59
Totals =								42,650,797	3,071	**3,071**

MARIGOLD PUMP STATION

static head =	30.0	m
friction C value =	120	
forcemain diameter =	600	mm
forcemain X-area =	0.2827	m^2
forcemain length =	3,700	m
pump efficiency =	70%	
fluid specific weight =	9.81	kN/m^3

Ref: Flow and pumping information from M. Homenuke Feb 2/09 e-mail and attached ConveyanceFlows_forDean_20090202.xls.

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Subject: Marigold Pump Station

Option 1
Life Cycle Analysis

Yellow-shaded cell denotes assumed/input values

Year	Capital Costs (Note 1)		Operation & Maintenance Costs				GHG CO2e		Total	
			Electricity		Maintenance (Note 1)					
	Total Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value
2008										
2009										
2010										
2011										
2012										
2013										
2014		$0							$0	$0
2015		$0	$58,078	$44,135	$0	$0	$896	$681	$58,078	$44,135
2016		$0	$58,094	$42,449	$0	$0	$896	$655	$58,094	$42,449
2017		$0	$58,109	$40,827	$0	$0	$897	$630	$58,109	$40,827
2018		$0	$58,125	$39,267	$0	$0	$897	$606	$58,125	$39,267
2019		$0	$58,140	$37,767	$0	$0	$897	$583	$58,140	$37,767
2020		$0	$58,155	$36,324	$0	$0	$897	$560	$58,155	$36,324
2021		$0	$58,171	$34,936	$0	$0	$897	$539	$58,171	$34,936
2022		$0	$58,186	$33,601	$0	$0	$898	$518	$58,186	$33,601
2023		$0	$58,201	$32,317	$0	$0	$898	$499	$58,201	$32,317
2024		$0	$58,217	$31,082	$0	$0	$898	$480	$58,217	$31,082
2025		$0	$58,232	$29,895	$0	$0	$898	$461	$58,232	$29,895
2026		$0	$58,248	$28,753	$0	$0	$899	$444	$58,248	$28,753
2027		$0	$58,263	$27,654	$0	$0	$899	$427	$58,263	$27,654
2028		$0	$58,278	$26,597	$0	$0	$899	$410	$58,278	$26,597
2029		$0	$58,294	$25,581	$0	$0	$899	$395	$58,294	$25,581
2030		$0	$58,309	$24,604	$0	$0	$900	$380	$58,309	$24,604
2031		$0	$58,397	$23,693	$0	$0	$901	$366	$58,397	$23,693
2032		$0	$58,486	$22,817	$0	$0	$902	$352	$58,486	$22,817
2033		$0	$58,574	$21,972	$0	$0	$904	$339	$58,574	$21,972
2034		$0	$58,663	$21,159	$0	$0	$905	$326	$58,663	$21,159
2035		$0	$58,751	$20,376	$0	$0	$906	$314	$58,751	$20,376
2036		$0	$58,840	$19,622	$0	$0	$908	$303	$58,840	$19,622
2037		$0	$58,929	$18,896	$0	$0	$909	$292	$58,929	$18,896
2038		$0	$59,017	$18,196	$0	$0	$911	$281	$59,017	$18,196
2039		$0	$59,106	$17,523	$0	$0	$912	$270	$59,106	$17,523
2040		$0	$59,195	$16,874	$0	$0	$913	$260	$59,195	$16,874
2041		$0	$59,284	$16,249	$0	$0	$915	$251	$59,284	$16,249
2042		$0	$59,373	$15,648	$0	$0	$916	$241	$59,373	$15,648
2043		$0	$59,462	$15,069	$0	$0	$917	$232	$59,462	$15,069
2044		$0	$59,551	$14,511	$0	$0	$919	$224	$59,551	$14,511
2045		$0	$59,640	$13,973	$0	$0	$920	$216	$59,640	$13,973
2046		$0	$59,527	$13,411	$0	$0	$918	$207	$59,527	$13,411
2047		$0	$59,414	$12,870	$0	$0	$917	$199	$59,414	$12,870
2048		$0	$59,301	$12,352	$0	$0	$915	$191	$59,301	$12,352
2049		$0	$59,189	$11,854	$0	$0	$913	$183	$59,189	$11,854
2050		$0	$59,076	$11,377	$0	$0	$911	$176	$59,076	$11,377
2051		$0	$58,963	$10,918	$0	$0	$910	$168	$58,963	$10,918
2052		$0	$58,851	$10,478	$0	$0	$908	$162	$58,851	$10,478
2053		$0	$58,739	$10,056	$0	$0	$906	$155	$58,739	$10,056
2054		$0	$58,626	$9,651	$0	$0	$905	$149	$58,626	$9,651
2055		$0	$58,514	$9,262	$0	$0	$903	$143	$58,514	$9,262
2056		$0	$58,402	$8,888	$0	$0	$901	$137	$58,402	$8,888
2057		$0	$58,290	$8,530	$0	$0	$899	$132	$58,290	$8,530
2058		$0	$58,178	$8,186	$0	$0	$898	$126	$58,178	$8,186
2059		$0	$58,066	$7,856	$0	$0	$896	$121	$58,066	$7,856
2060		$0	$57,954	$7,540	$0	$0	$894	$116	$57,954	$7,540
2061		$0	$57,843	$7,236	$0	$0	$892	$112	$57,843	$7,236
2062		$0	$57,731	$6,944	$0	$0	$891	$107	$57,731	$6,944
2063		$0	$57,620	$6,664	$0	$0	$889	$103	$57,620	$6,664
2064		$0	$57,508	$6,395	$0	$0	$887	$99	$57,508	$6,395
2065		$0	$57,397	$6,137	$0	$0	$886	$95	$57,397	$6,137
Total Capital =		$0								
Total Net Present Value =			$0	$998,970		$0		$15,413	$2,985,556	**$998,970**

Notes:
1. No capital costs. Annual O&M cost assumed to be included in Existing Trunk Sewers LCA.

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Subject: Currie Road Pump Station

Option 1
Material Flows
and Carbon Footprint Analysis

Yellow-shaded cell denotes assumed/input values

Year	Wastewater ADWF		ADWF Friction Losses		TDH	Velocity	Pump Energy	Materials	GHG Sources	Total GHG Emissions
			Unit	Total				Electricity	Electricity Purchased	
	(m3/d)	Done (L/s)	(m/m)	(m)	(m)	(m/s)	(kW)	(kWh/yr)	(t CO2e/yr)	(t CO2e/yr)
2008										
2009										
2010										
2011										
2012										
2013										
2014										
2015	14,433	167	0.000224	0.40	20.4	0.38	47.8	418,436	30	30
2016	14,409	167	0.000224	0.40	20.4	0.38	47.7	417,729	30	30
2017	14,386	167	0.000223	0.40	20.4	0.38	47.6	417,022	30	30
2018	14,362	166	0.000222	0.40	20.4	0.38	47.5	416,315	30	30
2019	14,339	166	0.000222	0.40	20.4	0.38	47.4	415,608	30	30
2020	14,315	166	0.000221	0.40	20.4	0.38	47.4	414,901	30	30
2021	14,292	165	0.000220	0.40	20.4	0.37	47.3	414,195	30	30
2022	14,268	165	0.000220	0.40	20.4	0.37	47.2	413,488	30	30
2023	14,245	165	0.000219	0.39	20.4	0.37	47.1	412,782	30	30
2024	14,221	165	0.000218	0.39	20.4	0.37	47.0	412,075	30	30
2025	14,198	164	0.000218	0.39	20.4	0.37	47.0	411,369	30	30
2026	14,174	164	0.000217	0.39	20.4	0.37	46.9	410,663	30	30
2027	14,151	164	0.000216	0.39	20.4	0.37	46.8	409,957	30	30
2028	14,127	164	0.000216	0.39	20.4	0.37	46.7	409,252	29	29
2029	14,104	163	0.000215	0.39	20.4	0.37	46.6	408,546	29	29
2030	14,080	163	0.000214	0.39	20.4	0.37	46.6	407,840	29	29
2031	14,078	163	0.000214	0.39	20.4	0.37	46.6	407,788	29	29
2032	14,077	163	0.000214	0.39	20.4	0.37	46.5	407,736	29	29
2033	14,075	163	0.000214	0.39	20.4	0.37	46.5	407,684	29	29
2034	14,073	163	0.000214	0.39	20.4	0.37	46.5	407,632	29	29
2035	14,071	163	0.000214	0.39	20.4	0.37	46.5	407,580	29	29
2036	14,070	163	0.000214	0.39	20.4	0.37	46.5	407,528	29	29
2037	14,068	163	0.000214	0.39	20.4	0.37	46.5	407,477	29	29
2038	14,066	163	0.000214	0.39	20.4	0.37	46.5	407,425	29	29
2039	14,064	163	0.000214	0.38	20.4	0.37	46.5	407,373	29	29
2040	14,063	163	0.000214	0.38	20.4	0.37	46.5	407,321	29	29
2041	14,061	163	0.000214	0.38	20.4	0.37	46.5	407,269	29	29
2042	14,059	163	0.000214	0.38	20.4	0.37	46.5	407,217	29	29
2043	14,057	163	0.000214	0.38	20.4	0.37	46.5	407,165	29	29
2044	14,056	163	0.000214	0.38	20.4	0.37	46.5	407,113	29	29
2045	14,054	163	0.000214	0.38	20.4	0.37	46.5	407,061	29	29
2046	14,036	162	0.000213	0.38	20.4	0.37	46.4	406,533	29	29
2047	14,019	162	0.000213	0.38	20.4	0.37	46.3	406,006	29	29
2048	14,001	162	0.000212	0.38	20.4	0.37	46.3	405,478	29	29
2049	13,984	162	0.000212	0.38	20.4	0.37	46.2	404,951	29	29
2050	13,966	162	0.000211	0.38	20.4	0.37	46.2	404,424	29	29
2051	13,948	161	0.000211	0.38	20.4	0.37	46.1	403,897	29	29
2052	13,931	161	0.000210	0.38	20.4	0.36	46.0	403,370	29	29
2053	13,913	161	0.000210	0.38	20.4	0.36	46.0	402,842	29	29
2054	13,896	161	0.000209	0.38	20.4	0.36	45.9	402,315	29	29
2055	13,878	161	0.000209	0.38	20.4	0.36	45.9	401,789	29	29
2056	13,860	160	0.000208	0.37	20.4	0.36	45.8	401,262	29	29
2057	13,843	160	0.000208	0.37	20.4	0.36	45.7	400,735	29	29
2058	13,825	160	0.000207	0.37	20.4	0.36	45.7	400,208	29	29
2059	13,808	160	0.000207	0.37	20.4	0.36	45.6	399,681	29	29
2060	13,790	160	0.000206	0.37	20.4	0.36	45.6	399,155	29	29
2061	13,772	159	0.000206	0.37	20.4	0.36	45.5	398,628	29	29
2062	13,755	159	0.000205	0.37	20.4	0.36	45.4	398,102	29	29
2063	13,737	159	0.000205	0.37	20.4	0.36	45.4	397,575	29	29
2064	13,720	159	0.000204	0.37	20.4	0.36	45.3	397,049	29	29
2065	13,702	159	0.000204	0.37	20.4	0.36	45.3	396,522	29	29
Totals =								20,752,068	1,494	**1,494**

CURRIE ROAD PUMP STATION

static head =	20.0	m
friction C value =	120	
forcemain diameter =	750	mm
forcemain X-area =	0.4418	m^2
forcemain length =	1,800	m
pump efficiency =	70%	
fluid specific weight =	9.81	kN/m^3

Ref: Flow and pumping information from M. Homenuke Feb 2/09 e-mail and attached ConveyanceFlows_forDean_20090202.xls.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 5, 2009
Last Revision By: D. Shiskowski

Subject: Currie Road Pump Station

Option 1
Life Cycle Analysis

Yellow-shaded cell denotes assumed/input values

Year	Capital Costs (Note 1)		Operation & Maintenance Costs				GHG CO2e		Total	
			Electricity		Maintenance (Note 1)					
	Total Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value
2008										
2009										
2010										
2011										
2012										
2013										
2014		$0							$0	$0
2015		$0	$29,291	$22,258	$0	$0	$452	$343	$29,291	$22,258
2016		$0	$29,241	$21,366	$0	$0	$451	$330	$29,241	$21,366
2017		$0	$29,192	$20,510	$0	$0	$450	$316	$29,192	$20,510
2018		$0	$29,142	$19,687	$0	$0	$450	$304	$29,142	$19,687
2019		$0	$29,093	$18,898	$0	$0	$449	$292	$29,093	$18,898
2020		$0	$29,043	$18,140	$0	$0	$448	$280	$29,043	$18,140
2021		$0	$28,994	$17,413	$0	$0	$447	$269	$28,994	$17,413
2022		$0	$28,944	$16,715	$0	$0	$447	$258	$28,944	$16,715
2023		$0	$28,895	$16,044	$0	$0	$446	$248	$28,895	$16,044
2024		$0	$28,845	$15,401	$0	$0	$445	$238	$28,845	$15,401
2025		$0	$28,796	$14,783	$0	$0	$444	$228	$28,796	$14,783
2026		$0	$28,746	$14,190	$0	$0	$444	$219	$28,746	$14,190
2027		$0	$28,697	$13,621	$0	$0	$443	$210	$28,697	$13,621
2028		$0	$28,648	$13,074	$0	$0	$442	$202	$28,648	$13,074
2029		$0	$28,598	$12,550	$0	$0	$441	$194	$28,598	$12,550
2030		$0	$28,549	$12,046	$0	$0	$440	$186	$28,549	$12,046
2031		$0	$28,545	$11,582	$0	$0	$440	$179	$28,545	$11,582
2032		$0	$28,542	$11,135	$0	$0	$440	$172	$28,542	$11,135
2033		$0	$28,538	$10,705	$0	$0	$440	$165	$28,538	$10,705
2034		$0	$28,534	$10,292	$0	$0	$440	$159	$28,534	$10,292
2035		$0	$28,531	$9,895	$0	$0	$440	$153	$28,531	$9,895
2036		$0	$28,527	$9,513	$0	$0	$440	$147	$28,527	$9,513
2037		$0	$28,523	$9,146	$0	$0	$440	$141	$28,523	$9,146
2038		$0	$28,520	$8,793	$0	$0	$440	$136	$28,520	$8,793
2039		$0	$28,516	$8,454	$0	$0	$440	$130	$28,516	$8,454
2040		$0	$28,512	$8,128	$0	$0	$440	$125	$28,512	$8,128
2041		$0	$28,509	$7,814	$0	$0	$440	$121	$28,509	$7,814
2042		$0	$28,505	$7,513	$0	$0	$440	$116	$28,505	$7,513
2043		$0	$28,502	$7,223	$0	$0	$440	$111	$28,502	$7,223
2044		$0	$28,498	$6,944	$0	$0	$440	$107	$28,498	$6,944
2045		$0	$28,494	$6,676	$0	$0	$440	$103	$28,494	$6,676
2046		$0	$28,457	$6,411	$0	$0	$439	$99	$28,457	$6,411
2047		$0	$28,420	$6,156	$0	$0	$438	$95	$28,420	$6,156
2048		$0	$28,383	$5,912	$0	$0	$438	$91	$28,383	$5,912
2049		$0	$28,347	$5,677	$0	$0	$437	$88	$28,347	$5,677
2050		$0	$28,310	$5,452	$0	$0	$437	$84	$28,310	$5,452
2051		$0	$28,273	$5,235	$0	$0	$436	$81	$28,273	$5,235
2052		$0	$28,236	$5,027	$0	$0	$436	$78	$28,236	$5,027
2053		$0	$28,199	$4,828	$0	$0	$435	$74	$28,199	$4,828
2054		$0	$28,162	$4,636	$0	$0	$435	$72	$28,162	$4,636
2055		$0	$28,125	$4,452	$0	$0	$434	$69	$28,125	$4,452
2056		$0	$28,088	$4,275	$0	$0	$433	$66	$28,088	$4,275
2057		$0	$28,051	$4,105	$0	$0	$433	$63	$28,051	$4,105
2058		$0	$28,015	$3,942	$0	$0	$432	$61	$28,015	$3,942
2059		$0	$27,978	$3,785	$0	$0	$432	$58	$27,978	$3,785
2060		$0	$27,941	$3,635	$0	$0	$431	$56	$27,941	$3,635
2061		$0	$27,904	$3,491	$0	$0	$431	$54	$27,904	$3,491
2062		$0	$27,867	$3,352	$0	$0	$430	$52	$27,867	$3,352
2063		$0	$27,830	$3,219	$0	$0	$429	$50	$27,830	$3,219
2064		$0	$27,793	$3,091	$0	$0	$429	$48	$27,793	$3,091
2065		$0	$27,757	$2,968	$0	$0	$428	$46	$27,757	$2,968
Total Capital =	$0									
Total Net Present Value =			$0	$490,157		$0		$7,562	$1,452,645	**$490,157**

Notes:
1. Capital costs included in CS Mods LCA. Existing annual O&M cost assumed to be included in Existing Trunk Sewers LCA.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 2, 2009
Last Revision By: D. Shiskowski

Subject: Colwood Diversion Pump Station

Option 1
Material Flows
and Carbon Footprint Analysis

Yellow-shaded cell denotes assumed/input values

Year	Wastewater ADWF		ADWF Friction Losses		TDH	Velocity	Pump Energy	Materials	GHG Sources	Total GHG Emissions
			Unit	Total				Electricity	Electricity Purchased	
	(m3/d)	(L/s)	(m/m)	(m)	(m)	(m/s)	(kW)	(kWh/yr)	(t CO2e/yr)	(t CO2e/yr)
2008										
2009										
2010										
2011										
2012										
2013										
2014										
2015	10,248	119	0.000049	0.13	25.1	0.19	41.8	365,889	26	26
2016	10,818	125	0.000054	0.14	25.1	0.20	44.1	386,439	28	28
2017	11,388	132	0.000060	0.15	25.2	0.21	46.5	407,021	29	29
2018	11,957	138	0.000065	0.17	25.2	0.22	48.8	427,636	31	31
2019	12,527	145	0.000071	0.18	25.2	0.23	51.2	448,286	32	32
2020	13,097	152	0.000077	0.20	25.2	0.24	53.5	468,971	34	34
2021	13,667	158	0.000084	0.22	25.2	0.25	55.9	489,694	35	35
2022	14,237	165	0.000090	0.23	25.2	0.26	58.3	510,455	37	37
2023	14,806	171	0.000097	0.25	25.3	0.27	60.6	531,256	38	38
2024	15,376	178	0.000104	0.27	25.3	0.28	63.0	552,099	40	40
2025	15,946	185	0.000111	0.29	25.3	0.29	65.4	572,984	41	41
2026	16,516	191	0.000119	0.31	25.3	0.30	67.8	593,914	43	43
2027	17,086	198	0.000126	0.33	25.3	0.31	70.2	614,888	44	44
2028	17,655	204	0.000134	0.35	25.3	0.32	72.6	635,910	46	46
2029	18,225	211	0.000142	0.37	25.4	0.33	75.0	656,980	47	47
2030	18,795	218	0.000151	0.39	25.4	0.34	77.4	678,099	49	49
2031	19,059	221	0.000155	0.40	25.4	0.35	78.5	687,910	50	50
2032	19,324	224	0.000159	0.41	25.4	0.35	79.6	697,733	50	50
2033	19,588	227	0.000163	0.42	25.4	0.36	80.8	707,567	51	51
2034	19,852	230	0.000167	0.43	25.4	0.36	81.9	717,413	52	52
2035	20,116	233	0.000171	0.44	25.4	0.37	83.0	727,269	52	52
2036	20,381	236	0.000175	0.45	25.5	0.37	84.1	737,138	53	53
2037	20,645	239	0.000179	0.47	25.5	0.38	85.3	747,018	54	54
2038	20,909	242	0.000183	0.48	25.5	0.38	86.4	756,909	54	54
2039	21,173	245	0.000188	0.49	25.5	0.39	87.5	766,813	55	55
2040	21,438	248	0.000192	0.50	25.5	0.39	88.7	776,729	56	56
2041	21,702	251	0.000196	0.51	25.5	0.39	89.8	786,657	57	57
2042	21,966	254	0.000201	0.52	25.5	0.40	90.9	796,597	57	57
2043	22,230	257	0.000205	0.53	25.5	0.40	92.1	806,550	58	58
2044	22,495	260	0.000210	0.55	25.5	0.41	93.2	816,515	59	59
2045	22,759	263	0.000215	0.56	25.6	0.41	94.3	826,493	60	60
2046	23,071	267	0.000220	0.57	25.6	0.42	95.7	838,273	60	60
2047	23,382	271	0.000226	0.59	25.6	0.43	97.0	850,071	61	61
2048	23,694	274	0.000231	0.60	25.6	0.43	98.4	861,887	62	62
2049	24,005	278	0.000237	0.62	25.6	0.44	99.7	873,721	63	63
2050	24,317	281	0.000243	0.63	25.6	0.44	101.1	885,574	64	64
2051	24,628	285	0.000248	0.65	25.6	0.45	102.4	897,446	65	65
2052	24,940	289	0.000254	0.66	25.7	0.45	103.8	909,337	65	65
2053	25,251	292	0.000260	0.68	25.7	0.46	105.2	921,248	66	66
2054	25,563	296	0.000266	0.69	25.7	0.47	106.5	933,178	67	67
2055	25,875	299	0.000272	0.71	25.7	0.47	107.9	945,127	68	68
2056	26,186	303	0.000278	0.72	25.7	0.48	109.3	957,096	69	69
2057	26,498	307	0.000284	0.74	25.7	0.48	110.6	969,086	70	70
2058	26,809	310	0.000291	0.76	25.8	0.49	112.0	981,095	71	71
2059	27,121	314	0.000297	0.77	25.8	0.49	113.4	993,126	72	72
2060	27,432	318	0.000303	0.79	25.8	0.50	114.7	1,005,176	72	72
2061	27,744	321	0.000310	0.80	25.8	0.50	116.1	1,017,248	73	73
2062	28,055	325	0.000316	0.82	25.8	0.51	117.5	1,029,341	74	74
2063	28,367	328	0.000323	0.84	25.8	0.52	118.9	1,041,455	75	75
2064	28,678	332	0.000329	0.86	25.9	0.52	120.3	1,053,591	76	76
2065	28,990	336	0.000336	0.87	25.9	0.53	121.7	1,065,748	77	77
Totals =								38,724,658	2,788	**2,788**

COLWOOD DIVERSION PUMP STATION

static head =	25.0	m
friction C value =	120	
forcemain diameter =	900	mm
forcemain X-area =	0.6362	m^2
forcemain length =	2,600	m
pump efficiency =	70%	
fluid specific weight =	9.81	kN/m^3

Ref: Flow and pumping information from M. Homenuke Feb 2/09 e-mail and attached ConveyanceFlows_forDean_20090202.xls.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 5, 2009
Last Revision By: D. Shiskowski

Subject: Colwood Diversion Pump Station

Option 1
Life Cycle Analysis

Yellow-shaded cell denotes assumed/input values

Year	Capital Costs (Note 1)		Operation & Maintenance Costs				GHG CO2e		Total	
			Electricity		Maintenance (Note 1)					
	Total Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value
2008										
2009										
2010										
2011										
2012										
2013										
2014		$0							$0	$0
2015		$0	$25,612	$19,463	$0	$0	$395	$300	$25,612	$19,463
2016		$0	$27,051	$19,766	$0	$0	$417	$305	$27,051	$19,766
2017		$0	$28,491	$20,018	$0	$0	$440	$309	$28,491	$20,018
2018		$0	$29,935	$20,223	$0	$0	$462	$312	$29,935	$20,223
2019		$0	$31,380	$20,384	$0	$0	$484	$314	$31,380	$20,384
2020		$0	$32,828	$20,504	$0	$0	$506	$316	$32,828	$20,504
2021		$0	$34,279	$20,587	$0	$0	$529	$318	$34,279	$20,587
2022		$0	$35,732	$20,634	$0	$0	$551	$318	$35,732	$20,634
2023		$0	$37,188	$20,649	$0	$0	$574	$319	$37,188	$20,649
2024		$0	$38,647	$20,634	$0	$0	$596	$318	$38,647	$20,634
2025		$0	$40,109	$20,591	$0	$0	$619	$318	$40,109	$20,591
2026		$0	$41,574	$20,522	$0	$0	$641	$317	$41,574	$20,522
2027		$0	$43,042	$20,430	$0	$0	$664	$315	$43,042	$20,430
2028		$0	$44,514	$20,315	$0	$0	$687	$313	$44,514	$20,315
2029		$0	$45,989	$20,181	$0	$0	$710	$311	$45,989	$20,181
2030		$0	$47,467	$20,029	$0	$0	$732	$309	$47,467	$20,029
2031		$0	$48,154	$19,537	$0	$0	$743	$301	$48,154	$19,537
2032		$0	$48,841	$19,054	$0	$0	$754	$294	$48,841	$19,054
2033		$0	$49,530	$18,579	$0	$0	$764	$287	$49,530	$18,579
2034		$0	$50,219	$18,113	$0	$0	$775	$279	$50,219	$18,113
2035		$0	$50,909	$17,656	$0	$0	$785	$272	$50,909	$17,656
2036		$0	$51,600	$17,207	$0	$0	$796	$265	$51,600	$17,207
2037		$0	$52,291	$16,767	$0	$0	$807	$259	$52,291	$16,767
2038		$0	$52,984	$16,336	$0	$0	$817	$252	$52,984	$16,336
2039		$0	$53,677	$15,913	$0	$0	$828	$246	$53,677	$15,913
2040		$0	$54,371	$15,499	$0	$0	$839	$239	$54,371	$15,499
2041		$0	$55,066	$15,093	$0	$0	$850	$233	$55,066	$15,093
2042		$0	$55,762	$14,696	$0	$0	$860	$227	$55,762	$14,696
2043		$0	$56,458	$14,307	$0	$0	$871	$221	$56,458	$14,307
2044		$0	$57,156	$13,927	$0	$0	$882	$215	$57,156	$13,927
2045		$0	$57,855	$13,555	$0	$0	$893	$209	$57,855	$13,555
2046		$0	$58,679	$13,220	$0	$0	$905	$204	$58,679	$13,220
2047		$0	$59,505	$12,890	$0	$0	$918	$199	$59,505	$12,890
2048		$0	$60,332	$12,567	$0	$0	$931	$194	$60,332	$12,567
2049		$0	$61,160	$12,249	$0	$0	$944	$189	$61,160	$12,249
2050		$0	$61,990	$11,938	$0	$0	$956	$184	$61,990	$11,938
2051		$0	$62,821	$11,632	$0	$0	$969	$179	$62,821	$11,632
2052		$0	$63,654	$11,333	$0	$0	$982	$175	$63,654	$11,333
2053		$0	$64,487	$11,040	$0	$0	$995	$170	$64,487	$11,040
2054		$0	$65,322	$10,753	$0	$0	$1,008	$166	$65,322	$10,753
2055		$0	$66,159	$10,472	$0	$0	$1,021	$162	$66,159	$10,472
2056		$0	$66,997	$10,197	$0	$0	$1,034	$157	$66,997	$10,197
2057		$0	$67,836	$9,927	$0	$0	$1,047	$153	$67,836	$9,927
2058		$0	$68,677	$9,664	$0	$0	$1,060	$149	$68,677	$9,664
2059		$0	$69,519	$9,406	$0	$0	$1,073	$145	$69,519	$9,406
2060		$0	$70,362	$9,154	$0	$0	$1,086	$141	$70,362	$9,154
2061		$0	$71,207	$8,908	$0	$0	$1,099	$137	$71,207	$8,908
2062		$0	$72,054	$8,667	$0	$0	$1,112	$134	$72,054	$8,667
2063		$0	$72,902	$8,432	$0	$0	$1,125	$130	$72,902	$8,432
2064		$0	$73,751	$8,202	$0	$0	$1,138	$127	$73,751	$8,202
2065		$0	$74,602	$7,977	$0	$0	$1,151	$123	$74,602	$7,977
Total Capital =	$0									
Total Net Present Value =			$0	$779,797		$0		$12,031	$2,710,726	**$779,797**

Notes:
1. Capital costs included in CS Mods LCA. Existing annual O&M cost assumed to be included in Existing Trunk Sewers LCA.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 2, 2009
Last Revision By: D. Shiskowski

Subject: Craigflower Pump Station

Option 1
Material Flows
and Carbon Footprint Analysis

Yellow-shaded cell denotes assumed/input values

Year	Wastewater ADWF		ADWF Friction Losses		TDH	Velocity	Pump Energy	Materials	GHG Sources	Total GHG Emissions
			Unit	Total				Electricity	Electricity Purchased	
	(m3/d)	(L/s)	(m/m)	(m)	(m)	(m/s)	(kW)	(kWh/yr)	(t CO2e/yr)	(t CO2e/yr)
2008										
2009										
2010										
2011										
2012										
2013										
2014										
2015	7,156	83	0.000181	0.47	35.5	0.29	41.2	360,674	26	26
2016	7,438	86	0.000195	0.51	35.5	0.30	42.8	375,260	27	27
2017	7,720	89	0.000209	0.54	35.5	0.32	44.5	389,887	28	28
2018	8,002	93	0.000223	0.58	35.6	0.33	46.2	404,555	29	29
2019	8,284	96	0.000238	0.62	35.6	0.34	47.9	419,267	30	30
2020	8,566	99	0.000253	0.66	35.7	0.35	49.5	434,024	31	31
2021	8,848	102	0.000269	0.70	35.7	0.36	51.2	448,826	32	32
2022	9,130	106	0.000285	0.74	35.7	0.37	52.9	463,676	33	33
2023	9,413	109	0.000301	0.78	35.8	0.39	54.6	478,573	34	34
2024	9,695	112	0.000318	0.83	35.8	0.40	56.3	493,520	36	36
2025	9,977	115	0.000336	0.87	35.9	0.41	58.1	508,519	37	37
2026	10,259	119	0.000353	0.92	35.9	0.42	59.8	523,569	38	38
2027	10,541	122	0.000371	0.97	36.0	0.43	61.5	538,672	39	39
2028	10,823	125	0.000390	1.01	36.0	0.44	63.2	553,831	40	40
2029	11,105	129	0.000409	1.06	36.1	0.45	65.0	569,045	41	41
2030	11,387	132	0.000429	1.11	36.1	0.47	66.7	584,316	42	42
2031	11,662	135	0.000448	1.16	36.2	0.48	68.4	599,264	43	43
2032	11,937	138	0.000468	1.22	36.2	0.49	70.1	614,269	44	44
2033	12,212	141	0.000488	1.27	36.3	0.50	71.8	629,332	45	45
2034	12,487	145	0.000508	1.32	36.3	0.51	73.6	644,453	46	46
2035	12,762	148	0.000529	1.38	36.4	0.52	75.3	659,635	47	47
2036	13,037	151	0.000550	1.43	36.4	0.53	77.0	674,878	49	49
2037	13,312	154	0.000572	1.49	36.5	0.54	78.8	690,182	50	50
2038	13,588	157	0.000594	1.54	36.5	0.56	80.5	705,551	51	51
2039	13,863	160	0.000617	1.60	36.6	0.57	82.3	720,983	52	52
2040	14,138	164	0.000639	1.66	36.7	0.58	84.1	736,481	53	53
2041	14,413	167	0.000663	1.72	36.7	0.59	85.9	752,046	54	54
2042	14,688	170	0.000686	1.78	36.8	0.60	87.6	767,679	55	55
2043	14,963	173	0.000710	1.85	36.8	0.61	89.4	783,380	56	56
2044	15,238	176	0.000735	1.91	36.9	0.62	91.2	799,152	58	58
2045	15,513	180	0.000759	1.97	37.0	0.64	93.0	814,994	59	59
2046	15,706	182	0.000777	2.02	37.0	0.64	94.3	826,136	59	59
2047	15,898	184	0.000795	2.07	37.1	0.65	95.6	837,313	60	60
2048	16,091	186	0.000812	2.11	37.1	0.66	96.9	848,526	61	61
2049	16,284	188	0.000831	2.16	37.2	0.67	98.1	859,776	62	62
2050	16,477	191	0.000849	2.21	37.2	0.67	99.4	871,063	63	63
2051	16,669	193	0.000867	2.25	37.3	0.68	100.7	882,387	64	64
2052	16,862	195	0.000886	2.30	37.3	0.69	102.0	893,748	64	64
2053	17,055	197	0.000905	2.35	37.4	0.70	103.3	905,148	65	65
2054	17,247	200	0.000924	2.40	37.4	0.71	104.6	916,586	66	66
2055	17,440	202	0.000943	2.45	37.5	0.71	105.9	928,063	67	67
2056	17,633	204	0.000962	2.50	37.5	0.72	107.3	939,579	68	68
2057	17,825	206	0.000982	2.55	37.6	0.73	108.6	951,134	68	68
2058	18,018	209	0.001002	2.60	37.6	0.74	109.9	962,729	69	69
2059	18,211	211	0.001021	2.66	37.7	0.75	111.2	974,365	70	70
2060	18,404	213	0.001042	2.71	37.7	0.75	112.6	986,041	71	71
2061	18,596	215	0.001062	2.76	37.8	0.76	113.9	997,758	72	72
2062	18,789	217	0.001082	2.81	37.8	0.77	115.2	1,009,516	73	73
2063	18,982	220	0.001103	2.87	37.9	0.78	116.6	1,021,316	74	74
2064	19,174	222	0.001124	2.92	37.9	0.78	117.9	1,033,157	74	74
2065	19,367	224	0.001145	2.98	38.0	0.79	119.3	1,045,042	75	75
Totals =								36,827,875	2,652	**2,652**

CRAIGFLOWER PUMP STATION

static head =	35.0	m
friction C value =	120	
forcemain diameter =	600	mm
forcemain X-area =	0.2827	m^2
forcemain length =	2,600	m
pump efficiency =	70%	
fluid specific weight =	9.81	kN/m^3

Ref: Flow and pumping information from M. Homenuke Feb 2/09 e-mail and attached ConveyanceFlows_forDean_20090202.xls.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 5, 2009
Last Revision By: D. Shiskowski

Subject: Craigflower Pump Station

Option 1
Life Cycle Analysis

Yellow-shaded cell denotes assumed/input values

Year	Capital Costs (Note 1)		Operation & Maintenance Costs				GHG CO2e		Total	
			Electricity		Maintenance (Note 1)					
	Total Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value
2008										
2009										
2010										
2011										
2012										
2013										
2014		$0							$0	$0
2015		$0	$25,247	$19,186	$0	$0	$390	$296	$25,247	$19,186
2016		$0	$26,268	$19,194	$0	$0	$405	$296	$26,268	$19,194
2017		$0	$27,292	$19,175	$0	$0	$421	$296	$27,292	$19,175
2018		$0	$28,319	$19,131	$0	$0	$437	$295	$28,319	$19,131
2019		$0	$29,349	$19,064	$0	$0	$453	$294	$29,349	$19,064
2020		$0	$30,382	$18,976	$0	$0	$469	$293	$30,382	$18,976
2021		$0	$31,418	$18,869	$0	$0	$485	$291	$31,418	$18,869
2022		$0	$32,457	$18,743	$0	$0	$501	$289	$32,457	$18,743
2023		$0	$33,500	$18,601	$0	$0	$517	$287	$33,500	$18,601
2024		$0	$34,546	$18,445	$0	$0	$533	$285	$34,546	$18,445
2025		$0	$35,596	$18,274	$0	$0	$549	$282	$35,596	$18,274
2026		$0	$36,650	$18,091	$0	$0	$565	$279	$36,650	$18,091
2027		$0	$37,707	$17,897	$0	$0	$582	$276	$37,707	$17,897
2028		$0	$38,768	$17,693	$0	$0	$598	$273	$38,768	$17,693
2029		$0	$39,833	$17,480	$0	$0	$615	$270	$39,833	$17,480
2030		$0	$40,902	$17,259	$0	$0	$631	$266	$40,902	$17,259
2031		$0	$41,949	$17,020	$0	$0	$647	$263	$41,949	$17,020
2032		$0	$42,999	$16,775	$0	$0	$663	$259	$42,999	$16,775
2033		$0	$44,053	$16,525	$0	$0	$680	$255	$44,053	$16,525
2034		$0	$45,112	$16,271	$0	$0	$696	$251	$45,112	$16,271
2035		$0	$46,174	$16,014	$0	$0	$712	$247	$46,174	$16,014
2036		$0	$47,241	$15,754	$0	$0	$729	$243	$47,241	$15,754
2037		$0	$48,313	$15,492	$0	$0	$745	$239	$48,313	$15,492
2038		$0	$49,389	$15,227	$0	$0	$762	$235	$49,389	$15,227
2039		$0	$50,469	$14,962	$0	$0	$779	$231	$50,469	$14,962
2040		$0	$51,554	$14,696	$0	$0	$795	$227	$51,554	$14,696
2041		$0	$52,643	$14,429	$0	$0	$812	$223	$52,643	$14,429
2042		$0	$53,738	$14,163	$0	$0	$829	$219	$53,738	$14,163
2043		$0	$54,837	$13,896	$0	$0	$846	$214	$54,837	$13,896
2044		$0	$55,941	$13,631	$0	$0	$863	$210	$55,941	$13,631
2045		$0	$57,050	$13,367	$0	$0	$880	$206	$57,050	$13,367
2046		$0	$57,829	$13,028	$0	$0	$892	$201	$57,829	$13,028
2047		$0	$58,612	$12,697	$0	$0	$904	$196	$58,612	$12,697
2048		$0	$59,397	$12,372	$0	$0	$916	$191	$59,397	$12,372
2049		$0	$60,184	$12,054	$0	$0	$929	$186	$60,184	$12,054
2050		$0	$60,974	$11,742	$0	$0	$941	$181	$60,974	$11,742
2051		$0	$61,767	$11,437	$0	$0	$953	$176	$61,767	$11,437
2052		$0	$62,562	$11,139	$0	$0	$965	$172	$62,562	$11,139
2053		$0	$63,360	$10,847	$0	$0	$978	$167	$63,360	$10,847
2054		$0	$64,161	$10,562	$0	$0	$990	$163	$64,161	$10,562
2055		$0	$64,964	$10,283	$0	$0	$1,002	$159	$64,964	$10,283
2056		$0	$65,771	$10,010	$0	$0	$1,015	$154	$65,771	$10,010
2057		$0	$66,579	$9,743	$0	$0	$1,027	$150	$66,579	$9,743
2058		$0	$67,391	$9,483	$0	$0	$1,040	$146	$67,391	$9,483
2059		$0	$68,206	$9,228	$0	$0	$1,052	$142	$68,206	$9,228
2060		$0	$69,023	$8,980	$0	$0	$1,065	$139	$69,023	$8,980
2061		$0	$69,843	$8,737	$0	$0	$1,078	$135	$69,843	$8,737
2062		$0	$70,666	$8,500	$0	$0	$1,090	$131	$70,666	$8,500
2063		$0	$71,492	$8,268	$0	$0	$1,103	$128	$71,492	$8,268
2064		$0	$72,321	$8,043	$0	$0	$1,116	$124	$72,321	$8,043
2065		$0	$73,153	$7,822	$0	$0	$1,129	$121	$73,153	$7,822
Total Capital =		$0								
Total Net Present Value =			$0	$729,275		$0		$11,252	$2,577,951	**$729,275**

Notes:
1. Capital costs included in CS Mods LCA. Existing annual O&M cost assumed to be included in Existing Trunk Sewers LCA.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 17, 2009
Last Revision By: D. Shiskowski

Subject: Saanich East WWTF
Option 1

Material Flows
and Carbon Footprint Analysis

Yellow-shaded cell denotes assumed/input values

Year	Equivalent Population	Wastewater ADWF	Sludge Production and Truck Transport		Saleable Effluent Heat[1]	Saleable Reclaimed Water (irrigation only)	Materials			GHG Sources			GHG Offsets	Total GHG Emissions
			Mass	Thickened Volume			Electricity	Diesel Fuel	Sludge Thickening Polymer	Electricity Purchased	Diesel Fuel Combusted	Sludge Thickening Polymer Used	Avoided Natural Gas/Elect Use via Effluent Heat	
	(pe)	(m3/d)	(dry t/yr)	(m3/yr)	(GJ/yr)	(m3/yr)	(kWh/yr)	(L/yr)	(kg/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)
2008														
2009														
2010														
2011														
2012														
2013														
2014														
2015	47,656	16,125	1,035	0	36,488	29,428	3,972,797	-	0	286	0.0	0.0	-1,385	-1,099
2016	48,074	16,157	1,044	0	44,864	29,487	3,980,681	-	0	287	0.0	0.0	-1,703	-1,417
2017	48,491	16,189	1,053	0	53,241	29,545	3,988,565	-	0	287	0.0	0.0	-2,021	-1,734
2018	48,909	16,221	1,062	0	61,617	29,603	3,996,449	-	0	288	0.0	0.0	-2,339	-2,052
2019	49,326	16,253	1,071	0	69,994	29,662	4,004,333	-	0	288	0.0	0.0	-2,657	-2,369
2020	49,744	16,285	1,080	0	78,371	29,720	4,012,217	-	0	289	0.0	0.0	-2,975	-2,687
2021	50,161	16,317	1,089	0	86,747	29,779	4,020,101	-	0	289	0.0	0.0	-3,294	-3,004
2022	50,579	16,349	1,098	0	95,124	29,837	4,027,985	-	0	290	0.0	0.0	-3,612	-3,322
2023	50,996	16,381	1,108	0	103,500	29,895	4,035,869	-	0	291	0.0	0.0	-3,930	-3,639
2024	51,414	16,413	1,117	0	111,877	29,954	4,043,753	-	0	291	0.0	0.0	-4,248	-3,956
2025	51,831	16,445	1,126	0	120,253	30,012	4,051,637	-	0	292	0.0	0.0	-4,566	-4,274
2026	52,249	16,477	1,135	0	128,630	30,071	4,059,521	-	0	292	0.0	0.0	-4,884	-4,591
2027	52,666	16,509	1,144	0	137,007	30,129	4,067,405	-	0	293	0.0	0.0	-5,202	-4,909
2028	53,084	16,541	1,153	0	145,383	30,187	4,075,289	-	0	293	0.0	0.0	-5,520	-5,226
2029	53,501	16,573	1,162	0	153,760	30,246	4,083,173	-	0	294	0.0	0.0	-5,838	-5,544
2030	53,919	16,605	1,171	0	162,136	30,304	4,091,057	-	0	295	0.0	0.0	-6,156	-5,861
2031	54,470	16,673	1,183	0	163,871	30,428	4,107,794	-	0	296	0.0	0.0	-6,222	-5,926
2032	55,021	16,741	1,195	0	165,605	30,552	4,124,531	-	0	297	0.0	0.0	-6,287	-5,991
2033	55,573	16,809	1,207	0	167,339	30,676	4,141,268	-	0	298	0.0	0.0	-6,353	-6,055
2034	56,124	16,877	1,219	0	169,074	30,800	4,158,005	-	0	299	0.0	0.0	-6,419	-6,120
2035	56,675	16,945	1,231	0	170,808	30,924	4,174,742	-	0	301	0.0	0.0	-6,485	-6,184
2036	57,226	17,013	1,243	0	172,543	31,048	4,191,479	-	0	302	0.0	0.0	-6,551	-6,249
2037	57,777	17,081	1,255	0	174,277	31,172	4,208,216	-	0	303	0.0	0.0	-6,617	-6,314
2038	58,329	17,148	1,267	0	176,011	31,296	4,224,953	-	0	304	0.0	0.0	-6,683	-6,378
2039	58,880	17,216	1,279	0	177,746	31,420	4,241,691	-	0	305	0.0	0.0	-6,748	-6,443
2040	59,431	17,284	1,291	0	179,480	31,544	4,258,428	-	0	307	0.0	0.0	-6,814	-6,508
2041	59,982	17,352	1,303	0	181,215	31,668	4,275,165	-	0	308	0.0	0.0	-6,880	-6,572
2042	60,533	17,420	1,315	0	182,949	31,792	4,291,902	-	0	309	0.0	0.0	-6,946	-6,637
2043	61,085	17,488	1,327	0	184,683	31,916	4,308,639	-	0	310	0.0	0.0	-7,012	-6,702
2044	61,636	17,556	1,339	0	186,418	32,040	4,325,376	-	0	311	0.0	0.0	-7,078	-6,766
2045	62,187	17,624	1,351	0	188,152	32,164	4,342,113	-	0	313	0.0	0.0	-7,144	-6,831
2046	62,252	17,602	1,352	0	195,957	32,123	4,336,631	-	0	312	0.0	0.0	-7,440	-7,128
2047	62,317	17,580	1,353	0	203,762	32,083	4,331,149	-	0	312	0.0	0.0	-7,736	-7,424
2048	62,382	17,557	1,355	0	211,566	32,042	4,325,667	-	0	311	0.0	0.0	-8,033	-7,721
2049	62,447	17,535	1,356	0	219,371	32,001	4,320,186	-	0	311	0.0	0.0	-8,329	-8,018
2050	62,512	17,513	1,358	0	227,176	31,961	4,314,704	-	0	311	0.0	0.0	-8,625	-8,314
2051	62,576	17,491	1,359	0	234,981	31,920	4,309,222	-	0	310	0.0	0.0	-8,921	-8,611
2052	62,641	17,468	1,360	0	242,785	31,880	4,303,740	-	0	310	0.0	0.0	-9,218	-8,908
2053	62,706	17,446	1,362	0	250,590	31,839	4,298,258	-	0	309	0.0	0.0	-9,514	-9,205
2054	62,771	17,424	1,363	0	258,395	31,798	4,292,776	-	0	309	0.0	0.0	-9,810	-9,501
2055	62,836	17,402	1,365	0	266,200	31,758	4,287,295	-	0	309	0.0	0.0	-10,107	-9,798
2056	62,901	17,379	1,366	0	274,004	31,717	4,281,813	-	0	308	0.0	0.0	-10,403	-10,095
2057	62,966	17,357	1,367	0	281,809	31,677	4,276,331	-	0	308	0.0	0.0	-10,699	-10,392
2058	63,031	17,335	1,369	0	289,614	31,636	4,270,849	-	0	308	0.0	0.0	-10,996	-10,688
2059	63,096	17,313	1,370	0	290,628	31,595	4,265,367	-	0	307	0.0	0.0	-11,034	-10,727
2060	63,161	17,290	1,372	0	291,307	31,555	4,259,885	-	0	307	0.0	0.0	-11,060	-10,753
2061	63,225	17,268	1,373	0	291,987	31,514	4,254,404	-	0	306	0.0	0.0	-11,086	-10,779
2062	63,290	17,246	1,375	0	292,666	31,473	4,248,922	-	0	306	0.0	0.0	-11,112	-10,806
2063	63,355	17,224	1,376	0	293,346	31,433	4,243,440	-	0	306	0.0	0.0	-11,137	-10,832
2064	63,420	17,201	1,377	0	294,025	31,392	4,237,958	-	0	305	0.0	0.0	-11,163	-10,858
2065	63,485	17,179	1,379	0	294,705	31,352	4,232,476	-	0	305	0.0	0.0	-11,189	-10,884
Totals =					9,434,036		1,582,046	213,576,205	0	15,377	0	0	-358,180	**-342,803**

SAANICH EAST WWTF ASSUMPTIONS

Electricity:

"base" unit power requirement =	0.600	kW-hr/d per m3/d of ADWF treated wastewater	**Ref:** Based on Jan 15/09 TM from T. Dokken.
wastewater strength adjustment =	0	x "base" unit power requirement	**Note:** Not required as WW BOD = 260 mg/L (i.e. typical)
influent pumping power adjustment =	0.075	x "base" unit power requirement	**Ref:** Based on Table 1.4, WEF ___.
UV disinfection power adjustment =	0	x "base" unit power requirement	**Note:** Not required - effluent to marine environment.
effluent pumping power adjustment =	0.05	x "base" unit power requirement	**Note:** Not required for ADWF effluent disposal. Allowance is for heat recovery pumping; i.e. pumping effluent to a nearby District Energy System for use by others.
raw sludge thickening adjustment =	0	x "base" unit power requirement	**Note:** Not required - sludge to sewer.
total unit power requirement =	0.675	kW-hr/d per m3/d of ADWF treated wastewater	

Raw Sludge Thickening and Truck Transport:

thickening required (1 = yes, 0 = no)?	0	
chemical-P removal chemical sludge production allowance =	0%	of combined PS + WBS
round-trip transport distance to solids processing facility =	0	km

Saleable Reclaimed Water:

mean fraction of annual ADWF volume sold for landscape irrigation =	0.50%	/yr	**Note:** See dnt_eff_irr_ds.xls for assumptions and details. Reclaimed water used for toilet flushing handled separately in analysis. See Flush Rev LCA worksheet.

Notes:
1. Data from M. Homenuke in Feb 4/09 e-mail, DES_SaleableHeatEnergy.xls, Saleable.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 18, 2009
Last Revision By: D. Shiskowski

Subject: Saanich East WWTF
Option 1

Life Cycle Analysis

Yellow-shaded cell denotes assumed/input values

Year	Capital Costs		Operation & Maintenance Costs												GHG CO2e		Heat Revenues		Reclaimed Water Revenues (irrigation only)		Total	
			Labour		Electricity		Diesel Fuel		Chemicals		Maintenance		Administration									
	Total Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Rev	Net Present Value	Total Annual Rev	Net Present Value	Total Annual Cost	Net Present Value
2008																						
2009																						
2010																						
2011																						
2012																						
2013																						
2014	$126,009,560	$99,587,186																			$126,009,560	$99,587,186
2015	$0		$375,000	$284,969	$278,096	$211,330	$0	$0	$63,498	$48,253	$1,260,096	$957,569	$100,000	$75,992	-$16,489	-$12,530	-$195,245	-$148,371	-$21,188	-$16,101	$1,843,766	$1,401,111
2016	$0		$375,000	$274,009	$278,648	$203,605	$0	$0	$63,624	$46,489	$1,260,096	$920,740	$100,000	$73,069	-$21,251	-$15,528	-$240,069	-$175,416	-$21,230	-$15,513	$1,794,817	$1,311,455
2017	$0		$375,000	$263,470	$279,200	$196,162	$0	$0	$63,750	$44,790	$1,260,096	$885,326	$100,000	$70,259	-$26,013	-$18,276	-$284,892	-$200,161	-$21,272	-$14,946	$1,745,868	$1,226,624
2018	$0		$375,000	$253,337	$279,751	$188,990	$0	$0	$63,876	$43,152	$1,260,096	$851,275	$100,000	$67,556	-$30,775	-$20,791	-$329,715	-$222,743	-$21,314	-$14,399	$1,696,919	$1,146,378
2019	$0		$375,000	$243,593	$280,303	$182,080	$0	$0	$64,002	$41,574	$1,260,096	$818,534	$100,000	$64,956	-$35,537	-$23,084	-$374,538	-$243,292	-$21,356	-$13,873	$1,647,970	$1,070,490
2020	$0		$375,000	$234,224	$280,855	$175,421	$0	$0	$64,128	$40,054	$1,260,096	$787,052	$100,000	$62,460	-$40,299	-$25,171	-$419,361	-$261,931	-$21,398	-$13,365	$1,599,020	$998,743
2021	$0		$375,000	$225,215	$281,407	$169,006	$0	$0	$64,254	$38,589	$1,260,096	$756,781	$100,000	$60,057	-$45,061	-$27,062	-$464,184	-$278,777	-$21,441	-$12,877	$1,550,071	$930,933
2022	$0		$375,000	$216,553	$281,959	$162,824	$0	$0	$64,380	$37,178	$1,260,096	$727,674	$100,000	$57,748	-$49,823	-$28,771	-$509,007	-$293,939	-$21,483	-$12,406	$1,501,122	$866,861
2023	$0		$375,000	$208,224	$282,511	$156,868	$0	$0	$64,506	$35,818	$1,260,096	$699,686	$100,000	$55,526	-$54,585	-$30,309	-$553,830	-$307,522	-$21,525	-$11,952	$1,452,173	$806,340
2024	$0		$375,000	$200,216	$283,063	$151,129	$0	$0	$64,632	$34,507	$1,260,096	$672,775	$100,000	$53,391	-$59,347	-$31,686	-$598,653	-$319,626	-$21,567	-$11,515	$1,403,224	$749,193
2025	$0		$375,000	$192,515	$283,615	$145,600	$0	$0	$64,758	$33,245	$1,260,096	$646,899	$100,000	$51,337	-$64,109	-$32,912	-$643,476	-$330,343	-$21,609	-$11,093	$1,354,275	$695,248
2026	$0		$375,000	$185,111	$284,166	$140,273	$0	$0	$64,884	$32,029	$1,260,096	$622,019	$100,000	$49,363	-$68,871	-$33,997	-$688,299	-$339,764	-$21,651	-$10,687	$1,305,326	$644,345
2027	$0		$375,000	$177,991	$284,718	$135,139	$0	$0	$65,010	$30,856	$1,260,096	$598,095	$100,000	$47,464	-$73,633	-$34,949	-$733,122	-$347,971	-$21,693	-$10,296	$1,256,376	$596,330
2028	$0		$375,000	$171,145	$285,270	$130,194	$0	$0	$65,136	$29,727	$1,260,096	$575,091	$100,000	$45,639	-$78,395	-$35,778	-$777,945	-$355,044	-$21,735	-$9,920	$1,207,427	$551,054
2029	$0		$375,000	$164,563	$285,822	$125,428	$0	$0	$65,262	$28,639	$1,260,096	$552,972	$100,000	$43,883	-$83,157	-$36,492	-$822,768	-$361,058	-$21,777	-$9,556	$1,158,478	$508,379
2030	$10,296,000	$4,344,453	$375,000	$158,233	$286,374	$120,837	$0	$0	$65,388	$27,591	$1,363,056	$575,149	$100,000	$42,196	-$87,919	-$37,098	-$867,591	-$366,085	-$21,819	-$9,207	$11,508,489	$4,856,069
2031	$0		$375,000	$152,147	$287,546	$116,665	$0	$0	$65,655	$26,638	$1,363,056	$553,028	$100,000	$40,573	-$88,888	-$36,064	-$876,872	-$355,770	-$21,908	-$8,889	$1,203,588	$488,328
2032	$0		$375,000	$146,296	$288,717	$112,635	$0	$0	$65,923	$25,718	$1,363,056	$531,757	$100,000	$39,012	-$89,858	-$35,056	-$886,152	-$345,707	-$21,997	-$8,582	$1,194,688	$466,073
2033	$0		$375,000	$140,669	$289,889	$108,742	$0	$0	$66,190	$24,829	$1,363,056	$511,305	$100,000	$37,512	-$90,828	-$34,071	-$895,433	-$335,892	-$22,087	-$8,285	$1,185,787	$444,809
2034	$0		$375,000	$135,258	$291,060	$104,982	$0	$0	$66,458	$23,971	$1,363,056	$491,639	$100,000	$36,069	-$91,797	-$33,110	-$904,714	-$326,321	-$22,176	-$7,999	$1,176,887	$424,490
2035	$0		$375,000	$130,056	$292,232	$101,351	$0	$0	$66,725	$23,142	$1,363,056	$472,730	$100,000	$34,682	-$92,767	-$32,173	-$913,995	-$316,988	-$22,265	-$7,722	$1,167,986	$405,077
2036	$0		$375,000	$125,054	$293,404	$97,843	$0	$0	$66,993	$22,341	$1,363,056	$454,548	$100,000	$33,348	-$93,737	-$31,259	-$923,275	-$307,892	-$22,355	-$7,455	$1,159,086	$386,529
2037	$0		$375,000	$120,244	$294,575	$94,456	$0	$0	$67,261	$21,567	$1,363,056	$437,066	$100,000	$32,065	-$94,706	-$30,368	-$932,556	-$299,025	-$22,444	-$7,197	$1,150,185	$368,808
2038	$0		$375,000	$115,620	$295,747	$91,184	$0	$0	$67,528	$20,820	$1,363,056	$420,255	$100,000	$30,832	-$95,676	-$29,499	-$941,837	-$290,386	-$22,533	-$6,947	$1,141,285	$351,879
2039	$0		$375,000	$111,173	$296,918	$88,024	$0	$0	$67,796	$20,099	$1,363,056	$404,092	$100,000	$29,646	-$96,646	-$28,652	-$951,118	-$281,969	-$22,622	-$6,707	$1,132,384	$335,707
2040	$0		$375,000	$106,897	$298,090	$84,973	$0	$0	$68,063	$19,402	$1,363,056	$388,550	$100,000	$28,506	-$97,615	-$27,826	-$960,398	-$273,769	-$22,712	-$6,474	$1,123,483	$320,258
2041	$0		$375,000	$102,785	$299,262	$82,026	$0	$0	$68,331	$18,729	$1,363,056	$373,606	$100,000	$27,409	-$98,585	-$27,022	-$969,679	-$265,783	-$22,801	-$6,250	$1,114,583	$305,501
2042	$0		$375,000	$98,832	$300,433	$79,180	$0	$0	$68,598	$18,079	$1,363,056	$359,236	$100,000	$26,355	-$99,555	-$26,238	-$978,960	-$258,007	-$22,890	-$6,033	$1,105,682	$291,405
2043	$0		$375,000	$95,031	$301,605	$76,431	$0	$0	$68,866	$17,452	$1,363,056	$345,419	$100,000	$25,342	-$100,524	-$25,474	-$988,240	-$250,435	-$22,979	-$5,823	$1,096,782	$277,941
2044	$0		$375,000	$91,376	$302,776	$73,777	$0	$0	$69,133	$16,846	$1,363,056	$332,134	$100,000	$24,367	-$101,494	-$24,731	-$997,521	-$243,065	-$23,069	-$5,621	$1,087,881	$265,083
2045	$0		$375,000	$87,861	$303,948	$71,214	$0	$0	$69,401	$16,260	$1,363,056	$319,360	$100,000	$23,430	-$102,464	-$24,007	-$1,006,802	-$235,891	-$23,158	-$5,426	$1,078,981	$252,802
2046	$0		$375,000	$84,482	$303,564	$68,389	$0	$0	$69,313	$15,615	$1,363,056	$307,077	$100,000	$22,529	-$106,914	-$24,086	-$1,048,565	-$236,226	-$23,129	-$5,211	$1,032,325	$232,568
2047	$0		$375,000	$81,233	$303,180	$65,675	$0	$0	$69,225	$14,996	$1,363,056	$295,266	$100,000	$21,662	-$111,365	-$24,124	-$1,090,328	-$236,188	-$23,099	-$5,004	$985,668	$213,516
2048	$0		$375,000	$78,108	$302,797	$63,069	$0	$0	$69,138	$14,401	$1,363,056	$283,910	$100,000	$20,829	-$115,816	-$24,123	-$1,132,092	-$235,802	-$23,070	-$4,805	$939,012	$195,586
2049	$0		$375,000	$75,104	$302,413	$60,567	$0	$0	$69,050	$13,829	$1,363,056	$272,990	$100,000	$20,028	-$120,267	-$24,087	-$1,173,855	-$235,097	-$23,041	-$4,615	$892,356	$178,719
2050	$0		$375,000	$72,216	$302,029	$58,163	$0	$0	$68,963	$13,280	$1,363,056	$262,490	$100,000	$19,257	-$124,717	-$24,017	-$1,215,618	-$234,098	-$23,012	-$4,431	$845,700	$162,861
2051	$0		$375,000	$69,438	$301,646	$55,855	$0	$0	$68,875	$12,753	$1,363,056	$252,395	$100,000	$18,517	-$129,168	-$23,918	-$1,257,382	-$232,827	-$22,983	-$4,256	$799,044	$147,958
2052	$0		$375,000	$66,767	$301,262	$53,639	$0	$0	$68,787	$12,247	$1,363,056	$242,687	$100,000	$17,805	-$133,619	-$23,790	-$1,299,145	-$231,308	-$22,953	-$4,087	$752,388	$133,960
2053	$0		$375,000	$64,199	$300,878	$51,510	$0	$0	$68,700	$11,761	$1,363,056	$233,353	$100,000	$17,120	-$138,070	-$23,637	-$1,340,908	-$229,561	-$22,924	-$3,925	$705,732	$120,820
2054	$0		$375,000	$61,730	$300,494	$49,466	$0	$0	$68,612	$11,294	$1,363,056	$224,378	$100,000	$16,461	-$142,520	-$23,461	-$1,382,671	-$227,607	-$22,895	-$3,769	$659,076	$108,493
2055	$0		$375,000	$59,356	$300,111	$47,502	$0	$0	$68,524	$10,846	$1,363,056	$215,748	$100,000	$15,828	-$146,971	-$23,263	-$1,424,435	-$225,463	-$22,866	-$3,619	$612,419	$96,935
2056	$0		$375,000	$57,073	$299,727	$45,617	$0	$0	$68,437	$10,416	$1,363,056	$207,450	$100,000	$15,219	-$151,422	-$23,046	-$1,466,198	-$223,148	-$22,836	-$3,476	$565,763	$86,106
2057	$0		$375,000	$54,878	$299,343	$43,806	$0	$0	$68,349	$10,002	$1,363,056	$199,471	$100,000	$14,634	-$155,873	-$22,811	-$1,507,961	-$220,677	-$22,807	-$3,338	$519,107	$75,967
2058	$0		$375,000	$52,767	$298,959	$42,067	$0	$0	$68,262	$9,605	$1,363,056	$191,799	$100,000	$14,071	-$160,323	-$22,560	-$1,549,725	-$218,066	-$22,778	-$3,205	$472,451	$66,480
2059	$0		$375,000	$50,738	$298,576	$40,397	$0	$0	$68,174	$9,224	$1,363,056	$184,422	$100,000	$13,530	-$160,906	-$21,771	-$1,555,148	-$210,413	-$22,749	-$3,078	$466,002	$63,050
2060	$0		$375,000	$48,786	$298,192	$38,794	$0	$0	$68,086	$8,858	$1,363,056	$177,329	$100,000	$13,010	-$161,299	-$20,985	-$1,558,785	-$202,793	-$22,719	-$2,956	$461,531	$60,044
2061	$0		$375,000	$46,910	$297,808	$37,254	$0	$0	$67,999	$8,506	$1,363,056	$170,509	$100,000	$12,509	-$161,692	-$20,227	-$1,562,421	-$195,448	-$22,690	-$2,838	$457,060	$57,175
2062	$0		$375,000	$45,106	$297,425	$35,775	$0	$0	$67,911	$8,168	$1,363,056	$163,951	$100,000	$12,028	-$162,085	-$19,496	-$1,566,057	-$188,368	-$22,661	-$2,726	$452,588	$54,438
2063	$0		$375,000	$43,371	$297,041	$34,354	$0	$0	$67,824	$7,844	$1,363,056	$157,645	$100,000	$11,566	-$162,478	-$18,791	-$1,569,693	-$181,544	-$22,632	-$2,617	$448,117	$51,827
2064	$0		$375,000	$41,703	$296,657	$32,990	$0	$0	$67,736	$7,533	$1,363,056	$151,582	$100,000	$11,121	-$162,871	-$18,112	-$1,573,329	-$174,966	-$22,602	-$2,514	$443,646	$49,337
2065	$0		$375,000	$40,099	$296,273	$31,681	$0	$0	$67,648	$7,234	$1,363,056	$145,752	$100,000	$10,693	-$163,264	-$17,458	-$1,576,965	-$168,625	-$22,573	-$2,414	$439,175	$46,961
Total Capital =	$136,305,560																					
Total Net Present Value =		$103,931,638		$6,406,730		$4,934,941		$0		$1,126,798		$22,382,565		$1,708,461		-$1,333,745		-$13,247,165		-$375,995	$190,103,310	**$125,534,228**

SAANICH EAST WWTF ASSUMPTIONS

Labour:
number of facility manager(s) = 1
number of operations staff = 2
number of maintenance staff = 2
number of administration staff = 0
total staff = 5 persons

Ref: Based on Jan 15/09 TM from T. Dokken.

Chemical Phosphorus Removal Chemicals:
chemical-P removal required (1 = yes, 0 = no)? 0

Wet-Weather CEPT Chemicals:
fraction of total annual ADWF treated = 5.0%

Ref: Allowance to account for potential costs.

Reclaimed Water Disinfection:
allowance = 10.0% of other chemical costs

Ref: Allowance to account for potential costs.

Saleable Heat Energy:
unit energy cost to third-party "heat recovery" utility = $ 8.65 /GJ
unit CRD saleable energy price to third-party utility = $ 5.35 /GJ

Ref: This is the cost that a third-party heat recovery utility would incur to make the heat available to customers. Value is from Table 6 of Feb 10/09 memo from M. Homenuke, reduced by 7% to remove CRD share of capital cost.
Note: This value is the difference between the general energy market unit price (from Generic Assumptions sheet) and the above value, which reflects the maximum amount the utility would be willing to pay the CRD for the heat.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: March 6, 2009
Last Revision By: D. Shiskowski

Subject: South Colwood WWTF (Liquid-Stream) Option 1

Material Flows and Carbon Footprint Analysis

Yellow-shaded cell denotes assumed/input values

Year	Equivalent Population	Wastewater ADWF	Sludge Production and Truck Transport		Saleable Effluent Heat[1]	Saleable Reclaimed Water (irrigation only)	Materials			GHG Sources			GHG Offsets	Total GHG Emissions
			Mass	Thickened Volume			Electricity	Diesel Fuel	Sludge Thickening Polymer	Electricity Purchased	Diesel Fuel Combusted	Sludge Thickening Polymer Used	Avoided Natural Gas/Elect Use via Effluent Heat2	
	(pe)	(m3/d)	(dry t/yr)	(m3/yr)	(GJ/yr)	(m3/yr)	(kWh/yr)	(L/yr)	(kg/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)
2008														
2009														
2010														
2011														
2012														
2013														
2014														
2015	47,329	11,750	1,028	0	43,861	10,722	3,023,569	-	0	218	0.0	0.0	0	218
2016	50,922	12,510	1,106	0	56,341	11,415	3,219,016	-	0	232	0.0	0.0	0	232
2017	54,516	13,269	1,184	0	68,821	12,108	3,414,463	-	0	246	0.0	0.0	0	246
2018	58,109	14,029	1,262	0	81,301	12,801	3,609,909	-	0	260	0.0	0.0	0	260
2019	61,703	14,788	1,340	0	93,781	13,494	3,805,356	-	0	274	0.0	0.0	0	274
2020	65,296	15,548	1,418	0	106,260	14,187	4,000,803	-	0	288	0.0	0.0	0	288
2021	68,890	16,307	1,496	0	118,740	14,880	4,196,250	-	0	302	0.0	0.0	0	302
2022	72,483	17,067	1,574	0	131,220	15,573	4,391,697	-	0	316	0.0	0.0	0	316
2023	76,077	17,826	1,652	0	143,700	16,266	4,587,144	-	0	330	0.0	0.0	0	330
2024	79,670	18,586	1,730	0	156,180	16,960	4,782,591	-	0	344	0.0	0.0	0	344
2025	83,264	19,345	1,808	0	168,660	17,653	4,978,038	-	0	358	0.0	0.0	0	358
2026	86,857	20,105	1,886	0	181,140	18,346	5,173,485	-	0	372	0.0	0.0	0	372
2027	90,451	20,864	1,964	0	193,620	19,039	5,368,932	-	0	387	0.0	0.0	0	387
2028	94,044	21,624	2,042	0	206,100	19,732	5,564,379	-	0	401	0.0	0.0	0	401
2029	97,638	22,383	2,120	0	218,580	20,425	5,759,826	-	0	415	0.0	0.0	0	415
2030	101,231	23,143	2,198	0	231,060	21,118	5,955,272	-	0	429	0.0	0.0	0	429
2031	103,684	23,585	2,252	0	232,183	21,521	6,068,993	-	0	437	0.0	0.0	0	437
2032	106,138	24,027	2,305	0	233,305	21,925	6,182,713	-	0	445	0.0	0.0	0	445
2033	108,591	24,469	2,358	0	234,428	22,328	6,296,434	-	0	453	0.0	0.0	0	453
2034	111,045	24,911	2,412	0	235,551	22,731	6,410,154	-	0	462	0.0	0.0	0	462
2035	113,498	25,353	2,465	0	236,674	23,134	6,523,875	-	0	470	0.0	0.0	0	470
2036	115,951	25,795	2,518	0	237,797	23,538	6,637,595	-	0	478	0.0	0.0	0	478
2037	118,405	26,237	2,571	0	238,920	23,941	6,751,316	-	0	486	0.0	0.0	0	486
2038	120,858	26,678	2,625	0	240,043	24,344	6,865,036	-	0	494	0.0	0.0	0	494
2039	123,312	27,120	2,678	0	241,165	24,747	6,978,757	-	0	502	0.0	0.0	0	502
2040	125,765	27,562	2,731	0	242,288	25,151	7,092,477	-	0	511	0.0	0.0	0	511
2041	128,218	28,004	2,785	0	243,411	25,554	7,206,198	-	0	519	0.0	0.0	0	519
2042	130,672	28,446	2,838	0	244,534	25,957	7,319,918	-	0	527	0.0	0.0	0	527
2043	133,125	28,888	2,891	0	245,657	26,360	7,433,639	-	0	535	0.0	0.0	0	535
2044	135,579	29,330	2,944	0	246,780	26,764	7,547,359	-	0	543	0.0	0.0	0	543
2045	138,032	29,772	2,998	0	247,903	27,167	7,661,080	-	0	552	0.0	0.0	0	552
2046	140,567	30,200	3,053	0	252,956	27,558	7,771,318	-	0	560	0.0	0.0	0	560
2047	143,102	30,629	3,108	0	258,008	27,949	7,881,556	-	0	567	0.0	0.0	0	567
2048	145,637	31,057	3,163	0	263,061	28,340	7,991,794	-	0	575	0.0	0.0	0	575
2049	148,173	31,486	3,218	0	268,114	28,731	8,102,032	-	0	583	0.0	0.0	0	583
2050	150,708	31,914	3,273	0	273,167	29,122	8,212,270	-	0	591	0.0	0.0	0	591
2051	153,243	32,342	3,328	0	278,220	29,512	8,322,508	-	0	599	0.0	0.0	0	599
2052	155,778	32,771	3,383	0	283,273	29,903	8,432,746	-	0	607	0.0	0.0	0	607
2053	158,313	33,199	3,438	0	288,326	30,294	8,542,984	-	0	615	0.0	0.0	0	615
2054	160,848	33,628	3,493	0	293,379	30,685	8,653,222	-	0	623	0.0	0.0	0	623
2055	163,384	34,056	3,548	0	298,431	31,076	8,763,460	-	0	631	0.0	0.0	0	631
2056	165,919	34,484	3,603	0	303,484	31,467	8,873,698	-	0	639	0.0	0.0	0	639
2057	168,454	34,913	3,658	0	308,537	31,858	8,983,936	-	0	647	0.0	0.0	0	647
2058	170,989	35,341	3,713	0	313,590	32,249	9,094,174	-	0	655	0.0	0.0	0	655
2059	173,524	35,770	3,769	0	318,643	32,640	9,204,412	-	0	663	0.0	0.0	0	663
2060	176,059	36,198	3,824	0	323,696	33,031	9,314,650	-	0	671	0.0	0.0	0	671
2061	178,594	36,626	3,879	0	328,749	33,422	9,424,888	-	0	679	0.0	0.0	0	679
2062	181,130	37,055	3,934	0	333,802	33,813	9,535,126	-	0	687	0.0	0.0	0	687
2063	183,665	37,483	3,989	0	338,854	34,203	9,645,364	-	0	694	0.0	0.0	0	694
2064	186,200	37,912	4,044	0	343,907	34,594	9,755,602	-	0	702	0.0	0.0	0	702
2065	188,735	38,340	4,099	0	348,960	34,985	9,865,841	-	0	710	0.0	0.0	0	710
Totals =					11,819,162	1,245,312	351,177,861	0		25,285	0	0	0	**25,285**

SOUTH COLWOOD WWTF ASSUMPTIONS (Liquid-Stream)

Electricity:

"base" unit power requirement =	0.600	kW-hr/d per m3/d of ADWF treated wastewater	**Ref:** Based on Jan 15/09 TM from T. Dokken.
wastewater strength adjustment =	0	x "base" unit power requirement	**Note:** Not required as WW BOD = 260 mg/L (i.e. typical)
influent pumping power adjustment =	0.075	x "base" unit power requirement	**Ref:** Based on Table 1.4. WEF .
recycled centrate aeration power adjustment =	0.050	x "base" unit power requirement	**Note:** Assuming extra N load is 15% of total facility N load and aeration electrical demand makes up one-half of total facility electrical demand.
UV disinfection power adjustment =	0	x "base" unit power requirement	**Note:** Not required - effluent to marine environment.
effluent pumping power adjustment =	0.05	x "base" unit power requirement	**Note:** Not required for ADWF effluent disposal. Allowance is for heat recovery pumping; i.e. pumping effluent to a nearby District Energy System for use by others.
raw sludge thickening adjustment =	0	x "base" unit power requirement	**Note:** Not required - sludge to sewer.
total unit power requirement =	0.705	kW-hr/d per m3/d of ADWF treated wastewater	

Raw Sludge Thickening and Truck Transport:

thickening required (1 = yes, 0 = no)?	0	
chemical-P removal chemical sludge production allowance =	0%	of combined PS + WBS
round-trip transport distance to solids processing facility =	0	km

Saleable Reclaimed Water:

mean fraction of annual ADWF volume sold for landscape irrigation =	0.25%	/yr	**Note:** See dnt_eff_irr_ds.xls for assumptions and details. Reclaimed water used for toilet flushing handled separately in analysis. See Flush Rev LCA worksheet.

Notes:
1. Data from M. Homenuke in Feb 4/09 e-mail, DES_SaleableHeatEnergy.xls, Saleable.
2. Set to zero since heat would not be sold - see LCA sheet.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: March 6, 2009
Last Revision By: D. Shiskowski

Subject: South Colwood WWTF
(Liquid-Stream)
Option 1
Life Cycle Analysis

Yellow-shaded cell denotes assumed/input values

Year	Capital Costs[1]		Operation & Maintenance Costs												GHG CO2e		Heat Revenues		Reclaimed Water Revenues (irrigation only)		Total	
			Labour		Electricity		Diesel Fuel		Chemicals		Maintenance		Administration									
	Total Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Rev	Net Present Value	Total Annual Rev	Net Present Value	Total Annual Cost	Net Present Value
2008																						
2009																						
2010																						
2011																						
2012																						
2013																						
2014	$91,542,360	$72,347,257																			$91,542,360	$72,347,257
2015		$0	$450,000	$341,963	$211,650	$160,836	$0	$0	$46,270	$35,161	$915,424	$695,647	$100,000	$75,992	$3,265	$2,481	$0	$0	-$7,720	-$5,866	$1,718,889	$1,306,214
2016		$0	$450,000	$328,811	$225,331	$164,647	$0	$0	$49,261	$35,994	$915,424	$668,891	$100,000	$73,069	$3,477	$2,540	$0	$0	-$8,219	-$6,005	$1,735,273	$1,267,947
2017		$0	$450,000	$316,164	$239,012	$167,927	$0	$0	$52,252	$36,711	$915,424	$643,164	$100,000	$70,259	$3,688	$2,591	$0	$0	-$8,718	-$6,125	$1,751,657	$1,230,691
2018		$0	$450,000	$304,004	$252,694	$170,711	$0	$0	$55,242	$37,320	$915,424	$618,427	$100,000	$67,556	$3,899	$2,634	$0	$0	-$9,217	-$6,227	$1,768,042	$1,194,426
2019		$0	$450,000	$292,311	$266,375	$173,032	$0	$0	$58,233	$37,827	$915,424	$594,642	$100,000	$64,958	$4,110	$2,670	$0	$0	-$9,716	-$6,311	$1,784,426	$1,159,129
2020		$0	$450,000	$281,069	$280,056	$174,922	$0	$0	$61,224	$38,241	$915,424	$571,771	$100,000	$62,460	$4,321	$2,699	$0	$0	-$10,215	-$6,380	$1,800,810	$1,124,781
2021		$0	$450,000	$270,258	$293,738	$176,411	$0	$0	$64,215	$38,566	$915,424	$549,780	$100,000	$60,057	$4,532	$2,722	$0	$0	-$10,714	-$6,434	$1,817,194	$1,091,360
2022		$0	$450,000	$259,864	$307,419	$177,527	$0	$0	$67,206	$38,810	$915,424	$528,634	$100,000	$57,748	$4,743	$2,739	$0	$0	-$11,213	-$6,475	$1,833,579	$1,058,846
2023		$0	$450,000	$249,869	$321,100	$178,295	$0	$0	$70,197	$38,978	$915,424	$508,302	$100,000	$55,526	$4,954	$2,751	$0	$0	-$11,712	-$6,503	$1,849,963	$1,027,219
2024		$0	$450,000	$240,259	$334,781	$178,743	$0	$0	$73,188	$39,076	$915,424	$488,752	$100,000	$53,391	$5,165	$2,758	$0	$0	-$12,211	-$6,519	$1,866,347	$996,458
2025		$0	$450,000	$231,018	$348,463	$178,891	$0	$0	$76,179	$39,108	$915,424	$469,954	$100,000	$51,337	$5,376	$2,760	$0	$0	-$12,710	-$6,525	$1,882,732	$966,544
2026		$0	$450,000	$222,133	$362,144	$178,764	$0	$0	$79,170	$39,080	$915,424	$451,879	$100,000	$49,363	$5,587	$2,758	$0	$0	-$13,209	-$6,520	$1,899,116	$937,457
2027		$0	$450,000	$213,589	$375,825	$178,383	$0	$0	$82,161	$38,997	$915,424	$434,499	$100,000	$47,464	$5,798	$2,752	$0	$0	-$13,708	-$6,506	$1,915,500	$909,178
2028		$0	$450,000	$205,374	$389,507	$177,766	$0	$0	$85,152	$38,862	$915,424	$417,787	$100,000	$45,639	$6,010	$2,743	$0	$0	-$14,207	-$6,484	$1,931,884	$881,687
2029		$0	$450,000	$197,475	$403,188	$176,932	$0	$0	$88,143	$38,680	$915,424	$401,719	$100,000	$43,883	$6,221	$2,730	$0	$0	-$14,706	-$6,453	$1,948,269	$854,966
2030	$47,338,200	$19,974,608	$450,000	$189,880	$416,869	$175,900	$0	$0	$91,134	$38,454	$1,388,806	$586,014	$100,000	$42,196	$6,432	$2,714	$0	$0	-$15,205	-$6,416	$49,776,235	$21,003,350
2031		$0	$450,000	$182,577	$424,830	$172,365	$0	$0	$92,874	$37,681	$1,388,806	$563,475	$100,000	$40,573	$6,555	$2,659	$0	$0	-$15,495	-$6,287	$2,447,568	$993,043
2032		$0	$450,000	$175,555	$432,790	$168,841	$0	$0	$94,614	$36,911	$1,388,806	$541,803	$100,000	$39,012	$6,677	$2,605	$0	$0	-$15,786	-$6,158	$2,457,101	$958,568
2033		$0	$450,000	$168,803	$440,750	$165,333	$0	$0	$96,354	$36,144	$1,388,806	$520,964	$100,000	$37,512	$6,800	$2,551	$0	$0	-$16,076	-$6,030	$2,466,635	$925,276
2034		$0	$450,000	$162,310	$448,711	$161,845	$0	$0	$98,095	$35,382	$1,388,806	$500,927	$100,000	$36,069	$6,923	$2,497	$0	$0	-$16,366	-$5,903	$2,476,168	$893,127
2035		$0	$450,000	$156,067	$456,671	$158,381	$0	$0	$99,835	$34,624	$1,388,806	$481,661	$100,000	$34,682	$7,046	$2,444	$0	$0	-$16,657	-$5,777	$2,485,701	$862,082
2036		$0	$450,000	$150,065	$464,632	$154,944	$0	$0	$101,575	$33,873	$1,388,806	$463,135	$100,000	$33,348	$7,169	$2,391	$0	$0	-$16,947	-$5,651	$2,495,234	$832,104
2037		$0	$450,000	$144,293	$472,592	$151,537	$0	$0	$103,315	$33,128	$1,388,806	$445,322	$100,000	$32,065	$7,291	$2,338	$0	$0	-$17,237	-$5,527	$2,504,767	$803,157
2038		$0	$450,000	$138,743	$480,553	$148,163	$0	$0	$105,056	$32,391	$1,388,806	$428,195	$100,000	$30,832	$7,414	$2,286	$0	$0	-$17,528	-$5,404	$2,514,300	$775,206
2039		$0	$450,000	$133,407	$488,513	$144,825	$0	$0	$106,796	$31,661	$1,388,806	$411,726	$100,000	$29,646	$7,537	$2,234	$0	$0	-$17,818	-$5,282	$2,523,834	$748,216
2040		$0	$450,000	$128,276	$496,473	$141,524	$0	$0	$108,536	$30,939	$1,388,806	$395,890	$100,000	$28,506	$7,660	$2,184	$0	$0	-$18,108	-$5,162	$2,533,367	$722,156
2041		$0	$450,000	$123,342	$504,434	$138,262	$0	$0	$110,277	$30,226	$1,388,806	$380,664	$100,000	$27,409	$7,783	$2,133	$0	$0	-$18,399	-$5,043	$2,542,900	$696,994
2042		$0	$450,000	$118,598	$512,394	$135,043	$0	$0	$112,017	$29,522	$1,388,806	$366,023	$100,000	$26,355	$7,906	$2,084	$0	$0	-$18,689	-$4,926	$2,552,433	$672,699
2043		$0	$450,000	$114,037	$520,355	$131,866	$0	$0	$113,757	$28,828	$1,388,806	$351,945	$100,000	$25,342	$8,028	$2,035	$0	$0	-$18,980	-$4,810	$2,561,966	$649,242
2044		$0	$450,000	$109,651	$528,315	$128,734	$0	$0	$115,497	$28,143	$1,388,806	$338,408	$100,000	$24,367	$8,151	$1,986	$0	$0	-$19,270	-$4,695	$2,571,499	$626,594
2045		$0	$450,000	$105,434	$536,276	$125,648	$0	$0	$117,238	$27,468	$1,388,806	$325,393	$100,000	$23,430	$8,274	$1,939	$0	$0	-$19,560	-$4,583	$2,581,033	$604,728
2046		$0	$450,000	$101,378	$543,992	$122,554	$0	$0	$118,925	$26,792	$1,388,806	$312,878	$100,000	$22,529	$8,393	$1,891	$0	$0	-$19,842	-$4,470	$2,590,274	$583,551
2047		$0	$450,000	$97,479	$551,709	$119,512	$0	$0	$120,612	$26,127	$1,388,806	$300,844	$100,000	$21,662	$8,512	$1,844	$0	$0	-$20,123	-$4,359	$2,599,515	$563,109
2048		$0	$450,000	$93,730	$559,426	$116,522	$0	$0	$122,298	$25,473	$1,388,806	$289,273	$100,000	$20,829	$8,631	$1,798	$0	$0	-$20,405	-$4,250	$2,608,756	$543,375
2049		$0	$450,000	$90,125	$567,142	$113,586	$0	$0	$123,985	$24,832	$1,388,806	$278,147	$100,000	$20,028	$8,750	$1,752	$0	$0	-$20,686	-$4,143	$2,617,997	$524,327
2050		$0	$450,000	$86,659	$574,859	$110,703	$0	$0	$125,672	$24,201	$1,388,806	$267,449	$100,000	$19,257	$8,869	$1,708	$0	$0	-$20,967	-$4,038	$2,627,239	$505,940
2051		$0	$450,000	$83,326	$582,576	$107,874	$0	$0	$127,359	$23,583	$1,388,806	$257,163	$100,000	$18,517	$8,988	$1,664	$0	$0	-$21,249	-$3,935	$2,636,480	$488,192
2052		$0	$450,000	$80,121	$590,292	$105,099	$0	$0	$129,046	$22,976	$1,388,806	$247,272	$100,000	$17,805	$9,107	$1,622	$0	$0	-$21,530	-$3,833	$2,645,721	$471,061
2053		$0	$450,000	$77,039	$598,009	$102,378	$0	$0	$130,733	$22,381	$1,388,806	$237,761	$100,000	$17,120	$9,226	$1,580	$0	$0	-$21,812	-$3,734	$2,654,962	$454,525
2054		$0	$450,000	$74,076	$605,726	$99,711	$0	$0	$132,420	$21,798	$1,388,806	$228,617	$100,000	$16,461	$9,345	$1,538	$0	$0	-$22,093	-$3,637	$2,664,204	$438,565
2055		$0	$450,000	$71,227	$613,442	$97,097	$0	$0	$134,107	$21,227	$1,388,806	$219,824	$100,000	$15,828	$9,465	$1,498	$0	$0	-$22,375	-$3,542	$2,673,445	$423,160
2056		$0	$450,000	$68,488	$621,159	$94,537	$0	$0	$135,794	$20,667	$1,388,806	$211,369	$100,000	$15,219	$9,584	$1,459	$0	$0	-$22,656	-$3,448	$2,682,686	$408,291
2057		$0	$450,000	$65,854	$628,876	$92,030	$0	$0	$137,481	$20,119	$1,388,806	$203,239	$100,000	$14,634	$9,703	$1,420	$0	$0	-$22,938	-$3,357	$2,691,927	$393,940
2058		$0	$450,000	$63,321	$636,592	$89,577	$0	$0	$139,168	$19,583	$1,388,806	$195,422	$100,000	$14,071	$9,822	$1,382	$0	$0	-$23,219	-$3,267	$2,701,169	$380,088
2059		$0	$450,000	$60,885	$644,309	$87,175	$0	$0	$140,855	$19,058	$1,388,806	$187,906	$100,000	$13,530	$9,941	$1,345	$0	$0	-$23,501	-$3,180	$2,710,410	$366,720
2060		$0	$450,000	$58,544	$652,026	$84,826	$0	$0	$142,542	$18,544	$1,388,806	$180,679	$100,000	$13,010	$10,060	$1,309	$0	$0	-$23,782	-$3,094	$2,719,651	$353,818
2061		$0	$450,000	$56,292	$659,742	$82,529	$0	$0	$144,229	$18,042	$1,388,806	$173,730	$100,000	$12,509	$10,179	$1,273	$0	$0	-$24,064	-$3,010	$2,728,892	$341,365
2062		$0	$450,000	$54,127	$667,459	$80,283	$0	$0	$145,916	$17,551	$1,388,806	$167,048	$100,000	$12,028	$10,298	$1,239	$0	$0	-$24,345	-$2,928	$2,738,133	$329,347
2063		$0	$450,000	$52,045	$675,176	$78,088	$0	$0	$147,603	$17,071	$1,388,806	$160,623	$100,000	$11,566	$10,417	$1,205	$0	$0	-$24,626	-$2,848	$2,747,375	$317,749
2064		$0	$450,000	$50,043	$682,892	$75,943	$0	$0	$149,290	$16,602	$1,388,806	$154,445	$100,000	$11,121	$10,536	$1,172	$0	$0	-$24,908	-$2,770	$2,756,616	$306,556
2065		$0	$450,000	$48,119	$690,609	$73,847	$0	$0	$150,977	$16,144	$1,388,806	$148,505	$100,000	$10,693	$10,655	$1,139	$0	$0	-$25,189	-$2,694	$2,765,857	$295,753
Total Capital =	$138,880,560																					
Total Net Present Value =		$92,321,865		$7,688,076		$6,950,870		$0		$1,519,560		$19,567,587		$1,708,461		$107,242		$0		-$253,527	$260,098,091	**$129,610,135**

SOUTH COLWOOD WWTF ASSUMPTIONS (Liquid-Stream)

Labour:
number of facility manager(s) = 1
number of operations staff = 3
number of maintenance staff = 2
number of administration staff = 0
total staff = 6 persons

Ref: Based on Jan 15/09 TM from T. Dokken.

Chemical Phosphorus Removal Chemicals:
chemical-P removal required (1 = yes, 0 = no)? 0

Wet-Weather CEPT Chemicals:
fraction of total annual ADWF treated = 5.0%

Ref: Allowance to account for potential costs.

Reclaimed Water Disinfection:
allowance = 10.0% of other chemical costs

Ref: Allowance to account for potential costs.

Saleable Heat Energy:
unit energy cost to third-party "heat recovery" utility = $ 14.14 /GJ
unit CRD saleable energy price to third-party utility = $ - /GJ

Ref: This is the cost that a third-party heat recovery utility would incur to make the heat available to customers. Value is from Table 6 of Feb 10/09 memo from M. Homenuke, reduced by 3% to remove CRD share of capital cost.

Note: This value is the difference between the general energy market unit price (from Generic Assumptions sheet) and the above value, which reflects the maximum amount the utility would be willing to pay the CRD for the heat. Set to zero in this case since the unit selling price would be a negative value, indicating the CRD would need to subsidize the scheme.

Notes:
1. Excludes solids processing capital costs. Included in Biosolids LCA.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 17, 2009
Last Revision By: D. Shiskowski

Subject: Macaulay/McLoughlin WWTF
(Liquid-Stream)
Option 1
Material Flows
and Carbon Footprint Analysis

Yellow-shaded cell denotes assumed/input values

Year	Equivalent Population	Wastewater ADWF	Sludge Production and Truck Transport		Saleable Effluent Heat[1]	Saleable Reclaimed Water (irrigation only)	Materials			GHG Sources			GHG Offsets	Total GHG Emissions
			Mass	Thickened Volume			Electricity	Diesel Fuel	Sludge Thickening Polymer	Electricity Purchased	Diesel Fuel Combusted	Sludge Thickening Polymer Used	Avoided Natural Gas/Elect Use via Effluent Heat2	
	(pe)	(m3/d)	(dry t/yr)	(m3/yr)	(GJ/yr)	(m3/yr)	(kWh/yr)	(L/yr)	(kg/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)
2008														
2009														
2010														
2011														
2012														
2013														
2014														
2015	309,137	83,326	6,714	0	334,921	149,029	17,932,849	-	0	1,291	0.0	0.0	0	1,291
2016	311,083	83,381	6,756	0	361,090	149,127	17,944,657	-	0	1,292	0.0	0.0	0	1,292
2017	313,029	83,436	6,798	0	387,260	149,225	17,956,465	-	0	1,293	0.0	0.0	0	1,293
2018	314,974	83,491	6,840	0	413,430	149,323	17,968,273	-	0	1,294	0.0	0.0	0	1,294
2019	316,920	83,545	6,883	0	439,599	149,421	17,980,081	-	0	1,295	0.0	0.0	0	1,295
2020	318,866	83,600	6,925	0	465,769	149,519	17,991,889	-	0	1,295	0.0	0.0	0	1,295
2021	320,812	83,655	6,967	0	491,938	149,617	18,003,697	-	0	1,296	0.0	0.0	0	1,296
2022	322,758	83,710	7,009	0	518,108	149,715	18,015,505	-	0	1,297	0.0	0.0	0	1,297
2023	324,703	83,765	7,052	0	544,278	149,814	18,027,313	-	0	1,298	0.0	0.0	0	1,298
2024	326,649	83,820	7,094	0	570,447	149,912	18,039,121	-	0	1,299	0.0	0.0	0	1,299
2025	328,595	83,875	7,136	0	596,617	150,010	18,050,929	-	0	1,300	0.0	0.0	0	1,300
2026	330,541	83,930	7,179	0	622,786	150,108	18,062,737	-	0	1,301	0.0	0.0	0	1,301
2027	332,487	83,984	7,221	0	648,956	150,206	18,074,545	-	0	1,301	0.0	0.0	0	1,301
2028	334,432	84,039	7,263	0	675,125	150,304	18,086,353	-	0	1,302	0.0	0.0	0	1,302
2029	336,378	84,094	7,305	0	701,295	150,402	18,098,161	-	0	1,303	0.0	0.0	0	1,303
2030	338,324	84,149	7,348	0	727,465	150,500	18,109,969	-	0	1,304	0.0	0.0	0	1,304
2031	340,460	84,322	7,394	0	734,786	150,809	18,147,144	-	0	1,307	0.0	0.0	0	1,307
2032	342,595	84,494	7,440	0	742,108	151,118	18,184,318	-	0	1,309	0.0	0.0	0	1,309
2033	344,731	84,667	7,487	0	749,429	151,427	18,221,493	-	0	1,312	0.0	0.0	0	1,312
2034	346,866	84,840	7,533	0	756,751	151,736	18,258,667	-	0	1,315	0.0	0.0	0	1,315
2035	349,002	85,013	7,579	0	764,072	152,045	18,295,842	-	0	1,317	0.0	0.0	0	1,317
2036	351,137	85,185	7,626	0	771,394	152,354	18,333,016	-	0	1,320	0.0	0.0	0	1,320
2037	353,273	85,358	7,672	0	778,715	152,663	18,370,191	-	0	1,323	0.0	0.0	0	1,323
2038	355,408	85,531	7,719	0	786,037	152,972	18,407,365	-	0	1,325	0.0	0.0	0	1,325
2039	357,544	85,704	7,765	0	793,359	153,281	18,444,540	-	0	1,328	0.0	0.0	0	1,328
2040	359,679	85,876	7,811	0	800,680	153,590	18,481,714	-	0	1,331	0.0	0.0	0	1,331
2041	361,815	86,049	7,858	0	808,002	153,899	18,518,889	-	0	1,333	0.0	0.0	0	1,333
2042	363,950	86,222	7,904	0	815,323	154,208	18,556,063	-	0	1,336	0.0	0.0	0	1,336
2043	366,086	86,395	7,950	0	822,645	154,517	18,593,238	-	0	1,339	0.0	0.0	0	1,339
2044	368,221	86,567	7,997	0	829,966	154,826	18,630,412	-	0	1,341	0.0	0.0	0	1,341
2045	370,357	86,740	8,043	0	837,288	155,134	18,667,586	-	0	1,344	0.0	0.0	0	1,344
2046	371,666	86,777	8,072	0	870,235	155,201	18,675,582	-	0	1,345	0.0	0.0	0	1,345
2047	372,975	86,814	8,100	0	903,182	155,267	18,683,577	-	0	1,345	0.0	0.0	0	1,345
2048	374,284	86,851	8,129	0	936,129	155,334	18,691,572	-	0	1,346	0.0	0.0	0	1,346
2049	375,593	86,889	8,157	0	969,076	155,400	18,699,567	-	0	1,346	0.0	0.0	0	1,346
2050	376,902	86,926	8,185	0	1,002,022	155,467	18,707,562	-	0	1,347	0.0	0.0	0	1,347
2051	378,210	86,963	8,214	0	1,034,969	155,533	18,715,557	-	0	1,348	0.0	0.0	0	1,348
2052	379,519	87,000	8,242	0	1,067,916	155,600	18,723,553	-	0	1,348	0.0	0.0	0	1,348
2053	380,828	87,037	8,271	0	1,100,863	155,666	18,731,548	-	0	1,349	0.0	0.0	0	1,349
2054	382,137	87,074	8,299	0	1,133,810	155,732	18,739,543	-	0	1,349	0.0	0.0	0	1,349
2055	383,446	87,111	8,327	0	1,166,757	155,799	18,747,538	-	0	1,350	0.0	0.0	0	1,350
2056	384,755	87,149	8,356	0	1,199,704	155,865	18,755,533	-	0	1,350	0.0	0.0	0	1,350
2057	386,064	87,186	8,384	0	1,232,651	155,932	18,763,528	-	0	1,351	0.0	0.0	0	1,351
2058	387,373	87,223	8,413	0	1,265,598	155,998	18,771,524	-	0	1,352	0.0	0.0	0	1,352
2059	388,682	87,260	8,441	0	1,298,545	156,065	18,779,519	-	0	1,352	0.0	0.0	0	1,352
2060	389,991	87,297	8,470	0	1,331,492	156,131	18,787,514	-	0	1,353	0.0	0.0	0	1,353
2061	391,299	87,334	8,498	0	1,364,439	156,198	18,795,509	-	0	1,353	0.0	0.0	0	1,353
2062	392,608	87,372	8,526	0	1,397,386	156,264	18,803,504	-	0	1,354	0.0	0.0	0	1,354
2063	393,917	87,409	8,555	0	1,430,333	156,330	18,811,499	-	0	1,354	0.0	0.0	0	1,354
2064	395,226	87,446	8,583	0	1,463,280	156,397	18,819,495	-	0	1,355	0.0	0.0	0	1,355
2065	396,535	87,483	8,612	0	1,496,227	156,463	18,827,490	-	0	1,356	0.0	0.0	0	1,356
Totals =					43,954,251	7,807,454	939,483,736	0		67,643	0	0	0	**67,643**

MACAULAY/MCLOUGHLIN WWTF ASSUMPTIONS (Liquid-Stream)

Electricity:

"base" unit power requirement =	0.445	kW-hr/d per m3/d of ADWF treated wastewater	**Ref:** Based on Jan 15/09 TM from T. Dokken.
wastewater strength adjustment =	0.050	x "base" unit power requirement	**Note:** To account for Saanich East WWTF sludge impact on liquid-stream system.
influent pumping power adjustment =	0.075	x "base" unit power requirement	**Ref:** Based on Table 1.4. WEF .
recycled centrate aeration power adjustment =	0.050	x "base" unit power requirement	
Hartland landfill leachate aeration power adjustment =	0.150	x "base" unit power requirement	**Note:** To account for leachate impact on liquid-stream system.
UV disinfection power adjustment =	0	x "base" unit power requirement	**Note:** Not required - effluent to marine environment.
effluent pumping power adjustment =	0	x "base" unit power requirement	**Note:** See MM OUT sheets for outfall pumping. See MM Heat for pumping to/from Victoria.
raw sludge thickening adjustment =	0	x "base" unit power requirement	**Note:** Accounted for in solids-stream calculations.
total unit power requirement =	0.590	kW-hr/d per m3/d of ADWF treated wastewater	

Raw Sludge Thickening and Truck Transport:

thickening required (1 = yes, 0 = no)?	0		**Note:** Yes, but not from a trucking perspective.
chemical-P removal chemical sludge production allowance =	0%	of combined PS + WBS	
round-trip transport distance to solids processing facility =	0	km	

Saleable Reclaimed Water:

mean fraction of annual ADWF volume sold for landscape irrigation =	0.49%	/yr	**Note:** See dnt_eff_irr_ds.xls for assumptions and details. Reclaimed water used for toilet flushing handled separately in analysis. See Flush Rev LCA worksheet.

Notes:
1. Data from M. Homenuke in Feb 4/09 e-mail, DES_SaleableHeatEnergy.xls, Saleable.
2. Set to zero since heat would not be sold - see LCA sheet.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 18, 2009
Last Revision By: D. Shiskowski

Subject: Macaulay/McLoughlin WWTF
(Liquid-Stream)
Option 1
Life Cycle Analysis

Yellow-shaded cell denotes assumed/input values

Year	Capital Costs[1]		Operation & Maintenance Costs												GHG CO2e		Heat Revenues		Reclaimed Water Revenues (irrigation only)		Total	
			Labour		Electricity		Diesel Fuel		Chemicals		Maintenance		Administration									
	Total Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Rev	Net Present Value	Total Annual Rev	Net Present Value	Total Annual Cost	Net Present Value
2008																						
2009																						
2010																						
2011																						
2012																						
2013																						
2014	$326,905,080	$258,357,833																			$326,905,080	$258,357,833
2015		$0	$1,275,000	$968,895	$1,255,299	$953,924	$0	$0	$328,125	$249,348	$3,269,051	$2,484,210	$100,000	$75,992	$19,367	$14,718	$0	$0	-$107,301	-$81,540	$6,139,542	$4,665,547
2016		$0	$1,275,000	$931,630	$1,256,126	$917,839	$0	$0	$328,341	$239,916	$3,269,051	$2,388,663	$100,000	$73,069	$19,380	$14,161	$0	$0	-$107,371	-$78,455	$6,140,527	$4,486,823
2017		$0	$1,275,000	$895,798	$1,256,953	$883,118	$0	$0	$328,557	$230,840	$3,269,051	$2,296,792	$100,000	$70,259	$19,393	$13,625	$0	$0	-$107,442	-$75,487	$6,141,512	$4,314,945
2018		$0	$1,275,000	$861,344	$1,257,779	$849,710	$0	$0	$328,773	$222,107	$3,269,051	$2,208,454	$100,000	$67,556	$19,406	$13,110	$0	$0	-$107,513	-$72,632	$6,142,496	$4,149,650
2019		$0	$1,275,000	$828,216	$1,258,606	$817,566	$0	$0	$328,989	$213,705	$3,269,051	$2,123,513	$100,000	$64,958	$19,418	$12,614	$0	$0	-$107,583	-$69,884	$6,143,481	$3,990,688
2020		$0	$1,275,000	$796,361	$1,259,432	$786,638	$0	$0	$329,205	$205,621	$3,269,051	$2,041,839	$100,000	$62,460	$19,431	$12,137	$0	$0	-$107,654	-$67,240	$6,144,466	$3,837,815
2021		$0	$1,275,000	$765,732	$1,260,259	$756,879	$0	$0	$329,421	$197,842	$3,269,051	$1,963,307	$100,000	$60,057	$19,444	$11,678	$0	$0	-$107,724	-$64,697	$6,145,450	$3,690,798
2022		$0	$1,275,000	$736,281	$1,261,085	$728,245	$0	$0	$329,637	$190,357	$3,269,051	$1,887,795	$100,000	$57,748	$19,457	$11,236	$0	$0	-$107,795	-$62,249	$6,146,435	$3,549,413
2023		$0	$1,275,000	$707,962	$1,261,912	$700,695	$0	$0	$329,853	$183,156	$3,269,051	$1,815,188	$100,000	$55,526	$19,469	$10,811	$0	$0	-$107,866	-$59,894	$6,147,420	$3,413,444
2024		$0	$1,275,000	$680,733	$1,262,738	$674,186	$0	$0	$330,070	$176,227	$3,269,051	$1,745,373	$100,000	$53,391	$19,482	$10,402	$0	$0	-$107,936	-$57,628	$6,148,405	$3,282,683
2025		$0	$1,275,000	$654,551	$1,263,565	$648,680	$0	$0	$330,286	$169,560	$3,269,051	$1,678,243	$100,000	$51,337	$19,495	$10,008	$0	$0	-$108,007	-$55,448	$6,149,389	$3,156,932
2026		$0	$1,275,000	$629,376	$1,264,392	$624,139	$0	$0	$330,502	$163,145	$3,269,051	$1,613,695	$100,000	$49,363	$19,508	$9,630	$0	$0	-$108,078	-$53,350	$6,150,374	$3,035,998
2027		$0	$1,275,000	$605,169	$1,265,218	$600,526	$0	$0	$330,718	$156,973	$3,269,051	$1,551,630	$100,000	$47,464	$19,521	$9,265	$0	$0	-$108,148	-$51,332	$6,151,359	$2,919,696
2028		$0	$1,275,000	$581,893	$1,266,045	$577,806	$0	$0	$330,934	$151,034	$3,269,051	$1,491,952	$100,000	$45,639	$19,533	$8,915	$0	$0	-$108,219	-$49,390	$6,152,343	$2,807,849
2029		$0	$1,275,000	$559,513	$1,266,871	$555,946	$0	$0	$331,150	$145,320	$3,269,051	$1,434,569	$100,000	$43,883	$19,546	$8,577	$0	$0	-$108,290	-$47,521	$6,153,328	$2,700,287
2030	$6,417,840	$2,708,042	$1,275,000	$537,993	$1,267,698	$534,912	$0	$0	$331,366	$139,822	$3,333,229	$1,406,474	$100,000	$42,196	$19,559	$8,253	$0	$0	-$108,360	-$45,723	$12,636,331	$5,331,968
2031		$0	$1,275,000	$517,301	$1,270,300	$515,394	$0	$0	$332,046	$134,720	$3,333,229	$1,352,379	$100,000	$40,573	$19,599	$7,952	$0	$0	-$108,583	-$44,055	$6,221,591	$2,524,263
2032		$0	$1,275,000	$497,405	$1,272,902	$496,587	$0	$0	$332,726	$129,804	$3,333,229	$1,300,364	$100,000	$39,012	$19,639	$7,662	$0	$0	-$108,805	-$42,447	$6,224,692	$2,428,386
2033		$0	$1,275,000	$478,274	$1,275,504	$478,463	$0	$0	$333,406	$125,066	$3,333,229	$1,250,350	$100,000	$37,512	$19,679	$7,382	$0	$0	-$109,028	-$40,898	$6,227,792	$2,336,149
2034		$0	$1,275,000	$459,879	$1,278,107	$460,999	$0	$0	$334,087	$120,501	$3,333,229	$1,202,260	$100,000	$36,069	$19,719	$7,113	$0	$0	-$109,250	-$39,405	$6,230,892	$2,247,416
2035		$0	$1,275,000	$442,191	$1,280,709	$444,171	$0	$0	$334,767	$116,103	$3,333,229	$1,156,019	$100,000	$34,682	$19,760	$6,853	$0	$0	-$109,473	-$37,967	$6,233,992	$2,162,052
2036		$0	$1,275,000	$425,184	$1,283,311	$427,955	$0	$0	$335,447	$111,864	$3,333,229	$1,111,557	$100,000	$33,348	$19,800	$6,603	$0	$0	-$109,695	-$36,581	$6,237,092	$2,079,930
2037		$0	$1,275,000	$408,831	$1,285,913	$412,330	$0	$0	$336,127	$107,780	$3,333,229	$1,068,805	$100,000	$32,065	$19,840	$6,362	$0	$0	-$109,917	-$35,245	$6,240,192	$2,000,926
2038		$0	$1,275,000	$393,106	$1,288,516	$397,273	$0	$0	$336,807	$103,844	$3,333,229	$1,027,697	$100,000	$30,832	$19,880	$6,129	$0	$0	-$110,140	-$33,958	$6,243,292	$1,924,924
2039		$0	$1,275,000	$377,987	$1,291,118	$382,765	$0	$0	$337,488	$100,052	$3,333,229	$988,170	$100,000	$29,646	$19,920	$5,906	$0	$0	-$110,362	-$32,718	$6,246,392	$1,851,807
2040		$0	$1,275,000	$363,449	$1,293,720	$368,785	$0	$0	$338,168	$96,397	$3,333,229	$950,163	$100,000	$28,506	$19,960	$5,690	$0	$0	-$110,585	-$31,523	$6,249,493	$1,781,467
2041		$0	$1,275,000	$349,470	$1,296,322	$355,314	$0	$0	$338,848	$92,876	$3,333,229	$913,619	$100,000	$27,409	$20,000	$5,482	$0	$0	-$110,807	-$30,372	$6,252,593	$1,713,799
2042		$0	$1,275,000	$336,029	$1,298,924	$342,334	$0	$0	$339,528	$89,483	$3,333,229	$878,480	$100,000	$26,355	$20,041	$5,282	$0	$0	-$111,030	-$29,262	$6,255,693	$1,648,701
2043		$0	$1,275,000	$323,105	$1,301,527	$329,827	$0	$0	$340,208	$86,214	$3,333,229	$844,692	$100,000	$25,342	$20,081	$5,089	$0	$0	-$111,252	-$28,193	$6,258,793	$1,586,075
2044		$0	$1,275,000	$310,678	$1,304,129	$317,775	$0	$0	$340,889	$83,064	$3,333,229	$812,204	$100,000	$24,367	$20,121	$4,903	$0	$0	-$111,474	-$27,163	$6,261,893	$1,525,827
2045		$0	$1,275,000	$298,728	$1,306,731	$306,163	$0	$0	$341,569	$80,028	$3,333,229	$780,965	$100,000	$23,430	$20,161	$4,724	$0	$0	-$111,697	-$26,170	$6,264,993	$1,467,868
2046		$0	$1,275,000	$287,239	$1,307,291	$294,514	$0	$0	$341,715	$76,983	$3,333,229	$750,928	$100,000	$22,529	$20,170	$4,544	$0	$0	-$111,745	-$25,174	$6,265,660	$1,411,562
2047		$0	$1,275,000	$276,191	$1,307,850	$283,307	$0	$0	$341,861	$74,054	$3,333,229	$722,046	$100,000	$21,662	$20,178	$4,371	$0	$0	-$111,793	-$24,217	$6,266,327	$1,357,415
2048		$0	$1,275,000	$265,569	$1,308,410	$272,527	$0	$0	$342,008	$71,236	$3,333,229	$694,275	$100,000	$20,829	$20,187	$4,205	$0	$0	-$111,840	-$23,295	$6,266,993	$1,305,346
2049		$0	$1,275,000	$255,354	$1,308,970	$262,158	$0	$0	$342,154	$68,526	$3,333,229	$667,572	$100,000	$20,028	$20,196	$4,045	$0	$0	-$111,888	-$22,409	$6,267,660	$1,255,274
2050		$0	$1,275,000	$245,533	$1,309,529	$252,183	$0	$0	$342,300	$65,918	$3,333,229	$641,896	$100,000	$19,257	$20,204	$3,891	$0	$0	-$111,936	-$21,556	$6,268,327	$1,207,123
2051		$0	$1,275,000	$236,089	$1,310,089	$242,587	$0	$0	$342,447	$63,410	$3,333,229	$617,208	$100,000	$18,517	$20,213	$3,743	$0	$0	-$111,984	-$20,736	$6,268,994	$1,160,818
2052		$0	$1,275,000	$227,009	$1,310,649	$233,356	$0	$0	$342,593	$60,997	$3,333,229	$593,469	$100,000	$17,805	$20,221	$3,600	$0	$0	-$112,032	-$19,947	$6,269,660	$1,116,290
2053		$0	$1,275,000	$218,278	$1,311,208	$224,477	$0	$0	$342,739	$58,676	$3,333,229	$570,644	$100,000	$17,120	$20,230	$3,463	$0	$0	-$112,080	-$19,188	$6,270,327	$1,073,470
2054		$0	$1,275,000	$209,883	$1,311,768	$215,935	$0	$0	$342,885	$56,444	$3,333,229	$548,696	$100,000	$16,461	$20,239	$3,332	$0	$0	-$112,127	-$18,458	$6,270,994	$1,032,293
2055		$0	$1,275,000	$201,810	$1,312,328	$207,719	$0	$0	$343,032	$54,296	$3,333,229	$527,592	$100,000	$15,828	$20,247	$3,205	$0	$0	-$112,175	-$17,755	$6,271,661	$992,694
2056		$0	$1,275,000	$194,048	$1,312,887	$199,815	$0	$0	$343,178	$52,230	$3,333,229	$507,300	$100,000	$15,219	$20,256	$3,083	$0	$0	-$112,223	-$17,080	$6,272,327	$954,615
2057		$0	$1,275,000	$186,585	$1,313,447	$192,211	$0	$0	$343,324	$50,242	$3,333,229	$487,788	$100,000	$14,634	$20,265	$2,966	$0	$0	-$112,271	-$16,430	$6,272,994	$917,997
2058		$0	$1,275,000	$179,409	$1,314,007	$184,897	$0	$0	$343,471	$48,331	$3,333,229	$469,027	$100,000	$14,071	$20,273	$2,853	$0	$0	-$112,319	-$15,805	$6,273,661	$882,783
2059		$0	$1,275,000	$172,508	$1,314,566	$177,862	$0	$0	$343,617	$46,492	$3,333,229	$450,988	$100,000	$13,530	$20,282	$2,744	$0	$0	-$112,367	-$15,203	$6,274,328	$848,920
2060		$0	$1,275,000	$165,873	$1,315,126	$171,094	$0	$0	$343,763	$44,722	$3,333,229	$433,642	$100,000	$13,010	$20,291	$2,640	$0	$0	-$112,414	-$14,625	$6,274,994	$816,356
2061		$0	$1,275,000	$159,494	$1,315,686	$164,583	$0	$0	$343,909	$43,021	$3,333,229	$416,964	$100,000	$12,509	$20,299	$2,539	$0	$0	-$112,462	-$14,068	$6,275,661	$785,041
2062		$0	$1,275,000	$153,359	$1,316,245	$158,320	$0	$0	$344,056	$41,384	$3,333,229	$400,927	$100,000	$12,028	$20,308	$2,443	$0	$0	-$112,510	-$13,533	$6,276,328	$754,928
2063		$0	$1,275,000	$147,461	$1,316,805	$152,296	$0	$0	$344,202	$39,809	$3,333,229	$385,506	$100,000	$11,566	$20,316	$2,350	$0	$0	-$112,558	-$13,018	$6,276,995	$725,969
2064		$0	$1,275,000	$141,789	$1,317,365	$146,500	$0	$0	$344,348	$38,294	$3,333,229	$370,679	$100,000	$11,121	$20,325	$2,260	$0	$0	-$112,606	-$12,523	$6,277,661	$698,121
2065		$0	$1,275,000	$136,336	$1,317,924	$140,926	$0	$0	$344,495	$36,837	$3,333,229	$356,422	$100,000	$10,693	$20,334	$2,174	$0	$0	-$112,654	-$12,046	$6,278,328	$671,342
Total Capital =	$333,322,920																					
Total Net Present Value =		$261,065,875		$21,782,881		$21,824,214		$0		$5,704,671		$56,382,992		$1,708,461		$336,716		$0		-$1,865,491		**$366,940,320**

MACAULAY/MCLOUGHLIN WWTF ASSUMPTIONS (Liquid-Stream)

Labour:
number of facility manager(s) = 1
number of operations staff = 8
number of maintenance staff = 7
number of administration staff = 1
total staff = 17 persons

Ref: Based on Jan 15/09 TM from T. Dokken.

Chemical Phosphorus Removal Chemicals:
chemical-P removal required (1 = yes, 0 = no)? 0

Wet-Weather CEPT Chemicals:
fraction of total annual ADWF treated = 5.0%

Ref: Allowance to account for potential costs.

Reclaimed Water Disinfection:
allowance = 10.0% of other chemical costs

Ref: Allowance to account for potential costs.

Saleable Heat Energy:
unit energy cost to third-party "heat recovery" utility = $ 14.67 /GJ
unit CRD saleable energy price to third-party utility = $ - /GJ

Ref: This is the cost that a third-party heat recovery utility would incur to make the heat available to customers. Value is from Table 6 of Feb 10/09 memo from M. Homenuke, reduced by 16% to remove CRD share of capital cost.

Note: This value is the difference between the general energy market unit price (from Generic Assumptions sheet) and the above value, which reflects the maximum amount the utility would be willing to pay the CRD for the heat. Set to zero in this case since the unit selling price would be a negative value, indicating the CRD would need to subsidize the scheme.

Notes:
1. Excludes solids processing capital costs. Included in Biosolids LCA.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 6, 2009
Last Revision By: D. Shiskowski

Subject: Macaulay/McLouglin WWTF Outfall Pumping Option 1

Material Flows and Carbon Footprint Analysis

Yellow-shaded cell denotes assumed/input values
Note: Coloured cells contain data linked to external spreadsheets

Year	Effluent ADWF		ADWF Friction Losses Unit	ADWF Friction Losses Total	TDH	Velocity	Pump Energy	Materials Electricity	GHG Sources Electricity Purchased	Total GHG Emissions
	(m3/d)	(L/s)	(m/m)	(m)	(m)	(m/s)	(kW)	(kWh/yr)	(t CO2e/yr)	(t CO2e/yr)
2008										
2009										
2010										
2011										
2012										
2013										
2014										
2015	83,326	964	0.000197	0.43	5.2	0.55	69.9	612,484	44	44
2016	83,381	965	0.000197	0.43	5.2	0.55	70.0	612,950	44	44
2017	83,436	966	0.000198	0.43	5.2	0.55	70.0	613,416	44	44
2018	83,491	966	0.000198	0.44	5.2	0.55	70.1	613,882	44	44
2019	83,545	967	0.000198	0.44	5.2	0.55	70.1	614,348	44	44
2020	83,600	968	0.000198	0.44	5.2	0.55	70.2	614,815	44	44
2021	83,655	968	0.000199	0.44	5.2	0.55	70.2	615,281	44	44
2022	83,710	969	0.000199	0.44	5.2	0.55	70.3	615,748	44	44
2023	83,765	970	0.000199	0.44	5.2	0.55	70.3	616,215	44	44
2024	83,820	970	0.000199	0.44	5.2	0.55	70.4	616,682	44	44
2025	83,875	971	0.000200	0.44	5.2	0.55	70.5	617,149	44	44
2026	83,930	971	0.000200	0.44	5.2	0.55	70.5	617,616	44	44
2027	83,984	972	0.000200	0.44	5.2	0.55	70.6	618,083	45	45
2028	84,039	973	0.000200	0.44	5.2	0.55	70.6	618,550	45	45
2029	84,094	973	0.000201	0.44	5.2	0.55	70.7	619,018	45	45
2030	84,149	974	0.000201	0.44	5.2	0.55	70.7	619,485	45	45
2031	84,322	976	0.000202	0.44	5.2	0.55	70.9	620,958	45	45
2032	84,494	978	0.000202	0.45	5.2	0.55	71.1	622,432	45	45
2033	84,667	980	0.000203	0.45	5.2	0.55	71.2	623,907	45	45
2034	84,840	982	0.000204	0.45	5.2	0.56	71.4	625,383	45	45
2035	85,013	984	0.000205	0.45	5.2	0.56	71.6	626,861	45	45
2036	85,185	986	0.000205	0.45	5.2	0.56	71.7	628,340	45	45
2037	85,358	988	0.000206	0.45	5.2	0.56	71.9	629,820	45	45
2038	85,531	990	0.000207	0.46	5.2	0.56	72.1	631,301	45	45
2039	85,704	992	0.000208	0.46	5.2	0.56	72.2	632,783	46	46
2040	85,876	994	0.000208	0.46	5.2	0.56	72.4	634,266	46	46
2041	86,049	996	0.000209	0.46	5.2	0.56	72.6	635,751	46	46
2042	86,222	998	0.000210	0.46	5.2	0.56	72.7	637,237	46	46
2043	86,395	1,000	0.000211	0.46	5.2	0.57	72.9	638,724	46	46
2044	86,567	1,002	0.000212	0.47	5.2	0.57	73.1	640,212	46	46
2045	86,740	1,004	0.000212	0.47	5.2	0.57	73.3	641,701	46	46
2046	86,777	1,004	0.000213	0.47	5.2	0.57	73.3	642,022	46	46
2047	86,814	1,005	0.000213	0.47	5.2	0.57	73.3	642,343	46	46
2048	86,851	1,005	0.000213	0.47	5.2	0.57	73.4	642,663	46	46
2049	86,889	1,006	0.000213	0.47	5.2	0.57	73.4	642,984	46	46
2050	86,926	1,006	0.000213	0.47	5.2	0.57	73.4	643,304	46	46
2051	86,963	1,007	0.000213	0.47	5.2	0.57	73.5	643,625	46	46
2052	87,000	1,007	0.000214	0.47	5.2	0.57	73.5	643,946	46	46
2053	87,037	1,007	0.000214	0.47	5.2	0.57	73.5	644,267	46	46
2054	87,074	1,008	0.000214	0.47	5.2	0.57	73.6	644,588	46	46
2055	87,111	1,008	0.000214	0.47	5.2	0.57	73.6	644,909	46	46
2056	87,149	1,009	0.000214	0.47	5.2	0.57	73.7	645,230	46	46
2057	87,186	1,009	0.000214	0.47	5.2	0.57	73.7	645,551	46	46
2058	87,223	1,010	0.000215	0.47	5.2	0.57	73.7	645,872	47	47
2059	87,260	1,010	0.000215	0.47	5.2	0.57	73.8	646,193	47	47
2060	87,297	1,010	0.000215	0.47	5.2	0.57	73.8	646,515	47	47
2061	87,334	1,011	0.000215	0.47	5.2	0.57	73.8	646,836	47	47
2062	87,372	1,011	0.000215	0.47	5.2	0.57	73.9	647,157	47	47
2063	87,409	1,012	0.000215	0.47	5.2	0.57	73.9	647,479	47	47
2064	87,446	1,012	0.000216	0.47	5.2	0.57	73.9	647,800	47	47
2065	87,483	1,013	0.000216	0.47	5.2	0.57	74.0	648,122	47	47
Totals =								32,226,803	2,320	**2,320**

MACAULAY / MCLOUGHLIN WWTF OUTFALL PUMPING

static head =	2.03	m
effluent discharge depth =	61.0	m
effluent density @ 20°C =	998.2	kg/m3
ocean water density @ 10°C =	1026.2	kg/m3
seawater density adjustment =	1.7	m
diffuser exit loss allowance =	1.0	m
friction C value =	120	
forcemain diameter =	1500	mm
forcemain X-area =	1.7671	m^2
forcemain length =	2,200	m
pump efficiency =	70%	
fluid specific weight =	9.81	kN/m^3

Ref: M. Maynard file est_Outfall&Interceptor Cost Estimates_20090206.xls.

Ref: Assumes effluent is fresh water. Table A.1, Fischer et al (1979).

Ref: Assumes ocean salinity of 34 o/oo. Table A.2, Fischer et al (1979).

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 6, 2009
Last Revision By: D. Shiskowski

Subject: Macaulay/McLouglin WWTF
Outfall Pumping
Option 1
Life Cycle Analysis

Yellow-shaded cell denotes assumed/input values

Year	Operations Costs Electricity		GHG CO2e		Total	
	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value
2008						
2009						
2010						
2011						
2012						
2013						
2014						
2015	$42,874	$32,581	$661	$503	$43,535	$33,083
2016	$42,906	$31,351	$662	$484	$43,568	$31,835
2017	$42,939	$30,168	$662	$465	$43,602	$30,634
2018	$42,972	$29,030	$663	$448	$43,635	$29,478
2019	$43,004	$27,935	$663	$431	$43,668	$28,366
2020	$43,037	$26,881	$664	$415	$43,701	$27,296
2021	$43,070	$25,867	$665	$399	$43,734	$26,266
2022	$43,102	$24,891	$665	$384	$43,767	$25,275
2023	$43,135	$23,951	$666	$370	$43,801	$24,321
2024	$43,168	$23,048	$666	$356	$43,834	$23,403
2025	$43,200	$22,178	$667	$342	$43,867	$22,520
2026	$43,233	$21,341	$667	$329	$43,900	$21,670
2027	$43,266	$20,536	$668	$317	$43,933	$20,853
2028	$43,299	$19,761	$668	$305	$43,967	$20,066
2029	$43,331	$19,015	$669	$293	$44,000	$19,309
2030	$43,364	$18,298	$669	$282	$44,033	$18,580
2031	$43,467	$17,636	$671	$272	$44,138	$17,908
2032	$43,570	$16,998	$672	$262	$44,242	$17,260
2033	$43,673	$16,383	$674	$253	$44,347	$16,635
2034	$43,777	$15,790	$675	$244	$44,452	$16,033
2035	$43,880	$15,218	$677	$235	$44,557	$15,453
2036	$43,984	$14,668	$679	$226	$44,662	$14,894
2037	$44,087	$14,137	$680	$218	$44,768	$14,355
2038	$44,191	$13,625	$682	$210	$44,873	$13,835
2039	$44,295	$13,132	$683	$203	$44,978	$13,334
2040	$44,399	$12,656	$685	$195	$45,084	$12,851
2041	$44,503	$12,198	$687	$188	$45,189	$12,386
2042	$44,607	$11,756	$688	$181	$45,295	$11,938
2043	$44,711	$11,330	$690	$175	$45,400	$11,505
2044	$44,815	$10,920	$691	$168	$45,506	$11,088
2045	$44,919	$10,524	$693	$162	$45,612	$10,687
2046	$44,942	$10,125	$693	$156	$45,635	$10,281
2047	$44,964	$9,740	$694	$150	$45,658	$9,890
2048	$44,986	$9,370	$694	$145	$45,680	$9,515
2049	$45,009	$9,014	$694	$139	$45,703	$9,153
2050	$45,031	$8,672	$695	$134	$45,726	$8,806
2051	$45,054	$8,343	$695	$129	$45,749	$8,471
2052	$45,076	$8,026	$695	$124	$45,772	$8,149
2053	$45,099	$7,721	$696	$119	$45,794	$7,840
2054	$45,121	$7,428	$696	$115	$45,817	$7,542
2055	$45,144	$7,145	$697	$110	$45,840	$7,256
2056	$45,166	$6,874	$697	$106	$45,863	$6,980
2057	$45,189	$6,613	$697	$102	$45,886	$6,715
2058	$45,211	$6,362	$698	$98	$45,909	$6,460
2059	$45,234	$6,120	$698	$94	$45,931	$6,215
2060	$45,256	$5,888	$698	$91	$45,954	$5,978
2061	$45,279	$5,664	$699	$87	$45,977	$5,751
2062	$45,301	$5,449	$699	$84	$46,000	$5,533
2063	$45,324	$5,242	$699	$81	$46,023	$5,323
2064	$45,346	$5,043	$700	$78	$46,046	$5,121
2065	$45,369	$4,851	$700	$75	$46,069	$4,926
Total Net Present Value =		$747,490		$11,533	$2,290,681	**$759,022**

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 18, 2009
Last Revision By: D. Shiskowski

Subject: Macaulay/McLouglin WWTF Heat Recovery
Pumping to/from Victoria
Option 1
Material Flows
and Carbon Footprint Analysis

Yellow-shaded cell denotes assumed/input values
Note: Other coloured cells contain data linked to external spreadsheets

Year	Ratio of Effluent Pumped to/from Victoria	Effluent Pumped to/from Victoria		ADWF Friction Losses		TDH	Velocity	Pump Energy	Materials	GHG Sources	Total GHG Emissions
				Unit	Total				Electricity	Electricity Purchased	
	(annual basis)	(m3/d)	(L/s)	(m/m)	(m)	(m)	(m/s)	(kW)	(kWh/yr)	(t CO2e/yr)	(t CO2e/yr)
2008											
2009											
2010											
2011											
2012											
2013											
2014											
2015	0.298	24,800	287	0.000252	0.38	3.4	0.45	13.6	119,007	9	9
2016	0.318	26,532	307	0.000285	0.43	3.4	0.48	14.8	129,210	9	9
2017	0.339	28,237	327	0.000320	0.48	3.5	0.51	15.9	139,611	10	10
2018	0.359	29,917	346	0.000356	0.53	3.5	0.54	17.1	150,217	11	11
2019	0.379	31,571	365	0.000393	0.59	3.6	0.57	18.4	161,031	12	12
2020	0.398	33,201	384	0.000431	0.65	3.6	0.60	19.6	172,058	12	12
2021	0.418	34,807	403	0.000471	0.71	3.7	0.63	20.9	183,302	13	13
2022	0.437	36,389	421	0.000511	0.77	3.8	0.66	22.2	194,763	14	14
2023	0.455	37,948	439	0.000552	0.83	3.8	0.69	23.6	206,442	15	15
2024	0.474	39,484	457	0.000595	0.89	3.9	0.72	24.9	218,342	16	16
2025	0.492	40,998	475	0.000637	0.96	4.0	0.75	26.3	230,461	17	17
2026	0.510	42,490	492	0.000681	1.02	4.0	0.77	27.7	242,799	17	17
2027	0.528	43,962	509	0.000725	1.09	4.1	0.80	29.2	255,354	18	18
2028	0.545	45,412	526	0.000770	1.16	4.2	0.83	30.6	268,126	19	19
2029	0.562	46,843	542	0.000816	1.22	4.2	0.85	32.1	281,111	20	20
2030	0.579	48,253	558	0.000862	1.29	4.3	0.88	33.6	294,308	21	21
2031	0.581	48,412	560	0.000867	1.30	4.3	0.88	33.8	295,816	21	21
2032	0.583	48,568	562	0.000872	1.31	4.3	0.88	33.9	297,309	21	21
2033	0.585	48,722	564	0.000877	1.32	4.3	0.89	34.1	298,787	22	22
2034	0.587	48,875	566	0.000882	1.32	4.3	0.89	34.3	300,250	22	22
2035	0.588	49,025	567	0.000887	1.33	4.3	0.89	34.4	301,699	22	22
2036	0.590	49,173	569	0.000892	1.34	4.3	0.89	34.6	303,133	22	22
2037	0.592	49,320	571	0.000897	1.35	4.3	0.90	34.8	304,554	22	22
2038	0.594	49,465	573	0.000902	1.35	4.4	0.90	34.9	305,960	22	22
2039	0.595	49,607	574	0.000907	1.36	4.4	0.90	35.1	307,353	22	22
2040	0.597	49,748	576	0.000912	1.37	4.4	0.91	35.2	308,732	22	22
2041	0.599	49,887	577	0.000916	1.37	4.4	0.91	35.4	310,098	22	22
2042	0.600	50,025	579	0.000921	1.38	4.4	0.91	35.6	311,451	22	22
2043	0.602	50,160	581	0.000926	1.39	4.4	0.91	35.7	312,790	23	23
2044	0.604	50,295	582	0.000930	1.40	4.4	0.92	35.9	314,117	23	23
2045	0.605	50,427	584	0.000935	1.40	4.4	0.92	36.0	315,432	23	23
2046	0.626	52,190	604	0.000996	1.49	4.5	0.95	38.0	333,287	24	24
2047	0.647	53,938	624	0.001059	1.59	4.6	0.98	40.1	351,651	25	25
2048	0.668	55,672	644	0.001123	1.68	4.7	1.01	42.3	370,528	27	27
2049	0.689	57,391	664	0.001188	1.78	4.8	1.04	44.5	389,919	28	28
2050	0.709	59,097	684	0.001254	1.88	4.9	1.08	46.8	409,829	30	30
2051	0.730	60,787	704	0.001321	1.98	5.0	1.11	49.1	430,259	31	31
2052	0.750	62,465	723	0.001389	2.08	5.1	1.14	51.5	451,210	32	32
2053	0.770	64,128	742	0.001458	2.19	5.2	1.17	54.0	472,683	34	34
2054	0.789	65,778	761	0.001529	2.29	5.3	1.20	56.5	494,680	36	36
2055	0.809	67,414	780	0.001600	2.40	5.4	1.23	59.0	517,200	37	37
2056	0.829	69,037	799	0.001672	2.51	5.5	1.26	61.7	540,242	39	39
2057	0.848	70,647	818	0.001744	2.62	5.6	1.29	64.4	563,808	41	41
2058	0.867	72,244	836	0.001818	2.73	5.7	1.31	67.1	587,894	42	42
2059	0.886	73,828	854	0.001893	2.84	5.8	1.34	69.9	612,500	44	44
2060	0.905	75,400	873	0.001968	2.95	6.0	1.37	72.8	637,625	46	46
2061	0.924	76,959	891	0.002044	3.07	6.1	1.40	75.7	663,266	48	48
2062	0.942	78,506	909	0.002120	3.18	6.2	1.43	78.7	689,422	50	50
2063	0.961	80,041	926	0.002198	3.30	6.3	1.46	81.7	716,089	52	52
2064	0.979	81,563	944	0.002276	3.41	6.4	1.48	84.8	743,265	54	54
2065	0.997	83,074	962	0.002354	3.53	6.5	1.51	88.0	770,947	56	56
Totals =									18,579,926	1,338	**1,338**

MACAULAY / MCLOUGHLIN WWTF HEAT RECOVERY PUMPING

static head =	3.0	m
friction C value =	120	
forcemain diameter =	900	mm
forcemain X-area =	0.6362	m^2
forcemain length =	1,500	m
pump efficiency =	70%	
fluid specific weight =	9.81	kN/m^3

Ref: M. Maynard information, Feb 18/09.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File:	20062935.04.E.03.06	**Subject:**	Macaulay/McLouglin WWTF Heat Recovery
Prepared:	D. Shiskowski		Pumping to/from Victoria
Last Revision:	**February 6, 2009**		Option 1
Last Revision By:	**D. Shiskowski**		Life Cycle Analysis

Yellow-shaded cell denotes assumed/input values

Year	Operation & Maintenance Costs		GHG CO2e		Total	
	Electricity					
	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value
2008						
2009						
2010						
2011						
2012						
2013						
2014						
2015	$8,330	$6,330	$129	$98	$8,459	$6,428
2016	$9,045	$6,609	$140	$102	$9,184	$6,711
2017	$9,773	$6,866	$151	$106	$9,924	$6,972
2018	$10,515	$7,104	$162	$110	$10,677	$7,213
2019	$11,272	$7,322	$174	$113	$11,446	$7,435
2020	$12,044	$7,523	$186	$116	$12,230	$7,639
2021	$12,831	$7,706	$198	$119	$13,029	$7,825
2022	$13,633	$7,873	$210	$121	$13,844	$7,994
2023	$14,451	$8,024	$223	$124	$14,674	$8,148
2024	$15,284	$8,160	$236	$126	$15,520	$8,286
2025	$16,132	$8,282	$249	$128	$16,381	$8,410
2026	$16,996	$8,390	$262	$129	$17,258	$8,519
2027	$17,875	$8,484	$276	$131	$18,151	$8,615
2028	$18,769	$8,566	$290	$132	$19,058	$8,698
2029	$19,678	$8,635	$304	$133	$19,981	$8,768
2030	$20,602	$8,693	$318	$134	$20,919	$8,827
2031	$20,707	$8,401	$319	$130	$21,027	$8,531
2032	$20,812	$8,119	$321	$125	$21,133	$8,244
2033	$20,915	$7,846	$323	$121	$21,238	$7,967
2034	$21,018	$7,581	$324	$117	$21,342	$7,698
2035	$21,119	$7,324	$326	$113	$21,445	$7,437
2036	$21,219	$7,076	$327	$109	$21,547	$7,185
2037	$21,319	$6,836	$329	$105	$21,648	$6,941
2038	$21,417	$6,603	$330	$102	$21,748	$6,705
2039	$21,515	$6,378	$332	$98	$21,847	$6,477
2040	$21,611	$6,160	$333	$95	$21,945	$6,256
2041	$21,707	$5,950	$335	$92	$22,042	$6,042
2042	$21,802	$5,746	$336	$89	$22,138	$5,834
2043	$21,895	$5,549	$338	$86	$22,233	$5,634
2044	$21,988	$5,358	$339	$83	$22,327	$5,441
2045	$22,080	$5,173	$341	$80	$22,421	$5,253
2046	$23,330	$5,256	$360	$81	$23,690	$5,337
2047	$24,616	$5,332	$380	$82	$24,995	$5,415
2048	$25,937	$5,402	$400	$83	$26,337	$5,486
2049	$27,294	$5,466	$421	$84	$27,715	$5,551
2050	$28,688	$5,525	$443	$85	$29,131	$5,610
2051	$30,118	$5,577	$465	$86	$30,583	$5,663
2052	$31,585	$5,624	$487	$87	$32,072	$5,710
2053	$33,088	$5,665	$510	$87	$33,598	$5,752
2054	$34,628	$5,700	$534	$88	$35,162	$5,788
2055	$36,204	$5,730	$559	$88	$36,763	$5,819
2056	$37,817	$5,756	$583	$89	$38,400	$5,844
2057	$39,467	$5,776	$609	$89	$40,075	$5,865
2058	$41,153	$5,791	$635	$89	$41,788	$5,880
2059	$42,875	$5,801	$662	$90	$43,537	$5,891
2060	$44,634	$5,807	$689	$90	$45,322	$5,896
2061	$46,429	$5,808	$716	$90	$47,145	$5,898
2062	$48,260	$5,805	$745	$90	$49,004	$5,894
2063	$50,126	$5,797	$773	$89	$50,900	$5,887
2064	$52,029	$5,786	$803	$89	$52,831	$5,875
2065	$53,966	$5,771	$833	$89	$54,799	$5,860
Total Net Present Value =		$337,841		$5,212	$1,320,661	**$343,054**

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 6, 2009
Last Revision By: D. Shiskowski

Subject: Clover Point Wet-Weather Treatment Facility Option 1

Material Flows
and Carbon Footprint Analysis

Yellow-shaded cell denotes assumed/input values

Year	Equivalent Population	Wastewater ADWF (to Mac/McL WWTF)		ADWF Friction Losses		TDH	Velocity	Pump Energy	Materials	GHG Sources	Total GHG Emissions
				Unit	Total				Electricity	Electricity Purchased	
	(pe)	(m3/d)	(L/s)	(m/m)	(m)	(m)	(m/s)	(kW)	(kWh/yr)	(t CO2e/yr)	(t CO2e/yr)
2008											
2009											
2010											
2011											
2012											
2013											
2014											
2015	131,016	38,561	446	0.001382	6.56	28.6	1.01	178.7	1,721,545	124	124
2016	131,488	38,510	446	0.001378	6.55	28.5	1.01	178.3	1,718,285	124	124
2017	131,960	38,458	445	0.001375	6.53	28.5	1.01	178.0	1,715,029	123	123
2018	132,431	38,407	445	0.001372	6.52	28.5	1.01	177.6	1,711,776	123	123
2019	132,903	38,356	444	0.001368	6.50	28.5	1.00	177.3	1,708,527	123	123
2020	133,375	38,305	443	0.001365	6.48	28.5	1.00	177.0	1,705,282	123	123
2021	133,847	38,253	443	0.001362	6.47	28.5	1.00	176.6	1,702,040	123	123
2022	134,319	38,202	442	0.001358	6.45	28.5	1.00	176.3	1,698,802	122	122
2023	134,790	38,151	442	0.001355	6.44	28.4	1.00	176.0	1,695,568	122	122
2024	135,262	38,100	441	0.001351	6.42	28.4	1.00	175.6	1,692,338	122	122
2025	135,734	38,048	440	0.001348	6.40	28.4	1.00	175.3	1,689,111	122	122
2026	136,206	37,997	440	0.001345	6.39	28.4	1.00	175.0	1,685,887	121	121
2027	136,678	37,946	439	0.001341	6.37	28.4	0.99	174.6	1,682,668	121	121
2028	137,149	37,895	439	0.001338	6.36	28.4	0.99	174.3	1,679,452	121	121
2029	137,621	37,843	438	0.001335	6.34	28.3	0.99	174.0	1,676,239	121	121
2030	138,093	37,792	437	0.001331	6.32	28.3	0.99	173.6	1,673,030	120	120
2031	138,730	37,815	438	0.001333	6.33	28.3	0.99	173.8	1,674,470	121	121
2032	139,367	37,838	438	0.001334	6.34	28.3	0.99	173.9	1,675,909	121	121
2033	140,005	37,861	438	0.001336	6.35	28.3	0.99	174.1	1,677,350	121	121
2034	140,642	37,884	438	0.001337	6.35	28.4	0.99	174.2	1,678,791	121	121
2035	141,279	37,907	439	0.001339	6.36	28.4	0.99	174.4	1,680,233	121	121
2036	141,916	37,930	439	0.001340	6.37	28.4	0.99	174.5	1,681,676	121	121
2037	142,553	37,953	439	0.001342	6.37	28.4	0.99	174.7	1,683,120	121	121
2038	143,191	37,976	440	0.001343	6.38	28.4	0.99	174.8	1,684,564	121	121
2039	143,828	37,999	440	0.001345	6.39	28.4	1.00	175.0	1,686,009	121	121
2040	144,465	38,022	440	0.001346	6.40	28.4	1.00	175.1	1,687,454	121	121
2041	145,102	38,045	440	0.001348	6.40	28.4	1.00	175.3	1,688,901	122	122
2042	145,739	38,068	441	0.001349	6.41	28.4	1.00	175.4	1,690,348	122	122
2043	146,377	38,091	441	0.001351	6.42	28.4	1.00	175.6	1,691,796	122	122
2044	147,014	38,114	441	0.001352	6.42	28.4	1.00	175.7	1,693,245	122	122
2045	147,651	38,137	441	0.001354	6.43	28.4	1.00	175.9	1,694,694	122	122
2046	147,797	38,083	441	0.001350	6.41	28.4	1.00	175.5	1,691,273	122	122
2047	147,944	38,028	440	0.001347	6.40	28.4	1.00	175.2	1,687,857	122	122
2048	148,090	37,974	440	0.001343	6.38	28.4	0.99	174.8	1,684,444	121	121
2049	148,237	37,920	439	0.001340	6.36	28.4	0.99	174.5	1,681,036	121	121
2050	148,383	37,866	438	0.001336	6.35	28.3	0.99	174.1	1,677,632	121	121
2051	148,530	37,811	438	0.001333	6.33	28.3	0.99	173.7	1,674,232	121	121
2052	148,676	37,757	437	0.001329	6.31	28.3	0.99	173.4	1,670,836	120	120
2053	148,823	37,703	436	0.001325	6.30	28.3	0.99	173.0	1,667,444	120	120
2054	148,969	37,648	436	0.001322	6.28	28.3	0.99	172.7	1,664,056	120	120
2055	149,116	37,594	435	0.001318	6.26	28.3	0.98	172.3	1,660,672	120	120
2056	149,262	37,540	434	0.001315	6.25	28.2	0.98	172.0	1,657,292	119	119
2057	149,408	37,485	434	0.001311	6.23	28.2	0.98	171.6	1,653,916	119	119
2058	149,555	37,431	433	0.001308	6.21	28.2	0.98	171.3	1,650,544	119	119
2059	149,701	37,377	433	0.001304	6.20	28.2	0.98	170.9	1,647,176	119	119
2060	149,848	37,323	432	0.001301	6.18	28.2	0.98	170.6	1,643,813	118	118
2061	149,994	37,268	431	0.001297	6.16	28.2	0.98	170.2	1,640,453	118	118
2062	150,141	37,214	431	0.001294	6.15	28.1	0.97	169.9	1,637,097	118	118
2063	150,287	37,160	430	0.001290	6.13	28.1	0.97	169.5	1,633,745	118	118
2064	150,434	37,105	429	0.001287	6.11	28.1	0.97	169.2	1,630,398	117	117
2065	150,580	37,051	429	0.001283	6.10	28.1	0.97	168.9	1,627,054	117	117
Totals =									85,605,106	6,164	**6,164**

CLOVER POINT WET-WEATHER TF ASSUMPTIONS

Dry-Weather Flow Pumping Station:

static head =	22.0	m	**Ref:** M. Maynard file est_Outfall&Interceptor Cost Estimates_20090206.xls.
friction C value =	120		
forcemain diameter =	750	mm	
forcemain X-area =	0.4418	m^2	
forcemain length =	4,750	m	
pump efficiency =	70%		
fluid specific weight =	9.81	kN/m^3	

Electricity:

wet-weather treatment and pumping adjustment =	0.10	x dry-weather flow pumping requirement

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 18, 2009
Last Revision By: D. Shiskowski

Subject: Clover Point Wet-Weather Treatment Facility Option 1 Life Cycle Analysis

Yellow-shaded cell denotes assumed/input values

Year	Capital Costs[1]		Operation & Maintenance Costs										GHG CO2e		Total	
			Labour		Electricity		Chemicals		Maintenance		Administration					
	Total Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value
2008																
2009																
2010																
2011																
2012																
2013																
2014	$145,960,800	$115,354,940													$145,960,800	$115,354,940
2015		$0	$75,000	$56,994	$120,508	$91,576	$251,082	$190,802	$1,459,608	$1,109,182	$100,000	$75,992	$1,859	$1,413	$2,008,058	$1,525,959
2016		$0	$75,000	$54,802	$120,280	$87,887	$250,749	$183,219	$1,459,608	$1,066,521	$100,000	$73,069	$1,856	$1,356	$2,007,492	$1,466,855
2017		$0	$75,000	$52,694	$120,052	$84,347	$250,415	$175,938	$1,459,608	$1,025,501	$100,000	$70,259	$1,852	$1,301	$2,006,927	$1,410,040
2018		$0	$75,000	$50,667	$119,824	$80,949	$250,081	$168,946	$1,459,608	$986,059	$100,000	$67,556	$1,849	$1,249	$2,006,362	$1,355,426
2019		$0	$75,000	$48,719	$119,597	$77,688	$249,747	$162,231	$1,459,608	$948,134	$100,000	$64,958	$1,845	$1,199	$2,005,797	$1,302,928
2020		$0	$75,000	$46,845	$119,370	$74,558	$249,413	$155,783	$1,459,608	$911,667	$100,000	$62,460	$1,842	$1,150	$2,005,233	$1,252,462
2021		$0	$75,000	$45,043	$119,143	$71,554	$249,079	$149,591	$1,459,608	$876,603	$100,000	$60,057	$1,838	$1,104	$2,004,668	$1,203,952
2022		$0	$75,000	$43,311	$118,916	$68,671	$248,746	$143,644	$1,459,608	$842,887	$100,000	$57,748	$1,835	$1,059	$2,004,105	$1,157,320
2023		$0	$75,000	$41,645	$118,690	$65,904	$248,412	$137,934	$1,459,608	$810,469	$100,000	$55,526	$1,831	$1,017	$2,003,541	$1,112,495
2024		$0	$75,000	$40,043	$118,464	$63,249	$248,078	$132,451	$1,459,608	$779,297	$100,000	$53,391	$1,828	$976	$2,002,977	$1,069,406
2025		$0	$75,000	$38,503	$118,238	$60,700	$247,744	$127,185	$1,459,608	$749,324	$100,000	$51,337	$1,824	$937	$2,002,414	$1,027,986
2026		$0	$75,000	$37,022	$118,012	$58,254	$247,410	$122,129	$1,459,608	$720,504	$100,000	$49,363	$1,821	$899	$2,001,851	$988,170
2027		$0	$75,000	$35,598	$117,787	$55,907	$247,077	$117,273	$1,459,608	$692,792	$100,000	$47,464	$1,817	$863	$2,001,289	$949,896
2028		$0	$75,000	$34,229	$117,562	$53,654	$246,743	$112,610	$1,459,608	$666,146	$100,000	$45,639	$1,814	$828	$2,000,726	$913,105
2029		$0	$75,000	$32,913	$117,337	$51,491	$246,409	$108,133	$1,459,608	$640,525	$100,000	$43,883	$1,810	$794	$2,000,164	$877,739
2030		$0	$75,000	$31,647	$117,112	$49,416	$246,075	$103,833	$1,459,608	$615,889	$100,000	$42,196	$1,807	$762	$1,999,602	$843,743
2031		$0	$75,000	$30,429	$117,213	$47,556	$246,225	$99,900	$1,459,608	$592,201	$100,000	$40,573	$1,808	$734	$1,999,854	$811,394
2032		$0	$75,000	$29,259	$117,314	$45,767	$246,375	$96,116	$1,459,608	$569,424	$100,000	$39,012	$1,810	$706	$2,000,106	$780,284
2033		$0	$75,000	$28,134	$117,414	$44,044	$246,524	$92,475	$1,459,608	$547,523	$100,000	$37,512	$1,812	$680	$2,000,358	$750,368
2034		$0	$75,000	$27,052	$117,515	$42,387	$246,674	$88,973	$1,459,608	$526,465	$100,000	$36,069	$1,813	$654	$2,000,611	$721,599
2035		$0	$75,000	$26,011	$117,616	$40,791	$246,824	$85,603	$1,459,608	$506,216	$100,000	$34,682	$1,815	$629	$2,000,863	$693,932
2036		$0	$75,000	$25,011	$117,717	$39,256	$246,974	$82,360	$1,459,608	$486,746	$100,000	$33,348	$1,816	$606	$2,001,115	$667,327
2037		$0	$75,000	$24,049	$117,818	$37,779	$247,123	$79,240	$1,459,608	$468,025	$100,000	$32,065	$1,818	$583	$2,001,368	$641,741
2038		$0	$75,000	$23,124	$117,919	$36,357	$247,273	$76,239	$1,459,608	$450,024	$100,000	$30,832	$1,819	$561	$2,001,620	$617,137
2039		$0	$75,000	$22,235	$118,021	$34,988	$247,423	$73,351	$1,459,608	$432,716	$100,000	$29,646	$1,821	$540	$2,001,872	$593,476
2040		$0	$75,000	$21,379	$118,122	$33,672	$247,573	$70,573	$1,459,608	$416,073	$100,000	$28,506	$1,822	$520	$2,002,125	$570,722
2041		$0	$75,000	$20,557	$118,223	$32,404	$247,723	$67,899	$1,459,608	$400,070	$100,000	$27,409	$1,824	$500	$2,002,378	$548,840
2042		$0	$75,000	$19,766	$118,324	$31,185	$247,872	$65,327	$1,459,608	$384,683	$100,000	$26,355	$1,826	$481	$2,002,630	$527,797
2043		$0	$75,000	$19,006	$118,426	$30,011	$248,022	$62,853	$1,459,608	$369,887	$100,000	$25,342	$1,827	$463	$2,002,883	$507,562
2044		$0	$75,000	$18,275	$118,527	$28,881	$248,172	$60,472	$1,459,608	$355,661	$100,000	$24,367	$1,829	$446	$2,003,136	$488,101
2045		$0	$75,000	$17,572	$118,629	$27,794	$248,322	$58,181	$1,459,608	$341,982	$100,000	$23,430	$1,830	$429	$2,003,388	$469,388
2046		$0	$75,000	$16,896	$118,389	$26,671	$247,968	$55,864	$1,459,608	$328,828	$100,000	$22,529	$1,827	$412	$2,002,792	$451,200
2047		$0	$75,000	$16,247	$118,150	$25,594	$247,614	$53,638	$1,459,608	$316,181	$100,000	$21,662	$1,823	$395	$2,002,195	$433,717
2048		$0	$75,000	$15,622	$117,911	$24,560	$247,261	$51,502	$1,459,608	$304,020	$100,000	$20,829	$1,819	$379	$2,001,599	$416,911
2049		$0	$75,000	$15,021	$117,673	$23,567	$246,907	$49,450	$1,459,608	$292,327	$100,000	$20,028	$1,816	$364	$2,001,003	$400,757
2050		$0	$75,000	$14,443	$117,434	$22,615	$246,554	$47,480	$1,459,608	$281,084	$100,000	$19,257	$1,812	$349	$2,000,408	$385,228
2051		$0	$75,000	$13,888	$117,196	$21,701	$246,200	$45,588	$1,459,608	$270,273	$100,000	$18,517	$1,808	$335	$1,999,813	$370,302
2052		$0	$75,000	$13,353	$116,958	$20,824	$245,847	$43,772	$1,459,608	$259,878	$100,000	$17,805	$1,805	$321	$1,999,218	$355,953
2053		$0	$75,000	$12,840	$116,721	$19,982	$245,493	$42,028	$1,459,608	$249,883	$100,000	$17,120	$1,801	$308	$1,998,623	$342,161
2054		$0	$75,000	$12,346	$116,484	$19,175	$245,139	$40,353	$1,459,608	$240,272	$100,000	$16,461	$1,797	$296	$1,998,029	$328,903
2055		$0	$75,000	$11,871	$116,247	$18,400	$244,786	$38,745	$1,459,608	$231,030	$100,000	$15,828	$1,794	$284	$1,997,434	$316,159
2056		$0	$75,000	$11,415	$116,010	$17,656	$244,432	$37,201	$1,459,608	$222,145	$100,000	$15,219	$1,790	$272	$1,996,841	$303,909
2057		$0	$75,000	$10,976	$115,774	$16,943	$244,079	$35,719	$1,459,608	$213,601	$100,000	$14,634	$1,786	$261	$1,996,247	$292,133
2058		$0	$75,000	$10,553	$115,538	$16,258	$243,725	$34,295	$1,459,608	$205,385	$100,000	$14,071	$1,783	$251	$1,995,654	$280,814
2059		$0	$75,000	$10,148	$115,302	$15,600	$243,372	$32,928	$1,459,608	$197,486	$100,000	$13,530	$1,779	$241	$1,995,061	$269,933
2060		$0	$75,000	$9,757	$115,067	$14,970	$243,018	$31,616	$1,459,608	$189,890	$100,000	$13,010	$1,775	$231	$1,994,468	$259,474
2061		$0	$75,000	$9,382	$114,832	$14,365	$242,665	$30,356	$1,459,608	$182,587	$100,000	$12,509	$1,772	$222	$1,993,876	$249,420
2062		$0	$75,000	$9,021	$114,597	$13,784	$242,311	$29,146	$1,459,608	$175,564	$100,000	$12,028	$1,768	$213	$1,993,284	$239,756
2063		$0	$75,000	$8,674	$114,362	$13,227	$241,957	$27,984	$1,459,608	$168,812	$100,000	$11,566	$1,764	$204	$1,992,692	$230,466
2064		$0	$75,000	$8,341	$114,128	$12,692	$241,604	$26,868	$1,459,608	$162,319	$100,000	$11,121	$1,761	$196	$1,992,100	$221,536
2065		$0	$75,000	$8,020	$113,894	$12,179	$241,250	$25,797	$1,459,608	$156,076	$100,000	$10,693	$1,757	$188	$1,991,509	$212,952
Total Capital =	$145,960,800															
Total Net Present Value =		$115,354,940		$1,281,346		$2,019,438		$4,231,594		$24,936,837		$1,708,461		$31,157	$247,989,160	**$149,563,774**

CLOVER POINT WET-WEATHER TF ASSUMPTIONS

Labour:

number of facility manager(s) =	0
number of operations staff =	0.5
number of maintenance staff =	0.5
number of administration staff =	0
total staff =	1 persons

Wet-Weather CEPT Chemicals:
fraction of total annual ADWF treated = 25.0%

Ref: Allowance to account for potential costs.

Notes:
1. Excludes dry-weather flow forcemain. Included in CS Mods LCA.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 18, 2009
Last Revision By: D. Shiskowski

Subject: Outfalls (Saanich East, Royal Bay, Macaulay / McLoughlin, Clover)
Option 1
Life Cycle Analysis

Yellow-shaded cell denotes assumed/input values

Year	Capital Costs		Maintenance		Total	
	Total Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value
2008						
2009						
2010						
2011						
2012						
2013						
2014	$50,275,680	$39,733,600			$50,275,680	$39,733,600
2015		$0	$125,689	$95,513	$125,689	$95,513
2016		$0	$125,689	$91,840	$125,689	$91,840
2017		$0	$125,689	$88,308	$125,689	$88,308
2018		$0	$125,689	$84,911	$125,689	$84,911
2019		$0	$125,689	$81,645	$125,689	$81,645
2020		$0	$125,689	$78,505	$125,689	$78,505
2021		$0	$125,689	$75,486	$125,689	$75,486
2022		$0	$125,689	$72,582	$125,689	$72,582
2023		$0	$125,689	$69,791	$125,689	$69,791
2024		$0	$125,689	$67,106	$125,689	$67,106
2025		$0	$125,689	$64,525	$125,689	$64,525
2026		$0	$125,689	$62,044	$125,689	$62,044
2027		$0	$125,689	$59,657	$125,689	$59,657
2028		$0	$125,689	$57,363	$125,689	$57,363
2029		$0	$125,689	$55,157	$125,689	$55,157
2030		$0	$125,689	$53,035	$125,689	$53,035
2031		$0	$125,689	$50,995	$125,689	$50,995
2032		$0	$125,689	$49,034	$125,689	$49,034
2033		$0	$125,689	$47,148	$125,689	$47,148
2034		$0	$125,689	$45,335	$125,689	$45,335
2035		$0	$125,689	$43,591	$125,689	$43,591
2036		$0	$125,689	$41,915	$125,689	$41,915
2037		$0	$125,689	$40,302	$125,689	$40,302
2038		$0	$125,689	$38,752	$125,689	$38,752
2039		$0	$125,689	$37,262	$125,689	$37,262
2040		$0	$125,689	$35,829	$125,689	$35,829
2041		$0	$125,689	$34,451	$125,689	$34,451
2042		$0	$125,689	$33,126	$125,689	$33,126
2043		$0	$125,689	$31,852	$125,689	$31,852
2044		$0	$125,689	$30,627	$125,689	$30,627
2045		$0	$125,689	$29,449	$125,689	$29,449
2046		$0	$125,689	$28,316	$125,689	$28,316
2047		$0	$125,689	$27,227	$125,689	$27,227
2048		$0	$125,689	$26,180	$125,689	$26,180
2049		$0	$125,689	$25,173	$125,689	$25,173
2050		$0	$125,689	$24,205	$125,689	$24,205
2051		$0	$125,689	$23,274	$125,689	$23,274
2052		$0	$125,689	$22,379	$125,689	$22,379
2053		$0	$125,689	$21,518	$125,689	$21,518
2054		$0	$125,689	$20,690	$125,689	$20,690
2055		$0	$125,689	$19,894	$125,689	$19,894
2056		$0	$125,689	$19,129	$125,689	$19,129
2057		$0	$125,689	$18,393	$125,689	$18,393
2058		$0	$125,689	$17,686	$125,689	$17,686
2059		$0	$125,689	$17,006	$125,689	$17,006
2060		$0	$125,689	$16,352	$125,689	$16,352
2061		$0	$125,689	$15,723	$125,689	$15,723
2062		$0	$125,689	$15,118	$125,689	$15,118
2063		$0	$125,689	$14,537	$125,689	$14,537
2064		$0	$125,689	$13,978	$125,689	$13,978
2065		$0	$125,689	$13,440	$125,689	$13,440
Total Capital =	$50,275,680					
Total Net Present Value =		$39,733,600		$2,147,351	$56,685,829	**$41,880,951**

Notes:

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 18, 2009
Last Revision By: D. Shiskowski

Subject: Conveyance System Modifications

Life Cycle Analysis

Yellow-shaded cell denotes assumed/input values

Year	Capital Costs[1]		Maintenance		Total	
	Total Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value
2008						
2009						
2010						
2011						
2012						
2013						
2014	$106,494,960	$84,164,514			$106,494,960	$84,164,514
2015		$0	$266,237	$202,319	$266,237	$202,319
2016		$0	$266,237	$194,537	$266,237	$194,537
2017		$0	$266,237	$187,055	$266,237	$187,055
2018		$0	$266,237	$179,860	$266,237	$179,860
2019		$0	$266,237	$172,943	$266,237	$172,943
2020		$0	$266,237	$166,291	$266,237	$166,291
2021		$0	$266,237	$159,895	$266,237	$159,895
2022		$0	$266,237	$153,745	$266,237	$153,745
2023		$0	$266,237	$147,832	$266,237	$147,832
2024		$0	$266,237	$142,146	$266,237	$142,146
2025		$0	$266,237	$136,679	$266,237	$136,679
2026		$0	$266,237	$131,422	$266,237	$131,422
2027		$0	$266,237	$126,368	$266,237	$126,368
2028		$0	$266,237	$121,507	$266,237	$121,507
2029		$0	$266,237	$116,834	$266,237	$116,834
2030		$0	$266,237	$112,340	$266,237	$112,340
2031		$0	$266,237	$108,020	$266,237	$108,020
2032		$0	$266,237	$103,865	$266,237	$103,865
2033		$0	$266,237	$99,870	$266,237	$99,870
2034		$0	$266,237	$96,029	$266,237	$96,029
2035		$0	$266,237	$92,336	$266,237	$92,336
2036		$0	$266,237	$88,784	$266,237	$88,784
2037		$0	$266,237	$85,369	$266,237	$85,369
2038		$0	$266,237	$82,086	$266,237	$82,086
2039		$0	$266,237	$78,929	$266,237	$78,929
2040		$0	$266,237	$75,893	$266,237	$75,893
2041		$0	$266,237	$72,974	$266,237	$72,974
2042		$0	$266,237	$70,167	$266,237	$70,167
2043		$0	$266,237	$67,469	$266,237	$67,469
2044		$0	$266,237	$64,874	$266,237	$64,874
2045		$0	$266,237	$62,379	$266,237	$62,379
2046		$0	$266,237	$59,979	$266,237	$59,979
2047		$0	$266,237	$57,673	$266,237	$57,673
2048		$0	$266,237	$55,454	$266,237	$55,454
2049		$0	$266,237	$53,321	$266,237	$53,321
2050		$0	$266,237	$51,271	$266,237	$51,271
2051		$0	$266,237	$49,299	$266,237	$49,299
2052		$0	$266,237	$47,403	$266,237	$47,403
2053		$0	$266,237	$45,579	$266,237	$45,579
2054		$0	$266,237	$43,826	$266,237	$43,826
2055		$0	$266,237	$42,141	$266,237	$42,141
2056		$0	$266,237	$40,520	$266,237	$40,520
2057		$0	$266,237	$38,961	$266,237	$38,961
2058		$0	$266,237	$37,463	$266,237	$37,463
2059		$0	$266,237	$36,022	$266,237	$36,022
2060		$0	$266,237	$34,637	$266,237	$34,637
2061		$0	$266,237	$33,304	$266,237	$33,304
2062		$0	$266,237	$32,023	$266,237	$32,023
2063		$0	$266,237	$30,792	$266,237	$30,792
2064		$0	$266,237	$29,608	$266,237	$29,608
2065		$0	$266,237	$28,469	$266,237	$28,469
Total Capital =	$106,494,960					
Total Net Present Value =		$84,164,514		$4,548,563	$120,073,067	**$88,713,077**

Notes:
1. Includes dry-weather Clover Point forcemain and influent sewer for Macaulay / McLoughling WWTF.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: January 19, 2009
Last Revision By: D. Shiskowski
Checked:

Subject: Existing Trunk Sewer System

Option 1
Life Cycle Analysis

Yellow-shaded cell denotes assumed/input values

Year	Operation and Maintenance		Total	
	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value
2008				
2009				
2010				
2011				
2012				
2013				
2014				
2015	$4,763,435	$3,619,819	$4,763,435	$3,619,819
2016	$4,787,252	$3,497,998	$4,787,252	$3,497,998
2017	$4,811,189	$3,380,277	$4,811,189	$3,380,277
2018	$4,835,245	$3,266,518	$4,835,245	$3,266,518
2019	$4,859,421	$3,156,587	$4,859,421	$3,156,587
2020	$4,883,718	$3,050,356	$4,883,718	$3,050,356
2021	$4,908,137	$2,947,700	$4,908,137	$2,947,700
2022	$4,932,677	$2,848,498	$4,932,677	$2,848,498
2023	$4,957,341	$2,752,635	$4,957,341	$2,752,635
2024	$4,982,127	$2,659,998	$4,982,127	$2,659,998
2025	$5,007,038	$2,570,479	$5,007,038	$2,570,479
2026	$5,032,073	$2,483,973	$5,032,073	$2,483,973
2027	$5,057,233	$2,400,378	$5,057,233	$2,400,378
2028	$5,082,520	$2,319,596	$5,082,520	$2,319,596
2029	$5,107,932	$2,241,532	$5,107,932	$2,241,532
2030	$5,133,472	$2,166,096	$5,133,472	$2,166,096
2031	$5,159,139	$2,093,199	$5,159,139	$2,093,199
2032	$5,184,935	$2,022,754	$5,184,935	$2,022,754
2033	$5,210,860	$1,954,681	$5,210,860	$1,954,681
2034	$5,236,914	$1,888,898	$5,236,914	$1,888,898
2035	$5,263,099	$1,825,330	$5,263,099	$1,825,330
2036	$5,289,414	$1,763,900	$5,289,414	$1,763,900
2037	$5,315,861	$1,704,538	$5,315,861	$1,704,538
2038	$5,342,440	$1,647,174	$5,342,440	$1,647,174
2039	$5,369,153	$1,591,740	$5,369,153	$1,591,740
2040	$5,395,998	$1,538,172	$5,395,998	$1,538,172
2041	$5,422,978	$1,486,407	$5,422,978	$1,486,407
2042	$5,450,093	$1,436,383	$5,450,093	$1,436,383
2043	$5,477,344	$1,388,044	$5,477,344	$1,388,044
2044	$5,504,730	$1,341,331	$5,504,730	$1,341,331
2045	$5,532,254	$1,296,190	$5,532,254	$1,296,190
2046	$5,559,915	$1,252,568	$5,559,915	$1,252,568
2047	$5,587,715	$1,210,414	$5,587,715	$1,210,414
2048	$5,615,653	$1,169,679	$5,615,653	$1,169,679
2049	$5,643,732	$1,130,315	$5,643,732	$1,130,315
2050	$5,671,950	$1,092,275	$5,671,950	$1,092,275
2051	$5,700,310	$1,055,516	$5,700,310	$1,055,516
2052	$5,728,812	$1,019,994	$5,728,812	$1,019,994
2053	$5,757,456	$985,667	$5,757,456	$985,667
2054	$5,786,243	$952,496	$5,786,243	$952,496
2055	$5,815,174	$920,441	$5,815,174	$920,441
2056	$5,844,250	$889,464	$5,844,250	$889,464
2057	$5,873,471	$859,530	$5,873,471	$859,530
2058	$5,902,839	$830,604	$5,902,839	$830,604
2059	$5,932,353	$802,651	$5,932,353	$802,651
2060	$5,962,015	$775,639	$5,962,015	$775,639
2061	$5,991,825	$749,535	$5,991,825	$749,535
2062	$6,021,784	$724,311	$6,021,784	$724,311
2063	$6,051,893	$699,935	$6,051,893	$699,935
2064	$6,082,152	$676,379	$6,082,152	$676,379
2065	$6,112,563	$653,617	$6,112,563	$653,617
Total Capital =				
Total Net Present Value =		$88,792,213	$275,938,128	**$88,792,213**

Notes:

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski, D. Forgie
Last Revision: March 6, 2009
Last Revision By: D. Shiskowski

Subject: Combined S. Colwood and Macaulay/McLoughlin WWTF Solids Processing Systems, Hartland Biosolids Drying Facility, and Industrial Biosolids Land Application / Willow Coppice Program
Option 1
Material Flows
and GHG Emissions

Note: Coloured cells contain data linked to external spreadsheets

Year	Materials											GHG Sources				GHG Offsets		Total GHG Emissions
	Electricity		Biogas (WW Sludges)			Biomethane (WW Sludges)	Diesel Fuel		Willow Coppice	Natural Gas	Dried WW Biosolids	Electricity Purchased[4]	Biogas Lost	Natural Gas Combusted	Diesel Fuel Combusted	Avoided Natural Gas Use via Biomethane	Avoided Coal Use via Dried WW Biosolids	
	WW Sludges (kWh/yr)	Total (kWh/yr)	Boiler (m3/yr)	for Biomethane (m3/yr)	System Loss (m3/yr)	Available for Sale (GJ/yr)	WW Sludges[1] (L/yr)	Total (L/yr)	(odt/yr)	WW Sludges (GJ/yr)	(dry t/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)
2008																		
2009																		
2010																		
2011																		
2012																		
2013																		
2014																		
2015																		
2016	1,558,100	1,558,100	2,369,141	1,681,970	40,511	37,299	78,428	78,428	0	21,400	2,416	112	401	1,204	216	-2,098	-3,466	-3,631
2017	1,570,600	1,570,600	2,393,156	1,717,658	41,108	38,091	78,558	78,558	0	21,720	2,452	113	407	1,222	217	-2,142	-3,517	-3,702
2018	1,582,900	1,582,900	2,417,172	1,753,346	41,705	38,882	71,744	71,744	3,720	22,030	2,488	114	413	1,239	198	-2,187	-3,568	-3,792
2019	1,595,300	1,595,300	2,441,187	1,789,035	42,302	39,674	75,649	75,649	3,720	22,350	2,523	115	419	1,257	209	-2,231	-3,620	-3,852
2020	1,607,800	1,607,800	2,465,203	1,824,723	42,899	40,465	75,779	75,779	3,720	22,660	2,559	116	425	1,275	209	-2,276	-3,671	-3,923
2021	1,620,100	1,620,100	2,489,218	1,860,411	43,496	41,256	75,909	75,909	3,720	22,980	2,595	117	430	1,293	209	-2,320	-3,722	-3,993
2022	1,632,500	1,632,500	2,513,234	1,896,099	44,093	42,048	76,044	76,044	3,720	23,290	2,630	118	436	1,310	210	-2,365	-3,773	-4,064
2023	1,644,900	1,644,900	2,537,249	1,931,787	44,690	42,839	76,174	76,174	3,720	23,610	2,666	118	442	1,328	210	-2,409	-3,824	-4,135
2024	1,657,300	1,657,300	2,561,265	1,967,475	45,287	43,631	80,074	80,074	3,720	23,920	2,701	119	448	1,345	221	-2,454	-3,875	-4,195
2025	1,669,700	1,669,700	2,585,280	2,003,164	45,884	44,422	80,209	80,209	3,720	24,240	2,737	120	454	1,363	221	-2,499	-3,926	-4,266
2026	1,682,100	1,682,100	2,609,296	2,038,852	46,481	45,214	80,339	80,339	3,720	24,550	2,773	121	460	1,381	221	-2,543	-3,977	-4,337
2027	1,694,500	1,694,500	2,633,311	2,074,540	47,079	46,005	80,469	80,469	3,720	24,870	2,808	122	466	1,399	222	-2,588	-4,028	-4,407
2028	1,706,800	1,706,800	2,657,327	2,110,228	47,676	46,796	80,604	80,604	3,720	25,180	2,844	123	472	1,416	222	-2,632	-4,079	-4,478
2029	1,719,300	1,719,300	2,681,342	2,145,916	48,273	47,588	80,734	80,734	3,720	25,500	2,879	124	478	1,434	223	-2,677	-4,130	-4,549
2030	1,731,700	1,731,700	2,705,357	2,181,604	48,870	48,379	84,634	84,634	3,720	25,810	2,915	125	484	1,452	233	-2,721	-4,181	-4,609
2031	1,741,900	1,741,900	2,729,373	2,208,492	49,379	48,976	84,749	84,749	3,720	26,080	2,945	125	489	1,467	234	-2,755	-4,225	-4,665
2032	1,752,200	1,752,200	2,753,388	2,235,379	49,888	49,572	88,059	88,059	3,720	26,350	2,976	126	494	1,482	243	-2,788	-4,269	-4,712
2033	1,762,400	1,762,400	2,777,404	2,262,267	50,397	50,168	88,169	88,169	3,720	26,620	3,006	127	499	1,497	243	-2,822	-4,312	-4,768
2034	1,772,600	1,772,600	2,801,419	2,289,155	50,906	50,764	88,284	88,284	3,720	26,890	3,036	128	504	1,512	243	-2,855	-4,356	-4,824
2035	1,782,800	1,782,800	2,825,435	2,316,042	51,415	51,361	88,394	88,394	3,720	27,160	3,067	128	509	1,528	244	-2,889	-4,399	-4,880
2036	1,793,200	1,793,200	2,849,450	2,342,930	51,924	51,957	101,642	101,642	4,368	27,430	3,097	129	514	1,543	280	-2,922	-4,443	-4,899
2037	1,803,400	1,803,400	2,873,466	2,369,817	52,433	52,553	101,752	101,752	4,368	27,700	3,128	130	519	1,558	280	-2,956	-4,486	-4,955
2038	1,813,600	1,813,600	2,897,481	2,396,705	52,942	53,149	101,867	101,867	4,368	27,970	3,158	131	524	1,573	281	-2,989	-4,530	-5,011
2039	1,823,900	1,823,900	2,921,497	2,423,592	53,451	53,746	93,824	93,824	4,368	28,230	3,188	131	529	1,588	259	-3,023	-4,573	-5,090
2040	1,834,100	1,834,100	2,945,512	2,450,480	53,960	54,342	93,934	93,934	4,368	28,500	3,219	132	534	1,603	259	-3,056	-4,617	-5,145
2041	1,844,400	1,844,400	2,969,528	2,477,367	54,469	54,938	94,049	94,049	4,368	28,770	3,249	133	539	1,618	259	-3,090	-4,661	-5,201
2042	1,854,600	1,854,600	2,993,543	2,504,255	54,978	55,534	97,929	97,929	4,368	29,040	3,279	134	544	1,633	270	-3,124	-4,704	-5,247
2043	1,864,900	1,864,900	3,017,559	2,531,142	55,487	56,131	98,044	98,044	4,368	29,310	3,310	134	549	1,649	270	-3,157	-4,748	-5,303
2044	1,875,100	1,875,100	3,041,574	2,558,030	55,996	56,727	98,154	98,154	4,368	29,580	3,340	135	554	1,664	271	-3,191	-4,791	-5,358
2045	1,885,300	1,885,300	3,065,590	2,584,917	56,505	57,323	98,269	98,269	4,368	29,850	3,370	136	559	1,679	271	-3,224	-4,835	-5,414
2046	1,892,600	1,892,600	3,089,605	2,599,571	56,892	57,648	98,354	98,354	4,368	30,050	3,394	136	563	1,690	271	-3,242	-4,868	-5,450
2047	1,899,900	1,899,900	3,113,620	2,614,225	57,278	57,973	98,439	98,439	4,368	30,260	3,417	137	567	1,702	271	-3,261	-4,901	-5,485
2048	1,907,100	1,907,100	3,137,636	2,628,879	57,665	58,298	98,524	98,524	4,368	30,460	3,440	137	571	1,713	272	-3,279	-4,934	-5,520
2049	1,914,400	1,914,400	3,161,651	2,643,533	58,052	58,623	102,379	102,379	4,368	30,660	3,463	138	575	1,724	282	-3,297	-4,967	-5,545
2050	1,921,700	1,921,700	3,185,667	2,658,187	58,439	58,948	102,464	102,464	4,368	30,870	3,486	138	578	1,736	282	-3,316	-5,000	-5,580
2051	1,928,900	1,928,900	3,209,682	2,672,841	58,825	59,273	102,549	102,549	4,368	31,070	3,509	139	582	1,748	283	-3,334	-5,033	-5,616
2052	1,936,100	1,936,100	3,233,698	2,687,495	59,212	59,598	102,634	102,634	4,368	31,280	3,532	139	586	1,759	283	-3,352	-5,066	-5,651
2053	1,943,500	1,943,500	3,257,713	2,702,149	59,599	59,923	102,719	102,719	4,368	31,480	3,555	140	590	1,771	283	-3,370	-5,100	-5,686
2054	1,950,700	1,950,700	3,281,729	2,716,803	59,985	60,248	102,804	102,804	4,368	31,690	3,578	140	594	1,782	283	-3,389	-5,133	-5,721
2055	1,958,000	1,958,000	3,305,744	2,731,457	60,372	60,573	102,889	102,889	4,368	31,890	3,601	141	597	1,794	284	-3,407	-5,166	-5,757
2056	1,965,200	1,965,200	3,329,760	2,746,111	60,759	60,898	102,974	102,974	4,368	32,090	3,624	141	601	1,805	284	-3,425	-5,199	-5,792
2057	1,972,400	1,972,400	3,353,775	2,760,765	61,145	61,223	112,825	112,825	4,800	32,300	3,647	142	605	1,817	311	-3,443	-5,232	-5,800
2058	1,979,700	1,979,700	3,377,791	2,775,419	61,532	61,548	116,680	116,680	4,800	32,500	3,670	143	609	1,828	322	-3,462	-5,265	-5,826
2059	1,987,000	1,987,000	3,401,806	2,790,073	61,919	61,873	116,765	116,765	4,800	32,710	3,693	143	613	1,840	322	-3,480	-5,298	-5,861
2060	1,994,200	1,994,200	3,425,822	2,804,727	62,305	62,198	107,890	107,890	4,800	32,910	3,716	144	617	1,851	297	-3,498	-5,331	-5,921
2061	2,001,500	2,001,500	3,449,837	2,819,381	62,692	62,523	107,975	107,975	4,800	33,110	3,740	144	620	1,862	298	-3,517	-5,364	-5,956
2062	2,008,800	2,008,800	3,473,853	2,834,035	63,079	62,848	108,060	108,060	4,800	33,320	3,763	145	624	1,874	298	-3,535	-5,397	-5,991
2063	2,016,000	2,016,000	3,497,868	2,848,689	63,466	63,173	108,145	108,145	4,800	33,520	3,786	145	628	1,885	298	-3,553	-5,430	-6,027
2064	2,023,300	2,023,300	3,521,884	2,863,343	63,852	63,497	108,230	108,230	4,800	33,730	3,809	146	632	1,897	298	-3,571	-5,463	-6,062
2065	2,030,500	2,030,500	3,545,899	2,877,997	64,239	63,822	108,315	108,315	4,800	33,930	3,832	146	636	1,908	299	-3,590	-5,497	-6,097
Totals =	91,109,500	91,109,500	147,875,996	119,703,060	2,675,791	2,654,535	4,704,074	4,704,074	201,888	1,413,420	159,609	6,560	26,482	79,497	12,968	-149,303	-228,952	**-252,749**

Notes:
1. Includes transport of biosolids to land application site plus actual land application and coppice equipment.

3. Assumes that land applied biosolids are not off-setting commercial fertilizer use.
4. Negative values imply an off-set and are considered as an offset in the analysis.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski, D. Forgie
Last Revision: **March 6, 2009**
Last Revision By: D. Shiskowski

Subject: Combined South Colwood and Macaulay/McLoughln WWTF Solids Processing Systems, Hartland Biosolids Drying Facility, and Industrial Biosolids Land Application / Willow Coppice Program
Option 1
Life-Cycle Analysis

Yellow-shaded cell denotes assumed/input values
Note: Other coloured cells contain data linked to external spreadsheets

Year	Capital Costs			Operations & Maintenance Costs: Labour			Electricity		Natural Gas	
	WW Sludges[5]	**Total** Cost	Net Present Value	**WW Sludges[1]** Annual Cost	**Total** Annual Cost	Net Present Value	**Total** Annual Cost	Net Present Value	**Total** Annual Cost	Net Present Value
2008										
2009										
2010										
2011										
2012										
2013										
2014										
2015	$191,797,320	$191,797,320	$145,750,200							
2016		$0	$0	$1,085,769	$1,085,769	$793,361	$109,067	$79,694	$214,000	$156,368
2017		$0	$0	$1,085,769	$1,085,769	$762,847	$109,942	$77,244	$217,200	$152,602
2018		$0	$0	$1,067,885	$1,067,885	$721,425	$110,803	$74,855	$220,300	$148,827
2019		$0	$0	$1,067,885	$1,067,885	$693,677	$111,671	$72,539	$223,500	$145,181
2020		$0	$0	$1,067,885	$1,067,885	$666,998	$112,546	$70,296	$226,600	$141,534
2021		$0	$0	$1,067,885	$1,067,885	$641,344	$113,407	$68,109	$229,800	$138,012
2022		$0	$0	$1,067,885	$1,067,885	$616,677	$114,275	$65,991	$232,900	$134,494
2023		$0	$0	$1,067,885	$1,067,885	$592,958	$115,143	$63,935	$236,100	$131,098
2024		$0	$0	$1,067,885	$1,067,885	$570,152	$116,011	$61,939	$239,200	$127,711
2025		$0	$0	$1,067,885	$1,067,885	$548,223	$116,879	$60,003	$242,400	$124,442
2026		$0	$0	$1,067,885	$1,067,885	$527,138	$117,747	$58,123	$245,500	$121,186
2027		$0	$0	$1,067,885	$1,067,885	$506,863	$118,615	$56,300	$248,700	$118,044
2028		$0	$0	$1,067,885	$1,067,885	$487,369	$119,476	$54,527	$251,800	$114,918
2029		$0	$0	$1,067,885	$1,067,885	$468,624	$120,351	$52,814	$255,000	$111,903
2030		$0	$0	$1,067,885	$1,067,885	$450,600	$121,219	$51,149	$258,100	$108,907
2031		$0	$0	$1,067,885	$1,067,885	$433,269	$121,933	$49,471	$260,800	$105,813
2032		$0	$0	$1,067,885	$1,067,885	$416,605	$122,654	$47,850	$263,500	$102,797
2033		$0	$0	$1,067,885	$1,067,885	$400,581	$123,368	$46,277	$266,200	$99,856
2034		$0	$0	$1,067,885	$1,067,885	$385,174	$124,082	$44,755	$268,900	$96,989
2035		$0	$0	$1,067,885	$1,067,885	$370,360	$124,796	$43,281	$271,600	$94,195
2036		$0	$0	$1,092,000	$1,092,000	$364,157	$125,524	$41,859	$274,300	$91,473
2037		$0	$0	$1,092,000	$1,092,000	$350,151	$126,238	$40,478	$277,000	$88,820
2038		$0	$0	$1,092,000	$1,092,000	$336,684	$126,952	$39,142	$279,700	$86,237
2039		$0	$0	$1,071,000	$1,071,000	$317,509	$127,673	$37,850	$282,300	$83,691
2040		$0	$0	$1,071,000	$1,071,000	$305,297	$128,387	$36,598	$285,000	$81,242
2041		$0	$0	$1,071,000	$1,071,000	$293,555	$129,108	$35,388	$287,700	$78,857
2042		$0	$0	$1,071,000	$1,071,000	$282,264	$129,822	$34,215	$290,400	$76,536
2043		$0	$0	$1,071,000	$1,071,000	$271,408	$130,543	$33,082	$293,100	$74,276
2044		$0	$0	$1,071,000	$1,071,000	$260,969	$131,257	$31,983	$295,800	$72,077
2045		$0	$0	$1,071,000	$1,071,000	$250,932	$131,971	$30,920	$298,500	$69,938
2046		$0	$0	$1,071,000	$1,071,000	$241,281	$132,482	$29,846	$300,500	$67,698
2047		$0	$0	$1,071,000	$1,071,000	$232,001	$132,993	$28,809	$302,600	$65,549
2048		$0	$0	$1,071,000	$1,071,000	$223,078	$133,497	$27,806	$304,600	$63,445
2049		$0	$0	$1,071,000	$1,071,000	$214,498	$134,008	$26,839	$306,600	$61,405
2050		$0	$0	$1,071,000	$1,071,000	$206,248	$134,519	$25,905	$308,700	$59,448
2051		$0	$0	$1,071,000	$1,071,000	$198,315	$135,023	$25,002	$310,700	$57,532
2052		$0	$0	$1,071,000	$1,071,000	$190,688	$135,527	$24,130	$312,800	$55,693
2053		$0	$0	$1,071,000	$1,071,000	$183,353	$136,045	$23,291	$314,800	$53,893
2054		$0	$0	$1,071,000	$1,071,000	$176,301	$136,549	$22,478	$316,900	$52,166
2055		$0	$0	$1,071,000	$1,071,000	$169,521	$137,060	$21,694	$318,900	$50,476
2056		$0	$0	$1,071,000	$1,071,000	$163,001	$137,564	$20,937	$320,900	$48,839
2057		$0	$0	$1,096,154	$1,096,154	$160,412	$138,068	$20,205	$323,000	$47,268
2058		$0	$0	$1,096,154	$1,096,154	$154,243	$138,579	$19,500	$325,000	$45,732
2059		$0	$0	$1,096,154	$1,096,154	$148,310	$139,090	$18,819	$327,100	$44,257
2060		$0	$0	$1,073,077	$1,073,077	$139,604	$139,594	$18,161	$329,100	$42,815
2061		$0	$0	$1,073,077	$1,073,077	$134,234	$140,105	$17,526	$331,100	$41,418
2062		$0	$0	$1,073,077	$1,073,077	$129,072	$140,616	$16,914	$333,200	$40,078
2063		$0	$0	$1,073,077	$1,073,077	$124,107	$141,120	$16,321	$335,200	$38,768
2064		$0	$0	$1,073,077	$1,073,077	$119,334	$141,631	$15,750	$337,300	$37,510
2065		$0	$0	$1,073,077	$1,073,077	$114,744	$142,135	$15,198	$339,300	$36,281
Total Capital =	$191,797,320	$191,797,320								
Total Net Present Value =			$145,750,200			$17,509,516		$1,995,799		$4,288,293

Year	Chemicals			Trucking/Equipment[3]			Land Lease for Willow Coppice		Maintenance		Administration	
	WW Sludges Annual Cost	**Total** Annual Cost	Net Present Value	**WW Sludges[2]** Annual Cost	**Total** Annual Cost	Net Present Value	**Total** Annual Cost	Net Present Value	**Total** Annual Cost	Net Present Value	**Total** Annual Cost	Net Present Value
2008												
2009												
2010												
2011												
2012												
2013												
2014												
2015												
2016	$423,300	$423,300	$309,301	$849,850	$849,850	$620,977	$153,450	$112,124	$1,917,973	$1,401,444	$100,000	$73,069
2017	$429,800	$429,800	$301,972	$852,850	$852,850	$599,201	$153,450	$107,812	$1,917,973	$1,347,543	$100,000	$70,259
2018	$436,400	$436,400	$294,816	$594,650	$594,650	$401,724	$153,450	$103,665	$1,917,973	$1,295,714	$100,000	$67,556
2019	$441,900	$441,900	$287,050	$608,500	$608,500	$395,270	$153,450	$99,678	$1,917,973	$1,245,879	$100,000	$64,958
2020	$448,400	$448,400	$280,069	$611,000	$611,000	$381,629	$153,450	$95,844	$1,917,973	$1,197,960	$100,000	$62,460
2021	$455,000	$455,000	$273,261	$614,000	$614,000	$368,752	$153,450	$92,158	$1,917,973	$1,151,885	$100,000	$60,057
2022	$460,500	$460,500	$265,927	$617,000	$617,000	$356,302	$153,450	$88,614	$1,917,973	$1,107,582	$100,000	$57,748
2023	$467,000	$467,000	$259,309	$620,000	$620,000	$344,264	$153,450	$85,205	$1,917,973	$1,064,982	$100,000	$55,526
2024	$473,600	$473,600	$252,859	$633,450	$633,450	$338,204	$153,450	$81,928	$1,917,973	$1,024,022	$100,000	$53,391
2025	$479,100	$479,100	$245,957	$636,450	$636,450	$326,736	$153,450	$78,777	$1,917,973	$984,636	$100,000	$51,337
2026	$485,600	$485,600	$239,706	$639,450	$639,450	$315,651	$153,450	$75,747	$1,917,973	$946,766	$100,000	$49,363
2027	$492,200	$492,200	$233,619	$642,450	$642,450	$304,934	$153,450	$72,834	$1,917,973	$910,351	$100,000	$47,464
2028	$498,700	$498,700	$227,600	$645,450	$645,450	$294,575	$153,450	$70,033	$1,917,973	$875,338	$100,000	$45,639
2029	$504,200	$504,200	$221,260	$647,950	$647,950	$284,342	$153,450	$67,339	$1,917,973	$841,671	$100,000	$43,883
2030	$510,800	$510,800	$215,535	$661,750	$661,750	$279,229	$153,450	$64,749	$1,917,973	$809,299	$100,000	$42,196
2031	$516,200	$516,200	$209,436	$664,250	$664,250	$269,504	$153,450	$62,259	$1,917,973	$778,172	$100,000	$40,573
2032	$521,700	$521,700	$203,526	$723,950	$723,950	$282,428	$153,450	$59,864	$1,917,973	$748,243	$100,000	$39,012
2033	$526,100	$526,100	$197,349	$726,450	$726,450	$272,504	$153,450	$57,562	$1,917,973	$719,464	$100,000	$37,512
2034	$531,600	$531,600	$191,742	$728,950	$728,950	$262,924	$153,450	$55,348	$1,917,973	$691,792	$100,000	$36,069
2035	$537,100	$537,100	$186,275	$731,450	$731,450	$253,679	$153,450	$53,219	$1,917,973	$665,185	$100,000	$34,682
2036	$542,500	$542,500	$180,912	$1,054,700	$1,054,700	$351,719	$180,180	$60,086	$1,917,973	$639,601	$100,000	$33,348
2037	$548,000	$548,000	$175,717	$1,057,200	$1,057,200	$338,993	$180,180	$57,775	$1,917,973	$615,001	$100,000	$32,065
2038	$553,400	$553,400	$170,624	$1,059,200	$1,059,200	$326,571	$180,180	$55,553	$1,917,973	$591,347	$100,000	$30,832
2039	$558,900	$558,900	$165,692	$754,900	$754,900	$223,798	$180,180	$53,416	$1,917,973	$568,603	$100,000	$29,646
2040	$563,300	$563,300	$160,573	$757,400	$757,400	$215,903	$180,180	$51,362	$1,917,973	$546,733	$100,000	$28,506
2041	$568,800	$568,800	$155,905	$759,900	$759,900	$208,284	$180,180	$49,386	$1,917,973	$525,705	$100,000	$27,409
2042	$574,200	$574,200	$151,332	$773,250	$773,250	$203,792	$180,180	$47,487	$1,917,973	$505,486	$100,000	$26,355
2043	$579,700	$579,700	$146,905	$775,750	$775,750	$196,587	$180,180	$45,660	$1,917,973	$486,044	$100,000	$25,342
2044	$585,200	$585,200	$142,595	$778,250	$778,250	$189,635	$180,180	$43,904	$1,917,973	$467,350	$100,000	$24,367
2045	$590,600	$590,600	$138,376	$780,750	$780,750	$182,927	$180,180	$42,216	$1,917,973	$449,375	$100,000	$23,430
2046	$594,000	$594,000	$133,820	$782,750	$782,750	$176,342	$180,180	$40,592	$1,917,973	$432,091	$100,000	$22,529
2047	$598,300	$598,300	$129,604	$784,250	$784,250	$169,885	$180,180	$39,031	$1,917,973	$415,473	$100,000	$21,662
2048	$602,600	$602,600	$125,515	$786,250	$786,250	$163,767	$180,180	$37,530	$1,917,973	$399,493	$100,000	$20,829
2049	$607,000	$607,000	$121,569	$799,150	$799,150	$160,052	$180,180	$36,086	$1,917,973	$384,128	$100,000	$20,028
2050	$610,300	$610,300	$117,528	$801,150	$801,150	$154,281	$180,180	$34,698	$1,917,973	$369,354	$100,000	$19,257
2051	$614,700	$614,700	$113,823	$802,650	$802,650	$148,625	$180,180	$33,364	$1,917,973	$355,148	$100,000	$18,517
2052	$619,000	$619,000	$110,211	$804,650	$804,650	$143,265	$180,180	$32,080	$1,917,973	$341,488	$100,000	$17,805
2053	$622,400	$622,400	$106,554	$806,650	$806,650	$138,097	$180,180	$30,847	$1,917,973	$328,354	$100,000	$17,120
2054	$626,700	$626,700	$103,164	$808,650	$808,650	$133,115	$180,180	$29,660	$1,917,973	$315,725	$100,000	$16,461
2055	$631,100	$631,100	$99,892	$810,150	$810,150	$128,233	$180,180	$28,519	$1,917,973	$303,582	$100,000	$15,828
2056	$634,400	$634,400	$96,552	$812,150	$812,150	$123,605	$180,180	$27,422	$1,917,973	$291,905	$100,000	$15,219
2057	$638,800	$638,800	$93,483	$1,153,250	$1,153,250	$168,768	$198,000	$28,976	$1,917,973	$280,678	$100,000	$14,634
2058	$643,100	$643,100	$90,492	$1,166,200	$1,166,200	$164,099	$198,000	$27,861	$1,917,973	$269,883	$100,000	$14,071
2059	$646,500	$646,500	$87,472	$1,167,700	$1,167,700	$157,991	$198,000	$26,790	$1,917,973	$259,503	$100,000	$13,530
2060	$650,800	$650,800	$84,667	$832,600	$832,600	$108,319	$198,000	$25,759	$1,917,973	$249,522	$100,000	$13,010
2061	$655,100	$655,100	$81,948	$834,600	$834,600	$104,403	$198,000	$24,768	$1,917,973	$239,925	$100,000	$12,509
2062	$659,500	$659,500	$79,326	$836,600	$836,600	$100,628	$198,000	$23,816	$1,917,973	$230,697	$100,000	$12,028
2063	$662,800	$662,800	$76,656	$838,100	$838,100	$96,931	$198,000	$22,900	$1,917,973	$221,824	$100,000	$11,566
2064	$667,200	$667,200	$74,197	$840,100	$840,100	$93,425	$198,000	$22,019	$1,917,973	$213,292	$100,000	$11,121
2065	$671,500	$671,500	$71,804	$842,100	$842,100	$90,046	$198,000	$21,172	$1,917,973	$205,089	$100,000	$10,693
Total Capital =												
Total Net Present Value =			$8,483,475			$12,114,915		$2,685,494		$31,310,327		$1,632,469

Year	GHG CO2e[4]		Dried WW Biosolids Revenues		Biomethane Revenues		Woodchip Revenues (via Willow Coppice)		Total	
	Total Annual Cost	Net Present Value	**Total** Annual Rev	Net Present Value	**Total** Annual Rev	Net Present Value	**Total** Annual Rev	Net Present Value	**Total** Annual Cost	Net Present Value
2008										
2009										
2010										
2011										
2012										
2013										
2014										
2015									$191,797,320	$145,750,200
2016	-$54,469	-$39,800	-$66,917	-$48,896	-$372,994	-$272,543	$0	$0	$4,359,030	$3,185,100
2017	-$55,525	-$39,011	-$67,903	-$47,708	-$380,908	-$267,621	$0	$0	$4,362,648	$3,065,139
2018	-$56,877	-$38,424	-$68,890	-$46,539	-$388,822	-$262,674	-$372,000	-$251,310	$3,714,872	$2,509,634
2019	-$57,778	-$37,531	-$69,876	-$45,390	-$396,736	-$257,712	-$372,000	-$241,644	$3,728,489	$2,421,955
2020	-$58,843	-$36,753	-$70,862	-$44,260	-$404,651	-$252,744	-$372,000	-$232,350	$3,731,499	$2,330,683
2021	-$59,900	-$35,974	-$71,848	-$43,150	-$412,565	-$247,776	-$372,000	-$223,414	$3,735,202	$2,243,266
2022	-$60,964	-$35,205	-$72,834	-$42,060	-$420,479	-$242,816	-$372,000	-$214,821	$3,737,705	$2,158,432
2023	-$62,021	-$34,438	-$73,821	-$40,990	-$428,393	-$237,872	-$372,000	-$206,558	$3,741,316	$2,077,420
2024	-$62,930	-$33,599	-$74,807	-$39,940	-$436,307	-$232,948	-$372,000	-$198,614	$3,755,525	$2,005,105
2025	-$63,987	-$32,849	-$75,793	-$38,910	-$444,222	-$228,051	-$372,000	-$190,975	$3,758,136	$1,929,326
2026	-$65,052	-$32,111	-$76,779	-$37,900	-$452,136	-$223,187	-$372,000	-$183,630	$3,761,638	$1,856,850
2027	-$66,108	-$31,378	-$77,765	-$36,911	-$460,050	-$218,359	-$372,000	-$176,567	$3,765,349	$1,787,195
2028	-$67,173	-$30,657	-$78,752	-$35,941	-$467,964	-$213,573	-$372,000	-$169,776	$3,768,845	$1,720,052
2029	-$68,230	-$29,941	-$79,738	-$34,992	-$475,878	-$208,831	-$372,000	-$163,246	$3,770,963	$1,654,825
2030	-$69,139	-$29,173	-$80,724	-$34,062	-$483,793	-$204,139	-$372,000	-$156,967	$3,785,522	$1,597,321
2031	-$69,976	-$28,391	-$81,565	-$33,093	-$489,755	-$198,707	-$372,000	-$150,930	$3,789,195	$1,537,376
2032	-$70,681	-$27,574	-$82,406	-$32,148	-$495,718	-$193,390	-$372,000	-$145,125	$3,850,308	$1,502,088
2033	-$71,518	-$26,828	-$83,246	-$31,227	-$501,680	-$188,189	-$372,000	-$139,543	$3,852,981	$1,445,318
2034	-$72,356	-$26,098	-$84,087	-$30,329	-$507,643	-$183,101	-$372,000	-$134,176	$3,856,754	$1,391,090
2035	-$73,193	-$25,385	-$84,928	-$29,454	-$513,605	-$178,127	-$372,000	-$129,016	$3,860,527	$1,338,895
2036	-$73,487	-$24,506	-$85,769	-$28,602	-$519,568	-$173,264	-$436,800	-$145,663	$4,171,553	$1,391,119
2037	-$74,325	-$23,832	-$86,610	-$27,772	-$525,531	-$168,512	-$436,800	-$140,061	$4,175,326	$1,338,824
2038	-$75,162	-$23,174	-$87,451	-$26,963	-$531,493	-$163,869	-$436,800	-$134,674	$4,178,500	$1,288,309
2039	-$76,345	-$22,633	-$88,291	-$26,175	-$537,456	-$159,334	-$436,800	-$129,494	$3,854,034	$1,142,568
2040	-$77,182	-$22,001	-$89,132	-$25,408	-$543,418	-$154,906	-$436,800	-$124,513	$3,856,708	$1,099,385
2041	-$78,019	-$21,385	-$89,973	-$24,661	-$549,381	-$150,582	-$436,800	-$119,724	$3,860,488	$1,058,137
2042	-$78,701	-$20,742	-$90,814	-$23,934	-$555,344	-$146,362	-$436,800	-$115,120	$3,875,167	$1,021,308
2043	-$79,538	-$20,156	-$91,655	-$23,227	-$561,306	-$142,244	-$436,800	-$110,692	$3,878,947	$982,985
2044	-$80,375	-$19,585	-$92,495	-$22,538	-$567,269	-$138,226	-$436,800	-$106,434	$3,882,721	$946,098
2045	-$81,213	-$19,028	-$93,336	-$21,868	-$573,231	-$134,306	-$436,800	-$102,341	$3,886,394	$910,570
2046	-$81,746	-$18,416	-$93,975	-$21,171	-$576,481	-$129,873	-$436,800	-$98,405	$3,889,884	$876,334
2047	-$82,270	-$17,821	-$94,614	-$20,495	-$579,731	-$125,582	-$436,800	-$94,620	$3,893,882	$843,495
2048	-$82,803	-$17,247	-$95,253	-$19,840	-$582,980	-$121,428	-$436,800	-$90,981	$3,898,264	$811,966
2049	-$83,180	-$16,659	-$95,891	-$19,205	-$586,230	-$117,409	-$436,800	-$87,481	$3,913,810	$783,850
2050	-$83,705	-$16,119	-$96,530	-$18,589	-$589,480	-$113,519	-$436,800	-$84,117	$3,917,308	$754,375
2051	-$84,238	-$15,598	-$97,169	-$17,993	-$592,729	-$109,755	-$436,800	-$80,881	$3,921,290	$726,098
2052	-$84,762	-$15,092	-$97,808	-$17,414	-$595,979	-$106,112	-$436,800	-$77,771	$3,925,781	$698,971
2053	-$85,295	-$14,602	-$98,446	-$16,854	-$599,229	-$102,587	-$436,800	-$74,779	$3,929,278	$672,686
2054	-$85,820	-$14,127	-$99,085	-$16,311	-$602,478	-$99,176	-$436,800	-$71,903	$3,933,769	$647,553
2055	-$86,353	-$13,668	-$99,724	-$15,785	-$605,728	-$95,876	-$436,800	-$69,138	$3,937,759	$623,279
2056	-$86,886	-$13,224	-$100,363	-$15,275	-$608,978	-$92,683	-$436,800	-$66,479	$3,941,141	$599,821
2057	-$87,006	-$12,733	-$101,001	-$14,781	-$612,227	-$89,594	-$480,000	-$70,244	$4,285,010	$627,073
2058	-$87,384	-$12,296	-$101,640	-$14,302	-$615,477	-$86,605	-$480,000	-$67,542	$4,300,506	$605,135
2059	-$87,908	-$11,894	-$102,279	-$13,838	-$618,727	-$83,714	-$480,000	-$64,944	$4,303,604	$582,280
2060	-$88,812	-$11,554	-$102,918	-$13,389	-$621,976	-$80,917	-$480,000	-$62,446	$3,947,439	$513,549
2061	-$89,344	-$11,176	-$103,556	-$12,954	-$625,226	-$78,211	-$480,000	-$60,045	$3,951,828	$494,346
2062	-$89,869	-$10,810	-$104,195	-$12,533	-$628,476	-$75,594	-$480,000	-$57,735	$3,956,427	$475,886
2063	-$90,402	-$10,455	-$104,834	-$12,125	-$631,725	-$73,063	-$480,000	-$55,515	$3,959,309	$457,916
2064	-$90,927	-$10,112	-$105,473	-$11,729	-$634,975	-$70,614	-$480,000	-$53,379	$3,963,907	$440,815
2065	-$91,460	-$9,780	-$106,111	-$11,346	-$638,225	-$68,245	-$480,000	-$51,326	$3,968,290	$424,329
Total Capital =										
Total Net Present Value =		-$1,141,547		-$1,340,977		-$7,964,522		-$5,977,110	$387,842,147	**$209,346,332**

Notes:
1. Copied from dnt_Organics_LCA_ds.xls, Alt1d - LCA.
3. Includes **diesel fuel**, driver, maintenance costs and same for coppice activities.
4. Excludes CO2e off-sets of commerical fertilizers by non-CRD end users (i.e. assumes that the CRD would not be able to sell these "credits"). Includes CO2 off-sets from sale of biomethane and dried WW sludges.
5. Includes biomethane upgrading and P recovery systems and willow coppice planting and harvesting equipment.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 6, 2009
Last Revision By: D. Shiskowski

Subject: Total Core Area
Saleable Reclaimed Water for
Toilet Flushing Purposes.
Life Cycle Analysis

Yellow-shaded cell denotes assumed/input values

Year	Total Core Area			Reclaimed Water Revenues (toilet flushing only)	
	Option 1 ADWF	Option 3 ADWF	Option 1 Saleable Reclaimed Water (toilet flushing only)		
	(m3/d)	(m3/d)	(m3/yr)	Total Annual Rev	Net Present Value
2008					
2009					
2010					
2011					
2012					
2013					
2014					
2015	111,202	111,202	0	$0	$0
2016	112,048	112,048	0	$0	$0
2017	112,895	112,895	0	$0	$0
2018	113,741	113,741	0	$0	$0
2019	114,588	114,588	0	$0	$0
2020	115,434	114,852	212,530	-$153,021	-$95,577
2021	116,280	115,116	425,059	-$306,043	-$183,801
2022	117,127	115,380	637,589	-$459,064	-$265,098
2023	117,973	115,644	850,118	-$612,085	-$339,869
2024	118,820	115,908	1,062,648	-$765,106	-$408,497
2025	119,666	116,172	1,275,177	-$918,128	-$471,342
2026	120,512	116,436	1,487,707	-$1,071,149	-$528,749
2027	121,359	116,701	1,700,236	-$1,224,170	-$581,043
2028	122,205	116,965	1,912,766	-$1,377,191	-$628,532
2029	123,052	117,229	2,125,295	-$1,530,213	-$671,509
2030	123,898	117,493	2,337,825	-$1,683,234	-$710,250
2031	124,581	117,766	2,487,426	-$1,790,947	-$726,634
2032	125,263	118,038	2,637,028	-$1,898,660	-$740,708
2033	125,946	118,311	2,786,629	-$2,006,373	-$752,624
2034	126,628	118,584	2,936,230	-$2,114,086	-$762,528
2035	127,311	118,856	3,085,832	-$2,221,799	-$770,557
2036	127,993	119,129	3,235,433	-$2,329,512	-$776,840
2037	128,676	119,402	3,385,034	-$2,437,225	-$781,500
2038	129,358	119,674	3,534,636	-$2,544,938	-$784,652
2039	130,041	119,947	3,684,237	-$2,652,651	-$786,405
2040	130,723	120,220	3,833,838	-$2,760,364	-$786,864
2041	131,406	120,492	3,983,440	-$2,868,077	-$786,123
2042	132,088	120,765	4,133,041	-$2,975,790	-$784,276
2043	132,771	121,038	4,282,642	-$3,083,502	-$781,407
2044	133,453	121,310	4,432,244	-$3,191,215	-$777,599
2045	134,136	121,583	4,581,845	-$3,298,928	-$772,929
2046	134,579	121,616	4,731,623	-$3,406,768	-$767,495
2047	135,023	121,649	4,881,400	-$3,514,608	-$761,337
2048	135,466	121,682	5,031,178	-$3,622,448	-$754,516
2049	135,909	121,715	5,180,956	-$3,730,288	-$747,094
2050	136,353	121,748	5,330,734	-$3,838,128	-$739,127
2051	136,796	121,781	5,480,511	-$3,945,968	-$730,668
2052	137,239	121,814	5,630,289	-$4,053,808	-$721,766
2053	137,682	121,847	5,780,067	-$4,161,648	-$712,468
2054	138,126	121,880	5,929,845	-$4,269,488	-$702,817
2055	138,569	121,913	6,079,622	-$4,377,328	-$692,855
2056	139,012	121,945	6,229,400	-$4,485,168	-$682,619
2057	139,456	121,978	6,379,178	-$4,593,008	-$672,146
2058	139,899	122,011	6,528,956	-$4,700,848	-$661,469
2059	140,342	122,044	6,678,733	-$4,808,688	-$650,618
2060	140,786	122,077	6,828,511	-$4,916,528	-$639,624
2061	141,229	122,110	6,978,289	-$5,024,368	-$628,513
2062	141,672	122,143	7,128,067	-$5,132,208	-$617,311
2063	142,115	122,176	7,277,844	-$5,240,048	-$606,040
2064	142,559	122,209	7,427,622	-$5,347,888	-$594,724
2065	143,002	122,242	7,577,400	-$5,455,728	-$583,381
Total Net Present Value =				**-$136,898,433**	**-$30,122,500**

Notes:

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 18, 2009
Last Revision By: D. Shiskowski

Subject: CFA and LCA Summary

Option 1

Year	GHG			Operations and Maintenance		Revenues		Capital		Total	
	Total Annual Emissions (t CO2e/yr)	Total Annual Costs	GHG CO2 Net Present Value	Total Annual Costs	Net Present Value	Total Annual Revenues	Net Present Value	Total Capital Cost	Net Present Value	Total Annual Cost	Net Present Value
2008											
2009											
2010											
2011											
2012											
2013											
2014								$847,188,440	$669,545,330	$847,188,440	$669,545,330
2015	728	$10,926	$8,303	$17,378,501	$13,206,232	-$331,454	-$251,878	$191,797,320	$145,750,200	$208,855,292	$158,712,857
2016	-3,202	-$48,036	-$35,099	$22,276,730	$16,277,389	-$816,800	-$596,827	$0	$0	$21,411,895	$15,645,462
2017	-3,572	-$53,585	-$37,648	$22,335,264	$15,692,460	-$871,135	-$612,048	$0	$0	$21,410,544	$15,042,764
2018	-3,962	-$59,429	-$40,148	$22,114,838	$14,939,992	-$1,297,470	-$876,524	$0	$0	$20,757,939	$14,023,320
2019	-4,321	-$64,821	-$42,107	$22,183,494	$14,409,975	-$1,351,805	-$878,107	$0	$0	$20,766,868	$13,489,762
2020	-4,692	-$70,378	-$43,958	$22,241,850	$13,892,194	-$1,559,162	-$973,848	$0	$0	$20,612,310	$12,874,388
2021	-5,062	-$75,925	-$45,599	$22,301,034	$13,393,423	-$1,766,518	-$1,060,925	$0	$0	$20,458,590	$12,286,899
2022	-5,432	-$81,481	-$47,053	$22,359,168	$12,911,862	-$1,973,874	-$1,139,863	$0	$0	$20,303,813	$11,724,946
2023	-5,802	-$87,028	-$48,324	$22,418,547	$12,448,223	-$2,181,231	-$1,211,160	$0	$0	$20,150,288	$11,188,740
2024	-6,162	-$92,427	-$49,348	$22,488,521	$12,006,805	-$2,388,587	-$1,275,286	$0	$0	$20,007,507	$10,682,171
2025	-6,532	-$97,974	-$50,297	$22,547,192	$11,575,125	-$2,595,944	-$1,332,688	$0	$0	$19,853,275	$10,192,140
2026	-6,902	-$103,528	-$51,104	$22,606,909	$11,159,406	-$2,803,300	-$1,383,788	$0	$0	$19,700,081	$9,724,514
2027	-7,272	-$109,074	-$51,771	$22,666,974	$10,758,708	-$3,010,657	-$1,428,985	$0	$0	$19,547,244	$9,277,951
2028	-7,642	-$114,627	-$52,314	$22,726,980	$10,372,297	-$3,218,013	-$1,468,659	$0	$0	$19,394,340	$8,851,324
2029	-8,011	-$120,172	-$52,736	$22,785,750	$9,999,153	-$3,425,369	-$1,503,167	$0	$0	$19,240,208	$8,443,250
2030	-8,371	-$125,570	-$52,985	$23,497,482	$9,914,889	-$3,632,726	-$1,532,848	$64,052,040	$27,027,103	$83,791,226	$35,356,159
2031	-8,479	-$127,181	-$51,601	$23,551,162	$9,555,327	-$3,757,125	-$1,524,365	$0	$0	$19,666,857	$7,979,362
2032	-8,577	-$128,660	-$50,193	$23,662,282	$9,231,164	-$3,881,524	-$1,514,266	$0	$0	$19,652,099	$7,666,706
2033	-8,685	-$130,271	-$48,867	$23,715,228	$8,895,980	-$4,005,923	-$1,502,689	$0	$0	$19,579,034	$7,344,425
2034	-8,792	-$131,882	-$47,568	$23,769,407	$8,573,369	-$4,130,322	-$1,489,763	$0	$0	$19,507,203	$7,036,038
2035	-8,900	-$133,493	-$46,297	$23,823,721	$8,262,461	-$4,254,721	-$1,475,608	$0	$0	$19,435,507	$6,740,556
2036	-8,971	-$134,560	-$44,873	$24,249,680	$8,086,722	-$4,443,921	-$1,481,947	$0	$0	$19,671,199	$6,559,902
2037	-9,078	-$136,171	-$43,663	$24,304,265	$7,793,197	-$4,568,320	-$1,464,838	$0	$0	$19,599,774	$6,284,695
2038	-9,185	-$137,782	-$42,481	$24,358,387	$7,510,145	-$4,692,719	-$1,446,853	$0	$0	$19,527,886	$6,020,812
2039	-9,316	-$139,738	-$41,427	$24,085,353	$7,140,350	-$4,817,118	-$1,428,084	$0	$0	$19,128,497	$5,670,839
2040	-9,423	-$141,349	-$40,293	$24,139,251	$6,881,085	-$4,941,517	-$1,408,619	$0	$0	$19,056,384	$5,432,174
2041	-9,531	-$142,959	-$39,184	$24,194,394	$6,631,542	-$5,065,916	-$1,388,538	$0	$0	$18,985,518	$5,203,820
2042	-9,628	-$144,414	-$38,061	$24,260,420	$6,393,884	-$5,190,315	-$1,367,918	$0	$0	$18,925,691	$4,987,905
2043	-9,735	-$146,024	-$37,005	$24,315,844	$6,162,011	-$5,314,715	-$1,346,831	$0	$0	$18,855,105	$4,778,175
2044	-9,842	-$147,635	-$35,974	$24,371,402	$5,938,548	-$5,439,114	-$1,325,342	$0	$0	$18,784,654	$4,577,233
2045	-9,950	-$149,245	-$34,968	$24,427,002	$5,723,170	-$5,563,513	-$1,303,514	$0	$0	$18,714,245	$4,384,689
2046	-10,271	-$154,062	-$34,708	$24,474,347	$5,513,714	-$5,717,305	-$1,288,025	$0	$0	$18,602,980	$4,190,980
2047	-10,591	-$158,871	-$34,415	$24,522,369	$5,312,051	-$5,871,096	-$1,271,800	$0	$0	$18,492,402	$4,005,835
2048	-10,912	-$163,687	-$34,094	$24,570,964	$5,117,863	-$6,024,888	-$1,254,918	$0	$0	$18,382,388	$3,828,850
2049	-11,223	-$168,347	-$33,716	$24,630,745	$4,932,995	-$6,178,680	-$1,237,453	$0	$0	$18,283,718	$3,661,825
2050	-11,544	-$173,154	-$33,345	$24,678,808	$4,752,520	-$6,332,472	-$1,219,475	$0	$0	$18,173,182	$3,499,699
2051	-11,865	-$177,968	-$32,954	$24,727,545	$4,578,755	-$6,486,263	-$1,201,050	$0	$0	$18,063,313	$3,344,751
2052	-12,185	-$182,774	-$32,542	$24,776,965	$4,411,448	-$6,640,055	-$1,182,238	$0	$0	$17,954,136	$3,196,668
2053	-12,506	-$187,587	-$32,115	$24,825,582	$4,250,100	-$6,793,847	-$1,163,096	$0	$0	$17,844,148	$3,054,890
2054	-12,826	-$192,391	-$31,670	$24,875,370	$4,094,831	-$6,947,638	-$1,143,678	$0	$0	$17,735,340	$2,919,483
2055	-13,147	-$197,203	-$31,214	$24,924,850	$3,945,169	-$7,101,430	-$1,124,033	$0	$0	$17,626,216	$2,789,922
2056	-13,468	-$202,015	-$30,746	$24,973,908	$3,800,898	-$7,255,222	-$1,104,207	$0	$0	$17,516,671	$2,665,946
2057	-13,761	-$206,413	-$30,207	$25,406,427	$3,718,005	-$7,452,214	-$1,090,565	$0	$0	$17,747,800	$2,597,233
2058	-14,071	-$211,068	-$29,700	$25,467,816	$3,583,643	-$7,606,005	-$1,070,261	$0	$0	$17,650,743	$2,483,682
2059	-14,133	-$212,001	-$28,684	$25,517,143	$3,452,485	-$7,723,458	-$1,044,988	$0	$0	$17,581,684	$2,378,812
2060	-14,208	-$213,123	-$27,727	$25,207,774	$3,279,449	-$7,839,122	-$1,019,844	$0	$0	$17,155,529	$2,231,878
2061	-14,258	-$213,873	-$26,754	$25,258,779	$3,159,696	-$7,954,787	-$995,088	$0	$0	$17,090,119	$2,137,854
2062	-14,308	-$214,614	-$25,814	$25,310,173	$3,044,351	-$8,070,451	-$970,728	$0	$0	$17,025,108	$2,047,809
2063	-14,358	-$215,363	-$24,908	$25,360,051	$2,933,030	-$8,186,116	-$946,769	$0	$0	$16,958,572	$1,961,352
2064	-14,407	-$216,103	-$24,032	$25,411,827	$2,825,979	-$8,301,781	-$923,218	$0	$0	$16,893,943	$1,878,728
2065	-14,457	-$216,851	-$23,188	$25,463,587	$2,722,822	-$8,417,445	-$900,078	$0	$0	$16,829,291	$1,799,556
Totals =	**-482,798**	**-$7,241,963**	**-$1,937,174**	**$1,216,542,061**	**$395,166,892**	**-$246,191,102.57**	**-$61,147,288.45**	**$ 1,103,037,800**	**$ 842,322,633.46**	**$2,066,146,796**	**$1,174,405,063**

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 18, 2009
Last Revision By: D. Shiskowski

Subject: Revenue Summary

Option 1

Year	Effluent Heat		Reclaimed Water Irrigation		Reclaimed Water Toilet Flushing		Dried WW Sludges		Biomethane		Woodchips		Total	
	Total Annual Revenues	Net Present Value	Total Annual Revenues	Net Present Value	Total Annual Revenues	Net Present Value	Total Annual Revenues	Net Present Value	Total Annual Revenues	Net Present Value	Total Annual Revenues	Net Present Value	Total Annual Revenues	Net Present Value
2008														
2009														
2010														
2011														
2012														
2013														
2014														
2015	-$195,245	-$148,371	-$136,209	-$103,507	$0	$0	$0	$0	$0	$0	$0	$0	-$331,454	-$251,878
2016	-$240,069	-$175,416	-$136,820	-$99,973	$0	$0	-$66,917	-$48,896	-$372,994	-$272,543	$0	$0	-$816,800	-$596,827
2017	-$284,892	-$200,161	-$137,432	-$96,558	$0	$0	-$67,903	-$47,708	-$380,908	-$267,621	$0	$0	-$871,135	-$612,048
2018	-$329,715	-$222,743	-$138,044	-$93,257	$0	$0	-$68,890	-$46,539	-$388,822	-$262,674	-$372,000	-$251,310	-$1,297,470	-$876,524
2019	-$374,538	-$243,292	-$138,655	-$90,068	$0	$0	-$69,876	-$45,390	-$396,736	-$257,712	-$372,000	-$241,644	-$1,351,805	-$878,107
2020	-$419,361	-$261,931	-$139,267	-$86,986	-$153,021	-$95,577	-$70,862	-$44,260	-$404,651	-$252,744	-$372,000	-$232,350	-$1,559,162	-$973,848
2021	-$464,184	-$278,777	-$139,879	-$84,008	-$306,043	-$183,801	-$71,848	-$43,150	-$412,565	-$247,776	-$372,000	-$223,414	-$1,766,518	-$1,060,925
2022	-$509,007	-$293,939	-$140,491	-$81,130	-$459,064	-$265,098	-$72,834	-$42,060	-$420,479	-$242,816	-$372,000	-$214,821	-$1,973,874	-$1,139,863
2023	-$553,830	-$307,522	-$141,102	-$78,349	-$612,085	-$339,869	-$73,821	-$40,990	-$428,393	-$237,872	-$372,000	-$206,558	-$2,181,231	-$1,211,160
2024	-$598,653	-$319,626	-$141,714	-$75,662	-$765,106	-$408,497	-$74,807	-$39,940	-$436,307	-$232,948	-$372,000	-$198,614	-$2,388,587	-$1,275,286
2025	-$643,476	-$330,343	-$142,326	-$73,066	-$918,128	-$471,342	-$75,793	-$38,910	-$444,222	-$228,051	-$372,000	-$190,975	-$2,595,944	-$1,332,688
2026	-$688,299	-$339,764	-$142,937	-$70,558	-$1,071,149	-$528,749	-$76,779	-$37,900	-$452,136	-$223,187	-$372,000	-$183,630	-$2,803,300	-$1,383,788
2027	-$733,122	-$347,971	-$143,549	-$68,135	-$1,224,170	-$581,043	-$77,765	-$36,911	-$460,050	-$218,359	-$372,000	-$176,567	-$3,010,657	-$1,428,985
2028	-$777,945	-$355,044	-$144,161	-$65,793	-$1,377,191	-$628,532	-$78,752	-$35,941	-$467,964	-$213,573	-$372,000	-$169,776	-$3,218,013	-$1,468,659
2029	-$822,768	-$361,058	-$144,773	-$63,531	-$1,530,213	-$671,509	-$79,738	-$34,992	-$475,878	-$208,831	-$372,000	-$163,246	-$3,425,369	-$1,503,167
2030	-$867,591	-$366,085	-$145,384	-$61,346	-$1,683,234	-$710,250	-$80,724	-$34,062	-$483,793	-$204,139	-$372,000	-$156,967	-$3,632,726	-$1,532,848
2031	-$876,872	-$355,770	-$145,986	-$59,230	-$1,790,947	-$726,634	-$81,565	-$33,093	-$489,755	-$198,707	-$372,000	-$150,930	-$3,757,125	-$1,524,365
2032	-$886,152	-$345,707	-$146,588	-$57,187	-$1,898,660	-$740,708	-$82,406	-$32,148	-$495,718	-$193,390	-$372,000	-$145,125	-$3,881,524	-$1,514,266
2033	-$895,433	-$335,892	-$147,190	-$55,214	-$2,006,373	-$752,624	-$83,246	-$31,227	-$501,680	-$188,189	-$372,000	-$139,543	-$4,005,923	-$1,502,689
2034	-$904,714	-$326,321	-$147,792	-$53,307	-$2,114,086	-$762,528	-$84,087	-$30,329	-$507,643	-$183,101	-$372,000	-$134,176	-$4,130,322	-$1,489,763
2035	-$913,995	-$316,988	-$148,395	-$51,466	-$2,221,799	-$770,557	-$84,928	-$29,454	-$513,605	-$178,127	-$372,000	-$129,016	-$4,254,721	-$1,475,608
2036	-$923,275	-$307,892	-$148,997	-$49,687	-$2,329,512	-$776,840	-$85,769	-$28,602	-$519,568	-$173,264	-$436,800	-$145,663	-$4,443,921	-$1,481,947
2037	-$932,556	-$299,025	-$149,599	-$47,969	-$2,437,225	-$781,500	-$86,610	-$27,772	-$525,531	-$168,512	-$436,800	-$140,061	-$4,568,320	-$1,464,838
2038	-$941,837	-$290,386	-$150,201	-$46,310	-$2,544,938	-$784,652	-$87,451	-$26,963	-$531,493	-$163,869	-$436,800	-$134,674	-$4,692,719	-$1,446,853
2039	-$951,118	-$281,969	-$150,803	-$44,707	-$2,652,651	-$786,405	-$88,291	-$26,175	-$537,456	-$159,334	-$436,800	-$129,494	-$4,817,118	-$1,428,084
2040	-$960,398	-$273,769	-$151,405	-$43,159	-$2,760,364	-$786,864	-$89,132	-$25,408	-$543,418	-$154,906	-$436,800	-$124,513	-$4,941,517	-$1,408,619
2041	-$969,679	-$265,783	-$152,007	-$41,664	-$2,868,077	-$786,123	-$89,973	-$24,661	-$549,381	-$150,582	-$436,800	-$119,724	-$5,065,916	-$1,388,538
2042	-$978,960	-$258,007	-$152,609	-$40,220	-$2,975,790	-$784,276	-$90,814	-$23,934	-$555,344	-$146,362	-$436,800	-$115,120	-$5,190,315	-$1,367,918
2043	-$988,240	-$250,435	-$153,211	-$38,826	-$3,083,502	-$781,407	-$91,655	-$23,227	-$561,306	-$142,244	-$436,800	-$110,692	-$5,314,715	-$1,346,831
2044	-$997,521	-$243,065	-$153,813	-$37,479	-$3,191,215	-$777,599	-$92,495	-$22,538	-$567,269	-$138,226	-$436,800	-$106,434	-$5,439,114	-$1,325,342
2045	-$1,006,802	-$235,891	-$154,415	-$36,179	-$3,298,928	-$772,929	-$93,336	-$21,868	-$573,231	-$134,306	-$436,800	-$102,341	-$5,563,513	-$1,303,514
2046	-$1,048,565	-$236,226	-$154,715	-$34,855	-$3,406,768	-$767,495	-$93,975	-$21,171	-$576,481	-$129,873	-$436,800	-$98,405	-$5,717,305	-$1,288,025
2047	-$1,090,328	-$236,188	-$155,015	-$33,579	-$3,514,608	-$761,337	-$94,614	-$20,495	-$579,731	-$125,582	-$436,800	-$94,620	-$5,871,096	-$1,271,800
2048	-$1,132,092	-$235,802	-$155,315	-$32,350	-$3,622,448	-$754,516	-$95,253	-$19,840	-$582,980	-$121,428	-$436,800	-$90,981	-$6,024,888	-$1,254,918
2049	-$1,173,855	-$235,097	-$155,615	-$31,166	-$3,730,288	-$747,094	-$95,891	-$19,205	-$586,230	-$117,409	-$436,800	-$87,481	-$6,178,680	-$1,237,453
2050	-$1,215,618	-$234,098	-$155,915	-$30,025	-$3,838,128	-$739,127	-$96,530	-$18,589	-$589,480	-$113,519	-$436,800	-$84,117	-$6,332,472	-$1,219,475
2051	-$1,257,382	-$232,827	-$156,215	-$28,926	-$3,945,968	-$730,668	-$97,169	-$17,993	-$592,729	-$109,755	-$436,800	-$80,881	-$6,486,263	-$1,201,050
2052	-$1,299,145	-$231,308	-$156,515	-$27,867	-$4,053,808	-$721,766	-$97,808	-$17,414	-$595,979	-$106,112	-$436,800	-$77,771	-$6,640,055	-$1,182,238
2053	-$1,340,908	-$229,561	-$156,815	-$26,847	-$4,161,648	-$712,468	-$98,446	-$16,854	-$599,229	-$102,587	-$436,800	-$74,779	-$6,793,847	-$1,163,096
2054	-$1,382,671	-$227,607	-$157,116	-$25,863	-$4,269,488	-$702,817	-$99,085	-$16,311	-$602,478	-$99,176	-$436,800	-$71,903	-$6,947,638	-$1,143,678
2055	-$1,424,435	-$225,463	-$157,416	-$24,916	-$4,377,328	-$692,855	-$99,724	-$15,785	-$605,728	-$95,876	-$436,800	-$69,138	-$7,101,430	-$1,124,033
2056	-$1,466,198	-$223,148	-$157,716	-$24,003	-$4,485,168	-$682,619	-$100,363	-$15,275	-$608,978	-$92,683	-$436,800	-$66,479	-$7,255,222	-$1,104,207
2057	-$1,507,961	-$220,677	-$158,016	-$23,124	-$4,593,008	-$672,146	-$101,001	-$14,781	-$612,227	-$89,594	-$480,000	-$70,244	-$7,452,214	-$1,090,565
2058	-$1,549,725	-$218,066	-$158,316	-$22,277	-$4,700,848	-$661,469	-$101,640	-$14,302	-$615,477	-$86,605	-$480,000	-$67,542	-$7,606,005	-$1,070,261
2059	-$1,555,148	-$210,413	-$158,616	-$21,461	-$4,808,688	-$650,618	-$102,279	-$13,838	-$618,727	-$83,714	-$480,000	-$64,944	-$7,723,458	-$1,044,988
2060	-$1,558,785	-$202,793	-$158,916	-$20,674	-$4,916,528	-$639,624	-$102,918	-$13,389	-$621,976	-$80,917	-$480,000	-$62,446	-$7,839,122	-$1,019,844
2061	-$1,562,421	-$195,448	-$159,216	-$19,917	-$5,024,368	-$628,513	-$103,556	-$12,954	-$625,226	-$78,211	-$480,000	-$60,045	-$7,954,787	-$995,088
2062	-$1,566,057	-$188,368	-$159,516	-$19,187	-$5,132,208	-$617,311	-$104,195	-$12,533	-$628,476	-$75,594	-$480,000	-$57,735	-$8,070,451	-$970,728
2063	-$1,569,693	-$181,544	-$159,816	-$18,484	-$5,240,048	-$606,040	-$104,834	-$12,125	-$631,725	-$73,063	-$480,000	-$55,515	-$8,186,116	-$946,769
2064	-$1,573,329	-$174,966	-$160,116	-$17,806	-$5,347,888	-$594,724	-$105,473	-$11,729	-$634,975	-$70,614	-$480,000	-$53,379	-$8,301,781	-$923,218
2065	-$1,576,965	-$168,625	-$160,416	-$17,153	-$5,455,728	-$583,381	-$106,111	-$11,346	-$638,225	-$68,245	-$480,000	-$51,326	-$8,417,445	-$900,078
Totals =	**-$50,481,525**	**-$13,247,165**	**-$7,657,065**	**-$2,495,014**	**-$136,898,433**	**-$30,122,500**	**-$4,419,929**	**-$1,340,977**	**-$26,545,350.60**	**-$7,964,522.36**	**-$20,188,800**	**-$5,977,110**	**-$246,191,103**	**-$61,147,288**

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

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Prepared: D. Shiskowski
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Last Revision By: D. Shiskowski

Subject: GHG Summary

Option 1

Year	GHG Sources					GHG Off-Sets			Total
	Electricity Consumption (t CO2e/yr)	Diesel Fuel Consumption[2] (t CO2e/yr)	Sludge Thickening Polymer Consumption[1] (t CO2e/yr)	Biogas Lost (t CO2e/yr)	Natural Gas Consumption (t CO2e/yr)	Avoided Natural Gas / Electricty Use via Wastewater-derived Heat[3] (t CO2e/yr)	Avoided Natural Gas Use Via Biomethane (t CO2e/yr)	Avoided Coal Use Via Dried Biosolids (t CO2e/yr)	(t CO2e/yr)
2008									
2009									
2010									
2011									
2012									
2013									
2014									
2015	2,114	0	0	0	0	-1,385	0	0	728
2016	2,244	216	0	401	1,204	-1,703	-2,098	-3,466	-3,202
2017	2,264	217	0	407	1,222	-2,021	-2,142	-3,517	-3,572
2018	2,283	198	0	413	1,239	-2,339	-2,187	-3,568	-3,962
2019	2,303	209	0	419	1,257	-2,657	-2,231	-3,620	-4,321
2020	2,322	209	0	425	1,275	-2,975	-2,276	-3,671	-4,692
2021	2,342	209	0	430	1,293	-3,294	-2,320	-3,722	-5,062
2022	2,361	210	0	436	1,310	-3,612	-2,365	-3,773	-5,432
2023	2,381	210	0	442	1,328	-3,930	-2,409	-3,824	-5,802
2024	2,400	221	0	448	1,345	-4,248	-2,454	-3,875	-6,162
2025	2,420	221	0	454	1,363	-4,566	-2,499	-3,926	-6,532
2026	2,440	221	0	460	1,381	-4,884	-2,543	-3,977	-6,902
2027	2,459	222	0	466	1,399	-5,202	-2,588	-4,028	-7,272
2028	2,479	222	0	472	1,416	-5,520	-2,632	-4,079	-7,642
2029	2,499	223	0	478	1,434	-5,838	-2,677	-4,130	-8,011
2030	2,518	233	0	484	1,452	-6,156	-2,721	-4,181	-8,371
2031	2,533	234	0	489	1,467	-6,222	-2,755	-4,225	-8,479
2032	2,548	243	0	494	1,482	-6,287	-2,788	-4,269	-8,577
2033	2,563	243	0	499	1,497	-6,353	-2,822	-4,312	-8,685
2034	2,578	243	0	504	1,512	-6,419	-2,855	-4,356	-8,792
2035	2,593	244	0	509	1,528	-6,485	-2,889	-4,399	-8,900
2036	2,608	280	0	514	1,543	-6,551	-2,922	-4,443	-8,971
2037	2,623	280	0	519	1,558	-6,617	-2,956	-4,486	-9,078
2038	2,638	281	0	524	1,573	-6,683	-2,989	-4,530	-9,185
2039	2,654	259	0	529	1,588	-6,748	-3,023	-4,573	-9,316
2040	2,669	259	0	534	1,603	-6,814	-3,056	-4,617	-9,423
2041	2,684	259	0	539	1,618	-6,880	-3,090	-4,661	-9,531
2042	2,699	270	0	544	1,633	-6,946	-3,124	-4,704	-9,628
2043	2,714	270	0	549	1,649	-7,012	-3,157	-4,748	-9,735
2044	2,729	271	0	554	1,664	-7,078	-3,191	-4,791	-9,842
2045	2,744	271	0	559	1,679	-7,144	-3,224	-4,835	-9,950
2046	2,755	271	0	563	1,690	-7,440	-3,242	-4,868	-10,271
2047	2,766	271	0	567	1,702	-7,736	-3,261	-4,901	-10,591
2048	2,778	272	0	571	1,713	-8,033	-3,279	-4,934	-10,912
2049	2,789	282	0	575	1,724	-8,329	-3,297	-4,967	-11,223
2050	2,800	282	0	578	1,736	-8,625	-3,316	-5,000	-11,544
2051	2,812	283	0	582	1,748	-8,921	-3,334	-5,033	-11,865
2052	2,823	283	0	586	1,759	-9,218	-3,352	-5,066	-12,185
2053	2,835	283	0	590	1,771	-9,514	-3,370	-5,100	-12,506
2054	2,846	283	0	594	1,782	-9,810	-3,389	-5,133	-12,826
2055	2,858	284	0	597	1,794	-10,107	-3,407	-5,166	-13,147
2056	2,869	284	0	601	1,805	-10,403	-3,425	-5,199	-13,468
2057	2,881	311	0	605	1,817	-10,699	-3,443	-5,232	-13,761
2058	2,893	322	0	609	1,828	-10,996	-3,462	-5,265	-14,071
2059	2,904	322	0	613	1,840	-11,034	-3,480	-5,298	-14,133
2060	2,916	297	0	617	1,851	-11,060	-3,498	-5,331	-14,208
2061	2,928	298	0	620	1,862	-11,086	-3,517	-5,364	-14,258
2062	2,940	298	0	624	1,874	-11,112	-3,535	-5,397	-14,308
2063	2,952	298	0	628	1,885	-11,137	-3,553	-5,430	-14,358
2064	2,964	298	0	632	1,897	-11,163	-3,571	-5,463	-14,407
2065	2,976	299	0	636	1,908	-11,189	-3,590	-5,497	-14,457
Totals =	**134,691**	**12,968**	**0**	**26,482**	**79,497**	**-358,180**	**-149,303**	**-228,952**	**-482,798**

Notes:
1. Only refers to situation where thickened, undigested sludges are truck-transported to another site for processing.
2. Includes biosolids transport.
3. Accounts for GHGs associated with electricity needed to power heat pumps.

OPTION 2

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 18, 2009
Last Revision By: D. Shiskowski

Subject: Option 2

Generic Assumptions
For Life Cycle and Carbon
Footprint Analyses

Yellow-shaded cell denotes assumed/input value

GENERIC ASSUMPTIONS

NPV Analysis:					
first year in analysis =			2008		
investment rate of return =			7.0%	/yr	**Note:** Values for Discount Rate Base scenario.
capital works / land lease inflation rate =			3.0%	/yr	
labour inflation rate =			3.0%	/yr	
electricity inflation rate =			3.0%	/yr	
natural gas/biomethane inflation rate =			3.0%	/yr	
diesel fuel inflation rate =			3.0%	/yr	
effluent heat inflation rate =			3.0%	/yr	
chemicals inflation rate =			3.0%	/yr	
reclaimed water inflation rate =			3.0%	/yr	
dried WW sludges / woodchip inflation rate =			3.0%	yr	
maintenance inflation rate =			3.0%	/yr	
administration inflation rate =			3.0%	/yr	
GHG CO2e price inflation rate =			3.0%	/yr	**Note / Ref:** Year 2065 CO2e cost assumed to vary between US$15 and US$155 t / CO2e, as per 032-DP-1 and based on Tirpak (2008).
	2065	$	81	/tonne CO2e	
Labour:					
annual average staff cost =		$	75,000	per year	
Energy and Carbon Equivalents:					
unit electrical price =		$	0.07	/kWh	
unit diesel fuel price =		$	1.50	/L	
unit CO2e price =		$	15	/t CO2e	**Ref:** Based on a 2009 value of $15 t / CO2e per the Province of British Columbia Carbon Tax (2008).
unit natural gas / biomethane price =		$	10.00	/GJ	
Chemical Phosphorus Removal Chemicals:					
liquid-stream alum requirement =			110	mg/L of alum product	**Ref:** Medicine Hat WWTF.
alum product specification =			638	mg alum/mL product	
unit alum product cost =		$	0.40	per L of alum product	**Ref:** Based on General Chemical information in Feb 4/09 e-mail from T. Znajewski. Includes allowance for polymer.
Wet-Weather CEPT Chemicals:					
liquid-stream alum requirement =			80	mg/L of alum product	
alum product specification =			638	mg alum/mL product	
unit alum product cost =		$	0.40	per L of alum product	**Ref:** Based on General Chemical information in Feb 4/09 e-mail from T. Znajewski. Includes allowance for polymer.
Raw Sludge Thickening and Truck Transport:					
unit wastewater BOD generation rate =			0.070	kg BOD/d - pe	
combined PS + WBS production rate =			0.85	kg TSS/kg BOD removed	
solids content of thickened sludge =			6.0%		
specific gravity of thickened sludge =			1.02		
thickening polymer requirement =			8	kg polymer/dry tonne	
thickening polymer unit cost =		$	10.00	/kg polymer	
transport truck volume =			22	m3/truck	
truck diesel fuel consumption =			1.6	km/L	
Odour Control Chemicals:					
unit scrubber chemical cost =		$	0.0053	/d per m3/d of ADWF treated wastewater	**Ref:** Based on Jan 15/09 TM from T. Dokken.
Membrane Cleaning Chemicals:					
unit chemical cost =		$	0.0020	/d per m3/d of ADWF treated wastewater	**Ref:** Based on Jan 19/09 e-mail from T. Dokken.
Maintenance:					
unit allowance (new treatment facilities) =			1.0%	of capital works	
unit allowance (new interceptors, pump stations, forcemains, outfalls) =			0.25%	of capital works	
Administration:					
lump sum annual allowance (treatment facilities) =		$	100,000	/yr	
Saleable Wastewater/Effluent Heat:					
unit natural gas / power utility energy price =		$	16.10	/GJ	**Ref:** This is the typical price (i.e. "market price") of energy available from the power and natural gas utilities, based on a variety of assumptions on energy used in existing areas/redevelopment and new development. See notes in file based on information provided in M. Homenuke Feb 10/09 e-mail.
profit and overhead allowance for third-party energy utility =			15.0%		**Note:** The actual price that the CRD could sell the heat energy to the third party "heat recovery" utility depends on the cost of the utilities infrastructure. See the LCA sheets for WWTF-specific assumptions.
maximum unit price paid for heat energy by third-party utility =		$	14.00		
Saleable Reclaimed Water:					
unit CRD potable water supply price (2008) =		$	0.90	/m3	**Ref:** Average 2008 consumption charge across the CRD, per the CRD web-site.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

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Last Revision By: D. Shiskowski

Subject: Option 2

Generic Assumptions
For Life Cycle and Carbon
Footprint Analyses

value of reclaimed water relative to CRD potable water =		80%		**Note:** Assumes use of same supply infrastructure for effluent heat. The "value" adjustment considers public perception of relaimed water relative to CRD potable water.
unit reclaimed water price =	$	0.72	/m3	**Note:** For both irrigation and toilet flushing.
GHG Sources:				
BC Hydro-supplied electricity (average annual) =		72	g CO2e/kWh	**Ref: Average value -** BC Hydro's (2005) prediction for 2010 was 72 t/ GWh, which is a large increase from the 33 value predicted for 2005 and actual values of 46 and 22 for 2000 and 2003, respectively. No other future projections were found. Heating Season value based on KWL (2008), West Shore C WWTP Concept Review Final Report.
BC Hydro-supplied electricity (average heating season) =		100	g CO2e/kWh	
diesel fuel combustion (mobile truck) =		2,757	g CO2e/L	**Ref:** Table A13-5, EC (2006). Moderately controlled HDDV.
production of sludge thickening polymer =		1.2	kg CO2e/kg product	**Ref:** de Haas et al (2008)
GHG Off-sets (heat recovery):				
effluent heat recovery coefficient of performance (COP) =		4.0		**Ref:** Heat recovery off-set information and calculations provided by W. Wong (KWL) in Dec 9/08 e-mail.
natural gas furnace / boiler efficiency (n) =		0.95		
energy extracted from effluent heat (x) =		1.00	GJ	
energy for heating delivered by heat pump =		0.75	GJ	
electrical energy required by heat pump =		**0.33**	**GJ elected power /GJ effluent heat**	
energy required for heating from natural gas combustion, equivalent to units of energy replaced via effluent heat =		1.40	GJ	
natural gas off-set via using effluent heat =		1.07	GJ	
therefore, unitless equivalence factor =		**1.07**	**GJ of natural gas off-set by GJ of effluent heat**	
natural gas combustion (stationary) =		0.0562	g CO2e/kJ	**Ref:** Table 2.5, IPCC (2006). Tier 1 Value is for residential category and commercial/institutional category.
1 J =		0.0002778	Wh	
BC Hydro-supplied electricity (average heating season) =		0.0278	g CO2e/kJ	
fraction of effluent heat off-setting "natural gas heat" =		60%		**Ref:** Based on information in Feb 10/ 9 e-mail from M. Homenuke.
fraction of effluent heat off-setting "electric heat" =		40%		

Existing CRD Trunk Sewer System

annual operations and maintenance cost (2008) =	$	4,600,000	/yr	**Ref:** The Path Forward work. ADWF Macaulay and Clover pumping energy and costs are small, therefore did not remove from annual cost value.
annual average increase in operations and maintenance expenditures =		0.5%	/yr	**Note:** Accounts for potential future increases in maintenance costs as system ages.

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Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

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Subject: Marigold Pump Station

Option 2
Material Flows
and Carbon Footprint Analysis

Yellow-shaded cell denotes assumed/input values

Year	Wastewater ADWF		ADWF Friction Losses		TDH	Velocity	Pump Energy	Materials	GHG Sources	Total GHG Emissions
			Unit	Total				Electricity	Electricity Purchased	
	(m3/d)	(L/s)	(m/m)	(m)	(m)	(m/s)	(kW)	(kWh/yr)	(t CO2e/yr)	(t CO2e/yr)
2008										
2009										
2010										
2011										
2012										
2013										
2014										
2015	17,437	202	0.000943	3.39	28.4	0.71	80.3	703,477	51	51
2016	17,441	202	0.000943	3.39	28.4	0.71	80.3	703,667	51	51
2017	17,445	202	0.000943	3.40	28.4	0.71	80.3	703,858	51	51
2018	17,449	202	0.000944	3.40	28.4	0.71	80.4	704,048	51	51
2019	17,452	202	0.000944	3.40	28.4	0.71	80.4	704,239	51	51
2020	17,456	202	0.000945	3.40	28.4	0.71	80.4	704,429	51	51
2021	17,460	202	0.000945	3.40	28.4	0.71	80.4	704,620	51	51
2022	17,464	202	0.000945	3.40	28.4	0.71	80.5	704,811	51	51
2023	17,468	202	0.000946	3.40	28.4	0.72	80.5	705,001	51	51
2024	17,472	202	0.000946	3.41	28.4	0.72	80.5	705,192	51	51
2025	17,476	202	0.000946	3.41	28.4	0.72	80.5	705,383	51	51
2026	17,480	202	0.000947	3.41	28.4	0.72	80.5	705,573	51	51
2027	17,483	202	0.000947	3.41	28.4	0.72	80.6	705,764	51	51
2028	17,487	202	0.000948	3.41	28.4	0.72	80.6	705,955	51	51
2029	17,491	202	0.000948	3.41	28.4	0.72	80.6	706,146	51	51
2030	17,495	202	0.000948	3.41	28.4	0.72	80.6	706,336	51	51
2031	17,517	203	0.000951	3.42	28.4	0.72	80.8	707,432	51	51
2032	17,539	203	0.000953	3.43	28.4	0.72	80.9	708,529	51	51
2033	17,562	203	0.000955	3.44	28.4	0.72	81.0	709,626	51	51
2034	17,584	204	0.000957	3.45	28.4	0.72	81.1	710,724	51	51
2035	17,606	204	0.000960	3.45	28.5	0.72	81.3	711,823	51	51
2036	17,628	204	0.000962	3.46	28.5	0.72	81.4	712,923	51	51
2037	17,650	204	0.000964	3.47	28.5	0.72	81.5	714,023	51	51
2038	17,673	205	0.000966	3.48	28.5	0.72	81.6	715,124	51	51
2039	17,695	205	0.000969	3.49	28.5	0.72	81.8	716,226	52	52
2040	17,717	205	0.000971	3.49	28.5	0.73	81.9	717,328	52	52
2041	17,739	205	0.000973	3.50	28.5	0.73	82.0	718,431	52	52
2042	17,761	206	0.000975	3.51	28.5	0.73	82.1	719,535	52	52
2043	17,784	206	0.000978	3.52	28.5	0.73	82.3	720,640	52	52
2044	17,806	206	0.000980	3.53	28.5	0.73	82.4	721,745	52	52
2045	17,828	206	0.000982	3.54	28.5	0.73	82.5	722,851	52	52
2046	17,800	206	0.000979	3.53	28.5	0.73	82.4	721,449	52	52
2047	17,772	206	0.000976	3.51	28.5	0.73	82.2	720,047	52	52
2048	17,744	205	0.000973	3.50	28.5	0.73	82.0	718,647	52	52
2049	17,715	205	0.000971	3.49	28.5	0.73	81.9	717,249	52	52
2050	17,687	205	0.000968	3.48	28.5	0.72	81.7	715,851	52	52
2051	17,659	204	0.000965	3.47	28.5	0.72	81.6	714,454	51	51
2052	17,631	204	0.000962	3.46	28.5	0.72	81.4	713,059	51	51
2053	17,603	204	0.000959	3.45	28.5	0.72	81.2	711,665	51	51
2054	17,575	203	0.000956	3.44	28.4	0.72	81.1	710,272	51	51
2055	17,547	203	0.000954	3.43	28.4	0.72	80.9	708,880	51	51
2056	17,518	203	0.000951	3.42	28.4	0.72	80.8	707,489	51	51
2057	17,490	202	0.000948	3.41	28.4	0.72	80.6	706,100	51	51
2058	17,462	202	0.000945	3.40	28.4	0.71	80.4	704,711	51	51
2059	17,434	202	0.000942	3.39	28.4	0.71	80.3	703,324	51	51
2060	17,406	201	0.000939	3.38	28.4	0.71	80.1	701,938	51	51
2061	17,378	201	0.000937	3.37	28.4	0.71	80.0	700,553	50	50
2062	17,349	201	0.000934	3.36	28.4	0.71	79.8	699,169	50	50
2063	17,321	200	0.000931	3.35	28.4	0.71	79.7	697,787	50	50
2064	17,293	200	0.000928	3.34	28.3	0.71	79.5	696,405	50	50
2065	17,265	200	0.000925	3.33	28.3	0.71	79.3	695,025	50	50
Totals =								36,169,533	2,604	**2,604**

MARIGOLD PUMP STATION

static head =	25	m
friction C value =	120	
forcemain diameter =	600	mm
forcemain X-area =	0.2827	m^2
forcemain length =	3,600	m
pump efficiency =	70%	
fluid specific weight =	9.81	kN/m^3

Ref: Flow and pumping information from M. Homenuke Feb 2/09 e-mail and attached ConveyanceFlows_forDean_20090202.xls.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 6, 2009
Last Revision By: D. Shiskowski

Subject: Marigold Pump Station

Option 2
Life Cycle Analysis

Yellow-shaded cell denotes assumed/input values

Year	Capital Costs (Note 1)		Operation & Maintenance Costs				GHG CO2e		Total	
			Electricity		Maintenance (Note 1)					
	Total Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value
2008										
2009										
2010										
2011										
2012										
2013										
2014		$0							$0	$0
2015		$0	$49,243	$37,421	$0	$0	$760	$577	$49,243	$37,421
2016		$0	$49,257	$35,991	$0	$0	$760	$555	$49,257	$35,991
2017		$0	$49,270	$34,616	$0	$0	$760	$534	$49,270	$34,616
2018		$0	$49,283	$33,294	$0	$0	$760	$514	$49,283	$33,294
2019		$0	$49,297	$32,022	$0	$0	$761	$494	$49,297	$32,022
2020		$0	$49,310	$30,799	$0	$0	$761	$475	$49,310	$30,799
2021		$0	$49,323	$29,622	$0	$0	$761	$457	$49,323	$29,622
2022		$0	$49,337	$28,491	$0	$0	$761	$440	$49,337	$28,491
2023		$0	$49,350	$27,402	$0	$0	$761	$423	$49,350	$27,402
2024		$0	$49,363	$26,356	$0	$0	$762	$407	$49,363	$26,356
2025		$0	$49,377	$25,349	$0	$0	$762	$391	$49,377	$25,349
2026		$0	$49,390	$24,380	$0	$0	$762	$376	$49,390	$24,380
2027		$0	$49,403	$23,449	$0	$0	$762	$362	$49,403	$23,449
2028		$0	$49,417	$22,553	$0	$0	$762	$348	$49,417	$22,553
2029		$0	$49,430	$21,692	$0	$0	$763	$335	$49,430	$21,692
2030		$0	$49,444	$20,863	$0	$0	$763	$322	$49,444	$20,863
2031		$0	$49,520	$20,092	$0	$0	$764	$310	$49,520	$20,092
2032		$0	$49,597	$19,349	$0	$0	$765	$299	$49,597	$19,349
2033		$0	$49,674	$18,633	$0	$0	$766	$287	$49,674	$18,633
2034		$0	$49,751	$17,945	$0	$0	$768	$277	$49,751	$17,945
2035		$0	$49,828	$17,281	$0	$0	$769	$267	$49,828	$17,281
2036		$0	$49,905	$16,642	$0	$0	$770	$257	$49,905	$16,642
2037		$0	$49,982	$16,027	$0	$0	$771	$247	$49,982	$16,027
2038		$0	$50,059	$15,434	$0	$0	$772	$238	$50,059	$15,434
2039		$0	$50,136	$14,863	$0	$0	$774	$229	$50,136	$14,863
2040		$0	$50,213	$14,314	$0	$0	$775	$221	$50,213	$14,314
2041		$0	$50,290	$13,784	$0	$0	$776	$213	$50,290	$13,784
2042		$0	$50,367	$13,274	$0	$0	$777	$205	$50,367	$13,274
2043		$0	$50,445	$12,783	$0	$0	$778	$197	$50,445	$12,783
2044		$0	$50,522	$12,311	$0	$0	$779	$190	$50,522	$12,311
2045		$0	$50,600	$11,855	$0	$0	$781	$183	$50,600	$11,855
2046		$0	$50,501	$11,377	$0	$0	$779	$176	$50,501	$11,377
2047		$0	$50,403	$10,918	$0	$0	$778	$168	$50,403	$10,918
2048		$0	$50,305	$10,478	$0	$0	$776	$162	$50,305	$10,478
2049		$0	$50,207	$10,055	$0	$0	$775	$155	$50,207	$10,055
2050		$0	$50,110	$9,650	$0	$0	$773	$149	$50,110	$9,650
2051		$0	$50,012	$9,261	$0	$0	$772	$143	$50,012	$9,261
2052		$0	$49,914	$8,887	$0	$0	$770	$137	$49,914	$8,887
2053		$0	$49,817	$8,529	$0	$0	$769	$132	$49,817	$8,529
2054		$0	$49,719	$8,184	$0	$0	$767	$126	$49,719	$8,184
2055		$0	$49,622	$7,854	$0	$0	$766	$121	$49,622	$7,854
2056		$0	$49,524	$7,537	$0	$0	$764	$116	$49,524	$7,537
2057		$0	$49,427	$7,233	$0	$0	$763	$112	$49,427	$7,233
2058		$0	$49,330	$6,941	$0	$0	$761	$107	$49,330	$6,941
2059		$0	$49,233	$6,661	$0	$0	$760	$103	$49,233	$6,661
2060		$0	$49,136	$6,392	$0	$0	$758	$99	$49,136	$6,392
2061		$0	$49,039	$6,134	$0	$0	$757	$95	$49,039	$6,134
2062		$0	$48,942	$5,887	$0	$0	$755	$91	$48,942	$5,887
2063		$0	$48,845	$5,649	$0	$0	$754	$87	$48,845	$5,649
2064		$0	$48,748	$5,421	$0	$0	$752	$84	$48,748	$5,421
2065		$0	$48,652	$5,202	$0	$0	$751	$80	$48,652	$5,202
Total Capital =		$0								
Total Net Present Value =			$0	$847,141		$0		$13,070		**$847,141**

Notes:
1. No capital costs. Annual O&M cost assumed to be included in Existing Trunk Sewers LCA.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 6, 2009
Last Revision By: D. Shiskowski

Subject: Currie Road Pump Station

Option 2
Material Flows
and Carbon Footprint Analysis

Yellow-shaded cell denotes assumed/input values

Year	Wastewater ADWF		ADWF Friction Losses		TDH	Velocity	Pump Energy	Materials	GHG Sources	Total GHG Emissions
			Unit	Total				Electricity	Electricity Purchased	
	(m3/d)	(L/s)	(m/m)	(m)	(m)	(m/s)	(kW)	(kWh/yr)	(t CO2e/yr)	(t CO2e/yr)
2008										
2009										
2010										
2011										
2012										
2013										
2014										
2015	14,433	167	0.000224	0.40	20.4	0.38	47.8	418,436	30	30
2016	14,409	167	0.000224	0.40	20.4	0.38	47.7	417,729	30	30
2017	14,386	167	0.000223	0.40	20.4	0.38	47.6	417,022	30	30
2018	14,362	166	0.000222	0.40	20.4	0.38	47.5	416,315	30	30
2019	14,339	166	0.000222	0.40	20.4	0.38	47.4	415,608	30	30
2020	14,315	166	0.000221	0.40	20.4	0.38	47.4	414,901	30	30
2021	14,292	165	0.000220	0.40	20.4	0.37	47.3	414,195	30	30
2022	14,268	165	0.000220	0.40	20.4	0.37	47.2	413,488	30	30
2023	14,245	165	0.000219	0.39	20.4	0.37	47.1	412,782	30	30
2024	14,221	165	0.000218	0.39	20.4	0.37	47.0	412,075	30	30
2025	14,198	164	0.000218	0.39	20.4	0.37	47.0	411,369	30	30
2026	14,174	164	0.000217	0.39	20.4	0.37	46.9	410,663	30	30
2027	14,151	164	0.000216	0.39	20.4	0.37	46.8	409,957	30	30
2028	14,127	164	0.000216	0.39	20.4	0.37	46.7	409,252	29	29
2029	14,104	163	0.000215	0.39	20.4	0.37	46.6	408,546	29	29
2030	14,080	163	0.000214	0.39	20.4	0.37	46.6	407,840	29	29
2031	14,078	163	0.000214	0.39	20.4	0.37	46.6	407,788	29	29
2032	14,077	163	0.000214	0.39	20.4	0.37	46.5	407,736	29	29
2033	14,075	163	0.000214	0.39	20.4	0.37	46.5	407,684	29	29
2034	14,073	163	0.000214	0.39	20.4	0.37	46.5	407,632	29	29
2035	14,071	163	0.000214	0.39	20.4	0.37	46.5	407,580	29	29
2036	14,070	163	0.000214	0.39	20.4	0.37	46.5	407,528	29	29
2037	14,068	163	0.000214	0.39	20.4	0.37	46.5	407,477	29	29
2038	14,066	163	0.000214	0.39	20.4	0.37	46.5	407,425	29	29
2039	14,064	163	0.000214	0.38	20.4	0.37	46.5	407,373	29	29
2040	14,063	163	0.000214	0.38	20.4	0.37	46.5	407,321	29	29
2041	14,061	163	0.000214	0.38	20.4	0.37	46.5	407,269	29	29
2042	14,059	163	0.000214	0.38	20.4	0.37	46.5	407,217	29	29
2043	14,057	163	0.000214	0.38	20.4	0.37	46.5	407,165	29	29
2044	14,056	163	0.000214	0.38	20.4	0.37	46.5	407,113	29	29
2045	14,054	163	0.000214	0.38	20.4	0.37	46.5	407,061	29	29
2046	14,036	162	0.000213	0.38	20.4	0.37	46.4	406,533	29	29
2047	14,019	162	0.000213	0.38	20.4	0.37	46.3	406,006	29	29
2048	14,001	162	0.000212	0.38	20.4	0.37	46.3	405,478	29	29
2049	13,984	162	0.000212	0.38	20.4	0.37	46.2	404,951	29	29
2050	13,966	162	0.000211	0.38	20.4	0.37	46.2	404,424	29	29
2051	13,948	161	0.000211	0.38	20.4	0.37	46.1	403,897	29	29
2052	13,931	161	0.000210	0.38	20.4	0.36	46.0	403,370	29	29
2053	13,913	161	0.000210	0.38	20.4	0.36	46.0	402,842	29	29
2054	13,896	161	0.000209	0.38	20.4	0.36	45.9	402,315	29	29
2055	13,878	161	0.000209	0.38	20.4	0.36	45.9	401,789	29	29
2056	13,860	160	0.000208	0.37	20.4	0.36	45.8	401,262	29	29
2057	13,843	160	0.000208	0.37	20.4	0.36	45.7	400,735	29	29
2058	13,825	160	0.000207	0.37	20.4	0.36	45.7	400,208	29	29
2059	13,808	160	0.000207	0.37	20.4	0.36	45.6	399,681	29	29
2060	13,790	160	0.000206	0.37	20.4	0.36	45.6	399,155	29	29
2061	13,772	159	0.000206	0.37	20.4	0.36	45.5	398,628	29	29
2062	13,755	159	0.000205	0.37	20.4	0.36	45.4	398,102	29	29
2063	13,737	159	0.000205	0.37	20.4	0.36	45.4	397,575	29	29
2064	13,720	159	0.000204	0.37	20.4	0.36	45.3	397,049	29	29
2065	13,702	159	0.000204	0.37	20.4	0.36	45.3	396,522	29	29
Totals =								20,752,068	1,494	**1,494**

CURRIE ROAD PUMP STATION

static head =	20.0	m
friction C value =	120	
forcemain diameter =	750	mm
forcemain X-area =	0.4418	m^2
forcemain length =	1,800	m
pump efficiency =	70%	
fluid specific weight =	9.81	kN/m^3

Ref: Flow and pumping information from M. Homenuke Feb 2/09 e-mail and attached ConveyanceFlows_forDean_20090202.xls.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 6, 2009
Last Revision By: D. Shiskowski

Subject: Currie Road Pump Station

Option 2
Life Cycle Analysis

Yellow-shaded cell denotes assumed/input values

Year	Capital Costs (Note 1)		Operation & Maintenance Costs				GHG CO2e		Total	
			Electricity		Maintenance (Note 1)					
	Total Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value
2008										
2009										
2010										
2011										
2012										
2013										
2014		$0							$0	$0
2015		$0	$29,291	$22,258	$0	$0	$452	$343	$29,291	$22,258
2016		$0	$29,241	$21,366	$0	$0	$451	$330	$29,241	$21,366
2017		$0	$29,192	$20,510	$0	$0	$450	$316	$29,192	$20,510
2018		$0	$29,142	$19,687	$0	$0	$450	$304	$29,142	$19,687
2019		$0	$29,093	$18,898	$0	$0	$449	$292	$29,093	$18,898
2020		$0	$29,043	$18,140	$0	$0	$448	$280	$29,043	$18,140
2021		$0	$28,994	$17,413	$0	$0	$447	$269	$28,994	$17,413
2022		$0	$28,944	$16,715	$0	$0	$447	$258	$28,944	$16,715
2023		$0	$28,895	$16,044	$0	$0	$446	$248	$28,895	$16,044
2024		$0	$28,845	$15,401	$0	$0	$445	$238	$28,845	$15,401
2025		$0	$28,796	$14,783	$0	$0	$444	$228	$28,796	$14,783
2026		$0	$28,746	$14,190	$0	$0	$444	$219	$28,746	$14,190
2027		$0	$28,697	$13,621	$0	$0	$443	$210	$28,697	$13,621
2028		$0	$28,648	$13,074	$0	$0	$442	$202	$28,648	$13,074
2029		$0	$28,598	$12,550	$0	$0	$441	$194	$28,598	$12,550
2030		$0	$28,549	$12,046	$0	$0	$440	$186	$28,549	$12,046
2031		$0	$28,545	$11,582	$0	$0	$440	$179	$28,545	$11,582
2032		$0	$28,542	$11,135	$0	$0	$440	$172	$28,542	$11,135
2033		$0	$28,538	$10,705	$0	$0	$440	$165	$28,538	$10,705
2034		$0	$28,534	$10,292	$0	$0	$440	$159	$28,534	$10,292
2035		$0	$28,531	$9,895	$0	$0	$440	$153	$28,531	$9,895
2036		$0	$28,527	$9,513	$0	$0	$440	$147	$28,527	$9,513
2037		$0	$28,523	$9,146	$0	$0	$440	$141	$28,523	$9,146
2038		$0	$28,520	$8,793	$0	$0	$440	$136	$28,520	$8,793
2039		$0	$28,516	$8,454	$0	$0	$440	$130	$28,516	$8,454
2040		$0	$28,512	$8,128	$0	$0	$440	$125	$28,512	$8,128
2041		$0	$28,509	$7,814	$0	$0	$440	$121	$28,509	$7,814
2042		$0	$28,505	$7,513	$0	$0	$440	$116	$28,505	$7,513
2043		$0	$28,502	$7,223	$0	$0	$440	$111	$28,502	$7,223
2044		$0	$28,498	$6,944	$0	$0	$440	$107	$28,498	$6,944
2045		$0	$28,494	$6,676	$0	$0	$440	$103	$28,494	$6,676
2046		$0	$28,457	$6,411	$0	$0	$439	$99	$28,457	$6,411
2047		$0	$28,420	$6,156	$0	$0	$438	$95	$28,420	$6,156
2048		$0	$28,383	$5,912	$0	$0	$438	$91	$28,383	$5,912
2049		$0	$28,347	$5,677	$0	$0	$437	$88	$28,347	$5,677
2050		$0	$28,310	$5,452	$0	$0	$437	$84	$28,310	$5,452
2051		$0	$28,273	$5,235	$0	$0	$436	$81	$28,273	$5,235
2052		$0	$28,236	$5,027	$0	$0	$436	$78	$28,236	$5,027
2053		$0	$28,199	$4,828	$0	$0	$435	$74	$28,199	$4,828
2054		$0	$28,162	$4,636	$0	$0	$435	$72	$28,162	$4,636
2055		$0	$28,125	$4,452	$0	$0	$434	$69	$28,125	$4,452
2056		$0	$28,088	$4,275	$0	$0	$433	$66	$28,088	$4,275
2057		$0	$28,051	$4,105	$0	$0	$433	$63	$28,051	$4,105
2058		$0	$28,015	$3,942	$0	$0	$432	$61	$28,015	$3,942
2059		$0	$27,978	$3,785	$0	$0	$432	$58	$27,978	$3,785
2060		$0	$27,941	$3,635	$0	$0	$431	$56	$27,941	$3,635
2061		$0	$27,904	$3,491	$0	$0	$431	$54	$27,904	$3,491
2062		$0	$27,867	$3,352	$0	$0	$430	$52	$27,867	$3,352
2063		$0	$27,830	$3,219	$0	$0	$429	$50	$27,830	$3,219
2064		$0	$27,793	$3,091	$0	$0	$429	$48	$27,793	$3,091
2065		$0	$27,757	$2,968	$0	$0	$428	$46	$27,757	$2,968
Total Capital =		$0								
Total Net Present Value =			$0	$490,157		$0		$7,562		**$490,157**

Notes:
1. Capital costs included in CS Mods LCA. Existing annual O&M cost assumed to be included in Existing Trunk Sewers LCA.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 6, 2009
Last Revision By: D. Shiskowski

Subject: Craigflower Pump Station

Option 2
Material Flows
and Carbon Footprint Analysis

Yellow-shaded cell denotes assumed/input values

Year	Wastewater ADWF		ADWF Friction Losses		TDH	Velocity	Pump Energy	Materials	GHG Sources	Total GHG Emissions
			Unit	Total				Electricity	Electricity Purchased	
	(m3/d)	(L/s)	(m/m)	(m)	(m)	(m/s)	(kW)	(kWh/yr)	(t CO2e/yr)	(t CO2e/yr)
2008										
2009										
2010										
2011										
2012										
2013										
2014										
2015	21,617	250	0.001403	5.05	45.0	0.88	158.0	1,383,726	100	100
2016	21,720	251	0.001415	5.09	45.1	0.89	158.9	1,391,700	100	100
2017	21,823	253	0.001428	5.14	45.1	0.89	159.8	1,399,694	101	101
2018	21,926	254	0.001440	5.18	45.2	0.90	160.7	1,407,706	101	101
2019	22,029	255	0.001453	5.23	45.2	0.90	161.6	1,415,737	102	102
2020	22,132	256	0.001465	5.27	45.3	0.91	162.5	1,423,787	103	103
2021	22,235	257	0.001478	5.32	45.3	0.91	163.5	1,431,856	103	103
2022	22,338	259	0.001491	5.37	45.4	0.91	164.4	1,439,944	104	104
2023	22,442	260	0.001503	5.41	45.4	0.92	165.3	1,448,051	104	104
2024	22,545	261	0.001516	5.46	45.5	0.92	166.2	1,456,177	105	105
2025	22,648	262	0.001529	5.50	45.5	0.93	167.2	1,464,323	105	105
2026	22,751	263	0.001542	5.55	45.6	0.93	168.1	1,472,488	106	106
2027	22,854	265	0.001555	5.60	45.6	0.94	169.0	1,480,672	107	107
2028	22,957	266	0.001568	5.64	45.6	0.94	170.0	1,488,876	107	107
2029	23,060	267	0.001581	5.69	45.7	0.94	170.9	1,497,099	108	108
2030	23,163	268	0.001594	5.74	45.7	0.95	171.8	1,505,342	108	108
2031	23,287	270	0.001610	5.80	45.8	0.95	173.0	1,515,286	109	109
2032	23,411	271	0.001626	5.85	45.9	0.96	174.1	1,525,258	110	110
2033	23,535	272	0.001642	5.91	45.9	0.96	175.3	1,535,258	111	111
2034	23,659	274	0.001658	5.97	46.0	0.97	176.4	1,545,288	111	111
2035	23,783	275	0.001674	6.03	46.0	0.97	177.6	1,555,347	112	112
2036	23,907	277	0.001690	6.08	46.1	0.98	178.7	1,565,435	113	113
2037	24,031	278	0.001706	6.14	46.1	0.98	179.9	1,575,552	113	113
2038	24,155	280	0.001723	6.20	46.2	0.99	181.0	1,585,699	114	114
2039	24,279	281	0.001739	6.26	46.3	0.99	182.2	1,595,875	115	115
2040	24,403	282	0.001755	6.32	46.3	1.00	183.3	1,606,081	116	116
2041	24,527	284	0.001772	6.38	46.4	1.00	184.5	1,616,317	116	116
2042	24,651	285	0.001789	6.44	46.4	1.01	185.7	1,626,583	117	117
2043	24,775	287	0.001805	6.50	46.5	1.01	186.9	1,636,879	118	118
2044	24,899	288	0.001822	6.56	46.6	1.02	188.0	1,647,205	119	119
2045	25,023	290	0.001839	6.62	46.6	1.02	189.2	1,657,561	119	119
2046	25,051	290	0.001843	6.63	46.6	1.03	189.5	1,659,933	120	120
2047	25,080	290	0.001847	6.65	46.6	1.03	189.8	1,662,307	120	120
2048	25,108	291	0.001850	6.66	46.7	1.03	190.0	1,664,682	120	120
2049	25,136	291	0.001854	6.68	46.7	1.03	190.3	1,667,059	120	120
2050	25,165	291	0.001858	6.69	46.7	1.03	190.6	1,669,437	120	120
2051	25,193	292	0.001862	6.70	46.7	1.03	190.8	1,671,817	120	120
2052	25,221	292	0.001866	6.72	46.7	1.03	191.1	1,674,199	121	121
2053	25,250	292	0.001870	6.73	46.7	1.03	191.4	1,676,582	121	121
2054	25,278	293	0.001874	6.75	46.7	1.03	191.7	1,678,967	121	121
2055	25,307	293	0.001878	6.76	46.8	1.04	191.9	1,681,353	121	121
2056	25,335	293	0.001881	6.77	46.8	1.04	192.2	1,683,742	121	121
2057	25,363	294	0.001885	6.79	46.8	1.04	192.5	1,686,131	121	121
2058	25,392	294	0.001889	6.80	46.8	1.04	192.8	1,688,523	122	122
2059	25,420	294	0.001893	6.82	46.8	1.04	193.0	1,690,915	122	122
2060	25,448	295	0.001897	6.83	46.8	1.04	193.3	1,693,310	122	122
2061	25,477	295	0.001901	6.84	46.8	1.04	193.6	1,695,706	122	122
2062	25,505	295	0.001905	6.86	46.9	1.04	193.8	1,698,104	122	122
2063	25,533	296	0.001909	6.87	46.9	1.05	194.1	1,700,503	122	122
2064	25,562	296	0.001913	6.89	46.9	1.05	194.4	1,702,904	123	123
2065	25,590	296	0.001917	6.90	46.9	1.05	194.7	1,705,307	123	123
Totals =								80,548,284	5,799	**5,799**

CRAIGFLOWER PUMP STATION

static head =	40.0	m
friction C value =	120	
forcemain diameter =	600	mm
forcemain X-area =	0.2827	m^2
forcemain length =	3,600	m
pump efficiency =	70%	
fluid specific weight =	9.81	kN/m^3

Ref: Flow and pumping information from M. Homenuke Feb 2/09 e-mail and attached ConveyanceFlows_forDean_20090202.xls.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 6, 2009
Last Revision By: D. Shiskowski

Subject: Craigflower Pump Station

Option 2
Life Cycle Analysis

Yellow-shaded cell denotes assumed/input values

Year	Capital Costs (Note 1)		Operation & Maintenance Costs				GHG CO2e		Total	
			Electricity		Maintenance (Note 1)					
	Total Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value
2008										
2009										
2010										
2011										
2012										
2013										
2014		$0							$0	$0
2015		$0	$96,861	$73,606	$0	$0	$1,494	$1,136	$96,861	$73,606
2016		$0	$97,419	$71,183	$0	$0	$1,503	$1,098	$97,419	$71,183
2017		$0	$97,979	$68,838	$0	$0	$1,512	$1,062	$97,979	$68,838
2018		$0	$98,539	$66,570	$0	$0	$1,520	$1,027	$98,539	$66,570
2019		$0	$99,102	$64,375	$0	$0	$1,529	$993	$99,102	$64,375
2020		$0	$99,665	$62,251	$0	$0	$1,538	$960	$99,665	$62,251
2021		$0	$100,230	$60,195	$0	$0	$1,546	$929	$100,230	$60,195
2022		$0	$100,796	$58,207	$0	$0	$1,555	$898	$100,796	$58,207
2023		$0	$101,364	$56,284	$0	$0	$1,564	$868	$101,364	$56,284
2024		$0	$101,932	$54,423	$0	$0	$1,573	$840	$101,932	$54,423
2025		$0	$102,503	$52,622	$0	$0	$1,581	$812	$102,503	$52,622
2026		$0	$103,074	$50,880	$0	$0	$1,590	$785	$103,074	$50,880
2027		$0	$103,647	$49,195	$0	$0	$1,599	$759	$103,647	$49,195
2028		$0	$104,221	$47,565	$0	$0	$1,608	$734	$104,221	$47,565
2029		$0	$104,797	$45,988	$0	$0	$1,617	$710	$104,797	$45,988
2030		$0	$105,374	$44,463	$0	$0	$1,626	$686	$105,374	$44,463
2031		$0	$106,070	$43,035	$0	$0	$1,637	$664	$106,070	$43,035
2032		$0	$106,768	$41,653	$0	$0	$1,647	$643	$106,768	$41,653
2033		$0	$107,468	$40,313	$0	$0	$1,658	$622	$107,468	$40,313
2034		$0	$108,170	$39,016	$0	$0	$1,669	$602	$108,170	$39,016
2035		$0	$108,874	$37,759	$0	$0	$1,680	$583	$108,874	$37,759
2036		$0	$109,580	$36,543	$0	$0	$1,691	$564	$109,580	$36,543
2037		$0	$110,289	$35,364	$0	$0	$1,702	$546	$110,289	$35,364
2038		$0	$110,999	$34,223	$0	$0	$1,713	$528	$110,999	$34,223
2039		$0	$111,711	$33,118	$0	$0	$1,724	$511	$111,711	$33,118
2040		$0	$112,426	$32,048	$0	$0	$1,735	$494	$112,426	$32,048
2041		$0	$113,142	$31,012	$0	$0	$1,746	$478	$113,142	$31,012
2042		$0	$113,861	$30,008	$0	$0	$1,757	$463	$113,861	$30,008
2043		$0	$114,581	$29,037	$0	$0	$1,768	$448	$114,581	$29,037
2044		$0	$115,304	$28,096	$0	$0	$1,779	$433	$115,304	$28,096
2045		$0	$116,029	$27,185	$0	$0	$1,790	$419	$116,029	$27,185
2046		$0	$116,195	$26,177	$0	$0	$1,793	$404	$116,195	$26,177
2047		$0	$116,361	$25,206	$0	$0	$1,795	$389	$116,361	$25,206
2048		$0	$116,528	$24,271	$0	$0	$1,798	$374	$116,528	$24,271
2049		$0	$116,694	$23,371	$0	$0	$1,800	$361	$116,694	$23,371
2050		$0	$116,861	$22,504	$0	$0	$1,803	$347	$116,861	$22,504
2051		$0	$117,027	$21,670	$0	$0	$1,806	$334	$117,027	$21,670
2052		$0	$117,194	$20,866	$0	$0	$1,808	$322	$117,194	$20,866
2053		$0	$117,361	$20,092	$0	$0	$1,811	$310	$117,361	$20,092
2054		$0	$117,528	$19,347	$0	$0	$1,813	$298	$117,528	$19,347
2055		$0	$117,695	$18,629	$0	$0	$1,816	$287	$117,695	$18,629
2056		$0	$117,862	$17,938	$0	$0	$1,818	$277	$117,862	$17,938
2057		$0	$118,029	$17,273	$0	$0	$1,821	$266	$118,029	$17,273
2058		$0	$118,197	$16,632	$0	$0	$1,824	$257	$118,197	$16,632
2059		$0	$118,364	$16,015	$0	$0	$1,826	$247	$118,364	$16,015
2060		$0	$118,532	$15,421	$0	$0	$1,829	$238	$118,532	$15,421
2061		$0	$118,699	$14,848	$0	$0	$1,831	$229	$118,699	$14,848
2062		$0	$118,867	$14,298	$0	$0	$1,834	$221	$118,867	$14,298
2063		$0	$119,035	$13,767	$0	$0	$1,837	$212	$119,035	$13,767
2064		$0	$119,203	$13,256	$0	$0	$1,839	$205	$119,203	$13,256
2065		$0	$119,371	$12,764	$0	$0	$1,842	$197	$119,371	$12,764
Total Capital =		$0								
Total Net Present Value =			$0	$1,819,401		$0		$28,071		**$1,819,401**

Notes:
1. Capital costs included in CS Mods LCA. Existing annual O&M cost assumed to be included in Existing Trunk Sewers LCA.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 18, 2009
Last Revision By: D. Shiskowski

Subject: Saanich East WWTF
Option 2

Material Flows
and Carbon Footprint Analysis

Yellow-shaded cell denotes assumed/input values

Year	Equivalent Population	Wastewater ADWF	Sludge Production and Truck Transport		Saleable Effluent Heat[1]	Saleable Reclaimed Water (irrigation only)	Materials			GHG Sources			GHG Offsets Done	Total GHG Emissions
			Mass	Thickened Volume			Electricity	Diesel Fuel	Sludge Thickening Polymer	Electricity Purchased	Diesel Fuel Combusted	Sludge Thickening Polymer Used	Avoided Natural Gas/Elect Use via Effluent Heat	
	(pe)	(m3/d)	(dry t/yr)	(m3/yr)	(GJ/yr)	(m3/yr)	(kWh/yr)	(L/yr)	(kg/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)
2008														
2009														
2010														
2011														
2012														
2013														
2014														
2015	47,656	16,125	1,035	0	36,488	29,428	3,972,797	-	0	286	0.0	0.0	-1,385	-1,099
2016	48,074	16,157	1,044	0	44,864	29,487	3,980,681	-	0	287	0.0	0.0	-1,703	-1,417
2017	48,491	16,189	1,053	0	53,241	29,545	3,988,565	-	0	287	0.0	0.0	-2,021	-1,734
2018	48,909	16,221	1,062	0	61,617	29,603	3,996,449	-	0	288	0.0	0.0	-2,339	-2,052
2019	49,326	16,253	1,071	0	69,994	29,662	4,004,333	-	0	288	0.0	0.0	-2,657	-2,369
2020	49,744	16,285	1,080	0	78,371	29,720	4,012,217	-	0	289	0.0	0.0	-2,975	-2,687
2021	50,161	16,317	1,089	0	86,747	29,779	4,020,101	-	0	289	0.0	0.0	-3,294	-3,004
2022	50,579	16,349	1,098	0	95,124	29,837	4,027,985	-	0	290	0.0	0.0	-3,612	-3,322
2023	50,996	16,381	1,108	0	103,500	29,895	4,035,869	-	0	291	0.0	0.0	-3,930	-3,639
2024	51,414	16,413	1,117	0	111,877	29,954	4,043,753	-	0	291	0.0	0.0	-4,248	-3,956
2025	51,831	16,445	1,126	0	120,253	30,012	4,051,637	-	0	292	0.0	0.0	-4,566	-4,274
2026	52,249	16,477	1,135	0	128,630	30,071	4,059,521	-	0	292	0.0	0.0	-4,884	-4,591
2027	52,666	16,509	1,144	0	137,007	30,129	4,067,405	-	0	293	0.0	0.0	-5,202	-4,909
2028	53,084	16,541	1,153	0	145,383	30,187	4,075,289	-	0	293	0.0	0.0	-5,520	-5,226
2029	53,501	16,573	1,162	0	153,760	30,246	4,083,173	-	0	294	0.0	0.0	-5,838	-5,544
2030	53,919	16,605	1,171	0	162,136	30,304	4,091,057	-	0	295	0.0	0.0	-6,156	-5,861
2031	54,470	16,673	1,183	0	163,871	30,428	4,107,794	-	0	296	0.0	0.0	-6,222	-5,926
2032	55,021	16,741	1,195	0	165,605	30,552	4,124,531	-	0	297	0.0	0.0	-6,287	-5,991
2033	55,573	16,809	1,207	0	167,339	30,676	4,141,268	-	0	298	0.0	0.0	-6,353	-6,055
2034	56,124	16,877	1,219	0	169,074	30,800	4,158,005	-	0	299	0.0	0.0	-6,419	-6,120
2035	56,675	16,945	1,231	0	170,808	30,924	4,174,742	-	0	301	0.0	0.0	-6,485	-6,184
2036	57,226	17,013	1,243	0	172,543	31,048	4,191,479	-	0	302	0.0	0.0	-6,551	-6,249
2037	57,777	17,081	1,255	0	174,277	31,172	4,208,216	-	0	303	0.0	0.0	-6,617	-6,314
2038	58,329	17,148	1,267	0	176,011	31,296	4,224,953	-	0	304	0.0	0.0	-6,683	-6,378
2039	58,880	17,216	1,279	0	177,746	31,420	4,241,691	-	0	305	0.0	0.0	-6,748	-6,443
2040	59,431	17,284	1,291	0	179,480	31,544	4,258,428	-	0	307	0.0	0.0	-6,814	-6,508
2041	59,982	17,352	1,303	0	181,215	31,668	4,275,165	-	0	308	0.0	0.0	-6,880	-6,572
2042	60,533	17,420	1,315	0	182,949	31,792	4,291,902	-	0	309	0.0	0.0	-6,946	-6,637
2043	61,085	17,488	1,327	0	184,683	31,916	4,308,639	-	0	310	0.0	0.0	-7,012	-6,702
2044	61,636	17,556	1,339	0	186,418	32,040	4,325,376	-	0	311	0.0	0.0	-7,078	-6,766
2045	62,187	17,624	1,351	0	188,152	32,164	4,342,113	-	0	313	0.0	0.0	-7,144	-6,831
2046	62,252	17,602	1,352	0	195,957	32,123	4,336,631	-	0	312	0.0	0.0	-7,440	-7,128
2047	62,317	17,580	1,353	0	203,762	32,083	4,331,149	-	0	312	0.0	0.0	-7,736	-7,424
2048	62,382	17,557	1,355	0	211,566	32,042	4,325,667	-	0	311	0.0	0.0	-8,033	-7,721
2049	62,447	17,535	1,356	0	219,371	32,001	4,320,186	-	0	311	0.0	0.0	-8,329	-8,018
2050	62,512	17,513	1,358	0	227,176	31,961	4,314,704	-	0	311	0.0	0.0	-8,625	-8,314
2051	62,576	17,491	1,359	0	234,981	31,920	4,309,222	-	0	310	0.0	0.0	-8,921	-8,611
2052	62,641	17,468	1,360	0	242,785	31,880	4,303,740	-	0	310	0.0	0.0	-9,218	-8,908
2053	62,706	17,446	1,362	0	250,590	31,839	4,298,258	-	0	309	0.0	0.0	-9,514	-9,205
2054	62,771	17,424	1,363	0	258,395	31,798	4,292,776	-	0	309	0.0	0.0	-9,810	-9,501
2055	62,836	17,402	1,365	0	266,200	31,758	4,287,295	-	0	309	0.0	0.0	-10,107	-9,798
2056	62,901	17,379	1,366	0	274,004	31,717	4,281,813	-	0	308	0.0	0.0	-10,403	-10,095
2057	62,966	17,357	1,367	0	281,809	31,677	4,276,331	-	0	308	0.0	0.0	-10,699	-10,392
2058	63,031	17,335	1,369	0	289,614	31,636	4,270,849	-	0	308	0.0	0.0	-10,996	-10,688
2059	63,096	17,313	1,370	0	290,628	31,595	4,265,367	-	0	307	0.0	0.0	-11,034	-10,727
2060	63,161	17,290	1,372	0	291,307	31,555	4,259,885	-	0	307	0.0	0.0	-11,060	-10,753
2061	63,225	17,268	1,373	0	291,987	31,514	4,254,404	-	0	306	0.0	0.0	-11,086	-10,779
2062	63,290	17,246	1,375	0	292,666	31,473	4,248,922	-	0	306	0.0	0.0	-11,112	-10,806
2063	63,355	17,224	1,376	0	293,346	31,433	4,243,440	-	0	306	0.0	0.0	-11,137	-10,832
2064	63,420	17,201	1,377	0	294,025	31,392	4,237,958	-	0	305	0.0	0.0	-11,163	-10,858
2065	63,485	17,179	1,379	0	294,705	31,352	4,232,476	-	0	305	0.0	0.0	-11,189	-10,884
Totals =					9,434,036		1,582,046	213,576,205	0	15,377	0	0	-358,180	**-342,803**

SAANICH EAST WWTF ASSUMPTIONS

Electricity:

"base" unit power requirement =	0.600	kW-hr/d per m3/d of ADWF treated wastewater	**Ref:** Based on Jan 15/09 TM from T. Dokken.
wastewater strength adjustment =	0	x "base" unit power requirement	**Note:** Not required as WW BOD = 260 mg/L (i.e. typical)
influent pumping power adjustment =	0.075	x "base" unit power requirement	**Ref:** Based on Table 1.4, WEF ___.
UV disinfection power adjustment =	0	x "base" unit power requirement	**Note:** Not required - effluent to marine environment.
effluent pumping power adjustment =	0.05	x "base" unit power requirement	**Note:** Not required for ADWF effluent disposal. Allowance is for heat recovery pumping; i.e. pumping effluent to a nearby District Energy System for use by others.
raw sludge thickening adjustment =	0	x "base" unit power requirement	**Note:** Not required - sludge to sewer.
total unit power requirement =	0.675	kW-hr/d per m3/d of ADWF treated wastewater	

Raw Sludge Thickening and Truck Transport:

thickening required (1 = yes, 0 = no)?	0	
chemical-P removal chemical sludge production allowance =	0%	of combined PS + WBS
round-trip transport distance to solids processing facility =	0	km

Saleable Reclaimed Water:

mean fraction of annual ADWF volume sold for landscape irrigation =	0.50%	/yr	**Note:** See dnt_eff_irr_ds.xls for assumptions and details. Reclaimed water used for toilet flushing handled separately in analysis. See Flush Rev LCA worksheet.

Notes:
1. Data from M. Homenuke in Feb 4/09 e-mail, DES_SaleableHeatEnergy.xls, Saleable.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 17, 2009
Last Revision By: D. Shiskowski

Subject: Saanich East WWTF
Option 2

Life Cycle Analysis

Yellow-shaded cell denotes assumed/input values

Year	Capital Costs		Operation & Maintenance Costs												GHG CO2e		Heat Revenues		Reclaimed Water Revenues (irrigation only)		Total	
			Labour		Electricity		Diesel Fuel		Chemicals		Maintenance		Administration									
	Total Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Rev	Net Present Value	Total Annual Rev	Net Present Value	Total Annual Cost	Net Present Value
2008																						
2009																						
2010																						
2011																						
2012																						
2013																						
2014	$126,009,560	$99,587,186																			$126,009,560	$99,587,186
2015	$0		$375,000	$284,969	$278,096	$211,330	$0	$0	$63,498	$48,253	$1,260,096	$957,569	$100,000	$75,992	-$16,489	-$12,530	-$198,299	-$150,691	-$21,188	-$16,101	$1,840,712	$1,398,790
2016	$0		$375,000	$274,009	$278,648	$203,605	$0	$0	$63,624	$46,489	$1,260,096	$920,740	$100,000	$73,069	-$21,251	-$15,528	-$243,824	-$178,160	-$21,230	-$15,513	$1,791,062	$1,308,711
2017	$0		$375,000	$263,470	$279,200	$196,162	$0	$0	$63,750	$44,790	$1,260,096	$885,326	$100,000	$70,259	-$26,013	-$18,276	-$289,348	-$203,292	-$21,272	-$14,946	$1,741,412	$1,223,493
2018	$0		$375,000	$253,337	$279,751	$188,990	$0	$0	$63,876	$43,152	$1,260,096	$851,275	$100,000	$67,556	-$30,775	-$20,791	-$334,872	-$226,227	-$21,314	-$14,399	$1,691,761	$1,142,893
2019	$0		$375,000	$243,593	$280,303	$182,080	$0	$0	$64,002	$41,574	$1,260,096	$818,534	$100,000	$64,956	-$35,537	-$23,084	-$380,396	-$247,098	-$21,356	-$13,873	$1,642,111	$1,066,684
2020	$0		$375,000	$234,224	$280,855	$175,421	$0	$0	$64,128	$40,054	$1,260,096	$787,052	$100,000	$62,460	-$40,299	-$25,171	-$425,920	-$266,029	-$21,398	-$13,365	$1,592,461	$994,646
2021	$0		$375,000	$225,215	$281,407	$169,006	$0	$0	$64,254	$38,589	$1,260,096	$756,781	$100,000	$60,057	-$45,061	-$27,062	-$471,444	-$283,137	-$21,441	-$12,877	$1,542,811	$926,572
2022	$0		$375,000	$216,553	$281,959	$162,824	$0	$0	$64,380	$37,178	$1,260,096	$727,674	$100,000	$57,748	-$49,823	-$28,771	-$516,969	-$298,536	-$21,483	-$12,406	$1,493,160	$862,263
2023	$0		$375,000	$208,224	$282,511	$156,868	$0	$0	$64,506	$35,818	$1,260,096	$699,686	$100,000	$55,526	-$54,585	-$30,309	-$562,493	-$312,332	-$21,525	-$11,952	$1,443,510	$801,530
2024	$0		$375,000	$200,216	$283,063	$151,129	$0	$0	$64,632	$34,507	$1,260,096	$672,775	$100,000	$53,391	-$59,347	-$31,686	-$608,017	-$324,625	-$21,567	-$11,515	$1,393,860	$744,193
2025	$0		$375,000	$192,515	$283,615	$145,600	$0	$0	$64,758	$33,245	$1,260,096	$646,899	$100,000	$51,337	-$64,109	-$32,912	-$653,541	-$335,510	-$21,609	-$11,093	$1,344,210	$690,081
2026	$0		$375,000	$185,111	$284,166	$140,273	$0	$0	$64,884	$32,029	$1,260,096	$622,019	$100,000	$49,363	-$68,871	-$33,997	-$699,065	-$345,078	-$21,651	-$10,687	$1,294,559	$639,031
2027	$0		$375,000	$177,991	$284,718	$135,139	$0	$0	$65,010	$30,856	$1,260,096	$598,095	$100,000	$47,464	-$73,633	-$34,949	-$744,589	-$353,414	-$21,693	-$10,296	$1,244,909	$590,887
2028	$0		$375,000	$171,145	$285,270	$130,194	$0	$0	$65,136	$29,727	$1,260,096	$575,091	$100,000	$45,639	-$78,395	-$35,778	-$790,114	-$360,597	-$21,735	-$9,920	$1,195,259	$545,500
2029	$0		$375,000	$164,563	$285,822	$125,428	$0	$0	$65,262	$28,639	$1,260,096	$552,972	$100,000	$43,883	-$83,157	-$36,492	-$835,638	-$366,706	-$21,777	-$9,556	$1,145,608	$502,731
2030	$10,296,000	$4,344,453	$375,000	$158,233	$286,374	$120,837	$0	$0	$65,388	$27,591	$1,363,056	$575,149	$100,000	$42,196	-$87,919	-$37,098	-$881,162	-$371,811	-$21,819	-$9,207	$11,494,918	$4,850,343
2031	$0		$375,000	$152,147	$287,546	$116,665	$0	$0	$65,655	$26,638	$1,363,056	$553,028	$100,000	$40,573	-$88,888	-$36,064	-$890,588	-$361,335	-$21,908	-$8,889	$1,189,872	$482,763
2032	$0		$375,000	$146,296	$288,717	$112,635	$0	$0	$65,923	$25,718	$1,363,056	$531,757	$100,000	$39,012	-$89,858	-$35,056	-$900,014	-$351,115	-$21,997	-$8,582	$1,180,827	$460,666
2033	$0		$375,000	$140,669	$289,889	$108,742	$0	$0	$66,190	$24,829	$1,363,056	$511,305	$100,000	$37,512	-$90,828	-$34,071	-$909,440	-$341,146	-$22,087	-$8,285	$1,171,781	$439,555
2034	$0		$375,000	$135,258	$291,060	$104,982	$0	$0	$66,458	$23,971	$1,363,056	$491,639	$100,000	$36,069	-$91,797	-$33,110	-$918,865	-$331,425	-$22,176	-$7,999	$1,162,735	$419,386
2035	$0		$375,000	$130,056	$292,232	$101,351	$0	$0	$66,725	$23,142	$1,363,056	$472,730	$100,000	$34,682	-$92,767	-$32,173	-$928,291	-$321,947	-$22,265	-$7,722	$1,153,690	$400,119
2036	$0		$375,000	$125,054	$293,404	$97,843	$0	$0	$66,993	$22,341	$1,363,056	$454,548	$100,000	$33,348	-$93,737	-$31,259	-$937,717	-$312,708	-$22,355	-$7,455	$1,144,644	$381,713
2037	$0		$375,000	$120,244	$294,575	$94,456	$0	$0	$67,261	$21,567	$1,363,056	$437,066	$100,000	$32,065	-$94,706	-$30,368	-$947,143	-$303,703	-$22,444	-$7,197	$1,135,598	$364,131
2038	$0		$375,000	$115,620	$295,747	$91,184	$0	$0	$67,528	$20,820	$1,363,056	$420,255	$100,000	$30,832	-$95,676	-$29,499	-$956,569	-$294,928	-$22,533	-$6,947	$1,126,552	$347,337
2039	$0		$375,000	$111,173	$296,918	$88,024	$0	$0	$67,796	$20,099	$1,363,056	$404,092	$100,000	$29,646	-$96,646	-$28,652	-$965,995	-$286,379	-$22,622	-$6,707	$1,117,507	$331,296
2040	$0		$375,000	$106,897	$298,090	$84,973	$0	$0	$68,063	$19,402	$1,363,056	$388,550	$100,000	$28,506	-$97,615	-$27,826	-$975,421	-$278,051	-$22,712	-$6,474	$1,108,461	$315,976
2041	$0		$375,000	$102,785	$299,262	$82,026	$0	$0	$68,331	$18,729	$1,363,056	$373,606	$100,000	$27,409	-$98,585	-$27,022	-$984,847	-$269,941	-$22,801	-$6,250	$1,099,415	$301,343
2042	$0		$375,000	$98,832	$300,433	$79,180	$0	$0	$68,598	$18,079	$1,363,056	$359,236	$100,000	$26,355	-$99,555	-$26,238	-$994,273	-$262,043	-$22,890	-$6,033	$1,090,370	$287,369
2043	$0		$375,000	$95,031	$301,605	$76,431	$0	$0	$68,866	$17,452	$1,363,056	$345,419	$100,000	$25,342	-$100,524	-$25,474	-$1,003,698	-$254,353	-$22,979	-$5,823	$1,081,324	$274,024
2044	$0		$375,000	$91,376	$302,776	$73,777	$0	$0	$69,133	$16,846	$1,363,056	$332,134	$100,000	$24,367	-$101,494	-$24,731	-$1,013,124	-$246,867	-$23,069	-$5,621	$1,072,278	$261,281
2045	$0		$375,000	$87,861	$303,948	$71,214	$0	$0	$69,401	$16,260	$1,363,056	$319,360	$100,000	$23,430	-$102,464	-$24,007	-$1,022,550	-$239,580	-$23,158	-$5,426	$1,063,232	$249,112
2046	$0		$375,000	$84,482	$303,564	$68,389	$0	$0	$69,313	$15,615	$1,363,056	$307,077	$100,000	$22,529	-$106,914	-$24,086	-$1,064,967	-$239,922	-$23,129	-$5,211	$1,015,923	$228,873
2047	$0		$375,000	$81,233	$303,180	$65,675	$0	$0	$69,225	$14,996	$1,363,056	$295,266	$100,000	$21,662	-$111,365	-$24,124	-$1,107,383	-$239,882	-$23,099	-$5,004	$968,614	$209,822
2048	$0		$375,000	$78,108	$302,797	$63,069	$0	$0	$69,138	$14,401	$1,363,056	$283,910	$100,000	$20,829	-$115,816	-$24,123	-$1,149,800	-$239,491	-$23,070	-$4,805	$921,304	$191,898
2049	$0		$375,000	$75,104	$302,413	$60,567	$0	$0	$69,050	$13,829	$1,363,056	$272,990	$100,000	$20,028	-$120,267	-$24,087	-$1,192,216	-$238,775	-$23,041	-$4,615	$873,995	$175,042
2050	$0		$375,000	$72,216	$302,029	$58,163	$0	$0	$68,963	$13,280	$1,363,056	$262,490	$100,000	$19,257	-$124,717	-$24,017	-$1,234,633	-$237,759	-$23,012	-$4,431	$826,685	$159,199
2051	$0		$375,000	$69,438	$301,646	$55,855	$0	$0	$68,875	$12,753	$1,363,056	$252,395	$100,000	$18,517	-$129,168	-$23,918	-$1,277,049	-$236,469	-$22,983	-$4,256	$779,376	$144,316
2052	$0		$375,000	$66,767	$301,262	$53,639	$0	$0	$68,787	$12,247	$1,363,056	$242,687	$100,000	$17,805	-$133,619	-$23,790	-$1,319,466	-$234,926	-$22,953	-$4,087	$732,067	$130,342
2053	$0		$375,000	$64,199	$300,878	$51,510	$0	$0	$68,700	$11,761	$1,363,056	$233,353	$100,000	$17,120	-$138,070	-$23,637	-$1,361,883	-$233,152	-$22,924	-$3,925	$684,757	$117,229
2054	$0		$375,000	$61,730	$300,494	$49,466	$0	$0	$68,612	$11,294	$1,363,056	$224,378	$100,000	$16,461	-$142,520	-$23,461	-$1,404,299	-$231,167	-$22,895	-$3,769	$637,448	$104,933
2055	$0		$375,000	$59,356	$300,111	$47,502	$0	$0	$68,524	$10,846	$1,363,056	$215,748	$100,000	$15,828	-$146,971	-$23,263	-$1,446,716	-$228,990	-$22,866	-$3,619	$590,138	$93,409
2056	$0		$375,000	$57,073	$299,727	$45,617	$0	$0	$68,437	$10,416	$1,363,056	$207,450	$100,000	$15,219	-$151,422	-$23,046	-$1,489,132	-$226,638	-$22,836	-$3,476	$542,829	$82,616
2057	$0		$375,000	$54,878	$299,343	$43,806	$0	$0	$68,349	$10,002	$1,363,056	$199,471	$100,000	$14,634	-$155,873	-$22,811	-$1,531,549	-$224,129	-$22,807	-$3,338	$495,520	$72,515
2058	$0		$375,000	$52,767	$298,959	$42,067	$0	$0	$68,262	$9,605	$1,363,056	$191,799	$100,000	$14,071	-$160,323	-$22,560	-$1,573,965	-$221,477	-$22,778	-$3,205	$448,210	$63,069
2059	$0		$375,000	$50,738	$298,576	$40,397	$0	$0	$68,174	$9,224	$1,363,056	$184,422	$100,000	$13,530	-$160,906	-$21,771	-$1,579,474	-$213,704	-$22,749	-$3,078	$441,676	$59,759
2060	$0		$375,000	$48,786	$298,192	$38,794	$0	$0	$68,086	$8,858	$1,363,056	$177,329	$100,000	$13,010	-$161,299	-$20,985	-$1,583,167	-$205,965	-$22,719	-$2,956	$437,148	$56,872
2061	$0		$375,000	$46,910	$297,808	$37,254	$0	$0	$67,999	$8,506	$1,363,056	$170,509	$100,000	$12,509	-$161,692	-$20,227	-$1,586,860	-$198,505	-$22,690	-$2,838	$432,620	$54,118
2062	$0		$375,000	$45,106	$297,425	$35,775	$0	$0	$67,911	$8,168	$1,363,056	$163,951	$100,000	$12,028	-$162,085	-$19,496	-$1,590,553	-$191,314	-$22,661	-$2,726	$428,092	$51,492
2063	$0		$375,000	$43,371	$297,041	$34,354	$0	$0	$67,824	$7,844	$1,363,056	$157,645	$100,000	$11,566	-$162,478	-$18,791	-$1,594,246	-$184,383	-$22,632	-$2,617	$423,564	$48,988
2064	$0		$375,000	$41,703	$296,657	$32,990	$0	$0	$67,736	$7,533	$1,363,056	$151,582	$100,000	$11,121	-$162,871	-$18,112	-$1,597,939	-$177,702	-$22,602	-$2,514	$419,036	$46,600
2065	$0		$375,000	$40,099	$296,273	$31,681	$0	$0	$67,648	$7,234	$1,363,056	$145,752	$100,000	$10,693	-$163,264	-$17,458	-$1,601,632	-$171,263	-$22,573	-$2,414	$414,508	$44,323
Total Capital =	$136,305,560																					
Total Net Present Value =		$103,931,638		$6,406,730		$4,934,941		$0		$1,126,798		$22,382,565		$1,708,461		-$1,333,745		-$13,454,376		-$375,995		**$125,327,016**

SAANICH EAST WWTF ASSUMPTIONS

Labour:
number of facility manager(s) = 1
number of operations staff = 2
number of maintenance staff = 2
number of administration staff = 0
total staff = 5 persons

Ref: Based on Jan 15/09 TM from T. Dokken.

Chemical Phosphorus Removal Chemicals:
chemical-P removal required (1 = yes, 0 = no)? 0

Wet-Weather CEPT Chemicals:
fraction of total annual ADWF treated = 5.0%

Ref: Allowance to account for potential costs.

Reclaimed Water Disinfection:
allowance = 10.0% of other chemical costs

Ref: Allowance to account for potential costs.

Saleable Heat Energy:
unit energy cost to third-party "heat recovery" utility = $ 8.57 /GJ
unit CRD saleable energy price to third-party utility = $ 5.43 /GJ

Ref: This is the cost that a third-party heat recovery utility would incur to make the heat available to customers. Value is from Table 6 of Feb 10/09 memo from M. Homenuke, reduced by 7% to remove CRD share of capital cost.
Note: This value is the difference between the general energy market unit price (from Generic Assumptions sheet) and the above value, which reflects the maximum amount the utility would be willing to pay the CRD for the heat.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: March 6, 2009
Last Revision By: D. Shiskowski

Subject: South Colwood WWTF (Liquid-Stream) Option 2

Material Flows and Carbon Footprint Analysis

Yellow-shaded cell denotes assumed/input values

Year	Equivalent Population	Wastewater ADWF	Sludge Production and Truck Transport		Saleable Effluent Heat[1]	Saleable Reclaimed Water (irrigation only)	Materials			GHG Sources			GHG Offsets	Total GHG Emissions
			Mass	Thickened Volume			Electricity	Diesel Fuel	Sludge Thickening Polymer	Electricity Purchased	Diesel Fuel Combusted	Sludge Thickening Polymer Used	Avoided Natural Gas/Elect Use via Effluent Heat2	
	(pe)	(m3/d)	(dry t/yr)	(m3/yr)	(GJ/yr)	(m3/yr)	(kWh/yr)	(L/yr)	(kg/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)
2008														
2009														
2010														
2011														
2012														
2013														
2014														
2015	6,589	1,582	143	2,338	21,361	5,774	454,582	2,325	1,145	33	6.4	1.4	0	41
2016	7,547	1,782	164	2,678	24,492	6,503	511,955	2,663	1,311	37	7.3	1.6	0	46
2017	8,506	1,981	185	3,018	27,623	7,232	569,329	3,001	1,478	41	8.3	1.8	0	51
2018	9,464	2,181	206	3,358	30,754	7,961	626,702	3,339	1,644	45	9.2	2.0	0	56
2019	10,422	2,381	226	3,698	33,886	8,689	684,076	3,677	1,811	49	10.1	2.2	0	62
2020	11,381	2,580	247	4,039	37,017	9,418	741,449	4,016	1,977	53	11.1	2.4	0	67
2021	12,339	2,780	268	4,379	40,148	10,147	798,823	4,354	2,144	58	12.0	2.6	0	72
2022	13,297	2,980	289	4,719	43,279	10,876	856,196	4,692	2,310	62	12.9	2.8	0	77
2023	14,256	3,179	310	5,059	46,410	11,605	913,570	5,030	2,477	66	13.9	3.0	0	83
2024	15,214	3,379	330	5,399	49,541	12,333	970,943	5,368	2,643	70	14.8	3.2	0	88
2025	16,172	3,579	351	5,739	52,672	13,062	1,028,316	5,706	2,810	74	15.7	3.4	0	93
2026	17,131	3,778	372	6,079	55,803	13,791	1,085,690	6,044	2,976	78	16.7	3.6	0	98
2027	18,089	3,978	393	6,419	58,934	14,520	1,143,063	6,383	3,143	82	17.6	3.8	0	104
2028	19,047	4,178	414	6,759	62,065	15,248	1,200,437	6,721	3,309	86	18.5	4.0	0	109
2029	20,006	4,377	434	7,099	65,196	15,977	1,257,810	7,059	3,476	91	19.5	4.2	0	114
2030	20,964	4,577	455	7,439	68,327	16,706	1,315,184	7,397	3,642	95	20.4	4.4	0	119
2031	21,914	4,764	476	7,776	71,622	17,389	1,368,918	7,732	3,807	99	21.3	4.6	0	124
2032	22,864	4,951	497	8,114	74,917	18,071	1,422,651	8,067	3,972	102	22.2	4.8	0	129
2033	23,814	5,138	517	8,451	78,212	18,754	1,476,385	8,403	4,137	106	23.2	5.0	0	134
2034	24,764	5,325	538	8,788	81,507	19,436	1,530,119	8,738	4,302	110	24.1	5.2	0	139
2035	25,714	5,512	558	9,125	84,802	20,119	1,583,853	9,073	4,468	114	25.0	5.4	0	144
2036	26,664	5,699	579	9,462	88,097	20,801	1,637,586	9,408	4,633	118	25.9	5.6	0	149
2037	27,614	5,886	600	9,799	91,392	21,484	1,691,320	9,743	4,798	122	26.9	5.8	0	154
2038	28,564	6,073	620	10,136	94,687	22,166	1,745,054	10,079	4,963	126	27.8	6.0	0	159
2039	29,514	6,260	641	10,473	97,982	22,849	1,798,788	10,414	5,128	130	28.7	6.2	0	164
2040	30,464	6,447	662	10,810	101,276	23,532	1,852,521	10,749	5,293	133	29.6	6.4	0	169
2041	31,414	6,634	682	11,148	104,571	24,214	1,906,255	11,084	5,458	137	30.6	6.5	0	174
2042	32,364	6,821	703	11,485	107,866	24,897	1,959,989	11,419	5,623	141	31.5	6.7	0	179
2043	33,314	7,008	723	11,822	111,161	25,579	2,013,723	11,755	5,788	145	32.4	6.9	0	184
2044	34,264	7,195	744	12,159	114,456	26,262	2,067,456	12,090	5,953	149	33.3	7.1	0	189
2045	35,214	7,382	765	12,496	117,751	26,944	2,121,190	12,425	6,118	153	34.3	7.3	0	194
2046	35,936	7,505	780	12,752	120,306	27,393	2,156,534	12,680	6,244	155	35.0	7.5	0	198
2047	36,658	7,628	796	13,008	122,860	27,842	2,191,877	12,935	6,369	158	35.7	7.6	0	201
2048	37,380	7,751	812	13,265	125,415	28,291	2,227,221	13,189	6,494	160	36.4	7.8	0	205
2049	38,102	7,874	827	13,521	127,969	28,740	2,262,564	13,444	6,620	163	37.1	7.9	0	208
2050	38,824	7,997	843	13,777	130,524	29,189	2,297,908	13,699	6,745	165	37.8	8.1	0	211
2051	39,545	8,120	859	14,033	133,079	29,638	2,333,252	13,953	6,871	168	38.5	8.2	0	215
2052	40,267	8,243	875	14,289	135,633	30,087	2,368,595	14,208	6,996	171	39.2	8.4	0	218
2053	40,989	8,366	890	14,545	138,188	30,536	2,403,939	14,463	7,121	173	39.9	8.5	0	221
2054	41,711	8,489	906	14,802	140,742	30,985	2,439,282	14,718	7,247	176	40.6	8.7	0	225
2055	42,433	8,612	922	15,058	143,297	31,434	2,474,626	14,972	7,372	178	41.3	8.8	0	228
2056	43,155	8,735	937	15,314	145,852	31,883	2,509,969	15,227	7,498	181	42.0	9.0	0	232
2057	43,877	8,858	953	15,570	148,406	32,332	2,545,313	15,482	7,623	183	42.7	9.1	0	235
2058	44,599	8,981	969	15,826	150,961	32,781	2,580,657	15,736	7,749	186	43.4	9.3	0	238
2059	45,321	9,104	984	16,083	153,515	33,230	2,616,000	15,991	7,874	188	44.1	9.4	0	242
2060	46,043	9,227	1,000	16,339	156,070	33,679	2,651,344	16,246	7,999	191	44.8	9.6	0	245
2061	46,764	9,350	1,016	16,595	158,625	34,128	2,686,687	16,501	8,125	193	45.5	9.7	0	249
2062	47,486	9,473	1,031	16,851	161,179	34,576	2,722,031	16,755	8,250	196	46.2	9.9	0	252
2063	48,208	9,596	1,047	17,107	163,734	35,025	2,757,375	17,010	8,376	199	46.9	10.1	0	255
2064	48,930	9,719	1,063	17,363	166,289	35,474	2,792,718	17,265	8,501	201	47.6	10.2	0	259
2065	49,652	9,842	1,078	17,620	168,843	35,923	2,828,062	17,519	8,627	204	48.3	10.4	0	262
Totals =					5,029,296		1,145,505	90,179,885	530,948		6,493	1,464	314	0	**8,270**

SOUTH COLWOOD WWTF ASSUMPTIONS (Liquid-Stream)

Electricity:

"base" unit power requirement =	0.670	kW-hr/d per m3/d of ADWF treated wastewater	**Ref:** Based on Jan 15/09 TM from T. Dokken.
wastewater strength adjustment =	0	x "base" unit power requirement	**Note:** Not required as WW BOD = 260 mg/L (i.e. typical)
influent pumping power adjustment =	0.075	x "base" unit power requirement	**Ref:** Based on Table 1.4. WEF .
recycled centrate aeration power adjustment =	0	x "base" unit power requirement	**Note:** No solids processing therefore no centrate.
UV disinfection power adjustment =	0	x "base" unit power requirement	**Note:** Not required - effluent to marine environment.
effluent pumping power adjustment =	0.05	x "base" unit power requirement	**Note:** Not required for ADWF effluent disposal. Allowance is for heat recovery pumping; i.e. pumping effluent to a nearby District Energy System for use by others.
raw sludge thickening adjustment =	0.05	x "base" unit power requirement	**Ref:** Based on Table 1.4. WEF .
total unit power requirement =	0.787	kW-hr/d per m3/d of ADWF treated wastewater	

Raw Sludge Thickening and Truck Transport:

thickening required (1 = yes, 0 = no)?	1		
chemical-P removal chemical sludge production allowance =	0%	of combined PS + WBS	
round-trip transport distance to solids processing facility =	35	km	**Note:** To/from Macaulay / McLouglin WWTF.

Saleable Reclaimed Water:

mean fraction of annual ADWF volume sold for landscape irrigation =	1.00%	/yr	**Note:** See dnt_eff_irr_ds.xls for assumptions and details. Reclaimed water used for toilet flushing handled separately in analysis. See Flush Rev LCA worksheet.

Notes:
1. Data from M. Homenuke in Feb 4/09 e-mail, DES_SaleableHeatEnergy.xls, Saleable.
2. Set to zero since heat would not be sold - see LCA sheet.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: March 6, 2009
Last Revision By: D. Shiskowski

Subject: South Colwood WWTF
(Liquid-Stream)
Option 2
Life Cycle Analysis

Yellow-shaded cell denotes assumed/input values

Year	Capital Costs[1]		Operation & Maintenance Costs												GHG CO2e		Heat Revenues		Reclaimed Water Revenues (irrigation only)		Total	
			Labour		Electricity		Diesel Fuel		Chemicals		Maintenance		Administration									
	Total Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Rev	Net Present Value	Total Annual Rev	Net Present Value	Total Annual Cost	Net Present Value
2008																						
2009																						
2010																						
2011																						
2012																						
2013																						
2014	$47,625,240	$37,638,919																			$47,625,240	$37,638,919
2015	$0		$300,000	$227,975	$31,821	$24,181	$3,487	$2,650	$18,822	$14,303	$476,252	$361,913	$100,000	$75,992	$608	$462	$0	$0	-$4,157	-$3,159	$926,833	$704,317
2016	$0		$300,000	$219,207	$35,837	$26,186	$3,995	$2,919	$21,440	$15,666	$476,252	$347,993	$100,000	$73,069	$687	$502	$0	$0	-$4,682	-$3,421	$933,528	$682,120
2017	$0		$300,000	$210,776	$39,853	$28,000	$4,502	$3,163	$24,058	$16,903	$476,252	$334,609	$100,000	$70,259	$766	$538	$0	$0	-$5,207	-$3,658	$940,224	$660,589
2018	$0		$300,000	$202,669	$43,869	$29,636	$5,009	$3,384	$26,675	$18,021	$476,252	$321,739	$100,000	$67,556	$845	$571	$0	$0	-$5,732	-$3,872	$946,919	$639,704
2019	$0		$300,000	$194,874	$47,885	$31,105	$5,516	$3,583	$29,293	$19,028	$476,252	$309,364	$100,000	$64,958	$923	$600	$0	$0	-$6,256	-$4,064	$953,614	$619,450
2020	$0		$300,000	$187,379	$51,901	$32,417	$6,023	$3,762	$31,911	$19,932	$476,252	$297,466	$100,000	$62,460	$1,002	$626	$0	$0	-$6,781	-$4,235	$960,310	$599,807
2021	$0		$300,000	$180,172	$55,918	$33,583	$6,531	$3,922	$34,529	$20,737	$476,252	$286,025	$100,000	$60,057	$1,081	$649	$0	$0	-$7,306	-$4,388	$967,005	$580,758
2022	$0		$300,000	$173,243	$59,934	$34,610	$7,038	$4,064	$37,147	$21,451	$476,252	$275,024	$100,000	$57,748	$1,160	$670	$0	$0	-$7,831	-$4,522	$973,700	$562,288
2023	$0		$300,000	$166,579	$63,950	$35,509	$7,545	$4,190	$39,764	$22,080	$476,252	$264,446	$100,000	$55,526	$1,239	$688	$0	$0	-$8,355	-$4,639	$980,396	$544,379
2024	$0		$300,000	$160,172	$67,966	$36,288	$8,052	$4,299	$42,382	$22,628	$476,252	$254,275	$100,000	$53,391	$1,318	$704	$0	$0	-$8,880	-$4,741	$987,091	$527,016
2025	$0		$300,000	$154,012	$71,982	$36,954	$8,559	$4,394	$45,000	$23,102	$476,252	$244,495	$100,000	$51,337	$1,397	$717	$0	$0	-$9,405	-$4,828	$993,786	$510,183
2026	$0		$300,000	$148,088	$75,998	$37,515	$9,067	$4,476	$47,618	$23,505	$476,252	$235,092	$100,000	$49,363	$1,476	$729	$0	$0	-$9,929	-$4,901	$1,000,482	$493,866
2027	$0		$300,000	$142,393	$80,014	$37,978	$9,574	$4,544	$50,235	$23,844	$476,252	$226,050	$100,000	$47,464	$1,555	$738	$0	$0	-$10,454	-$4,962	$1,007,177	$478,049
2028	$0		$300,000	$136,916	$84,031	$38,350	$10,081	$4,601	$52,853	$24,121	$476,252	$217,355	$100,000	$45,639	$1,634	$746	$0	$0	-$10,979	-$5,011	$1,013,872	$462,718
2029	$0		$300,000	$131,650	$88,047	$38,638	$10,588	$4,647	$55,471	$24,342	$476,252	$208,996	$100,000	$43,883	$1,713	$752	$0	$0	-$11,504	-$5,048	$1,020,568	$447,859
2030	$22,407,840	$9,455,109	$300,000	$126,587	$92,063	$38,846	$11,096	$4,682	$58,089	$24,511	$700,331	$295,508	$100,000	$42,196	$1,792	$756	$0	$0	-$12,028	-$5,075	$23,659,181	$9,983,119
2031	$0		$300,000	$121,718	$95,824	$38,878	$11,598	$4,706	$60,641	$24,603	$700,331	$284,143	$100,000	$40,573	$1,867	$757	$0	$0	-$12,520	-$5,080	$1,257,741	$510,299
2032	$0		$300,000	$117,036	$99,586	$38,850	$12,101	$4,721	$63,193	$24,653	$700,331	$273,214	$100,000	$39,012	$1,942	$757	$0	$0	-$13,011	-$5,076	$1,264,140	$493,168
2033	$0		$300,000	$112,535	$103,347	$38,767	$12,604	$4,728	$65,745	$24,662	$700,331	$262,706	$100,000	$37,512	$2,016	$756	$0	$0	-$13,503	-$5,065	$1,270,540	$476,601
2034	$0		$300,000	$108,207	$107,108	$38,633	$13,107	$4,727	$68,297	$24,634	$700,331	$252,602	$100,000	$36,069	$2,091	$754	$0	$0	-$13,994	-$5,048	$1,276,940	$460,578
2035	$0		$300,000	$104,045	$110,870	$38,451	$13,610	$4,720	$70,848	$24,571	$700,331	$242,886	$100,000	$34,682	$2,166	$751	$0	$0	-$14,486	-$5,024	$1,283,339	$445,083
2036	$0		$300,000	$100,043	$114,631	$38,227	$14,112	$4,706	$73,400	$24,477	$700,331	$233,545	$100,000	$33,348	$2,241	$747	$0	$0	-$14,977	-$4,994	$1,289,739	$430,099
2037	$0		$300,000	$96,195	$118,392	$37,963	$14,615	$4,686	$75,952	$24,354	$700,331	$224,562	$100,000	$32,065	$2,316	$743	$0	$0	-$15,468	-$4,960	$1,296,138	$415,609
2038	$0		$300,000	$92,496	$122,154	$37,662	$15,118	$4,661	$78,504	$24,204	$700,331	$215,925	$100,000	$30,832	$2,391	$737	$0	$0	-$15,960	-$4,921	$1,302,538	$401,597
2039	$0		$300,000	$88,938	$125,915	$37,329	$15,621	$4,631	$81,056	$24,030	$700,331	$207,620	$100,000	$29,646	$2,466	$731	$0	$0	-$16,451	-$4,877	$1,308,937	$388,048
2040	$0		$300,000	$85,517	$129,676	$36,965	$16,124	$4,596	$83,608	$23,833	$700,331	$199,635	$100,000	$28,506	$2,540	$724	$0	$0	-$16,943	-$4,830	$1,315,337	$374,947
2041	$0		$300,000	$82,228	$133,438	$36,575	$16,626	$4,557	$86,160	$23,616	$700,331	$191,957	$100,000	$27,409	$2,615	$717	$0	$0	-$17,434	-$4,779	$1,321,736	$362,280
2042	$0		$300,000	$79,066	$137,199	$36,159	$17,129	$4,514	$88,712	$23,390	$700,331	$184,574	$100,000	$26,355	$2,690	$709	$0	$0	-$17,926	-$4,724	$1,328,136	$350,033
2043	$0		$300,000	$76,025	$140,961	$35,722	$17,632	$4,468	$91,264	$23,128	$700,331	$177,475	$100,000	$25,342	$2,765	$701	$0	$0	-$18,417	-$4,667	$1,334,536	$338,192
2044	$0		$300,000	$73,101	$144,722	$35,264	$18,135	$4,419	$93,816	$22,860	$700,331	$170,649	$100,000	$24,367	$2,840	$692	$0	$0	-$18,908	-$4,607	$1,340,935	$326,744
2045	$15,768,480	$3,694,505	$300,000	$70,289	$148,483	$34,789	$18,638	$4,367	$96,368	$22,579	$858,016	$201,030	$100,000	$23,430	$2,915	$683	$0	$0	-$19,400	-$4,545	$17,273,499	$4,047,126
2046	$0		$300,000	$67,586	$150,957	$34,008	$19,020	$4,285	$98,232	$22,130	$858,016	$193,298	$100,000	$22,529	$2,966	$668	$0	$0	-$19,723	-$4,443	$1,509,467	$340,061
2047	$0		$300,000	$64,986	$153,431	$33,236	$19,402	$4,203	$100,096	$21,683	$858,016	$185,864	$100,000	$21,662	$3,017	$653	$0	$0	-$20,046	-$4,342	$1,513,915	$327,945
2048	$0		$300,000	$62,487	$155,905	$32,473	$19,784	$4,121	$101,960	$21,237	$858,016	$178,715	$100,000	$20,829	$3,068	$639	$0	$0	-$20,370	-$4,243	$1,518,363	$316,258
2049	$0		$300,000	$60,083	$158,380	$31,720	$20,166	$4,039	$103,824	$20,794	$858,016	$171,842	$100,000	$20,028	$3,119	$625	$0	$0	-$20,693	-$4,144	$1,522,811	$304,985
2050	$0		$300,000	$57,772	$160,854	$30,976	$20,548	$3,957	$105,688	$20,353	$858,016	$165,232	$100,000	$19,257	$3,170	$610	$0	$0	-$21,016	-$4,047	$1,527,259	$294,112
2051	$0		$300,000	$55,550	$163,328	$30,243	$20,930	$3,876	$107,552	$19,915	$858,016	$158,877	$100,000	$18,517	$3,221	$596	$0	$0	-$21,339	-$3,951	$1,531,707	$283,623
2052	$0		$300,000	$53,414	$165,802	$29,520	$21,312	$3,795	$109,416	$19,481	$858,016	$152,767	$100,000	$17,805	$3,272	$582	$0	$0	-$21,663	-$3,857	$1,536,154	$273,507
2053	$0		$300,000	$51,360	$168,276	$28,809	$21,694	$3,714	$111,280	$19,051	$858,016	$146,891	$100,000	$17,120	$3,322	$569	$0	$0	-$21,986	-$3,764	$1,540,602	$263,749
2054	$0		$300,000	$49,384	$170,750	$28,108	$22,076	$3,634	$113,144	$18,625	$858,016	$141,241	$100,000	$16,461	$3,373	$555	$0	$0	-$22,309	-$3,672	$1,545,050	$254,337
2055	$0		$300,000	$47,485	$173,224	$27,418	$22,458	$3,555	$115,008	$18,204	$858,016	$135,809	$100,000	$15,828	$3,424	$542	$0	$0	-$22,632	-$3,582	$1,549,498	$245,259
2056	$0		$300,000	$45,658	$175,698	$26,740	$22,840	$3,476	$116,872	$17,787	$858,016	$130,585	$100,000	$15,219	$3,475	$529	$0	$0	-$22,956	-$3,494	$1,553,946	$236,502
2057	$0		$300,000	$43,902	$178,172	$26,074	$23,223	$3,398	$118,736	$17,376	$858,016	$125,563	$100,000	$14,634	$3,526	$516	$0	$0	-$23,279	-$3,407	$1,558,394	$228,057
2058	$0		$300,000	$42,214	$180,646	$25,419	$23,605	$3,321	$120,600	$16,970	$858,016	$120,734	$100,000	$14,071	$3,577	$503	$0	$0	-$23,602	-$3,321	$1,562,842	$219,912
2059	$0		$300,000	$40,590	$183,120	$24,776	$23,987	$3,245	$122,464	$16,569	$858,016	$116,090	$100,000	$13,530	$3,628	$491	$0	$0	-$23,925	-$3,237	$1,567,289	$212,055
2060	$0		$300,000	$39,029	$185,594	$24,145	$24,369	$3,170	$124,328	$16,175	$858,016	$111,625	$100,000	$13,010	$3,679	$479	$0	$0	-$24,249	-$3,155	$1,571,737	$204,478
2061	$0		$300,000	$37,528	$188,068	$23,526	$24,751	$3,096	$126,192	$15,786	$858,016	$107,332	$100,000	$12,509	$3,730	$467	$0	$0	-$24,572	-$3,074	$1,576,185	$197,170
2062	$0		$300,000	$36,085	$190,542	$22,919	$25,133	$3,023	$128,056	$15,403	$858,016	$103,204	$100,000	$12,028	$3,781	$455	$0	$0	-$24,895	-$2,994	$1,580,633	$190,121
2063	$0		$300,000	$34,697	$193,016	$22,323	$25,515	$2,951	$129,920	$15,026	$858,016	$99,234	$100,000	$11,566	$3,832	$443	$0	$0	-$25,218	-$2,917	$1,585,081	$183,323
2064	$0		$300,000	$33,362	$195,490	$21,740	$25,897	$2,880	$131,784	$14,655	$858,016	$95,418	$100,000	$11,121	$3,883	$432	$0	$0	-$25,542	-$2,840	$1,589,529	$176,767
2065	$0		$300,000	$32,079	$197,964	$21,168	$26,279	$2,810	$133,648	$14,291	$858,016	$91,748	$100,000	$10,693	$3,934	$421	$0	$0	-$25,865	-$2,766	$1,593,977	$170,444
Total Capital =	$85,801,560																					
Total Net Present Value =		$50,788,533		$5,125,384		$1,645,376		$203,037		$1,055,271		$10,534,939		$1,708,461		$32,183		$0		-$214,975		**$70,878,209**

SOUTH COLWOOD WWTF ASSUMPTIONS (Liquid-Stream)

Labour:
number of facility manager(s) = 1
number of operations staff = 2
number of maintenance staff = 1
number of administration staff = 0
total staff = 4 persons

Ref: Based on Jan 15/09 TM from T. Dokken.

Chemical Phosphorus Removal Chemicals:
chemical-P removal required (1 = yes, 0 = no)? 0

Wet-Weather CEPT Chemicals:
fraction of total annual ADWF treated = 5.0%

Ref: Allowance to account for potential costs.

Reclaimed Water Disinfection:
allowance = 10.0% of other chemical costs

Ref: Allowance to account for potential costs.

Saleable Heat Energy:
unit energy cost to third-party "heat recovery" utility = $ 15.51 /GJ
unit CRD saleable energy price to third-party utility = $ - /GJ

Ref: This is the cost that a third-party heat recovery utility would incur to make the heat available to customers. Value is from Table 6 of Feb 10/09 memo from M. Homenuke, reduced by 4% to remove CRD share of capital cost.

Note: This value is the difference between the general energy market unit price (from Generic Assumptions sheet) and the above value, which reflects the maximum amount the utility would be willing to pay the CRD for the heat. Set to zero in this case since the unit selling price would be a negative value, indicating the CRD would need to subsidize the scheme.

Notes:
1. Excludes solids processing capital costs. Included in Biosolids LCA.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 18, 2009
Last Revision By: D. Shiskowski
Checked:

Subject: Macaulay/McLoughlin WWTF
(Liquid-Stream)
Option 2
Material Flows
and Carbon Footprint Analysis

Yellow-shaded cell denotes assumed/input values

Year	Equivalent Population	Wastewater ADWF	Sludge Production and Truck Transport		Saleable Effuent Heat[1]	Saleable Reclaimed Water (irrigation only)	Materials			GHG Sources			GHG Offsets	Total GHG Emissions
			Mass	Thickened Volume			Electricity	Diesel Fuel	Sludge Thickening Polymer	Electricity Purchased	Diesel Fuel Combusted	Sludge Thickening Polymer Used	Avoided Natural Gas/Elect Use via Effluent Heat2	
	(pe)	(m3/d)	(dry t/yr)	(m3/yr)	(GJ/yr)	(m3/yr)	(kWh/yr)	(L/yr)	(kg/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)
2008														
2009														
2010														
2011														
2012														
2013														
2014														
2015	88,249	21,675	1,917	0	62,838	67,247	7,392,191	-	0	532	0.0	0.0	0	532
2016	88,783	21,685	1,928	0	67,976	67,278	7,395,579	-	0	532	0.0	0.0	0	532
2017	89,317	21,695	1,940	0	73,114	67,308	7,398,966	-	0	533	0.0	0.0	0	533
2018	89,850	21,705	1,951	0	78,251	67,339	7,402,354	-	0	533	0.0	0.0	0	533
2019	90,384	21,715	1,963	0	83,389	67,370	7,405,742	-	0	533	0.0	0.0	0	533
2020	90,918	21,725	1,975	0	88,527	67,401	7,409,130	-	0	533	0.0	0.0	0	533
2021	91,452	21,735	1,986	0	93,665	67,432	7,412,517	-	0	534	0.0	0.0	0	534
2022	91,986	21,745	1,998	0	98,803	67,462	7,415,905	-	0	534	0.0	0.0	0	534
2023	92,519	21,754	2,009	0	103,940	67,493	7,419,293	-	0	534	0.0	0.0	0	534
2024	93,053	21,764	2,021	0	109,078	67,524	7,422,681	-	0	534	0.0	0.0	0	534
2025	93,587	21,774	2,032	0	114,216	67,555	7,426,068	-	0	535	0.0	0.0	0	535
2026	94,121	21,784	2,044	0	119,354	67,586	7,429,456	-	0	535	0.0	0.0	0	535
2027	94,655	21,794	2,056	0	124,492	67,617	7,432,844	-	0	535	0.0	0.0	0	535
2028	95,188	21,804	2,067	0	129,629	67,647	7,436,232	-	0	535	0.0	0.0	0	535
2029	95,722	21,814	2,079	0	134,767	67,678	7,439,619	-	0	536	0.0	0.0	0	536
2030	96,256	21,824	2,090	0	139,905	67,709	7,443,007	-	0	536	0.0	0.0	0	536
2031	96,774	21,854	2,102	0	141,441	67,802	7,453,284	-	0	537	0.0	0.0	0	537
2032	97,293	21,884	2,113	0	142,976	67,896	7,463,561	-	0	537	0.0	0.0	0	537
2033	97,811	21,914	2,124	0	144,512	67,989	7,473,838	-	0	538	0.0	0.0	0	538
2034	98,330	21,945	2,135	0	146,048	68,083	7,484,115	-	0	539	0.0	0.0	0	539
2035	98,848	21,975	2,147	0	147,583	68,176	7,494,391	-	0	540	0.0	0.0	0	540
2036	99,367	22,005	2,158	0	149,119	68,270	7,504,668	-	0	540	0.0	0.0	0	540
2037	99,885	22,035	2,169	0	150,654	68,363	7,514,945	-	0	541	0.0	0.0	0	541
2038	100,404	22,065	2,181	0	152,190	68,457	7,525,222	-	0	542	0.0	0.0	0	542
2039	100,922	22,095	2,192	0	153,726	68,550	7,535,499	-	0	543	0.0	0.0	0	543
2040	101,441	22,125	2,203	0	155,261	68,644	7,545,776	-	0	543	0.0	0.0	0	543
2041	101,959	22,155	2,214	0	156,797	68,737	7,556,053	-	0	544	0.0	0.0	0	544
2042	102,478	22,186	2,226	0	158,333	68,831	7,566,330	-	0	545	0.0	0.0	0	545
2043	102,996	22,216	2,237	0	159,868	68,924	7,576,606	-	0	546	0.0	0.0	0	546
2044	103,515	22,246	2,248	0	161,404	69,018	7,586,883	-	0	546	0.0	0.0	0	546
2045	104,033	22,276	2,259	0	162,940	69,111	7,597,160	-	0	547	0.0	0.0	0	547
2046	104,580	22,320	2,271	0	169,850	69,247	7,612,047	-	0	548	0.0	0.0	0	548
2047	105,126	22,363	2,283	0	176,760	69,382	7,626,934	-	0	549	0.0	0.0	0	549
2048	105,673	22,407	2,295	0	183,671	69,518	7,641,820	-	0	550	0.0	0.0	0	550
2049	106,220	22,451	2,307	0	190,581	69,653	7,656,707	-	0	551	0.0	0.0	0	551
2050	106,766	22,494	2,319	0	197,491	69,788	7,671,594	-	0	552	0.0	0.0	0	552
2051	107,313	22,538	2,331	0	204,402	69,924	7,686,480	-	0	553	0.0	0.0	0	553
2052	107,860	22,582	2,342	0	211,312	70,059	7,701,367	-	0	554	0.0	0.0	0	554
2053	108,406	22,625	2,354	0	218,222	70,195	7,716,254	-	0	556	0.0	0.0	0	556
2054	108,953	22,669	2,366	0	225,133	70,330	7,731,140	-	0	557	0.0	0.0	0	557
2055	109,500	22,713	2,378	0	232,043	70,466	7,746,027	-	0	558	0.0	0.0	0	558
2056	110,046	22,756	2,390	0	238,953	70,601	7,760,914	-	0	559	0.0	0.0	0	559
2057	110,593	22,800	2,402	0	245,864	70,736	7,775,801	-	0	560	0.0	0.0	0	560
2058	111,139	22,843	2,414	0	252,774	70,872	7,790,687	-	0	561	0.0	0.0	0	561
2059	111,686	22,887	2,426	0	259,685	71,007	7,805,574	-	0	562	0.0	0.0	0	562
2060	112,233	22,931	2,437	0	266,595	71,143	7,820,461	-	0	563	0.0	0.0	0	563
2061	112,779	22,974	2,449	0	273,505	71,278	7,835,347	-	0	564	0.0	0.0	0	564
2062	113,326	23,018	2,461	0	280,416	71,414	7,850,234	-	0	565	0.0	0.0	0	565
2063	113,873	23,062	2,473	0	287,326	71,549	7,865,121	-	0	566	0.0	0.0	0	566
2064	114,419	23,105	2,485	0	294,236	71,684	7,880,007	-	0	567	0.0	0.0	0	567
2065	114,966	23,149	2,497	0	301,147	71,820	7,894,894	-	0	568	0.0	0.0	0	568
Totals =					8,614,762	3,517,163	386,629,325	0		27,837	0	0	0	**27,837**

MACAULAY/MCLOUGHLIN WWTF ASSUMPTIONS (Liquid-Stream)

Electricity:

"base" unit power requirement =	0.575	kW-hr/d per m3/d of ADWF treated wastewater	**Ref:** Based on Jan 15/09 TM from T. Dokken.
wastewater strength adjustment =	0.250	x "base" unit power requirement	**Note:** To account for external WWTF sludge impact on liquid-stream system.
influent pumping power adjustment =	0.075	x "base" unit power requirement	**Ref:** Based on Table 1.4. WEF .
recycled centrate aeration power adjustment =	0	x "base" unit power requirement	**Note:** Side-stream SHARON-ANAMMOX system used.
Hartland landfill leachate aeration power adjustment =	0.300	x "base" unit power requirement	**Note:** To account for leachate impact on liquid-stream system.
UV disinfection power adjustment =	0	x "base" unit power requirement	**Note:** Not required - effluent to marine environment.
effluent pumping power adjustment =	0	x "base" unit power requirement	**Note:** See MM OUT sheets for outfall pumping. See MM Heat for pumping to/from Victoria.
raw sludge thickening adjustment =	0	x "base" unit power requirement	**Note:** Accounted for in solids-stream calculations.
total unit power requirement =	0.934	kW-hr/d per m3/d of ADWF treated wastewater	

Raw Sludge Thickening and Truck Transport:

thickening required (1 = yes, 0 = no)?	0		**Note:** Yes, but not from a trucking perspective.
chemical-P removal chemical sludge production allowance =	0%	of combined PS + WBS	
round-trip transport distance to solids processing facility =	0	km	

Saleable Reclaimed Water:

mean fraction of annual ADWF volume sold for landscape irrigation =	0.85%	/yr	**Note:** See dnt_eff_irr_ds.xls for assumptions and details. Reclaimed water used for toilet flushing handled separately in analysis. See Flush Rev LCA worksheet.

Notes:
1. Data from M. Homenuke in Feb 4/09 e-mail, DES_SaleableHeatEnergy.xls, Saleable.
2. Set to zero since heat would not be sold - see LCA sheet.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 17, 2009
Last Revision By: D. Shiskowski

Subject: Macaulay/McLoughlin WWTF
(Liquid-Stream)
Option 2
Life Cycle Analysis

Yellow-shaded cell denotes assumed/input values

Year	Capital Costs[1]		Operation & Maintenance Costs												GHG CO2e		Heat Revenues		Reclaimed Water Revenues (irrigation only)		Total	
			Labour		Electricity		Diesel Fuel		Chemicals		Maintenance		Administration									
	Total Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Rev	Net Present Value	Total Annual Rev	Net Present Value	Total Annual Cost	Net Present Value
2008																						
2009																						
2010																						
2011																						
2012																						
2013																						
2014	$214,688,040	$169,671,077																			$214,688,040	$169,671,077
2015		$0	$600,000	$455,951	$517,453	$393,222	$0	$0	$85,353	$64,861	$2,146,880	$1,631,453	$100,000	$75,992	$7,984	$6,067	$0	$0	-$48,418	-$36,793	$3,409,253	$2,590,752
2016		$0	$600,000	$438,414	$517,691	$378,271	$0	$0	$85,392	$62,395	$2,146,880	$1,568,704	$100,000	$73,069	$7,987	$5,836	$0	$0	-$48,440	-$35,394	$3,409,510	$2,491,296
2017		$0	$600,000	$421,552	$517,928	$363,889	$0	$0	$85,431	$60,023	$2,146,880	$1,508,370	$100,000	$70,259	$7,991	$5,614	$0	$0	-$48,462	-$34,049	$3,409,768	$2,395,658
2018		$0	$600,000	$405,339	$518,165	$350,054	$0	$0	$85,470	$57,741	$2,146,880	$1,450,355	$100,000	$67,556	$7,995	$5,401	$0	$0	-$48,484	-$32,754	$3,410,026	$2,303,691
2019		$0	$600,000	$389,749	$518,402	$336,744	$0	$0	$85,509	$55,545	$2,146,880	$1,394,573	$100,000	$64,958	$7,998	$5,195	$0	$0	-$48,506	-$31,509	$3,410,283	$2,215,255
2020		$0	$600,000	$374,758	$518,639	$323,940	$0	$0	$85,548	$53,433	$2,146,880	$1,340,935	$100,000	$62,460	$8,002	$4,998	$0	$0	-$48,529	-$30,311	$3,410,541	$2,130,214
2021		$0	$600,000	$360,344	$518,876	$311,624	$0	$0	$85,588	$51,402	$2,146,880	$1,289,361	$100,000	$60,057	$8,006	$4,808	$0	$0	-$48,551	-$29,158	$3,410,799	$2,048,437
2022		$0	$600,000	$346,485	$519,113	$299,775	$0	$0	$85,627	$49,447	$2,146,880	$1,239,770	$100,000	$57,748	$8,009	$4,625	$0	$0	-$48,573	-$28,050	$3,411,057	$1,969,800
2023		$0	$600,000	$333,159	$519,351	$288,377	$0	$0	$85,666	$47,567	$2,146,880	$1,192,086	$100,000	$55,526	$8,013	$4,449	$0	$0	-$48,595	-$26,983	$3,411,314	$1,894,182
2024		$0	$600,000	$320,345	$519,588	$277,412	$0	$0	$85,705	$45,759	$2,146,880	$1,146,237	$100,000	$53,391	$8,016	$4,280	$0	$0	-$48,617	-$25,957	$3,411,572	$1,821,466
2025		$0	$600,000	$308,024	$519,825	$266,864	$0	$0	$85,744	$44,019	$2,146,880	$1,102,151	$100,000	$51,337	$8,020	$4,117	$0	$0	-$48,640	-$24,970	$3,411,830	$1,751,542
2026		$0	$600,000	$296,177	$520,062	$256,717	$0	$0	$85,783	$42,345	$2,146,880	$1,059,761	$100,000	$49,363	$8,024	$3,961	$0	$0	-$48,662	-$24,021	$3,412,088	$1,684,302
2027		$0	$600,000	$284,785	$520,299	$246,956	$0	$0	$85,822	$40,735	$2,146,880	$1,019,001	$100,000	$47,464	$8,027	$3,810	$0	$0	-$48,684	-$23,107	$3,412,345	$1,619,644
2028		$0	$600,000	$273,832	$520,536	$237,566	$0	$0	$85,861	$39,186	$2,146,880	$979,808	$100,000	$45,639	$8,031	$3,665	$0	$0	-$48,706	-$22,229	$3,412,603	$1,557,467
2029		$0	$600,000	$263,300	$520,773	$228,533	$0	$0	$85,900	$37,696	$2,146,880	$942,123	$100,000	$43,883	$8,035	$3,526	$0	$0	-$48,728	-$21,384	$3,412,861	$1,497,678
2030		$0	$600,000	$253,173	$521,010	$219,843	$0	$0	$85,940	$36,263	$2,146,880	$905,888	$100,000	$42,196	$8,038	$3,392	$0	$0	-$48,750	-$20,571	$3,413,118	$1,440,184
2031		$0	$600,000	$243,436	$521,730	$211,680	$0	$0	$86,058	$34,916	$2,146,880	$871,046	$100,000	$40,573	$8,050	$3,266	$0	$0	-$48,818	-$19,807	$3,413,900	$1,385,109
2032		$0	$600,000	$234,073	$522,449	$203,819	$0	$0	$86,177	$33,619	$2,146,880	$837,544	$100,000	$39,012	$8,061	$3,145	$0	$0	-$48,885	-$19,071	$3,414,682	$1,332,141
2033		$0	$600,000	$225,070	$523,169	$196,249	$0	$0	$86,296	$32,371	$2,146,880	$805,331	$100,000	$37,512	$8,072	$3,028	$0	$0	-$48,952	-$18,363	$3,415,464	$1,281,198
2034		$0	$600,000	$216,414	$523,888	$188,961	$0	$0	$86,414	$31,169	$2,146,880	$774,357	$100,000	$36,069	$8,083	$2,915	$0	$0	-$49,020	-$17,681	$3,416,246	$1,232,203
2035		$0	$600,000	$208,090	$524,607	$181,943	$0	$0	$86,533	$30,011	$2,146,880	$744,574	$100,000	$34,682	$8,094	$2,807	$0	$0	-$49,087	-$17,024	$3,417,028	$1,185,082
2036		$0	$600,000	$200,086	$525,327	$175,185	$0	$0	$86,652	$28,896	$2,146,880	$715,936	$100,000	$33,348	$8,105	$2,703	$0	$0	-$49,154	-$16,392	$3,417,809	$1,139,762
2037		$0	$600,000	$192,391	$526,046	$168,677	$0	$0	$86,770	$27,823	$2,146,880	$688,400	$100,000	$32,065	$8,116	$2,602	$0	$0	-$49,222	-$15,783	$3,418,591	$1,096,176
2038		$0	$600,000	$184,991	$526,766	$162,412	$0	$0	$86,889	$26,789	$2,146,880	$661,923	$100,000	$30,832	$8,127	$2,506	$0	$0	-$49,289	-$15,197	$3,419,373	$1,054,257
2039		$0	$600,000	$177,876	$527,485	$156,378	$0	$0	$87,008	$25,794	$2,146,880	$636,465	$100,000	$29,646	$8,138	$2,413	$0	$0	-$49,356	-$14,632	$3,420,155	$1,013,940
2040		$0	$600,000	$171,035	$528,204	$150,569	$0	$0	$87,126	$24,836	$2,146,880	$611,985	$100,000	$28,506	$8,149	$2,323	$0	$0	-$49,424	-$14,089	$3,420,937	$975,165
2041		$0	$600,000	$164,457	$528,924	$144,975	$0	$0	$87,245	$23,913	$2,146,880	$588,447	$100,000	$27,409	$8,161	$2,237	$0	$0	-$49,491	-$13,565	$3,421,719	$937,873
2042		$0	$600,000	$158,131	$529,643	$139,589	$0	$0	$87,363	$23,025	$2,146,880	$565,815	$100,000	$26,355	$8,172	$2,154	$0	$0	-$49,558	-$13,061	$3,422,500	$902,007
2043		$0	$600,000	$152,049	$530,362	$134,402	$0	$0	$87,482	$22,169	$2,146,880	$544,053	$100,000	$25,342	$8,183	$2,074	$0	$0	-$49,626	-$12,576	$3,423,282	$867,513
2044		$0	$600,000	$146,201	$531,082	$129,408	$0	$0	$87,601	$21,346	$2,146,880	$523,128	$100,000	$24,367	$8,194	$1,997	$0	$0	-$49,693	-$12,109	$3,424,064	$834,337
2045		$0	$600,000	$140,578	$531,801	$124,599	$0	$0	$87,719	$20,552	$2,146,880	$503,007	$100,000	$23,430	$8,205	$1,922	$0	$0	-$49,760	-$11,659	$3,424,846	$802,431
2046		$0	$600,000	$135,171	$532,843	$120,042	$0	$0	$87,891	$19,801	$2,146,880	$483,661	$100,000	$22,529	$8,221	$1,852	$0	$0	-$49,858	-$11,232	$3,425,978	$771,823
2047		$0	$600,000	$129,972	$533,885	$115,651	$0	$0	$88,063	$19,076	$2,146,880	$465,059	$100,000	$21,662	$8,237	$1,784	$0	$0	-$49,955	-$10,821	$3,427,111	$742,383
2048		$0	$600,000	$124,973	$534,927	$111,420	$0	$0	$88,235	$18,378	$2,146,880	$447,172	$100,000	$20,829	$8,253	$1,719	$0	$0	-$50,053	-$10,425	$3,428,243	$714,066
2049		$0	$600,000	$120,167	$535,969	$107,343	$0	$0	$88,407	$17,706	$2,146,880	$429,973	$100,000	$20,028	$8,269	$1,656	$0	$0	-$50,150	-$10,044	$3,429,376	$686,828
2050		$0	$600,000	$115,545	$537,012	$103,415	$0	$0	$88,579	$17,058	$2,146,880	$413,435	$100,000	$19,257	$8,285	$1,596	$0	$0	-$50,248	-$9,676	$3,430,509	$660,630
2051		$0	$600,000	$111,101	$538,054	$99,630	$0	$0	$88,751	$16,434	$2,146,880	$397,534	$100,000	$18,517	$8,301	$1,537	$0	$0	-$50,345	-$9,322	$3,431,641	$635,431
2052		$0	$600,000	$106,828	$539,096	$95,984	$0	$0	$88,923	$15,832	$2,146,880	$382,244	$100,000	$17,805	$8,317	$1,481	$0	$0	-$50,443	-$8,981	$3,432,774	$611,193
2053		$0	$600,000	$102,719	$540,138	$92,471	$0	$0	$89,095	$15,253	$2,146,880	$367,543	$100,000	$17,120	$8,334	$1,427	$0	$0	-$50,540	-$8,652	$3,433,906	$587,879
2054		$0	$600,000	$98,768	$541,180	$89,086	$0	$0	$89,266	$14,694	$2,146,880	$353,406	$100,000	$16,461	$8,350	$1,374	$0	$0	-$50,638	-$8,336	$3,435,039	$565,455
2055		$0	$600,000	$94,970	$542,222	$85,824	$0	$0	$89,438	$14,157	$2,146,880	$339,814	$100,000	$15,828	$8,366	$1,324	$0	$0	-$50,735	-$8,030	$3,436,171	$543,886
2056		$0	$600,000	$91,317	$543,264	$82,682	$0	$0	$89,610	$13,638	$2,146,880	$326,744	$100,000	$15,219	$8,382	$1,276	$0	$0	-$50,833	-$7,736	$3,437,304	$523,140
2057		$0	$600,000	$87,805	$544,306	$79,654	$0	$0	$89,782	$13,139	$2,146,880	$314,177	$100,000	$14,634	$8,398	$1,229	$0	$0	-$50,930	-$7,453	$3,438,436	$503,185
2058		$0	$600,000	$84,428	$545,348	$76,737	$0	$0	$89,954	$12,658	$2,146,880	$302,093	$100,000	$14,071	$8,414	$1,184	$0	$0	-$51,028	-$7,180	$3,439,569	$483,991
2059		$0	$600,000	$81,180	$546,390	$73,927	$0	$0	$90,126	$12,194	$2,146,880	$290,474	$100,000	$13,530	$8,430	$1,141	$0	$0	-$51,125	-$6,917	$3,440,701	$465,529
2060		$0	$600,000	$78,058	$547,432	$71,219	$0	$0	$90,298	$11,747	$2,146,880	$279,302	$100,000	$13,010	$8,446	$1,099	$0	$0	-$51,223	-$6,664	$3,441,834	$447,771
2061		$0	$600,000	$75,056	$548,474	$68,610	$0	$0	$90,470	$11,317	$2,146,880	$268,560	$100,000	$12,509	$8,462	$1,059	$0	$0	-$51,320	-$6,420	$3,442,966	$430,691
2062		$0	$600,000	$72,169	$549,516	$66,097	$0	$0	$90,642	$10,903	$2,146,880	$258,230	$100,000	$12,028	$8,478	$1,020	$0	$0	-$51,418	-$6,185	$3,444,099	$414,262
2063		$0	$600,000	$69,393	$550,558	$63,675	$0	$0	$90,813	$10,503	$2,146,880	$248,299	$100,000	$11,566	$8,494	$982	$0	$0	-$51,515	-$5,958	$3,445,231	$398,460
2064		$0	$600,000	$66,724	$551,601	$61,342	$0	$0	$90,985	$10,118	$2,146,880	$238,749	$100,000	$11,121	$8,510	$946	$0	$0	-$51,613	-$5,740	$3,446,364	$383,261
2065		$0	$600,000	$64,158	$552,643	$59,094	$0	$0	$91,157	$9,747	$2,146,880	$229,566	$100,000	$10,693	$8,526	$912	$0	$0	-$51,710	-$5,529	$3,447,496	$368,641
Total Capital =	$214,688,040																					
Total Net Present Value =		$169,671,077		$10,250,768		$8,972,535		$0		$1,480,000		$36,678,620		$1,708,461		$138,433		$0		-$839,551		**$228,060,342**

MACAULAY/MCLOUGHLIN WWTF ASSUMPTIONS (Liquid-Stream)

Labour:
number of facility manager(s) = 1
number of operations staff = 4
number of maintenance staff = 2
number of administration staff = 1
total staff = 8 persons

Ref: Based on Jan 15/09 TM from T. Dokken.

Chemical Phosphorus Removal Chemicals:
chemical-P removal required (1 = yes, 0 = no)? 0

Wet-Weather CEPT Chemicals:
fraction of total annual ADWF treated = 5.0%

Ref: Allowance to account for potential costs.

Reclaimed Water Disinfection:
allowance = 10.0% of other chemical costs

Ref: Allowance to account for potential costs.

Saleable Heat Energy:
unit energy cost to third-party "heat recovery" utility = $ 14.34 /GJ
unit CRD saleable energy price to third-party utility = $ - /GJ

Ref: This is the cost that a third-party heat recovery utility would incur to make the heat available to customers. Value is from Table 6 of Feb 10/09 memo from M. Homenuke, reduced by 3% to remove CRD share of capital cost.

Note: This value is the difference between the general energy market unit price (from Generic Assumptions sheet) and the above value, which reflects the maximum amount the utility would be willing to pay the CRD for the heat. Set to zero in this case since the unit selling price would be a negative value, indicating the CRD would need to subsidize the scheme.

Notes:
1. Excludes solids processing capital costs. Included in Biosolids LCA.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 17, 2009
Last Revision By: D. Shiskowski

Subject: Juan de Fuca WWTF
Option 2

Material Flows
and Carbon Footprint Analysis

Yellow-shaded cell denotes assumed/input values

Year	Equivalent Population	Wastewater ADWF	Sludge Production and Truck Transport		Saleable Effluent Heat[1]	Saleable Reclaimed Water (irrigation only)	Materials			GHG Sources			GHG Offsets Done	Total GHG Emissions
			Mass	Thickened Volume			Electricity	Diesel Fuel	Sludge Thickening Polymer	Electricity Purchased	Diesel Fuel Combusted	Sludge Thickening Polymer Used	Avoided Natural Gas/Elect Use via Effluent Heat	
	(pe)	(m3/d)	(dry t/yr)	(m3/yr)	(GJ/yr)	(m3/yr)	(kWh/yr)	(L/yr)	(kg/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)
2008														
2009														
2010														
2011														
2012														
2013														
2014														
2015	130,611	33,259	2,837	0	86,833	24,279	7,063,692	-	0	509	0.0	0.0	-3,297	-2,788
2016	134,204	33,915	2,915	0	107,976	24,758	7,203,030	-	0	519	0.0	0.0	-4,100	-3,581
2017	137,798	34,571	2,993	0	129,119	25,237	7,342,369	-	0	529	0.0	0.0	-4,902	-4,374
2018	141,391	35,227	3,071	0	150,262	25,716	7,481,707	-	0	539	0.0	0.0	-5,705	-5,166
2019	144,984	35,883	3,149	0	171,405	26,195	7,621,045	-	0	549	0.0	0.0	-6,508	-5,959
2020	148,578	36,539	3,227	0	192,548	26,674	7,760,383	-	0	559	0.0	0.0	-7,310	-6,752
2021	152,171	37,195	3,305	0	213,691	27,153	7,899,722	-	0	569	0.0	0.0	-8,113	-7,544
2022	155,764	37,851	3,383	0	234,834	27,632	8,039,060	-	0	579	0.0	0.0	-8,916	-8,337
2023	159,358	38,508	3,461	0	255,977	28,110	8,178,398	-	0	589	0.0	0.0	-9,719	-9,130
2024	162,951	39,164	3,539	0	277,120	28,589	8,317,737	-	0	599	0.0	0.0	-10,521	-9,922
2025	166,544	39,820	3,617	0	298,263	29,068	8,457,075	-	0	609	0.0	0.0	-11,324	-10,715
2026	170,138	40,476	3,695	0	319,405	29,547	8,596,413	-	0	619	0.0	0.0	-12,127	-11,508
2027	173,731	41,132	3,773	0	340,548	30,026	8,735,752	-	0	629	0.0	0.0	-12,930	-12,301
2028	177,324	41,788	3,851	0	361,691	30,505	8,875,090	-	0	639	0.0	0.0	-13,732	-13,093
2029	180,918	42,444	3,929	0	382,834	30,984	9,014,428	-	0	649	0.0	0.0	-14,535	-13,886
2030	184,511	43,100	4,007	0	403,977	31,463	9,153,767	-	0	659	0.0	0.0	-15,338	-14,679
2031	186,978	43,474	4,061	0	406,278	31,736	9,233,297	-	0	665	0.0	0.0	-15,425	-14,760
2032	189,446	43,849	4,114	0	408,579	32,010	9,312,828	-	0	671	0.0	0.0	-15,512	-14,842
2033	191,913	44,223	4,168	0	410,879	32,283	9,392,359	-	0	676	0.0	0.0	-15,600	-14,924
2034	194,381	44,598	4,221	0	413,180	32,556	9,471,890	-	0	682	0.0	0.0	-15,687	-15,005
2035	196,848	44,972	4,275	0	415,481	32,830	9,551,421	-	0	688	0.0	0.0	-15,774	-15,087
2036	199,315	45,347	4,329	0	417,781	33,103	9,630,952	-	0	693	0.0	0.0	-15,862	-15,168
2037	201,783	45,721	4,382	0	420,082	33,377	9,710,483	-	0	699	0.0	0.0	-15,949	-15,250
2038	204,250	46,096	4,436	0	422,383	33,650	9,790,014	-	0	705	0.0	0.0	-16,037	-15,332
2039	206,718	46,470	4,489	0	424,683	33,923	9,869,544	-	0	711	0.0	0.0	-16,124	-15,413
2040	209,185	46,845	4,543	0	426,984	34,197	9,949,075	-	0	716	0.0	0.0	-16,211	-15,495
2041	211,652	47,219	4,597	0	429,285	34,470	10,028,606	-	0	722	0.0	0.0	-16,299	-15,577
2042	214,120	47,594	4,650	0	431,586	34,743	10,108,137	-	0	728	0.0	0.0	-16,386	-15,658
2043	216,587	47,968	4,704	0	433,886	35,017	10,187,668	-	0	734	0.0	0.0	-16,473	-15,740
2044	219,055	48,343	4,757	0	436,187	35,290	10,267,199	-	0	739	0.0	0.0	-16,561	-15,821
2045	221,522	48,717	4,811	0	438,488	35,563	10,346,730	-	0	745	0.0	0.0	-16,648	-15,903
2046	223,950	49,070	4,864	0	448,841	35,821	10,421,733	-	0	750	0.0	0.0	-17,041	-16,291
2047	226,377	49,423	4,916	0	459,194	36,079	10,496,737	-	0	756	0.0	0.0	-17,434	-16,678
2048	228,805	49,776	4,969	0	469,547	36,337	10,571,740	-	0	761	0.0	0.0	-17,827	-17,066
2049	231,232	50,130	5,022	0	479,900	36,595	10,646,744	-	0	767	0.0	0.0	-18,220	-17,454
2050	233,660	50,483	5,075	0	490,254	36,852	10,721,747	-	0	772	0.0	0.0	-18,613	-17,841
2051	236,087	50,836	5,127	0	500,607	37,110	10,796,751	-	0	777	0.0	0.0	-19,006	-18,229
2052	238,515	51,189	5,180	0	510,960	37,368	10,871,754	-	0	783	0.0	0.0	-19,400	-18,617
2053	240,942	51,542	5,233	0	521,313	37,626	10,946,758	-	0	788	0.0	0.0	-19,793	-19,004
2054	243,370	51,895	5,285	0	531,666	37,884	11,021,761	-	0	794	0.0	0.0	-20,186	-19,392
2055	245,797	52,249	5,338	0	542,019	38,141	11,096,765	-	0	799	0.0	0.0	-20,579	-19,780
2056	248,225	52,602	5,391	0	552,373	38,399	11,171,769	-	0	804	0.0	0.0	-20,972	-20,167
2057	250,652	52,955	5,444	0	562,726	38,657	11,246,772	-	0	810	0.0	0.0	-21,365	-20,555
2058	253,080	53,308	5,496	0	573,079	38,915	11,321,776	-	0	815	0.0	0.0	-21,758	-20,943
2059	255,507	53,661	5,549	0	583,432	39,173	11,396,779	-	0	821	0.0	0.0	-22,151	-21,330
2060	257,935	54,014	5,602	0	593,785	39,430	11,471,783	-	0	826	0.0	0.0	-22,544	-21,718
2061	260,362	54,367	5,654	0	604,138	39,688	11,546,786	-	0	831	0.0	0.0	-22,937	-22,106
2062	262,790	54,721	5,707	0	614,491	39,946	11,621,790	-	0	837	0.0	0.0	-23,330	-22,494
2063	265,217	55,074	5,760	0	624,845	40,204	11,696,793	-	0	842	0.0	0.0	-23,723	-22,881
2064	267,645	55,427	5,813	0	635,198	40,462	11,771,797	-	0	848	0.0	0.0	-24,116	-23,269
2065	270,072	55,780	5,865	0	645,551	40,719	11,846,800	-	0	853	0.0	0.0	-24,510	-23,657
Totals =					21,206,144		1,716,091	499,275,206	0	35,948	0	0	-805,130	**-769,182**

JUAN DE FUCA WWTF ASSUMPTIONS

Electricity:

"base" unit power requirement =	0.475	kW-hr/d per m3/d of ADWF treated wastewater	**Ref:** Based on Jan 15/09 TM from T. Dokken.
wastewater strength adjustment =	0	x "base" unit power requirement	**Note:** Not required as WW BOD = 260 mg/L (i.e. typical)
influent pumping power adjustment =	0.075	x "base" unit power requirement	**Ref:** Based on Table 1.4, WEF ___.
UV disinfection power adjustment =	0.100	x "base" unit power requirement	**Note:** Required - effluent to sensitive marine environment.
effluent pumping power adjustment =	0.05	x "base" unit power requirement	**Note:** See JF OUT sheets for outfall pumping. Allowance is for heat recovery pumping; i.e. pumping effluent to a nearby District Energy System for use by others.
raw sludge thickening adjustment =	0	x "base" unit power requirement	**Note:** Not required - sludge to sewer.
total unit power requirement =	0.582	kW-hr/d per m3/d of ADWF treated wastewater	

Raw Sludge Thickening and Truck Transport:

thickening required (1 = yes, 0 = no)?	0	
chemical-P removal chemical sludge production allowance =	0%	of combined PS + WBS
round-trip transport distance to solids processing facility =	0	km

Saleable Reclaimed Water:

mean fraction of annual ADWF volume sold for landscape irrigation =	0.20%	/yr	**Note:** See dnt_eff_irr_ds.xls for assumptions and details. Reclaimed water used for toilet flushing handled separately in analysis. See Flush Rev LCA worksheet.

Notes:
1. Data from M. Homenuke in Feb 4/09 e-mail, DES_SaleableHeatEnergy.xls, Saleable.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 18, 2009
Last Revision By: D. Shiskowski

Subject: Juan de Fuca WWTF
Option 2

Life Cycle Analysis

Yellow-shaded cell denotes assumed/input values

Year	Capital Costs		Operation & Maintenance Costs												GHG CO2e		Heat Revenues		Reclaimed Water Revenues (irrigation only)		Total	
			Labour		Electricity		Diesel Fuel		Chemicals		Maintenance		Administration									
	Total Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Rev	Net Present Value	Total Annual Rev	Net Present Value	Total Annual Cost	Net Present Value
2008																						
2009																						
2010																						
2011																						
2012																						
2013																						
2014	$158,620,560	$125,360,133																			$158,620,560	$125,360,133
2015	$0		$1,125,000	$854,908	$494,458	$375,748	$0	$0	$88,619	$67,343	$1,586,206	$1,205,386	$100,000	$75,992	-$41,823	-$31,782	-$208,183	-$158,202	-$17,481	-$13,284	$3,126,796	$2,376,108
2016	$0		$1,125,000	$822,026	$504,212	$368,423	$0	$0	$90,367	$66,030	$1,586,206	$1,159,025	$100,000	$73,069	-$53,713	-$39,248	-$258,873	-$189,156	-$17,826	-$13,025	$3,075,372	$2,247,144
2017	$0		$1,125,000	$790,410	$513,966	$361,106	$0	$0	$92,115	$64,719	$1,586,206	$1,114,447	$100,000	$70,259	-$65,604	-$46,092	-$309,563	-$217,495	-$18,171	-$12,766	$3,023,948	$2,124,586
2018	$0		$1,125,000	$760,010	$523,719	$353,806	$0	$0	$93,863	$63,410	$1,586,206	$1,071,584	$100,000	$67,556	-$77,494	-$52,352	-$360,253	-$243,374	-$18,515	-$12,508	$2,972,525	$2,008,131
2019	$0		$1,125,000	$730,779	$533,473	$346,534	$0	$0	$95,611	$62,107	$1,586,206	$1,030,369	$100,000	$64,958	-$89,385	-$58,063	-$410,944	-$266,941	-$18,860	-$12,251	$2,921,101	$1,897,492
2020	$0		$1,125,000	$702,672	$543,227	$339,298	$0	$0	$97,359	$60,810	$1,586,206	$990,739	$100,000	$62,460	-$101,275	-$63,256	-$461,634	-$288,335	-$19,205	-$11,995	$2,869,677	$1,792,392
2021	$0		$1,125,000	$675,646	$552,981	$332,106	$0	$0	$99,107	$59,521	$1,586,206	$952,634	$100,000	$60,057	-$113,166	-$67,964	-$512,324	-$307,688	-$19,550	-$11,741	$2,818,254	$1,692,570
2022	$0		$1,125,000	$649,659	$562,734	$324,965	$0	$0	$100,855	$58,241	$1,586,206	$915,994	$100,000	$57,748	-$125,056	-$72,217	-$563,014	-$325,127	-$19,895	-$11,489	$2,766,830	$1,597,775
2023	$0		$1,125,000	$624,673	$572,488	$317,882	$0	$0	$102,603	$56,972	$1,586,206	$880,764	$100,000	$55,526	-$136,947	-$76,042	-$613,704	-$340,768	-$20,240	-$11,238	$2,715,406	$1,507,769
2024	$0		$1,125,000	$600,647	$582,242	$310,864	$0	$0	$104,351	$55,714	$1,586,206	$846,888	$100,000	$53,391	-$148,837	-$79,465	-$664,394	-$354,726	-$20,584	-$10,990	$2,663,983	$1,422,322
2025	$0		$1,125,000	$577,545	$591,995	$303,915	$0	$0	$106,100	$54,469	$1,586,206	$814,316	$100,000	$51,337	-$160,728	-$82,513	-$715,084	-$367,105	-$20,929	-$10,744	$2,612,559	$1,341,218
2026	$0		$1,125,000	$555,332	$601,749	$297,040	$0	$0	$107,848	$53,237	$1,586,206	$782,996	$100,000	$49,363	-$172,618	-$85,209	-$765,775	-$378,008	-$21,274	-$10,501	$2,561,136	$1,264,249
2027	$0		$1,125,000	$533,973	$611,503	$290,245	$0	$0	$109,596	$52,019	$1,586,206	$752,880	$100,000	$47,464	-$184,508	-$87,576	-$816,465	-$387,529	-$21,619	-$10,261	$2,509,712	$1,191,216
2028	$0		$1,125,000	$513,435	$621,256	$283,533	$0	$0	$111,344	$50,816	$1,586,206	$723,924	$100,000	$45,639	-$196,399	-$89,634	-$867,155	-$395,758	-$21,964	-$10,024	$2,458,288	$1,121,931
2029	$0		$1,125,000	$493,688	$631,010	$276,908	$0	$0	$113,092	$49,629	$1,586,206	$696,080	$100,000	$43,883	-$208,289	-$91,404	-$917,845	-$402,781	-$22,309	-$9,790	$2,406,865	$1,056,213
2030	$51,012,000	$21,524,788	$1,125,000	$474,700	$640,764	$270,374	$0	$0	$114,840	$48,457	$2,096,326	$884,556	$100,000	$42,196	-$220,180	-$92,906	-$968,535	-$408,679	-$22,653	-$9,559	$53,877,561	$22,733,927
2031	$0		$1,125,000	$456,442	$646,331	$262,233	$0	$0	$115,838	$46,998	$2,096,326	$850,534	$100,000	$40,573	-$221,404	-$89,829	-$974,051	-$395,198	-$22,850	-$9,271	$2,865,189	$1,162,483
2032	$0		$1,125,000	$438,887	$651,898	$254,319	$0	$0	$116,835	$45,580	$2,096,326	$817,822	$100,000	$39,012	-$222,628	-$86,852	-$979,567	-$382,150	-$23,047	-$8,991	$2,864,817	$1,117,626
2033	$0		$1,125,000	$422,006	$657,465	$246,626	$0	$0	$117,833	$44,201	$2,096,326	$786,367	$100,000	$37,512	-$223,853	-$83,971	-$985,083	-$369,521	-$23,244	-$8,719	$2,864,444	$1,074,501
2034	$0		$1,125,000	$405,775	$663,032	$239,149	$0	$0	$118,831	$42,861	$2,096,326	$756,122	$100,000	$36,069	-$225,077	-$81,183	-$990,599	-$357,298	-$23,441	-$8,455	$2,864,072	$1,033,040
2035	$0		$1,125,000	$390,169	$668,599	$231,881	$0	$0	$119,829	$41,559	$2,096,326	$727,040	$100,000	$34,682	-$226,302	-$78,485	-$996,115	-$345,469	-$23,637	-$8,198	$2,863,700	$993,179
2036	$0		$1,125,000	$375,162	$674,167	$224,819	$0	$0	$120,827	$40,293	$2,096,326	$699,077	$100,000	$33,348	-$227,526	-$75,875	-$1,001,631	-$334,021	-$23,834	-$7,948	$2,863,328	$954,855
2037	$0		$1,125,000	$360,733	$679,734	$217,958	$0	$0	$121,824	$39,063	$2,096,326	$672,190	$100,000	$32,065	-$228,750	-$73,349	-$1,007,147	-$322,943	-$24,031	-$7,706	$2,862,956	$918,011
2038	$0		$1,125,000	$346,859	$685,301	$211,291	$0	$0	$122,822	$37,868	$2,096,326	$646,336	$100,000	$30,832	-$229,975	-$70,905	-$1,012,663	-$312,223	-$24,228	-$7,470	$2,862,583	$882,588
2039	$0		$1,125,000	$333,518	$690,868	$204,815	$0	$0	$123,820	$36,708	$2,096,326	$621,477	$100,000	$29,646	-$231,199	-$68,541	-$1,018,179	-$301,849	-$24,425	-$7,241	$2,862,211	$848,532
2040	$0		$1,125,000	$320,690	$696,435	$198,524	$0	$0	$124,818	$35,580	$2,096,326	$597,574	$100,000	$28,506	-$232,423	-$66,254	-$1,023,695	-$291,812	-$24,622	-$7,019	$2,861,839	$815,790
2041	$0		$1,125,000	$308,356	$702,002	$192,415	$0	$0	$125,815	$34,485	$2,096,326	$574,591	$100,000	$27,409	-$233,648	-$64,041	-$1,029,210	-$282,101	-$24,818	-$6,803	$2,861,467	$784,311
2042	$0		$1,125,000	$296,496	$707,570	$186,481	$0	$0	$126,813	$33,422	$2,096,326	$552,491	$100,000	$26,355	-$234,872	-$61,901	-$1,034,726	-$272,704	-$25,015	-$6,593	$2,861,095	$754,047
2043	$0		$1,125,000	$285,092	$713,137	$180,720	$0	$0	$127,811	$32,389	$2,096,326	$531,241	$100,000	$25,342	-$236,096	-$59,830	-$1,040,242	-$263,614	-$25,212	-$6,389	$2,860,722	$724,951
2044	$0		$1,125,000	$274,127	$718,704	$175,126	$0	$0	$128,809	$31,387	$2,096,326	$510,809	$100,000	$24,367	-$237,321	-$57,828	-$1,045,758	-$254,819	-$25,409	-$6,191	$2,860,350	$696,978
2045	$0		$1,125,000	$263,584	$724,271	$169,694	$0	$0	$129,806	$30,413	$2,096,326	$491,162	$100,000	$23,430	-$238,545	-$55,890	-$1,051,274	-$246,310	-$25,606	-$5,999	$2,859,978	$670,084
2046	$0		$1,125,000	$253,446	$729,521	$164,351	$0	$0	$130,747	$29,455	$2,096,326	$472,272	$100,000	$22,529	-$244,360	-$55,051	-$1,076,096	-$242,429	-$25,791	-$5,810	$2,835,347	$638,762
2047	$0		$1,125,000	$243,698	$734,772	$159,167	$0	$0	$131,688	$28,526	$2,096,326	$454,107	$100,000	$21,662	-$250,175	-$54,193	-$1,100,918	-$238,481	-$25,977	-$5,627	$2,810,716	$608,859
2048	$0		$1,125,000	$234,325	$740,022	$154,138	$0	$0	$132,629	$27,625	$2,096,326	$436,642	$100,000	$20,829	-$255,991	-$53,320	-$1,125,739	-$234,479	-$26,163	-$5,449	$2,786,084	$580,311
2049	$0		$1,125,000	$225,313	$745,272	$149,262	$0	$0	$133,570	$26,751	$2,096,326	$419,848	$100,000	$20,028	-$261,806	-$52,434	-$1,150,561	-$230,432	-$26,348	-$5,277	$2,761,453	$553,058
2050	$0		$1,125,000	$216,647	$750,522	$144,532	$0	$0	$134,511	$25,904	$2,096,326	$403,700	$100,000	$19,257	-$267,621	-$51,537	-$1,175,383	-$226,349	-$26,534	-$5,110	$2,736,822	$527,043
2051	$0		$1,125,000	$208,314	$755,773	$139,945	$0	$0	$135,452	$25,081	$2,096,326	$388,173	$100,000	$18,517	-$273,436	-$50,632	-$1,200,205	-$222,240	-$26,719	-$4,948	$2,712,191	$502,211
2052	$0		$1,125,000	$200,302	$761,023	$135,497	$0	$0	$136,393	$24,284	$2,096,326	$373,243	$100,000	$17,805	-$279,251	-$49,720	-$1,225,026	-$218,111	-$26,905	-$4,790	$2,687,559	$478,510
2053	$0		$1,125,000	$192,598	$766,273	$131,185	$0	$0	$137,334	$23,511	$2,096,326	$358,888	$100,000	$17,120	-$285,066	-$48,803	-$1,249,848	-$213,972	-$27,091	-$4,638	$2,662,928	$455,889
2054	$0		$1,125,000	$185,191	$771,523	$127,003	$0	$0	$138,275	$22,762	$2,096,326	$345,084	$100,000	$16,461	-$290,881	-$47,883	-$1,274,670	-$209,828	-$27,276	-$4,490	$2,638,297	$434,300
2055	$0		$1,125,000	$178,068	$776,774	$122,950	$0	$0	$139,216	$22,035	$2,096,326	$331,812	$100,000	$15,828	-$296,697	-$46,962	-$1,299,491	-$205,687	-$27,462	-$4,347	$2,613,665	$413,698
2056	$0		$1,125,000	$171,219	$782,024	$119,020	$0	$0	$140,157	$21,331	$2,096,326	$319,050	$100,000	$15,219	-$302,512	-$46,041	-$1,324,313	-$201,554	-$27,647	-$4,208	$2,589,034	$394,037
2057	$0		$1,125,000	$164,634	$787,274	$115,211	$0	$0	$141,098	$20,648	$2,096,326	$306,779	$100,000	$14,634	-$308,327	-$45,121	-$1,349,135	-$197,434	-$27,833	-$4,073	$2,564,403	$375,278
2058	$0		$1,125,000	$158,302	$792,524	$111,518	$0	$0	$142,039	$19,987	$2,096,326	$294,979	$100,000	$14,071	-$314,142	-$44,204	-$1,373,957	-$193,333	-$28,019	-$3,943	$2,539,772	$357,378
2059	$0		$1,125,000	$152,213	$797,775	$107,939	$0	$0	$142,980	$19,345	$2,096,326	$283,634	$100,000	$13,530	-$319,957	-$43,290	-$1,398,778	-$189,256	-$28,204	-$3,816	$2,515,140	$340,300
2060	$0		$1,125,000	$146,359	$803,025	$104,471	$0	$0	$143,921	$18,724	$2,096,326	$272,725	$100,000	$13,010	-$325,772	-$42,382	-$1,423,600	-$185,206	-$28,390	-$3,693	$2,490,509	$324,007
2061	$0		$1,125,000	$140,730	$808,275	$101,110	$0	$0	$144,862	$18,121	$2,096,326	$262,236	$100,000	$12,509	-$331,588	-$41,479	-$1,448,422	-$181,187	-$28,576	-$3,575	$2,465,878	$308,464
2062	$0		$1,125,000	$135,317	$813,525	$97,852	$0	$0	$145,803	$17,537	$2,096,326	$252,150	$100,000	$12,028	-$337,403	-$40,583	-$1,473,243	-$177,204	-$28,761	-$3,459	$2,441,247	$293,637
2063	$0		$1,125,000	$130,112	$818,776	$94,696	$0	$0	$146,744	$16,972	$2,096,326	$242,452	$100,000	$11,566	-$343,218	-$39,695	-$1,498,065	-$173,259	-$28,947	-$3,348	$2,416,615	$279,495
2064	$0		$1,125,000	$125,108	$824,026	$91,638	$0	$0	$147,685	$16,424	$2,096,326	$233,127	$100,000	$11,121	-$349,033	-$38,815	-$1,522,887	-$169,356	-$29,132	-$3,240	$2,391,984	$266,006
2065	$0		$1,125,000	$120,296	$829,276	$88,675	$0	$0	$148,626	$15,893	$2,096,326	$224,160	$100,000	$10,693	-$354,848	-$37,944	-$1,547,708	-$165,497	-$29,318	-$3,135	$2,367,353	$253,141
Total Capital =	$209,632,560																					
Total Net Present Value =		$146,884,921		$19,220,189		$10,808,956		$0		$1,937,220		$31,332,474		$1,708,461		-$3,120,549		-$13,839,000		-$382,136		**$194,550,537**

JUAN DE FUCA WWTF ASSUMPTIONS

Labour:
number of facility manager(s) = 1
number of operations staff = 8
number of maintenance staff = 5
number of administration staff = 1
total staff = 15 persons

Ref: Based on Jan 15/09 TM from T. Dokken.

Chemical Phosphorus Removal Chemicals:
chemical-P removal required (1 = yes, 0 = no)? 0

Wet-Weather CEPT Chemicals:
fraction of total annual ADWF treated = 0.0%

Note: No secondary treatment bypass.

Saleable Heat Energy:
unit energy cost to third-party "heat recovery" utility = $ 11.60 /GJ
unit CRD saleable energy price to third-party utility = $ 2.40 /GJ

Ref: This is the cost that a third-party heat recovery utility would incur to make the heat available to customers. Value is from Table 6 of Feb 10/09 memo from M. Homenuke, reduced by 2.5% to remove CRD share of capital cost.

Note: This value is the difference between the general energy market unit price (from Generic Assumptions sheet) and the above value, which reflects the maximum amount the utility would be willing to pay the CRD for the heat.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 18, 2009
Last Revision By: D. Shiskowski
Checked:

Subject: Odgen Point WWTF
Option 2

Material Flows
and Carbon Footprint Analysis

Yellow-shaded cell denotes assumed/input values

Year	Equivalent Population	Wastewater ADWF	Sludge Production and Truck Transport		Saleable Effluent Heat[1]	Saleable Reclaimed Water	Materials			GHG Sources			GHG Offsets Done	Total GHG Emissions
			Mass	Thickened Volume		(irrigation only)	Electricity	Diesel Fuel	Sludge Thickening Polymer	Electricity Purchased	Diesel Fuel Combusted	Sludge Thickening Polymer Used	Avoided Natural Gas/Elect Use via Effluent Heat	
	(pe)	(m3/d)	(dry t/yr)	(m3/yr)	(GJ/yr)	(m3/yr)	(kWh/yr)	(L/yr)	(kg/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)
2008														
2009														
2010														
2011														
2012														
2013														
2014														
2015	131,016	38,561	2,845	0	300,632	97,116	8,682,371	-	0	625	0.0	0.0	-11,414	-10,789
2016	131,488	38,510	2,856	0	318,694	96,987	8,670,827	-	0	624	0.0	0.0	-12,100	-11,475
2017	131,960	38,458	2,866	0	336,756	96,858	8,659,284	-	0	623	0.0	0.0	-12,786	-12,162
2018	132,431	38,407	2,876	0	354,818	96,729	8,647,741	-	0	623	0.0	0.0	-13,471	-12,849
2019	132,903	38,356	2,886	0	372,880	96,599	8,636,198	-	0	622	0.0	0.0	-14,157	-13,535
2020	133,375	38,305	2,897	0	390,942	96,470	8,624,655	-	0	621	0.0	0.0	-14,843	-14,222
2021	133,847	38,253	2,907	0	409,004	96,341	8,613,112	-	0	620	0.0	0.0	-15,529	-14,908
2022	134,319	38,202	2,917	0	427,066	96,212	8,601,568	-	0	619	0.0	0.0	-16,214	-15,595
2023	134,790	38,151	2,927	0	445,128	96,083	8,590,025	-	0	618	0.0	0.0	-16,900	-16,282
2024	135,262	38,100	2,938	0	463,190	95,954	8,578,482	-	0	618	0.0	0.0	-17,586	-16,968
2025	135,734	38,048	2,948	0	481,252	95,825	8,566,939	-	0	617	0.0	0.0	-18,272	-17,655
2026	136,206	37,997	2,958	0	499,314	95,696	8,555,396	-	0	616	0.0	0.0	-18,957	-18,341
2027	136,678	37,946	2,968	0	517,376	95,566	8,543,853	-	0	615	0.0	0.0	-19,643	-19,028
2028	137,149	37,895	2,979	0	535,438	95,437	8,532,309	-	0	614	0.0	0.0	-20,329	-19,715
2029	137,621	37,843	2,989	0	553,500	95,308	8,520,766	-	0	613	0.0	0.0	-21,015	-20,401
2030	138,093	37,792	2,999	0	564,176	95,179	8,509,223	-	0	613	0.0	0.0	-21,420	-20,807
2031	138,730	37,815	3,013	0	567,117	95,237	8,514,402	-	0	613	0.0	0.0	-21,532	-20,919
2032	139,367	37,838	3,027	0	570,059	95,295	8,519,580	-	0	613	0.0	0.0	-21,643	-21,030
2033	140,005	37,861	3,041	0	573,000	95,353	8,524,759	-	0	614	0.0	0.0	-21,755	-21,141
2034	140,642	37,884	3,054	0	575,942	95,411	8,529,938	-	0	614	0.0	0.0	-21,867	-21,253
2035	141,279	37,907	3,068	0	578,883	95,469	8,535,116	-	0	615	0.0	0.0	-21,978	-21,364
2036	141,916	37,930	3,082	0	581,824	95,527	8,540,295	-	0	615	0.0	0.0	-22,090	-21,475
2037	142,553	37,953	3,096	0	584,766	95,585	8,545,474	-	0	615	0.0	0.0	-22,202	-21,586
2038	143,191	37,976	3,110	0	587,707	95,643	8,550,652	-	0	616	0.0	0.0	-22,313	-21,698
2039	143,828	37,999	3,124	0	590,649	95,700	8,555,831	-	0	616	0.0	0.0	-22,425	-21,809
2040	144,465	38,022	3,137	0	593,590	95,758	8,561,010	-	0	616	0.0	0.0	-22,537	-21,920
2041	145,102	38,045	3,151	0	596,531	95,816	8,566,188	-	0	617	0.0	0.0	-22,648	-22,032
2042	145,739	38,068	3,165	0	599,473	95,874	8,571,367	-	0	617	0.0	0.0	-22,760	-22,143
2043	146,377	38,091	3,179	0	602,414	95,932	8,576,546	-	0	618	0.0	0.0	-22,872	-22,254
2044	147,014	38,114	3,193	0	605,356	95,990	8,581,724	-	0	618	0.0	0.0	-22,983	-22,366
2045	147,651	38,137	3,207	0	608,297	96,048	8,586,903	-	0	618	0.0	0.0	-23,095	-22,477
2046	147,797	38,083	3,210	0	609,663	95,911	8,574,677	-	0	617	0.0	0.0	-23,147	-22,530
2047	147,944	38,028	3,213	0	611,029	95,775	8,562,451	-	0	616	0.0	0.0	-23,199	-22,582
2048	148,090	37,974	3,216	0	612,395	95,638	8,550,225	-	0	616	0.0	0.0	-23,251	-22,635
2049	148,237	37,920	3,219	0	613,761	95,501	8,537,998	-	0	615	0.0	0.0	-23,303	-22,688
2050	148,383	37,866	3,223	0	615,127	95,364	8,525,772	-	0	614	0.0	0.0	-23,354	-22,741
2051	148,530	37,811	3,226	0	616,493	95,228	8,513,546	-	0	613	0.0	0.0	-23,406	-22,793
2052	148,676	37,757	3,229	0	617,859	95,091	8,501,320	-	0	612	0.0	0.0	-23,458	-22,846
2053	148,823	37,703	3,232	0	619,224	94,954	8,489,094	-	0	611	0.0	0.0	-23,510	-22,899
2054	148,969	37,648	3,235	0	620,590	94,817	8,476,868	-	0	610	0.0	0.0	-23,562	-22,952
2055	149,116	37,594	3,238	0	621,956	94,680	8,464,642	-	0	609	0.0	0.0	-23,614	-23,004
2056	149,262	37,540	3,242	0	623,322	94,544	8,452,415	-	0	609	0.0	0.0	-23,666	-23,057
2057	149,408	37,485	3,245	0	624,688	94,407	8,440,189	-	0	608	0.0	0.0	-23,717	-23,110
2058	149,555	37,431	3,248	0	626,054	94,270	8,427,963	-	0	607	0.0	0.0	-23,769	-23,162
2059	149,701	37,377	3,251	0	627,420	94,133	8,415,737	-	0	606	0.0	0.0	-23,821	-23,215
2060	149,848	37,323	3,254	0	628,786	93,997	8,403,511	-	0	605	0.0	0.0	-23,873	-23,268
2061	149,994	37,268	3,257	0	630,152	93,860	8,391,285	-	0	604	0.0	0.0	-23,925	-23,321
2062	150,141	37,214	3,261	0	631,518	93,723	8,379,058	-	0	603	0.0	0.0	-23,977	-23,373
2063	150,287	37,160	3,264	0	632,884	93,586	8,366,832	-	0	602	0.0	0.0	-24,029	-23,426
2064	150,434	37,105	3,267	0	634,250	93,450	8,354,606	-	0	602	0.0	0.0	-24,080	-23,479
2065	150,580	37,051	3,270	0	635,616	93,313	8,342,380	-	0	601	0.0	0.0	-24,132	-23,532
Totals =					28,238,560		4,865,241	434,963,106	0	31,317	0	0	-1,072,128	**-1,040,811**

OGDEN POINT WWTF ASSUMPTIONS

Electricity:

"base" unit power requirement =	0.525	kW-hr/d per m3/d of ADWF treated wastewater	**Ref:** Based on Jan 15/09 TM from T. Dokken.
wastewater strength adjustment =	0	x "base" unit power requirement	**Note:** Not required as WW BOD = 260 mg/L (i.e. typical)
influent pumping power adjustment =	0.075	x "base" unit power requirement	**Ref:** Based on Table 1.4, WEF ___.
UV disinfection power adjustment =	0	x "base" unit power requirement	**Note:** Not required - effluent to sensitive marine environment.
effluent/raw sludge pumping power adjustment =	0.100	x "base" unit power requirement	**Note:** See OP OUT sheets for outfall pumping. Allowance is for heat recovery pumping; i.e. pumping effluent to a nearby District Energy System for use by others. And
raw sludge thickening adjustment =	0	x "base" unit power requirement	sludge pumping to Macaulay / McLoughlin WWTF.
total unit power requirement =	0.617	kW-hr/d per m3/d of ADWF treated wastewater	**Note:** Not required - sludge to sewer.

Raw Sludge Thickening and Truck Transport:

thickening required (1 = yes, 0 = no)?	0	
chemical-P removal chemical sludge production allowance =	0%	of combined PS + WBS
round-trip transport distance to solids processing facility =	0	km

Saleable Reclaimed Water:

mean fraction of annual ADWF volume sold for landscape irrigation =	0.69%	/yr	**Note:** See dnt_eff_irr_ds.xls for assumptions and details. Reclaimed water used for toilet flushing handled separately in analysis. See Flush Rev LCA worksheet.

Notes:
1. Data from M. Homenuke in Feb 4/09 e-mail, DES_SaleableHeatEnergy.xls, Saleable.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 18, 2009
Last Revision By: D. Shiskowski

Subject: Ogden Point WWTF
Option 2

Life Cycle Analysis

Yellow-shaded cell denotes assumed/input values

Year	Capital Costs		Operation & Maintenance Costs												GHG CO2e		Heat Revenues		Reclaimed Water Revenues (irrigation only)		Total	
			Labour		Electricity		Diesel Fuel		Chemicals		Maintenance		Administration									
	Total Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Rev	Net Present Value	Total Annual Rev	Net Present Value	Total Annual Cost	Net Present Value
2008																						
2009																						
2010																						
2011																						
2012																						
2013																						
2014	$402,745,560	$318,295,666																			$402,745,560	$318,295,666
2015	$0		$750,000	$569,938	$607,766	$461,852	$0	$0	$151,847	$115,391	$4,027,456	$3,060,535	$100,000	$75,992	-$161,833	-$122,980	-$1,403,529	-$1,066,567	-$69,923	-$53,136	$4,001,783	$3,041,026
2016	$0		$750,000	$548,018	$606,958	$443,498	$0	$0	$151,645	$110,806	$4,027,456	$2,942,822	$100,000	$73,069	-$172,132	-$125,775	-$1,487,853	-$1,087,160	-$69,830	-$51,024	$3,906,243	$2,854,253
2017	$0		$750,000	$526,940	$606,150	$425,873	$0	$0	$151,444	$106,402	$4,027,456	$2,829,637	$100,000	$70,259	-$182,431	-$128,174	-$1,572,178	-$1,104,591	-$69,738	-$48,997	$3,810,703	$2,677,349
2018	$0		$750,000	$506,673	$605,342	$408,947	$0	$0	$151,242	$102,173	$4,027,456	$2,720,805	$100,000	$67,556	-$192,730	-$130,201	-$1,656,502	-$1,119,074	-$69,645	-$47,049	$3,715,162	$2,509,831
2019	$0		$750,000	$487,186	$604,534	$392,694	$0	$0	$151,040	$98,113	$4,027,456	$2,616,158	$100,000	$64,958	-$203,029	-$131,884	-$1,740,827	-$1,130,808	-$69,552	-$45,179	$3,619,622	$2,351,237
2020	$0		$750,000	$468,448	$603,726	$377,085	$0	$0	$150,838	$94,213	$4,027,456	$2,515,537	$100,000	$62,460	-$213,328	-$133,244	-$1,825,151	-$1,139,984	-$69,459	-$43,384	$3,524,082	$2,201,131
2021	$0		$750,000	$450,431	$602,918	$362,097	$0	$0	$150,636	$90,468	$4,027,456	$2,418,785	$100,000	$60,057	-$223,626	-$134,304	-$1,909,476	-$1,146,782	-$69,366	-$41,659	$3,428,542	$2,059,093
2022	$0		$750,000	$433,106	$602,110	$347,703	$0	$0	$150,434	$86,872	$4,027,456	$2,325,755	$100,000	$57,748	-$233,925	-$135,086	-$1,993,800	-$1,151,370	-$69,273	-$40,003	$3,333,001	$1,924,725
2023	$0		$750,000	$416,448	$601,302	$333,882	$0	$0	$150,232	$83,419	$4,027,456	$2,236,303	$100,000	$55,526	-$244,224	-$135,609	-$2,078,125	-$1,153,909	-$69,180	-$38,413	$3,237,461	$1,797,647
2024	$0		$750,000	$400,431	$600,494	$320,609	$0	$0	$150,030	$80,102	$4,027,456	$2,150,291	$100,000	$53,391	-$254,523	-$135,892	-$2,162,449	-$1,154,549	-$69,087	-$36,886	$3,141,921	$1,677,497
2025	$0		$750,000	$385,030	$599,686	$307,863	$0	$0	$149,828	$76,918	$4,027,456	$2,067,588	$100,000	$51,337	-$264,822	-$135,952	-$2,246,774	-$1,153,434	-$68,994	-$35,420	$3,046,380	$1,563,930
2026	$0		$750,000	$370,221	$598,878	$295,623	$0	$0	$149,627	$73,860	$4,027,456	$1,988,065	$100,000	$49,363	-$275,121	-$135,807	-$2,331,098	-$1,150,696	-$68,901	-$34,011	$2,950,840	$1,456,618
2027	$0		$750,000	$355,982	$598,070	$283,869	$0	$0	$149,425	$70,923	$4,027,456	$1,911,601	$100,000	$47,464	-$285,420	-$135,472	-$2,415,423	-$1,146,462	-$68,808	-$32,659	$2,855,300	$1,355,246
2028	$0		$750,000	$342,290	$597,262	$272,582	$0	$0	$149,223	$68,103	$4,027,456	$1,838,078	$100,000	$45,639	-$295,718	-$134,962	-$2,499,747	-$1,140,852	-$68,715	-$31,361	$2,759,759	$1,259,518
2029	$0		$750,000	$329,125	$596,454	$261,744	$0	$0	$149,021	$65,395	$4,027,456	$1,767,383	$100,000	$43,883	-$306,017	-$134,291	-$2,584,072	-$1,133,978	-$68,622	-$30,114	$2,664,219	$1,169,149
2030	$0		$750,000	$316,467	$595,646	$251,336	$0	$0	$148,819	$62,795	$4,027,456	$1,699,407	$100,000	$42,196	-$312,109	-$131,696	-$2,633,912	-$1,111,393	-$68,529	-$28,916	$2,607,370	$1,100,194
2031	$0		$750,000	$304,295	$596,008	$241,816	$0	$0	$148,910	$60,417	$4,027,456	$1,634,045	$100,000	$40,573	-$313,779	-$127,308	-$2,647,644	-$1,074,219	-$68,571	-$27,821	$2,592,380	$1,051,797
2032	$0		$750,000	$292,591	$596,371	$232,657	$0	$0	$149,000	$58,128	$4,027,456	$1,571,197	$100,000	$39,012	-$315,448	-$123,063	-$2,661,376	-$1,038,260	-$68,612	-$26,767	$2,577,389	$1,005,495
2033	$0		$750,000	$281,338	$596,733	$223,845	$0	$0	$149,091	$55,926	$4,027,456	$1,510,766	$100,000	$37,512	-$317,118	-$118,956	-$2,675,108	-$1,003,478	-$68,654	-$25,753	$2,562,399	$961,199
2034	$0		$750,000	$270,517	$597,096	$215,366	$0	$0	$149,181	$53,808	$4,027,456	$1,452,660	$100,000	$36,069	-$318,788	-$114,983	-$2,688,841	-$969,836	-$68,696	-$24,778	$2,547,409	$918,823
2035	$0		$750,000	$260,112	$597,458	$207,208	$0	$0	$149,272	$51,770	$4,027,456	$1,396,788	$100,000	$34,682	-$320,457	-$111,140	-$2,702,573	-$937,297	-$68,738	-$23,839	$2,532,418	$878,285
2036	$0		$750,000	$250,108	$597,821	$199,360	$0	$0	$149,363	$49,809	$4,027,456	$1,343,066	$100,000	$33,348	-$322,127	-$107,422	-$2,716,305	-$905,827	-$68,779	-$22,936	$2,517,428	$839,505
2037	$0		$750,000	$240,489	$598,183	$191,808	$0	$0	$149,453	$47,922	$4,027,456	$1,291,409	$100,000	$32,065	-$323,796	-$103,826	-$2,730,037	-$875,390	-$68,821	-$22,068	$2,502,437	$802,410
2038	$0		$750,000	$231,239	$598,546	$184,543	$0	$0	$149,544	$46,107	$4,027,456	$1,241,740	$100,000	$30,832	-$325,466	-$100,347	-$2,743,770	-$845,955	-$68,863	-$21,232	$2,487,447	$766,926
2039	$0		$750,000	$222,345	$598,908	$177,552	$0	$0	$149,634	$44,361	$4,027,456	$1,193,981	$100,000	$29,646	-$327,135	-$96,983	-$2,757,502	-$817,490	-$68,904	-$20,427	$2,472,457	$732,985
2040	$0		$750,000	$213,793	$599,271	$170,827	$0	$0	$149,725	$42,680	$4,027,456	$1,148,058	$100,000	$28,506	-$328,805	-$93,728	-$2,771,234	-$789,962	-$68,946	-$19,654	$2,457,466	$700,520
2041	$0		$750,000	$205,571	$599,633	$164,356	$0	$0	$149,815	$41,064	$4,027,456	$1,103,902	$100,000	$27,409	-$330,474	-$90,581	-$2,784,966	-$763,343	-$68,988	-$18,909	$2,442,476	$669,468
2042	$0		$750,000	$197,664	$599,996	$158,130	$0	$0	$149,906	$39,508	$4,027,456	$1,061,444	$100,000	$26,355	-$332,144	-$87,537	-$2,798,698	-$737,603	-$69,029	-$18,193	$2,427,485	$639,769
2043	$0		$750,000	$190,062	$600,358	$152,140	$0	$0	$149,997	$38,011	$4,027,456	$1,020,620	$100,000	$25,342	-$333,813	-$84,593	-$2,812,431	-$712,713	-$69,071	-$17,504	$2,412,495	$611,364
2044	$0		$750,000	$182,752	$600,721	$146,377	$0	$0	$150,087	$36,572	$4,027,456	$981,365	$100,000	$24,367	-$335,483	-$81,747	-$2,826,163	-$688,648	-$69,113	-$16,841	$2,397,505	$584,197
2045	$0		$750,000	$175,723	$601,083	$140,832	$0	$0	$150,178	$35,186	$4,027,456	$943,620	$100,000	$23,430	-$337,153	-$78,994	-$2,839,895	-$665,378	-$69,155	-$16,203	$2,382,514	$558,216
2046	$0		$750,000	$168,964	$600,227	$135,222	$0	$0	$149,964	$33,785	$4,027,456	$907,327	$100,000	$22,529	-$337,944	-$76,134	-$2,846,272	-$641,224	-$69,056	-$15,557	$2,374,375	$534,912
2047	$0		$750,000	$162,465	$599,372	$129,836	$0	$0	$149,750	$32,439	$4,027,456	$872,430	$100,000	$21,662	-$338,735	-$73,377	-$2,852,649	-$617,943	-$68,958	-$14,938	$2,366,236	$512,575
2048	$0		$750,000	$156,217	$598,516	$124,664	$0	$0	$149,536	$31,147	$4,027,456	$838,875	$100,000	$20,829	-$339,526	-$70,720	-$2,859,026	-$595,504	-$68,859	-$14,343	$2,358,096	$491,166
2049	$0		$750,000	$150,208	$597,660	$119,698	$0	$0	$149,322	$29,906	$4,027,456	$806,610	$100,000	$20,028	-$340,317	-$68,158	-$2,865,403	-$573,877	-$68,761	-$13,771	$2,349,957	$470,644
2050	$0		$750,000	$144,431	$596,804	$114,930	$0	$0	$149,109	$28,715	$4,027,456	$775,587	$100,000	$19,257	-$341,108	-$65,689	-$2,871,780	-$553,033	-$68,662	-$13,223	$2,341,818	$450,975
2051	$0		$750,000	$138,876	$595,948	$110,351	$0	$0	$148,895	$27,571	$4,027,456	$745,757	$100,000	$18,517	-$341,899	-$63,309	-$2,878,157	-$532,943	-$68,564	-$12,696	$2,333,678	$432,123
2052	$0		$750,000	$133,535	$595,092	$105,954	$0	$0	$148,681	$26,472	$4,027,456	$717,074	$100,000	$17,805	-$342,690	-$61,015	-$2,884,534	-$513,581	-$68,465	-$12,190	$2,325,539	$414,054
2053	$0		$750,000	$128,399	$594,237	$101,732	$0	$0	$148,467	$25,417	$4,027,456	$689,494	$100,000	$17,120	-$343,481	-$58,803	-$2,890,911	-$494,919	-$68,367	-$11,704	$2,317,400	$396,735
2054	$0		$750,000	$123,460	$593,381	$97,679	$0	$0	$148,253	$24,405	$4,027,456	$662,975	$100,000	$16,461	-$344,273	-$56,672	-$2,897,288	-$476,934	-$68,268	-$11,238	$2,309,260	$380,136
2055	$0		$750,000	$118,712	$592,525	$93,786	$0	$0	$148,039	$23,432	$4,027,456	$637,476	$100,000	$15,828	-$345,064	-$54,618	-$2,903,665	-$459,600	-$68,170	-$10,790	$2,301,121	$364,227
2056	$0		$750,000	$114,146	$591,669	$90,049	$0	$0	$147,826	$22,498	$4,027,456	$612,958	$100,000	$15,219	-$345,855	-$52,637	-$2,910,043	-$442,893	-$68,071	-$10,360	$2,292,982	$348,980
2057	$0		$750,000	$109,756	$590,813	$86,460	$0	$0	$147,612	$21,602	$4,027,456	$589,382	$100,000	$14,634	-$346,646	-$50,729	-$2,916,420	-$426,792	-$67,973	-$9,947	$2,284,842	$334,366
2058	$0		$750,000	$105,534	$589,957	$83,014	$0	$0	$147,398	$20,741	$4,027,456	$566,714	$100,000	$14,071	-$347,437	-$48,889	-$2,922,797	-$411,274	-$67,875	-$9,551	$2,276,703	$320,361
2059	$0		$750,000	$101,475	$589,102	$79,706	$0	$0	$147,184	$19,914	$4,027,456	$544,917	$100,000	$13,530	-$348,228	-$47,115	-$2,929,174	-$396,319	-$67,776	-$9,170	$2,268,563	$306,938
2060	$0		$750,000	$97,573	$588,246	$76,529	$0	$0	$146,970	$19,120	$4,027,456	$523,959	$100,000	$13,010	-$349,019	-$45,406	-$2,935,551	-$381,906	-$67,678	-$8,805	$2,260,424	$294,074
2061	$0		$750,000	$93,820	$587,390	$73,478	$0	$0	$146,756	$18,358	$4,027,456	$503,807	$100,000	$12,509	-$349,810	-$43,759	-$2,941,928	-$368,015	-$67,579	-$8,454	$2,252,285	$281,745
2062	$0		$750,000	$90,211	$586,534	$70,549	$0	$0	$146,543	$17,626	$4,027,456	$484,429	$100,000	$12,028	-$350,601	-$42,171	-$2,948,305	-$354,627	-$67,481	-$8,117	$2,244,145	$269,930
2063	$0		$750,000	$86,742	$585,678	$67,737	$0	$0	$146,329	$16,924	$4,027,456	$465,797	$100,000	$11,566	-$351,393	-$40,640	-$2,954,682	-$341,725	-$67,382	-$7,793	$2,236,006	$258,606
2064	$0		$750,000	$83,405	$584,822	$65,036	$0	$0	$146,115	$16,249	$4,027,456	$447,882	$100,000	$11,121	-$352,184	-$39,165	-$2,961,059	-$329,291	-$67,284	-$7,482	$2,227,867	$247,755
2065	$0		$750,000	$80,198	$583,967	$62,444	$0	$0	$145,901	$15,601	$4,027,456	$430,656	$100,000	$10,693	-$352,975	-$37,744	-$2,967,436	-$317,308	-$67,185	-$7,184	$2,219,727	$237,356
Total Capital =	$402,745,560																					
Total Net Present Value =		$318,295,666		$12,813,459		$10,242,930		$0		$2,559,145		$68,807,519		$1,708,461		-$4,739,288		-$40,146,714		-$1,178,448		**$368,362,729**

OGDEN POINT WWTF ASSUMPTIONS

Labour:
number of facility manager(s) = 1
number of operations staff = 6
number of maintenance staff = 3
number of administration staff = 0
total staff = 10 persons

Ref: Based on Jan 15/09 TM from T. Dokken.

Chemical Phosphorus Removal Chemicals:
chemical-P removal required (1 = yes, 0 = no)? 0

Wet-Weather CEPT Chemicals:
fraction of total annual ADWF treated = 5.0%

Ref: Allowance to account for potential costs.

Reclaimed Water Disinfection:
allowance = 10.0% of other chemical costs

Ref: Allowance to account for potential costs.

Saleable Heat Energy:
unit energy cost to third-party "heat recovery" utility = $ 9.33 /GJ
unit CRD saleable energy price to third-party utility = $ 4.67 /GJ

Ref: This is the cost that a third-party heat recovery utility would incur to make the heat available to customers. Value is from Table 6 of Feb 10/09 memo from M. Homenuke, reduced by 3% to remove CRD share of capital cost.
Note: This value is the difference between the general energy market unit price (from Generic Assumptions sheet) and the above value, which reflects the maximum amount the utility would be willing to pay the CRD for the heat.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 7, 2009
Last Revision By: D. Shiskowski

Subject: Macaulay/McLouglin WWTF Outfall Pumping Option 2

Material Flows and Carbon Footprint Analysis

Yellow-shaded cell denotes assumed/input values

Year	Effluent ADWF		ADWF Friction Losses Unit	ADWF Friction Losses Total	TDH	Velocity	Pump Energy	Materials Electricity	GHG Sources Electricity Purchased	Total GHG Emissions
	(m3/d)	(L/s)	(m/m)	(m)	(m)	(m/s)	(kW)	(kWh/yr)	(t CO2e/yr)	(t CO2e/yr)
2008										
2009										
2010										
2011										
2012										
2013										
2014										
2015	21,675	251	0.000040	0.09	4.8	0.20	17.0	148,647	11	11
2016	21,685	251	0.000040	0.09	4.8	0.20	17.0	148,718	11	11
2017	21,695	251	0.000040	0.09	4.8	0.20	17.0	148,788	11	11
2018	21,705	251	0.000040	0.09	4.8	0.20	17.0	148,858	11	11
2019	21,715	251	0.000040	0.09	4.8	0.20	17.0	148,929	11	11
2020	21,725	251	0.000040	0.09	4.8	0.20	17.0	148,999	11	11
2021	21,735	252	0.000040	0.09	4.8	0.20	17.0	149,070	11	11
2022	21,745	252	0.000040	0.09	4.8	0.21	17.0	149,140	11	11
2023	21,754	252	0.000040	0.09	4.8	0.21	17.0	149,210	11	11
2024	21,764	252	0.000040	0.09	4.8	0.21	17.0	149,281	11	11
2025	21,774	252	0.000040	0.09	4.8	0.21	17.0	149,351	11	11
2026	21,784	252	0.000040	0.09	4.8	0.21	17.1	149,422	11	11
2027	21,794	252	0.000040	0.09	4.8	0.21	17.1	149,492	11	11
2028	21,804	252	0.000040	0.09	4.8	0.21	17.1	149,563	11	11
2029	21,814	252	0.000040	0.09	4.8	0.21	17.1	149,633	11	11
2030	21,824	253	0.000040	0.09	4.8	0.21	17.1	149,704	11	11
2031	21,854	253	0.000040	0.09	4.8	0.21	17.1	149,917	11	11
2032	21,884	253	0.000040	0.09	4.8	0.21	17.1	150,131	11	11
2033	21,914	254	0.000040	0.09	4.8	0.21	17.2	150,345	11	11
2034	21,945	254	0.000041	0.09	4.8	0.21	17.2	150,559	11	11
2035	21,975	254	0.000041	0.09	4.8	0.21	17.2	150,772	11	11
2036	22,005	255	0.000041	0.09	4.8	0.21	17.2	150,986	11	11
2037	22,035	255	0.000041	0.09	4.8	0.21	17.3	151,200	11	11
2038	22,065	255	0.000041	0.09	4.8	0.21	17.3	151,414	11	11
2039	22,095	256	0.000041	0.09	4.8	0.21	17.3	151,628	11	11
2040	22,125	256	0.000041	0.09	4.8	0.21	17.3	151,842	11	11
2041	22,155	256	0.000041	0.09	4.8	0.21	17.4	152,056	11	11
2042	22,186	257	0.000041	0.09	4.8	0.21	17.4	152,270	11	11
2043	22,216	257	0.000041	0.09	4.8	0.21	17.4	152,484	11	11
2044	22,246	257	0.000042	0.09	4.8	0.21	17.4	152,698	11	11
2045	22,276	258	0.000042	0.09	4.8	0.21	17.5	152,912	11	11
2046	22,320	258	0.000042	0.09	4.8	0.21	17.5	153,222	11	11
2047	22,363	259	0.000042	0.09	4.8	0.21	17.5	153,533	11	11
2048	22,407	259	0.000042	0.09	4.8	0.21	17.6	153,843	11	11
2049	22,451	260	0.000042	0.09	4.8	0.21	17.6	154,153	11	11
2050	22,494	260	0.000042	0.09	4.8	0.21	17.6	154,464	11	11
2051	22,538	261	0.000043	0.09	4.8	0.21	17.7	154,774	11	11
2052	22,582	261	0.000043	0.09	4.8	0.21	17.7	155,085	11	11
2053	22,625	262	0.000043	0.09	4.8	0.21	17.7	155,395	11	11
2054	22,669	262	0.000043	0.09	4.8	0.21	17.8	155,706	11	11
2055	22,713	263	0.000043	0.10	4.8	0.21	17.8	156,017	11	11
2056	22,756	263	0.000043	0.10	4.8	0.21	17.8	156,327	11	11
2057	22,800	264	0.000044	0.10	4.8	0.22	17.9	156,638	11	11
2058	22,843	264	0.000044	0.10	4.8	0.22	17.9	156,949	11	11
2059	22,887	265	0.000044	0.10	4.8	0.22	18.0	157,260	11	11
2060	22,931	265	0.000044	0.10	4.8	0.22	18.0	157,571	11	11
2061	22,974	266	0.000044	0.10	4.8	0.22	18.0	157,882	11	11
2062	23,018	266	0.000044	0.10	4.8	0.22	18.1	158,193	11	11
2063	23,062	267	0.000044	0.10	4.8	0.22	18.1	158,505	11	11
2064	23,105	267	0.000045	0.10	4.8	0.22	18.1	158,816	11	11
2065	23,149	268	0.000045	0.10	4.8	0.22	18.2	159,127	11	11
Totals =								7,781,480	560	**560**

MACAULAY / MCLOUGHLIN WWTF OUTFALL PUMPING

static head =	2.03	m
effluent discharge depth =	61.0	m
effluent density @ 20°C =	998.2	kg/m3
ocean water density @ 10°C =	1026.2	kg/m3
seawater density adjustment =	1.7	m
diffuser exit loss allowance =	1.0	m
friction C value =	120	
forcemain diameter =	1250	mm
forcemain X-area =	1.2271	m^2
forcemain length =	2,200	m
pump efficiency =	70%	
fluid specific weight =	9.81	kN/m^3

Ref: M. Maynard file est_Outfall&Interceptor Cost Estimates_20090206.xls.

Ref: Assumes effluent is fresh water. Table A.1, Fischer et al (1979).

Ref: Assumes ocean salinity of 34 o/oo. Table A.2, Fischer et al (1979).

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File:	20062935.04.E.03.06	**Subject:**	Macaulay/McLouglin WWTF
Prepared:	D. Shiskowski		Outfall Pumping
Last Revision:	**February 7, 2009**		Option 2
Last Revision By:	**D. Shiskowski**		Life Cycle Analysis

Yellow-shaded cell denotes assumed/input values

Year	Operations Costs		GHG CO2e		Total	
	Electricity					
	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value
2008						
2009						
2010						
2011						
2012						
2013						
2014						
2015	$10,405	$7,907	$161	$122	$10,566	$8,029
2016	$10,410	$7,607	$161	$117	$10,571	$7,724
2017	$10,415	$7,318	$161	$113	$10,576	$7,430
2018	$10,420	$7,039	$161	$109	$10,581	$7,148
2019	$10,425	$6,772	$161	$104	$10,586	$6,876
2020	$10,430	$6,515	$161	$101	$10,591	$6,615
2021	$10,435	$6,267	$161	$97	$10,596	$6,364
2022	$10,440	$6,029	$161	$93	$10,601	$6,122
2023	$10,445	$5,800	$161	$89	$10,606	$5,889
2024	$10,450	$5,579	$161	$86	$10,611	$5,665
2025	$10,455	$5,367	$161	$83	$10,616	$5,450
2026	$10,460	$5,163	$161	$80	$10,621	$5,243
2027	$10,464	$4,967	$161	$77	$10,626	$5,044
2028	$10,469	$4,778	$162	$74	$10,631	$4,852
2029	$10,474	$4,596	$162	$71	$10,636	$4,667
2030	$10,479	$4,422	$162	$68	$10,641	$4,490
2031	$10,494	$4,258	$162	$66	$10,656	$4,323
2032	$10,509	$4,100	$162	$63	$10,671	$4,163
2033	$10,524	$3,948	$162	$61	$10,687	$4,009
2034	$10,539	$3,801	$163	$59	$10,702	$3,860
2035	$10,554	$3,660	$163	$56	$10,717	$3,717
2036	$10,569	$3,525	$163	$54	$10,732	$3,579
2037	$10,584	$3,394	$163	$52	$10,747	$3,446
2038	$10,599	$3,268	$164	$50	$10,763	$3,318
2039	$10,614	$3,147	$164	$49	$10,778	$3,195
2040	$10,629	$3,030	$164	$47	$10,793	$3,077
2041	$10,644	$2,917	$164	$45	$10,808	$2,962
2042	$10,659	$2,809	$164	$43	$10,823	$2,853
2043	$10,674	$2,705	$165	$42	$10,839	$2,747
2044	$10,689	$2,605	$165	$40	$10,854	$2,645
2045	$10,704	$2,508	$165	$39	$10,869	$2,547
2046	$10,726	$2,416	$165	$37	$10,891	$2,454
2047	$10,747	$2,328	$166	$36	$10,913	$2,364
2048	$10,769	$2,243	$166	$35	$10,935	$2,278
2049	$10,791	$2,161	$166	$33	$10,957	$2,194
2050	$10,812	$2,082	$167	$32	$10,979	$2,114
2051	$10,834	$2,006	$167	$31	$11,001	$2,037
2052	$10,856	$1,933	$167	$30	$11,023	$1,963
2053	$10,878	$1,862	$168	$29	$11,045	$1,891
2054	$10,899	$1,794	$168	$28	$11,068	$1,822
2055	$10,921	$1,729	$168	$27	$11,090	$1,755
2056	$10,943	$1,665	$169	$26	$11,112	$1,691
2057	$10,965	$1,605	$169	$25	$11,134	$1,629
2058	$10,986	$1,546	$170	$24	$11,156	$1,570
2059	$11,008	$1,489	$170	$23	$11,178	$1,512
2060	$11,030	$1,435	$170	$22	$11,200	$1,457
2061	$11,052	$1,382	$171	$21	$11,222	$1,404
2062	$11,074	$1,332	$171	$21	$11,244	$1,352
2063	$11,095	$1,283	$171	$20	$11,267	$1,303
2064	$11,117	$1,236	$172	$19	$11,289	$1,255
2065	$11,139	$1,191	$172	$18	$11,311	$1,209
Total Net Present Value =		$180,519		$2,785		**$183,304**

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 7, 2009
Last Revision By: D. Shiskowski

Subject: Juan de Fuca WWTF Outfall Pumping
Option 2

Material Flows
and Carbon Footprint Analysis

Yellow-shaded cell denotes assumed/input values

Year	Effluent ADWF		ADWF Friction Losses Unit	ADWF Friction Losses Total	TDH	Velocity	Pump Energy	Materials Electricity	GHG Sources Electricity Purchased	Total GHG Emissions
	(m3/d)	(L/s)	(m/m)	(m)	(m)	(m/s)	(kW)	(kWh/yr)	(t CO2e/yr)	(t CO2e/yr)
2008										
2009										
2010										
2011										
2012										
2013										
2014										
2015	33,259	385	0.000433	0.11	6.6	0.61	35.6	312,185	22	22
2016	33,915	393	0.000449	0.11	6.6	0.62	36.4	318,532	23	23
2017	34,571	400	0.000465	0.11	6.6	0.63	37.1	324,888	23	23
2018	35,227	408	0.000481	0.12	6.6	0.64	37.8	331,256	24	24
2019	35,883	415	0.000498	0.12	6.6	0.65	38.5	337,634	24	24
2020	36,539	423	0.000515	0.13	6.6	0.66	39.3	344,023	25	25
2021	37,195	431	0.000532	0.13	6.6	0.68	40.0	350,423	25	25
2022	37,851	438	0.000550	0.13	6.6	0.69	40.7	356,835	26	26
2023	38,508	446	0.000568	0.14	6.6	0.70	41.5	363,258	26	26
2024	39,164	453	0.000586	0.14	6.6	0.71	42.2	369,692	27	27
2025	39,820	461	0.000604	0.15	6.6	0.72	42.9	376,139	27	27
2026	40,476	468	0.000623	0.15	6.7	0.74	43.7	382,597	28	28
2027	41,132	476	0.000641	0.16	6.7	0.75	44.4	389,068	28	28
2028	41,788	484	0.000660	0.16	6.7	0.76	45.2	395,551	28	28
2029	42,444	491	0.000680	0.17	6.7	0.77	45.9	402,046	29	29
2030	43,100	499	0.000699	0.17	6.7	0.78	46.6	408,554	29	29
2031	43,474	503	0.000711	0.17	6.7	0.79	47.1	412,275	30	30
2032	43,849	508	0.000722	0.18	6.7	0.80	47.5	415,999	30	30
2033	44,223	512	0.000733	0.18	6.7	0.80	47.9	419,728	30	30
2034	44,598	516	0.000745	0.18	6.7	0.81	48.3	423,461	30	30
2035	44,972	521	0.000756	0.19	6.7	0.82	48.8	427,198	31	31
2036	45,347	525	0.000768	0.19	6.7	0.83	49.2	430,940	31	31
2037	45,721	529	0.000780	0.19	6.7	0.83	49.6	434,686	31	31
2038	46,096	534	0.000792	0.19	6.7	0.84	50.0	438,437	32	32
2039	46,470	538	0.000804	0.20	6.7	0.85	50.5	442,192	32	32
2040	46,845	542	0.000816	0.20	6.7	0.85	50.9	445,951	32	32
2041	47,219	547	0.000828	0.20	6.7	0.86	51.3	449,715	32	32
2042	47,594	551	0.000840	0.21	6.7	0.87	51.8	453,483	33	33
2043	47,968	555	0.000852	0.21	6.7	0.87	52.2	457,256	33	33
2044	48,343	560	0.000865	0.21	6.7	0.88	52.6	461,033	33	33
2045	48,717	564	0.000877	0.21	6.7	0.89	53.1	464,815	33	33
2046	49,070	568	0.000889	0.22	6.7	0.89	53.5	468,386	34	34
2047	49,423	572	0.000901	0.22	6.7	0.90	53.9	471,961	34	34
2048	49,776	576	0.000913	0.22	6.7	0.91	54.3	475,541	34	34
2049	50,130	580	0.000925	0.23	6.7	0.91	54.7	479,124	34	34
2050	50,483	584	0.000937	0.23	6.7	0.92	55.1	482,712	35	35
2051	50,836	588	0.000949	0.23	6.7	0.92	55.5	486,304	35	35
2052	51,189	592	0.000961	0.24	6.7	0.93	55.9	489,900	35	35
2053	51,542	597	0.000973	0.24	6.7	0.94	56.3	493,501	36	36
2054	51,895	601	0.000986	0.24	6.7	0.94	56.7	497,106	36	36
2055	52,249	605	0.000998	0.24	6.7	0.95	57.2	500,715	36	36
2056	52,602	609	0.001011	0.25	6.7	0.96	57.6	504,329	36	36
2057	52,955	613	0.001023	0.25	6.8	0.96	58.0	507,947	37	37
2058	53,308	617	0.001036	0.25	6.8	0.97	58.4	511,569	37	37
2059	53,661	621	0.001049	0.26	6.8	0.98	58.8	515,196	37	37
2060	54,014	625	0.001062	0.26	6.8	0.98	59.2	518,827	37	37
2061	54,367	629	0.001075	0.26	6.8	0.99	59.6	522,463	38	38
2062	54,721	633	0.001087	0.27	6.8	1.00	60.1	526,103	38	38
2063	55,074	637	0.001100	0.27	6.8	1.00	60.5	529,748	38	38
2064	55,427	642	0.001114	0.27	6.8	1.01	60.9	533,398	38	38
2065	55,780	646	0.001127	0.28	6.8	1.01	61.3	537,052	39	39
Totals =								22,391,731	1,612	**1,612**

JUAN DE FUCA WWTF OUTFALL PUMPING

static head =	6.50	m
effluent discharge depth =		m
effluent density @ 20°C =	998.2	kg/m3
ocean water density @ 10°C =	1026.2	kg/m3
seawater density adjustment =	0.0	m
diffuser exit loss allowance =		m
friction C value =	120	
forcemain diameter =	900	mm
forcemain X-area =	0.6362	m^2
forcemain length =	245	m
pump efficiency =	70%	
fluid specific weight =	9.81	kN/m^3

Ref: M. Maynard file est_Outfall&Interceptor Cost Estimates_20090206.xls. Note that this is only to high-point on land; gravity the remainder of the way.
Ref: Assumes effluent is fresh water. Table A.1, Fischer et al (1979).
Ref: Assumes ocean salinity of 34 o/oo. Table A.2, Fischer et al (1979).

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File:	20062935.04.E.03.06	**Subject:**	Juan de Fuca WWTF
Prepared:	D. Shiskowski		Outfall Pumping
Last Revision:	**February 7, 2009**		Option 2
Last Revision By:	**D. Shiskowski**		Life Cycle Analysis

Yellow-shaded cell denotes assumed/input values

Year	Operations Costs		GHG CO2e		Total	
	Electricity					
	Done Total Annual Cost	**Done** Net Present Value	**Done** Total Annual Cost	**Done** Net Present Value	**Done** Total Annual Cost	**Done** Net Present Value
2008						
2009						
2010						
2011						
2012						
2013						
2014						
2015	$21,853	$16,606	$337	$256	$22,190	$16,863
2016	$22,297	$16,292	$344	$251	$22,641	$16,544
2017	$22,742	$15,978	$351	$247	$23,093	$16,225
2018	$23,188	$15,665	$358	$242	$23,546	$15,907
2019	$23,634	$15,352	$365	$237	$23,999	$15,589
2020	$24,082	$15,041	$372	$232	$24,453	$15,273
2021	$24,530	$14,732	$378	$227	$24,908	$14,959
2022	$24,978	$14,424	$385	$223	$25,364	$14,647
2023	$25,428	$14,119	$392	$218	$25,820	$14,337
2024	$25,878	$13,817	$399	$213	$26,278	$14,030
2025	$26,330	$13,517	$406	$209	$26,736	$13,726
2026	$26,782	$13,220	$413	$204	$27,195	$13,424
2027	$27,235	$12,927	$420	$199	$27,655	$13,126
2028	$27,689	$12,637	$427	$195	$28,116	$12,832
2029	$28,143	$12,350	$434	$191	$28,577	$12,541
2030	$28,599	$12,067	$441	$186	$29,040	$12,254
2031	$28,859	$11,709	$445	$181	$29,304	$11,890
2032	$29,120	$11,360	$449	$175	$29,569	$11,536
2033	$29,381	$11,021	$453	$170	$29,834	$11,191
2034	$29,642	$10,692	$457	$165	$30,100	$10,857
2035	$29,904	$10,371	$461	$160	$30,365	$10,531
2036	$30,166	$10,060	$465	$155	$30,631	$10,215
2037	$30,428	$9,757	$469	$151	$30,897	$9,907
2038	$30,691	$9,462	$474	$146	$31,164	$9,608
2039	$30,953	$9,176	$478	$142	$31,431	$9,318
2040	$31,217	$8,899	$482	$137	$31,698	$9,036
2041	$31,480	$8,628	$486	$133	$31,966	$8,762
2042	$31,744	$8,366	$490	$129	$32,234	$8,495
2043	$32,008	$8,111	$494	$125	$32,502	$8,236
2044	$32,272	$7,864	$498	$121	$32,770	$7,985
2045	$32,537	$7,623	$502	$118	$33,039	$7,741
2046	$32,787	$7,386	$506	$114	$33,293	$7,500
2047	$33,037	$7,157	$510	$110	$33,547	$7,267
2048	$33,288	$6,933	$514	$107	$33,801	$7,040
2049	$33,539	$6,717	$517	$104	$34,056	$6,821
2050	$33,790	$6,507	$521	$100	$34,311	$6,607
2051	$34,041	$6,303	$525	$97	$34,566	$6,401
2052	$34,293	$6,106	$529	$94	$34,822	$6,200
2053	$34,545	$5,914	$533	$91	$35,078	$6,005
2054	$34,797	$5,728	$537	$88	$35,334	$5,817
2055	$35,050	$5,548	$541	$86	$35,591	$5,633
2056	$35,303	$5,373	$545	$83	$35,848	$5,456
2057	$35,556	$5,203	$549	$80	$36,105	$5,284
2058	$35,810	$5,039	$552	$78	$36,362	$5,117
2059	$36,064	$4,879	$556	$75	$36,620	$4,955
2060	$36,318	$4,725	$560	$73	$36,878	$4,798
2061	$36,572	$4,575	$564	$71	$37,137	$4,646
2062	$36,827	$4,430	$568	$68	$37,395	$4,498
2063	$37,082	$4,289	$572	$66	$37,655	$4,355
2064	$37,338	$4,152	$576	$64	$37,914	$4,216
2065	$37,594	$4,020	$580	$62	$38,174	$4,082
Total Net Present Value =		$482,831		$7,449		**$490,281**

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 7, 2009
Last Revision By: D. Shiskowski

Subject: Ogden Point WWTF Outfall Pumping
Option 2

Material Flows
and Carbon Footprint Analysis

Yellow-shaded cell denotes assumed/input values

Year	Effluent ADWF		ADWF Friction Losses Unit	ADWF Friction Losses Total	TDH	Velocity	Pump Energy	Materials Electricity	GHG Sources Electricity Purchased	Total GHG Emissions
	(m3/d)	(L/s)	(m/m)	(m)	(m)	(m/s)	(kW)	(kWh/yr)	(t CO2e/yr)	(t CO2e/yr)
2008										
2009										
2010										
2011										
2012										
2013										
2014										
2015	38,561	446	0.001382	2.57	5.3	1.01	33.0	289,273	21	21
2016	38,510	446	0.001378	2.56	5.3	1.01	32.9	288,543	21	21
2017	38,458	445	0.001375	2.56	5.3	1.01	32.9	287,814	21	21
2018	38,407	445	0.001372	2.55	5.3	1.01	32.8	287,086	21	21
2019	38,356	444	0.001368	2.55	5.3	1.00	32.7	286,360	21	21
2020	38,305	443	0.001365	2.54	5.2	1.00	32.6	285,635	21	21
2021	38,253	443	0.001362	2.53	5.2	1.00	32.5	284,911	21	21
2022	38,202	442	0.001358	2.53	5.2	1.00	32.4	284,188	20	20
2023	38,151	442	0.001355	2.52	5.2	1.00	32.4	283,467	20	20
2024	38,100	441	0.001351	2.51	5.2	1.00	32.3	282,747	20	20
2025	38,048	440	0.001348	2.51	5.2	1.00	32.2	282,029	20	20
2026	37,997	440	0.001345	2.50	5.2	1.00	32.1	281,312	20	20
2027	37,946	439	0.001341	2.49	5.2	0.99	32.0	280,596	20	20
2028	37,895	439	0.001338	2.49	5.2	0.99	31.9	279,881	20	20
2029	37,843	438	0.001335	2.48	5.2	0.99	31.9	279,168	20	20
2030	37,792	437	0.001331	2.48	5.2	0.99	31.8	278,456	20	20
2031	37,815	438	0.001333	2.48	5.2	0.99	31.8	278,775	20	20
2032	37,838	438	0.001334	2.48	5.2	0.99	31.9	279,094	20	20
2033	37,861	438	0.001336	2.48	5.2	0.99	31.9	279,414	20	20
2034	37,884	438	0.001337	2.49	5.2	0.99	31.9	279,734	20	20
2035	37,907	439	0.001339	2.49	5.2	0.99	32.0	280,055	20	20
2036	37,930	439	0.001340	2.49	5.2	0.99	32.0	280,375	20	20
2037	37,953	439	0.001342	2.50	5.2	0.99	32.0	280,696	20	20
2038	37,976	440	0.001343	2.50	5.2	0.99	32.1	281,017	20	20
2039	37,999	440	0.001345	2.50	5.2	1.00	32.1	281,339	20	20
2040	38,022	440	0.001346	2.50	5.2	1.00	32.2	281,660	20	20
2041	38,045	440	0.001348	2.51	5.2	1.00	32.2	281,982	20	20
2042	38,068	441	0.001349	2.51	5.2	1.00	32.2	282,304	20	20
2043	38,091	441	0.001351	2.51	5.2	1.00	32.3	282,627	20	20
2044	38,114	441	0.001352	2.52	5.2	1.00	32.3	282,950	20	20
2045	38,137	441	0.001354	2.52	5.2	1.00	32.3	283,272	20	20
2046	38,083	441	0.001350	2.51	5.2	1.00	32.3	282,510	20	20
2047	38,028	440	0.001347	2.50	5.2	1.00	32.2	281,750	20	20
2048	37,974	440	0.001343	2.50	5.2	0.99	32.1	280,991	20	20
2049	37,920	439	0.001340	2.49	5.2	0.99	32.0	280,233	20	20
2050	37,866	438	0.001336	2.49	5.2	0.99	31.9	279,477	20	20
2051	37,811	438	0.001333	2.48	5.2	0.99	31.8	278,722	20	20
2052	37,757	437	0.001329	2.47	5.2	0.99	31.7	277,969	20	20
2053	37,703	436	0.001325	2.47	5.2	0.99	31.6	277,217	20	20
2054	37,648	436	0.001322	2.46	5.2	0.99	31.6	276,466	20	20
2055	37,594	435	0.001318	2.45	5.2	0.98	31.5	275,717	20	20
2056	37,540	434	0.001315	2.45	5.2	0.98	31.4	274,970	20	20
2057	37,485	434	0.001311	2.44	5.1	0.98	31.3	274,224	20	20
2058	37,431	433	0.001308	2.43	5.1	0.98	31.2	273,479	20	20
2059	37,377	433	0.001304	2.43	5.1	0.98	31.1	272,736	20	20
2060	37,323	432	0.001301	2.42	5.1	0.98	31.0	271,994	20	20
2061	37,268	431	0.001297	2.41	5.1	0.98	31.0	271,254	20	20
2062	37,214	431	0.001294	2.41	5.1	0.97	30.9	270,515	19	19
2063	37,160	430	0.001290	2.40	5.1	0.97	30.8	269,777	19	19
2064	37,105	429	0.001287	2.39	5.1	0.97	30.7	269,041	19	19
2065	37,051	429	0.001283	2.39	5.1	0.97	30.6	268,306	19	19
Totals =								14,264,108	1,027	**1,027**

OGDEN POINT WWTF OUTFALL PUMPING

static head =	0.00	m
effluent discharge depth =	61.0	m
effluent density @ 20°C =	998.2	kg/m3
ocean water density @ 10°C =	1026.2	kg/m3
seawater density adjustment =	1.7	m
diffuser exit loss allowance =	1.0	m
friction C value =	120	
forcemain diameter =	750	mm
forcemain X-area =	0.4418	m^2
forcemain length =	1,860	m
pump efficiency =	70%	
fluid specific weight =	9.81	kN/m^3

Ref: M. Maynard file est_Outfall&Interceptor Cost Estimates_20090206.xls.

Ref: Assumes effluent is fresh water. Table A.1, Fischer et al (1979).
Ref: Assumes ocean salinity of 34 o/oo. Table A.2, Fischer et al (1979).

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File:	20062935.04.E.03.06	**Subject:**	Odgen Point WWTF
Prepared:	D. Shiskowski		Outfall Pumping
Last Revision:	**February 7, 2009**		Option 2
Last Revision By:	**D. Shiskowski**		Life Cycle Analysis

Yellow-shaded cell denotes assumed/input values

Year	Operations Costs Electricity		GHG CO2e		Total	
	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value
2008						
2009						
2010						
2011						
2012						
2013						
2014						
2015	$20,249	$15,388	$312	$237	$20,562	$15,625
2016	$20,198	$14,758	$312	$228	$20,510	$14,986
2017	$20,147	$14,155	$311	$218	$20,458	$14,373
2018	$20,096	$13,576	$310	$209	$20,406	$13,786
2019	$20,045	$13,021	$309	$201	$20,354	$13,222
2020	$19,994	$12,488	$308	$193	$20,303	$12,681
2021	$19,944	$11,978	$308	$185	$20,251	$12,163
2022	$19,893	$11,488	$307	$177	$20,200	$11,665
2023	$19,843	$11,018	$306	$170	$20,149	$11,188
2024	$19,792	$10,567	$305	$163	$20,098	$10,730
2025	$19,742	$10,135	$305	$156	$20,047	$10,291
2026	$19,692	$9,720	$304	$150	$19,996	$9,870
2027	$19,642	$9,323	$303	$144	$19,945	$9,467
2028	$19,592	$8,941	$302	$138	$19,894	$9,079
2029	$19,542	$8,576	$302	$132	$19,843	$8,708
2030	$19,492	$8,225	$301	$127	$19,793	$8,352
2031	$19,514	$7,917	$301	$122	$19,815	$8,040
2032	$19,537	$7,622	$301	$118	$19,838	$7,739
2033	$19,559	$7,337	$302	$113	$19,861	$7,450
2034	$19,581	$7,063	$302	$109	$19,884	$7,172
2035	$19,604	$6,799	$302	$105	$19,906	$6,904
2036	$19,626	$6,545	$303	$101	$19,929	$6,646
2037	$19,649	$6,300	$303	$97	$19,952	$6,398
2038	$19,671	$6,065	$303	$94	$19,975	$6,159
2039	$19,694	$5,838	$304	$90	$19,998	$5,928
2040	$19,716	$5,620	$304	$87	$20,020	$5,707
2041	$19,739	$5,410	$305	$83	$20,043	$5,494
2042	$19,761	$5,208	$305	$80	$20,066	$5,288
2043	$19,784	$5,014	$305	$77	$20,089	$5,091
2044	$19,806	$4,826	$306	$74	$20,112	$4,901
2045	$19,829	$4,646	$306	$72	$20,135	$4,718
2046	$19,776	$4,455	$305	$69	$20,081	$4,524
2047	$19,722	$4,272	$304	$66	$20,027	$4,338
2048	$19,669	$4,097	$303	$63	$19,973	$4,160
2049	$19,616	$3,929	$303	$61	$19,919	$3,989
2050	$19,563	$3,767	$302	$58	$19,865	$3,826
2051	$19,511	$3,613	$301	$56	$19,812	$3,668
2052	$19,458	$3,464	$300	$53	$19,758	$3,518
2053	$19,405	$3,322	$299	$51	$19,705	$3,373
2054	$19,353	$3,186	$299	$49	$19,651	$3,235
2055	$19,300	$3,055	$298	$47	$19,598	$3,102
2056	$19,248	$2,929	$297	$45	$19,545	$2,975
2057	$19,196	$2,809	$296	$43	$19,492	$2,852
2058	$19,144	$2,694	$295	$42	$19,439	$2,735
2059	$19,092	$2,583	$295	$40	$19,386	$2,623
2060	$19,040	$2,477	$294	$38	$19,333	$2,515
2061	$18,988	$2,375	$293	$37	$19,281	$2,412
2062	$18,936	$2,278	$292	$35	$19,228	$2,313
2063	$18,884	$2,184	$291	$34	$19,176	$2,218
2064	$18,833	$2,094	$291	$32	$19,123	$2,127
2065	$18,781	$2,008	$290	$31	$19,071	$2,039
Total Net Present Value =		$337,161		$5,202		**$342,362**

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 6, 2009
Last Revision By: D. Shiskowski

Subject: Clover Point Wet-Weather Treatment Facility Option 2

Material Flows and Carbon Footprint Analysis

Yellow-shaded cell denotes assumed/input values

Year	Equivalent Population	Wastewater ADWF (to Mac/McL WWTF)		ADWF Friction Losses		TDH	Velocity	Pump Energy	Materials	GHG Sources	Total GHG Emissions
				Unit	Total				Electricity	Electricity Purchased	
	(pe)	(m3/d)	(L/s)	(m/m)	(m)	(m)	(m/s)	(kW)	(kWh/yr)	(t CO2e/yr)	(t CO2e/yr)
2008											
2009											
2010											
2011											
2012											
2013											
2014											
2015	131,016	38,561	446	0.001382	4.49	26.5	1.01	165.7	1,596,618	115	115
2016	131,488	38,510	446	0.001378	4.48	26.5	1.01	165.4	1,593,831	115	115
2017	131,960	38,458	445	0.001375	4.47	26.5	1.01	165.1	1,591,046	115	115
2018	132,431	38,407	445	0.001372	4.46	26.5	1.01	164.8	1,588,264	114	114
2019	132,903	38,356	444	0.001368	4.45	26.4	1.00	164.5	1,585,485	114	114
2020	133,375	38,305	443	0.001365	4.44	26.4	1.00	164.2	1,582,707	114	114
2021	133,847	38,253	443	0.001362	4.42	26.4	1.00	164.0	1,579,933	114	114
2022	134,319	38,202	442	0.001358	4.41	26.4	1.00	163.7	1,577,161	114	114
2023	134,790	38,151	442	0.001355	4.40	26.4	1.00	163.4	1,574,391	113	113
2024	135,262	38,100	441	0.001351	4.39	26.4	1.00	163.1	1,571,624	113	113
2025	135,734	38,048	440	0.001348	4.38	26.4	1.00	162.8	1,568,859	113	113
2026	136,206	37,997	440	0.001345	4.37	26.4	1.00	162.5	1,566,097	113	113
2027	136,678	37,946	439	0.001341	4.36	26.4	0.99	162.2	1,563,338	113	113
2028	137,149	37,895	439	0.001338	4.35	26.3	0.99	162.0	1,560,581	112	112
2029	137,621	37,843	438	0.001335	4.34	26.3	0.99	161.7	1,557,826	112	112
2030	138,093	37,792	437	0.001331	4.33	26.3	0.99	161.4	1,555,074	112	112
2031	138,730	37,815	438	0.001333	4.33	26.3	0.99	161.5	1,556,308	112	112
2032	139,367	37,838	438	0.001334	4.34	26.3	0.99	161.6	1,557,543	112	112
2033	140,005	37,861	438	0.001336	4.34	26.3	0.99	161.8	1,558,778	112	112
2034	140,642	37,884	438	0.001337	4.35	26.3	0.99	161.9	1,560,014	112	112
2035	141,279	37,907	439	0.001339	4.35	26.4	0.99	162.0	1,561,251	112	112
2036	141,916	37,930	439	0.001340	4.36	26.4	0.99	162.2	1,562,488	112	112
2037	142,553	37,953	439	0.001342	4.36	26.4	0.99	162.3	1,563,725	113	113
2038	143,191	37,976	440	0.001343	4.37	26.4	0.99	162.4	1,564,963	113	113
2039	143,828	37,999	440	0.001345	4.37	26.4	1.00	162.5	1,566,201	113	113
2040	144,465	38,022	440	0.001346	4.38	26.4	1.00	162.7	1,567,440	113	113
2041	145,102	38,045	440	0.001348	4.38	26.4	1.00	162.8	1,568,680	113	113
2042	145,739	38,068	441	0.001349	4.39	26.4	1.00	162.9	1,569,920	113	113
2043	146,377	38,091	441	0.001351	4.39	26.4	1.00	163.1	1,571,160	113	113
2044	147,014	38,114	441	0.001352	4.40	26.4	1.00	163.2	1,572,401	113	113
2045	147,651	38,137	441	0.001354	4.40	26.4	1.00	163.3	1,573,642	113	113
2046	147,797	38,083	441	0.001350	4.39	26.4	1.00	163.0	1,570,712	113	113
2047	147,944	38,028	440	0.001347	4.38	26.4	1.00	162.7	1,567,785	113	113
2048	148,090	37,974	440	0.001343	4.37	26.4	0.99	162.4	1,564,861	113	113
2049	148,237	37,920	439	0.001340	4.35	26.4	0.99	162.1	1,561,939	112	112
2050	148,383	37,866	438	0.001336	4.34	26.3	0.99	161.8	1,559,020	112	112
2051	148,530	37,811	438	0.001333	4.33	26.3	0.99	161.5	1,556,104	112	112
2052	148,676	37,757	437	0.001329	4.32	26.3	0.99	161.2	1,553,191	112	112
2053	148,823	37,703	436	0.001325	4.31	26.3	0.99	160.9	1,550,280	112	112
2054	148,969	37,648	436	0.001322	4.30	26.3	0.99	160.6	1,547,373	111	111
2055	149,116	37,594	435	0.001318	4.28	26.3	0.98	160.3	1,544,468	111	111
2056	149,262	37,540	434	0.001315	4.27	26.3	0.98	160.0	1,541,565	111	111
2057	149,408	37,485	434	0.001311	4.26	26.3	0.98	159.7	1,538,666	111	111
2058	149,555	37,431	433	0.001308	4.25	26.3	0.98	159.4	1,535,769	111	111
2059	149,701	37,377	433	0.001304	4.24	26.2	0.98	159.1	1,532,876	110	110
2060	149,848	37,323	432	0.001301	4.23	26.2	0.98	158.8	1,529,984	110	110
2061	149,994	37,268	431	0.001297	4.22	26.2	0.98	158.5	1,527,096	110	110
2062	150,141	37,214	431	0.001294	4.21	26.2	0.97	158.2	1,524,210	110	110
2063	150,287	37,160	430	0.001290	4.19	26.2	0.97	157.9	1,521,327	110	110
2064	150,434	37,105	429	0.001287	4.18	26.2	0.97	157.6	1,518,447	109	109
2065	150,580	37,051	429	0.001283	4.17	26.2	0.97	157.3	1,515,570	109	109
Totals =									79,548,594	5,727	**5,727**

CLOVER POINT WET-WEATHER TF ASSUMPTIONS

Dry-Weather Flow Pumping Station:

static head =	22.0	m	**Ref:** M. Maynard file est_Outfall&Interceptor Cost Estimates_20090206.xls.
friction C value =	120		
forcemain diameter =	750	mm	
forcemain X-area =	0.4418	m^2	
forcemain length =	3,250	m	
pump efficiency =	70%		
fluid specific weight =	9.81	kN/m^3	

Electricity:

wet-weather treatment and pumping adjustment = 0.10 x dry-weather flow pumping requirement

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 18, 2009
Last Revision By: D. Shiskowski

Subject: Clover Point Wet-Weather Treatment Facility Option 2 Life Cycle Analysis

Yellow-shaded cell denotes assumed/input values

Year	Capital Costs[1]		Operation & Maintenance Costs										GHG CO2e		Total	
			Labour		Electricity		Chemicals		Maintenance		Administration					
	Total Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value
2008																
2009																
2010																
2011																
2012																
2013																
2014	$145,960,800	$115,354,940													$145,960,800	$115,354,940
2015		$0	$75,000	$56,994	$111,763	$84,931	$251,082	$190,802	$1,459,608	$1,109,182	$100,000	$75,992	$1,724	$1,310	$1,999,178	$1,519,211
2016		$0	$75,000	$54,802	$111,568	$81,522	$250,749	$183,219	$1,459,608	$1,066,521	$100,000	$73,069	$1,721	$1,258	$1,998,646	$1,460,391
2017		$0	$75,000	$52,694	$111,373	$78,249	$250,415	$175,938	$1,459,608	$1,025,501	$100,000	$70,259	$1,718	$1,207	$1,998,114	$1,403,849
2018		$0	$75,000	$50,667	$111,178	$75,108	$250,081	$168,946	$1,459,608	$986,059	$100,000	$67,556	$1,715	$1,159	$1,997,583	$1,349,495
2019		$0	$75,000	$48,719	$110,984	$72,093	$249,747	$162,231	$1,459,608	$948,134	$100,000	$64,958	$1,712	$1,112	$1,997,051	$1,297,246
2020		$0	$75,000	$46,845	$110,790	$69,199	$249,413	$155,783	$1,459,608	$911,667	$100,000	$62,460	$1,709	$1,068	$1,996,520	$1,247,021
2021		$0	$75,000	$45,043	$110,595	$66,421	$249,079	$149,591	$1,459,608	$876,603	$100,000	$60,057	$1,706	$1,025	$1,995,989	$1,198,739
2022		$0	$75,000	$43,311	$110,401	$63,754	$248,746	$143,644	$1,459,608	$842,887	$100,000	$57,748	$1,703	$984	$1,995,458	$1,152,327
2023		$0	$75,000	$41,645	$110,207	$61,194	$248,412	$137,934	$1,459,608	$810,469	$100,000	$55,526	$1,700	$944	$1,994,928	$1,107,712
2024		$0	$75,000	$40,043	$110,014	$58,737	$248,078	$132,451	$1,459,608	$779,297	$100,000	$53,391	$1,697	$906	$1,994,397	$1,064,825
2025		$0	$75,000	$38,503	$109,820	$56,379	$247,744	$127,185	$1,459,608	$749,324	$100,000	$51,337	$1,694	$870	$1,993,867	$1,023,598
2026		$0	$75,000	$37,022	$109,627	$54,115	$247,410	$122,129	$1,459,608	$720,504	$100,000	$49,363	$1,691	$835	$1,993,337	$983,967
2027		$0	$75,000	$35,598	$109,434	$51,942	$247,077	$117,273	$1,459,608	$692,792	$100,000	$47,464	$1,688	$801	$1,992,807	$945,871
2028		$0	$75,000	$34,229	$109,241	$49,856	$246,743	$112,610	$1,459,608	$666,146	$100,000	$45,639	$1,685	$769	$1,992,277	$909,249
2029		$0	$75,000	$32,913	$109,048	$47,854	$246,409	$108,133	$1,459,608	$640,525	$100,000	$43,883	$1,682	$738	$1,991,747	$874,046
2030		$0	$75,000	$31,647	$108,855	$45,932	$246,075	$103,833	$1,459,608	$615,889	$100,000	$42,196	$1,679	$709	$1,991,218	$840,205
2031		$0	$75,000	$30,429	$108,942	$44,200	$246,225	$99,900	$1,459,608	$592,201	$100,000	$40,573	$1,681	$682	$1,991,455	$807,986
2032		$0	$75,000	$29,259	$109,028	$42,534	$246,375	$96,116	$1,459,608	$569,424	$100,000	$39,012	$1,682	$656	$1,991,693	$777,002
2033		$0	$75,000	$28,134	$109,114	$40,931	$246,524	$92,475	$1,459,608	$547,523	$100,000	$37,512	$1,683	$632	$1,991,930	$747,207
2034		$0	$75,000	$27,052	$109,201	$39,388	$246,674	$88,973	$1,459,608	$526,465	$100,000	$36,069	$1,685	$608	$1,992,168	$718,554
2035		$0	$75,000	$26,011	$109,288	$37,903	$246,824	$85,603	$1,459,608	$506,216	$100,000	$34,682	$1,686	$585	$1,992,406	$690,999
2036		$0	$75,000	$25,011	$109,374	$36,474	$246,974	$82,360	$1,459,608	$486,746	$100,000	$33,348	$1,687	$563	$1,992,643	$664,502
2037		$0	$75,000	$24,049	$109,461	$35,099	$247,123	$79,240	$1,459,608	$468,025	$100,000	$32,065	$1,689	$542	$1,992,881	$639,020
2038		$0	$75,000	$23,124	$109,547	$33,776	$247,273	$76,239	$1,459,608	$450,024	$100,000	$30,832	$1,690	$521	$1,993,119	$614,516
2039		$0	$75,000	$22,235	$109,634	$32,502	$247,423	$73,351	$1,459,608	$432,716	$100,000	$29,646	$1,691	$501	$1,993,357	$590,951
2040		$0	$75,000	$21,379	$109,721	$31,277	$247,573	$70,573	$1,459,608	$416,073	$100,000	$28,506	$1,693	$483	$1,993,594	$568,290
2041		$0	$75,000	$20,557	$109,808	$30,098	$247,723	$67,899	$1,459,608	$400,070	$100,000	$27,409	$1,694	$464	$1,993,832	$546,498
2042		$0	$75,000	$19,766	$109,894	$28,963	$247,872	$65,327	$1,459,608	$384,683	$100,000	$26,355	$1,696	$447	$1,994,070	$525,541
2043		$0	$75,000	$19,006	$109,981	$27,871	$248,022	$62,853	$1,459,608	$369,887	$100,000	$25,342	$1,697	$430	$1,994,308	$505,389
2044		$0	$75,000	$18,275	$110,068	$26,820	$248,172	$60,472	$1,459,608	$355,661	$100,000	$24,367	$1,698	$414	$1,994,546	$486,008
2045		$0	$75,000	$17,572	$110,155	$25,809	$248,322	$58,181	$1,459,608	$341,982	$100,000	$23,430	$1,700	$398	$1,994,784	$467,372
2046		$0	$75,000	$16,896	$109,950	$24,770	$247,968	$55,864	$1,459,608	$328,828	$100,000	$22,529	$1,696	$382	$1,994,222	$449,269
2047		$0	$75,000	$16,247	$109,745	$23,773	$247,614	$53,638	$1,459,608	$316,181	$100,000	$21,662	$1,693	$367	$1,993,661	$431,868
2048		$0	$75,000	$15,622	$109,540	$22,816	$247,261	$51,502	$1,459,608	$304,020	$100,000	$20,829	$1,690	$352	$1,993,099	$415,141
2049		$0	$75,000	$15,021	$109,336	$21,898	$246,907	$49,450	$1,459,608	$292,327	$100,000	$20,028	$1,687	$338	$1,992,538	$399,061
2050		$0	$75,000	$14,443	$109,131	$21,016	$246,554	$47,480	$1,459,608	$281,084	$100,000	$19,257	$1,684	$324	$1,991,977	$383,605
2051		$0	$75,000	$13,888	$108,927	$20,170	$246,200	$45,588	$1,459,608	$270,273	$100,000	$18,517	$1,681	$311	$1,991,416	$368,747
2052		$0	$75,000	$13,353	$108,723	$19,358	$245,847	$43,772	$1,459,608	$259,878	$100,000	$17,805	$1,677	$299	$1,990,855	$354,465
2053		$0	$75,000	$12,840	$108,520	$18,578	$245,493	$42,028	$1,459,608	$249,883	$100,000	$17,120	$1,674	$287	$1,990,295	$340,735
2054		$0	$75,000	$12,346	$108,316	$17,830	$245,139	$40,353	$1,459,608	$240,272	$100,000	$16,461	$1,671	$275	$1,989,735	$327,538
2055		$0	$75,000	$11,871	$108,113	$17,112	$244,786	$38,745	$1,459,608	$231,030	$100,000	$15,828	$1,668	$264	$1,989,175	$314,852
2056		$0	$75,000	$11,415	$107,910	$16,423	$244,432	$37,201	$1,459,608	$222,145	$100,000	$15,219	$1,665	$253	$1,988,615	$302,657
2057		$0	$75,000	$10,976	$107,707	$15,762	$244,079	$35,719	$1,459,608	$213,601	$100,000	$14,634	$1,662	$243	$1,988,055	$290,934
2058		$0	$75,000	$10,553	$107,504	$15,127	$243,725	$34,295	$1,459,608	$205,385	$100,000	$14,071	$1,659	$233	$1,987,496	$279,666
2059		$0	$75,000	$10,148	$107,301	$14,518	$243,372	$32,928	$1,459,608	$197,486	$100,000	$13,530	$1,656	$224	$1,986,936	$268,834
2060		$0	$75,000	$9,757	$107,099	$13,933	$243,018	$31,616	$1,459,608	$189,890	$100,000	$13,010	$1,652	$215	$1,986,377	$258,421
2061		$0	$75,000	$9,382	$106,897	$13,372	$242,665	$30,356	$1,459,608	$182,587	$100,000	$12,509	$1,649	$206	$1,985,819	$248,412
2062		$0	$75,000	$9,021	$106,695	$12,833	$242,311	$29,146	$1,459,608	$175,564	$100,000	$12,028	$1,646	$198	$1,985,260	$238,790
2063		$0	$75,000	$8,674	$106,493	$12,316	$241,957	$27,984	$1,459,608	$168,812	$100,000	$11,566	$1,643	$190	$1,984,701	$229,542
2064		$0	$75,000	$8,341	$106,291	$11,820	$241,604	$26,868	$1,459,608	$162,319	$100,000	$11,121	$1,640	$182	$1,984,143	$220,651
2065		$0	$75,000	$8,020	$106,090	$11,344	$241,250	$25,797	$1,459,608	$156,076	$100,000	$10,693	$1,637	$175	$1,983,585	$212,105
Total Capital =	$145,960,800															
Total Net Present Value =		$115,354,940		$1,281,346		$1,875,700		$4,231,594		$24,936,837		$1,708,461		$28,939		**$149,417,818**

CLOVER POINT WET-WEATHER TF ASSUMPTIONS

Labour:

number of facility manager(s) =	0	
number of operations staff =	0.5	
number of maintenance staff =	0.5	
number of administration staff =	0	
total staff =	1	persons

Wet-Weather CEPT Chemicals:

fraction of total annual ADWF treated = 25.0%

Ref: Allowance to account for potential costs.

Notes:
1. Excludes dry-weather flow forcemain. Included in CS Mods LCA.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 18, 2008
Last Revision By: D. Shiskowski

Subject: Outfalls (Saanich East, Royal Bay, Macaulay / McLoughlin, Ogden, Juan de Fuca and Clover)
Option 2
Life Cycle Analysis

Yellow-shaded cell denotes assumed/input values

Year	Capital Costs		Maintenance		Total	
	Total Cost	Value	Annual Cost	Value	Annual Cost	Value
2008						
2009						
2010						
2011						
2012						
2013						
2014	$54,345,720	$42,950,212			$54,345,720	$42,950,212
2015		$0	$135,864	$103,246	$135,864	$103,246
2016		$0	$135,864	$99,275	$135,864	$99,275
2017		$0	$135,864	$95,456	$135,864	$95,456
2018		$0	$135,864	$91,785	$135,864	$91,785
2019		$0	$135,864	$88,255	$135,864	$88,255
2020		$0	$135,864	$84,860	$135,864	$84,860
2021		$0	$135,864	$81,597	$135,864	$81,597
2022		$0	$135,864	$78,458	$135,864	$78,458
2023		$0	$135,864	$75,441	$135,864	$75,441
2024		$0	$135,864	$72,539	$135,864	$72,539
2025		$0	$135,864	$69,749	$135,864	$69,749
2026		$0	$135,864	$67,066	$135,864	$67,066
2027		$0	$135,864	$64,487	$135,864	$64,487
2028		$0	$135,864	$62,007	$135,864	$62,007
2029		$0	$135,864	$59,622	$135,864	$59,622
2030		$0	$135,864	$57,329	$135,864	$57,329
2031		$0	$135,864	$55,124	$135,864	$55,124
2032		$0	$135,864	$53,004	$135,864	$53,004
2033		$0	$135,864	$50,965	$135,864	$50,965
2034		$0	$135,864	$49,005	$135,864	$49,005
2035		$0	$135,864	$47,120	$135,864	$47,120
2036		$0	$135,864	$45,308	$135,864	$45,308
2037		$0	$135,864	$43,565	$135,864	$43,565
2038		$0	$135,864	$41,890	$135,864	$41,890
2039		$0	$135,864	$40,278	$135,864	$40,278
2040		$0	$135,864	$38,729	$135,864	$38,729
2041		$0	$135,864	$37,240	$135,864	$37,240
2042		$0	$135,864	$35,807	$135,864	$35,807
2043		$0	$135,864	$34,430	$135,864	$34,430
2044		$0	$135,864	$33,106	$135,864	$33,106
2045		$0	$135,864	$31,833	$135,864	$31,833
2046		$0	$135,864	$30,608	$135,864	$30,608
2047		$0	$135,864	$29,431	$135,864	$29,431
2048		$0	$135,864	$28,299	$135,864	$28,299
2049		$0	$135,864	$27,211	$135,864	$27,211
2050		$0	$135,864	$26,164	$135,864	$26,164
2051		$0	$135,864	$25,158	$135,864	$25,158
2052		$0	$135,864	$24,190	$135,864	$24,190
2053		$0	$135,864	$23,260	$135,864	$23,260
2054		$0	$135,864	$22,365	$135,864	$22,365
2055		$0	$135,864	$21,505	$135,864	$21,505
2056		$0	$135,864	$20,678	$135,864	$20,678
2057		$0	$135,864	$19,883	$135,864	$19,883
2058		$0	$135,864	$19,118	$135,864	$19,118
2059		$0	$135,864	$18,383	$135,864	$18,383
2060		$0	$135,864	$17,676	$135,864	$17,676
2061		$0	$135,864	$16,996	$135,864	$16,996
2062		$0	$135,864	$16,342	$135,864	$16,342
2063		$0	$135,864	$15,713	$135,864	$15,713
2064		$0	$135,864	$15,109	$135,864	$15,109
2065		$0	$135,864	$14,528	$135,864	$14,528
Total Capital =	$54,345,720					
Total Net Present Value =		$42,950,212		$2,321,189		**$45,271,401**

Notes:

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 18, 2009
Last Revision By: D. Shiskowski

Subject: Conveyance System Modifications

Option 2
Life Cycle Analysis

Yellow-shaded cell denotes assumed/input values

Year	Capital Costs[1]		Maintenance		Total	
	Total Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value
2008						
2009						
2010						
2011						
2012						
2013						
2014	$120,302,520	$95,076,829			$120,302,520	$95,076,829
2015		$0	$300,756	$228,550	$300,756	$228,550
2016		$0	$300,756	$219,760	$300,756	$219,760
2017		$0	$300,756	$211,307	$300,756	$211,307
2018		$0	$300,756	$203,180	$300,756	$203,180
2019		$0	$300,756	$195,366	$300,756	$195,366
2020		$0	$300,756	$187,851	$300,756	$187,851
2021		$0	$300,756	$180,626	$300,756	$180,626
2022		$0	$300,756	$173,679	$300,756	$173,679
2023		$0	$300,756	$166,999	$300,756	$166,999
2024		$0	$300,756	$160,576	$300,756	$160,576
2025		$0	$300,756	$154,400	$300,756	$154,400
2026		$0	$300,756	$148,462	$300,756	$148,462
2027		$0	$300,756	$142,752	$300,756	$142,752
2028		$0	$300,756	$137,261	$300,756	$137,261
2029		$0	$300,756	$131,982	$300,756	$131,982
2030		$0	$300,756	$126,906	$300,756	$126,906
2031		$0	$300,756	$122,025	$300,756	$122,025
2032		$0	$300,756	$117,331	$300,756	$117,331
2033		$0	$300,756	$112,819	$300,756	$112,819
2034		$0	$300,756	$108,480	$300,756	$108,480
2035		$0	$300,756	$104,307	$300,756	$104,307
2036		$0	$300,756	$100,295	$300,756	$100,295
2037		$0	$300,756	$96,438	$300,756	$96,438
2038		$0	$300,756	$92,729	$300,756	$92,729
2039		$0	$300,756	$89,162	$300,756	$89,162
2040		$0	$300,756	$85,733	$300,756	$85,733
2041		$0	$300,756	$82,436	$300,756	$82,436
2042		$0	$300,756	$79,265	$300,756	$79,265
2043		$0	$300,756	$76,216	$300,756	$76,216
2044		$0	$300,756	$73,285	$300,756	$73,285
2045		$0	$300,756	$70,466	$300,756	$70,466
2046		$0	$300,756	$67,756	$300,756	$67,756
2047		$0	$300,756	$65,150	$300,756	$65,150
2048		$0	$300,756	$62,644	$300,756	$62,644
2049		$0	$300,756	$60,235	$300,756	$60,235
2050		$0	$300,756	$57,918	$300,756	$57,918
2051		$0	$300,756	$55,691	$300,756	$55,691
2052		$0	$300,756	$53,549	$300,756	$53,549
2053		$0	$300,756	$51,489	$300,756	$51,489
2054		$0	$300,756	$49,509	$300,756	$49,509
2055		$0	$300,756	$47,604	$300,756	$47,604
2056		$0	$300,756	$45,774	$300,756	$45,774
2057		$0	$300,756	$44,013	$300,756	$44,013
2058		$0	$300,756	$42,320	$300,756	$42,320
2059		$0	$300,756	$40,693	$300,756	$40,693
2060		$0	$300,756	$39,127	$300,756	$39,127
2061		$0	$300,756	$37,623	$300,756	$37,623
2062		$0	$300,756	$36,175	$300,756	$36,175
2063		$0	$300,756	$34,784	$300,756	$34,784
2064		$0	$300,756	$33,446	$300,756	$33,446
2065		$0	$300,756	$32,160	$300,756	$32,160
Total Capital =	$120,302,520					
Total Net Present Value =		$95,076,829		$5,138,305		**$100,215,134**

Notes:
1. Includes dry-weather Clover Point forcemain and plant-related convenyance for Odgen and Macaulay / McLoughlin WWTFs.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 7, 2009
Last Revision By: D. Shiskowski

Subject: Existing Trunk Sewer System

Option 2
Life Cycle Analysis

Yellow-shaded cell denotes assumed/input values

Year	Operation and Maintenance		Total	
	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value
2008				
2009				
2010				
2011				
2012				
2013				
2014				
2015	$4,763,435	$3,619,819	$4,763,435	$3,619,819
2016	$4,787,252	$3,497,998	$4,787,252	$3,497,998
2017	$4,811,189	$3,380,277	$4,811,189	$3,380,277
2018	$4,835,245	$3,266,518	$4,835,245	$3,266,518
2019	$4,859,421	$3,156,587	$4,859,421	$3,156,587
2020	$4,883,718	$3,050,356	$4,883,718	$3,050,356
2021	$4,908,137	$2,947,700	$4,908,137	$2,947,700
2022	$4,932,677	$2,848,498	$4,932,677	$2,848,498
2023	$4,957,341	$2,752,635	$4,957,341	$2,752,635
2024	$4,982,127	$2,659,998	$4,982,127	$2,659,998
2025	$5,007,038	$2,570,479	$5,007,038	$2,570,479
2026	$5,032,073	$2,483,973	$5,032,073	$2,483,973
2027	$5,057,233	$2,400,378	$5,057,233	$2,400,378
2028	$5,082,520	$2,319,596	$5,082,520	$2,319,596
2029	$5,107,932	$2,241,532	$5,107,932	$2,241,532
2030	$5,133,472	$2,166,096	$5,133,472	$2,166,096
2031	$5,159,139	$2,093,199	$5,159,139	$2,093,199
2032	$5,184,935	$2,022,754	$5,184,935	$2,022,754
2033	$5,210,860	$1,954,681	$5,210,860	$1,954,681
2034	$5,236,914	$1,888,898	$5,236,914	$1,888,898
2035	$5,263,099	$1,825,330	$5,263,099	$1,825,330
2036	$5,289,414	$1,763,900	$5,289,414	$1,763,900
2037	$5,315,861	$1,704,538	$5,315,861	$1,704,538
2038	$5,342,440	$1,647,174	$5,342,440	$1,647,174
2039	$5,369,153	$1,591,740	$5,369,153	$1,591,740
2040	$5,395,998	$1,538,172	$5,395,998	$1,538,172
2041	$5,422,978	$1,486,407	$5,422,978	$1,486,407
2042	$5,450,093	$1,436,383	$5,450,093	$1,436,383
2043	$5,477,344	$1,388,044	$5,477,344	$1,388,044
2044	$5,504,730	$1,341,331	$5,504,730	$1,341,331
2045	$5,532,254	$1,296,190	$5,532,254	$1,296,190
2046	$5,559,915	$1,252,568	$5,559,915	$1,252,568
2047	$5,587,715	$1,210,414	$5,587,715	$1,210,414
2048	$5,615,653	$1,169,679	$5,615,653	$1,169,679
2049	$5,643,732	$1,130,315	$5,643,732	$1,130,315
2050	$5,671,950	$1,092,275	$5,671,950	$1,092,275
2051	$5,700,310	$1,055,516	$5,700,310	$1,055,516
2052	$5,728,812	$1,019,994	$5,728,812	$1,019,994
2053	$5,757,456	$985,667	$5,757,456	$985,667
2054	$5,786,243	$952,496	$5,786,243	$952,496
2055	$5,815,174	$920,441	$5,815,174	$920,441
2056	$5,844,250	$889,464	$5,844,250	$889,464
2057	$5,873,471	$859,530	$5,873,471	$859,530
2058	$5,902,839	$830,604	$5,902,839	$830,604
2059	$5,932,353	$802,651	$5,932,353	$802,651
2060	$5,962,015	$775,639	$5,962,015	$775,639
2061	$5,991,825	$749,535	$5,991,825	$749,535
2062	$6,021,784	$724,311	$6,021,784	$724,311
2063	$6,051,893	$699,935	$6,051,893	$699,935
2064	$6,082,152	$676,379	$6,082,152	$676,379
2065	$6,112,563	$653,617	$6,112,563	$653,617
Total Capital =				
Total Net Present Value =		$88,792,213		**$88,792,213**

Notes:

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski, D. Forgie
Last Revision: February 7, 2009
Last Revision By: D. Shiskowski

Subject: Combined Macaulay/McLoughln WWTF Solids Processing Systems, Hartland Biosolids Drying Facility, and Industrial Biosolids Land Application / Willow Coppice Program
Option 2
Material Flows
and GHG Emissions

Note: **Coloured cells contain data linked to external spreadsheets**

Year	Materials											GHG Sources				GHG Offsets		Total GHG Emissions
	Electricity		Biogas (WW Sludges)			Biomethane (WW Sludges)	Diesel Fuel		Willow Coppice	Natural Gas	Dried WW Biosolids	Electricity Purchased[4]	Biogas Lost	Natural Gas Combusted	Diesel Fuel Combusted	Avoided Natural Gas Use via Biomethane	Avoided Coal Use via Dried WW Biosolids	
	WW Sludges (kWh/yr)	Total (kWh/yr)	Boiler (m3/yr)	for Biomethane (m3/yr)	System Loss (m3/yr)	Available for Sale (GJ/yr)	WW Sludges[1] (L/yr)	Total (L/yr)	(odt/yr)	WW Sludges (GJ/yr)	(dry t/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)
2008																		
2009																		
2010																		
2011																		
2012																		
2013																		
2014																		
2015																		
2016	1,558,100	1,558,100	2,369,141	1,681,970	40,511	37,299	78,428	78,428	0	21,400	2,416	112	401	1,204	216	-2,098	-3,466	-3,631
2017	1,570,600	1,570,600	2,393,156	1,717,658	41,108	38,091	78,558	78,558	0	21,720	2,452	113	407	1,222	217	-2,142	-3,517	-3,702
2018	1,582,900	1,582,900	2,417,172	1,753,346	41,705	38,882	71,744	71,744	3,720	22,030	2,488	114	413	1,239	198	-2,187	-3,568	-3,792
2019	1,595,300	1,595,300	2,441,187	1,789,035	42,302	39,674	75,649	75,649	3,720	22,350	2,523	115	419	1,257	209	-2,231	-3,620	-3,852
2020	1,607,800	1,607,800	2,465,203	1,824,723	42,899	40,465	75,779	75,779	3,720	22,660	2,559	116	425	1,275	209	-2,276	-3,671	-3,923
2021	1,620,100	1,620,100	2,489,218	1,860,411	43,496	41,256	75,909	75,909	3,720	22,980	2,595	117	430	1,293	209	-2,320	-3,722	-3,993
2022	1,632,500	1,632,500	2,513,234	1,896,099	44,093	42,048	76,044	76,044	3,720	23,290	2,630	118	436	1,310	210	-2,365	-3,773	-4,064
2023	1,644,900	1,644,900	2,537,249	1,931,787	44,690	42,839	76,174	76,174	3,720	23,610	2,666	118	442	1,328	210	-2,409	-3,824	-4,135
2024	1,657,300	1,657,300	2,561,265	1,967,475	45,287	43,631	80,074	80,074	3,720	23,920	2,701	119	448	1,345	221	-2,454	-3,875	-4,195
2025	1,669,700	1,669,700	2,585,280	2,003,164	45,884	44,422	80,209	80,209	3,720	24,240	2,737	120	454	1,363	221	-2,499	-3,926	-4,266
2026	1,682,100	1,682,100	2,609,296	2,038,852	46,481	45,214	80,339	80,339	3,720	24,550	2,773	121	460	1,381	221	-2,543	-3,977	-4,337
2027	1,694,500	1,694,500	2,633,311	2,074,540	47,079	46,005	80,469	80,469	3,720	24,870	2,808	122	466	1,399	222	-2,588	-4,028	-4,407
2028	1,706,800	1,706,800	2,657,327	2,110,228	47,676	46,796	80,604	80,604	3,720	25,180	2,844	123	472	1,416	222	-2,632	-4,079	-4,478
2029	1,719,300	1,719,300	2,681,342	2,145,916	48,273	47,588	80,734	80,734	3,720	25,500	2,879	124	478	1,434	223	-2,677	-4,130	-4,549
2030	1,731,700	1,731,700	2,705,357	2,181,604	48,870	48,379	84,634	84,634	3,720	25,810	2,915	125	484	1,452	233	-2,721	-4,181	-4,609
2031	1,741,900	1,741,900	2,729,373	2,208,492	49,379	48,976	84,749	84,749	3,720	26,080	2,945	125	489	1,467	234	-2,755	-4,225	-4,665
2032	1,752,200	1,752,200	2,753,388	2,235,379	49,888	49,572	88,059	88,059	3,720	26,350	2,976	126	494	1,482	243	-2,788	-4,269	-4,712
2033	1,762,400	1,762,400	2,777,404	2,262,267	50,397	50,168	88,169	88,169	3,720	26,620	3,006	127	499	1,497	243	-2,822	-4,312	-4,768
2034	1,772,600	1,772,600	2,801,419	2,289,155	50,906	50,764	88,284	88,284	3,720	26,890	3,036	128	504	1,512	243	-2,855	-4,356	-4,824
2035	1,782,800	1,782,800	2,825,435	2,316,042	51,415	51,361	88,394	88,394	3,720	27,160	3,067	128	509	1,528	244	-2,889	-4,399	-4,880
2036	1,793,200	1,793,200	2,849,450	2,342,930	51,924	51,957	101,642	101,642	4,368	27,430	3,097	129	514	1,543	280	-2,922	-4,443	-4,899
2037	1,803,400	1,803,400	2,873,466	2,369,817	52,433	52,553	101,752	101,752	4,368	27,700	3,128	130	519	1,558	280	-2,956	-4,486	-4,955
2038	1,813,600	1,813,600	2,897,481	2,396,705	52,942	53,149	101,867	101,867	4,368	27,970	3,158	131	524	1,573	281	-2,989	-4,530	-5,011
2039	1,823,900	1,823,900	2,921,497	2,423,592	53,451	53,746	93,824	93,824	4,368	28,230	3,188	131	529	1,588	259	-3,023	-4,573	-5,090
2040	1,834,100	1,834,100	2,945,512	2,450,480	53,960	54,342	93,934	93,934	4,368	28,500	3,219	132	534	1,603	259	-3,056	-4,617	-5,145
2041	1,844,400	1,844,400	2,969,528	2,477,367	54,469	54,938	94,049	94,049	4,368	28,770	3,249	133	539	1,618	259	-3,090	-4,661	-5,201
2042	1,854,600	1,854,600	2,993,543	2,504,255	54,978	55,534	97,929	97,929	4,368	29,040	3,279	134	544	1,633	270	-3,124	-4,704	-5,247
2043	1,864,900	1,864,900	3,017,559	2,531,142	55,487	56,131	98,044	98,044	4,368	29,310	3,310	134	549	1,649	270	-3,157	-4,748	-5,303
2044	1,875,100	1,875,100	3,041,574	2,558,030	55,996	56,727	98,154	98,154	4,368	29,580	3,340	135	554	1,664	271	-3,191	-4,791	-5,358
2045	1,885,300	1,885,300	3,065,590	2,584,917	56,505	57,323	98,269	98,269	4,368	29,850	3,370	136	559	1,679	271	-3,224	-4,835	-5,414
2046	1,892,600	1,892,600	3,089,605	2,599,571	56,892	57,648	98,354	98,354	4,368	30,050	3,394	136	563	1,690	271	-3,242	-4,868	-5,450
2047	1,899,900	1,899,900	3,113,620	2,614,225	57,278	57,973	98,439	98,439	4,368	30,260	3,417	137	567	1,702	271	-3,261	-4,901	-5,485
2048	1,907,100	1,907,100	3,137,636	2,628,879	57,665	58,298	98,524	98,524	4,368	30,460	3,440	137	571	1,713	272	-3,279	-4,934	-5,520
2049	1,914,400	1,914,400	3,161,651	2,643,533	58,052	58,623	102,379	102,379	4,368	30,660	3,463	138	575	1,724	282	-3,297	-4,967	-5,545
2050	1,921,700	1,921,700	3,185,667	2,658,187	58,439	58,948	102,464	102,464	4,368	30,870	3,486	138	578	1,736	282	-3,316	-5,000	-5,580
2051	1,928,900	1,928,900	3,209,682	2,672,841	58,825	59,273	102,549	102,549	4,368	31,070	3,509	139	582	1,748	283	-3,334	-5,033	-5,616
2052	1,936,100	1,936,100	3,233,698	2,687,495	59,212	59,598	102,634	102,634	4,368	31,280	3,532	139	586	1,759	283	-3,352	-5,066	-5,651
2053	1,943,500	1,943,500	3,257,713	2,702,149	59,599	59,923	102,719	102,719	4,368	31,480	3,555	140	590	1,771	283	-3,370	-5,100	-5,686
2054	1,950,700	1,950,700	3,281,729	2,716,803	59,985	60,248	102,804	102,804	4,368	31,690	3,578	140	594	1,782	283	-3,389	-5,133	-5,721
2055	1,958,000	1,958,000	3,305,744	2,731,457	60,372	60,573	102,889	102,889	4,368	31,890	3,601	141	597	1,794	284	-3,407	-5,166	-5,757
2056	1,965,200	1,965,200	3,329,760	2,746,111	60,759	60,898	102,974	102,974	4,368	32,090	3,624	141	601	1,805	284	-3,425	-5,199	-5,792
2057	1,972,400	1,972,400	3,353,775	2,760,765	61,145	61,223	112,825	112,825	4,800	32,300	3,647	142	605	1,817	311	-3,443	-5,232	-5,800
2058	1,979,700	1,979,700	3,377,791	2,775,419	61,532	61,548	116,680	116,680	4,800	32,500	3,670	143	609	1,828	322	-3,462	-5,265	-5,826
2059	1,987,000	1,987,000	3,401,806	2,790,073	61,919	61,873	116,765	116,765	4,800	32,710	3,693	143	613	1,840	322	-3,480	-5,298	-5,861
2060	1,994,200	1,994,200	3,425,822	2,804,727	62,305	62,198	107,890	107,890	4,800	32,910	3,716	144	617	1,851	297	-3,498	-5,331	-5,921
2061	2,001,500	2,001,500	3,449,837	2,819,381	62,692	62,523	107,975	107,975	4,800	33,110	3,740	144	620	1,862	298	-3,517	-5,364	-5,956
2062	2,008,800	2,008,800	3,473,853	2,834,035	63,079	62,848	108,060	108,060	4,800	33,320	3,763	145	624	1,874	298	-3,535	-5,397	-5,991
2063	2,016,000	2,016,000	3,497,868	2,848,689	63,466	63,173	108,145	108,145	4,800	33,520	3,786	145	628	1,885	298	-3,553	-5,430	-6,027
2064	2,023,300	2,023,300	3,521,884	2,863,343	63,852	63,497	108,230	108,230	4,800	33,730	3,809	146	632	1,897	298	-3,571	-5,463	-6,062
2065	2,030,500	2,030,500	3,545,899	2,877,997	64,239	63,822	108,315	108,315	4,800	33,930	3,832	146	636	1,908	299	-3,590	-5,497	-6,097
Totals =	91,109,500	91,109,500	147,875,996	119,703,060	2,675,791	2,654,535	4,704,074	4,704,074	201,888	1,413,420	159,609	6,560	26,482	79,497	12,968	-149,303	-228,952	**-252,749**

Notes:
1. Includes transport of biosolids to land application site plus actual land application and coppice equipment.

3. Assumes that land applied biosolids are not off-setting commercial fertilizer use.
4. Negative values imply an off-set and are considered as an offset in the analysis.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski, D. Forgie
Last Revision: **February 18, 2009**
Last Revision By: D. Shiskowski

Subject: Combined Macaulay/McLoughln WWTF Solids Processing Systems, Hartland Biosolids Drying Facility, and Industrial Biosolids Land Application / Willow Coppice Program
Option 2
Life-Cycle Analysis

Yellow-shaded cell denotes assumed/input values
Note: Other coloured cells contain data linked to external spreadsheets

Year	Capital Costs			Operations & Maintenance Costs: Labour			Electricity		Natural Gas	
	WW Sludges[5]	**Total** Cost	Net Present Value	**WW Sludges[1]** Annual Cost	**Total** Annual Cost	Net Present Value	**Total** Annual Cost	Net Present Value	**Total** Annual Cost	Net Present Value
2008										
2009										
2010										
2011										
2012										
2013										
2014										
2015	$173,717,100	$173,717,100	$132,010,719							
2016		$0	$0	$1,085,769	$1,085,769	$793,361	$109,067	$79,694	$214,000	$156,368
2017		$0	$0	$1,085,769	$1,085,769	$762,847	$109,942	$77,244	$217,200	$152,602
2018		$0	$0	$1,067,885	$1,067,885	$721,425	$110,803	$74,855	$220,300	$148,827
2019		$0	$0	$1,067,885	$1,067,885	$693,677	$111,671	$72,539	$223,500	$145,181
2020		$0	$0	$1,067,885	$1,067,885	$666,998	$112,546	$70,296	$226,600	$141,534
2021		$0	$0	$1,067,885	$1,067,885	$641,344	$113,407	$68,109	$229,800	$138,012
2022		$0	$0	$1,067,885	$1,067,885	$616,677	$114,275	$65,991	$232,900	$134,494
2023		$0	$0	$1,067,885	$1,067,885	$592,958	$115,143	$63,935	$236,100	$131,098
2024		$0	$0	$1,067,885	$1,067,885	$570,152	$116,011	$61,939	$239,200	$127,711
2025		$0	$0	$1,067,885	$1,067,885	$548,223	$116,879	$60,003	$242,400	$124,442
2026		$0	$0	$1,067,885	$1,067,885	$527,138	$117,747	$58,123	$245,500	$121,186
2027		$0	$0	$1,067,885	$1,067,885	$506,863	$118,615	$56,300	$248,700	$118,044
2028		$0	$0	$1,067,885	$1,067,885	$487,369	$119,476	$54,527	$251,800	$114,918
2029		$0	$0	$1,067,885	$1,067,885	$468,624	$120,351	$52,814	$255,000	$111,903
2030		$0	$0	$1,067,885	$1,067,885	$450,600	$121,219	$51,149	$258,100	$108,907
2031		$0	$0	$1,067,885	$1,067,885	$433,269	$121,933	$49,471	$260,800	$105,813
2032		$0	$0	$1,067,885	$1,067,885	$416,605	$122,654	$47,850	$263,500	$102,797
2033		$0	$0	$1,067,885	$1,067,885	$400,581	$123,368	$46,277	$266,200	$99,856
2034		$0	$0	$1,067,885	$1,067,885	$385,174	$124,082	$44,755	$268,900	$96,989
2035		$0	$0	$1,067,885	$1,067,885	$370,360	$124,796	$43,281	$271,600	$94,195
2036		$0	$0	$1,092,000	$1,092,000	$364,157	$125,524	$41,859	$274,300	$91,473
2037		$0	$0	$1,092,000	$1,092,000	$350,151	$126,238	$40,478	$277,000	$88,820
2038		$0	$0	$1,092,000	$1,092,000	$336,684	$126,952	$39,142	$279,700	$86,237
2039		$0	$0	$1,071,000	$1,071,000	$317,509	$127,673	$37,850	$282,300	$83,691
2040		$0	$0	$1,071,000	$1,071,000	$305,297	$128,387	$36,598	$285,000	$81,242
2041		$0	$0	$1,071,000	$1,071,000	$293,555	$129,108	$35,388	$287,700	$78,857
2042		$0	$0	$1,071,000	$1,071,000	$282,264	$129,822	$34,215	$290,400	$76,536
2043		$0	$0	$1,071,000	$1,071,000	$271,408	$130,543	$33,082	$293,100	$74,276
2044		$0	$0	$1,071,000	$1,071,000	$260,969	$131,257	$31,983	$295,800	$72,077
2045		$0	$0	$1,071,000	$1,071,000	$250,932	$131,971	$30,920	$298,500	$69,938
2046		$0	$0	$1,071,000	$1,071,000	$241,281	$132,482	$29,846	$300,500	$67,698
2047		$0	$0	$1,071,000	$1,071,000	$232,001	$132,993	$28,809	$302,600	$65,549
2048		$0	$0	$1,071,000	$1,071,000	$223,078	$133,497	$27,806	$304,600	$63,445
2049		$0	$0	$1,071,000	$1,071,000	$214,498	$134,008	$26,839	$306,600	$61,405
2050		$0	$0	$1,071,000	$1,071,000	$206,248	$134,519	$25,905	$308,700	$59,448
2051		$0	$0	$1,071,000	$1,071,000	$198,315	$135,023	$25,002	$310,700	$57,532
2052		$0	$0	$1,071,000	$1,071,000	$190,688	$135,527	$24,130	$312,800	$55,693
2053		$0	$0	$1,071,000	$1,071,000	$183,353	$136,045	$23,291	$314,800	$53,893
2054		$0	$0	$1,071,000	$1,071,000	$176,301	$136,549	$22,478	$316,900	$52,166
2055		$0	$0	$1,071,000	$1,071,000	$169,521	$137,060	$21,694	$318,900	$50,476
2056		$0	$0	$1,071,000	$1,071,000	$163,001	$137,564	$20,937	$320,900	$48,839
2057		$0	$0	$1,096,154	$1,096,154	$160,412	$138,068	$20,205	$323,000	$47,268
2058		$0	$0	$1,096,154	$1,096,154	$154,243	$138,579	$19,500	$325,000	$45,732
2059		$0	$0	$1,096,154	$1,096,154	$148,310	$139,090	$18,819	$327,100	$44,257
2060		$0	$0	$1,073,077	$1,073,077	$139,604	$139,594	$18,161	$329,100	$42,815
2061		$0	$0	$1,073,077	$1,073,077	$134,234	$140,105	$17,526	$331,100	$41,418
2062		$0	$0	$1,073,077	$1,073,077	$129,072	$140,616	$16,914	$333,200	$40,078
2063		$0	$0	$1,073,077	$1,073,077	$124,107	$141,120	$16,321	$335,200	$38,768
2064		$0	$0	$1,073,077	$1,073,077	$119,334	$141,631	$15,750	$337,300	$37,510
2065		$0	$0	$1,073,077	$1,073,077	$114,744	$142,135	$15,198	$339,300	$36,281
Total Capital =	$173,717,100	$173,717,100								
Total Net Present Value =			$132,010,719			$17,509,516		$1,995,799		$4,288,293

Year	Chemicals			Trucking/Equipment[3]			Land Lease for Willow Coppice		Maintenance	
	WW Sludges Annual Cost	**Total** Annual Cost	Net Present Value	**WW Sludges[2]** Annual Cost	**Total** Annual Cost	Net Present Value	**Total** Annual Cost	Net Present Value	**Total** Annual Cost	Net Present Value
2016	$423,300	$423,300	$309,301	$849,850	$849,850	$620,977	$153,450	$112,124	$1,737,171	$1,269,334
2017	$429,800	$429,800	$301,972	$852,850	$852,850	$599,201	$153,450	$107,812	$1,737,171	$1,220,513
2018	$436,400	$436,400	$294,816	$594,650	$594,650	$401,724	$153,450	$103,665	$1,737,171	$1,173,570
2019	$441,900	$441,900	$287,050	$608,500	$608,500	$395,270	$153,450	$99,678	$1,737,171	$1,128,433
2020	$448,400	$448,400	$280,069	$611,000	$611,000	$381,629	$153,450	$95,844	$1,737,171	$1,085,032
2021	$455,000	$455,000	$273,261	$614,000	$614,000	$368,752	$153,450	$92,158	$1,737,171	$1,043,300
2022	$460,500	$460,500	$265,927	$617,000	$617,000	$356,302	$153,450	$88,614	$1,737,171	$1,003,173
2023	$467,000	$467,000	$259,309	$620,000	$620,000	$344,264	$153,450	$85,205	$1,737,171	$964,589
2024	$473,600	$473,600	$252,859	$633,450	$633,450	$338,204	$153,450	$81,928	$1,737,171	$927,490
2025	$479,100	$479,100	$245,957	$636,450	$636,450	$326,736	$153,450	$78,777	$1,737,171	$891,817
2026	$485,600	$485,600	$239,706	$639,450	$639,450	$315,651	$153,450	$75,747	$1,737,171	$857,516
2027	$492,200	$492,200	$233,619	$642,450	$642,450	$304,934	$153,450	$72,834	$1,737,171	$824,535
2028	$498,700	$498,700	$227,600	$645,450	$645,450	$294,575	$153,450	$70,033	$1,737,171	$792,822
2029	$504,200	$504,200	$221,260	$647,950	$647,950	$284,342	$153,450	$67,339	$1,737,171	$762,329
2030	$510,800	$510,800	$215,535	$661,750	$661,750	$279,229	$153,450	$64,749	$1,737,171	$733,009
2031	$516,200	$516,200	$209,436	$664,250	$664,250	$269,504	$153,450	$62,259	$1,737,171	$704,816
2032	$521,700	$521,700	$203,526	$723,950	$723,950	$282,428	$153,450	$59,864	$1,737,171	$677,708
2033	$526,100	$526,100	$197,349	$726,450	$726,450	$272,504	$153,450	$57,562	$1,737,171	$651,642
2034	$531,600	$531,600	$191,742	$728,950	$728,950	$262,924	$153,450	$55,348	$1,737,171	$626,579
2035	$537,100	$537,100	$186,275	$731,450	$731,450	$253,679	$153,450	$53,219	$1,737,171	$602,480
2036	$542,500	$542,500	$180,912	$1,054,700	$1,054,700	$351,719	$180,180	$60,086	$1,737,171	$579,307
2037	$548,000	$548,000	$175,717	$1,057,200	$1,057,200	$338,993	$180,180	$57,775	$1,737,171	$557,026
2038	$553,400	$553,400	$170,624	$1,059,200	$1,059,200	$326,571	$180,180	$55,553	$1,737,171	$535,602
2039	$558,900	$558,900	$165,692	$754,900	$754,900	$223,798	$180,180	$53,416	$1,737,171	$515,002
2040	$563,300	$563,300	$160,573	$757,400	$757,400	$215,903	$180,180	$51,362	$1,737,171	$495,194
2041	$568,800	$568,800	$155,905	$759,900	$759,900	$208,284	$180,180	$49,386	$1,737,171	$476,148
2042	$574,200	$574,200	$151,332	$773,250	$773,250	$203,792	$180,180	$47,487	$1,737,171	$457,835
2043	$579,700	$579,700	$146,905	$775,750	$775,750	$196,587	$180,180	$45,660	$1,737,171	$440,226
2044	$585,200	$585,200	$142,595	$778,250	$778,250	$189,635	$180,180	$43,904	$1,737,171	$423,294
2045	$590,600	$590,600	$138,376	$780,750	$780,750	$182,927	$180,180	$42,216	$1,737,171	$407,014
2046	$594,000	$594,000	$133,820	$782,750	$782,750	$176,342	$180,180	$40,592	$1,737,171	$391,359
2047	$598,300	$598,300	$129,604	$784,250	$784,250	$169,885	$180,180	$39,031	$1,737,171	$376,307
2048	$602,600	$602,600	$125,515	$786,250	$786,250	$163,767	$180,180	$37,530	$1,737,171	$361,834
2049	$607,000	$607,000	$121,569	$799,150	$799,150	$160,052	$180,180	$36,086	$1,737,171	$347,917
2050	$610,300	$610,300	$117,528	$801,150	$801,150	$154,281	$180,180	$34,698	$1,737,171	$334,536
2051	$614,700	$614,700	$113,823	$802,650	$802,650	$148,625	$180,180	$33,364	$1,737,171	$321,669
2052	$619,000	$619,000	$110,211	$804,650	$804,650	$143,265	$180,180	$32,080	$1,737,171	$309,297
2053	$622,400	$622,400	$106,554	$806,650	$806,650	$138,097	$180,180	$30,847	$1,737,171	$297,401
2054	$626,700	$626,700	$103,164	$808,650	$808,650	$133,115	$180,180	$29,660	$1,737,171	$285,962
2055	$631,100	$631,100	$99,892	$810,150	$810,150	$128,233	$180,180	$28,519	$1,737,171	$274,964
2056	$634,400	$634,400	$96,552	$812,150	$812,150	$123,605	$180,180	$27,422	$1,737,171	$264,388
2057	$638,800	$638,800	$93,483	$1,153,250	$1,153,250	$168,768	$198,000	$28,976	$1,737,171	$254,220
2058	$643,100	$643,100	$90,492	$1,166,200	$1,166,200	$164,099	$198,000	$27,861	$1,737,171	$244,442
2059	$646,500	$646,500	$87,472	$1,167,700	$1,167,700	$157,991	$198,000	$26,790	$1,737,171	$235,040
2060	$650,800	$650,800	$84,667	$832,600	$832,600	$108,319	$198,000	$25,759	$1,737,171	$226,000
2061	$655,100	$655,100	$81,948	$834,600	$834,600	$104,403	$198,000	$24,768	$1,737,171	$217,308
2062	$659,500	$659,500	$79,326	$836,600	$836,600	$100,628	$198,000	$23,816	$1,737,171	$208,950
2063	$662,800	$662,800	$76,656	$838,100	$838,100	$96,931	$198,000	$22,900	$1,737,171	$200,913
2064	$667,200	$667,200	$74,197	$840,100	$840,100	$93,425	$198,000	$22,019	$1,737,171	$193,186
2065	$671,500	$671,500	$71,804	$842,100	$842,100	$90,046	$198,000	$21,172	$1,737,171	$185,756
Total Net Present Value =			$8,483,475			$12,114,915		$2,685,494		$28,358,786

Year	Administration		GHG CO2e[4]		Dried WW Biosolids Revenues		Biomethane Revenues		Woodchip Revenues (via Willow Coppice)		Total	
	Total Annual Cost	Net Present Value	**Total** Annual Cost	Net Present Value	**Total** Annual Rev	Net Present Value	**Total** Annual Rev	Net Present Value	**Total** Annual Rev	Net Present Value	**Total** Annual Cost	Net Present Value
2015											$173,717,100	$132,010,719
2016	$100,000	$73,069	-$54,469	-$39,800	-$66,917	-$48,896	-$372,994	-$272,543	$0	$0	$4,178,228	$3,052,990
2017	$100,000	$70,259	-$55,525	-$39,011	-$67,903	-$47,708	-$380,908	-$267,621	$0	$0	$4,181,846	$2,938,109
2018	$100,000	$67,556	-$56,877	-$38,424	-$68,890	-$46,539	-$388,822	-$262,674	-$372,000	-$251,310	$3,534,070	$2,387,491
2019	$100,000	$64,958	-$57,778	-$37,531	-$69,876	-$45,390	-$396,736	-$257,712	-$372,000	-$241,644	$3,547,687	$2,304,510
2020	$100,000	$62,460	-$58,843	-$36,753	-$70,862	-$44,260	-$404,651	-$252,744	-$372,000	-$232,350	$3,550,696	$2,217,754
2021	$100,000	$60,057	-$59,900	-$35,974	-$71,848	-$43,150	-$412,565	-$247,776	-$372,000	-$223,414	$3,554,400	$2,134,681
2022	$100,000	$57,748	-$60,964	-$35,205	-$72,834	-$42,060	-$420,479	-$242,816	-$372,000	-$214,821	$3,556,903	$2,054,023
2023	$100,000	$55,526	-$62,021	-$34,438	-$73,821	-$40,990	-$428,393	-$237,872	-$372,000	-$206,558	$3,560,514	$1,977,027
2024	$100,000	$53,391	-$62,930	-$33,599	-$74,807	-$39,940	-$436,307	-$232,948	-$372,000	-$198,614	$3,574,722	$1,908,574
2025	$100,000	$51,337	-$63,987	-$32,849	-$75,793	-$38,910	-$444,222	-$228,051	-$372,000	-$190,975	$3,577,334	$1,836,507
2026	$100,000	$49,363	-$65,052	-$32,111	-$76,779	-$37,900	-$452,136	-$223,187	-$372,000	-$183,630	$3,580,836	$1,767,601
2027	$100,000	$47,464	-$66,108	-$31,378	-$77,765	-$36,911	-$460,050	-$218,359	-$372,000	-$176,567	$3,584,547	$1,701,378
2028	$100,000	$45,639	-$67,173	-$30,657	-$78,752	-$35,941	-$467,964	-$213,573	-$372,000	-$169,776	$3,588,043	$1,637,536
2029	$100,000	$43,883	-$68,230	-$29,941	-$79,738	-$34,992	-$475,878	-$208,831	-$372,000	-$163,246	$3,590,161	$1,575,483
2030	$100,000	$42,196	-$69,139	-$29,173	-$80,724	-$34,062	-$483,793	-$204,139	-$372,000	-$156,967	$3,604,719	$1,521,031
2031	$100,000	$40,573	-$69,976	-$28,391	-$81,565	-$33,093	-$489,755	-$198,707	-$372,000	-$150,930	$3,608,393	$1,464,020
2032	$100,000	$39,012	-$70,681	-$27,574	-$82,406	-$32,148	-$495,718	-$193,390	-$372,000	-$145,125	$3,669,505	$1,431,553
2033	$100,000	$37,512	-$71,518	-$26,828	-$83,246	-$31,227	-$501,680	-$188,189	-$372,000	-$139,543	$3,672,178	$1,377,496
2034	$100,000	$36,069	-$72,356	-$26,098	-$84,087	-$30,329	-$507,643	-$183,101	-$372,000	-$134,176	$3,675,952	$1,325,876
2035	$100,000	$34,682	-$73,193	-$25,385	-$84,928	-$29,454	-$513,605	-$178,127	-$372,000	-$129,016	$3,679,725	$1,276,190
2036	$100,000	$33,348	-$73,487	-$24,506	-$85,769	-$28,602	-$519,568	-$173,264	-$436,800	-$145,663	$3,990,751	$1,330,826
2037	$100,000	$32,065	-$74,325	-$23,832	-$86,610	-$27,772	-$525,531	-$168,512	-$436,800	-$140,061	$3,994,524	$1,280,850
2038	$100,000	$30,832	-$75,162	-$23,174	-$87,451	-$26,963	-$531,493	-$163,869	-$436,800	-$134,674	$3,997,697	$1,232,565
2039	$100,000	$29,646	-$76,345	-$22,633	-$88,291	-$26,175	-$537,456	-$159,334	-$436,800	-$129,494	$3,673,232	$1,088,967
2040	$100,000	$28,506	-$77,182	-$22,001	-$89,132	-$25,408	-$543,418	-$154,906	-$436,800	-$124,513	$3,675,905	$1,047,846
2041	$100,000	$27,409	-$78,019	-$21,385	-$89,973	-$24,661	-$549,381	-$150,582	-$436,800	-$119,724	$3,679,686	$1,008,580
2042	$100,000	$26,355	-$78,701	-$20,742	-$90,814	-$23,934	-$555,344	-$146,362	-$436,800	-$115,120	$3,694,365	$973,658
2043	$100,000	$25,342	-$79,538	-$20,156	-$91,655	-$23,227	-$561,306	-$142,244	-$436,800	-$110,692	$3,698,145	$937,167
2044	$100,000	$24,367	-$80,375	-$19,585	-$92,495	-$22,538	-$567,269	-$138,226	-$436,800	-$106,434	$3,701,918	$902,042
2045	$100,000	$23,430	-$81,213	-$19,028	-$93,336	-$21,868	-$573,231	-$134,306	-$436,800	-$102,341	$3,705,592	$868,208
2046	$100,000	$22,529	-$81,746	-$18,416	-$93,975	-$21,171	-$576,481	-$129,873	-$436,800	-$98,405	$3,709,081	$835,602
2047	$100,000	$21,662	-$82,270	-$17,821	-$94,614	-$20,495	-$579,731	-$125,582	-$436,800	-$94,620	$3,713,080	$804,330
2048	$100,000	$20,829	-$82,803	-$17,247	-$95,253	-$19,840	-$582,980	-$121,428	-$436,800	-$90,981	$3,717,462	$774,307
2049	$100,000	$20,028	-$83,180	-$16,659	-$95,891	-$19,205	-$586,230	-$117,409	-$436,800	-$87,481	$3,733,008	$747,639
2050	$100,000	$19,257	-$83,705	-$16,119	-$96,530	-$18,589	-$589,480	-$113,519	-$436,800	-$84,117	$3,736,506	$719,557
2051	$100,000	$18,517	-$84,238	-$15,598	-$97,169	-$17,993	-$592,729	-$109,755	-$436,800	-$80,881	$3,740,488	$692,619
2052	$100,000	$17,805	-$84,762	-$15,092	-$97,808	-$17,414	-$595,979	-$106,112	-$436,800	-$77,771	$3,744,979	$666,780
2053	$100,000	$17,120	-$85,295	-$14,602	-$98,446	-$16,854	-$599,229	-$102,587	-$436,800	-$74,779	$3,748,476	$641,733
2054	$100,000	$16,461	-$85,820	-$14,127	-$99,085	-$16,311	-$602,478	-$99,176	-$436,800	-$71,903	$3,752,967	$617,790
2055	$100,000	$15,828	-$86,353	-$13,668	-$99,724	-$15,785	-$605,728	-$95,876	-$436,800	-$69,138	$3,756,957	$594,661
2056	$100,000	$15,219	-$86,886	-$13,224	-$100,363	-$15,275	-$608,978	-$92,683	-$436,800	-$66,479	$3,760,339	$572,304
2057	$100,000	$14,634	-$87,006	-$12,733	-$101,001	-$14,781	-$612,227	-$89,594	-$480,000	-$70,244	$4,104,208	$600,614
2058	$100,000	$14,071	-$87,384	-$12,296	-$101,640	-$14,302	-$615,477	-$86,605	-$480,000	-$67,542	$4,119,703	$579,694
2059	$100,000	$13,530	-$87,908	-$11,894	-$102,279	-$13,838	-$618,727	-$83,714	-$480,000	-$64,944	$4,122,801	$557,817
2060	$100,000	$13,010	-$88,812	-$11,554	-$102,918	-$13,389	-$621,976	-$80,917	-$480,000	-$62,446	$3,766,637	$490,027
2061	$100,000	$12,509	-$89,344	-$11,176	-$103,556	-$12,954	-$625,226	-$78,211	-$480,000	-$60,045	$3,771,026	$471,729
2062	$100,000	$12,028	-$89,869	-$10,810	-$104,195	-$12,533	-$628,476	-$75,594	-$480,000	-$57,735	$3,775,624	$454,139
2063	$100,000	$11,566	-$90,402	-$10,455	-$104,834	-$12,125	-$631,725	-$73,063	-$480,000	-$55,515	$3,778,507	$437,005
2064	$100,000	$11,121	-$90,927	-$10,112	-$105,473	-$11,729	-$634,975	-$70,614	-$480,000	-$53,379	$3,783,105	$420,709
2065	$100,000	$10,693	-$91,460	-$9,780	-$106,111	-$11,346	-$638,225	-$68,245	-$480,000	-$51,326	$3,787,487	$404,996
Total Net Present Value =		$1,632,469		-$1,141,547		-$1,340,977		-$7,964,522		-$5,977,110		**$192,655,310**

Notes:
1. Copied from dnt_Organics_LCA_ds.xls, Alt1d - LCA.
3. Includes **diesel fuel**, driver, maintenance costs and same for coppice activities.
4. Excludes CO2e off-sets of commerical fertilizers by non-CRD end users (i.e. assumes that the CRD would not be able to sell these "credits"). Includes CO2 off-sets from sale of biomethane and dried WW sludges.
5. Includes biomethane upgrading and P recovery systems and willow coppice planting and harvesting equipment.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 7, 2009
Last Revision By: D. Shiskowski

Subject: Total Core Area
Saleable Reclaimed Water for
Toilet Flushing Purposes.
Life Cycle Analysis
Option 2

Yellow-shaded cell denotes assumed/input values

Year	Total Core Area			Reclaimed Water Revenues (toilet flushing only)	
	Option 2 ADWF	Option 3 ADWF	Option 2 Saleable Reclaimed Water (toilet flushing only)		
	(m3/d)	(m3/d)	(m3/yr)	Total Annual Rev	Net Present Value
2008					
2009					
2010					
2011					
2012					
2013					
2014					
2015	111,202	111,202	0	$0	$0
2016	112,048	112,048	0	$0	$0
2017	112,895	112,895	0	$0	$0
2018	113,741	113,741	0	$0	$0
2019	114,588	114,588	0	$0	$0
2020	115,434	114,852	212,530	-$153,021	-$95,577
2021	116,280	115,116	425,059	-$306,043	-$183,801
2022	117,127	115,380	637,589	-$459,064	-$265,098
2023	117,973	115,644	850,118	-$612,085	-$339,869
2024	118,820	115,908	1,062,648	-$765,106	-$408,497
2025	119,666	116,172	1,275,177	-$918,128	-$471,342
2026	120,512	116,436	1,487,707	-$1,071,149	-$528,749
2027	121,359	116,701	1,700,236	-$1,224,170	-$581,043
2028	122,205	116,965	1,912,766	-$1,377,191	-$628,532
2029	123,052	117,229	2,125,295	-$1,530,213	-$671,509
2030	123,898	117,493	2,337,825	-$1,683,234	-$710,250
2031	124,581	117,766	2,487,426	-$1,790,947	-$726,634
2032	125,263	118,038	2,637,028	-$1,898,660	-$740,708
2033	125,946	118,311	2,786,629	-$2,006,373	-$752,624
2034	126,628	118,584	2,936,230	-$2,114,086	-$762,528
2035	127,311	118,856	3,085,832	-$2,221,799	-$770,557
2036	127,993	119,129	3,235,433	-$2,329,512	-$776,840
2037	128,676	119,402	3,385,034	-$2,437,225	-$781,500
2038	129,358	119,674	3,534,636	-$2,544,938	-$784,652
2039	130,041	119,947	3,684,237	-$2,652,651	-$786,405
2040	130,723	120,220	3,833,838	-$2,760,364	-$786,864
2041	131,406	120,492	3,983,440	-$2,868,077	-$786,123
2042	132,088	120,765	4,133,041	-$2,975,790	-$784,276
2043	132,771	121,038	4,282,642	-$3,083,502	-$781,407
2044	133,453	121,310	4,432,244	-$3,191,215	-$777,599
2045	134,136	121,583	4,581,845	-$3,298,928	-$772,929
2046	134,579	121,616	4,731,623	-$3,406,768	-$767,495
2047	135,023	121,649	4,881,400	-$3,514,608	-$761,337
2048	135,466	121,682	5,031,178	-$3,622,448	-$754,516
2049	135,909	121,715	5,180,956	-$3,730,288	-$747,094
2050	136,353	121,748	5,330,734	-$3,838,128	-$739,127
2051	136,796	121,781	5,480,511	-$3,945,968	-$730,668
2052	137,239	121,814	5,630,289	-$4,053,808	-$721,766
2053	137,682	121,847	5,780,067	-$4,161,648	-$712,468
2054	138,126	121,880	5,929,845	-$4,269,488	-$702,817
2055	138,569	121,913	6,079,622	-$4,377,328	-$692,855
2056	139,012	121,945	6,229,400	-$4,485,168	-$682,619
2057	139,456	121,978	6,379,178	-$4,593,008	-$672,146
2058	139,899	122,011	6,528,956	-$4,700,848	-$661,469
2059	140,342	122,044	6,678,733	-$4,808,688	-$650,618
2060	140,786	122,077	6,828,511	-$4,916,528	-$639,624
2061	141,229	122,110	6,978,289	-$5,024,368	-$628,513
2062	141,672	122,143	7,128,067	-$5,132,208	-$617,311
2063	142,115	122,176	7,277,844	-$5,240,048	-$606,040
2064	142,559	122,209	7,427,622	-$5,347,888	-$594,724
2065	143,002	122,242	7,577,400	-$5,455,728	-$583,381
Total Net Present Value =				**-$136,898,433**	**-$30,122,500**

Notes:

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 18, 2009
Last Revision By: D. Shiskowski
Checked:

Subject: CFA and LCA Summary

Option 2

Year	Carbon Footprint			Operations and Maintenance				Revenues		Capital		Total	
	Total Annual Emissions (t CO2e/yr)	Total Annual Costs	GHG CO2 Net Present Value	Total Annual Costs **(end of Existing Trunk Sewers)**	Net Present Value **(end of Existing Trunk Sewers)**	**Total Annual Costs** (complete to end)	**Net Present Value** (complete to end)	Total Annual Revenues	Net Present Value	Total Capital Cost	Net Present Value	Total Annual Cost	Net Present Value
2008													
2009													
2010													
2011													
2012													
2013													
2014										$1,270,298,000	$1,003,934,961	$1,270,298,000	$1,003,934,961
2015	-13,754	-$206,314	-$156,781	$22,913,521	$17,412,393	$22,913,521	$17,412,393	-$1,971,179	-$1,497,934	$173,717,100	$132,010,719	$194,453,129	$147,768,396
2016	-19,176	-$287,640	-$210,176	$22,956,317	$16,773,956	$27,628,924	$20,188,184	-$2,592,469	-$1,894,292	$0	$0	$24,748,815	$18,083,717
2017	-21,037	-$315,554	-$221,704	$22,999,234	$16,158,957	$27,685,416	$19,451,406	-$2,782,749	-$1,955,123	$0	$0	$24,587,113	$17,274,579
2018	-22,918	-$343,763	-$232,234	$23,042,273	$15,566,534	$27,462,931	$18,552,972	-$3,345,030	-$2,259,782	$0	$0	$23,774,138	$16,060,956
2019	-24,768	-$371,521	-$241,333	$23,085,434	$14,995,858	$27,529,511	$17,882,645	-$3,535,310	-$2,296,470	$0	$0	$23,622,680	$15,344,843
2020	-26,630	-$399,444	-$249,491	$23,128,719	$14,446,130	$27,585,771	$17,229,991	-$3,878,611	-$2,422,569	$0	$0	$23,307,716	$14,557,931
2021	-28,491	-$427,358	-$256,660	$23,172,128	$13,916,579	$27,642,840	$16,601,574	-$4,221,912	-$2,535,571	$0	$0	$22,993,571	$13,809,343
2022	-30,352	-$455,280	-$262,913	$23,215,661	$13,406,466	$27,698,842	$15,995,391	-$4,565,214	-$2,636,297	$0	$0	$22,678,348	$13,096,181
2023	-32,213	-$483,193	-$268,300	$23,259,319	$12,915,074	$27,756,068	$15,411,959	-$4,908,515	-$2,725,524	$0	$0	$22,364,360	$12,418,135
2024	-34,064	-$510,960	-$272,806	$23,303,103	$12,441,717	$27,823,870	$14,855,392	-$5,251,816	-$2,803,988	$0	$0	$22,061,094	$11,778,598
2025	-35,925	-$538,873	-$276,643	$23,347,014	$11,985,732	$27,880,348	$14,313,025	-$5,595,118	-$2,872,384	$0	$0	$21,746,358	$11,163,998
2026	-37,786	-$566,795	-$279,786	$23,391,051	$11,546,481	$27,937,854	$13,790,910	-$5,938,419	-$2,931,371	$0	$0	$21,432,640	$10,579,754
2027	-39,647	-$594,709	-$282,274	$23,435,216	$11,123,348	$27,995,687	$13,287,941	-$6,281,720	-$2,981,571	$0	$0	$21,119,258	$10,024,096
2028	-41,509	-$622,631	-$284,161	$23,479,510	$10,715,742	$28,053,441	$12,803,224	-$6,625,021	-$3,023,573	$0	$0	$20,805,789	$9,495,490
2029	-43,370	-$650,545	-$285,481	$23,523,932	$10,323,092	$28,109,939	$12,335,586	-$6,968,323	-$3,057,934	$0	$0	$20,491,071	$8,992,171
2030	-44,940	-$674,104	-$284,442	$24,405,642	$10,298,092	$29,016,017	$12,243,465	-$7,277,139	-$3,070,628	$83,715,840	$35,324,350	$104,780,614	$44,212,744
2031	-45,247	-$678,701	-$275,367	$24,448,724	$9,919,491	$29,070,413	$11,794,632	-$7,421,216	-$3,010,983	$0	$0	$20,970,495	$8,508,282
2032	-45,544	-$683,166	-$266,518	$24,491,937	$9,554,830	$29,182,246	$11,384,621	-$7,565,293	-$2,951,383	$0	$0	$20,933,787	$8,166,720
2033	-45,851	-$687,763	-$257,991	$24,535,280	$9,203,596	$29,235,904	$10,966,879	-$7,709,370	-$2,891,914	$0	$0	$20,838,771	$7,816,973
2034	-46,157	-$692,360	-$249,727	$24,578,756	$8,865,293	$29,290,794	$10,564,874	-$7,853,447	-$2,832,654	$0	$0	$20,744,987	$7,482,493
2035	-46,464	-$696,957	-$241,716	$24,622,365	$8,539,444	$29,345,816	$10,177,615	-$7,997,524	-$2,773,674	$0	$0	$20,651,335	$7,162,225
2036	-46,734	-$701,011	-$233,771	$24,666,107	$8,225,591	$29,772,482	$9,928,452	-$8,206,401	-$2,736,650	$0	$0	$20,865,070	$6,958,031
2037	-47,041	-$705,608	-$226,254	$24,709,983	$7,923,291	$29,827,772	$9,564,317	-$8,350,478	-$2,677,593	$0	$0	$20,771,686	$6,660,470
2038	-47,347	-$710,204	-$218,969	$24,753,993	$7,632,118	$29,882,596	$9,213,362	-$8,494,555	-$2,619,030	$0	$0	$20,677,837	$6,375,363
2039	-47,676	-$715,147	-$212,013	$24,798,139	$7,351,663	$29,610,263	$8,778,266	-$8,638,632	-$2,561,011	$0	$0	$20,256,484	$6,005,243
2040	-47,983	-$719,744	-$205,169	$24,842,421	$7,081,529	$29,664,859	$8,456,204	-$8,782,709	-$2,503,581	$0	$0	$20,162,407	$5,747,454
2041	-48,289	-$724,340	-$198,537	$24,886,840	$6,821,338	$29,720,699	$8,146,271	-$8,926,786	-$2,446,780	$0	$0	$20,069,573	$5,500,953
2042	-48,585	-$728,781	-$192,072	$24,931,397	$6,570,722	$29,787,420	$7,850,537	-$9,070,863	-$2,390,645	$0	$0	$19,987,775	$5,267,820
2043	-48,892	-$733,378	-$185,849	$24,976,091	$6,329,328	$29,843,535	$7,562,813	-$9,214,940	-$2,335,208	$0	$0	$19,895,217	$5,041,756
2044	-49,198	-$737,975	-$179,821	$25,020,924	$6,096,817	$29,899,782	$7,285,642	-$9,359,017	-$2,280,500	$0	$0	$19,802,791	$4,825,321
2045	-49,505	-$742,571	-$173,982	$25,223,582	$5,909,806	$30,113,754	$7,055,558	-$9,503,094	-$2,226,545	$15,768,480	$3,694,505	$35,636,569	$8,349,536
2046	-50,273	-$754,093	-$169,886	$25,261,518	$5,691,052	$30,159,601	$6,794,519	-$9,688,916	-$2,182,772	$0	$0	$19,716,591	$4,441,861
2047	-51,040	-$765,607	-$165,846	$25,299,593	$5,480,413	$30,206,087	$6,543,261	-$9,874,739	-$2,139,072	$0	$0	$19,565,742	$4,238,343
2048	-51,809	-$777,129	-$161,868	$25,337,808	$5,277,588	$30,253,106	$6,301,391	-$10,060,561	-$2,095,505	$0	$0	$19,415,416	$4,044,018
2049	-52,566	-$788,496	-$157,918	$25,376,164	$5,082,285	$30,311,273	$6,070,679	-$10,246,383	-$2,052,124	$0	$0	$19,276,394	$3,860,636
2050	-53,334	-$800,009	-$154,062	$25,414,661	$4,894,226	$30,357,681	$5,846,128	-$10,432,206	-$2,008,981	$0	$0	$19,125,466	$3,683,085
2051	-54,102	-$811,532	-$150,270	$25,453,299	$4,713,142	$30,404,723	$5,629,988	-$10,618,028	-$1,966,121	$0	$0	$18,975,164	$3,513,597
2052	-54,870	-$823,045	-$146,540	$25,492,080	$4,538,772	$30,452,408	$5,421,940	-$10,803,850	-$1,923,586	$0	$0	$18,825,513	$3,351,814
2053	-55,638	-$834,567	-$142,877	$25,531,005	$4,370,868	$30,499,251	$5,221,423	-$10,989,673	-$1,881,414	$0	$0	$18,675,011	$3,197,132
2054	-56,405	-$846,081	-$139,277	$25,570,074	$4,209,188	$30,547,224	$5,028,496	-$11,175,495	-$1,839,641	$0	$0	$18,525,647	$3,049,578
2055	-57,174	-$857,603	-$135,744	$25,609,287	$4,053,503	$30,594,848	$4,842,631	-$11,361,317	-$1,798,298	$0	$0	$18,375,927	$2,908,589
2056	-57,942	-$869,126	-$132,276	$25,648,646	$3,903,590	$30,642,011	$4,663,554	-$11,547,140	-$1,757,414	$0	$0	$18,225,746	$2,773,863
2057	-58,682	-$880,235	-$128,815	$25,688,151	$3,759,233	$31,072,593	$4,547,198	-$11,776,162	-$1,723,337	$0	$0	$18,416,196	$2,695,047
2058	-59,440	-$891,602	-$125,460	$25,727,803	$3,620,226	$31,132,006	$4,380,666	-$11,961,984	-$1,683,202	$0	$0	$18,278,420	$2,572,004
2059	-59,950	-$899,248	-$121,669	$25,767,602	$3,486,372	$31,179,317	$4,218,580	-$12,110,899	-$1,638,612	$0	$0	$18,169,170	$2,458,299
2060	-60,472	-$907,083	-$118,008	$25,807,550	$3,357,478	$30,867,892	$4,015,812	-$12,257,998	-$1,594,725	$0	$0	$17,702,812	$2,303,078
2061	-60,970	-$914,547	-$114,403	$25,847,647	$3,233,360	$30,916,800	$3,867,475	-$12,405,096	-$1,551,791	$0	$0	$17,597,157	$2,201,281
2062	-61,467	-$922,002	-$110,900	$25,887,894	$3,113,841	$30,966,058	$3,724,651	-$12,552,195	-$1,509,800	$0	$0	$17,491,860	$2,103,951
2063	-61,964	-$929,467	-$107,498	$25,928,291	$2,998,750	$31,013,759	$3,586,912	-$12,699,294	-$1,468,743	$0	$0	$17,384,999	$2,010,671
2064	-62,461	-$936,922	-$104,193	$25,968,840	$2,887,923	$31,063,319	$3,454,465	-$12,846,393	-$1,428,612	$0	$0	$17,280,004	$1,921,661
2065	-62,959	-$944,387	-$100,983	$26,009,541	$2,781,201	$31,112,824	$3,326,895	-$12,993,491	-$1,389,394	$0	$0	$17,174,946	$1,836,517
Totals =	**-2,350,611**	**-$35,259,171**	**-$10,071,434**	**n/a**	**n/a**	**$1,498,722,097**	**$488,572,765**	**-$431,234,690**	**-$115,836,306**	**$1,543,499,420**	**$1,174,964,535**	**$2,575,727,656**	**$1,537,629,560**

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 18, 2009
Last Revision By: D. Shiskowski
Checked:

Subject: Revenue Summary

Option 2

Year	Effluent Heat		Reclaimed Water Irrigation		Reclaimed Water Toilet Flushing		Dried WW Sludges		Biomethane		Woodchips		Total	
	Total Annual Revenues	Net Present Value	Total Annual Revenues	Net Present Value	Total Annual Revenues	Net Present Value	Total Annual Revenues	Net Present Value	Total Annual Revenues	Net Present Value	Total Annual Revenues	Net Present Value	Total Annual Revenues	Net Present Value
2008														
2009														
2010														
2011														
2012														
2013														
2014														
2015	-$1,810,011	-$1,375,460	-$161,168	-$122,474	$0	$0	$0	$0	$0	$0	$0	$0	-$1,971,179	-$1,497,934
2016	-$1,990,550	-$1,454,475	-$162,009	-$118,378	$0	$0	-$66,917	-$48,896	-$372,994	-$272,543	$0	$0	-$2,592,469	-$1,894,292
2017	-$2,171,089	-$1,525,378	-$162,849	-$114,416	$0	$0	-$67,903	-$47,708	-$380,908	-$267,621	$0	$0	-$2,782,749	-$1,955,123
2018	-$2,351,628	-$1,588,675	-$163,690	-$110,583	$0	$0	-$68,890	-$46,539	-$388,822	-$262,674	-$372,000	-$251,310	-$3,345,030	-$2,259,782
2019	-$2,532,166	-$1,644,847	-$164,531	-$106,876	$0	$0	-$69,876	-$45,390	-$396,736	-$257,712	-$372,000	-$241,644	-$3,535,310	-$2,296,470
2020	-$2,712,705	-$1,694,348	-$165,372	-$103,291	-$153,021	-$95,577	-$70,862	-$44,260	-$404,651	-$252,744	-$372,000	-$232,350	-$3,878,611	-$2,422,569
2021	-$2,893,244	-$1,737,607	-$166,213	-$99,823	-$306,043	-$183,801	-$71,848	-$43,150	-$412,565	-$247,776	-$372,000	-$223,414	-$4,221,912	-$2,535,571
2022	-$3,073,783	-$1,775,033	-$167,054	-$96,469	-$459,064	-$265,098	-$72,834	-$42,060	-$420,479	-$242,816	-$372,000	-$214,821	-$4,565,214	-$2,636,297
2023	-$3,254,322	-$1,807,009	-$167,894	-$93,226	-$612,085	-$339,869	-$73,821	-$40,990	-$428,393	-$237,872	-$372,000	-$206,558	-$4,908,515	-$2,725,524
2024	-$3,434,861	-$1,833,900	-$168,735	-$90,089	-$765,106	-$408,497	-$74,807	-$39,940	-$436,307	-$232,948	-$372,000	-$198,614	-$5,251,816	-$2,803,988
2025	-$3,615,399	-$1,856,049	-$169,576	-$87,056	-$918,128	-$471,342	-$75,793	-$38,910	-$444,222	-$228,051	-$372,000	-$190,975	-$5,595,118	-$2,872,384
2026	-$3,795,938	-$1,873,782	-$170,417	-$84,123	-$1,071,149	-$528,749	-$76,779	-$37,900	-$452,136	-$223,187	-$372,000	-$183,630	-$5,938,419	-$2,931,371
2027	-$3,976,477	-$1,887,405	-$171,258	-$81,286	-$1,224,170	-$581,043	-$77,765	-$36,911	-$460,050	-$218,359	-$372,000	-$176,567	-$6,281,720	-$2,981,571
2028	-$4,157,016	-$1,897,208	-$172,098	-$78,543	-$1,377,191	-$628,532	-$78,752	-$35,941	-$467,964	-$213,573	-$372,000	-$169,776	-$6,625,021	-$3,023,573
2029	-$4,337,555	-$1,903,465	-$172,939	-$75,892	-$1,530,213	-$671,509	-$79,738	-$34,992	-$475,878	-$208,831	-$372,000	-$163,246	-$6,968,323	-$3,057,934
2030	-$4,483,609	-$1,891,883	-$173,780	-$73,327	-$1,683,234	-$710,250	-$80,724	-$34,062	-$483,793	-$204,139	-$372,000	-$156,967	-$7,277,139	-$3,070,628
2031	-$4,512,283	-$1,830,752	-$174,667	-$70,867	-$1,790,947	-$726,634	-$81,565	-$33,093	-$489,755	-$198,707	-$372,000	-$150,930	-$7,421,216	-$3,010,983
2032	-$4,540,957	-$1,771,525	-$175,553	-$68,487	-$1,898,660	-$740,708	-$82,406	-$32,148	-$495,718	-$193,390	-$372,000	-$145,125	-$7,565,293	-$2,951,383
2033	-$4,569,631	-$1,714,145	-$176,440	-$66,186	-$2,006,373	-$752,624	-$83,246	-$31,227	-$501,680	-$188,189	-$372,000	-$139,543	-$7,709,370	-$2,891,914
2034	-$4,598,305	-$1,658,559	-$177,326	-$63,960	-$2,114,086	-$762,528	-$84,087	-$30,329	-$507,643	-$183,101	-$372,000	-$134,176	-$7,853,447	-$2,832,654
2035	-$4,626,979	-$1,604,713	-$178,213	-$61,807	-$2,221,799	-$770,557	-$84,928	-$29,454	-$513,605	-$178,127	-$372,000	-$129,016	-$7,997,524	-$2,773,674
2036	-$4,655,653	-$1,552,555	-$179,099	-$59,726	-$2,329,512	-$776,840	-$85,769	-$28,602	-$519,568	-$173,264	-$436,800	-$145,663	-$8,206,401	-$2,736,650
2037	-$4,684,327	-$1,502,036	-$179,986	-$57,713	-$2,437,225	-$781,500	-$86,610	-$27,772	-$525,531	-$168,512	-$436,800	-$140,061	-$8,350,478	-$2,677,593
2038	-$4,713,001	-$1,453,106	-$180,872	-$55,766	-$2,544,938	-$784,652	-$87,451	-$26,963	-$531,493	-$163,869	-$436,800	-$134,674	-$8,494,555	-$2,619,030
2039	-$4,741,675	-$1,405,718	-$181,759	-$53,884	-$2,652,651	-$786,405	-$88,291	-$26,175	-$537,456	-$159,334	-$436,800	-$129,494	-$8,638,632	-$2,561,011
2040	-$4,770,349	-$1,359,826	-$182,646	-$52,065	-$2,760,364	-$786,864	-$89,132	-$25,408	-$543,418	-$154,906	-$436,800	-$124,513	-$8,782,709	-$2,503,581
2041	-$4,799,023	-$1,315,384	-$183,532	-$50,305	-$2,868,077	-$786,123	-$89,973	-$24,661	-$549,381	-$150,582	-$436,800	-$119,724	-$8,926,786	-$2,446,780
2042	-$4,827,697	-$1,272,350	-$184,419	-$48,604	-$2,975,790	-$784,276	-$90,814	-$23,934	-$555,344	-$146,362	-$436,800	-$115,120	-$9,070,863	-$2,390,645
2043	-$4,856,372	-$1,230,680	-$185,305	-$46,959	-$3,083,502	-$781,407	-$91,655	-$23,227	-$561,306	-$142,244	-$436,800	-$110,692	-$9,214,940	-$2,335,208
2044	-$4,885,046	-$1,190,333	-$186,192	-$45,369	-$3,191,215	-$777,599	-$92,495	-$22,538	-$567,269	-$138,226	-$436,800	-$106,434	-$9,359,017	-$2,280,500
2045	-$4,913,720	-$1,151,269	-$187,078	-$43,832	-$3,298,928	-$772,929	-$93,336	-$21,868	-$573,231	-$134,306	-$436,800	-$102,341	-$9,503,094	-$2,226,545
2046	-$4,987,335	-$1,123,574	-$187,557	-$42,254	-$3,406,768	-$767,495	-$93,975	-$21,171	-$576,481	-$129,873	-$436,800	-$98,405	-$9,688,916	-$2,182,772
2047	-$5,060,950	-$1,096,306	-$188,036	-$40,732	-$3,514,608	-$761,337	-$94,614	-$20,495	-$579,731	-$125,582	-$436,800	-$94,620	-$9,874,739	-$2,139,072
2048	-$5,134,565	-$1,069,474	-$188,514	-$39,265	-$3,622,448	-$754,516	-$95,253	-$19,840	-$582,980	-$121,428	-$436,800	-$90,981	-$10,060,561	-$2,095,505
2049	-$5,208,181	-$1,043,084	-$188,993	-$37,851	-$3,730,288	-$747,094	-$95,891	-$19,205	-$586,230	-$117,409	-$436,800	-$87,481	-$10,246,383	-$2,052,124
2050	-$5,281,796	-$1,017,142	-$189,472	-$36,487	-$3,838,128	-$739,127	-$96,530	-$18,589	-$589,480	-$113,519	-$436,800	-$84,117	-$10,432,206	-$2,008,981
2051	-$5,355,411	-$991,652	-$189,950	-$35,173	-$3,945,968	-$730,668	-$97,169	-$17,993	-$592,729	-$109,755	-$436,800	-$80,881	-$10,618,028	-$1,966,121
2052	-$5,429,027	-$966,618	-$190,429	-$33,905	-$4,053,808	-$721,766	-$97,808	-$17,414	-$595,979	-$106,112	-$436,800	-$77,771	-$10,803,850	-$1,923,586
2053	-$5,502,642	-$942,044	-$190,908	-$32,683	-$4,161,648	-$712,468	-$98,446	-$16,854	-$599,229	-$102,587	-$436,800	-$74,779	-$10,989,673	-$1,881,414
2054	-$5,576,257	-$917,929	-$191,386	-$31,505	-$4,269,488	-$702,817	-$99,085	-$16,311	-$602,478	-$99,176	-$436,800	-$71,903	-$11,175,495	-$1,839,641
2055	-$5,649,872	-$894,276	-$191,865	-$30,369	-$4,377,328	-$692,855	-$99,724	-$15,785	-$605,728	-$95,876	-$436,800	-$69,138	-$11,361,317	-$1,798,298
2056	-$5,723,488	-$871,085	-$192,344	-$29,274	-$4,485,168	-$682,619	-$100,363	-$15,275	-$608,978	-$92,683	-$436,800	-$66,479	-$11,547,140	-$1,757,414
2057	-$5,797,103	-$848,355	-$192,822	-$28,218	-$4,593,008	-$672,146	-$101,001	-$14,781	-$612,227	-$89,594	-$480,000	-$70,244	-$11,776,162	-$1,723,337
2058	-$5,870,718	-$826,084	-$193,301	-$27,200	-$4,700,848	-$661,469	-$101,640	-$14,302	-$615,477	-$86,605	-$480,000	-$67,542	-$11,961,984	-$1,683,202
2059	-$5,907,426	-$799,278	-$193,780	-$26,218	-$4,808,688	-$650,618	-$102,279	-$13,838	-$618,727	-$83,714	-$480,000	-$64,944	-$12,110,899	-$1,638,612
2060	-$5,942,318	-$773,076	-$194,258	-$25,272	-$4,916,528	-$639,624	-$102,918	-$13,389	-$621,976	-$80,917	-$480,000	-$62,446	-$12,257,998	-$1,594,725
2061	-$5,977,209	-$747,707	-$194,737	-$24,360	-$5,024,368	-$628,513	-$103,556	-$12,954	-$625,226	-$78,211	-$480,000	-$60,045	-$12,405,096	-$1,551,791
2062	-$6,012,101	-$723,146	-$195,216	-$23,481	-$5,132,208	-$617,311	-$104,195	-$12,533	-$628,476	-$75,594	-$480,000	-$57,735	-$12,552,195	-$1,509,800
2063	-$6,046,993	-$699,368	-$195,694	-$22,633	-$5,240,048	-$606,040	-$104,834	-$12,125	-$631,725	-$73,063	-$480,000	-$55,515	-$12,699,294	-$1,468,743
2064	-$6,081,884	-$676,349	-$196,173	-$21,816	-$5,347,888	-$594,724	-$105,473	-$11,729	-$634,975	-$70,614	-$480,000	-$53,379	-$12,846,393	-$1,428,612
2065	-$6,116,776	-$654,067	-$196,652	-$21,028	-$5,455,728	-$583,381	-$106,111	-$11,346	-$638,225	-$68,245	-$480,000	-$51,326	-$12,993,491	-$1,389,394
Totals =	**-$233,947,424**	**-$67,440,090**	**-$9,234,753**	**-$2,991,106**	**-$136,898,433**	**-$30,122,500**	**-$4,419,929**	**-$1,340,977**	**-$26,545,351**	**-$7,964,522**	**-$20,188,800**	**-$5,977,110**	**-$431,234,690**	**-$115,836,306**

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: March 2, 2009
Last Revision By: D. Shiskowski

Subject: GHG Summary

Option 2

Year	GHG Sources					GHG Off-Sets			Total
	Electricity Consumption (t CO2e/yr)	Diesel Fuel Consumption[2] (t CO2e/yr)	Sludge Thickening Polymer Consumption[1] (t CO2e/yr)	Biogas Lost (t CO2e/yr)	Natural Gas Consumption (t CO2e/yr)	Avoided Natural Gas / Electricty Use via Wastewater-derived Heat[3] (t CO2e/yr)	Avoided Natural Gas Use Via Biomethane (t CO2e/yr)	Avoided Coal Use Via Dried Biosolids (t CO2e/yr)	(t CO2e/yr)
2008									
2009									
2010									
2011									
2012									
2013									
2014									
2015	2,334	6.4	1.4	0	0	-16,096	0	0	-13,754
2016	2,461	223.5	1.6	401	1,204	-17,903	-2,098	-3,466	-19,176
2017	2,477	224.8	1.8	407	1,222	-19,709	-2,142	-3,517	-21,037
2018	2,493	207.0	2.0	413	1,239	-21,516	-2,187	-3,568	-22,918
2019	2,509	218.7	2.2	419	1,257	-23,322	-2,231	-3,620	-24,768
2020	2,524	220.0	2.4	425	1,275	-25,129	-2,276	-3,671	-26,630
2021	2,540	221.3	2.6	430	1,293	-26,935	-2,320	-3,722	-28,491
2022	2,556	222.6	2.8	436	1,310	-28,742	-2,365	-3,773	-30,352
2023	2,572	223.9	3.0	442	1,328	-30,548	-2,409	-3,824	-32,213
2024	2,588	235.5	3.2	448	1,345	-32,355	-2,454	-3,875	-34,064
2025	2,603	236.8	3.4	454	1,363	-34,161	-2,499	-3,926	-35,925
2026	2,619	238.1	3.6	460	1,381	-35,968	-2,543	-3,977	-37,786
2027	2,635	239.4	3.8	466	1,399	-37,774	-2,588	-4,028	-39,647
2028	2,651	240.7	4.0	472	1,416	-39,581	-2,632	-4,079	-41,509
2029	2,667	242.0	4.2	478	1,434	-41,387	-2,677	-4,130	-43,370
2030	2,682	253.7	4.4	484	1,452	-42,913	-2,721	-4,181	-44,940
2031	2,696	254.9	4.6	489	1,467	-43,178	-2,755	-4,225	-45,247
2032	2,710	265.0	4.8	494	1,482	-43,443	-2,788	-4,269	-45,544
2033	2,724	266.2	5.0	499	1,497	-43,708	-2,822	-4,312	-45,851
2034	2,738	267.5	5.2	504	1,512	-43,973	-2,855	-4,356	-46,157
2035	2,752	268.7	5.4	509	1,528	-44,238	-2,889	-4,399	-46,464
2036	2,765	306.1	5.6	514	1,543	-44,503	-2,922	-4,443	-46,734
2037	2,779	307.4	5.8	519	1,558	-44,768	-2,956	-4,486	-47,041
2038	2,793	308.6	6.0	524	1,573	-45,032	-2,989	-4,530	-47,347
2039	2,807	287.3	6.2	529	1,588	-45,297	-3,023	-4,573	-47,676
2040	2,821	288.6	6.4	534	1,603	-45,562	-3,056	-4,617	-47,983
2041	2,835	289.8	6.5	539	1,618	-45,827	-3,090	-4,661	-48,289
2042	2,849	301.4	6.7	544	1,633	-46,092	-3,124	-4,704	-48,585
2043	2,862	302.7	6.9	549	1,649	-46,357	-3,157	-4,748	-48,892
2044	2,876	303.9	7.1	554	1,664	-46,622	-3,191	-4,791	-49,198
2045	2,890	305.1	7.3	559	1,679	-46,887	-3,224	-4,835	-49,505
2046	2,899	306.1	7.5	563	1,690	-47,628	-3,242	-4,868	-50,273
2047	2,907	307.0	7.6	567	1,702	-48,369	-3,261	-4,901	-51,040
2048	2,915	308.0	7.8	571	1,713	-49,110	-3,279	-4,934	-51,809
2049	2,923	319.3	7.9	575	1,724	-49,852	-3,297	-4,967	-52,566
2050	2,932	320.2	8.1	578	1,736	-50,593	-3,316	-5,000	-53,334
2051	2,940	321.2	8.2	582	1,748	-51,334	-3,334	-5,033	-54,102
2052	2,948	322.1	8.4	586	1,759	-52,075	-3,352	-5,066	-54,870
2053	2,957	323.0	8.5	590	1,771	-52,817	-3,370	-5,100	-55,638
2054	2,965	324.0	8.7	594	1,782	-53,558	-3,389	-5,133	-56,405
2055	2,973	324.9	8.8	597	1,794	-54,299	-3,407	-5,166	-57,174
2056	2,982	325.8	9.0	601	1,805	-55,040	-3,425	-5,199	-57,942
2057	2,990	353.7	9.1	605	1,817	-55,782	-3,443	-5,232	-58,682
2058	2,998	365.0	9.3	609	1,828	-56,523	-3,462	-5,265	-59,440
2059	3,007	366.0	9.4	613	1,840	-57,006	-3,480	-5,298	-59,950
2060	3,015	342.2	9.6	617	1,851	-57,477	-3,498	-5,331	-60,472
2061	3,023	343.1	9.7	620	1,862	-57,948	-3,517	-5,364	-60,970
2062	3,032	344.1	9.9	624	1,874	-58,419	-3,535	-5,397	-61,467
2063	3,040	345.0	10.1	628	1,885	-58,889	-3,553	-5,430	-61,964
2064	3,048	345.9	10.2	632	1,897	-59,360	-3,571	-5,463	-62,461
2065	3,057	346.9	10.4	636	1,908	-59,831	-3,590	-5,497	-62,959
Totals =	**142,358**	**14,431**	**314**	**26,482**	**79,497**	**-2,235,438**	**-149,303**	**-228,952**	**-2,350,611**

Notes:
1. Only refers to situation where thickened, undigested sludges are truck-transported to another site for processing.
2. Includes biosolids transport.
3. Accounts for GHGs associated with electricity needed to power heat pumps.

OPTION 3

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 18, 2009
Last Revision By: D. Shiskowski
Checked:

Subject: Option 3

Generic Assumptions
For Life Cycle and Carbon
Footprint Analyses

Yellow-shaded cell denotes assumed/input value

GENERIC ASSUMPTIONS

NPV Analysis:				
first year in analysis =		2008		
investment rate of return =		7.0%	/yr	**Note:** Values for Discount Rate Base scenario.
capital works / land lease inflation rate =		3.0%	/yr	
labour inflation rate =		3.0%	/yr	
electricity inflation rate =		3.0%	/yr	
natural gas/biomethane inflation rate =		3.0%	/yr	
diesel fuel inflation rate =		3.0%	/yr	
effluent heat inflation rate =		3.0%	/yr	
chemicals inflation rate =		3.0%	/yr	
reclaimed water inflation rate =		3.0%	/yr	
dried WW sludges / woodchip inflation rate =		3.0%	yr	
maintenance inflation rate =		3.0%	/yr	
administration inflation rate =		3.0%	/yr	
GHG CO2e price inflation rate =		3.0%	/yr	**Note / Ref:** Year 2065 CO2e cost assumed to vary between US$15 and US$155 t / CO2e, as per 032-DP-1 and based on Tirpak (2008).
	2065 $	81	/tonne CO2e	
Labour:				
annual average staff cost =	$	75,000	per year	
Energy and Carbon Equivalents:				
unit electrical price =	$	0.07	/kWh	
unit diesel fuel price =	$	1.50	/L	
unit CO2e price =	$	15	/t CO2e	**Ref:** Based on a 2009 value of $15 t / CO2e per the Province of British Columbia Carbon Tax (2008).
unit natural gas / biomethane price =	$	10.00	/GJ	
Chemical Phosphorus Removal Chemicals:				
liquid-stream alum requirement =		110	mg/L of alum product	**Ref:** Medicine Hat WWTF.
alum product specification =		638	mg alum/mL product	
unit alum product cost =	$	0.40	per L of alum product	**Ref:** Based on General Chemical information in Feb 4/09 e-mail from T. Znajewski. Includes allowance for polymer.
Wet-Weather CEPT Chemicals:				
liquid-stream alum requirement =		80	mg/L of alum product	
alum product specification =		638	mg alum/mL product	
unit alum product cost =	$	0.40	per L of alum product	**Ref:** Based on General Chemical information in Feb 4/09 e-mail from T. Znajewski. Includes allowance for polymer.
Raw Sludge Thickening and Truck Transport:				
unit wastewater BOD generation rate =		0.070	kg BOD/d - pe	
combined PS + WBS production rate =		0.85	kg TSS/kg BOD removed	
solids content of thickened sludge =		6.0%		
specific gravity of thickened sludge =		1.02		
thickening polymer requirement =		8	kg polymer/dry tonne	
thickening polymer unit cost =	$	10.00	/kg polymer	
transport truck volume =		22	m3/truck	
truck diesel fuel consumption =		1.6	km/L	
Odour Control Chemicals:				
unit scrubber chemical cost =	$	0.0053	/d per m3/d of ADWF treated wastewater	**Ref:** Based on Jan 15/09 TM from T. Dokken.
Membrane Cleaning Chemicals:				
unit chemical cost =	$	0.0020	/d per m3/d of ADWF treated wastewater	**Ref:** Based on Jan 19/09 e-mail from T. Dokken.
Maintenance:				
unit allowance (new treatment facilities) =		1.0%	of capital works	
unit allowance (new interceptors, pump stations, forcemains, outfalls) =		0.25%	of capital works	
Administration:				
lump sum annual allowance (treatment facilities) =	$	100,000	/yr	
Saleable Wastewater/Effluent Heat:				
unit natural gas / power utility energy price =	$	16.10	/GJ	**Ref:** This is the typical price (i.e. "market price") of energy available from the power and natural gas utilities, based on a variety of assumptions on energy used in existing areas/redevelopment and new development. See notes in file based on information provided in M. Homenuke Feb 10/09 e-mail.
profit and overhead allowance for third-party energy utility =		15.0%		**Note:** The actual price that the CRD could sell the heat energy to the third party "heat recovery" utility depends on the cost of the utilities infrastructure. See the LCA sheets for WWTF-specific assumptions.
maximum unit price paid for heat energy by third-party utility =	$	14.00		
Saleable Reclaimed Water:				
unit CRD potable water supply price (2008) =	$	0.90	/m3	**Ref:** Average 2008 consumption charge across the CRD, per the CRD web-site.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

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Prepared: D. Shiskowski
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Checked:

Subject: Option 3

Generic Assumptions
For Life Cycle and Carbon
Footprint Analyses

value of reclaimed water relative to CRD potable water =		80%		**Note:** Assumes use of same supply infrastructure for effluent heat. The "value" adjustment considers public perception of relaimed water relative to CRD potable water.
unit reclaimed water price =	$	0.72	/m3	**Note:** For both irrigation and toilet flushing.
GHG Sources:				
BC Hydro-supplied electricity (average annual) =		72	g CO2e/kWh	**Ref: Average value -** BC Hydro's (2005) prediction for 2010 was 72 t/ GWh, which is a large increase from the 33 value predicted for 2005 and actual values of 46 and 22 for 2000 and 2003, respectively. No other future projections were found. Heating Season value based on KWL (2008), West Shore C WWTP Concept Review Final Report.
BC Hydro-supplied electricity (average heating season) =		100	g CO2e/kWh	
diesel fuel combustion (mobile truck) =		2,757	g CO2e/L	**Ref:** Table A13-5, EC (2006). Moderately controlled HDDV.
production of sludge thickening polymer =		1.2	kg CO2e/kg product	**Ref:** de Haas et al (2008)
GHG Off-sets (heat recovery):				
effluent heat recovery coefficient of performance (COP) =		4.0		**Ref:** Heat recovery off-set information and calculations provided by W. Wong (KWL) in Dec 9/08 e-mail.
natural gas furnace / boiler efficiency (n) =		0.95		
energy extracted from effluent heat (x) =		1.00	GJ	
energy for heating delivered by heat pump =		0.75	GJ	
electrical energy required by heat pump =		**0.33**	**GJ elected power /GJ effluent heat**	
energy required for heating from natural gas combustion, equivalent to units of energy replaced via effluent heat =		1.40	GJ	
natural gas off-set via using effluent heat =		1.07	GJ	
therefore, unitless equivalence factor =		**1.07**	**GJ of natural gas off-set by GJ of effluent heat**	
natural gas combustion (stationary) =		0.0562	g CO2e/kJ	**Ref:** Table 2.5, IPCC (2006). Tier 1 Value is for residential category and commercial/institutional category.
1 J =		0.0002778	Wh	
BC Hydro-supplied electricity (average heating season) =		0.0278	g CO2e/kJ	
fraction of effluent heat off-setting "natural gas heat" =		60%		**Ref:** Based on information in Feb 10/ 9 e-mail from M. Homenuke.
fraction of effluent heat off-setting "electric heat" =		40%		

Existing CRD Trunk Sewer System

annual operations and maintenance cost (2008) =	$	4,600,000	/yr	**Ref:** The Path Forward work. ADWF Macaulay and Clover pumping energy and costs are small, therefore did not remove from annual cost value.
annual average increase in operations and maintenance expenditures =		0.5%	/yr	**Note:** Accounts for potential future increases in maintenance costs as system ages.

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Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

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Subject: Marigold Pump Station

Option 3
Material Flows
and Carbon Footprint Analysis

Yellow-shaded cell denotes assumed/input values

Year	Wastewater ADWF		ADWF Friction Losses		TDH	Velocity	Pump Energy	Materials	GHG Sources	Total GHG Emissions
			Unit	Total				Electricity	Electricity Purchased	
	(m3/d)	(L/s)	(m/m)	(m)	(m)	(m/s)	(kW)	(kWh/yr)	(t CO2e/yr)	(t CO2e/yr)
2008										
2009										
2010										
2011										
2012										
2013										
2014										
2015	17,437	202	0.000943	3.49	33.5	0.71	94.7	829,693	60	60
2016	17,377	201	0.000937	3.47	33.5	0.71	94.3	826,317	59	59
2017	17,318	200	0.000931	3.44	33.4	0.71	93.9	822,946	59	59
2018	17,258	200	0.000925	3.42	33.4	0.71	93.6	819,581	59	59
2019	17,199	199	0.000919	3.40	33.4	0.70	93.2	816,221	59	59
2020	17,139	198	0.000913	3.38	33.4	0.70	92.8	812,866	59	59
2021	17,080	198	0.000907	3.36	33.4	0.70	92.4	809,517	58	58
2022	17,020	197	0.000901	3.33	33.3	0.70	92.0	806,172	58	58
2023	16,961	196	0.000896	3.31	33.3	0.69	91.6	802,833	58	58
2024	16,901	196	0.000890	3.29	33.3	0.69	91.3	799,499	58	58
2025	16,842	195	0.000884	3.27	33.3	0.69	90.9	796,170	57	57
2026	16,782	194	0.000878	3.25	33.2	0.69	90.5	792,847	57	57
2027	16,723	194	0.000872	3.23	33.2	0.68	90.1	789,528	57	57
2028	16,663	193	0.000867	3.21	33.2	0.68	89.8	786,215	57	57
2029	16,604	192	0.000861	3.19	33.2	0.68	89.4	782,907	56	56
2030	16,544	191	0.000855	3.16	33.2	0.68	89.0	779,604	56	56
2031	16,514	191	0.000852	3.15	33.2	0.68	88.8	777,926	56	56
2032	16,483	191	0.000849	3.14	33.1	0.67	88.6	776,250	56	56
2033	16,453	190	0.000847	3.13	33.1	0.67	88.4	774,576	56	56
2034	16,423	190	0.000844	3.12	33.1	0.67	88.2	772,902	56	56
2035	16,393	190	0.000841	3.11	33.1	0.67	88.0	771,230	56	56
2036	16,362	189	0.000838	3.10	33.1	0.67	87.8	769,559	55	55
2037	16,332	189	0.000835	3.09	33.1	0.67	87.7	767,890	55	55
2038	16,302	189	0.000832	3.08	33.1	0.67	87.5	766,221	55	55
2039	16,272	188	0.000829	3.07	33.1	0.67	87.3	764,554	55	55
2040	16,241	188	0.000827	3.06	33.1	0.66	87.1	762,889	55	55
2041	16,211	188	0.000824	3.05	33.0	0.66	86.9	761,224	55	55
2042	16,181	187	0.000821	3.04	33.0	0.66	86.7	759,561	55	55
2043	16,151	187	0.000818	3.03	33.0	0.66	86.5	757,900	55	55
2044	16,120	187	0.000815	3.02	33.0	0.66	86.3	756,239	54	54
2045	16,090	186	0.000812	3.01	33.0	0.66	86.1	754,580	54	54
2046	16,020	185	0.000806	2.98	33.0	0.66	85.7	750,731	54	54
2047	15,949	185	0.000799	2.96	33.0	0.65	85.3	746,889	54	54
2048	15,879	184	0.000793	2.93	32.9	0.65	84.8	743,054	53	53
2049	15,809	183	0.000786	2.91	32.9	0.65	84.4	739,226	53	53
2050	15,739	182	0.000780	2.89	32.9	0.64	84.0	735,404	53	53
2051	15,668	181	0.000773	2.86	32.9	0.64	83.5	731,590	53	53
2052	15,598	181	0.000767	2.84	32.8	0.64	83.1	727,782	52	52
2053	15,528	180	0.000761	2.81	32.8	0.64	82.6	723,981	52	52
2054	15,457	179	0.000754	2.79	32.8	0.63	82.2	720,186	52	52
2055	15,387	178	0.000748	2.77	32.8	0.63	81.8	716,398	52	52
2056	15,317	177	0.000742	2.74	32.7	0.63	81.3	712,617	51	51
2057	15,246	176	0.000735	2.72	32.7	0.62	80.9	708,843	51	51
2058	15,176	176	0.000729	2.70	32.7	0.62	80.5	705,075	51	51
2059	15,106	175	0.000723	2.67	32.7	0.62	80.1	701,314	50	50
2060	15,036	174	0.000717	2.65	32.7	0.62	79.6	697,559	50	50
2061	14,965	173	0.000710	2.63	32.6	0.61	79.2	693,811	50	50
2062	14,895	172	0.000704	2.61	32.6	0.61	78.8	690,069	50	50
2063	14,825	172	0.000698	2.58	32.6	0.61	78.3	686,334	49	49
2064	14,754	171	0.000692	2.56	32.6	0.60	77.9	682,605	49	49
2065	14,684	170	0.000686	2.54	32.5	0.60	77.5	678,883	49	49
Totals =								38,658,766	2,783	**2,783**

MARIGOLD PUMP STATION

static head =	30	m
friction C value =	120	
forcemain diameter =	600	mm
forcemain X-area =	0.2827	m^2
forcemain length =	3,700	m
pump efficiency =	70%	
fluid specific weight =	9.81	kN/m^3

Ref: Flow and pumping information from M. Homenuke Feb 2/09 e-mail and attached ConveyanceFlows_forDean_20090202.xls.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 7, 2009
Last Revision By: D. Shiskowski

Subject: Marigold Pump Station

Option 3
Life Cycle Analysis

Yellow-shaded cell denotes assumed/input values

Year	Capital Costs (Note 1)		Operation & Maintenance Costs				GHG CO2e		Total	
			Electricity		Maintenance (Note 1)					
	Total Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value
2008										
2009										
2010										
2011										
2012										
2013										
2014		$0							$0	$0
2015		$0	$58,078	$44,135	$0	$0	$896	$681	$58,078	$44,135
2016		$0	$57,842	$42,265	$0	$0	$892	$652	$57,842	$42,265
2017		$0	$57,606	$40,473	$0	$0	$889	$624	$57,606	$40,473
2018		$0	$57,371	$38,758	$0	$0	$885	$598	$57,371	$38,758
2019		$0	$57,135	$37,114	$0	$0	$882	$573	$57,135	$37,114
2020		$0	$56,901	$35,540	$0	$0	$878	$548	$56,901	$35,540
2021		$0	$56,666	$34,032	$0	$0	$874	$525	$56,666	$34,032
2022		$0	$56,432	$32,588	$0	$0	$871	$503	$56,432	$32,588
2023		$0	$56,198	$31,205	$0	$0	$867	$481	$56,198	$31,205
2024		$0	$55,965	$29,880	$0	$0	$863	$461	$55,965	$29,880
2025		$0	$55,732	$28,611	$0	$0	$860	$441	$55,732	$28,611
2026		$0	$55,499	$27,396	$0	$0	$856	$423	$55,499	$27,396
2027		$0	$55,267	$26,232	$0	$0	$853	$405	$55,267	$26,232
2028		$0	$55,035	$25,117	$0	$0	$849	$388	$55,035	$25,117
2029		$0	$54,803	$24,050	$0	$0	$846	$371	$54,803	$24,050
2030		$0	$54,572	$23,027	$0	$0	$842	$355	$54,572	$23,027
2031		$0	$54,455	$22,094	$0	$0	$840	$341	$54,455	$22,094
2032		$0	$54,338	$21,198	$0	$0	$838	$327	$54,338	$21,198
2033		$0	$54,220	$20,339	$0	$0	$837	$314	$54,220	$20,339
2034		$0	$54,103	$19,514	$0	$0	$835	$301	$54,103	$19,514
2035		$0	$53,986	$18,723	$0	$0	$833	$289	$53,986	$18,723
2036		$0	$53,869	$17,964	$0	$0	$831	$277	$53,869	$17,964
2037		$0	$53,752	$17,236	$0	$0	$829	$266	$53,752	$17,236
2038		$0	$53,635	$16,537	$0	$0	$828	$255	$53,635	$16,537
2039		$0	$53,519	$15,866	$0	$0	$826	$245	$53,519	$15,866
2040		$0	$53,402	$15,223	$0	$0	$824	$235	$53,402	$15,223
2041		$0	$53,286	$14,605	$0	$0	$822	$225	$53,286	$14,605
2042		$0	$53,169	$14,013	$0	$0	$820	$216	$53,169	$14,013
2043		$0	$53,053	$13,444	$0	$0	$819	$207	$53,053	$13,444
2044		$0	$52,937	$12,899	$0	$0	$817	$199	$52,937	$12,899
2045		$0	$52,821	$12,376	$0	$0	$815	$191	$52,821	$12,376
2046		$0	$52,551	$11,839	$0	$0	$811	$183	$52,551	$11,839
2047		$0	$52,282	$11,325	$0	$0	$807	$175	$52,282	$11,325
2048		$0	$52,014	$10,834	$0	$0	$802	$167	$52,014	$10,834
2049		$0	$51,746	$10,364	$0	$0	$798	$160	$51,746	$10,364
2050		$0	$51,478	$9,913	$0	$0	$794	$153	$51,478	$9,913
2051		$0	$51,211	$9,483	$0	$0	$790	$146	$51,211	$9,483
2052		$0	$50,945	$9,071	$0	$0	$786	$140	$50,945	$9,071
2053		$0	$50,679	$8,676	$0	$0	$782	$134	$50,679	$8,676
2054		$0	$50,413	$8,299	$0	$0	$778	$128	$50,413	$8,299
2055		$0	$50,148	$7,938	$0	$0	$774	$122	$50,148	$7,938
2056		$0	$49,883	$7,592	$0	$0	$770	$117	$49,883	$7,592
2057		$0	$49,619	$7,261	$0	$0	$766	$112	$49,619	$7,261
2058		$0	$49,355	$6,945	$0	$0	$761	$107	$49,355	$6,945
2059		$0	$49,092	$6,642	$0	$0	$757	$102	$49,092	$6,642
2060		$0	$48,829	$6,353	$0	$0	$753	$98	$48,829	$6,353
2061		$0	$48,567	$6,075	$0	$0	$749	$94	$48,567	$6,075
2062		$0	$48,305	$5,810	$0	$0	$745	$90	$48,305	$5,810
2063		$0	$48,043	$5,556	$0	$0	$741	$86	$48,043	$5,556
2064		$0	$47,782	$5,314	$0	$0	$737	$82	$47,782	$5,314
2065		$0	$47,522	$5,082	$0	$0	$733	$78	$47,522	$5,082
Total Capital =		$0								
Total Net Present Value =			$0	$932,826		$0		$14,392		**$932,826**

Notes:
1. No capital costs. Annual O&M cost assumed to be included in Existing Trunk Sewers LCA.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

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Prepared: D. Shiskowski
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Last Revision By: D. Shiskowski

Subject: Currie Road Pump Station
(note: not required for ADWF conditions; wet-weather only)
Option 3
Material Flows
and Carbon Footprint Analysis

Yellow-shaded cell denotes assumed/input values

Year	Wastewater ADWF		ADWF Friction Losses		TDH	Velocity	Pump Energy	Materials	GHG Sources	Total GHG Emissions
			Unit	Total				Electricity	Electricity Purchased	
	(m3/d)	(L/s)	(m/m)	(m)	(m)	(m/s)	(kW)	(kWh/yr)	(t CO2e/yr)	(t CO2e/yr)
2008										
2009										
2010										
2011										
2012										
2013										
2014										
2015	0	0	0.000000	0.00	20.0	0.00	0.0	-	-	-
2016	-	0	0.000000	0.00	20.0	0.00	0.0	-	-	-
2017	-	0	0.000000	0.00	20.0	0.00	0.0	-	-	-
2018	-	0	0.000000	0.00	20.0	0.00	0.0	-	-	-
2019	-	0	0.000000	0.00	20.0	0.00	0.0	-	-	-
2020	-	0	0.000000	0.00	20.0	0.00	0.0	-	-	-
2021	-	0	0.000000	0.00	20.0	0.00	0.0	-	-	-
2022	-	0	0.000000	0.00	20.0	0.00	0.0	-	-	-
2023	-	0	0.000000	0.00	20.0	0.00	0.0	-	-	-
2024	-	0	0.000000	0.00	20.0	0.00	0.0	-	-	-
2025	-	0	0.000000	0.00	20.0	0.00	0.0	-	-	-
2026	-	0	0.000000	0.00	20.0	0.00	0.0	-	-	-
2027	-	0	0.000000	0.00	20.0	0.00	0.0	-	-	-
2028	-	0	0.000000	0.00	20.0	0.00	0.0	-	-	-
2029	-	0	0.000000	0.00	20.0	0.00	0.0	-	-	-
2030	0	0	0.000000	0.00	20.0	0.00	0.0	-	-	-
2031	-	0	0.000000	0.00	20.0	0.00	0.0	-	-	-
2032	-	0	0.000000	0.00	20.0	0.00	0.0	-	-	-
2033	-	0	0.000000	0.00	20.0	0.00	0.0	-	-	-
2034	-	0	0.000000	0.00	20.0	0.00	0.0	-	-	-
2035	-	0	0.000000	0.00	20.0	0.00	0.0	-	-	-
2036	-	0	0.000000	0.00	20.0	0.00	0.0	-	-	-
2037	-	0	0.000000	0.00	20.0	0.00	0.0	-	-	-
2038	-	0	0.000000	0.00	20.0	0.00	0.0	-	-	-
2039	-	0	0.000000	0.00	20.0	0.00	0.0	-	-	-
2040	-	0	0.000000	0.00	20.0	0.00	0.0	-	-	-
2041	-	0	0.000000	0.00	20.0	0.00	0.0	-	-	-
2042	-	0	0.000000	0.00	20.0	0.00	0.0	-	-	-
2043	-	0	0.000000	0.00	20.0	0.00	0.0	-	-	-
2044	-	0	0.000000	0.00	20.0	0.00	0.0	-	-	-
2045	0	0	0.000000	0.00	20.0	0.00	0.0	-	-	-
2046	-	0	0.000000	0.00	20.0	0.00	0.0	-	-	-
2047	-	0	0.000000	0.00	20.0	0.00	0.0	-	-	-
2048	-	0	0.000000	0.00	20.0	0.00	0.0	-	-	-
2049	-	0	0.000000	0.00	20.0	0.00	0.0	-	-	-
2050	-	0	0.000000	0.00	20.0	0.00	0.0	-	-	-
2051	-	0	0.000000	0.00	20.0	0.00	0.0	-	-	-
2052	-	0	0.000000	0.00	20.0	0.00	0.0	-	-	-
2053	-	0	0.000000	0.00	20.0	0.00	0.0	-	-	-
2054	-	0	0.000000	0.00	20.0	0.00	0.0	-	-	-
2055	-	0	0.000000	0.00	20.0	0.00	0.0	-	-	-
2056	-	0	0.000000	0.00	20.0	0.00	0.0	-	-	-
2057	-	0	0.000000	0.00	20.0	0.00	0.0	-	-	-
2058	-	0	0.000000	0.00	20.0	0.00	0.0	-	-	-
2059	-	0	0.000000	0.00	20.0	0.00	0.0	-	-	-
2060	-	0	0.000000	0.00	20.0	0.00	0.0	-	-	-
2061	-	0	0.000000	0.00	20.0	0.00	0.0	-	-	-
2062	-	0	0.000000	0.00	20.0	0.00	0.0	-	-	-
2063	-	0	0.000000	0.00	20.0	0.00	0.0	-	-	-
2064	-	0	0.000000	0.00	20.0	0.00	0.0	-	-	-
2065	0	0	0.000000	0.00	20.0	0.00	0.0	-	-	-
Totals =								0	0	**0**

CURRIE ROAD PUMP STATION

static head =	20.0	m
friction C value =	120	
forcemain diameter =	750	mm
forcemain X-area =	0.4418	m^2
forcemain length =	1,800	m
pump efficiency =	70%	
fluid specific weight =	9.81	kN/m^3

Ref: Flow and pumping information from M. Homenuke Feb 2/09 e-mail and attached ConveyanceFlows_forDean_20090202.xls.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 7, 2009
Last Revision By: D. Shiskowski

Subject: Currie Road Pump Station

Option 3
Life Cycle Analysis

Yellow-shaded cell denotes assumed/input values

Year	Capital Costs (Note 1)		Operation & Maintenance Costs				GHG CO2e		Total	
			Electricity		Maintenance (Note 1)					
	Total Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value
2008										
2009										
2010										
2011										
2012										
2013										
2014		$0							$0	$0
2015		$0	$0	$0	$0	$0	$0	$0	$0	$0
2016		$0	$0	$0	$0	$0	$0	$0	$0	$0
2017		$0	$0	$0	$0	$0	$0	$0	$0	$0
2018		$0	$0	$0	$0	$0	$0	$0	$0	$0
2019		$0	$0	$0	$0	$0	$0	$0	$0	$0
2020		$0	$0	$0	$0	$0	$0	$0	$0	$0
2021		$0	$0	$0	$0	$0	$0	$0	$0	$0
2022		$0	$0	$0	$0	$0	$0	$0	$0	$0
2023		$0	$0	$0	$0	$0	$0	$0	$0	$0
2024		$0	$0	$0	$0	$0	$0	$0	$0	$0
2025		$0	$0	$0	$0	$0	$0	$0	$0	$0
2026		$0	$0	$0	$0	$0	$0	$0	$0	$0
2027		$0	$0	$0	$0	$0	$0	$0	$0	$0
2028		$0	$0	$0	$0	$0	$0	$0	$0	$0
2029		$0	$0	$0	$0	$0	$0	$0	$0	$0
2030		$0	$0	$0	$0	$0	$0	$0	$0	$0
2031		$0	$0	$0	$0	$0	$0	$0	$0	$0
2032		$0	$0	$0	$0	$0	$0	$0	$0	$0
2033		$0	$0	$0	$0	$0	$0	$0	$0	$0
2034		$0	$0	$0	$0	$0	$0	$0	$0	$0
2035		$0	$0	$0	$0	$0	$0	$0	$0	$0
2036		$0	$0	$0	$0	$0	$0	$0	$0	$0
2037		$0	$0	$0	$0	$0	$0	$0	$0	$0
2038		$0	$0	$0	$0	$0	$0	$0	$0	$0
2039		$0	$0	$0	$0	$0	$0	$0	$0	$0
2040		$0	$0	$0	$0	$0	$0	$0	$0	$0
2041		$0	$0	$0	$0	$0	$0	$0	$0	$0
2042		$0	$0	$0	$0	$0	$0	$0	$0	$0
2043		$0	$0	$0	$0	$0	$0	$0	$0	$0
2044		$0	$0	$0	$0	$0	$0	$0	$0	$0
2045		$0	$0	$0	$0	$0	$0	$0	$0	$0
2046		$0	$0	$0	$0	$0	$0	$0	$0	$0
2047		$0	$0	$0	$0	$0	$0	$0	$0	$0
2048		$0	$0	$0	$0	$0	$0	$0	$0	$0
2049		$0	$0	$0	$0	$0	$0	$0	$0	$0
2050		$0	$0	$0	$0	$0	$0	$0	$0	$0
2051		$0	$0	$0	$0	$0	$0	$0	$0	$0
2052		$0	$0	$0	$0	$0	$0	$0	$0	$0
2053		$0	$0	$0	$0	$0	$0	$0	$0	$0
2054		$0	$0	$0	$0	$0	$0	$0	$0	$0
2055		$0	$0	$0	$0	$0	$0	$0	$0	$0
2056		$0	$0	$0	$0	$0	$0	$0	$0	$0
2057		$0	$0	$0	$0	$0	$0	$0	$0	$0
2058		$0	$0	$0	$0	$0	$0	$0	$0	$0
2059		$0	$0	$0	$0	$0	$0	$0	$0	$0
2060		$0	$0	$0	$0	$0	$0	$0	$0	$0
2061		$0	$0	$0	$0	$0	$0	$0	$0	$0
2062		$0	$0	$0	$0	$0	$0	$0	$0	$0
2063		$0	$0	$0	$0	$0	$0	$0	$0	$0
2064		$0	$0	$0	$0	$0	$0	$0	$0	$0
2065		$0	$0	$0	$0	$0	$0	$0	$0	$0
Total Capital =	$0									
Total Net Present Value =		$0		$0		$0		$0		**$0**

Notes:
1. Capital costs included in CS Mods LCA. Existing annual O&M cost assumed to be included in Existing Trunk Sewers LCA.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 7, 2009
Last Revision By: D. Shiskowski

Subject: Craigflower Pump Station

Option 3
Material Flows
and Carbon Footprint Analysis

Yellow-shaded cell denotes assumed/input values

Year	Wastewater ADWF		ADWF Friction Losses		TDH	Velocity	Pump Energy	Materials	GHG Sources	Total GHG Emissions
			Unit	Total				Electricity	Electricity Purchased	
	(m3/d)	(L/s)	(m/m)	(m)	(m)	(m/s)	(kW)	(kWh/yr)	(t CO2e/yr)	(t CO2e/yr)
2008										
2009										
2010										
2011										
2012										
2013										
2014										
2015	4,180	48	0.000067	0.17	35.2	0.17	23.8	208,913	15	15
2016	4,258	49	0.000069	0.18	35.2	0.17	24.3	212,835	15	15
2017	4,335	50	0.000072	0.19	35.2	0.18	24.7	216,758	16	16
2018	4,413	51	0.000074	0.19	35.2	0.18	25.2	220,684	16	16
2019	4,491	52	0.000077	0.20	35.2	0.18	25.6	224,611	16	16
2020	4,569	53	0.000079	0.21	35.2	0.19	26.1	228,541	16	16
2021	4,646	54	0.000082	0.21	35.2	0.19	26.5	232,472	17	17
2022	4,724	55	0.000084	0.22	35.2	0.19	27.0	236,406	17	17
2023	4,802	56	0.000087	0.23	35.2	0.20	27.4	240,342	17	17
2024	4,880	56	0.000089	0.23	35.2	0.20	27.9	244,279	18	18
2025	4,957	57	0.000092	0.24	35.2	0.20	28.3	248,219	18	18
2026	5,035	58	0.000095	0.25	35.2	0.21	28.8	252,162	18	18
2027	5,113	59	0.000097	0.25	35.3	0.21	29.2	256,106	18	18
2028	5,191	60	0.000100	0.26	35.3	0.21	29.7	260,053	19	19
2029	5,268	61	0.000103	0.27	35.3	0.22	30.1	264,001	19	19
2030	5,346	62	0.000106	0.28	35.3	0.22	30.6	267,953	19	19
2031	5,420	63	0.000109	0.28	35.3	0.22	31.0	271,713	20	20
2032	5,494	64	0.000111	0.29	35.3	0.22	31.4	275,475	20	20
2033	5,568	64	0.000114	0.30	35.3	0.23	31.9	279,240	20	20
2034	5,642	65	0.000117	0.30	35.3	0.23	32.3	283,006	20	20
2035	5,716	66	0.000120	0.31	35.3	0.23	32.7	286,775	21	21
2036	5,790	67	0.000123	0.32	35.3	0.24	33.2	290,546	21	21
2037	5,864	68	0.000126	0.33	35.3	0.24	33.6	294,320	21	21
2038	5,937	69	0.000128	0.33	35.3	0.24	34.0	298,095	21	21
2039	6,011	70	0.000131	0.34	35.3	0.25	34.5	301,873	22	22
2040	6,085	70	0.000134	0.35	35.3	0.25	34.9	305,654	22	22
2041	6,159	71	0.000137	0.36	35.4	0.25	35.3	309,436	22	22
2042	6,233	72	0.000141	0.37	35.4	0.26	35.8	313,221	23	23
2043	6,307	73	0.000144	0.37	35.4	0.26	36.2	317,009	23	23
2044	6,381	74	0.000147	0.38	35.4	0.26	36.6	320,798	23	23
2045	6,455	75	0.000150	0.39	35.4	0.26	37.1	324,591	23	23
2046	6,482	75	0.000151	0.39	35.4	0.27	37.2	325,953	23	23
2047	6,508	75	0.000152	0.40	35.4	0.27	37.4	327,316	24	24
2048	6,535	76	0.000153	0.40	35.4	0.27	37.5	328,679	24	24
2049	6,561	76	0.000155	0.40	35.4	0.27	37.7	330,042	24	24
2050	6,588	76	0.000156	0.40	35.4	0.27	37.8	331,406	24	24
2051	6,614	77	0.000157	0.41	35.4	0.27	38.0	332,770	24	24
2052	6,641	77	0.000158	0.41	35.4	0.27	38.1	334,135	24	24
2053	6,667	77	0.000159	0.41	35.4	0.27	38.3	335,499	24	24
2054	6,694	77	0.000160	0.42	35.4	0.27	38.5	336,864	24	24
2055	6,721	78	0.000162	0.42	35.4	0.28	38.6	338,230	24	24
2056	6,747	78	0.000163	0.42	35.4	0.28	38.8	339,595	24	24
2057	6,774	78	0.000164	0.43	35.4	0.28	38.9	340,961	25	25
2058	6,800	79	0.000165	0.43	35.4	0.28	39.1	342,328	25	25
2059	6,827	79	0.000166	0.43	35.4	0.28	39.2	343,694	25	25
2060	6,853	79	0.000167	0.44	35.4	0.28	39.4	345,061	25	25
2061	6,880	80	0.000169	0.44	35.4	0.28	39.5	346,429	25	25
2062	6,906	80	0.000170	0.44	35.4	0.28	39.7	347,796	25	25
2063	6,933	80	0.000171	0.44	35.4	0.28	39.9	349,165	25	25
2064	6,959	81	0.000172	0.45	35.4	0.28	40.0	350,533	25	25
2065	6,986	81	0.000174	0.45	35.5	0.29	40.2	351,902	25	25
Totals =								15,064,446	1,085	**1,085**

CRAIGFLOWER PUMP STATION

static head =	35.0	m
friction C value =	120	
forcemain diameter =	600	mm
forcemain X-area =	0.2827	m^2
forcemain length =	2,600	m
pump efficiency =	70%	
fluid specific weight =	9.81	kN/m^3

Ref: Flow and pumping information from M. Homenuke Feb 2/09 e-mail and attached ConveyanceFlows_forDean_20090202.xls.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 7, 2009
Last Revision By: D. Shiskowski

Subject: Craigflower Pump Station

Option 3
Life Cycle Analysis

Yellow-shaded cell denotes assumed/input values

Year	Capital Costs (Note 1)		Operation & Maintenance Costs				GHG CO2e		Total	
			Electricity		Maintenance (Note 1)					
	Total Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value
2008										
2009										
2010										
2011										
2012										
2013										
2014		$0							$0	$0
2015		$0	$14,624	$11,113	$0	$0	$226	$171	$14,624	$11,113
2016		$0	$14,898	$10,886	$0	$0	$230	$168	$14,898	$10,886
2017		$0	$15,173	$10,660	$0	$0	$234	$164	$15,173	$10,660
2018		$0	$15,448	$10,436	$0	$0	$238	$161	$15,448	$10,436
2019		$0	$15,723	$10,213	$0	$0	$243	$158	$15,723	$10,213
2020		$0	$15,998	$9,992	$0	$0	$247	$154	$15,998	$9,992
2021		$0	$16,273	$9,773	$0	$0	$251	$151	$16,273	$9,773
2022		$0	$16,548	$9,556	$0	$0	$255	$147	$16,548	$9,556
2023		$0	$16,824	$9,342	$0	$0	$260	$144	$16,824	$9,342
2024		$0	$17,100	$9,130	$0	$0	$264	$141	$17,100	$9,130
2025		$0	$17,375	$8,920	$0	$0	$268	$138	$17,375	$8,920
2026		$0	$17,651	$8,713	$0	$0	$272	$134	$17,651	$8,713
2027		$0	$17,927	$8,509	$0	$0	$277	$131	$17,927	$8,509
2028		$0	$18,204	$8,308	$0	$0	$281	$128	$18,204	$8,308
2029		$0	$18,480	$8,110	$0	$0	$285	$125	$18,480	$8,110
2030		$0	$18,757	$7,914	$0	$0	$289	$122	$18,757	$7,914
2031		$0	$19,020	$7,717	$0	$0	$293	$119	$19,020	$7,717
2032		$0	$19,283	$7,523	$0	$0	$298	$116	$19,283	$7,523
2033		$0	$19,547	$7,332	$0	$0	$302	$113	$19,547	$7,332
2034		$0	$19,810	$7,145	$0	$0	$306	$110	$19,810	$7,145
2035		$0	$20,074	$6,962	$0	$0	$310	$107	$20,074	$6,962
2036		$0	$20,338	$6,782	$0	$0	$314	$105	$20,338	$6,782
2037		$0	$20,602	$6,606	$0	$0	$318	$102	$20,602	$6,606
2038		$0	$20,867	$6,434	$0	$0	$322	$99	$20,867	$6,434
2039		$0	$21,131	$6,265	$0	$0	$326	$97	$21,131	$6,265
2040		$0	$21,396	$6,099	$0	$0	$330	$94	$21,396	$6,099
2041		$0	$21,661	$5,937	$0	$0	$334	$92	$21,661	$5,937
2042		$0	$21,925	$5,779	$0	$0	$338	$89	$21,925	$5,779
2043		$0	$22,191	$5,623	$0	$0	$342	$87	$22,191	$5,623
2044		$0	$22,456	$5,472	$0	$0	$346	$84	$22,456	$5,472
2045		$0	$22,721	$5,324	$0	$0	$351	$82	$22,721	$5,324
2046		$0	$22,817	$5,140	$0	$0	$352	$79	$22,817	$5,140
2047		$0	$22,912	$4,963	$0	$0	$354	$77	$22,912	$4,963
2048		$0	$23,008	$4,792	$0	$0	$355	$74	$23,008	$4,792
2049		$0	$23,103	$4,627	$0	$0	$356	$71	$23,103	$4,627
2050		$0	$23,198	$4,467	$0	$0	$358	$69	$23,198	$4,467
2051		$0	$23,294	$4,313	$0	$0	$359	$67	$23,294	$4,313
2052		$0	$23,389	$4,164	$0	$0	$361	$64	$23,389	$4,164
2053		$0	$23,485	$4,021	$0	$0	$362	$62	$23,485	$4,021
2054		$0	$23,581	$3,882	$0	$0	$364	$60	$23,581	$3,882
2055		$0	$23,676	$3,748	$0	$0	$365	$58	$23,676	$3,748
2056		$0	$23,772	$3,618	$0	$0	$367	$56	$23,772	$3,618
2057		$0	$23,867	$3,493	$0	$0	$368	$54	$23,867	$3,493
2058		$0	$23,963	$3,372	$0	$0	$370	$52	$23,963	$3,372
2059		$0	$24,059	$3,255	$0	$0	$371	$50	$24,059	$3,255
2060		$0	$24,154	$3,142	$0	$0	$373	$48	$24,154	$3,142
2061		$0	$24,250	$3,034	$0	$0	$374	$47	$24,250	$3,034
2062		$0	$24,346	$2,928	$0	$0	$376	$45	$24,346	$2,928
2063		$0	$24,442	$2,827	$0	$0	$377	$44	$24,442	$2,827
2064		$0	$24,537	$2,729	$0	$0	$379	$42	$24,537	$2,729
2065		$0	$24,633	$2,634	$0	$0	$380	$41	$24,633	$2,634
Total Capital =		$0								
Total Net Present Value =			$0	$323,725		$0		$4,995		**$323,725**

Notes:
1. Capital costs included in CS Mods LCA. Existing annual O&M cost assumed to be included in Existing Trunk Sewers LCA.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 7, 2009
Last Revision By: D. Shiskowski

Subject: Diversion Z to Westhills Pump Station

Option 3
Material Flows
and Carbon Footprint Analysis

Yellow-shaded cell denotes assumed/input values

Year	Wastewater ADWF		ADWF Friction Losses		TDH	Velocity	Pump Energy	Materials	GHG Sources	Total GHG Emissions
			Unit	Total				Electricity	Electricity Purchased	
	(m3/d)	(L/s)	(m/m)	(m)	(m)	(m/s)	(kW)	(kWh/yr)	(t CO2e/yr)	(t CO2e/yr)
2008										
2009										
2010										
2011										
2012										
2013										
2014										
2015	2,410	28	0.000098	0.13	15.1	0.18	5.9	51,803	4	4
2016	2,717	31	0.000123	0.16	15.2	0.20	6.7	58,515	4	4
2017	3,023	35	0.000149	0.19	15.2	0.22	7.5	65,269	5	5
2018	3,330	39	0.000179	0.23	15.2	0.24	8.2	72,068	5	5
2019	3,636	42	0.000210	0.27	15.3	0.26	9.0	78,916	6	6
2020	3,943	46	0.000244	0.32	15.3	0.29	9.8	85,817	6	6
2021	4,250	49	0.000281	0.36	15.4	0.31	10.6	92,775	7	7
2022	4,556	53	0.000319	0.41	15.4	0.33	11.4	99,794	7	7
2023	4,863	56	0.000360	0.47	15.5	0.35	12.2	106,876	8	8
2024	5,169	60	0.000403	0.52	15.5	0.38	13.0	114,026	8	8
2025	5,476	63	0.000448	0.58	15.6	0.40	13.8	121,248	9	9
2026	5,783	67	0.000496	0.64	15.6	0.42	14.7	128,544	9	9
2027	6,089	70	0.000546	0.71	15.7	0.44	15.5	135,919	10	10
2028	6,396	74	0.000598	0.78	15.8	0.47	16.4	143,376	10	10
2029	6,702	78	0.000652	0.85	15.8	0.49	17.2	150,919	11	11
2030	7,009	81	0.000708	0.92	15.9	0.51	18.1	158,550	11	11
2031	7,026	81	0.000711	0.92	15.9	0.51	18.1	158,969	11	11
2032	7,042	82	0.000714	0.93	15.9	0.51	18.2	159,389	11	11
2033	7,059	82	0.000717	0.93	15.9	0.51	18.2	159,808	12	12
2034	7,076	82	0.000720	0.94	15.9	0.51	18.3	160,228	12	12
2035	7,093	82	0.000724	0.94	15.9	0.52	18.3	160,649	12	12
2036	7,109	82	0.000727	0.94	15.9	0.52	18.4	161,069	12	12
2037	7,126	82	0.000730	0.95	15.9	0.52	18.4	161,490	12	12
2038	7,143	83	0.000733	0.95	16.0	0.52	18.5	161,911	12	12
2039	7,160	83	0.000736	0.96	16.0	0.52	18.5	162,332	12	12
2040	7,176	83	0.000739	0.96	16.0	0.52	18.6	162,754	12	12
2041	7,193	83	0.000743	0.97	16.0	0.52	18.6	163,176	12	12
2042	7,210	83	0.000746	0.97	16.0	0.52	18.7	163,598	12	12
2043	7,227	84	0.000749	0.97	16.0	0.53	18.7	164,021	12	12
2044	7,243	84	0.000752	0.98	16.0	0.53	18.8	164,444	12	12
2045	7,260	84	0.000755	0.98	16.0	0.53	18.8	164,867	12	12
2046	7,288	84	0.000761	0.99	16.0	0.53	18.9	165,586	12	12
2047	7,317	85	0.000766	1.00	16.0	0.53	19.0	166,307	12	12
2048	7,345	85	0.000772	1.00	16.0	0.53	19.1	167,029	12	12
2049	7,374	85	0.000778	1.01	16.0	0.54	19.1	167,751	12	12
2050	7,402	86	0.000783	1.02	16.0	0.54	19.2	168,474	12	12
2051	7,431	86	0.000789	1.03	16.0	0.54	19.3	169,199	12	12
2052	7,459	86	0.000794	1.03	16.0	0.54	19.4	169,923	12	12
2053	7,488	87	0.000800	1.04	16.0	0.54	19.5	170,649	12	12
2054	7,516	87	0.000806	1.05	16.0	0.55	19.6	171,376	12	12
2055	7,545	87	0.000811	1.05	16.1	0.55	19.6	172,103	12	12
2056	7,573	88	0.000817	1.06	16.1	0.55	19.7	172,831	12	12
2057	7,601	88	0.000823	1.07	16.1	0.55	19.8	173,561	12	12
2058	7,630	88	0.000828	1.08	16.1	0.56	19.9	174,291	13	13
2059	7,658	89	0.000834	1.08	16.1	0.56	20.0	175,021	13	13
2060	7,687	89	0.000840	1.09	16.1	0.56	20.1	175,753	13	13
2061	7,715	89	0.000845	1.10	16.1	0.56	20.1	176,486	13	13
2062	7,744	90	0.000851	1.11	16.1	0.56	20.2	177,219	13	13
2063	7,772	90	0.000857	1.11	16.1	0.57	20.3	177,953	13	13
2064	7,801	90	0.000863	1.12	16.1	0.57	20.4	178,689	13	13
2065	7,829	91	0.000869	1.13	16.1	0.57	20.5	179,425	13	13
Totals =								7,542,748	543	**543**

DIVERSION Z PUMP STATION

static head =	15.0	m
friction C value =	120	
forcemain diameter =	450	mm
forcemain X-area =	0.1590	m^2
forcemain length =	1,300	m
pump efficiency =	70%	
fluid specific weight =	9.81	kN/m^3

Ref: Flow and pumping information from M. Homenuke Feb 2/09 e-mail and attached ConveyanceFlows_forDean_20090202.xls.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 7, 2009
Last Revision By: D. Shiskowski

Subject: Diversion Z to Westhills Pump Station

Option 3
Life Cycle Analysis

Yellow-shaded cell denotes assumed/input values

Year	Capital Costs (Note 1)		Operation & Maintenance Costs				GHG CO2e		Total	
			Electricity		Maintenance (Note 1)					
	Total Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value
2008										
2009										
2010										
2011										
2012										
2013										
2014		$0							$0	$0
2015		$0	$3,626	$2,756	$0	$0	$56	$43	$3,626	$2,756
2016		$0	$4,096	$2,993	$0	$0	$63	$46	$4,096	$2,993
2017		$0	$4,569	$3,210	$0	$0	$70	$50	$4,569	$3,210
2018		$0	$5,045	$3,408	$0	$0	$78	$53	$5,045	$3,408
2019		$0	$5,524	$3,588	$0	$0	$85	$55	$5,524	$3,588
2020		$0	$6,007	$3,752	$0	$0	$93	$58	$6,007	$3,752
2021		$0	$6,494	$3,900	$0	$0	$100	$60	$6,494	$3,900
2022		$0	$6,986	$4,034	$0	$0	$108	$62	$6,986	$4,034
2023		$0	$7,481	$4,154	$0	$0	$115	$64	$7,481	$4,154
2024		$0	$7,982	$4,262	$0	$0	$123	$66	$7,982	$4,262
2025		$0	$8,487	$4,357	$0	$0	$131	$67	$8,487	$4,357
2026		$0	$8,998	$4,442	$0	$0	$139	$69	$8,998	$4,442
2027		$0	$9,514	$4,516	$0	$0	$147	$70	$9,514	$4,516
2028		$0	$10,036	$4,580	$0	$0	$155	$71	$10,036	$4,580
2029		$0	$10,564	$4,636	$0	$0	$163	$72	$10,564	$4,636
2030		$0	$11,099	$4,683	$0	$0	$171	$72	$11,099	$4,683
2031		$0	$11,128	$4,515	$0	$0	$172	$70	$11,128	$4,515
2032		$0	$11,157	$4,353	$0	$0	$172	$67	$11,157	$4,353
2033		$0	$11,187	$4,196	$0	$0	$173	$65	$11,187	$4,196
2034		$0	$11,216	$4,045	$0	$0	$173	$62	$11,216	$4,045
2035		$0	$11,245	$3,900	$0	$0	$174	$60	$11,245	$3,900
2036		$0	$11,275	$3,760	$0	$0	$174	$58	$11,275	$3,760
2037		$0	$11,304	$3,625	$0	$0	$174	$56	$11,304	$3,625
2038		$0	$11,334	$3,494	$0	$0	$175	$54	$11,334	$3,494
2039		$0	$11,363	$3,369	$0	$0	$175	$52	$11,363	$3,369
2040		$0	$11,393	$3,248	$0	$0	$176	$50	$11,393	$3,248
2041		$0	$11,422	$3,131	$0	$0	$176	$48	$11,422	$3,131
2042		$0	$11,452	$3,018	$0	$0	$177	$47	$11,452	$3,018
2043		$0	$11,481	$2,910	$0	$0	$177	$45	$11,481	$2,910
2044		$0	$11,511	$2,805	$0	$0	$178	$43	$11,511	$2,805
2045		$0	$11,541	$2,704	$0	$0	$178	$42	$11,541	$2,704
2046		$0	$11,591	$2,611	$0	$0	$179	$40	$11,591	$2,611
2047		$0	$11,642	$2,522	$0	$0	$180	$39	$11,642	$2,522
2048		$0	$11,692	$2,435	$0	$0	$180	$38	$11,692	$2,435
2049		$0	$11,743	$2,352	$0	$0	$181	$36	$11,743	$2,352
2050		$0	$11,793	$2,271	$0	$0	$182	$35	$11,793	$2,271
2051		$0	$11,844	$2,193	$0	$0	$183	$34	$11,844	$2,193
2052		$0	$11,895	$2,118	$0	$0	$184	$33	$11,895	$2,118
2053		$0	$11,945	$2,045	$0	$0	$184	$32	$11,945	$2,045
2054		$0	$11,996	$1,975	$0	$0	$185	$30	$11,996	$1,975
2055		$0	$12,047	$1,907	$0	$0	$186	$29	$12,047	$1,907
2056		$0	$12,098	$1,841	$0	$0	$187	$28	$12,098	$1,841
2057		$0	$12,149	$1,778	$0	$0	$187	$27	$12,149	$1,778
2058		$0	$12,200	$1,717	$0	$0	$188	$26	$12,200	$1,717
2059		$0	$12,252	$1,658	$0	$0	$189	$26	$12,252	$1,658
2060		$0	$12,303	$1,601	$0	$0	$190	$25	$12,303	$1,601
2061		$0	$12,354	$1,545	$0	$0	$191	$24	$12,354	$1,545
2062		$0	$12,405	$1,492	$0	$0	$191	$23	$12,405	$1,492
2063		$0	$12,457	$1,441	$0	$0	$192	$22	$12,457	$1,441
2064		$0	$12,508	$1,391	$0	$0	$193	$21	$12,508	$1,391
2065		$0	$12,560	$1,343	$0	$0	$194	$21	$12,560	$1,343
Total Capital =		$0								
Total Net Present Value =			$0	$154,579		$0		$2,385		**$154,579**

Notes:
1. Capital costs included in CS Mods LCA.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 7, 2009
Last Revision By: D. Shiskowski

Subject: Diversion W2 to Florence Lake Pump Station
(note: Diversion W1 PS negligible)
Option 3
Material Flows
and Carbon Footprint Analysis

Yellow-shaded cell denotes assumed/input values

Year	Wastewater ADWF		ADWF Friction Losses		TDH	Velocity	Pump Energy	Materials	GHG Sources	Total GHG Emissions
			Unit	Total				Electricity	Electricity Purchased	
	(m3/d)	(L/s)	(m/m)	(m)	(m)	(m/s)	(kW)	(kWh/yr)	(t CO2e/yr)	(t CO2e/yr)
2008										
2009										
2010										
2011										
2012										
2013										
2014										
2015	1,430	17	0.000269	0.30	10.3	0.23	2.4	20,920	2	2
2016	1,493	17	0.000291	0.32	10.3	0.24	2.5	21,893	2	2
2017	1,556	18	0.000314	0.35	10.3	0.25	2.6	22,872	2	2
2018	1,619	19	0.000338	0.37	10.4	0.27	2.7	23,857	2	2
2019	1,682	19	0.000363	0.40	10.4	0.28	2.8	24,850	2	2
2020	1,745	20	0.000389	0.43	10.4	0.29	3.0	25,849	2	2
2021	1,808	21	0.000415	0.46	10.5	0.30	3.1	26,856	2	2
2022	1,871	22	0.000442	0.49	10.5	0.31	3.2	27,870	2	2
2023	1,933	22	0.000470	0.52	10.5	0.32	3.3	28,892	2	2
2024	1,996	23	0.000499	0.55	10.5	0.33	3.4	29,922	2	2
2025	2,059	24	0.000528	0.58	10.6	0.34	3.5	30,960	2	2
2026	2,122	25	0.000558	0.61	10.6	0.35	3.7	32,007	2	2
2027	2,185	25	0.000589	0.65	10.6	0.36	3.8	33,062	2	2
2028	2,248	26	0.000621	0.68	10.7	0.37	3.9	34,126	2	2
2029	2,311	27	0.000654	0.72	10.7	0.38	4.0	35,199	3	3
2030	2,374	27	0.000687	0.76	10.8	0.39	4.1	36,281	3	3
2031	2,420	28	0.000712	0.78	10.8	0.40	4.2	37,073	3	3
2032	2,465	29	0.000737	0.81	10.8	0.40	4.3	37,870	3	3
2033	2,511	29	0.000762	0.84	10.8	0.41	4.4	38,673	3	3
2034	2,557	30	0.000788	0.87	10.9	0.42	4.5	39,481	3	3
2035	2,603	30	0.000814	0.90	10.9	0.43	4.6	40,294	3	3
2036	2,648	31	0.000841	0.93	10.9	0.43	4.7	41,112	3	3
2037	2,694	31	0.000868	0.95	11.0	0.44	4.8	41,936	3	3
2038	2,740	32	0.000895	0.99	11.0	0.45	4.9	42,765	3	3
2039	2,786	32	0.000923	1.02	11.0	0.46	5.0	43,600	3	3
2040	2,831	33	0.000952	1.05	11.0	0.46	5.1	44,441	3	3
2041	2,877	33	0.000980	1.08	11.1	0.47	5.2	45,288	3	3
2042	2,923	34	0.001009	1.11	11.1	0.48	5.3	46,140	3	3
2043	2,969	34	0.001039	1.14	11.1	0.49	5.4	46,999	3	3
2044	3,014	35	0.001068	1.18	11.2	0.49	5.5	47,863	3	3
2045	3,060	35	0.001099	1.21	11.2	0.50	5.6	48,734	4	4
2046	3,110	36	0.001132	1.25	11.2	0.51	5.7	49,698	4	4
2047	3,161	37	0.001166	1.28	11.3	0.52	5.8	50,671	4	4
2048	3,211	37	0.001201	1.32	11.3	0.53	5.9	51,651	4	4
2049	3,261	38	0.001236	1.36	11.4	0.53	6.0	52,638	4	4
2050	3,312	38	0.001271	1.40	11.4	0.54	6.1	53,634	4	4
2051	3,362	39	0.001307	1.44	11.4	0.55	6.2	54,637	4	4
2052	3,412	39	0.001344	1.48	11.5	0.56	6.4	55,649	4	4
2053	3,462	40	0.001381	1.52	11.5	0.57	6.5	56,669	4	4
2054	3,513	41	0.001418	1.56	11.6	0.58	6.6	57,697	4	4
2055	3,563	41	0.001456	1.60	11.6	0.58	6.7	58,734	4	4
2056	3,613	42	0.001494	1.64	11.6	0.59	6.8	59,779	4	4
2057	3,664	42	0.001533	1.69	11.7	0.60	6.9	60,833	4	4
2058	3,714	43	0.001572	1.73	11.7	0.61	7.1	61,896	4	4
2059	3,764	44	0.001612	1.77	11.8	0.62	7.2	62,967	5	5
2060	3,815	44	0.001652	1.82	11.8	0.62	7.3	64,047	5	5
2061	3,865	45	0.001692	1.86	11.9	0.63	7.4	65,137	5	5
2062	3,915	45	0.001733	1.91	11.9	0.64	7.6	66,235	5	5
2063	3,965	46	0.001775	1.95	12.0	0.65	7.7	67,343	5	5
2064	4,016	46	0.001816	2.00	12.0	0.66	7.8	68,460	5	5
2065	4,066	47	0.001859	2.04	12.0	0.67	7.9	69,586	5	5
Totals =								2,285,647	165	**165**

DIVERSION Z PUMP STATION

static head =	10.0	m
friction C value =	120	
forcemain diameter =	300	mm
forcemain X-area =	0.0707	m^2
forcemain length =	1,100	m
pump efficiency =	70%	
fluid specific weight =	9.81	kN/m^3

Ref: Flow and pumping information from M. Homenuke Feb 2/09 e-mail and attached ConveyanceFlows_forDean_20090202.xls.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 7, 2009
Last Revision By: D. Shiskowski

Subject: Diversion W2 to Florence Lake Pump Station
(note: Diversion W1 PS negligible)
Option 3
Life Cycle Analysis

Yellow-shaded cell denotes assumed/input values

Year	Capital Costs (Note 1)		Operation & Maintenance Costs				GHG CO2e		Total	
			Electricity		Maintenance (Note 1)					
	Total Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value
2008										
2009										
2010										
2011										
2012										
2013										
2014		$0							$0	$0
2015		$0	$1,464	$1,113	$0	$0	$23	$17	$1,464	$1,113
2016		$0	$1,532	$1,120	$0	$0	$24	$17	$1,532	$1,120
2017		$0	$1,601	$1,125	$0	$0	$25	$17	$1,601	$1,125
2018		$0	$1,670	$1,128	$0	$0	$26	$17	$1,670	$1,128
2019		$0	$1,739	$1,130	$0	$0	$27	$17	$1,739	$1,130
2020		$0	$1,809	$1,130	$0	$0	$28	$17	$1,809	$1,130
2021		$0	$1,880	$1,129	$0	$0	$29	$17	$1,880	$1,129
2022		$0	$1,951	$1,127	$0	$0	$30	$17	$1,951	$1,127
2023		$0	$2,022	$1,123	$0	$0	$31	$17	$2,022	$1,123
2024		$0	$2,095	$1,118	$0	$0	$32	$17	$2,095	$1,118
2025		$0	$2,167	$1,113	$0	$0	$33	$17	$2,167	$1,113
2026		$0	$2,240	$1,106	$0	$0	$35	$17	$2,240	$1,106
2027		$0	$2,314	$1,098	$0	$0	$36	$17	$2,314	$1,098
2028		$0	$2,389	$1,090	$0	$0	$37	$17	$2,389	$1,090
2029		$0	$2,464	$1,081	$0	$0	$38	$17	$2,464	$1,081
2030		$0	$2,540	$1,072	$0	$0	$39	$17	$2,540	$1,072
2031		$0	$2,595	$1,053	$0	$0	$40	$16	$2,595	$1,053
2032		$0	$2,651	$1,034	$0	$0	$41	$16	$2,651	$1,034
2033		$0	$2,707	$1,015	$0	$0	$42	$16	$2,707	$1,015
2034		$0	$2,764	$997	$0	$0	$43	$15	$2,764	$997
2035		$0	$2,821	$978	$0	$0	$44	$15	$2,821	$978
2036		$0	$2,878	$960	$0	$0	$44	$15	$2,878	$960
2037		$0	$2,936	$941	$0	$0	$45	$15	$2,936	$941
2038		$0	$2,994	$923	$0	$0	$46	$14	$2,994	$923
2039		$0	$3,052	$905	$0	$0	$47	$14	$3,052	$905
2040		$0	$3,111	$887	$0	$0	$48	$14	$3,111	$887
2041		$0	$3,170	$869	$0	$0	$49	$13	$3,170	$869
2042		$0	$3,230	$851	$0	$0	$50	$13	$3,230	$851
2043		$0	$3,290	$834	$0	$0	$51	$13	$3,290	$834
2044		$0	$3,350	$816	$0	$0	$52	$13	$3,350	$816
2045		$0	$3,411	$799	$0	$0	$53	$12	$3,411	$799
2046		$0	$3,479	$784	$0	$0	$54	$12	$3,479	$784
2047		$0	$3,547	$768	$0	$0	$55	$12	$3,547	$768
2048		$0	$3,616	$753	$0	$0	$56	$12	$3,616	$753
2049		$0	$3,685	$738	$0	$0	$57	$11	$3,685	$738
2050		$0	$3,754	$723	$0	$0	$58	$11	$3,754	$723
2051		$0	$3,825	$708	$0	$0	$59	$11	$3,825	$708
2052		$0	$3,895	$694	$0	$0	$60	$11	$3,895	$694
2053		$0	$3,967	$679	$0	$0	$61	$10	$3,967	$679
2054		$0	$4,039	$665	$0	$0	$62	$10	$4,039	$665
2055		$0	$4,111	$651	$0	$0	$63	$10	$4,111	$651
2056		$0	$4,185	$637	$0	$0	$65	$10	$4,185	$637
2057		$0	$4,258	$623	$0	$0	$66	$10	$4,258	$623
2058		$0	$4,333	$610	$0	$0	$67	$9	$4,333	$610
2059		$0	$4,408	$596	$0	$0	$68	$9	$4,408	$596
2060		$0	$4,483	$583	$0	$0	$69	$9	$4,483	$583
2061		$0	$4,560	$570	$0	$0	$70	$9	$4,560	$570
2062		$0	$4,636	$558	$0	$0	$72	$9	$4,636	$558
2063		$0	$4,714	$545	$0	$0	$73	$8	$4,714	$545
2064		$0	$4,792	$533	$0	$0	$74	$8	$4,792	$533
2065		$0	$4,871	$521	$0	$0	$75	$8	$4,871	$521
Total Capital =	$0									
Total Net Present Value =			$0	$44,604		$0		$688		**$44,604**

Notes:
1. Capital costs included in CS Mods LCA.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 17, 2009
Last Revision By: D. Shiskowski

Subject: Saanich East WWTF
Option 3

Material Flows
and Carbon Footprint Analysis

Yellow-shaded cell denotes assumed/input values

Year	Equivalent Population	Wastewater ADWF	Sludge Production and Truck Transport		Saleable Effluent Heat[1]	Saleable Reclaimed Water (irrigation only)	Materials			GHG Sources			GHG Offsets	Total GHG Emissions
			Mass	Thickened Volume			Electricity	Diesel Fuel	Sludge Thickening Polymer	Electricity Purchased	Diesel Fuel Combusted	Sludge Thickening Polymer Used	Avoided Natural Gas/Elect Use via Effluent Heat	
	(pe)	(m3/d)	(dry t/yr)	(m3/yr)	(GJ/yr)	(m3/yr)	(kWh/yr)	(L/yr)	(kg/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)
2008														
2009														
2010														
2011														
2012														
2013														
2014														
2015	47,656	16,125	1,035	16,911	36,488	31,194	4,449,533	16,815	8,280	320	46.4	9.9	-1,385	-1,009
2016	48,074	16,110	1,044	17,059	44,864	31,165	4,445,467	16,962	8,352	320	46.8	10.0	-1,703	-1,326
2017	48,491	16,096	1,053	17,208	53,241	31,137	4,441,401	17,110	8,425	320	47.2	10.1	-2,021	-1,644
2018	48,909	16,081	1,062	17,356	61,617	31,108	4,437,336	17,257	8,497	319	47.6	10.2	-2,339	-1,962
2019	49,326	16,066	1,071	17,504	69,994	31,080	4,433,270	17,404	8,570	319	48.0	10.3	-2,657	-2,280
2020	49,744	16,051	1,080	17,652	78,371	31,051	4,429,205	17,552	8,642	319	48.4	10.4	-2,975	-2,598
2021	50,161	16,037	1,089	17,800	86,747	31,023	4,425,139	17,699	8,715	319	48.8	10.5	-3,294	-2,916
2022	50,579	16,022	1,098	17,948	95,124	30,994	4,421,074	17,846	8,788	318	49.2	10.5	-3,612	-3,233
2023	50,996	16,007	1,108	18,097	103,500	30,966	4,417,008	17,994	8,860	318	49.6	10.6	-3,930	-3,551
2024	51,414	15,992	1,117	18,245	111,877	30,937	4,412,943	18,141	8,933	318	50.0	10.7	-4,248	-3,869
2025	51,831	15,978	1,126	18,393	120,253	30,909	4,408,877	18,288	9,005	317	50.4	10.8	-4,566	-4,187
2026	52,249	15,963	1,135	18,541	128,630	30,880	4,404,812	18,436	9,078	317	50.8	10.9	-4,884	-4,505
2027	52,666	15,948	1,144	18,689	137,007	30,852	4,400,746	18,583	9,150	317	51.2	11.0	-5,202	-4,823
2028	53,084	15,933	1,153	18,837	145,383	30,823	4,396,681	18,730	9,223	317	51.6	11.1	-5,520	-5,140
2029	53,501	15,919	1,162	18,986	153,760	30,795	4,392,615	18,878	9,295	316	52.0	11.2	-5,838	-5,458
2030	53,919	15,904	1,171	19,134	162,136	30,766	4,388,550	19,025	9,368	316	52.4	11.2	-6,156	-5,776
2031	54,470	15,927	1,183	19,329	163,871	30,812	4,395,025	19,220	9,464	316	53.0	11.4	-6,222	-5,841
2032	55,021	15,951	1,195	19,525	165,605	30,857	4,401,501	19,414	9,559	317	53.5	11.5	-6,287	-5,906
2033	55,573	15,974	1,207	19,721	167,339	30,902	4,407,976	19,609	9,655	317	54.1	11.6	-6,353	-5,970
2034	56,124	15,998	1,219	19,916	169,074	30,948	4,414,451	19,803	9,751	318	54.6	11.7	-6,419	-6,035
2035	56,675	16,021	1,231	20,112	170,808	30,993	4,420,927	19,997	9,847	318	55.1	11.8	-6,485	-6,100
2036	57,226	16,045	1,243	20,307	172,543	31,039	4,427,402	20,192	9,942	319	55.7	11.9	-6,551	-6,165
2037	57,777	16,068	1,255	20,503	174,277	31,084	4,433,878	20,386	10,038	319	56.2	12.0	-6,617	-6,229
2038	58,329	16,092	1,267	20,699	176,011	31,129	4,440,353	20,581	10,134	320	56.7	12.2	-6,683	-6,294
2039	58,880	16,115	1,279	20,894	177,746	31,175	4,446,828	20,775	10,230	320	57.3	12.3	-6,748	-6,359
2040	59,431	16,139	1,291	21,090	179,480	31,220	4,453,304	20,970	10,326	321	57.8	12.4	-6,814	-6,423
2041	59,982	16,162	1,303	21,285	181,215	31,266	4,459,779	21,164	10,421	321	58.3	12.5	-6,880	-6,488
2042	60,533	16,186	1,315	21,481	182,949	31,311	4,466,254	21,359	10,517	322	58.9	12.6	-6,946	-6,553
2043	61,085	16,209	1,327	21,677	184,683	31,356	4,472,730	21,553	10,613	322	59.4	12.7	-7,012	-6,618
2044	61,636	16,233	1,339	21,872	186,418	31,402	4,479,205	21,748	10,709	323	60.0	12.9	-7,078	-6,682
2045	62,187	16,256	1,351	22,068	188,152	31,447	4,485,681	21,942	10,804	323	60.5	13.0	-7,144	-6,747
2046	62,252	16,201	1,352	22,091	195,957	31,340	4,470,380	21,965	10,816	322	60.6	13.0	-7,440	-7,044
2047	62,317	16,145	1,353	22,114	203,762	31,233	4,455,079	21,988	10,827	321	60.6	13.0	-7,736	-7,342
2048	62,382	16,090	1,355	22,137	211,566	31,125	4,439,778	22,011	10,838	320	60.7	13.0	-8,033	-7,639
2049	62,447	16,034	1,356	22,160	219,371	31,018	4,424,477	22,034	10,849	319	60.7	13.0	-8,329	-7,936
2050	62,512	15,979	1,358	22,183	227,176	30,911	4,409,176	22,057	10,861	317	60.8	13.0	-8,625	-8,234
2051	62,576	15,923	1,359	22,206	234,981	30,804	4,393,875	22,080	10,872	316	60.9	13.0	-8,921	-8,531
2052	62,641	15,868	1,360	22,229	242,785	30,696	4,378,575	22,103	10,883	315	60.9	13.1	-9,218	-8,829
2053	62,706	15,812	1,362	22,252	250,590	30,589	4,363,274	22,126	10,895	314	61.0	13.1	-9,514	-9,126
2054	62,771	15,757	1,363	22,275	258,395	30,482	4,347,973	22,148	10,906	313	61.1	13.1	-9,810	-9,423
2055	62,836	15,702	1,365	22,298	263,801	30,375	4,332,672	22,171	10,917	312	61.1	13.1	-10,016	-9,629
2056	62,901	15,646	1,366	22,321	264,014	30,267	4,317,371	22,194	10,928	311	61.2	13.1	-10,024	-9,639
2057	62,966	15,591	1,367	22,344	264,228	30,160	4,302,070	22,217	10,940	310	61.2	13.1	-10,032	-9,648
2058	63,031	15,535	1,369	22,367	264,441	30,053	4,286,769	22,240	10,951	309	61.3	13.1	-10,040	-9,657
2059	63,096	15,480	1,370	22,390	264,655	29,945	4,271,468	22,263	10,962	308	61.4	13.2	-10,048	-9,666
2060	63,161	15,424	1,372	22,413	264,868	29,838	4,256,168	22,286	10,974	306	61.4	13.2	-10,056	-9,675
2061	63,225	15,369	1,373	22,436	265,082	29,731	4,240,867	22,309	10,985	305	61.5	13.2	-10,064	-9,684
2062	63,290	15,313	1,375	22,459	265,295	29,624	4,225,566	22,332	10,996	304	61.6	13.2	-10,072	-9,693
2063	63,355	15,258	1,376	22,482	265,509	29,516	4,210,265	22,355	11,007	303	61.6	13.2	-10,081	-9,703
2064	63,420	15,202	1,377	22,505	265,722	29,409	4,194,964	22,377	11,019	302	61.7	13.2	-10,089	-9,712
2065	63,485	15,147	1,379	22,528	265,936	29,302	4,179,663	22,400	11,030	301	61.8	13.2	-10,097	-9,721
Totals =					9,187,296		1,569,041	223,810,381	1,039,092		16,114	2,864	614	-348,812	**-329,220**

SAANICH EAST WWTF ASSUMPTIONS

Electricity:

"base" unit power requirement =	0.600	kW-hr/d per m3/d of ADWF treated wastewater	**Ref:** Based on Jan 15/09 TM from T. Dokken, based on Option 1/2 facilty.
wastewater strength adjustment =	0.100	x "base" unit power requirement	**Note:** To account for same load by reduction in Option 3 flow rate.
influent pumping power adjustment =	0.070	x "base" unit power requirement	**Ref:** Reduced relative to Options 1/2.
UV disinfection power adjustment =	0	x "base" unit power requirement	**Note:** Not required - effluent to marine environment.
effluent pumping power adjustment =	0.04	x "base" unit power requirement	**Note:** Reduced relative to Options 1/2.
raw sludge thickening adjustment =	0.05	x "base" unit power requirement	**Ref:** Based on Table 1.4, WEF.
total unit power requirement =	0.756	kW-hr/d per m3/d of ADWF treated wastewater	

Raw Sludge Thickening and Truck Transport:

thickening required (1 = yes, 0 = no)?	1		
chemical-P removal chemical sludge production allowance =	0%	of combined PS + WBS	
round-trip transport distance to solids processing facility =	35	km	**Note:** To/from Royal Roads Organics Facility.

Saleable Reclaimed Water:

mean fraction of annual ADWF volume sold for landscape irrigation =	0.53%	/yr	**Note:** See dnt_eff_irr_ds.xls for assumptions and details. Reclaimed water used for toilet flushing handled separately in analysis. See IRS LCA worksheet.

Notes:
1. Data from M. Homenuke in Feb 4/09 e-mail, DES_SaleableHeatEnergy.xls, Saleable.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 18, 2009
Last Revision By: D. Shiskowski

Subject: Saanich East WWTF
Option 3

Life Cycle Analysis

Yellow-shaded cell denotes assumed/input values

Year	Capital Costs		Operation & Maintenance Costs												GHG CO2e		Heat Revenues		Reclaimed Water Revenues (irrigation only)		Total	
			Labour		Electricity		Diesel Fuel		Chemicals		Maintenance		Administration									
	Total Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Rev	Net Present Value	Total Annual Rev	Net Present Value	Total Annual Cost	Net Present Value
2008																						
2009																						
2010																						
2011																						
2012																						
2013																						
2014	$132,561,560	$104,765,326																			$132,561,560	$104,765,326
2015	$0	$0	$375,000	$284,969	$311,467	$236,690	$25,223	$19,167	$154,575	$117,464	$1,325,616	$1,007,359	$100,000	$75,992	-$15,130	-$11,498	-$201,354	-$153,012	-$22,460	-$17,067	$2,052,938	$1,560,064
2016	$0	$0	$375,000	$274,009	$311,183	$227,378	$25,444	$18,591	$155,315	$113,487	$1,325,616	$968,614	$100,000	$73,069	-$19,897	-$14,539	-$247,579	-$180,903	-$22,439	-$16,396	$2,002,642	$1,463,311
2017	$0	$0	$375,000	$263,470	$310,898	$218,433	$25,665	$18,032	$156,055	$109,642	$1,325,616	$931,360	$100,000	$70,259	-$24,665	-$17,329	-$293,804	-$206,423	-$22,419	-$15,751	$1,952,346	$1,371,692
2018	$0	$0	$375,000	$253,337	$310,614	$209,839	$25,886	$17,487	$156,795	$105,925	$1,325,616	$895,538	$100,000	$67,556	-$29,432	-$19,883	-$340,029	-$229,712	-$22,398	-$15,131	$1,902,050	$1,284,957
2019	$0	$0	$375,000	$243,593	$310,329	$201,584	$26,107	$16,958	$157,535	$102,332	$1,325,616	$861,095	$100,000	$64,956	-$34,200	-$22,216	-$386,255	-$250,904	-$22,377	-$14,536	$1,851,754	$1,202,864
2020	$0	$0	$375,000	$234,224	$310,044	$193,653	$26,328	$16,444	$158,275	$98,858	$1,325,616	$827,976	$100,000	$62,460	-$38,967	-$24,339	-$432,480	-$270,126	-$22,357	-$13,964	$1,801,458	$1,125,186
2021	$0	$0	$375,000	$225,215	$309,760	$186,034	$26,549	$15,944	$159,015	$95,500	$1,325,616	$796,130	$100,000	$60,057	-$43,735	-$26,266	-$478,705	-$287,498	-$22,336	-$13,415	$1,751,162	$1,051,703
2022	$0	$0	$375,000	$216,553	$309,475	$178,714	$26,770	$15,459	$159,755	$92,254	$1,325,616	$765,510	$100,000	$57,748	-$48,502	-$28,009	-$524,930	-$303,134	-$22,316	-$12,887	$1,700,867	$982,208
2023	$0	$0	$375,000	$208,224	$309,191	$171,683	$26,991	$14,987	$160,495	$89,117	$1,325,616	$736,067	$100,000	$55,526	-$53,270	-$29,579	-$571,156	-$317,142	-$22,295	-$12,380	$1,650,571	$916,503
2024	$0	$0	$375,000	$200,216	$308,906	$164,927	$27,212	$14,529	$161,235	$86,084	$1,325,616	$707,757	$100,000	$53,391	-$58,037	-$30,987	-$617,381	-$329,625	-$22,275	-$11,893	$1,600,275	$854,400
2025	$0	$0	$375,000	$192,515	$308,621	$158,438	$27,433	$14,083	$161,975	$83,153	$1,325,616	$680,536	$100,000	$51,337	-$62,805	-$32,242	-$663,606	-$340,678	-$22,254	-$11,425	$1,549,979	$795,718
2026	$0	$0	$375,000	$185,111	$308,337	$152,204	$27,654	$13,651	$162,714	$80,320	$1,325,616	$654,361	$100,000	$49,363	-$67,572	-$33,355	-$709,832	-$350,393	-$22,234	-$10,975	$1,499,683	$740,286
2027	$0	$0	$375,000	$177,991	$308,052	$146,215	$27,875	$13,230	$163,454	$77,582	$1,325,616	$629,193	$100,000	$47,464	-$72,340	-$34,335	-$756,057	-$358,857	-$22,213	-$10,543	$1,449,387	$687,941
2028	$0	$0	$375,000	$171,145	$307,768	$140,461	$28,096	$12,822	$164,194	$74,936	$1,325,616	$604,994	$100,000	$45,639	-$77,107	-$35,191	-$802,282	-$366,151	-$22,193	-$10,128	$1,399,091	$638,527
2029	$0	$0	$375,000	$164,563	$307,483	$134,934	$28,317	$12,426	$164,934	$72,379	$1,325,616	$581,725	$100,000	$43,883	-$81,875	-$35,929	-$848,507	-$372,354	-$22,172	-$9,730	$1,348,795	$591,897
2030	$0	$0	$375,000	$158,233	$307,198	$129,624	$28,538	$12,042	$165,674	$69,907	$1,325,616	$559,351	$100,000	$42,196	-$86,642	-$36,559	-$894,733	-$377,537	-$22,152	-$9,347	$1,298,500	$547,909
2031	$0	$0	$375,000	$152,147	$307,652	$124,822	$28,829	$11,697	$166,820	$67,683	$1,325,616	$537,837	$100,000	$40,573	-$87,613	-$35,547	-$904,304	-$366,900	-$22,184	-$9,001	$1,289,816	$523,312
2032	$0	$0	$375,000	$146,296	$308,105	$120,198	$29,121	$11,361	$167,966	$65,527	$1,325,616	$517,151	$100,000	$39,012	-$88,584	-$34,558	-$913,875	-$356,522	-$22,217	-$8,667	$1,281,132	$499,797
2033	$0	$0	$375,000	$140,669	$308,558	$115,745	$29,413	$11,033	$169,112	$63,437	$1,325,616	$497,261	$100,000	$37,512	-$89,555	-$33,594	-$923,446	-$346,400	-$22,250	-$8,346	$1,272,448	$477,317
2034	$0	$0	$375,000	$135,258	$309,012	$111,457	$29,704	$10,714	$170,258	$61,410	$1,325,616	$478,135	$100,000	$36,069	-$90,526	-$32,652	-$933,017	-$336,529	-$22,282	-$8,037	$1,263,764	$455,826
2035	$0	$0	$375,000	$130,056	$309,465	$107,328	$29,996	$10,403	$171,403	$59,446	$1,325,616	$459,745	$100,000	$34,682	-$91,497	-$31,733	-$942,588	-$326,905	-$22,315	-$7,739	$1,255,080	$435,283
2036	$0	$0	$375,000	$125,054	$309,918	$103,351	$30,288	$10,100	$172,549	$57,541	$1,325,616	$442,063	$100,000	$33,348	-$92,468	-$30,836	-$952,159	-$317,524	-$22,348	-$7,453	$1,246,396	$415,645
2037	$0	$0	$375,000	$120,244	$310,371	$99,521	$30,580	$9,805	$173,695	$55,696	$1,325,616	$425,061	$100,000	$32,065	-$93,439	-$29,961	-$961,730	-$308,380	-$22,381	-$7,176	$1,237,712	$396,874
2038	$0	$0	$375,000	$115,620	$310,825	$95,833	$30,871	$9,518	$174,841	$53,907	$1,325,616	$408,712	$100,000	$30,832	-$94,410	-$29,108	-$971,301	-$299,470	-$22,413	-$6,910	$1,229,028	$378,932
2039	$0	$0	$375,000	$111,173	$311,278	$92,282	$31,163	$9,239	$175,987	$52,173	$1,325,616	$392,992	$100,000	$29,646	-$95,381	-$28,277	-$980,872	-$290,790	-$22,446	-$6,654	$1,220,345	$361,784
2040	$0	$0	$375,000	$106,897	$311,731	$88,861	$31,455	$8,966	$177,133	$50,493	$1,325,616	$377,877	$100,000	$28,506	-$96,352	-$27,466	-$990,443	-$282,334	-$22,479	-$6,408	$1,211,661	$345,393
2041	$0	$0	$375,000	$102,785	$312,185	$85,568	$31,747	$8,702	$178,278	$48,865	$1,325,616	$363,344	$100,000	$27,409	-$97,323	-$26,676	-$1,000,014	-$274,098	-$22,511	-$6,170	$1,202,977	$329,729
2042	$0	$0	$375,000	$98,832	$312,638	$82,396	$32,038	$8,444	$179,424	$47,288	$1,325,616	$349,369	$100,000	$26,355	-$98,294	-$25,906	-$1,009,585	-$266,078	-$22,544	-$5,942	$1,194,293	$314,758
2043	$0	$0	$375,000	$95,031	$313,091	$79,342	$32,330	$8,193	$180,570	$45,759	$1,325,616	$335,932	$100,000	$25,342	-$99,265	-$25,155	-$1,019,156	-$258,270	-$22,577	-$5,721	$1,185,609	$300,452
2044	$0	$0	$375,000	$91,376	$313,544	$76,401	$32,622	$7,949	$181,716	$44,278	$1,325,616	$323,011	$100,000	$24,367	-$100,236	-$24,424	-$1,028,728	-$250,669	-$22,609	-$5,509	$1,176,925	$286,780
2045	$0	$0	$375,000	$87,861	$313,998	$73,569	$32,914	$7,712	$182,862	$42,844	$1,325,616	$310,588	$100,000	$23,430	-$101,207	-$23,712	-$1,038,299	-$243,270	-$22,642	-$5,305	$1,168,241	$273,715
2046	$0	$0	$375,000	$84,482	$312,927	$70,498	$32,948	$7,423	$182,767	$41,175	$1,325,616	$298,642	$100,000	$22,529	-$105,667	-$23,805	-$1,081,368	-$243,617	-$22,565	-$5,084	$1,119,657	$252,242
2047	$0	$0	$375,000	$81,233	$311,856	$67,554	$32,982	$7,145	$182,673	$39,571	$1,325,616	$287,156	$100,000	$21,662	-$110,127	-$23,856	-$1,124,438	-$243,576	-$22,488	-$4,871	$1,071,074	$232,017
2048	$0	$0	$375,000	$78,108	$310,784	$64,733	$33,017	$6,877	$182,579	$38,029	$1,325,616	$276,111	$100,000	$20,829	-$114,587	-$23,867	-$1,167,508	-$243,179	-$22,410	-$4,668	$1,022,490	$212,973
2049	$0	$0	$375,000	$75,104	$309,713	$62,029	$33,051	$6,619	$182,484	$36,548	$1,325,616	$265,492	$100,000	$20,028	-$119,047	-$23,843	-$1,210,578	-$242,452	-$22,333	-$4,473	$973,906	$195,052
2050	$0	$0	$375,000	$72,216	$308,642	$59,437	$33,085	$6,371	$182,390	$35,124	$1,325,616	$255,280	$100,000	$19,257	-$123,508	-$23,784	-$1,253,648	-$241,421	-$22,256	-$4,286	$925,322	$178,194
2051	$0	$0	$375,000	$69,438	$307,571	$56,952	$33,120	$6,133	$182,296	$33,755	$1,325,616	$245,462	$100,000	$18,517	-$127,968	-$23,696	-$1,296,717	-$240,111	-$22,179	-$4,107	$876,738	$162,344
2052	$0	$0	$375,000	$66,767	$306,500	$54,571	$33,154	$5,903	$182,201	$32,440	$1,325,616	$236,021	$100,000	$17,805	-$132,428	-$23,578	-$1,339,787	-$238,544	-$22,101	-$3,935	$828,155	$147,450
2053	$0	$0	$375,000	$64,199	$305,429	$52,289	$33,188	$5,682	$182,107	$31,176	$1,325,616	$226,943	$100,000	$17,120	-$136,888	-$23,435	-$1,382,857	-$236,743	-$22,024	-$3,770	$779,571	$133,461
2054	$0	$0	$375,000	$61,730	$304,358	$50,102	$33,223	$5,469	$182,013	$29,962	$1,325,616	$218,215	$100,000	$16,461	-$141,349	-$23,268	-$1,425,927	-$234,727	-$21,947	-$3,613	$730,987	$120,331
2055	$0	$0	$375,000	$59,356	$303,287	$48,005	$33,257	$5,264	$181,918	$28,795	$1,325,616	$209,822	$100,000	$15,828	-$144,442	-$22,863	-$1,455,758	-$230,421	-$21,870	-$3,462	$697,008	$110,324
2056	$0	$0	$375,000	$57,073	$302,216	$45,996	$33,291	$5,067	$181,824	$27,673	$1,325,616	$201,752	$100,000	$15,219	-$144,579	-$22,004	-$1,456,936	-$221,738	-$21,792	-$3,317	$694,639	$105,720
2057	$0	$0	$375,000	$54,878	$301,145	$44,070	$33,326	$4,877	$181,730	$26,595	$1,325,616	$193,992	$100,000	$14,634	-$144,716	-$21,178	-$1,458,114	-$213,382	-$21,715	-$3,178	$692,270	$101,308
2058	$0	$0	$375,000	$52,767	$300,074	$42,224	$33,360	$4,694	$181,636	$25,558	$1,325,616	$186,531	$100,000	$14,071	-$144,853	-$20,383	-$1,459,292	-$205,341	-$21,638	-$3,045	$689,901	$97,078
2059	$0	$0	$375,000	$50,738	$299,003	$40,455	$33,394	$4,518	$181,541	$24,563	$1,325,616	$179,357	$100,000	$13,530	-$144,990	-$19,617	-$1,460,471	-$197,603	-$21,561	-$2,917	$687,532	$93,024
2060	$0	$0	$375,000	$48,786	$297,932	$38,760	$33,429	$4,349	$181,447	$23,606	$1,325,616	$172,458	$100,000	$13,010	-$145,127	-$18,881	-$1,461,649	-$190,156	-$21,484	-$2,795	$685,163	$89,138
2061	$0	$0	$375,000	$46,910	$296,861	$37,135	$33,463	$4,186	$181,353	$22,686	$1,325,616	$165,825	$100,000	$12,509	-$145,264	-$18,172	-$1,462,827	-$182,989	-$21,406	-$2,678	$682,794	$85,413
2062	$0	$0	$375,000	$45,106	$295,790	$35,578	$33,497	$4,029	$181,258	$21,802	$1,325,616	$159,447	$100,000	$12,028	-$145,401	-$17,489	-$1,464,005	-$176,093	-$21,329	-$2,565	$680,425	$81,843
2063	$0	$0	$375,000	$43,371	$294,719	$34,086	$33,532	$3,878	$181,164	$20,953	$1,325,616	$153,315	$100,000	$11,566	-$145,538	-$16,832	-$1,465,183	-$169,457	-$21,252	-$2,458	$678,056	$78,421
2064	$0	$0	$375,000	$41,703	$293,647	$32,656	$33,566	$3,733	$181,070	$20,136	$1,325,616	$147,418	$100,000	$11,121	-$145,675	-$16,200	-$1,466,362	-$163,070	-$21,175	-$2,355	$675,688	$75,141
2065	$0	$0	$375,000	$40,099	$292,576	$31,285	$33,601	$3,593	$180,975	$19,352	$1,325,616	$141,748	$100,000	$10,693	-$145,812	-$15,592	-$1,467,540	-$156,924	-$21,097	-$2,256	$673,319	$71,998
Total Capital =	$132,561,560																					
Total Net Present Value =		$104,765,326		$6,406,730		$5,275,900		$495,499		$2,864,786		$22,647,629		$1,708,461		-$1,294,203		-$13,490,131		-$380,439		**$128,999,559**

SAANICH EAST WWTF ASSUMPTIONS

Labour:
number of facility manager(s) = 1
number of operations staff = 2
number of maintenance staff = 2
number of administration staff = 0
total staff = 5 persons

Ref: Based on Jan 15/09 TM from T. Dokken.

Chemical Phosphorus Removal Chemicals:
chemical-P removal required (1 = yes, 0 = no)? 0

Wet-Weather CEPT Chemicals:
fraction of total annual ADWF treated = 5.0%

Ref: Allowance to account for potential costs.

Reclaimed Water Disinfection:
allowance = 10.0% of other chemical costs

Ref: Allowance to account for potential costs.

Saleable Heat Energy:
unit energy cost to third-party "heat recovery" utility = $ 8.48 /GJ
unit CRD saleable energy price to third-party utility = $ 5.52 /GJ

Ref: This is the cost that a third-party heat recovery utility would incur to make the heat available to customers. Value is from Table 6 of Feb 10/09 memo from M. Homenuke, reduced by 7% to remove CRD share of capital cost.
Note: This value is the difference between the general energy market unit price (from Generic Assumptions sheet) and the above value, which reflects the maximum amount the utility would be willing to pay the CRD for the heat.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: March 6, 2009
Last Revision By: D. Shiskowski

Subject: South Colwood WWTF
Option 3

Material Flows
and Carbon Footprint Analysis

Yellow-shaded cell denotes assumed/input values

Year	Equivalent Population	Wastewater ADWF	Sludge Production and Truck Transport		Saleable Effluent Heat[1]	Saleable Reclaimed Water (irrigation only)	Materials			GHG Sources			GHG Offsets	Total GHG Emissions
			Mass	Thickened Volume			Electricity	Diesel Fuel	Sludge Thickening Polymer	Electricity Purchased	Diesel Fuel Combusted	Sludge Thickening Polymer Used	Avoided Natural Gas/Elect Use via Effluent Heat2	
	(pe)	(m3/d)	(dry t/yr)	(m3/yr)	(GJ/yr)	(m3/yr)	(kWh/yr)	(L/yr)	(kg/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)
2008														
2009														
2010														
2011														
2012														
2013														
2014														
2015	6,589	1,582	143	2,338	21,361	7,507	487,466	465	1,145	35	1.3	1.4	0	38
2016	7,547	1,764	164	2,678	24,492	8,369	543,464	533	1,311	39	1.5	1.6	0	42
2017	8,506	1,945	185	3,018	27,623	9,231	599,462	600	1,478	43	1.7	1.8	0	47
2018	9,464	2,127	206	3,358	30,754	10,094	655,461	668	1,644	47	1.8	2.0	0	51
2019	10,422	2,309	226	3,698	33,886	10,956	711,459	735	1,811	51	2.0	2.2	0	55
2020	11,381	2,491	247	4,039	37,017	11,818	767,457	803	1,977	55	2.2	2.4	0	60
2021	12,339	2,672	268	4,379	40,148	12,681	823,455	871	2,144	59	2.4	2.6	0	64
2022	13,297	2,854	289	4,719	43,279	13,543	879,453	938	2,310	63	2.6	2.8	0	69
2023	14,256	3,036	310	5,059	46,410	14,405	935,451	1,006	2,477	67	2.8	3.0	0	73
2024	15,214	3,218	330	5,399	49,541	15,268	991,449	1,074	2,643	71	3.0	3.2	0	78
2025	16,172	3,399	351	5,739	52,672	16,130	1,047,447	1,141	2,810	75	3.1	3.4	0	82
2026	17,131	3,581	372	6,079	55,803	16,992	1,103,445	1,209	2,976	79	3.3	3.6	0	86
2027	18,089	3,763	393	6,419	58,934	17,854	1,159,443	1,277	3,143	83	3.5	3.8	0	91
2028	19,047	3,945	414	6,759	62,065	18,717	1,215,441	1,344	3,309	88	3.7	4.0	0	95
2029	20,006	4,126	434	7,099	65,196	19,579	1,271,439	1,412	3,476	92	3.9	4.2	0	100
2030	20,964	4,308	455	7,439	68,327	20,441	1,327,437	1,479	3,642	96	4.1	4.4	0	104
2031	21,914	4,461	476	7,776	71,622	21,169	1,374,684	1,546	3,807	99	4.3	4.6	0	108
2032	22,864	4,615	497	8,114	74,917	21,897	1,421,931	1,613	3,972	102	4.4	4.8	0	112
2033	23,814	4,768	517	8,451	78,212	22,624	1,469,178	1,681	4,137	106	4.6	5.0	0	115
2034	24,764	4,921	538	8,788	81,507	23,352	1,516,425	1,748	4,302	109	4.8	5.2	0	119
2035	25,714	5,075	558	9,125	84,802	24,079	1,563,672	1,815	4,468	113	5.0	5.4	0	123
2036	26,664	5,228	579	9,462	88,097	24,807	1,610,919	1,882	4,633	116	5.2	5.6	0	127
2037	27,614	5,381	600	9,799	91,392	25,534	1,658,166	1,949	4,798	119	5.4	5.8	0	131
2038	28,564	5,535	620	10,136	94,687	26,262	1,705,413	2,016	4,963	123	5.6	6.0	0	134
2039	29,514	5,688	641	10,473	97,982	26,990	1,752,661	2,083	5,128	126	5.7	6.2	0	138
2040	30,464	5,841	662	10,810	101,276	27,717	1,799,908	2,150	5,293	130	5.9	6.4	0	142
2041	31,414	5,995	682	11,148	104,571	28,445	1,847,155	2,217	5,458	133	6.1	6.5	0	146
2042	32,364	6,148	703	11,485	107,866	29,172	1,894,402	2,284	5,623	136	6.3	6.7	0	149
2043	33,314	6,301	723	11,822	111,161	29,900	1,941,649	2,351	5,788	140	6.5	6.9	0	153
2044	34,264	6,455	744	12,159	114,456	30,627	1,988,896	2,418	5,953	143	6.7	7.1	0	157
2045	35,214	6,608	765	12,496	117,751	31,355	2,036,143	2,485	6,118	147	6.9	7.3	0	161
2046	35,936	6,690	780	12,752	120,306	31,745	2,061,487	2,536	6,244	148	7.0	7.5	0	163
2047	36,658	6,773	796	13,008	122,860	32,136	2,086,831	2,587	6,369	150	7.1	7.6	0	165
2048	37,380	6,855	812	13,265	125,415	32,526	2,112,175	2,638	6,494	152	7.3	7.8	0	167
2049	38,102	6,937	827	13,521	127,969	32,916	2,137,519	2,689	6,620	154	7.4	7.9	0	169
2050	38,824	7,019	843	13,777	130,524	33,306	2,162,863	2,740	6,745	156	7.6	8.1	0	171
2051	39,545	7,102	859	14,033	133,079	33,697	2,188,206	2,791	6,871	158	7.7	8.2	0	173
2052	40,267	7,184	875	14,289	135,633	34,087	2,213,550	2,842	6,996	159	7.8	8.4	0	176
2053	40,989	7,266	890	14,545	138,188	34,477	2,238,894	2,893	7,121	161	8.0	8.5	0	178
2054	41,711	7,348	906	14,802	140,742	34,867	2,264,238	2,944	7,247	163	8.1	8.7	0	180
2055	42,433	7,431	922	15,058	143,297	35,258	2,289,582	2,994	7,372	165	8.3	8.8	0	182
2056	43,155	7,513	937	15,314	145,852	35,648	2,314,926	3,045	7,498	167	8.4	9.0	0	184
2057	43,877	7,595	953	15,570	148,406	36,038	2,340,270	3,096	7,623	168	8.5	9.1	0	186
2058	44,599	7,677	969	15,826	150,961	36,429	2,365,614	3,147	7,749	170	8.7	9.3	0	188
2059	45,321	7,760	984	16,083	153,515	36,819	2,390,958	3,198	7,874	172	8.8	9.4	0	190
2060	46,043	7,842	1,000	16,339	156,070	37,209	2,416,302	3,249	7,999	174	9.0	9.6	0	193
2061	46,764	7,924	1,016	16,595	158,625	37,599	2,441,646	3,300	8,125	176	9.1	9.7	0	195
2062	47,486	8,006	1,031	16,851	161,179	37,990	2,466,990	3,351	8,250	178	9.2	9.9	0	197
2063	48,208	8,089	1,047	17,107	163,734	38,380	2,492,334	3,402	8,376	179	9.4	10.1	0	199
2064	48,930	8,171	1,063	17,363	166,289	38,770	2,517,678	3,453	8,501	181	9.5	10.2	0	201
2065	49,652	8,253	1,078	17,620	168,843	39,160	2,543,022	3,504	8,627	183	9.7	10.4	0	203
Totals =					5,029,296		1,326,572	86,145,513	106,190		6,202	293	314	0	**6,809**

SOUTH COLWOOD WWTF ASSUMPTIONS

Electricity:

"base" unit power requirement =	0.670	kW-hr/d per m3/d of ADWF treated wastewater	**Ref:** Based on Jan 15/09 TM from T. Dokken.
wastewater strength adjustment =	0.100	x "base" unit power requirement	**Note:** To account for same load by reduction in Option 3 flow rate.
influent pumping power adjustment =	0.070	x "base" unit power requirement	**Ref:** Reduced relative to Options 1/2.
recycled centrate aeration power adjustment =	0	x "base" unit power requirement	**Note:** No solids processing therefore no centrate.
UV disinfection power adjustment =	0	x "base" unit power requirement	**Note:** Not required - effluent to marine environment.
effluent pumping power adjustment =	0.04	x "base" unit power requirement	**Ref:** Reduced relative to Options 1/2.
raw sludge thickening adjustment =	0.05	x "base" unit power requirement	**Ref:** Based on Table 1.4. WEF.
total unit power requirement =	0.844	kW-hr/d per m3/d of ADWF treated wastewater	

Raw Sludge Thickening and Truck Transport:

thickening required (1 = yes, 0 = no)?	1		
chemical-P removal chemical sludge production allowance =	0%	of combined PS + WBS	
round-trip transport distance to solids processing facility =	7	km	**Note:** To/from Royal Roads Organics Facility.

Saleable Reclaimed Water:

mean fraction of annual ADWF volume sold for landscape irrigation =	1.30%	/yr	**Note:** See dnt_eff_irr_ds.xls for assumptions and details. Reclaimed water used for toilet flushing handled separately in analysis. See IRS LCA worksheet.

Notes:
1. Data from M. Homenuke in Feb 4/09 e-mail, DES_SaleableHeatEnergy.xls, Saleable.
2. Set to zero since heat would not be sold - see LCA sheet.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: March 6, 2009
Last Revision By: D. Shiskowski

Subject: South Colwood WWTF
Option 3

Life Cycle Analysis

Yellow-shaded cell denotes assumed/input values

Year	Capital Costs[1]		Operation & Maintenance Costs												GHG CO2e		Heat Revenues		Reclaimed Water Revenues (irrigation only)		Total	
			Labour		Electricity		Diesel Fuel		Chemicals		Maintenance		Administration									
	Total Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Rev	Net Present Value	Total Annual Rev	Net Present Value	Total Annual Cost	Net Present Value
2008																						
2009																						
2010																						
2011																						
2012																						
2013																						
2014	$43,413,240	$34,310,114																			$43,413,240	$34,310,114
2015	$0		$300,000	$227,975	$34,123	$25,930	$697	$530	$18,822	$14,303	$434,132	$329,905	$100,000	$75,992	$566	$430	$0	$0	-$5,405	-$4,107	$882,936	$670,959
2016	$0		$300,000	$219,207	$38,043	$27,797	$799	$584	$21,369	$15,614	$434,132	$317,216	$100,000	$73,069	$633	$462	$0	$0	-$6,026	-$4,403	$888,950	$649,547
2017	$0		$300,000	$210,776	$41,962	$29,482	$900	$633	$23,916	$16,803	$434,132	$305,016	$100,000	$70,259	$699	$491	$0	$0	-$6,646	-$4,670	$894,964	$628,790
2018	$0		$300,000	$202,669	$45,882	$30,996	$1,002	$677	$26,464	$17,878	$434,132	$293,284	$100,000	$67,556	$765	$517	$0	$0	-$7,267	-$4,910	$900,978	$608,668
2019	$0		$300,000	$194,874	$49,802	$32,350	$1,103	$717	$29,011	$18,845	$434,132	$282,004	$100,000	$64,958	$831	$540	$0	$0	-$7,888	-$5,124	$906,992	$589,164
2020	$0		$300,000	$187,379	$53,722	$33,555	$1,205	$752	$31,558	$19,711	$434,132	$271,158	$100,000	$62,460	$898	$561	$0	$0	-$8,509	-$5,315	$913,005	$570,261
2021	$0		$300,000	$180,172	$57,642	$34,618	$1,306	$784	$34,105	$20,483	$434,132	$260,729	$100,000	$60,057	$964	$579	$0	$0	-$9,130	-$5,483	$919,019	$551,939
2022	$0		$300,000	$173,243	$61,562	$35,550	$1,408	$813	$36,652	$21,166	$434,132	$250,701	$100,000	$57,748	$1,030	$595	$0	$0	-$9,751	-$5,631	$925,033	$534,184
2023	$0		$300,000	$166,579	$65,482	$36,360	$1,509	$838	$39,199	$21,766	$434,132	$241,058	$100,000	$55,526	$1,096	$609	$0	$0	-$10,372	-$5,759	$931,047	$516,977
2024	$0		$300,000	$160,172	$69,401	$37,054	$1,610	$860	$41,746	$22,289	$434,132	$231,787	$100,000	$53,391	$1,163	$621	$0	$0	-$10,993	-$5,869	$937,061	$500,304
2025	$0		$300,000	$154,012	$73,321	$37,641	$1,712	$879	$44,294	$22,739	$434,132	$222,872	$100,000	$51,337	$1,229	$631	$0	$0	-$11,613	-$5,962	$943,075	$484,149
2026	$0		$300,000	$148,088	$77,241	$38,128	$1,813	$895	$46,841	$23,122	$434,132	$214,300	$100,000	$49,363	$1,295	$639	$0	$0	-$12,234	-$6,039	$949,089	$468,497
2027	$0		$300,000	$142,393	$81,161	$38,522	$1,915	$909	$49,388	$23,442	$434,132	$206,058	$100,000	$47,464	$1,362	$646	$0	$0	-$12,855	-$6,102	$955,102	$453,332
2028	$0		$300,000	$136,916	$85,081	$38,830	$2,016	$920	$51,935	$23,702	$434,132	$198,132	$100,000	$45,639	$1,428	$652	$0	$0	-$13,476	-$6,150	$961,116	$438,641
2029	$0		$300,000	$131,650	$89,001	$39,057	$2,118	$929	$54,482	$23,909	$434,132	$190,512	$100,000	$43,883	$1,494	$656	$0	$0	-$14,097	-$6,186	$967,130	$424,409
2030	$20,301,840	$8,566,471	$300,000	$126,587	$92,921	$39,208	$2,219	$936	$57,029	$24,064	$637,151	$268,849	$100,000	$42,196	$1,560	$658	$0	$0	-$14,718	-$6,210	$21,478,002	$9,062,759
2031	$0		$300,000	$121,718	$96,228	$39,042	$2,320	$941	$59,449	$24,120	$637,151	$258,509	$100,000	$40,573	$1,617	$656	$0	$0	-$15,242	-$6,184	$1,181,523	$479,375
2032	$0		$300,000	$117,036	$99,535	$38,831	$2,420	$944	$61,868	$24,136	$637,151	$248,566	$100,000	$39,012	$1,674	$653	$0	$0	-$15,766	-$6,150	$1,186,883	$463,028
2033	$0		$300,000	$112,535	$102,842	$38,578	$2,521	$946	$64,288	$24,115	$637,151	$239,006	$100,000	$37,512	$1,731	$649	$0	$0	-$16,289	-$6,110	$1,192,243	$447,230
2034	$0		$300,000	$108,207	$106,150	$38,287	$2,621	$945	$66,707	$24,060	$637,151	$229,813	$100,000	$36,069	$1,787	$645	$0	$0	-$16,813	-$6,064	$1,197,603	$431,963
2035	$0		$300,000	$104,045	$109,457	$37,962	$2,722	$944	$69,126	$23,974	$637,151	$220,974	$100,000	$34,682	$1,844	$640	$0	$0	-$17,337	-$6,013	$1,202,963	$417,208
2036	$0		$300,000	$100,043	$112,764	$37,604	$2,822	$941	$71,546	$23,859	$637,151	$212,475	$100,000	$33,348	$1,901	$634	$0	$0	-$17,861	-$5,956	$1,208,323	$402,949
2037	$0		$300,000	$96,195	$116,072	$37,219	$2,923	$937	$73,965	$23,717	$637,151	$204,303	$100,000	$32,065	$1,958	$628	$0	$0	-$18,385	-$5,895	$1,213,684	$389,169
2038	$0		$300,000	$92,496	$119,379	$36,807	$3,024	$932	$76,384	$23,551	$637,151	$196,445	$100,000	$30,832	$2,015	$621	$0	$0	-$18,909	-$5,830	$1,219,044	$375,854
2039	$0		$300,000	$88,938	$122,686	$36,372	$3,124	$926	$78,804	$23,362	$637,151	$188,890	$100,000	$29,646	$2,071	$614	$0	$0	-$19,432	-$5,761	$1,224,404	$362,987
2040	$0		$300,000	$85,517	$125,994	$35,915	$3,225	$919	$81,223	$23,153	$637,151	$181,625	$100,000	$28,506	$2,128	$607	$0	$0	-$19,956	-$5,689	$1,229,764	$350,554
2041	$0		$300,000	$82,228	$129,301	$35,441	$3,325	$911	$83,643	$22,926	$637,151	$174,639	$100,000	$27,409	$2,185	$599	$0	$0	-$20,480	-$5,613	$1,235,124	$338,540
2042	$0		$300,000	$79,066	$132,608	$34,949	$3,426	$903	$86,062	$22,682	$637,151	$167,922	$100,000	$26,355	$2,242	$591	$0	$0	-$21,004	-$5,536	$1,240,484	$326,932
2043	$0		$300,000	$76,025	$135,915	$34,443	$3,526	$894	$88,481	$22,423	$637,151	$161,464	$100,000	$25,342	$2,298	$582	$0	$0	-$21,528	-$5,455	$1,245,845	$315,716
2044	$0		$300,000	$73,101	$139,223	$33,924	$3,627	$884	$90,901	$22,150	$637,151	$155,254	$100,000	$24,367	$2,355	$574	$0	$0	-$22,052	-$5,373	$1,251,205	$304,879
2045	$14,286,480	$3,347,277	$300,000	$70,289	$142,530	$33,394	$3,728	$873	$93,320	$21,865	$780,016	$182,755	$100,000	$23,430	$2,412	$565	$0	$0	-$22,576	-$5,289	$15,685,910	$3,675,159
2046	$0		$300,000	$67,586	$144,304	$32,510	$3,804	$857	$95,024	$21,407	$780,016	$175,726	$100,000	$22,529	$2,444	$551	$0	$0	-$22,857	-$5,149	$1,402,734	$316,016
2047	$0		$300,000	$64,986	$146,078	$31,644	$3,880	$841	$96,727	$20,953	$780,016	$168,967	$100,000	$21,662	$2,475	$536	$0	$0	-$23,138	-$5,012	$1,406,039	$304,577
2048	$0		$300,000	$62,487	$147,852	$30,796	$3,957	$824	$98,431	$20,502	$780,016	$162,469	$100,000	$20,829	$2,507	$522	$0	$0	-$23,419	-$4,878	$1,409,344	$293,551
2049	$0		$300,000	$60,083	$149,626	$29,967	$4,033	$808	$100,134	$20,055	$780,016	$156,220	$100,000	$20,028	$2,539	$508	$0	$0	-$23,700	-$4,747	$1,412,649	$282,922
2050	$0		$300,000	$57,772	$151,400	$29,156	$4,110	$791	$101,838	$19,611	$780,016	$150,211	$100,000	$19,257	$2,571	$495	$0	$0	-$23,981	-$4,618	$1,415,953	$272,677
2051	$0		$300,000	$55,550	$153,174	$28,363	$4,186	$775	$103,541	$19,173	$780,016	$144,434	$100,000	$18,517	$2,602	$482	$0	$0	-$24,262	-$4,492	$1,419,258	$262,801
2052	$0		$300,000	$53,414	$154,949	$27,588	$4,262	$759	$105,245	$18,738	$780,016	$138,879	$100,000	$17,805	$2,634	$469	$0	$0	-$24,543	-$4,370	$1,422,563	$253,282
2053	$0		$300,000	$51,360	$156,723	$26,831	$4,339	$743	$106,948	$18,309	$780,016	$133,537	$100,000	$17,120	$2,666	$456	$0	$0	-$24,824	-$4,250	$1,425,868	$244,106
2054	$0		$300,000	$49,384	$158,497	$26,091	$4,415	$727	$108,652	$17,886	$780,016	$128,401	$100,000	$16,461	$2,698	$444	$0	$0	-$25,105	-$4,133	$1,429,173	$235,262
2055	$0		$300,000	$47,485	$160,271	$25,368	$4,492	$711	$110,356	$17,467	$780,016	$123,463	$100,000	$15,828	$2,729	$432	$0	$0	-$25,386	-$4,018	$1,432,477	$226,736
2056	$0		$300,000	$45,658	$162,045	$24,662	$4,568	$695	$112,059	$17,055	$780,016	$118,714	$100,000	$15,219	$2,761	$420	$0	$0	-$25,667	-$3,906	$1,435,782	$218,519
2057	$0		$300,000	$43,902	$163,819	$23,973	$4,645	$680	$113,763	$16,648	$780,016	$114,148	$100,000	$14,634	$2,793	$409	$0	$0	-$25,948	-$3,797	$1,439,087	$210,598
2058	$0		$300,000	$42,214	$165,593	$23,301	$4,721	$664	$115,466	$16,248	$780,016	$109,758	$100,000	$14,071	$2,824	$397	$0	$0	-$26,229	-$3,691	$1,442,392	$202,963
2059	$0		$300,000	$40,590	$167,367	$22,645	$4,797	$649	$117,170	$15,853	$780,016	$105,537	$100,000	$13,530	$2,856	$386	$0	$0	-$26,510	-$3,587	$1,445,696	$195,604
2060	$0		$300,000	$39,029	$169,141	$22,005	$4,874	$634	$118,873	$15,465	$780,016	$101,477	$100,000	$13,010	$2,888	$376	$0	$0	-$26,791	-$3,485	$1,449,001	$188,510
2061	$0		$300,000	$37,528	$170,915	$21,380	$4,950	$619	$120,577	$15,083	$780,016	$97,574	$100,000	$12,509	$2,920	$365	$0	$0	-$27,072	-$3,386	$1,452,306	$181,673
2062	$0		$300,000	$36,085	$172,689	$20,771	$5,027	$605	$122,280	$14,708	$780,016	$93,822	$100,000	$12,028	$2,951	$355	$0	$0	-$27,353	-$3,290	$1,455,611	$175,083
2063	$0		$300,000	$34,697	$174,463	$20,178	$5,103	$590	$123,984	$14,339	$780,016	$90,213	$100,000	$11,566	$2,983	$345	$0	$0	-$27,634	-$3,196	$1,458,915	$168,732
2064	$0		$300,000	$33,362	$176,237	$19,599	$5,179	$576	$125,687	$13,977	$780,016	$86,743	$100,000	$11,121	$3,015	$335	$0	$0	-$27,915	-$3,104	$1,462,220	$162,609
2065	$0		$300,000	$32,079	$178,012	$19,035	$5,256	$562	$127,391	$13,622	$780,016	$83,407	$100,000	$10,693	$3,047	$326	$0	$0	-$28,196	-$3,015	$1,465,525	$156,709
Total Capital =	$78,001,560																					
Total Net Present Value =		$46,223,862		$5,125,384		$1,609,710		$40,607		$1,027,029		$9,589,926		$1,708,461		$27,155		$0		-$254,965		**$65,097,169**

SOUTH COLWOOD WWTF ASSUMPTIONS

Labour:
number of facility manager(s) = 1
number of operations staff = 2
number of maintenance staff = 1
number of administration staff = 0
total staff = 4 persons

Ref: Based on Jan 15/09 TM from T. Dokken.

Chemical Phosphorus Removal Chemicals:
chemical-P removal required (1 = yes, 0 = no)? 0

Wet-Weather CEPT Chemicals:
fraction of total annual ADWF treated = 5.0%

Ref: Allowance to account for potential costs.

Reclaimed Water Disinfection:
allowance = 10.0% of other chemical costs

Ref: Allowance to account for potential costs.

Saleable Heat Energy:
unit energy cost to third-party "heat recovery" utility = $ 15.05 /GJ
unit CRD saleable energy price to third-party utility = $ - /GJ

Ref: This is the cost that a third-party heat recovery utility would incur to make the heat available to customers. Value is from Table 6 of Feb 10/09 memo from M. Homenuke, reduced by 4.5% to remove CRD share of capital cost.

Note: This value is the difference between the general energy market unit price (from Generic Assumptions sheet) and the above value, which reflects the maximum amount the utility would be willing to pay the CRD for the heat. Set to zero in this case since the unit selling price would be a negative value, indicating the CRD would need to subsidize the scheme.

Notes:
1. Excludes solids processing capital costs. Included in Biosolids LCA.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 17, 2009
Last Revision By: D. Shiskowski

Subject: Macaulay/McLoughlin WWTF
(Liquid-Stream, incl. Wet-Weather TF)
Option 3
Material Flows
and Carbon Footprint Analysis

Yellow-shaded cell denotes assumed/input values

Year	Equivalent Population	Wastewater ADWF	Sludge Production and Truck Transport		Saleable Effluent Heat[1]	Saleable Reclaimed Water (irrigation only)	Materials			GHG Sources			GHG Offsets	Total GHG Emissions
			Mass	Thickened Volume			Electricity	Diesel Fuel	Sludge Thickening Polymer	Electricity Purchased	Diesel Fuel Combusted	Sludge Thickening Polymer Used	Avoided Natural Gas/Elect Use via Effluent Heat	
	(pe)	(m3/d)	(dry t/yr)	(m3/yr)	(GJ/yr)	(m3/yr)	(kWh/yr)	(L/yr)	(kg/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)
2008														
2009														
2010														
2011														
2012														
2013														
2014														
2015	53,740	13,205	1,167	0	62,838	50,608	3,665,477	-	0	264	0.0	0.0	-2,386	-2,122
2016	53,996	13,147	1,173	0	67,976	50,386	3,649,359	-	0	263	0.0	0.0	-2,581	-2,318
2017	54,252	13,089	1,178	0	73,114	50,163	3,633,240	-	0	262	0.0	0.0	-2,776	-2,514
2018	54,508	13,031	1,184	0	78,251	49,941	3,617,122	-	0	260	0.0	0.0	-2,971	-2,711
2019	54,765	12,973	1,189	0	83,389	49,718	3,601,004	-	0	259	0.0	0.0	-3,166	-2,907
2020	55,021	12,915	1,195	0	88,527	49,495	3,584,885	-	0	258	0.0	0.0	-3,361	-3,103
2021	55,277	12,857	1,200	0	93,665	49,273	3,568,767	-	0	257	0.0	0.0	-3,556	-3,299
2022	55,533	12,799	1,206	0	98,803	49,050	3,552,649	-	0	256	0.0	0.0	-3,751	-3,495
2023	55,789	12,740	1,212	0	103,940	48,828	3,536,531	-	0	255	0.0	0.0	-3,946	-3,692
2024	56,045	12,682	1,217	0	109,078	48,605	3,520,412	-	0	253	0.0	0.0	-4,141	-3,888
2025	56,301	12,624	1,223	0	114,216	48,383	3,504,294	-	0	252	0.0	0.0	-4,336	-4,084
2026	56,557	12,566	1,228	0	119,354	48,160	3,488,176	-	0	251	0.0	0.0	-4,531	-4,280
2027	56,814	12,508	1,234	0	124,492	47,938	3,472,057	-	0	250	0.0	0.0	-4,727	-4,477
2028	57,070	12,450	1,239	0	129,629	47,715	3,455,939	-	0	249	0.0	0.0	-4,922	-4,673
2029	57,326	12,392	1,245	0	134,767	47,493	3,439,821	-	0	248	0.0	0.0	-5,117	-4,869
2030	57,582	12,334	1,251	0	139,905	47,270	3,423,703	-	0	247	0.0	0.0	-5,312	-5,065
2031	57,845	12,303	1,256	0	141,441	47,150	3,415,042	-	0	246	0.0	0.0	-5,370	-5,124
2032	58,109	12,272	1,262	0	142,976	47,031	3,406,381	-	0	245	0.0	0.0	-5,428	-5,183
2033	58,372	12,240	1,268	0	144,512	46,911	3,397,721	-	0	245	0.0	0.0	-5,487	-5,242
2034	58,635	12,209	1,273	0	146,048	46,792	3,389,060	-	0	244	0.0	0.0	-5,545	-5,301
2035	58,899	12,178	1,279	0	147,583	46,672	3,380,400	-	0	243	0.0	0.0	-5,603	-5,360
2036	59,162	12,147	1,285	0	149,119	46,553	3,371,739	-	0	243	0.0	0.0	-5,662	-5,419
2037	59,425	12,116	1,291	0	150,654	46,433	3,363,079	-	0	242	0.0	0.0	-5,720	-5,478
2038	59,689	12,084	1,296	0	152,190	46,313	3,354,418	-	0	242	0.0	0.0	-5,778	-5,537
2039	59,952	12,053	1,302	0	153,726	46,194	3,345,757	-	0	241	0.0	0.0	-5,836	-5,596
2040	60,215	12,022	1,308	0	155,261	46,074	3,337,097	-	0	240	0.0	0.0	-5,895	-5,655
2041	60,479	11,991	1,313	0	156,797	45,955	3,328,436	-	0	240	0.0	0.0	-5,953	-5,713
2042	60,742	11,960	1,319	0	158,333	45,835	3,319,776	-	0	239	0.0	0.0	-6,011	-5,772
2043	61,005	11,928	1,325	0	159,868	45,716	3,311,115	-	0	238	0.0	0.0	-6,070	-5,831
2044	61,269	11,897	1,331	0	161,404	45,596	3,302,455	-	0	238	0.0	0.0	-6,128	-5,890
2045	61,532	11,866	1,336	0	162,940	45,476	3,293,794	-	0	237	0.0	0.0	-6,186	-5,949
2046	62,036	11,878	1,347	0	169,850	45,522	3,297,111	-	0	237	0.0	0.0	-6,449	-6,211
2047	62,540	11,890	1,358	0	176,760	45,568	3,300,428	-	0	238	0.0	0.0	-6,711	-6,473
2048	63,043	11,902	1,369	0	183,671	45,614	3,303,745	-	0	238	0.0	0.0	-6,973	-6,736
2049	63,547	11,914	1,380	0	190,581	45,660	3,307,062	-	0	238	0.0	0.0	-7,236	-6,998
2050	64,051	11,926	1,391	0	196,376	45,705	3,310,379	-	0	238	0.0	0.0	-7,456	-7,217
2051	64,555	11,938	1,402	0	197,452	45,751	3,313,697	-	0	239	0.0	0.0	-7,497	-7,258
2052	65,059	11,950	1,413	0	198,528	45,797	3,317,014	-	0	239	0.0	0.0	-7,537	-7,299
2053	65,562	11,962	1,424	0	199,605	45,843	3,320,331	-	0	239	0.0	0.0	-7,578	-7,339
2054	66,066	11,974	1,435	0	200,681	45,889	3,323,648	-	0	239	0.0	0.0	-7,619	-7,380
2055	66,570	11,986	1,446	0	201,757	45,934	3,326,965	-	0	240	0.0	0.0	-7,660	-7,421
2056	67,074	11,997	1,457	0	202,834	45,980	3,330,282	-	0	240	0.0	0.0	-7,701	-7,461
2057	67,578	12,009	1,468	0	203,910	46,026	3,333,599	-	0	240	0.0	0.0	-7,742	-7,502
2058	68,081	12,021	1,479	0	204,986	46,072	3,336,916	-	0	240	0.0	0.0	-7,783	-7,542
2059	68,585	12,033	1,489	0	206,062	46,118	3,340,233	-	0	240	0.0	0.0	-7,824	-7,583
2060	69,089	12,045	1,500	0	207,139	46,163	3,343,551	-	0	241	0.0	0.0	-7,864	-7,624
2061	69,593	12,057	1,511	0	208,215	46,209	3,346,868	-	0	241	0.0	0.0	-7,905	-7,664
2062	70,097	12,069	1,522	0	209,291	46,255	3,350,185	-	0	241	0.0	0.0	-7,946	-7,705
2063	70,600	12,081	1,533	0	210,368	46,301	3,353,502	-	0	241	0.0	0.0	-7,987	-7,746
2064	71,104	12,093	1,544	0	211,444	46,347	3,356,819	-	0	242	0.0	0.0	-8,028	-7,786
2065	71,608	12,105	1,555	0	212,520	46,392	3,360,136	-	0	242	0.0	0.0	-8,069	-7,827
Totals =					7,896,826	2,396,874	173,602,177	0		12,499	0	0	-299,817	**-287,318**

MACAULAY/MCLOUGHLIN WWTF ASSUMPTIONS (Liquid-Stream)

Electricity:

"base" unit power requirement =	0.650	kW-hr/d per m3/d of ADWF treated wastewater	**Ref:** Based on Jan 15/09 TM from T. Dokken.
wastewater strength adjustment =	0.100	x "base" unit power requirement	**Note:** To account for reduce flow rate but same load.
influent pumping power adjustment =	0.070	x "base" unit power requirement	**Ref:** Reduced relative to Options 1/2.
recycled centrate aeration power adjustment =	0	x "base" unit power requirement	**Note:** Side-stream SHARON-ANAMMOX system used.
Hartland landfill leachate aeration power adjustment =	0.000	x "base" unit power requirement	**Note:** Received at the Roderick WWTF.
UV disinfection power adjustment =	0	x "base" unit power requirement	**Note:** Not required - effluent to marine environment.
effluent pumping power adjustment =	0	x "base" unit power requirement	**Note:** See MM OUT sheets for outfall pumping. See MM Heat for pumping to/from Victoria.
raw sludge thickening adjustment =	0	x "base" unit power requirement	**Note:** Accounted for in solids-stream calculations.
total unit power requirement =	0.761	kW-hr/d per m3/d of ADWF treated wastewater	

Raw Sludge Thickening and Truck Transport:

thickening required (1 = yes, 0 = no)?	0	
chemical-P removal chemical sludge production allowance =	0%	of combined PS + WBS
round-trip transport distance to solids processing facility =	0	km

Saleable Reclaimed Water:

mean fraction of annual ADWF volume sold for landscape irrigation =	1.05%	/yr	**Note:** See dnt_eff_irr_ds.xls for assumptions and details. Reclaimed water used for toilet flushing handled separately in analysis. See IRS LCA worksheet.

Notes:
1. Data from M. Homenuke in Feb 4/09 e-mail, DES_SaleableHeatEnergy.xls, Saleable.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 17, 2009
Last Revision By: D. Shiskowski

Subject: Macaulay/McLoughlin WWTF
(Liquid-Stream, incl. Wet-Weather TF)
Option 3
Life Cycle Analysis

Yellow-shaded cell denotes assumed/input values

Year	Capital Costs[1]		Operation & Maintenance Costs												GHG CO2e		Heat Revenues		Reclaimed Water Revenues (irrigation only)		Total	
			Labour		Electricity		Diesel Fuel		Chemicals		Maintenance		Administration									
	Total Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Rev	Net Present Value	Total Annual Rev	Net Present Value	Total Annual Cost	Net Present Value
2008																						
2009																						
2010																						
2011																						
2012																						
2013																						
2014	$137,402,520	$108,591,207																			$137,402,520	$108,591,207
2015		$0	$525,000	$398,957	$256,583	$194,982	$0	$0	$51,999	$39,515	$1,374,025	$1,044,146	$100,000	$75,992	-$31,828	-$24,186	-$106,976	-$81,293	-$36,438	-$27,690	$2,132,367	$1,620,423
2016		$0	$525,000	$383,612	$255,455	$186,659	$0	$0	$51,771	$37,828	$1,374,025	$1,003,987	$100,000	$73,069	-$34,771	-$25,407	-$115,722	-$84,557	-$36,278	-$26,508	$2,119,480	$1,548,683
2017		$0	$525,000	$368,858	$254,327	$178,687	$0	$0	$51,542	$36,213	$1,374,025	$965,372	$100,000	$70,259	-$37,715	-$26,498	-$124,469	-$87,450	-$36,117	-$25,376	$2,106,593	$1,480,065
2018		$0	$525,000	$354,671	$253,199	$171,052	$0	$0	$51,313	$34,665	$1,374,025	$928,242	$100,000	$67,556	-$40,658	-$27,467	-$133,215	-$89,996	-$35,957	-$24,291	$2,093,707	$1,414,433
2019		$0	$525,000	$341,030	$252,070	$163,740	$0	$0	$51,085	$33,184	$1,374,025	$892,541	$100,000	$64,958	-$43,601	-$28,323	-$141,962	-$92,216	-$35,797	-$23,253	$2,080,820	$1,351,661
2020		$0	$525,000	$327,913	$250,942	$156,738	$0	$0	$50,856	$31,764	$1,374,025	$858,212	$100,000	$62,460	-$46,545	-$29,072	-$150,708	-$94,132	-$35,637	-$22,259	$2,067,933	$1,291,625
2021		$0	$525,000	$315,301	$249,814	$150,032	$0	$0	$50,627	$30,405	$1,374,025	$825,204	$100,000	$60,057	-$49,488	-$29,721	-$159,455	-$95,765	-$35,477	-$21,306	$2,055,047	$1,234,208
2022		$0	$525,000	$303,174	$248,685	$143,610	$0	$0	$50,399	$29,104	$1,374,025	$793,465	$100,000	$57,748	-$52,431	-$30,278	-$168,202	-$97,132	-$35,316	-$20,394	$2,042,160	$1,179,296
2023		$0	$525,000	$291,514	$247,557	$137,460	$0	$0	$50,170	$27,858	$1,374,025	$762,947	$100,000	$55,526	-$55,375	-$30,748	-$176,948	-$98,253	-$35,156	-$19,521	$2,029,273	$1,126,783
2024		$0	$525,000	$280,302	$246,429	$131,570	$0	$0	$49,941	$26,664	$1,374,025	$733,603	$100,000	$53,391	-$58,318	-$31,137	-$185,695	-$99,144	-$34,996	-$18,685	$2,016,387	$1,076,565
2025		$0	$525,000	$269,521	$245,301	$125,931	$0	$0	$49,713	$25,521	$1,374,025	$705,388	$100,000	$51,337	-$61,262	-$31,450	-$194,441	-$99,821	-$34,836	-$17,884	$2,003,500	$1,028,543
2026		$0	$525,000	$259,155	$244,172	$120,530	$0	$0	$49,484	$24,427	$1,374,025	$678,257	$100,000	$49,363	-$64,205	-$31,693	-$203,188	-$100,299	-$34,675	-$17,117	$1,990,613	$982,623
2027		$0	$525,000	$249,187	$243,044	$115,359	$0	$0	$49,255	$23,379	$1,374,025	$652,171	$100,000	$47,464	-$67,148	-$31,871	-$211,935	-$100,593	-$34,515	-$16,382	$1,977,726	$938,713
2028		$0	$525,000	$239,603	$241,916	$110,407	$0	$0	$49,027	$22,375	$1,374,025	$627,087	$100,000	$45,639	-$70,092	-$31,989	-$220,681	-$100,716	-$34,355	-$15,679	$1,964,840	$896,727
2029		$0	$525,000	$230,388	$240,787	$105,666	$0	$0	$48,798	$21,414	$1,374,025	$602,968	$100,000	$43,883	-$73,035	-$32,050	-$229,428	-$100,681	-$34,195	-$15,006	$1,951,953	$856,583
2030		$0	$525,000	$221,527	$239,659	$101,125	$0	$0	$48,569	$20,494	$1,374,025	$579,777	$100,000	$42,196	-$75,979	-$32,060	-$238,174	-$100,499	-$34,034	-$14,361	$1,939,066	$818,200
2031		$0	$525,000	$213,006	$239,053	$96,990	$0	$0	$48,447	$19,656	$1,374,025	$557,478	$100,000	$40,573	-$76,862	-$31,185	-$240,789	-$97,694	-$33,948	-$13,774	$1,934,925	$785,050
2032		$0	$525,000	$204,814	$238,447	$93,023	$0	$0	$48,324	$18,852	$1,374,025	$536,037	$100,000	$39,012	-$77,746	-$30,331	-$243,403	-$94,957	-$33,862	-$13,210	$1,930,784	$753,240
2033		$0	$525,000	$196,936	$237,840	$89,218	$0	$0	$48,201	$18,081	$1,374,025	$515,420	$100,000	$37,512	-$78,630	-$29,496	-$246,017	-$92,285	-$33,776	-$12,670	$1,926,643	$722,716
2034		$0	$525,000	$189,362	$237,234	$85,568	$0	$0	$48,078	$17,341	$1,374,025	$495,596	$100,000	$36,069	-$79,514	-$28,680	-$248,631	-$89,679	-$33,690	-$12,152	$1,922,502	$693,426
2035		$0	$525,000	$182,079	$236,628	$82,067	$0	$0	$47,955	$16,632	$1,374,025	$476,535	$100,000	$34,682	-$80,398	-$27,883	-$251,246	-$87,136	-$33,604	-$11,654	$1,918,361	$665,319
2036		$0	$525,000	$175,076	$236,022	$78,708	$0	$0	$47,832	$15,951	$1,374,025	$458,206	$100,000	$33,348	-$81,282	-$27,106	-$253,860	-$84,657	-$33,518	-$11,177	$1,914,219	$638,349
2037		$0	$525,000	$168,342	$235,415	$75,486	$0	$0	$47,709	$15,298	$1,374,025	$440,583	$100,000	$32,065	-$82,166	-$26,347	-$256,474	-$82,239	-$33,432	-$10,720	$1,910,078	$612,469
2038		$0	$525,000	$161,867	$234,809	$72,396	$0	$0	$47,587	$14,672	$1,374,025	$423,638	$100,000	$30,832	-$83,050	-$25,606	-$259,088	-$79,882	-$33,346	-$10,281	$1,905,937	$587,636
2039		$0	$525,000	$155,642	$234,203	$69,432	$0	$0	$47,464	$14,071	$1,374,025	$407,344	$100,000	$29,646	-$83,934	-$24,883	-$261,703	-$77,584	-$33,260	-$9,860	$1,901,796	$563,807
2040		$0	$525,000	$149,655	$233,597	$66,589	$0	$0	$47,341	$13,495	$1,374,025	$391,677	$100,000	$28,506	-$84,818	-$24,178	-$264,317	-$75,346	-$33,174	-$9,456	$1,897,655	$540,942
2041		$0	$525,000	$143,899	$232,991	$63,861	$0	$0	$47,218	$12,942	$1,374,025	$376,612	$100,000	$27,409	-$85,702	-$23,490	-$266,931	-$73,164	-$33,087	-$9,069	$1,893,514	$519,001
2042		$0	$525,000	$138,365	$232,384	$61,245	$0	$0	$47,095	$12,412	$1,374,025	$362,127	$100,000	$26,355	-$86,585	-$22,820	-$269,545	-$71,039	-$33,001	-$8,698	$1,889,372	$497,948
2043		$0	$525,000	$133,043	$231,778	$58,736	$0	$0	$46,972	$11,903	$1,374,025	$348,199	$100,000	$25,342	-$87,469	-$22,166	-$272,160	-$68,969	-$32,915	-$8,341	$1,885,231	$477,747
2044		$0	$525,000	$127,926	$231,172	$56,329	$0	$0	$46,849	$11,416	$1,374,025	$334,807	$100,000	$24,367	-$88,353	-$21,529	-$274,774	-$66,954	-$32,829	-$7,999	$1,881,090	$458,363
2045		$0	$525,000	$123,006	$230,566	$54,021	$0	$0	$46,726	$10,948	$1,374,025	$321,930	$100,000	$23,430	-$89,237	-$20,908	-$277,388	-$64,991	-$32,743	-$7,672	$1,876,949	$439,763
2046		$0	$525,000	$118,275	$230,798	$51,995	$0	$0	$46,774	$10,537	$1,374,025	$309,548	$100,000	$22,529	-$93,169	-$20,990	-$289,152	-$65,142	-$32,776	-$7,384	$1,861,499	$419,369
2047		$0	$525,000	$113,726	$231,030	$50,046	$0	$0	$46,821	$10,142	$1,374,025	$297,642	$100,000	$21,662	-$97,101	-$21,034	-$300,917	-$65,185	-$32,809	-$7,107	$1,846,049	$399,892
2048		$0	$525,000	$109,352	$231,262	$48,169	$0	$0	$46,868	$9,762	$1,374,025	$286,194	$100,000	$20,829	-$101,033	-$21,044	-$312,681	-$65,128	-$32,842	-$6,841	$1,830,599	$381,294
2049		$0	$525,000	$105,146	$231,494	$46,363	$0	$0	$46,915	$9,396	$1,374,025	$275,187	$100,000	$20,028	-$104,965	-$21,022	-$324,445	-$64,979	-$32,875	-$6,584	$1,815,150	$363,534
2050		$0	$525,000	$101,102	$231,727	$44,625	$0	$0	$46,962	$9,044	$1,374,025	$264,603	$100,000	$19,257	-$108,261	-$20,848	-$334,310	-$64,380	-$32,908	-$6,337	$1,802,234	$347,065
2051		$0	$525,000	$97,213	$231,959	$42,951	$0	$0	$47,009	$8,705	$1,374,025	$254,426	$100,000	$18,517	-$108,871	-$20,159	-$336,143	-$62,243	-$32,941	-$6,100	$1,800,039	$333,310
2052		$0	$525,000	$93,474	$232,191	$41,341	$0	$0	$47,056	$8,378	$1,374,025	$244,640	$100,000	$17,805	-$109,480	-$19,493	-$337,975	-$60,175	-$32,974	-$5,871	$1,797,843	$320,099
2053		$0	$525,000	$89,879	$232,423	$39,790	$0	$0	$47,103	$8,064	$1,374,025	$235,231	$100,000	$17,120	-$110,089	-$18,847	-$339,807	-$58,174	-$33,007	-$5,651	$1,795,648	$307,412
2054		$0	$525,000	$86,422	$232,655	$38,298	$0	$0	$47,150	$7,762	$1,374,025	$226,184	$100,000	$16,461	-$110,699	-$18,223	-$341,639	-$56,239	-$33,040	-$5,439	$1,793,453	$295,227
2055		$0	$525,000	$83,098	$232,888	$36,862	$0	$0	$47,197	$7,470	$1,374,025	$217,484	$100,000	$15,828	-$111,308	-$17,618	-$343,472	-$54,366	-$33,073	-$5,235	$1,791,257	$283,525
2056		$0	$525,000	$79,902	$233,120	$35,480	$0	$0	$47,244	$7,190	$1,374,025	$209,119	$100,000	$15,219	-$111,917	-$17,033	-$345,304	-$52,553	-$33,106	-$5,039	$1,789,062	$272,286
2057		$0	$525,000	$76,829	$233,352	$34,149	$0	$0	$47,291	$6,921	$1,374,025	$201,076	$100,000	$14,634	-$112,527	-$16,467	-$347,136	-$50,800	-$33,139	-$4,850	$1,786,867	$261,492
2058		$0	$525,000	$73,874	$233,584	$32,868	$0	$0	$47,338	$6,661	$1,374,025	$193,343	$100,000	$14,071	-$113,136	-$15,920	-$348,968	-$49,104	-$33,172	-$4,668	$1,784,671	$251,126
2059		$0	$525,000	$71,033	$233,816	$31,635	$0	$0	$47,385	$6,411	$1,374,025	$185,906	$100,000	$13,530	-$113,746	-$15,390	-$350,801	-$47,464	-$33,205	-$4,493	$1,782,476	$241,170
2060		$0	$525,000	$68,301	$234,049	$30,449	$0	$0	$47,432	$6,171	$1,374,025	$178,756	$100,000	$13,010	-$114,355	-$14,877	-$352,633	-$45,876	-$33,238	-$4,324	$1,780,281	$231,609
2061		$0	$525,000	$65,674	$234,281	$29,307	$0	$0	$47,479	$5,939	$1,374,025	$171,881	$100,000	$12,509	-$114,964	-$14,381	-$354,465	-$44,341	-$33,271	-$4,162	$1,778,085	$222,426
2062		$0	$525,000	$63,148	$234,513	$28,208	$0	$0	$47,526	$5,717	$1,374,025	$165,270	$100,000	$12,028	-$115,574	-$13,901	-$356,298	-$42,856	-$33,304	-$4,006	$1,775,890	$213,607
2063		$0	$525,000	$60,719	$234,745	$27,150	$0	$0	$47,574	$5,502	$1,374,025	$158,914	$100,000	$11,566	-$116,183	-$13,437	-$358,130	-$41,420	-$33,337	-$3,856	$1,773,694	$205,138
2064		$0	$525,000	$58,384	$234,977	$26,131	$0	$0	$47,621	$5,296	$1,374,025	$152,802	$100,000	$11,121	-$116,792	-$12,988	-$359,962	-$40,030	-$33,370	-$3,711	$1,771,499	$197,003
2065		$0	$525,000	$56,138	$235,210	$25,151	$0	$0	$47,668	$5,097	$1,374,025	$146,925	$100,000	$10,693	-$117,402	-$12,554	-$361,794	-$38,687	-$33,403	-$3,572	$1,769,304	$189,192
Total Capital =	$137,402,520																					
Total Net Present Value =		$108,591,207		$8,969,422		$4,138,185		$0		$838,646		$23,474,688		$1,708,461		-$1,206,783		-$3,798,264		-$587,671		**$142,127,891**

MACAULAY/MCLOUGHLIN WWTF ASSUMPTIONS (Liquid-Stream)

Labour:
number of facility manager(s) = 1
number of operations staff = 3
number of maintenance staff = 2
number of administration staff = 1
total staff = 7 persons

Ref: Based on Jan 15/09 TM from T. Dokken.

Chemical Phosphorus Removal Chemicals:
chemical-P removal required (1 = yes, 0 = no)? 0

Wet-Weather CEPT Chemicals:
fraction of total annual ADWF treated = 5.0%

Ref: Allowance to account for potential costs.

Reclaimed Water Disinfection:
allowance = 10.0% of other chemical costs

Ref: Allowance to account for potential costs.

Saleable Heat Energy:
unit energy cost to third-party "heat recovery" utility = $ 12.30 /GJ
unit CRD saleable energy price to third-party utility = $ 1.70 /GJ

Ref: This is the cost that a third-party heat recovery utility would incur to make the heat available to customers. Value is from Table 6 of Feb 10/09 memo from M. Homenuke, reduced by 4% to remove CRD share of capital cost.
Note: This value is the difference between the general energy market unit price (from Generic Assumptions sheet) and the above value, which reflects the maximum amount the utility would be willing to pay the CRD for the heat.

Notes:
1. Excludes solids processing capital costs. Included in Biosolids LCA.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 17, 2009
Last Revision By: D. Shiskowski

Subject: Juan de Fuca WWTF
Option 3

Material Flows
and Carbon Footprint Analysis

Yellow-shaded cell denotes assumed/input values

Year	Equivalent Population	Wastewater ADWF	Sludge Production and Truck Transport		Saleable Effluent Heat[1]	Saleable Reclaimed Water (irrigation only)	Materials			GHG Sources			GHG Offsets	Total GHG Emissions
			Mass	Thickened Volume			Electricity	Diesel Fuel	Sludge Thickening Polymer	Electricity Purchased	Diesel Fuel Combusted	Sludge Thickening Polymer Used	Avoided Natural Gas/Elect Use via Effluent Heat	
	(pe)	(m3/d)	(dry t/yr)	(m3/yr)	(GJ/yr)	(m3/yr)	(kWh/yr)	(L/yr)	(kg/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)
2008														
2009														
2010														
2011														
2012														
2013														
2014														
2015	31,710	7,802	689	11,253	86,833	25,630	2,594,852	2,877	5,509	187	7.9	6.6	-3,297	-3,095
2016	32,502	7,910	706	11,534	107,720	25,986	2,630,926	2,949	5,647	189	8.1	6.8	-4,090	-3,885
2017	33,294	8,019	723	11,815	110,080	26,342	2,667,001	3,021	5,785	192	8.3	6.9	-4,179	-3,972
2018	34,087	8,127	740	12,096	112,440	26,699	2,703,076	3,093	5,922	195	8.5	7.1	-4,269	-4,059
2019	34,879	8,236	757	12,377	114,800	27,055	2,739,150	3,165	6,060	197	8.7	7.3	-4,359	-4,145
2020	35,671	8,344	775	12,658	117,161	27,411	2,775,225	3,236	6,197	200	8.9	7.4	-4,448	-4,232
2021	36,463	8,453	792	12,939	119,521	27,767	2,811,300	3,308	6,335	202	9.1	7.6	-4,538	-4,319
2022	37,255	8,561	809	13,220	121,881	28,124	2,847,375	3,380	6,473	205	9.3	7.8	-4,627	-4,405
2023	38,048	8,670	826	13,502	124,241	28,480	2,883,449	3,452	6,610	208	9.5	7.9	-4,717	-4,492
2024	38,840	8,778	844	13,783	126,602	28,836	2,919,524	3,524	6,748	210	9.7	8.1	-4,807	-4,579
2025	39,632	8,887	861	14,064	128,962	29,193	2,955,599	3,596	6,886	213	9.9	8.3	-4,896	-4,665
2026	40,424	8,995	878	14,345	131,322	29,549	2,991,673	3,668	7,023	215	10.1	8.4	-4,986	-4,752
2027	41,216	9,104	895	14,626	133,682	29,905	3,027,748	3,740	7,161	218	10.3	8.6	-5,075	-4,839
2028	42,009	9,212	912	14,907	136,043	30,262	3,063,823	3,812	7,299	221	10.5	8.8	-5,165	-4,925
2029	42,801	9,321	930	15,188	138,403	30,618	3,099,898	3,883	7,436	223	10.7	8.9	-5,255	-5,012
2030	43,593	9,429	947	15,469	140,763	30,974	3,135,972	3,955	7,574	226	10.9	9.1	-5,344	-5,099
2031	44,450	9,532	965	15,773	143,160	31,314	3,170,340	4,033	7,723	228	11.1	9.3	-5,435	-5,187
2032	45,306	9,636	984	16,078	145,557	31,653	3,204,707	4,111	7,872	231	11.3	9.4	-5,526	-5,275
2033	46,163	9,739	1,003	16,382	147,954	31,993	3,239,075	4,188	8,020	233	11.5	9.6	-5,617	-5,363
2034	47,020	9,842	1,021	16,686	150,351	32,332	3,273,442	4,266	8,169	236	11.8	9.8	-5,708	-5,451
2035	47,877	9,946	1,040	16,990	152,748	32,672	3,307,809	4,344	8,318	238	12.0	10.0	-5,799	-5,539
2036	48,733	10,049	1,058	17,294	155,145	33,011	3,342,177	4,422	8,467	241	12.2	10.2	-5,890	-5,627
2037	49,590	10,152	1,077	17,598	157,542	33,350	3,376,544	4,499	8,616	243	12.4	10.3	-5,981	-5,715
2038	50,447	10,256	1,096	17,902	159,938	33,690	3,410,912	4,577	8,765	246	12.6	10.5	-6,072	-5,804
2039	51,304	10,359	1,114	18,206	162,335	34,029	3,445,279	4,655	8,913	248	12.8	10.7	-6,163	-5,892
2040	52,160	10,462	1,133	18,510	164,732	34,369	3,479,647	4,733	9,062	251	13.0	10.9	-6,254	-5,980
2041	53,017	10,566	1,151	18,814	167,129	34,708	3,514,014	4,810	9,211	253	13.3	11.1	-6,345	-6,068
2042	53,874	10,669	1,170	19,118	169,526	35,048	3,548,381	4,888	9,360	255	13.5	11.2	-6,436	-6,156
2043	54,731	10,772	1,189	19,422	171,923	35,387	3,582,749	4,966	9,509	258	13.7	11.4	-6,527	-6,244
2044	55,587	10,876	1,207	19,726	174,320	35,727	3,617,116	5,044	9,658	260	13.9	11.6	-6,618	-6,332
2045	56,444	10,979	1,226	20,030	176,717	36,066	3,651,484	5,121	9,807	263	14.1	11.8	-6,709	-6,421
2046	57,592	11,109	1,251	20,437	179,796	36,492	3,694,620	5,225	10,006	266	14.4	12.0	-6,826	-6,534
2047	58,740	11,238	1,276	20,844	182,874	36,918	3,737,757	5,330	10,205	269	14.7	12.2	-6,943	-6,647
2048	59,888	11,368	1,301	21,252	185,953	37,344	3,780,894	5,434	10,405	272	15.0	12.5	-7,060	-6,760
2049	61,036	11,498	1,326	21,659	189,032	37,770	3,824,030	5,538	10,604	275	15.3	12.7	-7,177	-6,874
2050	62,184	11,628	1,350	22,067	192,111	38,196	3,867,167	5,642	10,804	278	15.6	13.0	-7,294	-6,987
2051	63,331	11,757	1,375	22,474	195,189	38,622	3,910,304	5,746	11,003	282	15.8	13.2	-7,411	-7,100
2052	64,479	11,887	1,400	22,881	198,268	39,048	3,953,440	5,850	11,203	285	16.1	13.4	-7,528	-7,213
2053	65,627	12,017	1,425	23,289	201,347	39,475	3,996,577	5,954	11,402	288	16.4	13.7	-7,644	-7,327
2054	66,775	12,146	1,450	23,696	204,426	39,901	4,039,714	6,059	11,602	291	16.7	13.9	-7,761	-7,440
2055	67,923	12,276	1,475	24,103	207,504	40,327	4,082,850	6,163	11,801	294	17.0	14.2	-7,878	-7,553
2056	69,071	12,406	1,500	24,511	210,583	40,753	4,125,987	6,267	12,000	297	17.3	14.4	-7,995	-7,666
2057	70,219	12,535	1,525	24,918	213,662	41,179	4,169,124	6,371	12,200	300	17.6	14.6	-8,112	-7,780
2058	71,367	12,665	1,550	25,325	216,740	41,605	4,212,260	6,475	12,399	303	17.9	14.9	-8,229	-7,893
2059	72,515	12,795	1,575	25,733	219,819	42,031	4,255,397	6,579	12,599	306	18.1	15.1	-8,346	-8,006
2060	73,663	12,925	1,600	26,140	222,898	42,457	4,298,534	6,684	12,798	309	18.4	15.4	-8,463	-8,119
2061	74,810	13,054	1,625	26,547	225,977	42,883	4,341,670	6,788	12,998	313	18.7	15.6	-8,580	-8,233
2062	75,958	13,184	1,650	26,955	229,055	43,309	4,384,807	6,892	13,197	316	19.0	15.8	-8,696	-8,346
2063	77,106	13,314	1,675	27,362	232,134	43,735	4,427,944	6,996	13,396	319	19.3	16.1	-8,813	-8,459
2064	78,254	13,443	1,699	27,769	235,213	44,161	4,471,080	7,100	13,596	322	19.6	16.3	-8,930	-8,572
2065	79,402	13,573	1,724	28,177	238,291	44,587	4,514,217	7,204	13,795	325	19.9	16.6	-9,047	-8,686
Totals =					8,530,402		1,768,973	179,098,638	247,612		12,895	683	569	-323,872	**-309,725**

JUAN DE FUCA WWTF ASSUMPTIONS

Electricity:

"base" unit power requirement =	0.670	kW-hr/d per m3/d of ADWF treated wastewater	**Ref:** Based on Jan 15/09 TM from T. Dokken.
wastewater strength adjustment =	0.100	x "base" unit power requirement	**Note:** To account for reduce flow rate but same load.
influent pumping power adjustment =	0.070	x "base" unit power requirement	**Ref:** Reduced relative to Options 1/2.
UV disinfection power adjustment =	0.100	x "base" unit power requirement	**Note:** Required - effluent to sensitive marine environment.
effluent pumping power adjustment =	0.04	x "base" unit power requirement	**Ref:** Reduced relative to Options 1/2.
raw sludge thickening adjustment =	0.05	x "base" unit power requirement	
total unit power requirement =	0.911	kW-hr/d per m3/d of ADWF treated wastewater	**Ref:** Based on Table 1.4. WEF.

Raw Sludge Thickening and Truck Transport:

thickening required (1 = yes, 0 = no)?	1		
chemical-P removal chemical sludge production allowance =	0%	of combined PS + WBS	
round-trip transport distance to solids processing facility =	9	km	**Note:** To/from Royal Roads Organics Facility.

Saleable Reclaimed Water:

mean fraction of annual ADWF volume sold for landscape irrigation =	0.90%	/yr	**Note:** See dnt_eff_irr_ds.xls for assumptions and details. Reclaimed water used for toilet flushing handled separately in analysis. See IRS LCA worksheet.

Notes:
1. Data from M. Homenuke in Feb 4/09 e-mail, DES_SaleableHeatEnergy.xls, Saleable.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 18, 2009
Last Revision By: D. Shiskowski

Subject: Juan de Fuca WWTF
Option 3

Life Cycle Analysis

Yellow-shaded cell denotes assumed/input values

Year	Capital Costs		Operation & Maintenance Costs												GHG CO2e		Heat Revenues		Reclaimed Water Revenues (irrigation only)		Total	
			Labour		Electricity		Diesel Fuel		Chemicals		Maintenance		Administration									
	Total Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Rev	Net Present Value	Total Annual Rev	Net Present Value	Total Annual Cost	Net Present Value
2008																						
2009																						
2010																						
2011																						
2012																						
2013																						
2014	$168,755,880	$133,370,223																			$168,755,880	$133,370,223
2015		$0	$300,000	$227,975	$181,640	$138,031	$4,316	$3,280	$75,881	$57,664	$1,687,559	$1,282,406	$100,000	$75,992	-$46,431	-$35,284	-$197,841	-$150,343	-$18,453	-$14,023	$2,086,670	$1,585,698
2016		$0	$300,000	$219,207	$184,165	$134,567	$4,423	$3,232	$77,547	$56,663	$1,687,559	$1,233,083	$100,000	$73,069	-$58,282	-$42,586	-$245,428	-$179,332	-$18,710	-$13,671	$2,031,274	$1,484,232
2017		$0	$300,000	$210,776	$186,690	$131,166	$4,531	$3,184	$79,212	$55,653	$1,687,559	$1,185,656	$100,000	$70,259	-$59,581	-$41,861	-$250,806	-$176,213	-$18,966	-$13,326	$2,028,639	$1,425,295
2018		$0	$300,000	$202,669	$189,215	$127,827	$4,639	$3,134	$80,878	$54,638	$1,687,559	$1,140,054	$100,000	$67,556	-$60,881	-$41,129	-$256,183	-$173,068	-$19,223	-$12,986	$2,026,003	$1,368,695
2019		$0	$300,000	$194,874	$191,741	$124,551	$4,747	$3,084	$82,543	$53,618	$1,687,559	$1,096,206	$100,000	$64,958	-$62,181	-$40,391	-$261,561	-$169,905	-$19,479	-$12,653	$2,023,368	$1,314,341
2020		$0	$300,000	$187,379	$194,266	$121,338	$4,855	$3,032	$84,208	$52,596	$1,687,559	$1,054,044	$100,000	$62,460	-$63,481	-$39,650	-$266,939	-$166,729	-$19,736	-$12,327	$2,020,732	$1,262,143
2021		$0	$300,000	$180,172	$196,791	$118,188	$4,963	$2,980	$85,874	$51,573	$1,687,559	$1,013,504	$100,000	$60,057	-$64,780	-$38,905	-$272,316	-$163,546	-$19,993	-$12,007	$2,018,097	$1,212,017
2022		$0	$300,000	$173,243	$199,316	$115,100	$5,070	$2,928	$87,539	$50,552	$1,687,559	$974,523	$100,000	$57,748	-$66,080	-$38,160	-$277,694	-$160,361	-$20,249	-$11,693	$2,015,461	$1,163,879
2023		$0	$300,000	$166,579	$201,841	$112,075	$5,178	$2,875	$89,204	$49,532	$1,687,559	$937,041	$100,000	$55,526	-$67,380	-$37,414	-$283,071	-$157,179	-$20,506	-$11,386	$2,012,826	$1,117,651
2024		$0	$300,000	$160,172	$204,367	$109,113	$5,286	$2,822	$90,870	$48,516	$1,687,559	$901,001	$100,000	$53,391	-$68,680	-$36,669	-$288,449	-$154,005	-$20,762	-$11,085	$2,010,191	$1,073,257
2025		$0	$300,000	$154,012	$206,892	$106,213	$5,394	$2,769	$92,535	$47,505	$1,687,559	$866,348	$100,000	$51,337	-$69,979	-$35,926	-$293,827	-$150,843	-$21,019	-$10,790	$2,007,555	$1,030,625
2026		$0	$300,000	$148,088	$209,417	$103,374	$5,502	$2,716	$94,201	$46,500	$1,687,559	$833,026	$100,000	$49,363	-$71,279	-$35,185	-$299,204	-$147,696	-$21,275	-$10,502	$2,004,920	$989,685
2027		$0	$300,000	$142,393	$211,942	$100,597	$5,609	$2,662	$95,866	$45,502	$1,687,559	$800,987	$100,000	$47,464	-$72,579	-$34,449	-$304,582	-$144,567	-$21,532	-$10,220	$2,002,284	$950,369
2028		$0	$300,000	$136,916	$214,468	$97,880	$5,717	$2,609	$97,531	$44,512	$1,687,559	$770,180	$100,000	$45,639	-$73,879	-$33,717	-$309,959	-$141,461	-$21,788	-$9,944	$1,999,649	$912,614
2029		$0	$300,000	$131,650	$216,993	$95,224	$5,825	$2,556	$99,197	$43,531	$1,687,559	$740,558	$100,000	$43,883	-$75,178	-$32,991	-$315,337	-$138,380	-$22,045	-$9,674	$1,997,013	$876,356
2030	$18,236,400	$7,694,947	$300,000	$126,587	$219,518	$92,627	$5,933	$2,503	$100,862	$42,559	$1,869,923	$789,024	$100,000	$42,196	-$76,478	-$32,270	-$320,715	-$135,327	-$22,301	-$9,410	$20,413,142	$8,613,435
2031		$0	$300,000	$121,718	$221,924	$90,040	$6,049	$2,454	$102,626	$41,638	$1,869,923	$758,677	$100,000	$40,573	-$77,800	-$31,566	-$326,176	-$132,338	-$22,546	-$9,147	$2,174,000	$882,049
2032		$0	$300,000	$117,036	$224,329	$87,516	$6,166	$2,406	$104,390	$40,725	$1,869,923	$729,497	$100,000	$39,012	-$79,122	-$30,867	-$331,637	-$129,379	-$22,790	-$8,891	$2,171,259	$847,055
2033		$0	$300,000	$112,535	$226,735	$85,052	$6,283	$2,357	$106,154	$39,820	$1,869,923	$701,439	$100,000	$37,512	-$80,444	-$30,176	-$337,098	-$126,451	-$23,035	-$8,641	$2,168,517	$813,447
2034		$0	$300,000	$108,207	$229,141	$82,649	$6,399	$2,308	$107,917	$38,925	$1,869,923	$674,461	$100,000	$36,069	-$81,766	-$29,492	-$342,559	-$123,557	-$23,279	-$8,397	$2,165,776	$781,172
2035		$0	$300,000	$104,045	$231,547	$80,304	$6,516	$2,260	$109,681	$38,039	$1,869,923	$648,520	$100,000	$34,682	-$83,088	-$28,816	-$348,020	-$120,699	-$23,523	-$8,158	$2,163,034	$750,176
2036		$0	$300,000	$100,043	$233,952	$78,018	$6,632	$2,212	$111,445	$37,164	$1,869,923	$623,577	$100,000	$33,348	-$84,410	-$28,149	-$353,482	-$117,878	-$23,768	-$7,926	$2,160,293	$720,409
2037		$0	$300,000	$96,195	$236,358	$75,789	$6,749	$2,164	$113,209	$36,301	$1,869,923	$599,593	$100,000	$32,065	-$85,732	-$27,490	-$358,943	-$115,095	-$24,012	-$7,700	$2,157,551	$691,822
2038		$0	$300,000	$92,496	$238,764	$73,615	$6,866	$2,117	$114,973	$35,448	$1,869,923	$576,532	$100,000	$30,832	-$87,054	-$26,841	-$364,404	-$112,353	-$24,257	-$7,479	$2,154,810	$664,368
2039		$0	$300,000	$88,938	$241,170	$71,497	$6,982	$2,070	$116,736	$34,608	$1,869,923	$554,358	$100,000	$29,646	-$88,377	-$26,200	-$369,865	-$109,650	-$24,501	-$7,264	$2,152,068	$638,003
2040		$0	$300,000	$85,517	$243,575	$69,433	$7,099	$2,024	$118,500	$33,779	$1,869,923	$533,036	$100,000	$28,506	-$89,699	-$25,569	-$375,326	-$106,990	-$24,746	-$7,054	$2,149,327	$612,683
2041		$0	$300,000	$82,228	$245,981	$67,422	$7,215	$1,978	$120,264	$32,964	$1,869,923	$512,535	$100,000	$27,409	-$91,021	-$24,948	-$380,787	-$104,372	-$24,990	-$6,850	$2,146,585	$588,367
2042		$0	$300,000	$79,066	$248,387	$65,463	$7,332	$1,932	$122,028	$32,161	$1,869,923	$492,822	$100,000	$26,355	-$92,343	-$24,337	-$386,249	-$101,797	-$25,234	-$6,651	$2,143,844	$565,015
2043		$0	$300,000	$76,025	$250,792	$63,555	$7,449	$1,888	$123,792	$31,371	$1,869,923	$473,867	$100,000	$25,342	-$93,665	-$23,736	-$391,710	-$99,265	-$25,479	-$6,457	$2,141,102	$542,588
2044		$0	$300,000	$73,101	$253,198	$61,696	$7,565	$1,843	$125,556	$30,594	$1,869,923	$455,642	$100,000	$24,367	-$94,987	-$23,145	-$397,171	-$96,778	-$25,723	-$6,268	$2,138,361	$521,052
2045		$0	$300,000	$70,289	$255,604	$59,887	$7,682	$1,800	$127,319	$29,831	$1,869,923	$438,117	$100,000	$23,430	-$96,309	-$22,565	-$402,632	-$94,335	-$25,968	-$6,084	$2,135,619	$500,369
2046		$0	$300,000	$67,586	$258,623	$58,264	$7,838	$1,766	$129,659	$29,210	$1,869,923	$421,266	$100,000	$22,529	-$98,008	-$22,080	-$409,647	-$92,287	-$26,274	-$5,919	$2,132,115	$480,334
2047		$0	$300,000	$64,986	$261,643	$56,677	$7,994	$1,732	$131,999	$28,594	$1,869,923	$405,064	$100,000	$21,662	-$99,707	-$21,598	-$416,661	-$90,257	-$26,581	-$5,758	$2,128,611	$461,101
2048		$0	$300,000	$62,487	$264,663	$55,126	$8,151	$1,698	$134,339	$27,981	$1,869,923	$389,484	$100,000	$20,829	-$101,405	-$21,122	-$423,676	-$88,247	-$26,888	-$5,600	$2,125,106	$442,636
2049		$0	$300,000	$60,083	$267,682	$53,611	$8,307	$1,664	$136,679	$27,374	$1,869,923	$374,504	$100,000	$20,028	-$103,104	-$20,650	-$430,690	-$86,258	-$27,195	-$5,446	$2,121,602	$424,910
2050		$0	$300,000	$57,772	$270,702	$52,130	$8,463	$1,630	$139,019	$26,772	$1,869,923	$360,100	$100,000	$19,257	-$104,803	-$20,182	-$437,705	-$84,291	-$27,501	-$5,296	$2,118,097	$407,892
2051		$0	$300,000	$55,550	$273,721	$50,684	$8,619	$1,596	$141,359	$26,175	$1,869,923	$346,250	$100,000	$18,517	-$106,502	-$19,721	-$444,719	-$82,348	-$27,808	-$5,149	$2,114,593	$391,555
2052		$0	$300,000	$53,414	$276,741	$49,273	$8,775	$1,562	$143,699	$25,585	$1,869,923	$332,933	$100,000	$17,805	-$108,201	-$19,265	-$451,734	-$80,430	-$28,115	-$5,006	$2,111,088	$375,872
2053		$0	$300,000	$51,360	$279,760	$47,895	$8,932	$1,529	$146,039	$25,002	$1,869,923	$320,128	$100,000	$17,120	-$109,900	-$18,815	-$458,749	-$78,537	-$28,422	-$4,866	$2,107,584	$360,815
2054		$0	$300,000	$49,384	$282,780	$46,549	$9,088	$1,496	$148,379	$24,425	$1,869,923	$307,815	$100,000	$16,461	-$111,599	-$18,371	-$465,763	-$76,671	-$28,728	-$4,729	$2,104,080	$346,361
2055		$0	$300,000	$47,485	$285,800	$45,237	$9,244	$1,463	$150,719	$23,856	$1,869,923	$295,976	$100,000	$15,828	-$113,297	-$17,933	-$472,778	-$74,832	-$29,035	-$4,596	$2,100,575	$332,484
2056		$0	$300,000	$45,658	$288,819	$43,957	$9,400	$1,431	$153,059	$23,295	$1,869,923	$284,592	$100,000	$15,219	-$114,996	-$17,502	-$479,792	-$73,022	-$29,342	-$4,466	$2,097,071	$319,163
2057		$0	$300,000	$43,902	$291,839	$42,708	$9,557	$1,399	$155,399	$22,741	$1,869,923	$273,647	$100,000	$14,634	-$116,695	-$17,077	-$486,807	-$71,240	-$29,649	-$4,339	$2,093,566	$306,375
2058		$0	$300,000	$42,214	$294,858	$41,490	$9,713	$1,367	$157,739	$22,196	$1,869,923	$263,122	$100,000	$14,071	-$118,394	-$16,660	-$493,821	-$69,487	-$29,955	-$4,215	$2,090,062	$294,098
2059		$0	$300,000	$40,590	$297,878	$40,303	$9,869	$1,335	$160,079	$21,659	$1,869,923	$253,002	$100,000	$13,530	-$120,093	-$16,249	-$500,836	-$67,763	-$30,262	-$4,095	$2,086,557	$282,312
2060		$0	$300,000	$39,029	$300,897	$39,146	$10,025	$1,304	$162,419	$21,130	$1,869,923	$243,271	$100,000	$13,010	-$121,792	-$15,845	-$507,850	-$66,070	-$30,569	-$3,977	$2,083,053	$270,998
2061		$0	$300,000	$37,528	$303,917	$38,018	$10,181	$1,274	$164,759	$20,610	$1,869,923	$233,914	$100,000	$12,509	-$123,490	-$15,448	-$514,865	-$64,406	-$30,876	-$3,862	$2,079,548	$260,137
2062		$0	$300,000	$36,085	$306,936	$36,919	$10,338	$1,243	$167,098	$20,099	$1,869,923	$224,918	$100,000	$12,028	-$125,189	-$15,058	-$521,880	-$62,773	-$31,183	-$3,751	$2,076,044	$249,710
2063		$0	$300,000	$34,697	$309,956	$35,848	$10,494	$1,214	$169,438	$19,596	$1,869,923	$216,267	$100,000	$11,566	-$126,888	-$14,675	-$528,894	-$61,170	-$31,489	-$3,642	$2,072,540	$239,701
2064		$0	$300,000	$33,362	$312,976	$34,805	$10,650	$1,184	$171,778	$19,103	$1,869,923	$207,949	$100,000	$11,121	-$128,587	-$14,300	-$535,909	-$59,597	-$31,796	-$3,536	$2,069,035	$230,092
2065		$0	$300,000	$32,079	$315,995	$33,789	$10,806	$1,156	$174,118	$18,618	$1,869,923	$199,951	$100,000	$10,693	-$130,286	-$13,931	-$542,923	-$58,055	-$32,103	-$3,433	$2,065,531	$220,867
Total Capital =	$186,992,280																					
Total Net Present Value =		$141,065,170		$5,125,384		$3,842,238		$107,221		$1,808,503		$30,344,470		$1,708,461		-$1,356,965		-$5,687,635		-$390,344		**$176,566,503**

JUAN DE FUCA WWTF ASSUMPTIONS

Labour:

number of facility manager(s) =	1	**Ref:** Based on Jan 15/09 TM from T. Dokken.
number of operations staff =	2	
number of maintenance staff =	1	
number of administration staff =	0	
total staff =	4 persons	

Chemical Phosphorus Removal Chemicals:

chemical-P removal required (1 = yes, 0 = no)?	0	

Wet-Weather CEPT Chemicals:

fraction of total annual ADWF treated =	0.0%	**Note:** No secondary treatment bypass.

Saleable Heat Energy:

unit energy cost to third-party "heat recovery" utility =	$ 11.72 /GJ	**Ref:** This is the cost that a third-party heat recovery utility would incur to make the heat available to customers. Value is from Table 6 of Feb 10/09 memo from M. Homenuke, reduced by 4% to remove CRD share of capital cost.
unit CRD saleable energy price to third-party utility =	$ 2.28 /GJ	**Note:** This value is the difference between the general energy market unit price (from Generic Assumptions sheet) and the above value, which reflects the maximum amount the utility would be willing to pay the CRD for the heat.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 17, 2009
Last Revision By: D. Shiskowski

Subject: Odgen Point WWTF
Option 3

Material Flows
and Carbon Footprint Analysis

Yellow-shaded cell denotes assumed/input values

Year	Equivalent Population	Wastewater ADWF	Sludge Production and Truck Transport		Saleable Effluent Heat[1]	Saleable Reclaimed Water (irrigation only)	Materials			GHG Sources			GHG Offsets	Total GHG Emissions
			Mass	Thickened Volume			Electricity	Diesel Fuel	Sludge Thickening Polymer	Electricity Purchased	Diesel Fuel Combusted	Sludge Thickening Polymer Used	Avoided Natural Gas/Elect Use via Effluent Heat	
	(pe)	(m3/d)	(dry t/yr)	(m3/yr)	(GJ/yr)	(m3/yr)	(kWh/yr)	(L/yr)	(kg/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)
2008														
2009														
2010														
2011														
2012														
2013														
2014														
2015	87,569	24,128	1,902	0	300,632	105,681	5,548,234	-	0	399	0.0	0.0	-11,414	-11,015
2016	87,916	24,020	1,909	0	318,694	105,207	5,523,368	-	0	398	0.0	0.0	-12,100	-11,702
2017	88,264	23,912	1,917	0	327,199	104,733	5,498,503	-	0	396	0.0	0.0	-12,423	-12,027
2018	88,611	23,804	1,924	0	327,875	104,260	5,473,638	-	0	394	0.0	0.0	-12,448	-12,054
2019	88,958	23,695	1,932	0	328,551	103,786	5,448,773	-	0	392	0.0	0.0	-12,474	-12,082
2020	89,305	23,587	1,939	0	329,227	103,313	5,423,907	-	0	391	0.0	0.0	-12,500	-12,109
2021	89,653	23,479	1,947	0	329,902	102,839	5,399,042	-	0	389	0.0	0.0	-12,525	-12,137
2022	90,000	23,371	1,955	0	330,578	102,365	5,374,177	-	0	387	0.0	0.0	-12,551	-12,164
2023	90,347	23,263	1,962	0	331,254	101,892	5,349,312	-	0	385	0.0	0.0	-12,577	-12,191
2024	90,694	23,155	1,970	0	331,929	101,418	5,324,446	-	0	383	0.0	0.0	-12,602	-12,219
2025	91,042	23,047	1,977	0	332,605	100,944	5,299,581	-	0	382	0.0	0.0	-12,628	-12,246
2026	91,389	22,939	1,985	0	333,281	100,471	5,274,716	-	0	380	0.0	0.0	-12,654	-12,274
2027	91,736	22,830	1,992	0	333,956	99,997	5,249,850	-	0	378	0.0	0.0	-12,679	-12,301
2028	92,083	22,722	2,000	0	334,632	99,524	5,224,985	-	0	376	0.0	0.0	-12,705	-12,329
2029	92,431	22,614	2,007	0	335,308	99,050	5,200,120	-	0	374	0.0	0.0	-12,731	-12,356
2030	92,778	22,506	2,015	0	335,983	98,576	5,175,255	-	0	373	0.0	0.0	-12,756	-12,384
2031	93,253	22,465	2,025	0	337,069	98,395	5,165,719	-	0	372	0.0	0.0	-12,797	-12,425
2032	93,729	22,423	2,036	0	338,154	98,213	5,156,184	-	0	371	0.0	0.0	-12,839	-12,467
2033	94,204	22,382	2,046	0	339,239	98,031	5,146,649	-	0	371	0.0	0.0	-12,880	-12,509
2034	94,680	22,340	2,056	0	340,325	97,850	5,137,114	-	0	370	0.0	0.0	-12,921	-12,551
2035	95,155	22,299	2,067	0	341,410	97,668	5,127,578	-	0	369	0.0	0.0	-12,962	-12,593
2036	95,631	22,257	2,077	0	342,496	97,487	5,118,043	-	0	368	0.0	0.0	-13,003	-12,635
2037	96,106	22,216	2,087	0	343,581	97,305	5,108,508	-	0	368	0.0	0.0	-13,045	-12,677
2038	96,582	22,174	2,098	0	344,666	97,123	5,098,973	-	0	367	0.0	0.0	-13,086	-12,719
2039	97,057	22,133	2,108	0	345,752	96,942	5,089,437	-	0	366	0.0	0.0	-13,127	-12,761
2040	97,533	22,091	2,118	0	346,837	96,760	5,079,902	-	0	366	0.0	0.0	-13,168	-12,803
2041	98,008	22,050	2,128	0	347,922	96,578	5,070,367	-	0	365	0.0	0.0	-13,209	-12,844
2042	98,484	22,008	2,139	0	349,008	96,397	5,060,832	-	0	364	0.0	0.0	-13,251	-12,886
2043	98,959	21,967	2,149	0	350,093	96,215	5,051,296	-	0	364	0.0	0.0	-13,292	-12,928
2044	99,435	21,925	2,159	0	351,178	96,034	5,041,761	-	0	363	0.0	0.0	-13,333	-12,970
2045	99,910	21,884	2,170	0	352,264	95,852	5,032,226	-	0	362	0.0	0.0	-13,374	-13,012
2046	100,009	21,794	2,172	0	352,285	95,459	5,011,588	-	0	361	0.0	0.0	-13,375	-13,014
2047	100,109	21,705	2,174	0	352,306	95,066	4,990,950	-	0	359	0.0	0.0	-13,376	-13,017
2048	100,208	21,615	2,176	0	352,327	94,673	4,970,312	-	0	358	0.0	0.0	-13,377	-13,019
2049	100,308	21,525	2,178	0	352,348	94,280	4,949,674	-	0	356	0.0	0.0	-13,378	-13,021
2050	100,407	21,435	2,181	0	352,369	93,886	4,929,036	-	0	355	0.0	0.0	-13,378	-13,023
2051	100,506	21,346	2,183	0	352,390	93,493	4,908,398	-	0	353	0.0	0.0	-13,379	-13,026
2052	100,606	21,256	2,185	0	352,411	93,100	4,887,760	-	0	352	0.0	0.0	-13,380	-13,028
2053	100,705	21,166	2,187	0	352,432	92,707	4,867,122	-	0	350	0.0	0.0	-13,381	-13,030
2054	100,805	21,076	2,189	0	352,453	92,314	4,846,484	-	0	349	0.0	0.0	-13,382	-13,033
2055	100,904	20,987	2,191	0	352,475	91,921	4,825,846	-	0	347	0.0	0.0	-13,382	-13,035
2056	101,003	20,897	2,194	0	352,496	91,528	4,805,208	-	0	346	0.0	0.0	-13,383	-13,037
2057	101,103	20,807	2,196	0	352,517	91,135	4,784,570	-	0	344	0.0	0.0	-13,384	-13,039
2058	101,202	20,717	2,198	0	352,538	90,742	4,763,932	-	0	343	0.0	0.0	-13,385	-13,042
2059	101,302	20,628	2,200	0	352,559	90,348	4,743,294	-	0	342	0.0	0.0	-13,386	-13,044
2060	101,401	20,538	2,202	0	352,580	89,955	4,722,656	-	0	340	0.0	0.0	-13,386	-13,046
2061	101,500	20,448	2,204	0	352,601	89,562	4,702,018	-	0	339	0.0	0.0	-13,387	-13,049
2062	101,600	20,358	2,206	0	352,622	89,169	4,681,380	-	0	337	0.0	0.0	-13,388	-13,051
2063	101,699	20,269	2,209	0	352,643	88,776	4,660,742	-	0	336	0.0	0.0	-13,389	-13,053
2064	101,799	20,179	2,211	0	352,664	88,383	4,640,104	-	0	334	0.0	0.0	-13,390	-13,055
2065	101,898	20,089	2,213	0	352,685	87,990	4,619,466	-	0	333	0.0	0.0	-13,390	-13,058
Totals =					17,481,301		4,925,391	258,583,029	0	18,618	0	0	-663,709	**-645,091**

OGDEN POINT WWTF ASSUMPTIONS

Electricity:

"base" unit power requirement =	0.500	kW-hr/d per m3/d of ADWF treated wastewater	**Ref:** Based on Jan 15/09 TM from T. Dokken.
wastewater strength adjustment =	0.100	x "base" unit power requirement	**Note:** To account for reduce flow rate but same load.
influent pumping power adjustment =	0.070	x "base" unit power requirement	**Ref:** Reduced relative to Options 1/2.
UV disinfection power adjustment =	0	x "base" unit power requirement	**Note:** Not required - effluent to sensitive marine environment.
effluent/raw sludge pumping power adjustment =	0.090	x "base" unit power requirement	**Ref:** Reduced relative to Options 1/2.
raw sludge thickening adjustment =	0	x "base" unit power requirement	
total unit power requirement =	0.630	kW-hr/d per m3/d of ADWF treated wastewater	**Note:** Not required - sludge to sewer.

Raw Sludge Thickening and Truck Transport:

thickening required (1 = yes, 0 = no)?	0	
chemical-P removal chemical sludge production allowance =	0%	of combined PS + WBS
round-trip transport distance to solids processing facility =	0	km

Saleable Reclaimed Water:

mean fraction of annual ADWF volume sold for landscape irrigation =	1.20%	/yr	**Note:** See dnt_eff_irr_ds.xls for assumptions and details. Reclaimed water used for toilet flushing handled separately in analysis. See IRS LCA worksheet.

Notes:
1. Data from M. Homenuke in Feb 4/09 e-mail, DES_SaleableHeatEnergy.xls, Saleable.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 18, 2009
Last Revision By: D. Shiskowski

Subject: Ogden Point WWTF
Option 3

Life Cycle Analysis

Yellow-shaded cell denotes assumed/input values

Year	Capital Costs		Operation & Maintenance Costs												GHG CO2e		Heat Revenues		Reclaimed Water Revenues (irrigation only)		Total	
			Labour		Electricity		Diesel Fuel		Chemicals		Maintenance		Administration									
	Total Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Rev	Net Present Value	Total Annual Rev	Net Present Value	Total Annual Cost	Net Present Value
2008																						
2009																						
2010																						
2011																						
2012																						
2013																						
2014	$241,187,280	$190,613,811																			$241,187,280	$190,613,811
2015		$0	$600,000	$455,951	$388,376	$295,134	$0	$0	$95,012	$72,202	$2,411,873	$1,832,825	$100,000	$75,992	-$165,218	-$125,552	-$1,305,463	-$992,044	-$76,090	-$57,822	$2,048,490	$1,556,684
2016		$0	$600,000	$438,414	$386,636	$282,511	$0	$0	$94,587	$69,113	$2,411,873	$1,762,332	$100,000	$73,069	-$175,531	-$128,259	-$1,383,895	-$1,011,199	-$75,749	-$55,349	$1,957,919	$1,430,632
2017		$0	$600,000	$421,552	$384,895	$270,422	$0	$0	$94,161	$66,156	$2,411,873	$1,694,550	$100,000	$70,259	-$180,402	-$126,748	-$1,420,831	-$998,257	-$75,408	-$52,981	$1,914,287	$1,344,953
2018		$0	$600,000	$405,339	$383,155	$258,846	$0	$0	$93,735	$63,324	$2,411,873	$1,629,375	$100,000	$67,556	-$180,814	-$122,151	-$1,423,765	-$961,845	-$75,067	-$50,713	$1,909,116	$1,289,730
2019		$0	$600,000	$389,749	$381,414	$247,759	$0	$0	$93,309	$60,612	$2,411,873	$1,566,707	$100,000	$64,958	-$181,226	-$117,721	-$1,426,699	-$926,757	-$74,726	-$48,541	$1,903,945	$1,236,766
2020		$0	$600,000	$374,758	$379,674	$237,143	$0	$0	$92,883	$58,015	$2,411,873	$1,506,449	$100,000	$62,460	-$181,637	-$113,450	-$1,429,633	-$892,945	-$74,385	-$46,461	$1,898,774	$1,185,969
2021		$0	$600,000	$360,344	$377,933	$226,977	$0	$0	$92,457	$55,528	$2,411,873	$1,448,508	$100,000	$60,057	-$182,049	-$109,334	-$1,432,567	-$860,363	-$74,044	-$44,469	$1,893,603	$1,137,249
2022		$0	$600,000	$346,485	$376,192	$217,242	$0	$0	$92,032	$53,146	$2,411,873	$1,392,796	$100,000	$57,748	-$182,461	-$105,366	-$1,435,501	-$828,966	-$73,703	-$42,562	$1,888,432	$1,090,522
2023		$0	$600,000	$333,159	$374,452	$207,920	$0	$0	$91,606	$50,865	$2,411,873	$1,339,227	$100,000	$55,526	-$182,872	-$101,543	-$1,438,436	-$798,712	-$73,362	-$40,735	$1,883,261	$1,045,708
2024		$0	$600,000	$320,345	$372,711	$198,994	$0	$0	$91,180	$48,682	$2,411,873	$1,287,719	$100,000	$53,391	-$183,284	-$97,857	-$1,441,370	-$769,559	-$73,021	-$38,986	$1,878,090	$1,002,727
2025		$0	$600,000	$308,024	$370,971	$190,446	$0	$0	$90,754	$46,591	$2,411,873	$1,238,191	$100,000	$51,337	-$183,696	-$94,304	-$1,444,304	-$741,467	-$72,680	-$37,312	$1,872,918	$961,506
2026		$0	$600,000	$296,177	$369,230	$182,262	$0	$0	$90,328	$44,589	$2,411,873	$1,190,568	$100,000	$49,363	-$184,107	-$90,881	-$1,447,238	-$714,397	-$72,339	-$35,709	$1,867,747	$921,973
2027		$0	$600,000	$284,785	$367,490	$174,426	$0	$0	$89,903	$42,672	$2,411,873	$1,144,777	$100,000	$47,464	-$184,519	-$87,581	-$1,450,172	-$688,313	-$71,998	-$34,173	$1,862,576	$884,058
2028		$0	$600,000	$273,832	$365,749	$166,923	$0	$0	$89,477	$40,836	$2,411,873	$1,100,747	$100,000	$45,639	-$184,931	-$84,400	-$1,453,106	-$663,179	-$71,657	-$32,703	$1,857,405	$847,695
2029		$0	$600,000	$263,300	$364,008	$159,739	$0	$0	$89,051	$39,079	$2,411,873	$1,058,411	$100,000	$43,883	-$185,342	-$81,334	-$1,456,040	-$638,959	-$71,316	-$31,296	$1,852,234	$812,822
2030		$0	$600,000	$253,173	$362,268	$152,861	$0	$0	$88,625	$37,396	$2,411,873	$1,017,703	$100,000	$42,196	-$185,754	-$78,380	-$1,458,974	-$615,622	-$70,975	-$29,948	$1,847,063	$779,378
2031		$0	$600,000	$243,436	$361,600	$146,711	$0	$0	$88,462	$35,891	$2,411,873	$978,560	$100,000	$40,573	-$186,382	-$75,620	-$1,463,687	-$593,856	-$70,844	-$28,743	$1,841,021	$746,951
2032		$0	$600,000	$234,073	$360,933	$140,808	$0	$0	$88,299	$34,447	$2,411,873	$940,923	$100,000	$39,012	-$187,011	-$72,957	-$1,468,400	-$572,854	-$70,713	-$27,587	$1,834,980	$715,865
2033		$0	$600,000	$225,070	$360,265	$135,142	$0	$0	$88,135	$33,061	$2,411,873	$904,734	$100,000	$37,512	-$187,639	-$70,387	-$1,473,113	-$552,590	-$70,583	-$26,477	$1,828,938	$686,066
2034		$0	$600,000	$216,414	$359,598	$129,703	$0	$0	$87,972	$31,731	$2,411,873	$869,937	$100,000	$36,069	-$188,268	-$67,906	-$1,477,826	-$533,036	-$70,452	-$25,411	$1,822,897	$657,499
2035		$0	$600,000	$208,090	$358,930	$124,483	$0	$0	$87,809	$30,454	$2,411,873	$836,477	$100,000	$34,682	-$188,896	-$65,512	-$1,482,539	-$514,169	-$70,321	-$24,389	$1,816,855	$630,116
2036		$0	$600,000	$200,086	$358,263	$119,473	$0	$0	$87,645	$29,228	$2,411,873	$804,305	$100,000	$33,348	-$189,524	-$63,202	-$1,487,253	-$495,965	-$70,190	-$23,407	$1,810,814	$603,866
2037		$0	$600,000	$192,391	$357,596	$114,664	$0	$0	$87,482	$28,051	$2,411,873	$773,370	$100,000	$32,065	-$190,153	-$60,973	-$1,491,966	-$478,401	-$70,060	-$22,465	$1,804,773	$578,703
2038		$0	$600,000	$184,991	$356,928	$110,048	$0	$0	$87,319	$26,922	$2,411,873	$743,625	$100,000	$30,832	-$190,781	-$58,821	-$1,496,679	-$461,454	-$69,929	-$21,560	$1,798,731	$554,582
2039		$0	$600,000	$177,876	$356,261	$105,617	$0	$0	$87,156	$25,838	$2,411,873	$715,024	$100,000	$29,646	-$191,410	-$56,745	-$1,501,392	-$445,103	-$69,798	-$20,692	$1,792,690	$531,461
2040		$0	$600,000	$171,035	$355,593	$101,365	$0	$0	$86,992	$24,798	$2,411,873	$687,523	$100,000	$28,506	-$192,038	-$54,742	-$1,506,105	-$429,327	-$69,667	-$19,859	$1,786,648	$509,298
2041		$0	$600,000	$164,457	$354,926	$97,283	$0	$0	$86,829	$23,799	$2,411,873	$661,080	$100,000	$27,409	-$192,666	-$52,809	-$1,510,818	-$414,106	-$69,536	-$19,060	$1,780,607	$488,054
2042		$0	$600,000	$158,131	$354,258	$93,365	$0	$0	$86,666	$22,841	$2,411,873	$635,654	$100,000	$26,355	-$193,295	-$50,943	-$1,515,531	-$399,421	-$69,406	-$18,292	$1,774,565	$467,690
2043		$0	$600,000	$152,049	$353,591	$89,605	$0	$0	$86,502	$21,921	$2,411,873	$611,206	$100,000	$25,342	-$193,923	-$49,143	-$1,520,244	-$385,253	-$69,275	-$17,555	$1,768,524	$448,171
2044		$0	$600,000	$146,201	$352,923	$85,996	$0	$0	$86,339	$21,038	$2,411,873	$587,698	$100,000	$24,367	-$194,552	-$47,406	-$1,524,957	-$371,584	-$69,144	-$16,848	$1,762,482	$429,462
2045		$0	$600,000	$140,578	$352,256	$82,532	$0	$0	$86,176	$20,191	$2,411,873	$565,094	$100,000	$23,430	-$195,180	-$45,730	-$1,529,670	-$358,397	-$69,013	-$16,170	$1,756,441	$411,529
2046		$0	$600,000	$135,171	$350,811	$79,033	$0	$0	$85,822	$19,335	$2,411,873	$543,360	$100,000	$22,529	-$195,214	-$43,979	-$1,529,762	-$344,633	-$68,730	-$15,484	$1,754,800	$395,331
2047		$0	$600,000	$129,972	$349,366	$75,680	$0	$0	$85,469	$18,514	$2,411,873	$522,461	$100,000	$21,662	-$195,249	-$42,295	-$1,529,853	-$331,398	-$68,447	-$14,827	$1,753,159	$379,770
2048		$0	$600,000	$124,973	$347,922	$72,468	$0	$0	$85,116	$17,729	$2,411,873	$502,367	$100,000	$20,829	-$195,283	-$40,675	-$1,529,945	-$318,671	-$68,164	-$14,198	$1,751,518	$364,822
2049		$0	$600,000	$120,167	$346,477	$69,392	$0	$0	$84,762	$16,976	$2,411,873	$483,045	$100,000	$20,028	-$195,317	-$39,118	-$1,530,036	-$306,432	-$67,881	-$13,595	$1,749,877	$350,462
2050		$0	$600,000	$115,545	$345,033	$66,445	$0	$0	$84,409	$16,255	$2,411,873	$464,466	$100,000	$19,257	-$195,352	-$37,620	-$1,530,128	-$294,664	-$67,598	-$13,018	$1,748,236	$336,666
2051		$0	$600,000	$111,101	$343,588	$63,622	$0	$0	$84,055	$15,564	$2,411,873	$446,602	$100,000	$18,517	-$195,386	-$36,179	-$1,530,219	-$283,348	-$67,315	-$12,465	$1,746,595	$323,414
2052		$0	$600,000	$106,828	$342,143	$60,917	$0	$0	$83,702	$14,903	$2,411,873	$429,425	$100,000	$17,805	-$195,420	-$34,794	-$1,530,311	-$272,466	-$67,032	-$11,935	$1,744,955	$310,683
2053		$0	$600,000	$102,719	$340,699	$58,327	$0	$0	$83,348	$14,269	$2,411,873	$412,909	$100,000	$17,120	-$195,455	-$33,462	-$1,530,403	-$262,002	-$66,749	-$11,427	$1,743,314	$298,453
2054		$0	$600,000	$98,768	$339,254	$55,846	$0	$0	$82,995	$13,662	$2,411,873	$397,028	$100,000	$16,461	-$195,489	-$32,180	-$1,530,494	-$251,941	-$66,466	-$10,941	$1,741,673	$286,703
2055		$0	$600,000	$94,970	$337,809	$53,469	$0	$0	$82,642	$13,081	$2,411,873	$381,757	$100,000	$15,828	-$195,523	-$30,948	-$1,530,586	-$242,265	-$66,183	-$10,476	$1,740,032	$275,417
2056		$0	$600,000	$91,317	$336,365	$51,193	$0	$0	$82,288	$12,524	$2,411,873	$367,074	$100,000	$15,219	-$195,557	-$29,763	-$1,530,677	-$232,961	-$65,900	-$10,030	$1,738,391	$264,574
2057		$0	$600,000	$87,805	$334,920	$49,013	$0	$0	$81,935	$11,990	$2,411,873	$352,956	$100,000	$14,634	-$195,592	-$28,623	-$1,530,769	-$224,014	-$65,617	-$9,602	$1,736,750	$254,158
2058		$0	$600,000	$84,428	$333,475	$46,924	$0	$0	$81,581	$11,480	$2,411,873	$339,381	$100,000	$14,071	-$195,626	-$27,527	-$1,530,860	-$215,411	-$65,334	-$9,193	$1,735,109	$244,152
2059		$0	$600,000	$81,180	$332,031	$44,924	$0	$0	$81,228	$10,990	$2,411,873	$326,328	$100,000	$13,530	-$195,660	-$26,473	-$1,530,952	-$207,139	-$65,051	-$8,801	$1,733,468	$234,539
2060		$0	$600,000	$78,058	$330,586	$43,008	$0	$0	$80,875	$10,522	$2,411,873	$313,777	$100,000	$13,010	-$195,695	-$25,459	-$1,531,043	-$199,184	-$64,768	-$8,426	$1,731,827	$225,305
2061		$0	$600,000	$75,056	$329,141	$41,173	$0	$0	$80,521	$10,073	$2,411,873	$301,708	$100,000	$12,509	-$195,729	-$24,484	-$1,531,135	-$191,534	-$64,485	-$8,067	$1,730,186	$216,434
2062		$0	$600,000	$72,169	$327,697	$39,416	$0	$0	$80,168	$9,643	$2,411,873	$290,104	$100,000	$12,028	-$195,763	-$23,547	-$1,531,226	-$184,179	-$64,202	-$7,722	$1,728,546	$207,912
2063		$0	$600,000	$69,393	$326,252	$37,733	$0	$0	$79,814	$9,231	$2,411,873	$278,946	$100,000	$11,566	-$195,797	-$22,645	-$1,531,318	-$177,105	-$63,919	-$7,393	$1,726,905	$199,726
2064		$0	$600,000	$66,724	$324,807	$36,121	$0	$0	$79,461	$8,837	$2,411,873	$268,218	$100,000	$11,121	-$195,832	-$21,778	-$1,531,410	-$170,304	-$63,636	-$7,077	$1,725,264	$191,862
2065		$0	$600,000	$64,158	$323,363	$34,577	$0	$0	$79,107	$8,459	$2,411,873	$257,902	$100,000	$10,693	-$195,866	-$20,944	-$1,531,501	-$163,763	-$63,353	-$6,774	$1,723,623	$184,307
Total Capital =	$241,187,280																					
Total Net Present Value =		$190,613,811		$10,250,768		$6,225,680		$0		$1,523,050		$41,205,912		$1,708,461		-$3,180,251		-$24,981,517		-$1,219,725		**$222,146,188**

OGDEN POINT WWTF ASSUMPTIONS

Labour:
number of facility manager(s) = 1
number of operations staff = 5
number of maintenance staff = 2
number of administration staff = 0
total staff = 8 persons

Ref: Based on Jan 15/09 TM from T. Dokken.

Chemical Phosphorus Removal Chemicals:
chemical-P removal required (1 = yes, 0 = no)? 0

Wet-Weather CEPT Chemicals:
fraction of total annual ADWF treated = 5.0%

Ref: Allowance to account for potential costs.

Reclaimed Water Disinfection:
allowance = 10.0% of other chemical costs

Ref: Allowance to account for potential costs.

Saleable Heat Energy:
unit energy cost to third-party "heat recovery" utility = $ 9.66 /GJ
unit CRD saleable energy price to third-party utility = $ 4.34 /GJ

Ref: This is the cost that a third-party heat recovery utility would incur to make the heat available to customers. Value is from Table 6 of Feb 10/09 memo from M. Homenuke, reduced by 4% to remove CRD share of capital cost.
Note: This value is the difference between the general energy market unit price (from Generic Assumptions sheet) and the above value, which reflects the maximum amount the utility would be willing to pay the CRD for the heat.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 17, 2009
Last Revision By: D. Shiskowski

Subject: Windsor Park WWTF
Option 3

Material Flows
and Carbon Footprint Analysis

Yellow-shaded cell denotes assumed/input values

Year	Equivalent Population	Wastewater ADWF	Sludge Production and Truck Transport		Saleable Effluent Heat[1]	Saleable Reclaimed Water (irrigation only)	Materials			GHG Sources			GHG Offsets	Total GHG Emissions
			Mass	Thickened Volume			Electricity	Diesel Fuel	Sludge Thickening Polymer	Electricity Purchased	Diesel Fuel Combusted	Sludge Thickening Polymer Used	Avoided Natural Gas/Elect Use via Effluent Heat	
	(pe)	(m3/d)	(dry t/yr)	(m3/yr)	(GJ/yr)	(m3/yr)	(kWh/yr)	(L/yr)	(kg/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)
2008														
2009														
2010														
2011														
2012														
2013														
2014														
2015	43,447	14,433	944	0	49,059	5,795	3,824,601	-	0	275	0.0	0.0	-1,863	-1,587
2016	43,572	14,370	946	0	49,664	5,770	3,807,942	-	0	274	0.0	0.0	-1,886	-1,611
2017	43,696	14,307	949	0	50,269	5,744	3,791,283	-	0	273	0.0	0.0	-1,909	-1,636
2018	43,821	14,244	952	0	50,873	5,719	3,774,624	-	0	272	0.0	0.0	-1,931	-1,660
2019	43,945	14,182	954	0	51,478	5,694	3,757,965	-	0	271	0.0	0.0	-1,954	-1,684
2020	44,070	14,119	957	0	52,083	5,669	3,741,305	-	0	269	0.0	0.0	-1,977	-1,708
2021	44,194	14,056	960	0	52,688	5,643	3,724,646	-	0	268	0.0	0.0	-2,000	-1,732
2022	44,319	13,993	962	0	53,292	5,618	3,707,987	-	0	267	0.0	0.0	-2,023	-1,756
2023	44,443	13,930	965	0	53,897	5,593	3,691,328	-	0	266	0.0	0.0	-2,046	-1,781
2024	44,568	13,867	968	0	54,502	5,568	3,674,669	-	0	265	0.0	0.0	-2,069	-1,805
2025	44,692	13,804	971	0	55,107	5,542	3,658,010	-	0	263	0.0	0.0	-2,092	-1,829
2026	44,817	13,741	973	0	55,712	5,517	3,641,351	-	0	262	0.0	0.0	-2,115	-1,853
2027	44,941	13,679	976	0	56,316	5,492	3,624,692	-	0	261	0.0	0.0	-2,138	-1,877
2028	45,066	13,616	979	0	56,921	5,467	3,608,033	-	0	260	0.0	0.0	-2,161	-1,901
2029	45,190	13,553	981	0	57,526	5,441	3,591,374	-	0	259	0.0	0.0	-2,184	-1,925
2030	45,315	13,490	984	0	58,131	5,416	3,574,715	-	0	257	0.0	0.0	-2,207	-1,950
2031	45,477	13,458	988	0	58,259	5,403	3,566,129	-	0	257	0.0	0.0	-2,212	-1,955
2032	45,638	13,425	991	0	58,387	5,390	3,557,544	-	0	256	0.0	0.0	-2,217	-1,961
2033	45,800	13,393	995	0	58,514	5,377	3,548,958	-	0	256	0.0	0.0	-2,222	-1,966
2034	45,962	13,360	998	0	58,642	5,364	3,540,372	-	0	255	0.0	0.0	-2,226	-1,972
2035	46,124	13,328	1,002	0	58,770	5,351	3,531,787	-	0	254	0.0	0.0	-2,231	-1,977
2036	46,285	13,296	1,005	0	58,898	5,338	3,523,201	-	0	254	0.0	0.0	-2,236	-1,983
2037	46,447	13,263	1,009	0	59,026	5,325	3,514,615	-	0	253	0.0	0.0	-2,241	-1,988
2038	46,609	13,231	1,012	0	59,154	5,312	3,506,030	-	0	252	0.0	0.0	-2,246	-1,993
2039	46,771	13,198	1,016	0	59,282	5,299	3,497,444	-	0	252	0.0	0.0	-2,251	-1,999
2040	46,932	13,166	1,019	0	59,410	5,286	3,488,858	-	0	251	0.0	0.0	-2,256	-2,004
2041	47,094	13,134	1,023	0	59,538	5,273	3,480,273	-	0	251	0.0	0.0	-2,260	-2,010
2042	47,256	13,101	1,026	0	59,666	5,260	3,471,687	-	0	250	0.0	0.0	-2,265	-2,015
2043	47,418	13,069	1,030	0	59,794	5,247	3,463,101	-	0	249	0.0	0.0	-2,270	-2,021
2044	47,579	13,036	1,033	0	59,922	5,234	3,454,516	-	0	249	0.0	0.0	-2,275	-2,026
2045	47,741	13,004	1,037	0	60,050	5,221	3,445,930	-	0	248	0.0	0.0	-2,280	-2,032
2046	47,788	12,961	1,038	0	60,626	5,204	3,434,535	-	0	247	0.0	0.0	-2,302	-2,054
2047	47,835	12,918	1,039	0	61,201	5,187	3,423,141	-	0	246	0.0	0.0	-2,324	-2,077
2048	47,882	12,875	1,040	0	61,777	5,169	3,411,746	-	0	246	0.0	0.0	-2,345	-2,100
2049	47,929	12,832	1,041	0	62,353	5,152	3,400,352	-	0	245	0.0	0.0	-2,367	-2,123
2050	47,976	12,789	1,042	0	62,929	5,135	3,388,957	-	0	244	0.0	0.0	-2,389	-2,145
2051	48,023	12,746	1,043	0	63,504	5,118	3,377,563	-	0	243	0.0	0.0	-2,411	-2,168
2052	48,070	12,703	1,044	0	64,080	5,100	3,366,168	-	0	242	0.0	0.0	-2,433	-2,191
2053	48,117	12,660	1,045	0	64,656	5,083	3,354,773	-	0	242	0.0	0.0	-2,455	-2,213
2054	48,164	12,617	1,046	0	65,232	5,066	3,343,379	-	0	241	0.0	0.0	-2,477	-2,236
2055	48,211	12,574	1,047	0	65,808	5,048	3,331,984	-	0	240	0.0	0.0	-2,499	-2,259
2056	48,258	12,531	1,048	0	66,383	5,031	3,320,590	-	0	239	0.0	0.0	-2,520	-2,281
2057	48,305	12,488	1,049	0	66,959	5,014	3,309,195	-	0	238	0.0	0.0	-2,542	-2,304
2058	48,352	12,445	1,050	0	67,535	4,997	3,297,801	-	0	237	0.0	0.0	-2,564	-2,327
2059	48,399	12,402	1,051	0	68,111	4,979	3,286,406	-	0	237	0.0	0.0	-2,586	-2,349
2060	48,446	12,359	1,052	0	68,686	4,962	3,275,011	-	0	236	0.0	0.0	-2,608	-2,372
2061	48,493	12,316	1,053	0	69,262	4,945	3,263,617	-	0	235	0.0	0.0	-2,630	-2,395
2062	48,540	12,273	1,054	0	69,838	4,928	3,252,222	-	0	234	0.0	0.0	-2,652	-2,417
2063	48,587	12,230	1,055	0	70,414	4,910	3,240,828	-	0	233	0.0	0.0	-2,673	-2,440
2064	48,634	12,187	1,056	0	70,989	4,893	3,229,433	-	0	233	0.0	0.0	-2,695	-2,463
2065	48,681	12,144	1,057	0	71,565	4,876	3,218,039	-	0	232	0.0	0.0	-2,717	-2,485
Totals =					3,066,739	270,168	178,310,711	0		12,838	0	0	-116,434	**-103,596**

WINDSOR PARK WWTF ASSUMPTIONS

Electricity:

"base" unit power requirement =	0.600	kW-hr/d per m3/d of ADWF treated wastewater	**Ref:** Based on Jan 15/09 TM from T. Dokken, based on Option 1/2 facilty.
wastewater strength adjustment =	0.100	x "base" unit power requirement	**Note:** To account for reduce flow rate but same load.
influent pumping power adjustment =	0.070	x "base" unit power requirement	**Ref:** Reduced relative to Options 1/2.
UV disinfection power adjustment =	0	x "base" unit power requirement	**Note:** Not required - effluent to marine environment.
effluent pumping power adjustment =	0.04	x "base" unit power requirement	**Note:** Reduced relative to Options 1/2.
raw sludge thickening adjustment =	0	x "base" unit power requirement	**Ref:** Not required - sludge to sewer.
total unit power requirement =	0.726	kW-hr/d per m3/d of ADWF treated wastewater	

Raw Sludge Thickening and Truck Transport:

thickening required (1 = yes, 0 = no)?	0	
chemical-P removal chemical sludge production allowance =	0%	of combined PS + WBS
round-trip transport distance to solids processing facility =	0	km

Saleable Reclaimed Water:

mean fraction of annual ADWF volume sold for landscape irrigation =	0.11%	/yr	**Note:** See dnt_eff_irr_ds.xls for assumptions and details. Reclaimed water used for toilet flushing handled separately in analysis. See IRS LCA worksheet.

Notes:
1. Data from M. Homenuke in Feb 4/09 e-mail, DES_SaleableHeatEnergy.xls, Saleable.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 17, 2009
Last Revision By: D. Shiskowski

Subject: Windsor Park WWTF
Option 3

Life Cycle Analysis

Yellow-shaded cell denotes assumed/input values

Year	Capital Costs		Operation & Maintenance Costs												GHG CO2e		Heat Revenues		Reclaimed Water Revenues (irrigation only)		Total	
			Labour		Electricity		Diesel Fuel		Chemicals		Maintenance		Administration									
	Total Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Rev	Net Present Value	Total Annual Rev	Net Present Value	Total Annual Cost	Net Present Value
2008																						
2009																						
2010																						
2011																						
2012																						
2013																						
2014	$144,640,280	$114,311,314																			$144,640,280	$114,311,314
2015	$0		$375,000	$284,969	$267,722	$203,447	$0	$0	$56,835	$43,190	$1,446,403	$1,099,147	$100,000	$75,992	-$23,809	-$18,093	-$124,002	-$94,231	-$4,172	-$3,171	$2,093,977	$1,591,251
2016	$0		$375,000	$274,009	$266,556	$194,770	$0	$0	$56,587	$41,348	$1,446,403	$1,056,872	$100,000	$73,069	-$24,171	-$17,662	-$125,530	-$91,724	-$4,154	-$3,035	$2,090,691	$1,527,647
2017	$0		$375,000	$263,470	$265,390	$186,459	$0	$0	$56,340	$39,584	$1,446,403	$1,016,223	$100,000	$70,259	-$24,533	-$17,237	-$127,059	-$89,270	-$4,136	-$2,906	$2,087,404	$1,466,582
2018	$0		$375,000	$253,337	$264,224	$178,500	$0	$0	$56,092	$37,894	$1,446,403	$977,138	$100,000	$67,556	-$24,896	-$16,819	-$128,588	-$86,869	-$4,118	-$2,782	$2,084,117	$1,407,955
2019	$0		$375,000	$243,593	$263,058	$170,877	$0	$0	$55,845	$36,276	$1,446,403	$939,556	$100,000	$64,958	-$25,258	-$16,407	-$130,116	-$84,521	-$4,100	-$2,663	$2,080,831	$1,351,668
2020	$0		$375,000	$234,224	$261,891	$163,577	$0	$0	$55,597	$34,726	$1,446,403	$903,419	$100,000	$62,460	-$25,621	-$16,003	-$131,645	-$82,225	-$4,081	-$2,549	$2,077,544	$1,297,628
2021	$0		$375,000	$225,215	$260,725	$156,585	$0	$0	$55,350	$33,242	$1,446,403	$868,672	$100,000	$60,057	-$25,983	-$15,605	-$133,173	-$79,980	-$4,063	-$2,440	$2,074,258	$1,245,746
2022	$0		$375,000	$216,553	$259,559	$149,889	$0	$0	$55,102	$31,820	$1,446,403	$835,262	$100,000	$57,748	-$26,346	-$15,214	-$134,702	-$77,787	-$4,045	-$2,336	$2,070,971	$1,195,934
2023	$0		$375,000	$208,224	$258,393	$143,476	$0	$0	$54,854	$30,459	$1,446,403	$803,136	$100,000	$55,526	-$26,708	-$14,830	-$136,231	-$75,644	-$4,027	-$2,236	$2,067,685	$1,148,112
2024	$0		$375,000	$200,216	$257,227	$137,336	$0	$0	$54,607	$29,155	$1,446,403	$772,246	$100,000	$53,391	-$27,070	-$14,453	-$137,759	-$73,551	-$4,009	-$2,140	$2,064,398	$1,102,199
2025	$0		$375,000	$192,515	$256,061	$131,455	$0	$0	$54,359	$27,907	$1,446,403	$742,545	$100,000	$51,337	-$27,433	-$14,083	-$139,288	-$71,507	-$3,991	-$2,049	$2,061,112	$1,058,120
2026	$0		$375,000	$185,111	$254,895	$125,823	$0	$0	$54,112	$26,711	$1,446,403	$713,985	$100,000	$49,363	-$27,795	-$13,720	-$140,817	-$69,511	-$3,972	-$1,961	$2,057,825	$1,015,800
2027	$0		$375,000	$177,991	$253,728	$120,430	$0	$0	$53,864	$25,566	$1,446,403	$686,524	$100,000	$47,464	-$28,158	-$13,365	-$142,345	-$67,563	-$3,954	-$1,877	$2,054,539	$975,171
2028	$0		$375,000	$171,145	$252,562	$115,266	$0	$0	$53,617	$24,470	$1,446,403	$660,119	$100,000	$45,639	-$28,520	-$13,016	-$143,874	-$65,662	-$3,936	-$1,796	$2,051,252	$936,165
2029	$0		$375,000	$164,563	$251,396	$110,321	$0	$0	$53,369	$23,420	$1,446,403	$634,730	$100,000	$43,883	-$28,882	-$12,675	-$145,402	-$63,807	-$3,918	-$1,719	$2,047,965	$898,716
2030	$0		$375,000	$158,233	$250,230	$105,586	$0	$0	$53,122	$22,415	$1,446,403	$610,317	$100,000	$42,196	-$29,245	-$12,340	-$146,931	-$61,998	-$3,900	-$1,645	$2,044,679	$862,763
2031	$0		$375,000	$152,147	$249,629	$101,281	$0	$0	$52,994	$21,501	$1,446,403	$586,844	$100,000	$40,573	-$29,327	-$11,899	-$147,254	-$59,745	-$3,890	-$1,578	$2,043,554	$829,124
2032	$0		$375,000	$146,296	$249,028	$97,151	$0	$0	$52,866	$20,624	$1,446,403	$564,273	$100,000	$39,012	-$29,409	-$11,473	-$147,578	-$57,573	-$3,881	-$1,514	$2,042,429	$796,796
2033	$0		$375,000	$140,669	$248,427	$93,189	$0	$0	$52,739	$19,783	$1,446,403	$542,570	$100,000	$37,512	-$29,491	-$11,063	-$147,901	-$55,480	-$3,872	-$1,452	$2,041,305	$765,728
2034	$0		$375,000	$135,258	$247,826	$89,388	$0	$0	$52,611	$18,976	$1,446,403	$521,702	$100,000	$36,069	-$29,573	-$10,667	-$148,225	-$53,463	-$3,862	-$1,393	$2,040,180	$735,871
2035	$0		$375,000	$130,056	$247,225	$85,742	$0	$0	$52,484	$18,202	$1,446,403	$501,636	$100,000	$34,682	-$29,656	-$10,285	-$148,548	-$51,519	-$3,853	-$1,336	$2,039,055	$707,178
2036	$0		$375,000	$125,054	$246,624	$82,244	$0	$0	$52,356	$17,460	$1,446,403	$482,343	$100,000	$33,348	-$29,738	-$9,917	-$148,871	-$49,645	-$3,843	-$1,282	$2,037,930	$679,604
2037	$0		$375,000	$120,244	$246,023	$78,888	$0	$0	$52,228	$16,747	$1,446,403	$463,791	$100,000	$32,065	-$29,820	-$9,562	-$149,195	-$47,840	-$3,834	-$1,229	$2,036,806	$653,105
2038	$0		$375,000	$115,620	$245,422	$75,668	$0	$0	$52,101	$16,064	$1,446,403	$445,953	$100,000	$30,832	-$29,902	-$9,219	-$149,518	-$46,099	-$3,825	-$1,179	$2,035,681	$627,638
2039	$0		$375,000	$111,173	$244,821	$72,580	$0	$0	$51,973	$15,408	$1,446,403	$428,801	$100,000	$29,646	-$29,984	-$8,889	-$149,842	-$44,422	-$3,815	-$1,131	$2,034,556	$603,165
2040	$0		$375,000	$106,897	$244,220	$69,617	$0	$0	$51,846	$14,779	$1,446,403	$412,309	$100,000	$28,506	-$30,066	-$8,571	-$150,165	-$42,806	-$3,806	-$1,085	$2,033,431	$579,646
2041	$0		$375,000	$102,785	$243,619	$66,775	$0	$0	$51,718	$14,176	$1,446,403	$396,451	$100,000	$27,409	-$30,148	-$8,263	-$150,488	-$41,248	-$3,797	-$1,041	$2,032,307	$557,043
2042	$0		$375,000	$98,832	$243,018	$64,048	$0	$0	$51,591	$13,597	$1,446,403	$381,202	$100,000	$26,355	-$30,230	-$7,967	-$150,812	-$39,747	-$3,787	-$998	$2,031,182	$535,322
2043	$0		$375,000	$95,031	$242,417	$61,432	$0	$0	$51,463	$13,042	$1,446,403	$366,541	$100,000	$25,342	-$30,313	-$7,682	-$151,135	-$38,300	-$3,778	-$957	$2,030,057	$514,448
2044	$0		$375,000	$91,376	$241,816	$58,923	$0	$0	$51,335	$12,509	$1,446,403	$352,443	$100,000	$24,367	-$30,395	-$7,406	-$151,459	-$36,906	-$3,769	-$918	$2,028,932	$494,387
2045	$0		$375,000	$87,861	$241,215	$56,516	$0	$0	$51,208	$11,998	$1,446,403	$338,888	$100,000	$23,430	-$30,477	-$7,141	-$151,782	-$35,562	-$3,759	-$881	$2,027,808	$475,109
2046	$0		$375,000	$84,482	$240,417	$54,163	$0	$0	$51,038	$11,498	$1,446,403	$325,853	$100,000	$22,529	-$30,817	-$6,943	-$153,237	-$34,522	-$3,747	-$844	$2,025,058	$456,216
2047	$0		$375,000	$81,233	$239,620	$51,907	$0	$0	$50,869	$11,019	$1,446,403	$313,321	$100,000	$21,662	-$31,157	-$6,749	-$154,693	-$33,510	-$3,734	-$809	$2,022,307	$438,073
2048	$0		$375,000	$78,108	$238,822	$49,744	$0	$0	$50,700	$10,560	$1,446,403	$301,270	$100,000	$20,829	-$31,498	-$6,561	-$156,148	-$32,524	-$3,722	-$775	$2,019,557	$420,652
2049	$0		$375,000	$75,104	$238,025	$47,671	$0	$0	$50,530	$10,120	$1,446,403	$289,683	$100,000	$20,028	-$31,838	-$6,376	-$157,603	-$31,564	-$3,709	-$743	$2,016,807	$403,922
2050	$0		$375,000	$72,216	$237,227	$45,684	$0	$0	$50,361	$9,698	$1,446,403	$278,541	$100,000	$19,257	-$32,178	-$6,197	-$159,059	-$30,631	-$3,697	-$712	$2,014,057	$387,857
2051	$0		$375,000	$69,438	$236,429	$43,779	$0	$0	$50,192	$9,294	$1,446,403	$267,828	$100,000	$18,517	-$32,518	-$6,021	-$160,514	-$29,722	-$3,685	-$682	$2,011,307	$372,430
2052	$0		$375,000	$66,767	$235,632	$41,953	$0	$0	$50,022	$8,906	$1,446,403	$257,527	$100,000	$17,805	-$32,858	-$5,850	-$161,969	-$28,838	-$3,672	-$654	$2,008,557	$357,616
2053	$0		$375,000	$64,199	$234,834	$40,203	$0	$0	$49,853	$8,535	$1,446,403	$247,622	$100,000	$17,120	-$33,199	-$5,684	-$163,424	-$27,978	-$3,660	-$627	$2,005,807	$343,391
2054	$0		$375,000	$61,730	$234,037	$38,526	$0	$0	$49,684	$8,179	$1,446,403	$238,098	$100,000	$16,461	-$33,539	-$5,521	-$164,880	-$27,141	-$3,647	-$600	$2,003,057	$329,731
2055	$0		$375,000	$59,356	$233,239	$36,918	$0	$0	$49,514	$7,837	$1,446,403	$228,940	$100,000	$15,828	-$33,879	-$5,362	-$166,335	-$26,328	-$3,635	-$575	$2,000,307	$316,614
2056	$0		$375,000	$57,073	$232,441	$35,376	$0	$0	$49,345	$7,510	$1,446,403	$220,135	$100,000	$15,219	-$34,219	-$5,208	-$167,790	-$25,537	-$3,622	-$551	$1,997,557	$304,018
2057	$0		$375,000	$54,878	$231,644	$33,899	$0	$0	$49,176	$7,196	$1,446,403	$211,668	$100,000	$14,634	-$34,559	-$5,057	-$169,246	-$24,768	-$3,610	-$528	$1,994,807	$291,922
2058	$0		$375,000	$52,767	$230,846	$32,483	$0	$0	$49,007	$6,896	$1,446,403	$203,527	$100,000	$14,071	-$34,900	-$4,911	-$170,701	-$24,020	-$3,598	-$506	$1,992,057	$280,308
2059	$0		$375,000	$50,738	$230,048	$31,126	$0	$0	$48,837	$6,608	$1,446,403	$195,699	$100,000	$13,530	-$35,240	-$4,768	-$172,156	-$23,293	-$3,585	-$485	$1,989,307	$269,154
2060	$0		$375,000	$48,786	$229,251	$29,825	$0	$0	$48,668	$6,332	$1,446,403	$188,172	$100,000	$13,010	-$35,580	-$4,629	-$173,612	-$22,586	-$3,573	-$465	$1,986,557	$258,445
2061	$0		$375,000	$46,910	$228,453	$28,578	$0	$0	$48,499	$6,067	$1,446,403	$180,935	$100,000	$12,509	-$35,920	-$4,493	-$175,067	-$21,900	-$3,560	-$445	$1,983,807	$248,160
2062	$0		$375,000	$45,106	$227,656	$27,383	$0	$0	$48,329	$5,813	$1,446,403	$173,976	$100,000	$12,028	-$36,260	-$4,361	-$176,522	-$21,232	-$3,548	-$427	$1,981,057	$238,285
2063	$0		$375,000	$43,371	$226,858	$26,237	$0	$0	$48,160	$5,570	$1,446,403	$167,284	$100,000	$11,566	-$36,601	-$4,233	-$177,977	-$20,584	-$3,535	-$409	$1,978,307	$228,802
2064	$0		$375,000	$41,703	$226,060	$25,140	$0	$0	$47,991	$5,337	$1,446,403	$160,850	$100,000	$11,121	-$36,941	-$4,108	-$179,433	-$19,954	-$3,523	-$392	$1,975,557	$219,696
2065	$0		$375,000	$40,099	$225,263	$24,087	$0	$0	$47,821	$5,114	$1,446,403	$154,664	$100,000	$10,693	-$37,281	-$3,986	-$180,888	-$19,342	-$3,511	-$375	$1,972,807	$210,952
Total Capital =	$144,640,280																					
Total Net Present Value =		$114,311,314		$6,406,730		$4,291,919		$0		$911,135		$24,711,231		$1,708,461		-$488,544		-$2,462,180		-$66,887		**$149,323,180**

WINDSOR PARK WWTF ASSUMPTIONS

Labour:
number of facility manager(s) = 1
number of operations staff = 2
number of maintenance staff = 2
number of administration staff = 0
total staff = 5 persons

Ref: Based on Jan 15/09 TM from T. Dokken.

Chemical Phosphorus Removal Chemicals:
chemical-P removal required (1 = yes, 0 = no)? 0

Wet-Weather CEPT Chemicals:
fraction of total annual ADWF treated = 5.0%

Ref: Allowance to account for potential costs.

Reclaimed Water Disinfection:
allowance = 10.0% of other chemical costs

Ref: Allowance to account for potential costs.

Saleable Heat Energy:
unit energy cost to third-party "heat recovery" utility = $ 11.47 /GJ
unit CRD saleable energy price to third-party utility = $ 2.53 /GJ

Ref: This is the cost that a third-party heat recovery utility would incur to make the heat available to customers. Value is from Table 6 of Feb 10/09 memo from M. Homenuke, reduced by 8% to remove CRD share of capital cost.

Note: This value is the difference between the general energy market unit price (from Generic Assumptions sheet) and the above value, which reflects the maximum amount the utility would be willing to pay the CRD for the heat.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 17, 2009
Last Revision By: D. Shiskowski

Subject: Westshills WWTF
Option 3

Material Flows
and Carbon Footprint Analysis

Yellow-shaded cell denotes assumed/input values

Year	Equivalent Population	Wastewater ADWF	Sludge Production and Truck Transport		Saleable Effluent Heat[1]	Saleable Reclaimed Water (irrigation only)	Materials			GHG Sources			GHG Offsets	Total GHG Emissions
			Mass	Thickened Volume			Electricity	Diesel Fuel	Sludge Thickening Polymer	Electricity Purchased	Diesel Fuel Combusted	Sludge Thickening Polymer Used	Avoided Natural Gas/Elect Use via Effluent Heat	
	(pe)	(m3/d)	(dry t/yr)	(m3/yr)	(GJ/yr)	(m3/yr)	(kWh/yr)	(L/yr)	(kg/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)
2008														
2009														
2010														
2011														
2012														
2013														
2014														
2015	9,316	2,410	223	3,636	31,865	2,639	806,639	620	1,780	58	1.7	2.1	-1,210	-1,148
2016	10,841	2,717	259	4,232	37,357	2,975	909,260	721	2,072	65	2.0	2.5	-1,418	-1,348
2017	12,366	3,023	295	4,827	42,163	3,310	1,011,880	823	2,363	73	2.3	2.8	-1,601	-1,523
2018	13,891	3,330	332	5,422	46,968	3,646	1,114,501	924	2,655	80	2.5	3.2	-1,783	-1,697
2019	15,416	3,636	368	6,018	51,773	3,982	1,217,121	1,026	2,946	88	2.8	3.5	-1,966	-1,872
2020	16,941	3,943	405	6,613	56,579	4,318	1,319,742	1,127	3,238	95	3.1	3.9	-2,148	-2,046
2021	18,466	4,250	441	7,208	61,384	4,653	1,422,362	1,229	3,529	102	3.4	4.2	-2,331	-2,221
2022	19,991	4,556	478	7,803	66,190	4,989	1,524,983	1,330	3,821	110	3.7	4.6	-2,513	-2,395
2023	21,516	4,863	514	8,399	70,995	5,325	1,627,603	1,432	4,112	117	3.9	4.9	-2,695	-2,569
2024	23,041	5,169	550	8,994	75,800	5,660	1,730,224	1,533	4,403	125	4.2	5.3	-2,878	-2,744
2025	24,566	5,476	587	9,589	80,606	5,996	1,832,845	1,635	4,695	132	4.5	5.6	-3,060	-2,918
2026	26,091	5,783	623	10,185	85,411	6,332	1,935,465	1,736	4,986	139	4.8	6.0	-3,243	-3,093
2027	27,616	6,089	660	10,780	90,217	6,668	2,038,086	1,837	5,278	147	5.1	6.3	-3,425	-3,267
2028	29,141	6,396	696	11,375	95,022	7,003	2,140,706	1,939	5,569	154	5.3	6.7	-3,608	-3,442
2029	30,666	6,702	733	11,970	99,828	7,339	2,243,327	2,040	5,861	162	5.6	7.0	-3,790	-3,616
2030	32,191	7,009	769	12,566	104,633	7,675	2,345,947	2,142	6,152	169	5.9	7.4	-3,973	-3,790
2031	32,493	7,026	776	12,683	105,448	7,693	2,351,548	2,162	6,210	169	6.0	7.5	-4,004	-3,821
2032	32,795	7,042	783	12,801	106,264	7,712	2,357,149	2,182	6,268	170	6.0	7.5	-4,034	-3,851
2033	33,096	7,059	791	12,919	107,079	7,730	2,362,750	2,202	6,325	170	6.1	7.6	-4,065	-3,882
2034	33,398	7,076	798	13,037	107,895	7,748	2,368,350	2,222	6,383	171	6.1	7.7	-4,096	-3,912
2035	33,700	7,093	805	13,155	108,710	7,766	2,373,951	2,242	6,441	171	6.2	7.7	-4,127	-3,943
2036	34,002	7,109	812	13,273	109,526	7,785	2,379,552	2,262	6,498	171	6.2	7.8	-4,158	-3,973
2037	34,304	7,126	819	13,390	110,341	7,803	2,385,152	2,282	6,556	172	6.3	7.9	-4,189	-4,003
2038	34,605	7,143	827	13,508	111,157	7,821	2,390,753	2,303	6,614	172	6.3	7.9	-4,220	-4,034
2039	34,907	7,160	834	13,626	111,972	7,840	2,396,354	2,323	6,671	173	6.4	8.0	-4,251	-4,064
2040	35,209	7,176	841	13,744	112,788	7,858	2,401,955	2,343	6,729	173	6.5	8.1	-4,282	-4,095
2041	35,511	7,193	848	13,862	113,603	7,876	2,407,555	2,363	6,787	173	6.5	8.1	-4,313	-4,125
2042	35,813	7,210	856	13,979	114,419	7,895	2,413,156	2,383	6,844	174	6.6	8.2	-4,344	-4,156
2043	36,114	7,227	863	14,097	115,234	7,913	2,418,757	2,403	6,902	174	6.6	8.3	-4,375	-4,186
2044	36,416	7,243	870	14,215	116,049	7,931	2,424,358	2,423	6,960	175	6.7	8.4	-4,406	-4,216
2045	36,718	7,260	877	14,333	116,865	7,950	2,429,958	2,443	7,017	175	6.7	8.4	-4,437	-4,247
2046	37,097	7,288	886	14,481	117,894	7,981	2,439,481	2,468	7,090	176	6.8	8.5	-4,476	-4,285
2047	37,477	7,317	895	14,629	118,923	8,012	2,449,003	2,494	7,162	176	6.9	8.6	-4,515	-4,323
2048	37,856	7,345	904	14,777	119,953	8,043	2,458,525	2,519	7,235	177	6.9	8.7	-4,554	-4,362
2049	38,236	7,374	913	14,925	120,982	8,074	2,468,048	2,544	7,307	178	7.0	8.8	-4,593	-4,400
2050	38,615	7,402	922	15,073	122,011	8,105	2,477,570	2,569	7,380	178	7.1	8.9	-4,632	-4,438
2051	38,995	7,431	932	15,221	123,040	8,137	2,487,092	2,595	7,452	179	7.2	8.9	-4,671	-4,476
2052	39,374	7,459	941	15,370	124,070	8,168	2,496,615	2,620	7,525	180	7.2	9.0	-4,711	-4,515
2053	39,754	7,488	950	15,518	125,099	8,199	2,506,137	2,645	7,597	180	7.3	9.1	-4,750	-4,553
2054	40,133	7,516	959	15,666	126,128	8,230	2,515,660	2,670	7,670	181	7.4	9.2	-4,789	-4,591
2055	40,513	7,545	968	15,814	127,158	8,261	2,525,182	2,696	7,743	182	7.4	9.3	-4,828	-4,629
2056	40,892	7,573	977	15,962	128,187	8,292	2,534,704	2,721	7,815	182	7.5	9.4	-4,867	-4,667
2057	41,271	7,601	986	16,110	129,216	8,324	2,544,227	2,746	7,888	183	7.6	9.5	-4,906	-4,706
2058	41,651	7,630	995	16,258	130,245	8,355	2,553,749	2,771	7,960	184	7.6	9.6	-4,945	-4,744
2059	42,030	7,658	1,004	16,406	131,275	8,386	2,563,271	2,797	8,033	185	7.7	9.6	-4,984	-4,782
2060	42,410	7,687	1,013	16,555	132,304	8,417	2,572,794	2,822	8,105	185	7.8	9.7	-5,023	-4,820
2061	42,789	7,715	1,022	16,703	133,333	8,448	2,582,316	2,847	8,178	186	7.8	9.8	-5,062	-4,859
2062	43,169	7,744	1,031	16,851	134,362	8,479	2,591,838	2,872	8,250	187	7.9	9.9	-5,101	-4,897
2063	43,548	7,772	1,040	16,999	135,392	8,510	2,601,361	2,898	8,323	187	8.0	10.0	-5,140	-4,935
2064	43,928	7,801	1,049	17,147	136,421	8,542	2,610,883	2,923	8,395	188	8.1	10.1	-5,179	-4,973
2065	44,307	7,829	1,058	17,295	137,450	8,573	2,620,405	2,948	8,468	189	8.1	10.2	-5,219	-5,012
Totals =					5,317,584	365,368	111,680,850	110,795		8,041	305	382	-201,892	**-193,163**

WESTHILLS WWTF ASSUMPTIONS

Electricity:

"base" unit power requirement =	0.700	kW-hr/d per m3/d of ADWF treated wastewater	**Ref:** Based on Jan 15/09 TM from T. Dokken.
wastewater strength adjustment =	0.100	x "base" unit power requirement	**Note:** To account for reduce flow rate but same load.
influent pumping power adjustment =	0.070	x "base" unit power requirement	**Ref:** Reduced relative to Options 1/2.
UV disinfection power adjustment =	0.050	x "base" unit power requirement	**Note:** Required - effluent to sensitive marine environment but only for one-half of year.
effluent pumping power adjustment =	0.04	x "base" unit power requirement	**Ref:** Reduced relative to Options 1/2.
raw sludge thickening adjustment =	0.05	x "base" unit power requirement	**Ref:** Based on Table 1.4. WEF.
total unit power requirement =	0.917	kW-hr/d per m3/d of ADWF treated wastewater	

Raw Sludge Thickening and Truck Transport:

thickening required (1 = yes, 0 = no)?	1		
chemical-P removal chemical sludge production allowance =	10%	of combined PS + WBS	**Note:** Only doing chem-P removal for half the year.
round-trip transport distance to solids processing facility =	6	km	**Note:** To/from Royal Roads Organics Facility.

Saleable Reclaimed Water:

mean fraction of annual ADWF volume sold for landscape irrigation =	0.30%	/yr	**Note:** See dnt_eff_irr_ds.xls for assumptions and details. Reclaimed water used for toilet flushing handled separately in analysis. See IRS LCA worksheet.

Notes:
1. Data from M. Homenuke in Feb 4/09 e-mail, DES_SaleableHeatEnergy.xls, Saleable.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 18, 2009
Last Revision By: D. Shiskowski

Subject: Westhills WWTF
Option 3

Life Cycle Analysis

Yellow-shaded cell denotes assumed/input values

Year	Capital Costs		Operation & Maintenance Costs												GHG CO2e		Heat Revenues		Reclaimed Water Revenues (irrigation only)		Total	
			Labour		Electricity		Diesel Fuel		Chemicals		Maintenance		Administration									
	Total Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Rev	Net Present Value	Total Annual Rev	Net Present Value	Total Annual Cost	Net Present Value
2008																						
2009																						
2010																						
2011																						
2012																						
2013																						
2014	$73,220,160	$57,866,956																			$73,220,160	$57,866,956
2015	$0		$300,000	$227,975	$56,465	$42,909	$930	$707	$54,558	$41,460	$732,202	$556,413	$100,000	$75,992	-$17,218	-$13,084	-$77,686	-$59,035	-$1,900	-$1,444	$1,147,350	$871,892
2016	$0		$300,000	$219,207	$63,648	$46,507	$1,082	$791	$62,149	$45,411	$732,202	$535,013	$100,000	$73,069	-$20,226	-$14,779	-$91,077	-$66,549	-$2,142	-$1,565	$1,145,636	$837,105
2017	$0		$300,000	$210,776	$70,832	$49,765	$1,234	$867	$69,739	$48,998	$732,202	$514,435	$100,000	$70,259	-$22,842	-$16,049	-$102,793	-$72,221	-$2,383	-$1,675	$1,145,988	$805,156
2018	$0		$300,000	$202,669	$78,015	$52,704	$1,386	$937	$77,329	$52,241	$732,202	$494,649	$100,000	$67,556	-$25,459	-$17,199	-$114,508	-$77,358	-$2,625	-$1,774	$1,146,340	$774,427
2019	$0		$300,000	$194,874	$85,198	$55,343	$1,539	$999	$84,920	$55,162	$732,202	$475,624	$100,000	$64,958	-$28,075	-$18,237	-$126,224	-$81,993	-$2,867	-$1,862	$1,146,693	$744,870
2020	$0		$300,000	$187,379	$92,382	$57,701	$1,691	$1,056	$92,510	$57,782	$732,202	$457,331	$100,000	$62,460	-$30,692	-$19,170	-$137,939	-$86,156	-$3,109	-$1,942	$1,147,045	$716,441
2021	$0		$300,000	$180,172	$99,565	$59,796	$1,843	$1,107	$100,101	$60,118	$732,202	$439,741	$100,000	$60,057	-$33,308	-$20,004	-$149,655	-$89,879	-$3,350	-$2,012	$1,147,397	$689,097
2022	$0		$300,000	$173,243	$106,749	$61,645	$1,995	$1,152	$107,691	$62,189	$732,202	$422,828	$100,000	$57,748	-$35,924	-$20,745	-$161,370	-$93,187	-$3,592	-$2,074	$1,147,750	$662,797
2023	$0		$300,000	$166,579	$113,932	$63,263	$2,147	$1,192	$115,281	$64,012	$732,202	$406,566	$100,000	$55,526	-$38,541	-$21,400	-$173,086	-$96,109	-$3,834	-$2,129	$1,148,102	$637,500
2024	$0		$300,000	$160,172	$121,116	$64,665	$2,300	$1,228	$122,872	$65,602	$732,202	$390,928	$100,000	$53,391	-$41,157	-$21,974	-$184,802	-$98,667	-$4,076	-$2,176	$1,148,454	$613,169
2025	$0		$300,000	$154,012	$128,299	$65,865	$2,452	$1,259	$130,462	$66,976	$732,202	$375,893	$100,000	$51,337	-$43,774	-$22,472	-$196,517	-$100,887	-$4,317	-$2,216	$1,148,806	$589,766
2026	$0		$300,000	$148,088	$135,483	$66,878	$2,604	$1,285	$138,052	$68,146	$732,202	$361,435	$100,000	$49,363	-$46,390	-$22,899	-$208,233	-$102,790	-$4,559	-$2,250	$1,149,159	$567,257
2027	$0		$300,000	$142,393	$142,666	$67,715	$2,756	$1,308	$145,643	$69,128	$732,202	$347,534	$100,000	$47,464	-$49,006	-$23,261	-$219,948	-$104,397	-$4,801	-$2,279	$1,149,511	$545,607
2028	$0		$300,000	$136,916	$149,849	$68,389	$2,908	$1,327	$153,233	$69,934	$732,202	$334,167	$100,000	$45,639	-$51,623	-$23,560	-$231,664	-$105,728	-$5,042	-$2,301	$1,149,863	$524,783
2029	$0		$300,000	$131,650	$157,033	$68,911	$3,061	$1,343	$160,823	$70,575	$732,202	$321,315	$100,000	$43,883	-$54,239	-$23,802	-$243,380	-$106,803	-$5,284	-$2,319	$1,150,215	$504,753
2030	$3,814,200	$1,609,422	$300,000	$126,587	$164,216	$69,292	$3,213	$1,356	$168,414	$71,063	$770,344	$325,051	$100,000	$42,196	-$56,856	-$23,991	-$255,095	-$107,639	-$5,526	-$2,332	$5,002,910	$2,111,005
2031	$0		$300,000	$121,718	$164,608	$66,786	$3,243	$1,316	$169,246	$68,667	$770,344	$312,549	$100,000	$40,573	-$57,312	-$23,253	-$257,083	-$104,305	-$5,539	-$2,247	$1,187,506	$481,802
2032	$0		$300,000	$117,036	$165,000	$64,370	$3,273	$1,277	$170,078	$66,351	$770,344	$300,528	$100,000	$39,012	-$57,769	-$22,537	-$259,071	-$101,069	-$5,552	-$2,166	$1,186,302	$462,802
2033	$0		$300,000	$112,535	$165,392	$62,041	$3,303	$1,239	$170,910	$64,111	$770,344	$288,969	$100,000	$37,512	-$58,225	-$21,841	-$261,059	-$97,928	-$5,565	-$2,088	$1,185,099	$444,550
2034	$0		$300,000	$108,207	$165,785	$59,797	$3,333	$1,202	$171,742	$61,945	$770,344	$277,855	$100,000	$36,069	-$58,682	-$21,166	-$263,048	-$94,878	-$5,579	-$2,012	$1,183,895	$427,018
2035	$0		$300,000	$104,045	$166,177	$57,633	$3,363	$1,166	$172,574	$59,851	$770,344	$267,168	$100,000	$34,682	-$59,138	-$20,510	-$265,036	-$91,919	-$5,592	-$1,939	$1,182,691	$410,177
2036	$0		$300,000	$100,043	$166,569	$55,547	$3,394	$1,132	$173,406	$57,827	$770,344	$256,892	$100,000	$33,348	-$59,595	-$19,873	-$267,024	-$89,046	-$5,605	-$1,869	$1,181,488	$394,000
2037	$0		$300,000	$96,195	$166,961	$53,536	$3,424	$1,098	$174,238	$55,870	$770,344	$247,012	$100,000	$32,065	-$60,051	-$19,256	-$269,012	-$86,259	-$5,618	-$1,801	$1,180,284	$378,460
2038	$0		$300,000	$92,496	$167,353	$51,598	$3,454	$1,065	$175,070	$53,977	$770,344	$237,511	$100,000	$30,832	-$60,508	-$18,656	-$271,000	-$83,554	-$5,631	-$1,736	$1,179,081	$363,533
2039	$0		$300,000	$88,938	$167,745	$49,730	$3,484	$1,033	$175,902	$52,148	$770,344	$228,376	$100,000	$29,646	-$60,964	-$18,073	-$272,988	-$80,930	-$5,645	-$1,673	$1,177,877	$349,194
2040	$0		$300,000	$85,517	$168,137	$47,929	$3,514	$1,002	$176,733	$50,379	$770,344	$219,593	$100,000	$28,506	-$61,421	-$17,508	-$274,976	-$78,384	-$5,658	-$1,613	$1,176,673	$335,420
2041	$0		$300,000	$82,228	$168,529	$46,193	$3,544	$971	$177,565	$48,670	$770,344	$211,147	$100,000	$27,409	-$61,877	-$16,960	-$276,964	-$75,914	-$5,671	-$1,554	$1,175,470	$322,189
2042	$0		$300,000	$79,066	$168,921	$44,519	$3,574	$942	$178,397	$47,017	$770,344	$203,026	$100,000	$26,355	-$62,334	-$16,428	-$278,952	-$73,518	-$5,684	-$1,498	$1,174,266	$309,480
2043	$0		$300,000	$76,025	$169,313	$42,907	$3,604	$913	$179,229	$45,420	$770,344	$195,217	$100,000	$25,342	-$62,790	-$15,912	-$280,941	-$71,195	-$5,697	-$1,444	$1,173,062	$297,272
2044	$0		$300,000	$73,101	$169,705	$41,352	$3,635	$886	$180,061	$43,875	$770,344	$187,709	$100,000	$24,367	-$63,247	-$15,411	-$282,929	-$68,941	-$5,711	-$1,391	$1,171,859	$285,545
2045	$0		$300,000	$70,289	$170,097	$39,853	$3,665	$859	$180,893	$42,383	$770,344	$180,489	$100,000	$23,430	-$63,703	-$14,925	-$284,917	-$66,755	-$5,724	-$1,341	$1,170,655	$274,281
2046	$0		$300,000	$67,586	$170,764	$38,471	$3,702	$834	$182,052	$41,014	$770,344	$173,547	$100,000	$22,529	-$64,277	-$14,481	-$287,426	-$64,753	-$5,746	-$1,295	$1,169,413	$263,452
2047	$0		$300,000	$64,986	$171,430	$37,135	$3,740	$810	$183,211	$39,687	$770,344	$166,872	$100,000	$21,662	-$64,850	-$14,048	-$289,935	-$62,806	-$5,769	-$1,250	$1,168,171	$253,050
2048	$0		$300,000	$62,487	$172,097	$35,846	$3,778	$787	$184,371	$38,402	$770,344	$160,454	$100,000	$20,829	-$65,424	-$13,627	-$292,445	-$60,913	-$5,791	-$1,206	$1,166,930	$243,059
2049	$0		$300,000	$60,083	$172,763	$34,601	$3,816	$764	$185,530	$37,157	$770,344	$154,283	$100,000	$20,028	-$65,997	-$13,218	-$294,954	-$59,073	-$5,814	-$1,164	$1,165,688	$233,462
2050	$0		$300,000	$57,772	$173,430	$33,398	$3,854	$742	$186,689	$35,952	$770,344	$148,349	$100,000	$19,257	-$66,571	-$12,820	-$297,463	-$57,284	-$5,836	-$1,124	$1,164,446	$224,243
2051	$0		$300,000	$55,550	$174,096	$32,237	$3,892	$721	$187,848	$34,783	$770,344	$142,643	$100,000	$18,517	-$67,144	-$12,433	-$299,973	-$55,545	-$5,858	-$1,085	$1,163,204	$215,388
2052	$0		$300,000	$53,414	$174,763	$31,116	$3,930	$700	$189,007	$33,652	$770,344	$137,157	$100,000	$17,805	-$67,718	-$12,057	-$302,482	-$53,856	-$5,881	-$1,047	$1,161,963	$206,883
2053	$0		$300,000	$51,360	$175,430	$30,033	$3,968	$679	$190,166	$32,556	$770,344	$131,882	$100,000	$17,120	-$68,291	-$11,691	-$304,991	-$52,214	-$5,903	-$1,011	$1,160,721	$198,714
2054	$0		$300,000	$49,384	$176,096	$28,988	$4,005	$659	$191,325	$31,495	$770,344	$126,809	$100,000	$16,461	-$68,865	-$11,336	-$307,501	-$50,619	-$5,926	-$975	$1,159,479	$190,866
2055	$0		$300,000	$47,485	$176,763	$27,978	$4,043	$640	$192,484	$30,467	$770,344	$121,932	$100,000	$15,828	-$69,438	-$10,991	-$310,010	-$49,069	-$5,948	-$941	$1,158,237	$183,329
2056	$0		$300,000	$45,658	$177,429	$27,004	$4,081	$621	$193,643	$29,471	$770,344	$117,242	$100,000	$15,219	-$70,012	-$10,655	-$312,519	-$47,564	-$5,971	-$909	$1,156,995	$176,089
2057	$0		$300,000	$43,902	$178,096	$26,063	$4,119	$603	$194,802	$28,508	$770,344	$112,733	$100,000	$14,634	-$70,586	-$10,330	-$315,029	-$46,102	-$5,993	-$877	$1,155,754	$169,134
2058	$0		$300,000	$42,214	$178,762	$25,154	$4,157	$585	$195,961	$27,574	$770,344	$108,397	$100,000	$14,071	-$71,159	-$10,013	-$317,538	-$44,682	-$6,015	-$846	$1,154,512	$162,454
2059	$0		$300,000	$40,590	$179,429	$24,277	$4,195	$568	$197,120	$26,670	$770,344	$104,228	$100,000	$13,530	-$71,733	-$9,705	-$320,047	-$43,303	-$6,038	-$817	$1,153,270	$156,038
2060	$0		$300,000	$39,029	$180,096	$23,430	$4,233	$551	$198,279	$25,795	$770,344	$100,219	$100,000	$13,010	-$72,306	-$9,407	-$322,557	-$41,964	-$6,060	-$788	$1,152,028	$149,875
2061	$0		$300,000	$37,528	$180,762	$22,612	$4,271	$534	$199,438	$24,948	$770,344	$96,365	$100,000	$12,509	-$72,880	-$9,117	-$325,066	-$40,663	-$6,083	-$761	$1,150,786	$143,955
2062	$0		$300,000	$36,085	$181,429	$21,823	$4,308	$518	$200,597	$24,128	$770,344	$92,658	$100,000	$12,028	-$73,453	-$8,835	-$327,575	-$39,401	-$6,105	-$734	$1,149,545	$138,269
2063	$0		$300,000	$34,697	$182,095	$21,060	$4,346	$503	$201,757	$23,334	$770,344	$89,094	$100,000	$11,566	-$74,027	-$8,562	-$330,085	-$38,176	-$6,128	-$709	$1,148,303	$132,808
2064	$0		$300,000	$33,362	$182,762	$20,324	$4,384	$488	$202,916	$22,566	$770,344	$85,668	$100,000	$11,121	-$74,600	-$8,296	-$332,594	-$36,987	-$6,150	-$684	$1,147,061	$127,561
2065	$0		$300,000	$32,079	$183,428	$19,614	$4,422	$473	$204,075	$21,822	$770,344	$82,373	$100,000	$10,693	-$75,174	-$8,038	-$335,103	-$35,833	-$6,172	-$660	$1,145,819	$122,522
Total Capital =	$77,034,360																					
Total Net Present Value =		$59,476,378		$5,125,384		$2,306,304		$46,794		$2,397,270		$12,825,867		$1,708,461		-$824,597		-$3,694,799		-$77,607		**$79,289,455**

WESTHILLS WWTF ASSUMPTIONS

Labour:

number of facility manager(s) =	1	**Ref:** Based on Jan 15/09 TM from T. Dokken.
number of operations staff =	2	
number of maintenance staff =	1	
number of administration staff =	0	
total staff =	4 persons	

Chemical Phosphorus Removal Chemicals:

chemical-P removal required (1 = yes, 0 = no)?	0.50	**Note:** Assumed for only one-half of year.

Wet-Weather CEPT Chemicals:

fraction of total annual ADWF treated =	0.0%	**Note:** No secondary treatment bypass.

Saleable Heat Energy:

unit energy cost to third-party "heat recovery" utility =	$ 11.56 /GJ	**Ref:** This is the cost that a third-party heat recovery utility would incur to make the heat available to customers. Value is from Table 6 of Feb 10/09 memo from M. Homenuke, reduced by 4% to remove CRD share of capital cost.
unit CRD saleable energy price to third-party utility =	$ 2.44 /GJ	**Note:** This value is the difference between the general energy market unit price (from Generic Assumptions sheet) and the above value, which reflects the maximum amount the utility would be willing to pay the CRD for the heat.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 18, 2009
Last Revision By: D. Shiskowski

Subject: Florence Lake WWTF
Option 3

Material Flows
and Carbon Footprint Analysis

Yellow-shaded cell denotes assumed/input values

Year	Equivalent Population	Wastewater ADWF	Sludge Production and Truck Transport		Saleable Effluent Heat[1]	Saleable Reclaimed Water (irrigation only)	Materials			GHG Sources			GHG Offsets	Total GHG Emissions
			Mass	Thickened Volume			Electricity	Diesel Fuel	Sludge Thickening Polymer	Electricity Purchased	Diesel Fuel Combusted	Sludge Thickening Polymer Used	Avoided Natural Gas/Elect Use via Effluent Heat2	
	(pe)	(m3/d)	(dry t/yr)	(m3/yr)	(GJ/yr)	(m3/yr)	(kWh/yr)	(L/yr)	(kg/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)
2008														
2009														
2010														
2011														
2012														
2013														
2014														
2015	5,740	1,430	137	2,241	19,308	1,566	478,628	509	1,097	34	1.4	1.3	0	37
2016	6,076	1,493	145	2,372	20,383	1,635	499,692	539	1,161	36	1.5	1.4	0	39
2017	6,412	1,556	153	2,503	21,458	1,704	520,756	569	1,225	37	1.6	1.5	0	41
2018	6,748	1,619	161	2,634	22,533	1,773	541,820	599	1,290	39	1.7	1.5	0	42
2019	7,084	1,682	169	2,765	23,608	1,841	562,885	628	1,354	41	1.7	1.6	0	44
2020	7,420	1,745	177	2,896	24,683	1,910	583,949	658	1,418	42	1.8	1.7	0	46
2021	7,756	1,808	185	3,027	25,758	1,979	605,013	688	1,482	44	1.9	1.8	0	47
2022	8,092	1,871	193	3,159	26,833	2,048	626,077	718	1,546	45	2.0	1.9	0	49
2023	8,427	1,933	201	3,290	27,908	2,117	647,141	748	1,611	47	2.1	1.9	0	51
2024	8,763	1,996	209	3,421	28,983	2,186	668,205	777	1,675	48	2.1	2.0	0	52
2025	9,099	2,059	217	3,552	30,058	2,255	689,269	807	1,739	50	2.2	2.1	0	54
2026	9,435	2,122	225	3,683	31,133	2,324	710,333	837	1,803	51	2.3	2.2	0	56
2027	9,771	2,185	233	3,814	32,208	2,393	731,397	867	1,867	53	2.4	2.2	0	57
2028	10,107	2,248	241	3,945	33,283	2,462	752,461	897	1,932	54	2.5	2.3	0	59
2029	10,443	2,311	249	4,076	34,358	2,531	773,526	926	1,996	56	2.6	2.4	0	61
2030	10,779	2,374	258	4,208	35,433	2,600	794,590	956	2,060	57	2.6	2.5	0	62
2031	11,106	2,420	265	4,335	36,355	2,650	809,897	985	2,122	58	2.7	2.5	0	64
2032	11,433	2,465	273	4,463	37,276	2,700	825,204	1,014	2,185	59	2.8	2.6	0	65
2033	11,760	2,511	281	4,590	38,198	2,750	840,511	1,043	2,247	61	2.9	2.7	0	66
2034	12,086	2,557	289	4,718	39,120	2,800	855,818	1,072	2,310	62	3.0	2.8	0	67
2035	12,413	2,603	297	4,846	40,041	2,850	871,126	1,101	2,372	63	3.0	2.8	0	69
2036	12,740	2,648	304	4,973	40,963	2,900	886,433	1,130	2,435	64	3.1	2.9	0	70
2037	13,067	2,694	312	5,101	41,884	2,950	901,740	1,159	2,497	65	3.2	3.0	0	71
2038	13,394	2,740	320	5,228	42,806	3,000	917,047	1,188	2,560	66	3.3	3.1	0	72
2039	13,721	2,786	328	5,356	43,728	3,050	932,354	1,217	2,622	67	3.4	3.1	0	74
2040	14,048	2,831	336	5,483	44,649	3,100	947,661	1,246	2,685	68	3.4	3.2	0	75
2041	14,375	2,877	343	5,611	45,571	3,150	962,969	1,275	2,747	69	3.5	3.3	0	76
2042	14,701	2,923	351	5,739	46,492	3,200	978,276	1,304	2,810	70	3.6	3.4	0	77
2043	15,028	2,969	359	5,866	47,414	3,251	993,583	1,333	2,872	72	3.7	3.4	0	79
2044	15,355	3,014	367	5,994	48,336	3,301	1,008,890	1,362	2,935	73	3.8	3.5	0	80
2045	15,682	3,060	375	6,121	49,257	3,351	1,024,197	1,391	2,997	74	3.8	3.6	0	81
2046	16,091	3,110	384	6,281	50,364	3,406	1,041,033	1,428	3,075	75	3.9	3.7	0	83
2047	16,501	3,161	394	6,441	51,470	3,461	1,057,869	1,464	3,154	76	4.0	3.8	0	84
2048	16,910	3,211	404	6,601	52,577	3,516	1,074,704	1,500	3,232	77	4.1	3.9	0	85
2049	17,320	3,261	414	6,761	53,683	3,571	1,091,540	1,537	3,310	79	4.2	4.0	0	87
2050	17,729	3,312	424	6,921	54,790	3,626	1,108,376	1,573	3,388	80	4.3	4.1	0	88
2051	18,139	3,362	433	7,080	55,896	3,681	1,125,211	1,609	3,467	81	4.4	4.2	0	90
2052	18,548	3,412	443	7,240	57,003	3,736	1,142,047	1,646	3,545	82	4.5	4.3	0	91
2053	18,958	3,462	453	7,400	58,109	3,791	1,158,883	1,682	3,623	83	4.6	4.3	0	92
2054	19,367	3,513	463	7,560	59,216	3,846	1,175,718	1,718	3,701	85	4.7	4.4	0	94
2055	19,777	3,563	472	7,720	60,322	3,901	1,192,554	1,754	3,780	86	4.8	4.5	0	95
2056	20,186	3,613	482	7,880	61,429	3,957	1,209,390	1,791	3,858	87	4.9	4.6	0	97
2057	20,595	3,664	492	8,039	62,535	4,012	1,226,225	1,827	3,936	88	5.0	4.7	0	98
2058	21,005	3,714	502	8,199	63,642	4,067	1,243,061	1,863	4,014	90	5.1	4.8	0	99
2059	21,414	3,764	512	8,359	64,748	4,122	1,259,897	1,900	4,093	91	5.2	4.9	0	101
2060	21,824	3,815	521	8,519	65,855	4,177	1,276,732	1,936	4,171	92	5.3	5.0	0	102
2061	22,233	3,865	531	8,679	66,961	4,232	1,293,568	1,972	4,249	93	5.4	5.1	0	104
2062	22,643	3,915	541	8,838	68,068	4,287	1,310,404	2,009	4,327	94	5.5	5.2	0	105
2063	23,052	3,965	551	8,998	69,174	4,342	1,327,239	2,045	4,406	96	5.6	5.3	0	106
2064	23,462	4,016	560	9,158	70,281	4,397	1,344,075	2,081	4,484	97	5.7	5.4	0	108
2065	23,871	4,066	570	9,318	71,387	4,452	1,360,911	2,118	4,562	98	5.8	5.5	0	109
Totals =					2,297,526	156,906	47,960,884	65,000		3,453	179	168	0	**3,800**

FLORENCE LAKE WWTF ASSUMPTIONS

Electricity:

"base" unit power requirement =	0.700	kW-hr/d per m3/d of ADWF treated wastewater	**Ref:** Based on Jan 15/09 TM from T. Dokken.
wastewater strength adjustment =	0.100	x "base" unit power requirement	**Note:** To account for reduce flow rate but same load.
influent pumping power adjustment =	0.070	x "base" unit power requirement	**Ref:** Reduced relative to Options 1/2.
UV disinfection power adjustment =	0.050	x "base" unit power requirement	**Note:** Required - effluent to sensitive marine environment, but only for one-half of year.
effluent pumping power adjustment =	0.04	x "base" unit power requirement	**Ref:** Reduced relative to Options 1/2.
raw sludge thickening adjustment =	0.05	x "base" unit power requirement	**Ref:** Based on Table 1.4. WEF.
total unit power requirement =	0.917	kW-hr/d per m3/d of ADWF treated wastewater	

Raw Sludge Thickening and Truck Transport:

thickening required (1 = yes, 0 = no)?	1		
chemical-P removal chemical sludge production allowance =	10%	of combined PS + WBS	**Note:** Only doing chem-P removal for half the year.
round-trip transport distance to solids processing facility =	8	km	**Note:** To/from Royal Roads Organics Facility.

Saleable Reclaimed Water:

mean fraction of annual ADWF volume sold for landscape irrigation =	0.30%	/yr	**Note:** See dnt_eff_irr_ds.xls for assumptions and details. Reclaimed water used for toilet flushing handled separately in analysis. See IRS LCA worksheet.

Notes:
1. Data from M. Homenuke in Feb 4/09 e-mail, DES_SaleableHeatEnergy.xls, Saleable.
2. Set to zero since heat would not be sold - see LCA sheet.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 18, 2009
Last Revision By: D. Shiskowski

Subject: Florence Lake WWTF
Option 3

Life Cycle Analysis

Yellow-shaded cell denotes assumed/input values

Year	Capital Costs		Operation & Maintenance Costs												GHG CO2e		Heat Revenues		Reclaimed Water Revenues (irrigation only)		Total	
			Labour		Electricity		Diesel Fuel		Chemicals		Maintenance		Administration									
	Total Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Rev	Net Present Value	Total Annual Rev	Net Present Value	Total Annual Cost	Net Present Value
2008																						
2009																						
2010																						
2011																						
2012																						
2013																						
2014	$36,645,900	$28,961,787																			$36,645,900	$28,961,787
2015	$0		$225,000	$170,982	$33,504	$25,460	$764	$580	$32,778	$24,909	$366,459	$278,479	$100,000	$75,992	$558	$424	$0	$0	-$1,127	-$857	$757,936	$575,969
2016	$0		$225,000	$164,405	$34,978	$25,558	$809	$591	$34,380	$25,121	$366,459	$267,768	$100,000	$73,069	$583	$426	$0	$0	-$1,177	-$860	$761,032	$556,079
2017	$0		$225,000	$158,082	$36,453	$25,611	$853	$599	$35,982	$25,281	$366,459	$257,469	$100,000	$70,259	$608	$427	$0	$0	-$1,227	-$862	$764,129	$536,867
2018	$0		$225,000	$152,002	$37,927	$25,622	$898	$607	$37,584	$25,390	$366,459	$247,567	$100,000	$67,556	$633	$428	$0	$0	-$1,276	-$862	$767,225	$518,310
2019	$0		$225,000	$146,156	$39,402	$25,595	$943	$612	$39,186	$25,454	$366,459	$238,045	$100,000	$64,958	$658	$428	$0	$0	-$1,326	-$861	$770,322	$500,386
2020	$0		$225,000	$140,534	$40,876	$25,531	$987	$617	$40,787	$25,476	$366,459	$228,889	$100,000	$62,460	$683	$427	$0	$0	-$1,375	-$859	$773,418	$483,075
2021	$0		$225,000	$135,129	$42,351	$25,435	$1,032	$620	$42,389	$25,458	$366,459	$220,086	$100,000	$60,057	$709	$426	$0	$0	-$1,425	-$856	$776,515	$466,355
2022	$0		$225,000	$129,932	$43,825	$25,308	$1,077	$622	$43,991	$25,404	$366,459	$211,621	$100,000	$57,748	$734	$424	$0	$0	-$1,475	-$852	$779,611	$450,206
2023	$0		$225,000	$124,935	$45,300	$25,153	$1,121	$623	$45,593	$25,316	$366,459	$203,482	$100,000	$55,526	$759	$421	$0	$0	-$1,524	-$846	$782,708	$434,610
2024	$0		$225,000	$120,129	$46,774	$24,973	$1,166	$623	$47,195	$25,198	$366,459	$195,655	$100,000	$53,391	$784	$419	$0	$0	-$1,574	-$840	$785,804	$419,547
2025	$0		$225,000	$115,509	$48,249	$24,770	$1,211	$622	$48,796	$25,051	$366,459	$188,130	$100,000	$51,337	$809	$415	$0	$0	-$1,624	-$834	$788,901	$405,000
2026	$0		$225,000	$111,066	$49,723	$24,545	$1,256	$620	$50,398	$24,878	$366,459	$180,894	$100,000	$49,363	$834	$412	$0	$0	-$1,673	-$826	$791,997	$390,952
2027	$0		$225,000	$106,795	$51,198	$24,301	$1,300	$617	$52,000	$24,681	$366,459	$173,937	$100,000	$47,464	$859	$408	$0	$0	-$1,723	-$818	$795,094	$377,385
2028	$0		$225,000	$102,687	$52,672	$24,039	$1,345	$614	$53,602	$24,463	$366,459	$167,247	$100,000	$45,639	$885	$404	$0	$0	-$1,772	-$809	$798,190	$364,284
2029	$0		$225,000	$98,738	$54,147	$23,761	$1,390	$610	$55,204	$24,225	$366,459	$160,815	$100,000	$43,883	$910	$399	$0	$0	-$1,822	-$800	$801,287	$351,632
2030	$8,087,040	$3,412,370	$225,000	$94,940	$55,621	$23,470	$1,434	$605	$56,805	$23,969	$447,329	$188,753	$100,000	$42,196	$935	$394	$0	$0	-$1,872	-$790	$8,972,294	$3,785,908
2031	$0		$225,000	$91,288	$56,693	$23,002	$1,478	$600	$58,128	$23,584	$447,329	$181,493	$100,000	$40,573	$954	$387	$0	$0	-$1,908	-$774	$887,673	$360,153
2032	$0		$225,000	$87,777	$57,764	$22,535	$1,521	$594	$59,450	$23,193	$447,329	$174,513	$100,000	$39,012	$972	$379	$0	$0	-$1,944	-$758	$890,093	$347,245
2033	$0		$225,000	$84,401	$58,836	$22,070	$1,565	$587	$60,772	$22,797	$447,329	$167,801	$100,000	$37,512	$991	$372	$0	$0	-$1,980	-$743	$892,513	$334,797
2034	$0		$225,000	$81,155	$59,907	$21,608	$1,608	$580	$62,094	$22,397	$447,329	$161,347	$100,000	$36,069	$1,010	$364	$0	$0	-$2,016	-$727	$894,933	$322,793
2035	$0		$225,000	$78,034	$60,979	$21,148	$1,652	$573	$63,416	$21,994	$447,329	$155,141	$100,000	$34,682	$1,029	$357	$0	$0	-$2,052	-$712	$897,353	$311,217
2036	$0		$225,000	$75,032	$62,050	$20,692	$1,695	$565	$64,738	$21,589	$447,329	$149,174	$100,000	$33,348	$1,048	$349	$0	$0	-$2,088	-$696	$899,773	$300,054
2037	$0		$225,000	$72,147	$63,122	$20,240	$1,739	$558	$66,060	$21,182	$447,329	$143,437	$100,000	$32,065	$1,067	$342	$0	$0	-$2,124	-$681	$902,193	$289,290
2038	$0		$225,000	$69,372	$64,193	$19,792	$1,782	$550	$67,383	$20,775	$447,329	$137,920	$100,000	$30,832	$1,086	$335	$0	$0	-$2,160	-$666	$904,613	$278,909
2039	$0		$225,000	$66,704	$65,265	$19,348	$1,826	$541	$68,705	$20,368	$447,329	$132,615	$100,000	$29,646	$1,104	$327	$0	$0	-$2,196	-$651	$907,033	$268,899
2040	$0		$225,000	$64,138	$66,336	$18,910	$1,869	$533	$70,027	$19,962	$447,329	$127,515	$100,000	$28,506	$1,123	$320	$0	$0	-$2,232	-$636	$909,453	$259,247
2041	$0		$225,000	$61,671	$67,408	$18,476	$1,913	$524	$71,349	$19,556	$447,329	$122,610	$100,000	$27,409	$1,142	$313	$0	$0	-$2,268	-$622	$911,873	$249,939
2042	$0		$225,000	$59,299	$68,479	$18,048	$1,956	$516	$72,671	$19,153	$447,329	$117,895	$100,000	$26,355	$1,161	$306	$0	$0	-$2,304	-$607	$914,293	$240,964
2043	$0		$225,000	$57,018	$69,551	$17,625	$2,000	$507	$73,993	$18,751	$447,329	$113,360	$100,000	$25,342	$1,180	$299	$0	$0	-$2,340	-$593	$916,713	$232,309
2044	$0		$225,000	$54,825	$70,622	$17,208	$2,043	$498	$75,316	$18,352	$447,329	$109,000	$100,000	$24,367	$1,199	$292	$0	$0	-$2,376	-$579	$919,133	$223,964
2045	$898,560	$210,530	$225,000	$52,717	$71,694	$16,798	$2,087	$489	$76,638	$17,956	$456,315	$106,913	$100,000	$23,430	$1,218	$285	$0	$0	-$2,413	-$565	$1,829,098	$428,552
2046	$0		$225,000	$50,689	$72,872	$16,417	$2,141	$482	$78,187	$17,614	$456,315	$102,801	$100,000	$22,529	$1,239	$279	$0	$0	-$2,452	-$552	$933,302	$210,259
2047	$0		$225,000	$48,740	$74,051	$16,041	$2,196	$476	$79,737	$17,273	$456,315	$98,847	$100,000	$21,662	$1,260	$273	$0	$0	-$2,492	-$540	$936,067	$202,771
2048	$0		$225,000	$46,865	$75,229	$15,669	$2,250	$469	$81,287	$16,931	$456,315	$95,045	$100,000	$20,829	$1,281	$267	$0	$0	-$2,531	-$527	$938,831	$195,548
2049	$0		$225,000	$45,063	$76,408	$15,303	$2,305	$462	$82,836	$16,590	$456,315	$91,390	$100,000	$20,028	$1,302	$261	$0	$0	-$2,571	-$515	$941,595	$188,581
2050	$0		$225,000	$43,329	$77,586	$14,941	$2,359	$454	$84,386	$16,251	$456,315	$87,875	$100,000	$19,257	$1,323	$255	$0	$0	-$2,611	-$503	$944,359	$181,860
2051	$0		$225,000	$41,663	$78,765	$14,585	$2,414	$447	$85,935	$15,913	$456,315	$84,495	$100,000	$18,517	$1,344	$249	$0	$0	-$2,650	-$491	$947,123	$175,377
2052	$0		$225,000	$40,060	$79,943	$14,234	$2,468	$439	$87,485	$15,576	$456,315	$81,245	$100,000	$17,805	$1,365	$243	$0	$0	-$2,690	-$479	$949,887	$169,124
2053	$0		$225,000	$38,520	$81,122	$13,888	$2,523	$432	$89,035	$15,243	$456,315	$78,120	$100,000	$17,120	$1,386	$237	$0	$0	-$2,730	-$467	$952,651	$163,092
2054	$0		$225,000	$37,038	$82,300	$13,548	$2,577	$424	$90,584	$14,911	$456,315	$75,116	$100,000	$16,461	$1,407	$232	$0	$0	-$2,769	-$456	$955,415	$157,275
2055	$0		$225,000	$35,614	$83,479	$13,213	$2,632	$417	$92,134	$14,583	$456,315	$72,227	$100,000	$15,828	$1,429	$226	$0	$0	-$2,809	-$445	$958,179	$151,663
2056	$0		$225,000	$34,244	$84,657	$12,884	$2,686	$409	$93,684	$14,258	$456,315	$69,449	$100,000	$15,219	$1,450	$221	$0	$0	-$2,849	-$434	$960,943	$146,250
2057	$0		$225,000	$32,927	$85,836	$12,561	$2,741	$401	$95,233	$13,937	$456,315	$66,778	$100,000	$14,634	$1,471	$215	$0	$0	-$2,888	-$423	$963,707	$141,030
2058	$0		$225,000	$31,660	$87,014	$12,244	$2,795	$393	$96,783	$13,619	$456,315	$64,209	$100,000	$14,071	$1,492	$210	$0	$0	-$2,928	-$412	$966,471	$135,995
2059	$0		$225,000	$30,443	$88,193	$11,933	$2,850	$386	$98,332	$13,304	$456,315	$61,740	$100,000	$13,530	$1,513	$205	$0	$0	-$2,968	-$402	$969,235	$131,138
2060	$0		$225,000	$29,272	$89,371	$11,627	$2,904	$378	$99,882	$12,994	$456,315	$59,365	$100,000	$13,010	$1,534	$200	$0	$0	-$3,007	-$391	$971,999	$126,454
2061	$0		$225,000	$28,146	$90,550	$11,327	$2,959	$370	$101,432	$12,688	$456,315	$57,082	$100,000	$12,509	$1,555	$195	$0	$0	-$3,047	-$381	$974,763	$121,936
2062	$0		$225,000	$27,063	$91,728	$11,033	$3,013	$362	$102,981	$12,387	$456,315	$54,886	$100,000	$12,028	$1,576	$190	$0	$0	-$3,087	-$371	$977,527	$117,579
2063	$0		$225,000	$26,022	$92,907	$10,745	$3,068	$355	$104,531	$12,090	$456,315	$52,775	$100,000	$11,566	$1,597	$185	$0	$0	-$3,126	-$362	$980,291	$113,376
2064	$0		$225,000	$25,022	$94,085	$10,463	$3,122	$347	$106,081	$11,797	$456,315	$50,746	$100,000	$11,121	$1,618	$180	$0	$0	-$3,166	-$352	$983,055	$109,323
2065	$0		$225,000	$24,059	$95,264	$10,187	$3,177	$340	$107,630	$11,509	$456,315	$48,794	$100,000	$10,693	$1,639	$175	$0	$0	-$3,206	-$343	$985,819	$105,414
Total Capital =	$45,631,500																					
Total Net Present Value =		$32,584,687		$3,844,038		$959,477		$26,237		$1,001,350		$6,962,556		$1,708,461		$16,205		$0		-$32,287		**$47,070,725**

FLORENCE LAKE ASSUMPTIONS

Labour:

number of facility manager(s) =	1	**Ref:** Based on Jan 15/09 TM from T. Dokken.
number of operations staff =	1	
number of maintenance staff =	1	
number of administration staff =	0	
total staff =	3 persons	

Chemical Phosphorus Removal Chemicals:

chemical-P removal required (1 = yes, 0 = no)?	0.50	**Note:** Assumed for onlv one-half of vear.

Wet-Weather CEPT Chemicals:

fraction of total annual ADWF treated =	0.0%	**Note:** No secondary treatment bypass.

Saleable Heat Energy:

unit energy cost to third-party "heat recovery" utility =	$ 14.66 /GJ	**Ref:** This is the cost that a third-party heat recovery utility would incur to make the heat available to customers. Value is from Table 6 of Feb 10/09 memo from M. Homenuke, reduced by 7% to remove CRD share of capital cost.
unit CRD saleable energy price to third-party utility =	$ - /GJ	**Note:** This value is the difference between the general energy market unit price (from Generic Assumptions sheet) and the above value, which reflects the maximum amount the utility would be willing to pay the CRD for the heat. Set to zero in this case since the unit selling price would be a negative value, indicating the CRD would need to subsidize the scheme.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 17, 2009
Last Revision By: D. Shiskowski

Subject: Lang Cove WWTF
Option 3

Material Flows
and Carbon Footprint Analysis

Yellow-shaded cell denotes assumed/input values

Year	Equivalent Population	Wastewater ADWF	Sludge Production and Truck Transport		Saleable Effluent Heat[1]	Saleable Reclaimed Water (irrigation only)	Materials			GHG Sources			GHG Offsets	Total GHG Emissions
			Mass	Thickened Volume			Electricity	Diesel Fuel	Sludge Thickening Polymer	Electricity Purchased	Diesel Fuel Combusted	Sludge Thickening Polymer Used	Avoided Natural Gas/Elect Use via Effluent Heat	
	(pe)	(m3/d)	(dry t/yr)	(m3/yr)	(GJ/yr)	(m3/yr)	(kWh/yr)	(L/yr)	(kg/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)
2008														
2009														
2010														
2011														
2012														
2013														
2014														
2015	21,931	5,483	476	0	27,553	10,006	1,835,188	-	0	132	0.0	0.0	-1,046	-914
2016	22,564	5,566	490	0	30,952	10,157	1,862,856	-	0	134	0.0	0.0	-1,175	-1,041
2017	23,197	5,648	504	0	34,352	10,308	1,890,525	-	0	136	0.0	0.0	-1,304	-1,168
2018	23,830	5,731	518	0	37,751	10,459	1,918,194	-	0	138	0.0	0.0	-1,433	-1,295
2019	24,462	5,814	531	0	41,150	10,610	1,945,863	-	0	140	0.0	0.0	-1,562	-1,422
2020	25,095	5,896	545	0	44,549	10,761	1,973,532	-	0	142	0.0	0.0	-1,691	-1,549
2021	25,728	5,979	559	0	47,948	10,912	2,001,201	-	0	144	0.0	0.0	-1,820	-1,676
2022	26,361	6,062	572	0	51,348	11,063	2,028,870	-	0	146	0.0	0.0	-1,950	-1,803
2023	26,994	6,144	586	0	54,747	11,213	2,056,539	-	0	148	0.0	0.0	-2,079	-1,930
2024	27,627	6,227	600	0	58,146	11,364	2,084,208	-	0	150	0.0	0.0	-2,208	-2,058
2025	28,260	6,310	614	0	61,545	11,515	2,111,877	-	0	152	0.0	0.0	-2,337	-2,185
2026	28,893	6,392	627	0	64,944	11,666	2,139,546	-	0	154	0.0	0.0	-2,466	-2,312
2027	29,525	6,475	641	0	68,344	11,817	2,167,215	-	0	156	0.0	0.0	-2,595	-2,439
2028	30,158	6,558	655	0	71,743	11,968	2,194,884	-	0	158	0.0	0.0	-2,724	-2,566
2029	30,791	6,640	669	0	75,142	12,119	2,222,553	-	0	160	0.0	0.0	-2,853	-2,693
2030	31,424	6,723	682	0	78,541	12,269	2,250,222	-	0	162	0.0	0.0	-2,982	-2,820
2031	32,074	6,798	697	0	79,466	12,406	2,275,302	-	0	164	0.0	0.0	-3,017	-2,853
2032	32,724	6,873	711	0	80,391	12,543	2,300,383	-	0	166	0.0	0.0	-3,052	-2,887
2033	33,374	6,948	725	0	81,316	12,680	2,325,463	-	0	167	0.0	0.0	-3,087	-2,920
2034	34,024	7,023	739	0	82,241	12,816	2,350,544	-	0	169	0.0	0.0	-3,122	-2,953
2035	34,674	7,098	753	0	83,165	12,953	2,375,625	-	0	171	0.0	0.0	-3,158	-2,986
2036	35,324	7,173	767	0	84,090	13,090	2,400,705	-	0	173	0.0	0.0	-3,193	-3,020
2037	35,974	7,248	781	0	85,015	13,227	2,425,786	-	0	175	0.0	0.0	-3,228	-3,053
2038	36,625	7,322	795	0	85,940	13,364	2,450,866	-	0	176	0.0	0.0	-3,263	-3,086
2039	37,275	7,397	810	0	86,865	13,500	2,475,947	-	0	178	0.0	0.0	-3,298	-3,120
2040	37,925	7,472	824	0	87,790	13,637	2,501,027	-	0	180	0.0	0.0	-3,333	-3,153
2041	38,575	7,547	838	0	88,714	13,774	2,526,108	-	0	182	0.0	0.0	-3,368	-3,186
2042	39,225	7,622	852	0	89,639	13,911	2,551,188	-	0	184	0.0	0.0	-3,403	-3,220
2043	39,875	7,697	866	0	90,564	14,047	2,576,269	-	0	185	0.0	0.0	-3,438	-3,253
2044	40,525	7,772	880	0	91,489	14,184	2,601,350	-	0	187	0.0	0.0	-3,474	-3,286
2045	41,175	7,847	894	0	92,414	14,321	2,626,430	-	0	189	0.0	0.0	-3,509	-3,320
2046	41,590	7,867	903	0	96,576	14,357	2,633,074	-	0	190	0.0	0.0	-3,667	-3,477
2047	42,005	7,887	912	0	100,737	14,393	2,639,718	-	0	190	0.0	0.0	-3,825	-3,635
2048	42,420	7,907	921	0	104,899	14,429	2,646,362	-	0	191	0.0	0.0	-3,983	-3,792
2049	42,835	7,926	930	0	109,061	14,466	2,653,006	-	0	191	0.0	0.0	-4,141	-3,950
2050	43,250	7,946	939	0	113,222	14,502	2,659,650	-	0	191	0.0	0.0	-4,299	-4,107
2051	43,665	7,966	948	0	117,384	14,538	2,666,294	-	0	192	0.0	0.0	-4,457	-4,265
2052	44,080	7,986	957	0	121,546	14,574	2,672,937	-	0	192	0.0	0.0	-4,615	-4,422
2053	44,495	8,006	966	0	125,708	14,611	2,679,581	-	0	193	0.0	0.0	-4,773	-4,580
2054	44,910	8,026	975	0	129,869	14,647	2,686,225	-	0	193	0.0	0.0	-4,931	-4,737
2055	45,326	8,046	984	0	134,031	14,683	2,692,869	-	0	194	0.0	0.0	-5,089	-4,895
2056	45,741	8,065	993	0	136,450	14,719	2,699,513	-	0	194	0.0	0.0	-5,181	-4,986
2057	46,156	8,085	1,002	0	137,371	14,755	2,706,157	-	0	195	0.0	0.0	-5,216	-5,021
2058	46,571	8,105	1,011	0	138,293	14,792	2,712,801	-	0	195	0.0	0.0	-5,251	-5,055
2059	46,986	8,125	1,020	0	139,214	14,828	2,719,445	-	0	196	0.0	0.0	-5,286	-5,090
2060	47,401	8,145	1,029	0	140,136	14,864	2,726,089	-	0	196	0.0	0.0	-5,321	-5,124
2061	47,816	8,165	1,038	0	141,057	14,900	2,732,732	-	0	197	0.0	0.0	-5,355	-5,159
2062	48,231	8,184	1,047	0	141,978	14,937	2,739,376	-	0	197	0.0	0.0	-5,390	-5,193
2063	48,646	8,204	1,056	0	142,900	14,973	2,746,020	-	0	198	0.0	0.0	-5,425	-5,228
2064	49,061	8,224	1,065	0	143,821	15,009	2,752,664	-	0	198	0.0	0.0	-5,460	-5,262
2065	49,476	8,244	1,074	0	144,743	15,045	2,759,308	-	0	199	0.0	0.0	-5,495	-5,297
Totals =					4,696,851	672,683	123,370,087	0		8,883	0	0	-178,324	**-169,442**

LANG COVE WWTF ASSUMPTIONS

Electricity:

"base" unit power requirement =	0.700	kW-hr/d per m3/d of ADWF treated wastewater	**Ref:** Based on Jan 15/09 TM from T. Dokken.
wastewater strength adjustment =	0.100	x "base" unit power requirement	**Note:** To account for reduce flow rate but same load.
influent pumping power adjustment =	0.070	x "base" unit power requirement	**Ref:** Reduced relative to Options 1/2.
UV disinfection power adjustment =	0.100	x "base" unit power requirement	**Note:** Required - effluent to sensitive marine environment.
effluent pumping power adjustment =	0.04	x "base" unit power requirement	**Ref:** Reduced relative to Options 1/2.
raw sludge thickening adjustment =	0	x "base" unit power requirement	**Ref:** Note required - sludge to sewer.
total unit power requirement =	0.917	kW-hr/d per m3/d of ADWF treated wastewater	

Raw Sludge Thickening and Truck Transport:

thickening required (1 = yes, 0 = no)?	0	
chemical-P removal chemical sludge production allowance =	0%	of combined PS + WBS
round-trip transport distance to solids processing facility =	0	km

Saleable Reclaimed Water:

mean fraction of annual ADWF volume sold for landscape irrigation =	0.50%	/yr	**Note:** See dnt_eff_irr_ds.xls for assumptions and details. Reclaimed water used for toilet flushing handled separately in analysis. See IRS LCA worksheet.

Notes:
1. Data from M. Homenuke in Feb 4/09 e-mail, DES_SaleableHeatEnergy.xls, Saleable.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 18, 2009
Last Revision By: D. Shiskowski

Subject: Lang Cove WWTF
Option 3

Life Cycle Analysis

Yellow-shaded cell denotes assumed/input values

Year	Capital Costs		Operation & Maintenance Costs												GHG CO2e		Heat Revenues		Reclaimed Water Revenues (irrigation only)		Total	
			Labour		Electricity		Diesel Fuel		Chemicals		Maintenance		Administration									
	Total Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Rev	Net Present Value	Total Annual Rev	Net Present Value	Total Annual Cost	Net Present Value
2008																						
2009																						
2010																						
2011																						
2012																						
2013																						
2014	$59,127,160	$46,729,053																			$59,127,160	$46,729,053
2015		$0	$300,000	$227,975	$128,463	$97,621	$0	$0	$14,609	$11,102	$591,272	$449,318	$100,000	$75,992	-$13,710	-$10,418	-$95,163	-$72,316	-$7,205	-$5,475	$1,018,267	$773,799
2016		$0	$300,000	$219,207	$130,400	$95,282	$0	$0	$14,830	$10,836	$591,272	$432,036	$100,000	$73,069	-$15,616	-$11,410	-$106,903	-$78,113	-$7,313	-$5,344	$1,006,669	$735,563
2017		$0	$300,000	$210,776	$132,337	$92,978	$0	$0	$15,050	$10,574	$591,272	$415,420	$100,000	$70,259	-$17,522	-$12,310	-$118,643	-$83,357	-$7,422	-$5,215	$995,072	$699,124
2018		$0	$300,000	$202,669	$134,274	$90,710	$0	$0	$15,270	$10,316	$591,272	$399,442	$100,000	$67,556	-$19,427	-$13,125	-$130,384	-$88,082	-$7,531	-$5,087	$983,474	$664,400
2019		$0	$300,000	$194,874	$136,210	$88,480	$0	$0	$15,491	$10,062	$591,272	$384,079	$100,000	$64,958	-$21,333	-$13,858	-$142,124	-$92,321	-$7,639	-$4,962	$971,876	$631,312
2020		$0	$300,000	$187,379	$138,147	$86,286	$0	$0	$15,711	$9,813	$591,272	$369,306	$100,000	$62,460	-$23,239	-$14,515	-$153,864	-$96,103	-$7,748	-$4,839	$960,278	$599,787
2021		$0	$300,000	$180,172	$140,084	$84,131	$0	$0	$15,931	$9,568	$591,272	$355,102	$100,000	$60,057	-$25,145	-$15,102	-$165,604	-$99,458	-$7,856	-$4,718	$948,681	$569,753
2022		$0	$300,000	$173,243	$142,021	$82,014	$0	$0	$16,151	$9,327	$591,272	$341,445	$100,000	$57,748	-$27,051	-$15,622	-$177,344	-$102,412	-$7,965	-$4,600	$937,083	$541,142
2023		$0	$300,000	$166,579	$143,958	$79,935	$0	$0	$16,372	$9,091	$591,272	$328,312	$100,000	$55,526	-$28,957	-$16,079	-$189,085	-$104,992	-$8,074	-$4,483	$925,485	$513,889
2024		$0	$300,000	$160,172	$145,895	$77,894	$0	$0	$16,592	$8,859	$591,272	$315,685	$100,000	$53,391	-$30,863	-$16,478	-$200,825	-$107,222	-$8,182	-$4,369	$913,888	$487,932
2025		$0	$300,000	$154,012	$147,831	$75,893	$0	$0	$16,812	$8,631	$591,272	$303,543	$100,000	$51,337	-$32,769	-$16,823	-$212,565	-$109,125	-$8,291	-$4,256	$902,290	$463,211
2026		$0	$300,000	$148,088	$149,768	$73,930	$0	$0	$17,032	$8,408	$591,272	$291,868	$100,000	$49,363	-$34,675	-$17,117	-$224,305	-$110,723	-$8,400	-$4,146	$890,692	$439,671
2027		$0	$300,000	$142,393	$151,705	$72,006	$0	$0	$17,253	$8,189	$591,272	$280,643	$100,000	$47,464	-$36,581	-$17,363	-$236,045	-$112,037	-$8,508	-$4,038	$879,094	$417,255
2028		$0	$300,000	$136,916	$153,642	$70,120	$0	$0	$17,473	$7,974	$591,272	$269,849	$100,000	$45,639	-$38,487	-$17,565	-$247,786	-$113,086	-$8,617	-$3,933	$867,497	$395,914
2029		$0	$300,000	$131,650	$155,579	$68,273	$0	$0	$17,693	$7,764	$591,272	$259,470	$100,000	$43,883	-$40,393	-$17,726	-$259,526	-$113,889	-$8,725	-$3,829	$855,899	$375,597
2030	$15,233,400	$6,427,815	$300,000	$126,587	$157,516	$66,465	$0	$0	$17,913	$7,559	$743,606	$313,768	$100,000	$42,196	-$42,299	-$17,848	-$271,266	-$114,462	-$8,834	-$3,728	$16,230,035	$6,848,351
2031		$0	$300,000	$121,718	$159,271	$64,621	$0	$0	$18,113	$7,349	$743,606	$301,700	$100,000	$40,573	-$42,799	-$17,365	-$274,460	-$111,356	-$8,932	-$3,624	$994,798	$403,616
2032		$0	$300,000	$117,036	$161,027	$62,820	$0	$0	$18,313	$7,144	$743,606	$290,097	$100,000	$39,012	-$43,298	-$16,892	-$277,654	-$108,319	-$9,031	-$3,523	$992,961	$387,376
2033		$0	$300,000	$112,535	$162,782	$61,062	$0	$0	$18,512	$6,944	$743,606	$278,939	$100,000	$37,512	-$43,798	-$16,429	-$280,849	-$105,351	-$9,129	-$3,425	$991,124	$371,787
2034		$0	$300,000	$108,207	$164,538	$59,347	$0	$0	$18,712	$6,749	$743,606	$268,211	$100,000	$36,069	-$44,298	-$15,978	-$284,043	-$102,451	-$9,228	-$3,328	$989,287	$356,825
2035		$0	$300,000	$104,045	$166,294	$57,673	$0	$0	$18,912	$6,559	$743,606	$257,895	$100,000	$34,682	-$44,797	-$15,536	-$287,237	-$99,619	-$9,326	-$3,235	$987,451	$342,464
2036		$0	$300,000	$100,043	$168,049	$56,041	$0	$0	$19,111	$6,373	$743,606	$247,976	$100,000	$33,348	-$45,297	-$15,105	-$290,431	-$96,852	-$9,425	-$3,143	$985,614	$328,680
2037		$0	$300,000	$96,195	$169,805	$54,448	$0	$0	$19,311	$6,192	$743,606	$238,438	$100,000	$32,065	-$45,796	-$14,685	-$293,625	-$94,151	-$9,523	-$3,054	$983,777	$315,449
2038		$0	$300,000	$92,496	$171,561	$52,895	$0	$0	$19,511	$6,016	$743,606	$229,267	$100,000	$30,832	-$46,296	-$14,274	-$296,819	-$91,515	-$9,622	-$2,967	$981,940	$302,750
2039		$0	$300,000	$88,938	$173,316	$51,381	$0	$0	$19,710	$5,843	$743,606	$220,450	$100,000	$29,646	-$46,796	-$13,873	-$300,014	-$88,942	-$9,720	-$2,882	$980,103	$290,562
2040		$0	$300,000	$85,517	$175,072	$49,906	$0	$0	$19,910	$5,676	$743,606	$211,971	$100,000	$28,506	-$47,295	-$13,482	-$303,208	-$86,432	-$9,819	-$2,799	$978,266	$278,862
2041		$0	$300,000	$82,228	$176,828	$48,467	$0	$0	$20,110	$5,512	$743,606	$203,818	$100,000	$27,409	-$47,795	-$13,100	-$306,402	-$83,983	-$9,917	-$2,718	$976,429	$267,633
2042		$0	$300,000	$79,066	$178,583	$47,066	$0	$0	$20,309	$5,353	$743,606	$195,979	$100,000	$26,355	-$48,294	-$12,728	-$309,596	-$81,595	-$10,016	-$2,640	$974,592	$256,856
2043		$0	$300,000	$76,025	$180,339	$45,701	$0	$0	$20,509	$5,197	$743,606	$188,441	$100,000	$25,342	-$48,794	-$12,365	-$312,790	-$79,266	-$10,114	-$2,563	$972,755	$246,511
2044		$0	$300,000	$73,101	$182,094	$44,371	$0	$0	$20,709	$5,046	$743,606	$181,193	$100,000	$24,367	-$49,294	-$12,011	-$315,985	-$76,996	-$10,212	-$2,488	$970,918	$236,582
2045		$0	$300,000	$70,289	$183,850	$43,076	$0	$0	$20,908	$4,899	$743,606	$174,224	$100,000	$23,430	-$49,793	-$11,666	-$319,179	-$74,783	-$10,311	-$2,416	$969,081	$227,053
2046		$0	$300,000	$67,586	$184,315	$41,524	$0	$0	$20,961	$4,722	$743,606	$167,524	$100,000	$22,529	-$52,156	-$11,750	-$333,552	-$75,145	-$10,337	-$2,329	$952,836	$214,660
2047		$0	$300,000	$64,986	$184,780	$40,027	$0	$0	$21,014	$4,552	$743,606	$161,080	$100,000	$21,662	-$54,519	-$11,810	-$347,926	-$75,368	-$10,363	-$2,245	$936,591	$202,885
2048		$0	$300,000	$62,487	$185,245	$38,585	$0	$0	$21,067	$4,388	$743,606	$154,885	$100,000	$20,829	-$56,882	-$11,848	-$362,300	-$75,463	-$10,389	-$2,164	$920,347	$191,698
2049		$0	$300,000	$60,083	$185,710	$37,194	$0	$0	$21,120	$4,230	$743,606	$148,928	$100,000	$20,028	-$59,245	-$11,865	-$376,674	-$75,439	-$10,415	-$2,086	$904,102	$181,072
2050		$0	$300,000	$57,772	$186,175	$35,853	$0	$0	$21,173	$4,077	$743,606	$143,200	$100,000	$19,257	-$61,608	-$11,864	-$391,048	-$75,306	-$10,441	-$2,011	$887,857	$170,979
2051		$0	$300,000	$55,550	$186,641	$34,560	$0	$0	$21,226	$3,930	$743,606	$137,692	$100,000	$18,517	-$63,971	-$11,845	-$405,421	-$75,071	-$10,467	-$1,938	$871,612	$161,395
2052		$0	$300,000	$53,414	$187,106	$33,313	$0	$0	$21,279	$3,789	$743,606	$132,396	$100,000	$17,805	-$66,334	-$11,811	-$419,795	-$74,743	-$10,494	-$1,868	$855,367	$152,295
2053		$0	$300,000	$51,360	$187,571	$32,112	$0	$0	$21,331	$3,652	$743,606	$127,304	$100,000	$17,120	-$68,697	-$11,761	-$434,169	-$74,329	-$10,520	-$1,801	$839,122	$143,656
2054		$0	$300,000	$49,384	$188,036	$30,953	$0	$0	$21,384	$3,520	$743,606	$122,408	$100,000	$16,461	-$71,060	-$11,697	-$448,543	-$73,836	-$10,546	-$1,736	$822,877	$135,457
2055		$0	$300,000	$47,485	$188,501	$29,836	$0	$0	$21,437	$3,393	$743,606	$117,700	$100,000	$15,828	-$73,423	-$11,622	-$462,917	-$73,272	-$10,572	-$1,673	$806,633	$127,676
2056		$0	$300,000	$45,658	$188,966	$28,760	$0	$0	$21,490	$3,271	$743,606	$113,173	$100,000	$15,219	-$74,793	-$11,383	-$471,271	-$71,725	-$10,598	-$1,613	$797,400	$121,360
2057		$0	$300,000	$43,902	$189,431	$27,722	$0	$0	$21,543	$3,153	$743,606	$108,820	$100,000	$14,634	-$75,311	-$11,021	-$474,453	-$69,432	-$10,624	-$1,555	$794,192	$116,223
2058		$0	$300,000	$42,214	$189,896	$26,721	$0	$0	$21,596	$3,039	$743,606	$104,635	$100,000	$14,071	-$75,828	-$10,670	-$477,635	-$67,209	-$10,650	-$1,499	$790,984	$111,301
2059		$0	$300,000	$40,590	$190,361	$25,756	$0	$0	$21,649	$2,929	$743,606	$100,610	$100,000	$13,530	-$76,346	-$10,330	-$480,818	-$65,055	-$10,676	-$1,444	$787,776	$106,587
2060		$0	$300,000	$39,029	$190,826	$24,826	$0	$0	$21,702	$2,823	$743,606	$96,741	$100,000	$13,010	-$76,863	-$10,000	-$484,000	-$62,967	-$10,702	-$1,392	$784,568	$102,070
2061		$0	$300,000	$37,528	$191,291	$23,929	$0	$0	$21,755	$2,721	$743,606	$93,020	$100,000	$12,509	-$77,381	-$9,680	-$487,183	-$60,943	-$10,728	-$1,342	$781,359	$97,743
2062		$0	$300,000	$36,085	$191,756	$23,065	$0	$0	$21,807	$2,623	$743,606	$89,442	$100,000	$12,028	-$77,899	-$9,370	-$490,365	-$58,982	-$10,754	-$1,294	$778,151	$93,597
2063		$0	$300,000	$34,697	$192,221	$22,231	$0	$0	$21,860	$2,528	$743,606	$86,002	$100,000	$11,566	-$78,416	-$9,069	-$493,548	-$57,082	-$10,780	-$1,247	$774,943	$89,626
2064		$0	$300,000	$33,362	$192,686	$21,428	$0	$0	$21,913	$2,437	$743,606	$82,694	$100,000	$11,121	-$78,934	-$8,778	-$496,730	-$55,240	-$10,807	-$1,202	$771,735	$85,822
2065		$0	$300,000	$32,079	$193,152	$20,654	$0	$0	$21,966	$2,349	$743,606	$79,514	$100,000	$10,693	-$79,451	-$8,496	-$499,913	-$53,456	-$10,833	-$1,158	$768,527	$82,179
Total Capital =	$74,360,560																					
Total Net Present Value =		$53,156,869		$5,125,384		$2,699,940		$0		$307,050		$11,365,651		$1,708,461		-$675,518		-$4,349,371		-$151,422		**$69,187,044**

LANG COVE WWTF ASSUMPTIONS

Labour:

number of facility manager(s) =	1	**Ref:** Based on Jan 15/09 TM from T. Dokken.
number of operations staff =	2	
number of maintenance staff =	1	
number of administration staff =	0	
total staff =	4 persons	

Chemical Phosphorus Removal Chemicals:

chemical-P removal required (1 = yes, 0 = no)?	0	

Wet-Weather CEPT Chemicals:

fraction of total annual ADWF treated =	0.0%	**Note:** No secondary treatment bypass.

Saleable Heat Energy:

unit energy cost to third-party "heat recovery" utility =	$ 10.55 /GJ	**Ref:** This is the cost that a third-party heat recovery utility would incur to make the heat available to customers. Value is from Table 6 of Feb 10/09 memo from M. Homenuke, reduced by 7% to remove CRD share of capital cost.
unit CRD saleable energy price to third-party utility =	$ 3.45 /GJ	**Note:** This value is the difference between the general energy market unit price (from Generic Assumptions sheet) and the above value, which reflects the maximum amount the utility would be willing to pay the CRD for the heat.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 17, 2009
Last Revision By: D. Shiskowski

Subject: Roderick WWTF

Option 3
Material Flows
and Carbon Footprint Analysis

Yellow-shaded cell denotes assumed/input values

Year	Equivalent Population	Wastewater ADWF	Sludge Production and Truck Transport		Saleable Effluent Heat[1]	Saleable Reclaimed Water (irrigation only)	Materials			GHG Sources			GHG Offsets	Total GHG Emissions
			Mass	Thickened Volume			Electricity	Diesel Fuel	Sludge Thickening Polymer	Electricity Purchased	Diesel Fuel Combusted	Sludge Thickening Polymer Used	Avoided Natural Gas/Elect Use via Effluent Heat	
	(pe)	(m3/d)	(dry t/yr)	(m3/yr)	(GJ/yr)	(m3/yr)	(kWh/yr)	(L/yr)	(kg/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)
2008														
2009														
2010														
2011														
2012														
2013														
2014														
2015	96,424	24,604	2,094	0	56,806	17,961	6,780,247	-	0	488	0.0	0.0	-2,157	-1,669
2016	97,009	24,524	2,107	0	71,435	17,903	6,758,220	-	0	487	0.0	0.0	-2,712	-2,226
2017	97,594	24,444	2,119	0	86,064	17,844	6,736,192	-	0	485	0.0	0.0	-3,268	-2,783
2018	98,179	24,364	2,132	0	100,693	17,786	6,714,164	-	0	483	0.0	0.0	-3,823	-3,340
2019	98,764	24,284	2,145	0	115,322	17,728	6,692,137	-	0	482	0.0	0.0	-4,378	-3,897
2020	99,349	24,204	2,158	0	129,951	17,669	6,670,109	-	0	480	0.0	0.0	-4,934	-4,454
2021	99,934	24,124	2,170	0	144,580	17,611	6,648,082	-	0	479	0.0	0.0	-5,489	-5,011
2022	100,519	24,044	2,183	0	159,209	17,552	6,626,054	-	0	477	0.0	0.0	-6,045	-5,568
2023	101,104	23,965	2,196	0	173,838	17,494	6,604,026	-	0	475	0.0	0.0	-6,600	-6,125
2024	101,689	23,885	2,208	0	188,467	17,436	6,581,999	-	0	474	0.0	0.0	-7,155	-6,682
2025	102,274	23,805	2,221	0	203,096	17,377	6,559,971	-	0	472	0.0	0.0	-7,711	-7,239
2026	102,859	23,725	2,234	0	217,725	17,319	6,537,943	-	0	471	0.0	0.0	-8,266	-7,796
2027	103,444	23,645	2,247	0	232,354	17,261	6,515,916	-	0	469	0.0	0.0	-8,822	-8,353
2028	104,029	23,565	2,259	0	246,983	17,202	6,493,888	-	0	468	0.0	0.0	-9,377	-8,910
2029	104,614	23,485	2,272	0	261,612	17,144	6,471,861	-	0	466	0.0	0.0	-9,933	-9,467
2030	105,199	23,405	2,285	0	276,241	17,086	6,449,833	-	0	464	0.0	0.0	-10,488	-10,024
2031	105,784	23,366	2,297	0	280,375	17,057	6,439,067	-	0	464	0.0	0.0	-10,645	-10,181
2032	106,369	23,327	2,310	0	284,509	17,029	6,428,301	-	0	463	0.0	0.0	-10,802	-10,339
2033	106,954	23,288	2,323	0	288,644	17,000	6,417,535	-	0	462	0.0	0.0	-10,959	-10,497
2034	107,539	23,249	2,335	0	292,778	16,972	6,406,770	-	0	461	0.0	0.0	-11,116	-10,655
2035	108,124	23,210	2,348	0	296,912	16,943	6,396,004	-	0	461	0.0	0.0	-11,273	-10,812
2036	108,709	23,171	2,361	0	301,047	16,915	6,385,238	-	0	460	0.0	0.0	-11,430	-10,970
2037	109,294	23,132	2,374	0	305,181	16,886	6,374,472	-	0	459	0.0	0.0	-11,587	-11,128
2038	109,879	23,092	2,386	0	309,315	16,858	6,363,707	-	0	458	0.0	0.0	-11,744	-11,286
2039	110,464	23,053	2,399	0	313,450	16,829	6,352,941	-	0	457	0.0	0.0	-11,901	-11,443
2040	111,049	23,014	2,412	0	317,584	16,800	6,342,175	-	0	457	0.0	0.0	-12,058	-11,601
2041	111,634	22,975	2,424	0	321,719	16,772	6,331,409	-	0	456	0.0	0.0	-12,215	-11,759
2042	112,219	22,936	2,437	0	325,853	16,743	6,320,643	-	0	455	0.0	0.0	-12,372	-11,917
2043	112,804	22,897	2,450	0	329,987	16,715	6,309,878	-	0	454	0.0	0.0	-12,529	-12,074
2044	113,389	22,858	2,463	0	334,122	16,686	6,299,112	-	0	454	0.0	0.0	-12,686	-12,232
2045	113,974	22,819	2,475	0	338,256	16,658	6,288,346	-	0	453	0.0	0.0	-12,843	-12,390
2046	114,094	22,718	2,478	0	356,861	16,584	6,260,403	-	0	451	0.0	0.0	-13,549	-13,098
2047	114,214	22,616	2,480	0	367,082	16,510	6,232,459	-	0	449	0.0	0.0	-13,937	-13,488
2048	114,334	22,515	2,483	0	366,967	16,436	6,204,516	-	0	447	0.0	0.0	-13,933	-13,486
2049	114,454	22,413	2,486	0	366,852	16,362	6,176,573	-	0	445	0.0	0.0	-13,928	-13,483
2050	114,575	22,312	2,488	0	366,737	16,288	6,148,629	-	0	443	0.0	0.0	-13,924	-13,481
2051	114,695	22,211	2,491	0	366,623	16,214	6,120,686	-	0	441	0.0	0.0	-13,919	-13,479
2052	114,815	22,109	2,493	0	366,508	16,140	6,092,743	-	0	439	0.0	0.0	-13,915	-13,476
2053	114,935	22,008	2,496	0	366,393	16,066	6,064,799	-	0	437	0.0	0.0	-13,911	-13,474
2054	115,055	21,906	2,499	0	366,278	15,992	6,036,856	-	0	435	0.0	0.0	-13,906	-13,472
2055	115,175	21,805	2,501	0	366,164	15,918	6,008,913	-	0	433	0.0	0.0	-13,902	-13,469
2056	115,295	21,704	2,504	0	366,049	15,844	5,980,970	-	0	431	0.0	0.0	-13,898	-13,467
2057	115,415	21,602	2,507	0	365,934	15,770	5,953,026	-	0	429	0.0	0.0	-13,893	-13,465
2058	115,535	21,501	2,509	0	365,819	15,696	5,925,083	-	0	427	0.0	0.0	-13,889	-13,462
2059	115,655	21,399	2,512	0	365,704	15,622	5,897,140	-	0	425	0.0	0.0	-13,885	-13,460
2060	115,776	21,298	2,514	0	365,590	15,548	5,869,196	-	0	423	0.0	0.0	-13,880	-13,458
2061	115,896	21,197	2,517	0	365,475	15,474	5,841,253	-	0	421	0.0	0.0	-13,876	-13,455
2062	116,016	21,095	2,520	0	365,360	15,399	5,813,310	-	0	419	0.0	0.0	-13,872	-13,453
2063	116,136	20,994	2,522	0	365,245	15,325	5,785,366	-	0	417	0.0	0.0	-13,867	-13,451
2064	116,256	20,892	2,525	0	365,131	15,251	5,757,423	-	0	415	0.0	0.0	-13,863	-13,448
2065	116,376	20,791	2,527	0	365,016	15,177	5,729,480	-	0	413	0.0	0.0	-13,858	-13,446
Totals =					14,615,894	850,848	321,195,063	0		23,126	0	0	-554,919	**-531,793**

RODERICK WWTF ASSUMPTIONS

Electricity:

"base" unit power requirement =	0.500	kW-hr/d per m3/d of ADWF treated wastewater	**Ref:** Based on Jan 15/09 TM from T. Dokken.
wastewater strength adjustment =	0.100	x "base" unit power requirement	**Note:** To account for reduce flow rate but same load.
influent pumping power adjustment =	0.070	x "base" unit power requirement	**Ref:** Reduced relative to Options 1/2.
recycled centrate aeration power adjustment =	0	x "base" unit power requirement	
Hartland landfill leachate aeration power adjustment =	0.300	x "base" unit power requirement	
UV disinfection power adjustment =	0	x "base" unit power requirement	**Note:** Not required - effluent to marine environment.
effluent pumping power adjustment =	0.04	x "base" unit power requirement	**Ref:** Reduced relative to Options 1/2.
raw sludge thickening adjustment =	0	x "base" unit power requirement	**Note:** Accounted for in solids-stream calculations.
total unit power requirement =	0.755	kW-hr/d per m3/d of ADWF treated wastewater	

Raw Sludge Thickening and Truck Transport:

thickening required (1 = yes, 0 = no)?	0	
chemical-P removal chemical sludge production allowance =	0%	of combined PS + WBS
round-trip transport distance to solids processing facility =	0	km

Saleable Reclaimed Water:

mean fraction of annual ADWF volume sold for landscape irrigation =	0.20%	/yr	**Note:** See dnt_eff_irr_ds.xls for assumptions and details. Reclaimed water used for toilet flushing handled separately in analysis. See IRS LCA worksheet.

Notes:
1. Data from M. Homenuke in Feb 4/09 e-mail, DES_SaleableHeatEnergy.xls, Saleable.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 18, 2009
Last Revision By: D. Shiskowski

Subject: Roderick WWTF
Option 3

Life Cycle Analysis

Yellow-shaded cell denotes assumed/input values

Year	Capital Costs		Operation & Maintenance Costs												GHG CO2e		Heat Revenues		Reclaimed Water Revenues (irrigation only)		Total	
			Labour		Electricity		Diesel Fuel		Chemicals		Maintenance		Administration									
	Total Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Rev	Net Present Value	Total Annual Rev	Net Present Value	Total Annual Cost	Net Present Value
2008																						
2009																						
2010																						
2011																						
2012																						
2013																						
2014	$183,201,280	$144,786,633																			$183,201,280	$144,786,633
2015		$0	$600,000	$455,951	$474,617	$360,670	$0	$0	$65,557	$49,818	$1,832,013	$1,392,179	$100,000	$75,992	-$25,029	-$19,020	-$270,125	-$205,273	-$12,932	-$9,827	$2,764,102	$2,100,490
2016		$0	$600,000	$438,414	$473,075	$345,672	$0	$0	$65,344	$47,746	$1,832,013	$1,338,634	$100,000	$73,069	-$33,384	-$24,393	-$339,688	-$248,207	-$12,890	-$9,418	$2,684,471	$1,961,516
2017		$0	$600,000	$421,552	$471,533	$331,293	$0	$0	$65,131	$45,760	$1,832,013	$1,287,148	$100,000	$70,259	-$41,739	-$29,325	-$409,252	-$287,535	-$12,848	-$9,027	$2,604,839	$1,830,125
2018		$0	$600,000	$405,339	$469,992	$317,509	$0	$0	$64,918	$43,857	$1,832,013	$1,237,642	$100,000	$67,556	-$50,094	-$33,841	-$478,816	-$323,471	-$12,806	-$8,651	$2,525,208	$1,705,940
2019		$0	$600,000	$389,749	$468,450	$304,296	$0	$0	$64,705	$42,031	$1,832,013	$1,190,041	$100,000	$64,958	-$58,449	-$37,967	-$548,379	-$356,217	-$12,764	-$8,291	$2,445,576	$1,588,600
2020		$0	$600,000	$374,758	$466,908	$291,629	$0	$0	$64,492	$40,282	$1,832,013	$1,144,270	$100,000	$62,460	-$66,804	-$41,725	-$617,943	-$385,965	-$12,722	-$7,946	$2,365,944	$1,477,762
2021		$0	$600,000	$360,344	$465,366	$279,487	$0	$0	$64,279	$38,605	$1,832,013	$1,100,259	$100,000	$60,057	-$75,159	-$45,138	-$687,507	-$412,899	-$12,680	-$7,615	$2,286,313	$1,373,100
2022		$0	$600,000	$346,485	$463,824	$267,847	$0	$0	$64,066	$36,997	$1,832,013	$1,057,942	$100,000	$57,748	-$83,514	-$48,227	-$757,070	-$437,189	-$12,638	-$7,298	$2,206,681	$1,274,304
2023		$0	$600,000	$333,159	$462,282	$256,689	$0	$0	$63,853	$35,456	$1,832,013	$1,017,252	$100,000	$55,526	-$91,869	-$51,011	-$826,634	-$459,000	-$12,596	-$6,994	$2,127,050	$1,181,075
2024		$0	$600,000	$320,345	$460,740	$245,993	$0	$0	$63,641	$33,978	$1,832,013	$978,127	$100,000	$53,391	-$100,224	-$53,510	-$896,197	-$478,487	-$12,554	-$6,703	$2,047,418	$1,093,133
2025		$0	$600,000	$308,024	$459,198	$235,740	$0	$0	$63,428	$32,562	$1,832,013	$940,506	$100,000	$51,337	-$108,579	-$55,741	-$965,761	-$495,796	-$12,512	-$6,423	$1,967,787	$1,010,209
2026		$0	$600,000	$296,177	$457,656	$225,912	$0	$0	$63,215	$31,204	$1,832,013	$904,333	$100,000	$49,363	-$116,934	-$57,722	-$1,035,325	-$511,065	-$12,470	-$6,155	$1,888,155	$932,047
2027		$0	$600,000	$284,785	$456,114	$216,491	$0	$0	$63,002	$29,903	$1,832,013	$869,551	$100,000	$47,464	-$125,289	-$59,467	-$1,104,888	-$524,427	-$12,428	-$5,899	$1,808,524	$858,402
2028		$0	$600,000	$273,832	$454,572	$207,461	$0	$0	$62,789	$28,656	$1,832,013	$836,107	$100,000	$45,639	-$133,644	-$60,993	-$1,174,452	-$536,005	-$12,386	-$5,653	$1,728,892	$789,044
2029		$0	$600,000	$263,300	$453,030	$198,805	$0	$0	$62,576	$27,460	$1,832,013	$803,949	$100,000	$43,883	-$141,999	-$62,314	-$1,244,016	-$545,916	-$12,344	-$5,417	$1,649,261	$723,751
2030		$0	$600,000	$253,173	$451,488	$190,508	$0	$0	$62,363	$26,314	$1,832,013	$773,028	$100,000	$42,196	-$150,354	-$63,443	-$1,313,579	-$554,272	-$12,302	-$5,191	$1,569,629	$662,313
2031		$0	$600,000	$243,436	$450,735	$182,875	$0	$0	$62,259	$25,260	$1,832,013	$743,296	$100,000	$40,573	-$152,720	-$61,962	-$1,333,239	-$540,930	-$12,281	-$4,983	$1,546,766	$627,564
2032		$0	$600,000	$234,073	$449,981	$175,547	$0	$0	$62,154	$24,248	$1,832,013	$714,708	$100,000	$39,012	-$155,086	-$60,502	-$1,352,899	-$527,795	-$12,261	-$4,783	$1,523,903	$594,507
2033		$0	$600,000	$225,070	$449,227	$168,513	$0	$0	$62,050	$23,276	$1,832,013	$687,219	$100,000	$37,512	-$157,452	-$59,063	-$1,372,558	-$514,870	-$12,240	-$4,591	$1,501,040	$563,065
2034		$0	$600,000	$216,414	$448,474	$161,760	$0	$0	$61,946	$22,343	$1,832,013	$660,787	$100,000	$36,069	-$159,818	-$57,645	-$1,392,218	-$502,158	-$12,220	-$4,407	$1,478,177	$533,163
2035		$0	$600,000	$208,090	$447,720	$155,277	$0	$0	$61,842	$21,448	$1,832,013	$635,372	$100,000	$34,682	-$162,185	-$56,248	-$1,411,878	-$489,663	-$12,199	-$4,231	$1,455,314	$504,727
2036		$0	$600,000	$200,086	$446,967	$149,053	$0	$0	$61,738	$20,588	$1,832,013	$610,935	$100,000	$33,348	-$164,551	-$54,874	-$1,431,537	-$477,386	-$12,178	-$4,061	$1,432,451	$477,690
2037		$0	$600,000	$192,391	$446,213	$143,079	$0	$0	$61,634	$19,763	$1,832,013	$587,437	$100,000	$32,065	-$166,917	-$53,522	-$1,451,197	-$465,328	-$12,158	-$3,898	$1,409,588	$451,986
2038		$0	$600,000	$184,991	$445,459	$137,343	$0	$0	$61,530	$18,971	$1,832,013	$564,844	$100,000	$30,832	-$169,283	-$52,193	-$1,470,857	-$453,493	-$12,137	-$3,742	$1,386,725	$427,553
2039		$0	$600,000	$177,876	$444,706	$131,838	$0	$0	$61,426	$18,210	$1,832,013	$543,119	$100,000	$29,646	-$171,649	-$50,887	-$1,490,517	-$441,879	-$12,117	-$3,592	$1,363,862	$404,331
2040		$0	$600,000	$171,035	$443,952	$126,552	$0	$0	$61,322	$17,480	$1,832,013	$522,230	$100,000	$28,506	-$174,015	-$49,604	-$1,510,176	-$430,488	-$12,096	-$3,448	$1,340,999	$382,262
2041		$0	$600,000	$164,457	$443,199	$121,478	$0	$0	$61,218	$16,779	$1,832,013	$502,144	$100,000	$27,409	-$176,381	-$48,345	-$1,529,836	-$419,319	-$12,076	-$3,310	$1,318,136	$361,293
2042		$0	$600,000	$158,131	$442,445	$116,607	$0	$0	$61,114	$16,107	$1,832,013	$482,831	$100,000	$26,355	-$178,748	-$47,109	-$1,549,496	-$408,373	-$12,055	-$3,177	$1,295,273	$341,372
2043		$0	$600,000	$152,049	$441,691	$111,931	$0	$0	$61,009	$15,461	$1,832,013	$464,260	$100,000	$25,342	-$181,114	-$45,897	-$1,569,156	-$397,648	-$12,035	-$3,050	$1,272,410	$322,448
2044		$0	$600,000	$146,201	$440,938	$107,443	$0	$0	$60,905	$14,841	$1,832,013	$446,404	$100,000	$24,367	-$183,480	-$44,708	-$1,588,815	-$387,145	-$12,014	-$2,927	$1,249,547	$304,475
2045		$0	$600,000	$140,578	$440,184	$103,134	$0	$0	$60,801	$14,246	$1,832,013	$429,235	$100,000	$23,430	-$185,846	-$43,543	-$1,608,475	-$376,861	-$11,994	-$2,810	$1,226,684	$287,408
2046		$0	$600,000	$135,171	$438,228	$98,726	$0	$0	$60,531	$13,637	$1,832,013	$412,726	$100,000	$22,529	-$196,472	-$44,262	-$1,696,944	-$382,297	-$11,940	-$2,690	$1,125,416	$253,540
2047		$0	$600,000	$129,972	$436,272	$94,506	$0	$0	$60,261	$13,054	$1,832,013	$396,852	$100,000	$21,662	-$202,323	-$43,827	-$1,745,547	-$378,121	-$11,887	-$2,575	$1,068,789	$231,522
2048		$0	$600,000	$124,973	$434,316	$90,463	$0	$0	$59,991	$12,495	$1,832,013	$381,588	$100,000	$20,829	-$202,288	-$42,134	-$1,745,001	-$363,465	-$11,834	-$2,465	$1,067,197	$222,285
2049		$0	$600,000	$120,167	$432,360	$86,592	$0	$0	$59,721	$11,961	$1,832,013	$366,912	$100,000	$20,028	-$202,252	-$40,507	-$1,744,455	-$349,376	-$11,780	-$2,359	$1,065,605	$213,417
2050		$0	$600,000	$115,545	$430,404	$82,885	$0	$0	$59,450	$11,449	$1,832,013	$352,800	$100,000	$19,257	-$202,217	-$38,942	-$1,743,910	-$335,833	-$11,727	-$2,258	$1,064,013	$204,902
2051		$0	$600,000	$111,101	$428,448	$79,335	$0	$0	$59,180	$10,958	$1,832,013	$339,231	$100,000	$18,517	-$202,182	-$37,438	-$1,743,364	-$322,816	-$11,674	-$2,162	$1,062,421	$196,727
2052		$0	$600,000	$106,828	$426,492	$75,935	$0	$0	$58,910	$10,489	$1,832,013	$326,183	$100,000	$17,805	-$202,147	-$35,992	-$1,742,818	-$310,302	-$11,621	-$2,069	$1,060,829	$188,877
2053		$0	$600,000	$102,719	$424,536	$72,680	$0	$0	$58,640	$10,039	$1,832,013	$313,638	$100,000	$17,120	-$202,112	-$34,601	-$1,742,272	-$298,274	-$11,567	-$1,980	$1,059,237	$181,340
2054		$0	$600,000	$98,768	$422,580	$69,563	$0	$0	$58,370	$9,608	$1,832,013	$301,575	$100,000	$16,461	-$202,076	-$33,265	-$1,741,727	-$286,712	-$11,514	-$1,895	$1,057,645	$174,103
2055		$0	$600,000	$94,970	$420,624	$66,577	$0	$0	$58,099	$9,196	$1,832,013	$289,976	$100,000	$15,828	-$202,041	-$31,980	-$1,741,181	-$275,599	-$11,461	-$1,814	$1,056,053	$167,155
2056		$0	$600,000	$91,317	$418,668	$63,719	$0	$0	$57,829	$8,801	$1,832,013	$278,823	$100,000	$15,219	-$202,006	-$30,744	-$1,740,635	-$264,916	-$11,407	-$1,736	$1,054,461	$160,483
2057		$0	$600,000	$87,805	$416,712	$60,982	$0	$0	$57,559	$8,423	$1,832,013	$268,099	$100,000	$14,634	-$201,971	-$29,557	-$1,740,089	-$254,647	-$11,354	-$1,662	$1,052,869	$154,078
2058		$0	$600,000	$84,428	$414,756	$58,361	$0	$0	$57,289	$8,061	$1,832,013	$257,787	$100,000	$14,071	-$201,936	-$28,415	-$1,739,544	-$244,776	-$11,301	-$1,590	$1,051,277	$147,928
2059		$0	$600,000	$81,180	$412,800	$55,852	$0	$0	$57,019	$7,715	$1,832,013	$247,872	$100,000	$13,530	-$201,901	-$27,317	-$1,738,998	-$235,287	-$11,248	-$1,522	$1,049,685	$142,023
2060		$0	$600,000	$78,058	$410,844	$53,449	$0	$0	$56,749	$7,383	$1,832,013	$238,339	$100,000	$13,010	-$201,865	-$26,262	-$1,738,452	-$226,167	-$11,194	-$1,456	$1,048,093	$136,353
2061		$0	$600,000	$75,056	$408,888	$51,149	$0	$0	$56,478	$7,065	$1,832,013	$229,172	$100,000	$12,509	-$201,830	-$25,248	-$1,737,906	-$217,400	-$11,141	-$1,394	$1,046,501	$130,910
2062		$0	$600,000	$72,169	$406,932	$48,946	$0	$0	$56,208	$6,761	$1,832,013	$220,358	$100,000	$12,028	-$201,795	-$24,272	-$1,737,361	-$208,973	-$11,088	-$1,334	$1,044,909	$125,683
2063		$0	$600,000	$69,393	$404,976	$46,838	$0	$0	$55,938	$6,470	$1,832,013	$211,882	$100,000	$11,566	-$201,760	-$23,335	-$1,736,815	-$200,872	-$11,034	-$1,276	$1,043,317	$120,665
2064		$0	$600,000	$66,724	$403,020	$44,819	$0	$0	$55,668	$6,191	$1,832,013	$203,733	$100,000	$11,121	-$201,725	-$22,433	-$1,736,269	-$193,086	-$10,981	-$1,221	$1,041,725	$115,847
2065		$0	$600,000	$64,158	$401,064	$42,886	$0	$0	$55,398	$5,924	$1,832,013	$195,897	$100,000	$10,693	-$201,689	-$21,567	-$1,735,723	-$185,601	-$10,928	-$1,169	$1,040,133	$111,221
Total Capital =	$183,201,280																					
Total Net Present Value =		$144,786,633		$10,250,768		$7,712,695		$0		$1,065,330		$31,299,229		$1,708,461		-$2,172,040		-$19,129,577		-$210,147		**$175,311,351**

RODERICK WWTF ASSUMPTIONS

Labour:

number of facility manager(s) =	1	**Ref:** Based on Jan 15/09 TM from T. Dokken.
number of operations staff =	5	
number of maintenance staff =	2	
number of administration staff =	0	
total staff =	8 persons	

Chemical Phosphorus Removal Chemicals:

chemical-P removal required (1 = yes, 0 = no)?	0	

Wet-Weather CEPT Chemicals:

fraction of total annual ADWF treated =	0.0%	**Note:** No secondary treatment bypass.

Saleable Heat Energy:

unit energy cost to third-party "heat recovery" utility =	$ 9.24 /GJ	**Ref:** This is the cost that a third-party heat recovery utility would incur to make the heat available to customers. Value is from Table 6 of Feb 10/09 memo from M. Homenuke, reduced by 4% to remove CRD share of capital cost.
unit CRD saleable energy price to third-party utility =	$ 4.76 /GJ	**Note:** This value is the difference between the general energy market unit price (from Generic Assumptions sheet) and the above value, which reflects the maximum amount the utility would be willing to pay the CRD for the heat.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 9, 2009
Last Revision By: D. Shiskowski

Subject: Raw Wastewater Heat Recovery
near Royal Jubilee Hospital
Option 3
Material Flows
and Carbon Footprint Analysis

Yellow-shaded cell denotes assumed/input values

Year	Saleable Wastewater Heat[1] (GJ/yr)	GHG Offsets Avoided Natural Gas/Elect Use via Wastewater Heat (t CO2e/yr)	Total GHG Emissions (t CO2e/yr)
2008			
2009			
2010			
2011			
2012			
2013			
2014			
2015	6,252	-237	-237
2016	8,005	-304	-304
2017	9,758	-370	-370
2018	11,512	-437	-437
2019	13,265	-504	-504
2020	15,018	-570	-570
2021	16,771	-637	-637
2022	18,524	-703	-703
2023	20,278	-770	-770
2024	22,031	-836	-836
2025	23,784	-903	-903
2026	25,537	-970	-970
2027	27,290	-1,036	-1,036
2028	29,043	-1,103	-1,103
2029	30,797	-1,169	-1,169
2030	32,550	-1,236	-1,236
2031	32,935	-1,250	-1,250
2032	33,320	-1,265	-1,265
2033	33,706	-1,280	-1,280
2034	34,091	-1,294	-1,294
2035	34,476	-1,309	-1,309
2036	34,861	-1,324	-1,324
2037	35,247	-1,338	-1,338
2038	35,632	-1,353	-1,353
2039	36,017	-1,367	-1,367
2040	36,402	-1,382	-1,382
2041	36,788	-1,397	-1,397
2042	37,173	-1,411	-1,411
2043	37,558	-1,426	-1,426
2044	37,943	-1,441	-1,441
2045	38,329	-1,455	-1,455
2046	40,062	-1,521	-1,521
2047	41,796	-1,587	-1,587
2048	43,530	-1,653	-1,653
2049	45,263	-1,719	-1,719
2050	46,997	-1,784	-1,784
2051	48,731	-1,850	-1,850
2052	50,464	-1,916	-1,916
2053	52,198	-1,982	-1,982
2054	53,932	-2,048	-2,048
2055	55,665	-2,113	-2,113
2056	57,399	-2,179	-2,179
2057	59,133	-2,245	-2,245
2058	60,866	-2,311	-2,311
2059	62,600	-2,377	-2,377
2060	64,334	-2,443	-2,443
2061	66,067	-2,508	-2,508
2062	67,801	-2,574	-2,574
2063	69,535	-2,640	-2,640
2064	71,268	-2,706	-2,706
2065	73,002	-2,772	-2,772
Totals =	1,975,535	-75,005	**-75,005**

Notes:
1. Data from M. Homenuke in Feb 4/09 e-mail, DES_SaleableHeatEnergy.xls, Saleable.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 17, 2009
Last Revision By: D. Shiskowski

Subject: Raw Wastewater Heat Recovery near Royal Jubilee Hospital

Life Cycle Analysis

Yellow-shaded cell denotes assumed/input values

Year	GHG CO2e		Heat Revenues		Total	
	Done Total Annual Cost	Done Net Present Value	Done Total Annual Rev	Done Net Present Value	Done Total Annual Cost	Done Net Present Value
2008						
2009						
2010						
2011						
2012						
2013						
2014					$0	$0
2015	-$3,561	-$2,706	-$32,783	-$24,912	-$36,344	-$27,618
2016	-$4,559	-$3,331	-$41,976	-$30,671	-$46,535	-$34,003
2017	-$5,557	-$3,905	-$51,169	-$35,950	-$56,726	-$39,855
2018	-$6,556	-$4,429	-$60,361	-$40,778	-$66,917	-$45,207
2019	-$7,554	-$4,907	-$69,554	-$45,181	-$77,108	-$50,088
2020	-$8,553	-$5,342	-$78,747	-$49,185	-$87,300	-$54,527
2021	-$9,551	-$5,736	-$87,940	-$52,814	-$97,491	-$58,551
2022	-$10,550	-$6,092	-$97,132	-$56,092	-$107,682	-$62,184
2023	-$11,548	-$6,412	-$106,325	-$59,039	-$117,873	-$65,451
2024	-$12,547	-$6,699	-$115,518	-$61,676	-$128,065	-$68,375
2025	-$13,545	-$6,954	-$124,711	-$64,023	-$138,256	-$70,977
2026	-$14,543	-$7,179	-$133,904	-$66,099	-$148,447	-$73,278
2027	-$15,542	-$7,377	-$143,096	-$67,920	-$158,638	-$75,296
2028	-$16,540	-$7,549	-$152,289	-$69,503	-$168,829	-$77,052
2029	-$17,539	-$7,697	-$161,482	-$70,864	-$179,021	-$78,560
2030	-$18,537	-$7,822	-$170,675	-$72,017	-$189,212	-$79,839
2031	-$18,757	-$7,610	-$172,695	-$70,067	-$191,451	-$77,677
2032	-$18,976	-$7,403	-$174,715	-$68,160	-$193,691	-$75,563
2033	-$19,195	-$7,201	-$176,735	-$66,296	-$195,930	-$73,497
2034	-$19,415	-$7,003	-$178,755	-$64,475	-$198,170	-$71,478
2035	-$19,634	-$6,809	-$180,775	-$62,696	-$200,409	-$69,505
2036	-$19,854	-$6,621	-$182,795	-$60,958	-$202,649	-$67,579
2037	-$20,073	-$6,436	-$184,815	-$59,261	-$204,888	-$65,698
2038	-$20,292	-$6,257	-$186,836	-$57,605	-$207,128	-$63,861
2039	-$20,512	-$6,081	-$188,856	-$55,988	-$209,367	-$62,069
2040	-$20,731	-$5,910	-$190,876	-$54,411	-$211,607	-$60,320
2041	-$20,951	-$5,742	-$192,896	-$52,872	-$213,846	-$58,614
2042	-$21,170	-$5,579	-$194,916	-$51,371	-$216,086	-$56,950
2043	-$21,389	-$5,420	-$196,936	-$49,907	-$218,325	-$55,327
2044	-$21,609	-$5,265	-$198,956	-$48,479	-$220,565	-$53,745
2045	-$21,828	-$5,114	-$200,976	-$47,088	-$222,804	-$52,202
2046	-$22,816	-$5,140	-$210,067	-$47,325	-$232,882	-$52,465
2047	-$23,803	-$5,156	-$219,157	-$47,474	-$242,960	-$52,630
2048	-$24,790	-$5,164	-$228,248	-$47,541	-$253,038	-$52,705
2049	-$25,778	-$5,163	-$237,338	-$47,534	-$263,116	-$52,696
2050	-$26,765	-$5,154	-$246,429	-$47,456	-$273,193	-$52,610
2051	-$27,752	-$5,139	-$255,519	-$47,314	-$283,271	-$52,453
2052	-$28,740	-$5,117	-$264,609	-$47,113	-$293,349	-$52,230
2053	-$29,727	-$5,089	-$273,700	-$46,857	-$303,427	-$51,946
2054	-$30,714	-$5,056	-$282,790	-$46,551	-$313,505	-$51,607
2055	-$31,701	-$5,018	-$291,881	-$46,200	-$323,582	-$51,217
2056	-$32,689	-$4,975	-$300,971	-$45,806	-$333,660	-$50,781
2057	-$33,676	-$4,928	-$310,062	-$45,375	-$343,738	-$50,303
2058	-$34,663	-$4,878	-$319,152	-$44,909	-$353,816	-$49,786
2059	-$35,651	-$4,824	-$328,243	-$44,411	-$363,893	-$49,235
2060	-$36,638	-$4,766	-$337,333	-$43,886	-$373,971	-$48,652
2061	-$37,625	-$4,707	-$346,424	-$43,335	-$384,049	-$48,042
2062	-$38,613	-$4,644	-$355,514	-$42,762	-$394,127	-$47,406
2063	-$39,600	-$4,580	-$364,605	-$42,169	-$404,205	-$46,748
2064	-$40,587	-$4,514	-$373,695	-$41,558	-$414,282	-$46,071
2065	-$41,575	-$4,446	-$382,785	-$40,931	-$424,360	-$45,377
Total Capital =	$0					
Total Net Present Value =	$0	$0	$0	$0	$0	$0	$0	-$287,044	-$2,642,863	$0	**-$2,929,907**

ROYAL JUBILEE HOSPITAL

Saleable Heat Energy:
unit energy cost to third-party "heat recovery" utility = $ 8.76 /GJ
unit CRD saleable energy price to third-party utility = $ 5.24 /GJ

Ref: This is the cost that a third-party heat recovery utility would incur to make the heat available to customers. Value is from Table 6 of Feb 10/09 memo from M. Homenuke, reduced by 17% to remove CRD share of capital cost.

Note: This value is the difference between the general energy market unit price (from Generic Assumptions sheet) and the above value, which reflects the maximum amount the utility would be willing to pay the CRD for the heat.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 7, 2009
Last Revision By: D. Shiskowski

Subject: Macaulay/McLouglin WWTF Outfall Pumping Option 3

Material Flows and Carbon Footprint Analysis

Yellow-shaded cell denotes assumed/input values

Year	Effluent ADWF		ADWF Friction Losses Unit	ADWF Friction Losses Total	TDH	Velocity	Pump Energy	Materials Electricity	GHG Sources Electricity Purchased	Total GHG Emissions
	(m3/d)	(L/s)	(m/m)	(m)	(m)	(m/s)	(kW)	(kWh/yr)	(t CO2e/yr)	(t CO2e/yr)
2008										
2009										
2010										
2011										
2012										
2013										
2014										
2015	13,205	153	0.000016	0.03	4.8	0.12	10.2	89,578	6	6
2016	13,147	152	0.000016	0.03	4.8	0.12	10.2	89,178	6	6
2017	13,089	151	0.000016	0.03	4.8	0.12	10.1	88,779	6	6
2018	13,031	151	0.000015	0.03	4.8	0.12	10.1	88,380	6	6
2019	12,973	150	0.000015	0.03	4.8	0.12	10.0	87,981	6	6
2020	12,915	149	0.000015	0.03	4.8	0.12	10.0	87,582	6	6
2021	12,857	149	0.000015	0.03	4.8	0.12	10.0	87,183	6	6
2022	12,799	148	0.000015	0.03	4.8	0.12	9.9	86,785	6	6
2023	12,740	147	0.000015	0.03	4.8	0.12	9.9	86,386	6	6
2024	12,682	147	0.000015	0.03	4.8	0.12	9.8	85,987	6	6
2025	12,624	146	0.000015	0.03	4.8	0.12	9.8	85,589	6	6
2026	12,566	145	0.000014	0.03	4.8	0.12	9.7	85,190	6	6
2027	12,508	145	0.000014	0.03	4.8	0.12	9.7	84,792	6	6
2028	12,450	144	0.000014	0.03	4.8	0.12	9.6	84,393	6	6
2029	12,392	143	0.000014	0.03	4.8	0.12	9.6	83,995	6	6
2030	12,334	143	0.000014	0.03	4.8	0.12	9.5	83,597	6	6
2031	12,303	142	0.000014	0.03	4.8	0.12	9.5	83,383	6	6
2032	12,272	142	0.000014	0.03	4.8	0.12	9.5	83,169	6	6
2033	12,240	142	0.000014	0.03	4.8	0.12	9.5	82,955	6	6
2034	12,209	141	0.000014	0.03	4.8	0.12	9.4	82,741	6	6
2035	12,178	141	0.000014	0.03	4.8	0.11	9.4	82,527	6	6
2036	12,147	141	0.000014	0.03	4.8	0.11	9.4	82,313	6	6
2037	12,116	140	0.000014	0.03	4.8	0.11	9.4	82,099	6	6
2038	12,084	140	0.000013	0.03	4.8	0.11	9.3	81,885	6	6
2039	12,053	140	0.000013	0.03	4.8	0.11	9.3	81,671	6	6
2040	12,022	139	0.000013	0.03	4.8	0.11	9.3	81,458	6	6
2041	11,991	139	0.000013	0.03	4.8	0.11	9.3	81,244	6	6
2042	11,960	138	0.000013	0.03	4.8	0.11	9.3	81,030	6	6
2043	11,928	138	0.000013	0.03	4.8	0.11	9.2	80,816	6	6
2044	11,897	138	0.000013	0.03	4.8	0.11	9.2	80,603	6	6
2045	11,866	137	0.000013	0.03	4.8	0.11	9.2	80,389	6	6
2046	11,878	137	0.000013	0.03	4.8	0.11	9.2	80,471	6	6
2047	11,890	138	0.000013	0.03	4.8	0.11	9.2	80,553	6	6
2048	11,902	138	0.000013	0.03	4.8	0.11	9.2	80,634	6	6
2049	11,914	138	0.000013	0.03	4.8	0.11	9.2	80,716	6	6
2050	11,926	138	0.000013	0.03	4.8	0.11	9.2	80,798	6	6
2051	11,938	138	0.000013	0.03	4.8	0.11	9.2	80,880	6	6
2052	11,950	138	0.000013	0.03	4.8	0.11	9.2	80,962	6	6
2053	11,962	138	0.000013	0.03	4.8	0.11	9.3	81,044	6	6
2054	11,974	139	0.000013	0.03	4.8	0.11	9.3	81,126	6	6
2055	11,986	139	0.000013	0.03	4.8	0.11	9.3	81,208	6	6
2056	11,997	139	0.000013	0.03	4.8	0.11	9.3	81,289	6	6
2057	12,009	139	0.000013	0.03	4.8	0.11	9.3	81,371	6	6
2058	12,021	139	0.000013	0.03	4.8	0.11	9.3	81,453	6	6
2059	12,033	139	0.000013	0.03	4.8	0.11	9.3	81,535	6	6
2060	12,045	139	0.000013	0.03	4.8	0.11	9.3	81,617	6	6
2061	12,057	140	0.000013	0.03	4.8	0.11	9.3	81,699	6	6
2062	12,069	140	0.000013	0.03	4.8	0.11	9.3	81,781	6	6
2063	12,081	140	0.000013	0.03	4.8	0.11	9.3	81,863	6	6
2064	12,093	140	0.000013	0.03	4.8	0.11	9.4	81,945	6	6
2065	12,105	140	0.000013	0.03	4.8	0.11	9.4	82,027	6	6
Totals =								4,238,630	305	**305**

MACAULAY / MCLOUGHLIN WWTF OUTFALL PUMPING

static head =	2.03	m
effluent discharge depth =	61.0	m
effluent density @ 20°C =	998.2	kg/m3
ocean water density @ 10°C =	1026.2	kg/m3
seawater density adjustment =	1.7	m
diffuser exit loss allowance =	1.0	m
friction C value =	120	
forcemain diameter =	1250	mm
forcemain X-area =	1.2271	m^2
forcemain length =	2,200	m
pump efficiency =	70%	
fluid specific weight =	9.81	kN/m^3

Ref: M. Maynard file est_Outfall&Interceptor Cost Estimates_20090206.xls.

Ref: Assumes effluent is fresh water. Table A.1, Fischer et al (1979).

Ref: Assumes ocean salinity of 34 o/oo. Table A.2, Fischer et al (1979).

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File:	20062935.04.E.03.06	**Subject:**	Macaulay/McLouglin WWTF
Prepared:	D. Shiskowski		Outfall Pumping
Last Revision:	**February 7, 2009**		Option 3
Last Revision By:	**D. Shiskowski**		Life Cycle Analysis

Yellow-shaded cell denotes assumed/input values

Year	Operations Costs Electricity		GHG CO2e		Total	
	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value
2008						
2009						
2010						
2011						
2012						
2013						
2014						
2015	$6,270	$4,765	$97	$74	$6,367	$4,839
2016	$6,242	$4,561	$96	$70	$6,339	$4,632
2017	$6,215	$4,366	$96	$67	$6,310	$4,434
2018	$6,187	$4,179	$95	$64	$6,282	$4,244
2019	$6,159	$4,001	$95	$62	$6,254	$4,062
2020	$6,131	$3,829	$95	$59	$6,225	$3,888
2021	$6,103	$3,665	$94	$57	$6,197	$3,722
2022	$6,075	$3,508	$94	$54	$6,169	$3,562
2023	$6,047	$3,358	$93	$52	$6,140	$3,409
2024	$6,019	$3,214	$93	$50	$6,112	$3,263
2025	$5,991	$3,076	$92	$47	$6,084	$3,123
2026	$5,963	$2,944	$92	$45	$6,055	$2,989
2027	$5,935	$2,817	$92	$43	$6,027	$2,861
2028	$5,908	$2,696	$91	$42	$5,999	$2,738
2029	$5,880	$2,580	$91	$40	$5,970	$2,620
2030	$5,852	$2,469	$90	$38	$5,942	$2,507
2031	$5,837	$2,368	$90	$37	$5,927	$2,405
2032	$5,822	$2,271	$90	$35	$5,912	$2,306
2033	$5,807	$2,178	$90	$34	$5,896	$2,212
2034	$5,792	$2,089	$89	$32	$5,881	$2,121
2035	$5,777	$2,004	$89	$31	$5,866	$2,034
2036	$5,762	$1,921	$89	$30	$5,851	$1,951
2037	$5,747	$1,843	$89	$28	$5,836	$1,871
2038	$5,732	$1,767	$88	$27	$5,820	$1,795
2039	$5,717	$1,695	$88	$26	$5,805	$1,721
2040	$5,702	$1,625	$88	$25	$5,790	$1,650
2041	$5,687	$1,559	$88	$24	$5,775	$1,583
2042	$5,672	$1,495	$88	$23	$5,760	$1,518
2043	$5,657	$1,434	$87	$22	$5,744	$1,456
2044	$5,642	$1,375	$87	$21	$5,729	$1,396
2045	$5,627	$1,318	$87	$20	$5,714	$1,339
2046	$5,633	$1,269	$87	$20	$5,720	$1,289
2047	$5,639	$1,221	$87	$19	$5,726	$1,240
2048	$5,644	$1,176	$87	$18	$5,731	$1,194
2049	$5,650	$1,132	$87	$17	$5,737	$1,149
2050	$5,656	$1,089	$87	$17	$5,743	$1,106
2051	$5,662	$1,048	$87	$16	$5,749	$1,065
2052	$5,667	$1,009	$87	$16	$5,755	$1,025
2053	$5,673	$971	$88	$15	$5,761	$986
2054	$5,679	$935	$88	$14	$5,766	$949
2055	$5,685	$900	$88	$14	$5,772	$914
2056	$5,690	$866	$88	$13	$5,778	$879
2057	$5,696	$834	$88	$13	$5,784	$846
2058	$5,702	$802	$88	$12	$5,790	$815
2059	$5,707	$772	$88	$12	$5,796	$784
2060	$5,713	$743	$88	$11	$5,801	$755
2061	$5,719	$715	$88	$11	$5,807	$726
2062	$5,725	$689	$88	$11	$5,813	$699
2063	$5,730	$663	$88	$10	$5,819	$673
2064	$5,736	$638	$89	$10	$5,825	$648
2065	$5,742	$614	$89	$9	$5,830	$623
Total Net Present Value =		$101,057		$1,559		**$102,616**

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 7, 2009
Last Revision By: D. Shiskowski

Subject: Juan de Fuca WWTF Outfall Pumping Option 3

Material Flows and Carbon Footprint Analysis

Yellow-shaded cell denotes assumed/input values

Year	Effluent ADWF		ADWF Friction Losses Unit	ADWF Friction Losses Total	TDH	Velocity	Pump Energy	Materials Electricity	GHG Sources Electricity Purchased	Total GHG Emissions
	(m3/d)	(L/s)	(m/m)	(m)	(m)	(m/s)	(kW)	(kWh/yr)	(t CO2e/yr)	(t CO2e/yr)
2008										
2009										
2010										
2011										
2012										
2013										
2014										
2015	7,802	90	0.000863	0.92	15.4	0.57	19.5	170,935	12	12
2016	7,910	92	0.000885	0.94	15.4	0.58	19.8	173,578	12	12
2017	8,019	93	0.000908	0.97	15.5	0.58	20.1	176,232	13	13
2018	8,127	94	0.000931	0.99	15.5	0.59	20.4	178,897	13	13
2019	8,236	95	0.000954	1.02	15.5	0.60	20.7	181,573	13	13
2020	8,344	97	0.000977	1.04	15.5	0.61	21.0	184,259	13	13
2021	8,453	98	0.001001	1.07	15.6	0.62	21.3	186,957	13	13
2022	8,561	99	0.001025	1.09	15.6	0.62	21.7	189,665	14	14
2023	8,670	100	0.001049	1.12	15.6	0.63	22.0	192,385	14	14
2024	8,778	102	0.001073	1.14	15.6	0.64	22.3	195,116	14	14
2025	8,887	103	0.001098	1.17	15.7	0.65	22.6	197,859	14	14
2026	8,995	104	0.001123	1.20	15.7	0.65	22.9	200,613	14	14
2027	9,104	105	0.001148	1.22	15.7	0.66	23.2	203,379	15	15
2028	9,212	107	0.001174	1.25	15.7	0.67	23.5	206,157	15	15
2029	9,321	108	0.001199	1.28	15.8	0.68	23.9	208,947	15	15
2030	9,429	109	0.001225	1.30	15.8	0.69	24.2	211,749	15	15
2031	9,532	110	0.001250	1.33	15.8	0.69	24.5	214,429	15	15
2032	9,636	112	0.001275	1.36	15.9	0.70	24.8	217,121	16	16
2033	9,739	113	0.001301	1.39	15.9	0.71	25.1	219,824	16	16
2034	9,842	114	0.001327	1.41	15.9	0.72	25.4	222,539	16	16
2035	9,946	115	0.001352	1.44	15.9	0.72	25.7	225,265	16	16
2036	10,049	116	0.001379	1.47	16.0	0.73	26.0	228,002	16	16
2037	10,152	118	0.001405	1.50	16.0	0.74	26.3	230,751	17	17
2038	10,256	119	0.001431	1.52	16.0	0.75	26.7	233,512	17	17
2039	10,359	120	0.001458	1.55	16.1	0.75	27.0	236,285	17	17
2040	10,462	121	0.001485	1.58	16.1	0.76	27.3	239,070	17	17
2041	10,566	122	0.001513	1.61	16.1	0.77	27.6	241,867	17	17
2042	10,669	123	0.001540	1.64	16.1	0.78	27.9	244,676	18	18
2043	10,772	125	0.001568	1.67	16.2	0.78	28.3	247,497	18	18
2044	10,876	126	0.001596	1.70	16.2	0.79	28.6	250,331	18	18
2045	10,979	127	0.001624	1.73	16.2	0.80	28.9	253,178	18	18
2046	11,109	129	0.001659	1.77	16.3	0.81	29.3	256,768	18	18
2047	11,238	130	0.001695	1.81	16.3	0.82	29.7	260,379	19	19
2048	11,368	132	0.001732	1.84	16.3	0.83	30.1	264,009	19	19
2049	11,498	133	0.001769	1.88	16.4	0.84	30.6	267,661	19	19
2050	11,628	135	0.001806	1.92	16.4	0.85	31.0	271,332	20	20
2051	11,757	136	0.001843	1.96	16.5	0.86	31.4	275,025	20	20
2052	11,887	138	0.001881	2.00	16.5	0.87	31.8	278,739	20	20
2053	12,017	139	0.001919	2.04	16.5	0.87	32.2	282,474	20	20
2054	12,146	141	0.001958	2.08	16.6	0.88	32.7	286,230	21	21
2055	12,276	142	0.001996	2.13	16.6	0.89	33.1	290,008	21	21
2056	12,406	144	0.002036	2.17	16.7	0.90	33.5	293,808	21	21
2057	12,535	145	0.002075	2.21	16.7	0.91	34.0	297,630	21	21
2058	12,665	147	0.002115	2.25	16.8	0.92	34.4	301,474	22	22
2059	12,795	148	0.002155	2.30	16.8	0.93	34.9	305,341	22	22
2060	12,925	150	0.002196	2.34	16.8	0.94	35.3	309,230	22	22
2061	13,054	151	0.002237	2.38	16.9	0.95	35.7	313,142	23	23
2062	13,184	153	0.002278	2.43	16.9	0.96	36.2	317,077	23	23
2063	13,314	154	0.002320	2.47	17.0	0.97	36.6	321,035	23	23
2064	13,443	156	0.002362	2.52	17.0	0.98	37.1	325,016	23	23
2065	13,573	157	0.002404	2.56	17.1	0.99	37.6	329,021	24	24
Totals =								12,408,050	893	**893**

JUAN DE FUCA WWTF OUTFALL PUMPING

static head =	14.50	m
effluent discharge depth =		m
effluent density @ 20°C =	998.2	kg/m3
ocean water density @ 10°C =	1026.2	kg/m3
seawater density adjustment =	0.0	m
diffuser exit loss allowance =		m
friction C value =	120	
forcemain diameter =	450	mm
forcemain X-area =	0.1590	m^2
forcemain length =	1,065	m
pump efficiency =	70%	
fluid specific weight =	9.81	kN/m^3

Ref: M. Maynard file est_Outfall&Interceptor Cost Estimates_20090206.xls. Note that this is only to high-point on land; gravity the remainder of the way.
Ref: Assumes effluent is fresh water. Table A.1, Fischer et al (1979).
Ref: Assumes ocean salinity of 34 o/oo. Table A.2, Fischer et al (1979).

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File:	20062935.04.E.03.06	**Subject:**	Juan de Fuca WWTF
Prepared:	D. Shiskowski		Outfall Pumping
Last Revision:	**February 7, 2009**		Option 3
Last Revision By:	**D. Shiskowski**		Life Cycle Analysis

Yellow-shaded cell denotes assumed/input values

Year	Operations Costs Electricity		GHG CO2e		Total	
	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value
2008						
2009						
2010						
2011						
2012						
2013						
2014						
2015	$11,965	$9,093	$185	$140	$12,150	$9,233
2016	$12,150	$8,878	$187	$137	$12,338	$9,015
2017	$12,336	$8,667	$190	$134	$12,527	$8,801
2018	$12,523	$8,460	$193	$131	$12,716	$8,590
2019	$12,710	$8,256	$196	$127	$12,906	$8,384
2020	$12,898	$8,056	$199	$124	$13,097	$8,180
2021	$13,087	$7,860	$202	$121	$13,289	$7,981
2022	$13,277	$7,667	$205	$118	$13,481	$7,785
2023	$13,467	$7,478	$208	$115	$13,675	$7,593
2024	$13,658	$7,292	$211	$113	$13,869	$7,405
2025	$13,850	$7,110	$214	$110	$14,064	$7,220
2026	$14,043	$6,932	$217	$107	$14,260	$7,039
2027	$14,237	$6,757	$220	$104	$14,456	$6,862
2028	$14,431	$6,586	$223	$102	$14,654	$6,688
2029	$14,626	$6,419	$226	$99	$14,852	$6,518
2030	$14,822	$6,254	$229	$96	$15,051	$6,351
2031	$15,010	$6,090	$232	$94	$15,242	$6,184
2032	$15,198	$5,929	$234	$91	$15,433	$6,021
2033	$15,388	$5,772	$237	$89	$15,625	$5,861
2034	$15,578	$5,619	$240	$87	$15,818	$5,705
2035	$15,769	$5,469	$243	$84	$16,012	$5,553
2036	$15,960	$5,322	$246	$82	$16,206	$5,404
2037	$16,153	$5,179	$249	$80	$16,402	$5,259
2038	$16,346	$5,040	$252	$78	$16,598	$5,117
2039	$16,540	$4,903	$255	$76	$16,795	$4,979
2040	$16,735	$4,770	$258	$74	$16,993	$4,844
2041	$16,931	$4,641	$261	$72	$17,192	$4,712
2042	$17,127	$4,514	$264	$70	$17,392	$4,584
2043	$17,325	$4,390	$267	$68	$17,592	$4,458
2044	$17,523	$4,270	$270	$66	$17,794	$4,336
2045	$17,722	$4,152	$273	$64	$17,996	$4,216
2046	$17,974	$4,049	$277	$62	$18,251	$4,112
2047	$18,227	$3,948	$281	$61	$18,508	$4,009
2048	$18,481	$3,849	$285	$59	$18,766	$3,909
2049	$18,736	$3,752	$289	$58	$19,025	$3,810
2050	$18,993	$3,658	$293	$56	$19,286	$3,714
2051	$19,252	$3,565	$297	$55	$19,549	$3,620
2052	$19,512	$3,474	$301	$54	$19,813	$3,528
2053	$19,773	$3,385	$305	$52	$20,078	$3,437
2054	$20,036	$3,298	$309	$51	$20,345	$3,349
2055	$20,301	$3,213	$313	$50	$20,614	$3,263
2056	$20,567	$3,130	$317	$48	$20,884	$3,178
2057	$20,834	$3,049	$321	$47	$21,156	$3,096
2058	$21,103	$2,969	$326	$46	$21,429	$3,015
2059	$21,374	$2,892	$330	$45	$21,704	$2,937
2060	$21,646	$2,816	$334	$43	$21,980	$2,860
2061	$21,920	$2,742	$338	$42	$22,258	$2,784
2062	$22,195	$2,670	$342	$41	$22,538	$2,711
2063	$22,472	$2,599	$347	$40	$22,819	$2,639
2064	$22,751	$2,530	$351	$39	$23,102	$2,569
2065	$23,031	$2,463	$355	$38	$23,387	$2,501
Total Net Present Value =		$261,879		$4,040		**$265,920**

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 7, 2009
Last Revision By: D. Shiskowski

Subject: Ogden Point WWTF Outfall Pumping
Option 3

Material Flows
and Carbon Footprint Analysis

Yellow-shaded cell denotes assumed/input values

Year	Effluent ADWF		ADWF Friction Losses Unit	ADWF Friction Losses Total	TDH	Velocity	Pump Energy	Materials Electricity	GHG Sources Electricity Purchased	Total GHG Emissions
	(m3/d)	(L/s)	(m/m)	(m)	(m)	(m/s)	(kW)	(kWh/yr)	(t CO2e/yr)	(t CO2e/yr)
2008										
2009										
2010										
2011										
2012										
2013										
2014										
2015	24,128	279	0.002625	4.88	7.6	1.18	29.7	260,272	19	19
2016	24,020	278	0.002603	4.84	7.6	1.17	29.4	257,727	19	19
2017	23,912	277	0.002582	4.80	7.5	1.16	29.1	255,199	18	18
2018	23,804	276	0.002560	4.76	7.5	1.16	28.8	252,689	18	18
2019	23,695	274	0.002539	4.72	7.4	1.15	28.6	250,196	18	18
2020	23,587	273	0.002517	4.68	7.4	1.15	28.3	247,721	18	18
2021	23,479	272	0.002496	4.64	7.4	1.14	28.0	245,263	18	18
2022	23,371	270	0.002475	4.60	7.3	1.14	27.7	242,823	17	17
2023	23,263	269	0.002454	4.56	7.3	1.13	27.4	240,400	17	17
2024	23,155	268	0.002432	4.52	7.2	1.13	27.2	237,993	17	17
2025	23,047	267	0.002412	4.49	7.2	1.12	26.9	235,605	17	17
2026	22,939	265	0.002391	4.45	7.2	1.12	26.6	233,233	17	17
2027	22,830	264	0.002370	4.41	7.1	1.11	26.4	230,878	17	17
2028	22,722	263	0.002349	4.37	7.1	1.11	26.1	228,540	16	16
2029	22,614	262	0.002328	4.33	7.0	1.10	25.8	226,219	16	16
2030	22,506	260	0.002308	4.29	7.0	1.10	25.6	223,914	16	16
2031	22,465	260	0.002300	4.28	7.0	1.09	25.5	223,035	16	16
2032	22,423	260	0.002292	4.26	7.0	1.09	25.4	222,158	16	16
2033	22,382	259	0.002284	4.25	7.0	1.09	25.3	221,284	16	16
2034	22,340	259	0.002277	4.23	6.9	1.09	25.2	220,412	16	16
2035	22,299	258	0.002269	4.22	6.9	1.09	25.1	219,543	16	16
2036	22,257	258	0.002261	4.21	6.9	1.08	25.0	218,676	16	16
2037	22,216	257	0.002253	4.19	6.9	1.08	24.9	217,811	16	16
2038	22,174	257	0.002245	4.18	6.9	1.08	24.8	216,949	16	16
2039	22,133	256	0.002238	4.16	6.9	1.08	24.7	216,089	16	16
2040	22,091	256	0.002230	4.15	6.9	1.08	24.6	215,232	15	15
2041	22,050	255	0.002222	4.13	6.8	1.07	24.5	214,377	15	15
2042	22,008	255	0.002214	4.12	6.8	1.07	24.4	213,524	15	15
2043	21,967	254	0.002207	4.10	6.8	1.07	24.3	212,674	15	15
2044	21,925	254	0.002199	4.09	6.8	1.07	24.2	211,827	15	15
2045	21,884	253	0.002191	4.08	6.8	1.07	24.1	210,982	15	15
2046	21,794	252	0.002175	4.04	6.8	1.06	23.9	209,160	15	15
2047	21,705	251	0.002158	4.01	6.7	1.06	23.7	207,350	15	15
2048	21,615	250	0.002142	3.98	6.7	1.05	23.5	205,551	15	15
2049	21,525	249	0.002125	3.95	6.7	1.05	23.3	203,764	15	15
2050	21,435	248	0.002109	3.92	6.6	1.04	23.1	201,987	15	15
2051	21,346	247	0.002093	3.89	6.6	1.04	22.9	200,221	14	14
2052	21,256	246	0.002076	3.86	6.6	1.04	22.7	198,467	14	14
2053	21,166	245	0.002060	3.83	6.5	1.03	22.5	196,723	14	14
2054	21,076	244	0.002044	3.80	6.5	1.03	22.3	194,990	14	14
2055	20,987	243	0.002028	3.77	6.5	1.02	22.1	193,269	14	14
2056	20,897	242	0.002012	3.74	6.5	1.02	21.9	191,558	14	14
2057	20,807	241	0.001996	3.71	6.4	1.01	21.7	189,857	14	14
2058	20,717	240	0.001980	3.68	6.4	1.01	21.5	188,168	14	14
2059	20,628	239	0.001964	3.65	6.4	1.00	21.3	186,489	13	13
2060	20,538	238	0.001948	3.62	6.3	1.00	21.1	184,821	13	13
2061	20,448	237	0.001933	3.59	6.3	1.00	20.9	183,164	13	13
2062	20,358	236	0.001917	3.57	6.3	0.99	20.7	181,517	13	13
2063	20,269	235	0.001901	3.54	6.2	0.99	20.5	179,881	13	13
2064	20,179	234	0.001886	3.51	6.2	0.98	20.3	178,255	13	13
2065	20,089	233	0.001870	3.48	6.2	0.98	20.2	176,640	13	13
Totals =								10,975,078	790	**790**

OGDEN POINT WWTF OUTFALL PUMPING

static head =	0.00	m
effluent discharge depth =	61.0	m
effluent density @ 20°C =	998.2	kg/m3
ocean water density @ 10°C =	1026.2	kg/m3
seawater density adjustment =	1.7	m
diffuser exit loss allowance =	1.0	m
friction C value =	120	
forcemain diameter =	550	mm
forcemain X-area =	0.2376	m^2
forcemain length =	1,860	m
pump efficiency =	70%	
fluid specific weight =	9.81	kN/m^3

Ref: M. Maynard file est_Outfall&Interceptor Cost Estimates_20090206.xls.

Ref: Assumes effluent is fresh water. Table A.1, Fischer et al (1979).

Ref: Assumes ocean salinity of 34 o/oo. Table A.2, Fischer et al (1979).

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File:	20062935.04.E.03.06	**Subject:**	Odgen Point WWTF
Prepared:	D. Shiskowski		Outfall Pumping
Last Revision:	**February 7, 2009**		Option 3
Last Revision By:	**D. Shiskowski**		Life Cycle Analysis

Yellow-shaded cell denotes assumed/input values

Year	Operations Costs		GHG CO2e		Total	
	Electricity					
	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value
2008						
2009						
2010						
2011						
2012						
2013						
2014						
2015	$18,219	$13,845	$281	$214	$18,500	$14,059
2016	$18,041	$13,182	$278	$203	$18,319	$13,386
2017	$17,864	$12,551	$276	$194	$18,140	$12,745
2018	$17,688	$11,950	$273	$184	$17,961	$12,134
2019	$17,514	$11,377	$270	$176	$17,784	$11,552
2020	$17,340	$10,831	$268	$167	$17,608	$10,998
2021	$17,168	$10,311	$265	$159	$17,433	$10,470
2022	$16,998	$9,816	$262	$151	$17,260	$9,967
2023	$16,828	$9,344	$260	$144	$17,088	$9,488
2024	$16,660	$8,895	$257	$137	$16,917	$9,032
2025	$16,492	$8,467	$254	$131	$16,747	$8,597
2026	$16,326	$8,059	$252	$124	$16,578	$8,183
2027	$16,161	$7,671	$249	$118	$16,411	$7,789
2028	$15,998	$7,301	$247	$113	$16,245	$7,414
2029	$15,835	$6,949	$244	$107	$16,080	$7,056
2030	$15,674	$6,614	$242	$102	$15,916	$6,716
2031	$15,612	$6,334	$241	$98	$15,853	$6,432
2032	$15,551	$6,067	$240	$94	$15,791	$6,160
2033	$15,490	$5,811	$239	$90	$15,729	$5,900
2034	$15,429	$5,565	$238	$86	$15,667	$5,651
2035	$15,368	$5,330	$237	$82	$15,605	$5,412
2036	$15,307	$5,105	$236	$79	$15,543	$5,183
2037	$15,247	$4,889	$235	$75	$15,482	$4,964
2038	$15,186	$4,682	$234	$72	$15,421	$4,754
2039	$15,126	$4,484	$233	$69	$15,360	$4,554
2040	$15,066	$4,295	$232	$66	$15,299	$4,361
2041	$15,006	$4,113	$232	$63	$15,238	$4,177
2042	$14,947	$3,939	$231	$61	$15,177	$4,000
2043	$14,887	$3,773	$230	$58	$15,117	$3,831
2044	$14,828	$3,613	$229	$56	$15,057	$3,669
2045	$14,769	$3,460	$228	$53	$14,997	$3,514
2046	$14,641	$3,298	$226	$51	$14,867	$3,349
2047	$14,515	$3,144	$224	$49	$14,738	$3,193
2048	$14,389	$2,997	$222	$46	$14,611	$3,043
2049	$14,263	$2,857	$220	$44	$14,484	$2,901
2050	$14,139	$2,723	$218	$42	$14,357	$2,765
2051	$14,015	$2,595	$216	$40	$14,232	$2,635
2052	$13,893	$2,474	$214	$38	$14,107	$2,512
2053	$13,771	$2,358	$212	$36	$13,983	$2,394
2054	$13,649	$2,247	$211	$35	$13,860	$2,282
2055	$13,529	$2,141	$209	$33	$13,738	$2,174
2056	$13,409	$2,041	$207	$31	$13,616	$2,072
2057	$13,290	$1,945	$205	$30	$13,495	$1,975
2058	$13,172	$1,853	$203	$29	$13,375	$1,882
2059	$13,054	$1,766	$201	$27	$13,256	$1,793
2060	$12,937	$1,683	$200	$26	$13,137	$1,709
2061	$12,821	$1,604	$198	$25	$13,019	$1,629
2062	$12,706	$1,528	$196	$24	$12,902	$1,552
2063	$12,592	$1,456	$194	$22	$12,786	$1,479
2064	$12,478	$1,388	$193	$21	$12,670	$1,409
2065	$12,365	$1,322	$191	$20	$12,556	$1,343
Total Net Present Value =		$272,041		$4,197		**$276,239**

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 7, 2009
Last Revision By: D. Shiskowski

Subject: Windsor Park WWTF Outfall Pumping
Option 3

Material Flows
and Carbon Footprint Analysis

Yellow-shaded cell denotes assumed/input values

Year	Effluent ADWF		ADWF Friction Losses Unit	ADWF Friction Losses Total	TDH	Velocity	Pump Energy	Materials Electricity	GHG Sources Electricity Purchased	Total GHG Emissions
	(m3/d)	(L/s)	(m/m)	(m)	(m)	(m/s)	(kW)	(kWh/yr)	(t CO2e/yr)	(t CO2e/yr)
2008										
2009										
2010										
2011										
2012										
2013										
2014										
2015	14,433	167	0.002070	2.40	15.9	0.94	37.2	326,107	23	23
2016	14,370	166	0.002054	2.38	15.9	0.94	37.0	324,293	23	23
2017	14,307	166	0.002037	2.36	15.9	0.93	36.8	322,483	23	23
2018	14,244	165	0.002021	2.34	15.8	0.93	36.6	320,677	23	23
2019	14,182	164	0.002004	2.32	15.8	0.93	36.4	318,877	23	23
2020	14,119	163	0.001988	2.31	15.8	0.92	36.2	317,082	23	23
2021	14,056	163	0.001971	2.29	15.8	0.92	36.0	315,291	23	23
2022	13,993	162	0.001955	2.27	15.8	0.91	35.8	313,506	23	23
2023	13,930	161	0.001939	2.25	15.7	0.91	35.6	311,725	22	22
2024	13,867	161	0.001923	2.23	15.7	0.91	35.4	309,949	22	22
2025	13,804	160	0.001907	2.21	15.7	0.90	35.2	308,177	22	22
2026	13,741	159	0.001891	2.19	15.7	0.90	35.0	306,411	22	22
2027	13,679	158	0.001875	2.17	15.7	0.89	34.8	304,649	22	22
2028	13,616	158	0.001859	2.16	15.7	0.89	34.6	302,892	22	22
2029	13,553	157	0.001843	2.14	15.6	0.89	34.4	301,139	22	22
2030	13,490	156	0.001827	2.12	15.6	0.88	34.2	299,391	22	22
2031	13,458	156	0.001819	2.11	15.6	0.88	34.1	298,492	21	21
2032	13,425	155	0.001811	2.10	15.6	0.88	34.0	297,595	21	21
2033	13,393	155	0.001803	2.09	15.6	0.87	33.9	296,698	21	21
2034	13,360	155	0.001795	2.08	15.6	0.87	33.8	295,803	21	21
2035	13,328	154	0.001787	2.07	15.6	0.87	33.7	294,909	21	21
2036	13,296	154	0.001779	2.06	15.6	0.87	33.6	294,016	21	21
2037	13,263	154	0.001771	2.05	15.6	0.87	33.5	293,124	21	21
2038	13,231	153	0.001763	2.04	15.5	0.86	33.4	292,234	21	21
2039	13,198	153	0.001755	2.04	15.5	0.86	33.3	291,345	21	21
2040	13,166	152	0.001747	2.03	15.5	0.86	33.2	290,457	21	21
2041	13,134	152	0.001739	2.02	15.5	0.86	33.1	289,570	21	21
2042	13,101	152	0.001731	2.01	15.5	0.86	33.0	288,685	21	21
2043	13,069	151	0.001723	2.00	15.5	0.85	32.9	287,800	21	21
2044	13,036	151	0.001715	1.99	15.5	0.85	32.8	286,917	21	21
2045	13,004	151	0.001707	1.98	15.5	0.85	32.7	286,035	21	21
2046	12,961	150	0.001697	1.97	15.5	0.85	32.5	284,867	21	21
2047	12,918	150	0.001686	1.96	15.5	0.84	32.4	283,700	20	20
2048	12,875	149	0.001676	1.94	15.4	0.84	32.3	282,536	20	20
2049	12,832	149	0.001666	1.93	15.4	0.84	32.1	281,373	20	20
2050	12,789	148	0.001655	1.92	15.4	0.84	32.0	280,213	20	20
2051	12,746	148	0.001645	1.91	15.4	0.83	31.9	279,055	20	20
2052	12,703	147	0.001635	1.90	15.4	0.83	31.7	277,899	20	20
2053	12,660	147	0.001625	1.88	15.4	0.83	31.6	276,745	20	20
2054	12,617	146	0.001614	1.87	15.4	0.82	31.5	275,593	20	20
2055	12,574	146	0.001604	1.86	15.4	0.82	31.3	274,443	20	20
2056	12,531	145	0.001594	1.85	15.3	0.82	31.2	273,295	20	20
2057	12,488	145	0.001584	1.84	15.3	0.82	31.1	272,149	20	20
2058	12,445	144	0.001574	1.83	15.3	0.81	30.9	271,006	20	20
2059	12,402	144	0.001564	1.81	15.3	0.81	30.8	269,864	19	19
2060	12,359	143	0.001554	1.80	15.3	0.81	30.7	268,724	19	19
2061	12,316	143	0.001544	1.79	15.3	0.80	30.5	267,586	19	19
2062	12,273	142	0.001534	1.78	15.3	0.80	30.4	266,451	19	19
2063	12,230	142	0.001524	1.77	15.3	0.80	30.3	265,317	19	19
2064	12,187	141	0.001514	1.76	15.3	0.80	30.2	264,185	19	19
2065	12,144	141	0.001504	1.74	15.2	0.79	30.0	263,056	19	19
Totals =								14,864,389	1,070	**1,070**

WINDSOR PARK WWTF OUTFALL PUMPING

static head =	13.50	m
effluent discharge depth =		m
effluent density @ 20°C =	998.2	kg/m3
ocean water density @ 10°C =	1026.2	kg/m3
seawater density adjustment =	0.0	m
diffuser exit loss allowance =		m
friction C value =	120	
forcemain diameter =	475	mm
forcemain X-area =	0.1772	m^2
forcemain length =	1,160	m
pump efficiency =	70%	
fluid specific weight =	9.81	kN/m^3

Ref: M. Maynard file est_Outfall&Interceptor Cost Estimates_20090206.xls. Note that this is only to high-point on land; gravity the remainder of the way.
Ref: Assumes effluent is fresh water. Table A.1, Fischer et al (1979).
Ref: Assumes ocean salinity of 34 o/oo. Table A.2, Fischer et al (1979).

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File:	20062935.04.E.03.06	**Subject:**	Windsor Park WWTF
Prepared:	D. Shiskowski		Outfall Pumping
Last Revision:	**February 7, 2009**		Option 3
Last Revision By:	**D. Shiskowski**		Life Cycle Analysis

Yellow-shaded cell denotes assumed/input values

Year	Operations Costs Electricity		GHG CO2e		Total	
	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value
2008						
2009						
2010						
2011						
2012						
2013						
2014						
2015	$22,828	$17,347	$352	$268	$23,180	$17,615
2016	$22,700	$16,587	$350	$256	$23,051	$16,843
2017	$22,574	$15,860	$348	$245	$22,922	$16,105
2018	$22,447	$15,165	$346	$234	$22,794	$15,399
2019	$22,321	$14,500	$344	$224	$22,666	$14,723
2020	$22,196	$13,863	$342	$214	$22,538	$14,077
2021	$22,070	$13,255	$341	$205	$22,411	$13,459
2022	$21,945	$12,673	$339	$196	$22,284	$12,868
2023	$21,821	$12,116	$337	$187	$22,157	$12,303
2024	$21,696	$11,584	$335	$179	$22,031	$11,763
2025	$21,572	$11,075	$333	$171	$21,905	$11,246
2026	$21,449	$10,588	$331	$163	$21,780	$10,751
2027	$21,325	$10,122	$329	$156	$21,654	$10,278
2028	$21,202	$9,677	$327	$149	$21,530	$9,826
2029	$21,080	$9,251	$325	$143	$21,405	$9,393
2030	$20,957	$8,843	$323	$136	$21,281	$8,980
2031	$20,894	$8,477	$322	$131	$21,217	$8,608
2032	$20,832	$8,127	$321	$125	$21,153	$8,252
2033	$20,769	$7,791	$320	$120	$21,089	$7,911
2034	$20,706	$7,469	$319	$115	$21,026	$7,584
2035	$20,644	$7,160	$319	$110	$20,962	$7,270
2036	$20,581	$6,863	$318	$106	$20,899	$6,969
2037	$20,519	$6,579	$317	$102	$20,835	$6,681
2038	$20,456	$6,307	$316	$97	$20,772	$6,404
2039	$20,394	$6,046	$315	$93	$20,709	$6,139
2040	$20,332	$5,796	$314	$89	$20,646	$5,885
2041	$20,270	$5,556	$313	$86	$20,583	$5,642
2042	$20,208	$5,326	$312	$82	$20,520	$5,408
2043	$20,146	$5,105	$311	$79	$20,457	$5,184
2044	$20,084	$4,894	$310	$76	$20,394	$4,969
2045	$20,022	$4,691	$309	$72	$20,331	$4,764
2046	$19,941	$4,492	$308	$69	$20,248	$4,562
2047	$19,859	$4,302	$306	$66	$20,165	$4,368
2048	$19,777	$4,119	$305	$64	$20,083	$4,183
2049	$19,696	$3,945	$304	$61	$20,000	$4,006
2050	$19,615	$3,777	$303	$58	$19,918	$3,836
2051	$19,534	$3,617	$301	$56	$19,835	$3,673
2052	$19,453	$3,464	$300	$53	$19,753	$3,517
2053	$19,372	$3,316	$299	$51	$19,671	$3,368
2054	$19,292	$3,176	$298	$49	$19,589	$3,225
2055	$19,211	$3,041	$296	$47	$19,507	$3,088
2056	$19,131	$2,912	$295	$45	$19,426	$2,957
2057	$19,050	$2,788	$294	$43	$19,344	$2,831
2058	$18,970	$2,669	$293	$41	$19,263	$2,711
2059	$18,890	$2,556	$291	$39	$19,182	$2,595
2060	$18,811	$2,447	$290	$38	$19,101	$2,485
2061	$18,731	$2,343	$289	$36	$19,020	$2,379
2062	$18,652	$2,243	$288	$35	$18,939	$2,278
2063	$18,572	$2,148	$287	$33	$18,859	$2,181
2064	$18,493	$2,057	$285	$32	$18,778	$2,088
2065	$18,414	$1,969	$284	$30	$18,698	$1,999
Total Net Present Value =		$360,072		$5,555		**$365,628**

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 7, 2009
Last Revision By: D. Shiskowski

Subject: Roderick WWTF Outfall Pumping
Option 3

Material Flows
and Carbon Footprint Analysis

Yellow-shaded cell denotes assumed/input values

Year	Effluent ADWF		ADWF Friction Losses Unit	ADWF Friction Losses Total	TDH	Velocity	Pump Energy	Materials Electricity	GHG Sources Electricity Purchased	Total GHG Emissions
	(m3/d)	(L/s)	(m/m)	(m)	(m)	(m/s)	(kW)	(kWh/yr)	(t CO2e/yr)	(t CO2e/yr)
2008										
2009										
2010										
2011										
2012										
2013										
2014										
2015	24,604	285	0.002722	2.86	15.4	1.20	61.3	536,899	39	39
2016	24,524	284	0.002705	2.84	15.3	1.19	61.0	534,557	38	38
2017	24,444	283	0.002689	2.82	15.3	1.19	60.8	532,221	38	38
2018	24,364	282	0.002673	2.81	15.3	1.19	60.5	529,890	38	38
2019	24,284	281	0.002657	2.79	15.3	1.18	60.2	527,564	38	38
2020	24,204	280	0.002640	2.77	15.3	1.18	60.0	525,245	38	38
2021	24,124	279	0.002624	2.76	15.3	1.18	59.7	522,930	38	38
2022	24,044	278	0.002608	2.74	15.2	1.17	59.4	520,621	37	37
2023	23,965	277	0.002592	2.72	15.2	1.17	59.2	518,318	37	37
2024	23,885	276	0.002576	2.71	15.2	1.16	58.9	516,020	37	37
2025	23,805	276	0.002560	2.69	15.2	1.16	58.6	513,727	37	37
2026	23,725	275	0.002544	2.67	15.2	1.16	58.4	511,440	37	37
2027	23,645	274	0.002529	2.65	15.2	1.15	58.1	509,158	37	37
2028	23,565	273	0.002513	2.64	15.1	1.15	57.9	506,882	36	36
2029	23,485	272	0.002497	2.62	15.1	1.14	57.6	504,611	36	36
2030	23,405	271	0.002481	2.61	15.1	1.14	57.3	502,345	36	36
2031	23,366	270	0.002474	2.60	15.1	1.14	57.2	501,240	36	36
2032	23,327	270	0.002466	2.59	15.1	1.14	57.1	500,135	36	36
2033	23,288	270	0.002458	2.58	15.1	1.13	57.0	499,033	36	36
2034	23,249	269	0.002451	2.57	15.1	1.13	56.8	497,931	36	36
2035	23,210	269	0.002443	2.57	15.1	1.13	56.7	496,831	36	36
2036	23,171	268	0.002436	2.56	15.1	1.13	56.6	495,732	36	36
2037	23,132	268	0.002428	2.55	15.0	1.13	56.5	494,634	36	36
2038	23,092	267	0.002420	2.54	15.0	1.13	56.3	493,537	36	36
2039	23,053	267	0.002413	2.53	15.0	1.12	56.2	492,442	35	35
2040	23,014	266	0.002405	2.53	15.0	1.12	56.1	491,348	35	35
2041	22,975	266	0.002398	2.52	15.0	1.12	56.0	490,255	35	35
2042	22,936	265	0.002390	2.51	15.0	1.12	55.8	489,164	35	35
2043	22,897	265	0.002383	2.50	15.0	1.12	55.7	488,073	35	35
2044	22,858	265	0.002375	2.49	15.0	1.11	55.6	486,984	35	35
2045	22,819	264	0.002368	2.49	15.0	1.11	55.5	485,896	35	35
2046	22,718	263	0.002348	2.47	15.0	1.11	55.1	483,079	35	35
2047	22,616	262	0.002329	2.45	14.9	1.10	54.8	480,270	35	35
2048	22,515	261	0.002310	2.43	14.9	1.10	54.5	477,469	34	34
2049	22,413	259	0.002290	2.40	14.9	1.09	54.2	474,676	34	34
2050	22,312	258	0.002271	2.38	14.9	1.09	53.9	471,892	34	34
2051	22,211	257	0.002252	2.36	14.9	1.08	53.6	469,116	34	34
2052	22,109	256	0.002233	2.34	14.8	1.08	53.2	466,348	34	34
2053	22,008	255	0.002214	2.32	14.8	1.07	52.9	463,588	33	33
2054	21,906	254	0.002195	2.31	14.8	1.07	52.6	460,836	33	33
2055	21,805	252	0.002177	2.29	14.8	1.06	52.3	458,093	33	33
2056	21,704	251	0.002158	2.27	14.8	1.06	52.0	455,357	33	33
2057	21,602	250	0.002139	2.25	14.7	1.05	51.7	452,630	33	33
2058	21,501	249	0.002121	2.23	14.7	1.05	51.4	449,911	32	32
2059	21,399	248	0.002102	2.21	14.7	1.04	51.1	447,199	32	32
2060	21,298	247	0.002084	2.19	14.7	1.04	50.7	444,496	32	32
2061	21,197	245	0.002066	2.17	14.7	1.03	50.4	441,800	32	32
2062	21,095	244	0.002047	2.15	14.6	1.03	50.1	439,113	32	32
2063	20,994	243	0.002029	2.13	14.6	1.02	49.8	436,433	31	31
2064	20,892	242	0.002011	2.11	14.6	1.02	49.5	433,761	31	31
2065	20,791	241	0.001993	2.09	14.6	1.01	49.2	431,097	31	31
Totals =								24,852,824	1,789	**1,789**

RODERICK WWTF OUTFALL PUMPING

static head =	12.50	m
effluent discharge depth =		m
effluent density @ 20°C =	998.2	kg/m3
ocean water density @ 10°C =	1026.2	kg/m3
seawater density adjustment =	0.0	m
diffuser exit loss allowance =		m
friction C value =	120	
forcemain diameter =	550	mm
forcemain X-area =	0.2376	m^2
forcemain length =	1,050	m
pump efficiency =	70%	
fluid specific weight =	9.81	kN/m^3

Ref: M. Maynard file est_Outfall&Interceptor Cost Estimates_20090206.xls. Note that this is only to high-point on land; gravity the remainder of the way.
Ref: Assumes effluent is fresh water. Table A.1, Fischer et al (1979).
Ref: Assumes ocean salinity of 34 o/oo. Table A.2, Fischer et al (1979).

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File:	20062935.04.E.03.06	**Subject:**	Roderick WWTF
Prepared:	D. Shiskowski		Outfall Pumping
Last Revision:	**February 7, 2009**		Option 3
Last Revision By:	**D. Shiskowski**		Life Cycle Analysis

Yellow-shaded cell denotes assumed/input values

Year	Operations Costs		GHG CO2e		Total	
	Electricity					
	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value
2008						
2009						
2010						
2011						
2012						
2013						
2014						
2015	$37,583	$28,560	$580	$441	$38,163	$29,001
2016	$37,419	$27,342	$577	$422	$37,996	$27,764
2017	$37,255	$26,175	$575	$404	$37,830	$26,579
2018	$37,092	$25,058	$572	$387	$37,665	$25,445
2019	$36,930	$23,989	$570	$370	$37,499	$24,359
2020	$36,767	$22,965	$567	$354	$37,334	$23,319
2021	$36,605	$21,984	$565	$339	$37,170	$22,323
2022	$36,443	$21,045	$562	$325	$37,006	$21,370
2023	$36,282	$20,146	$560	$311	$36,842	$20,457
2024	$36,121	$19,286	$557	$298	$36,679	$19,583
2025	$35,961	$18,461	$555	$285	$36,516	$18,746
2026	$35,801	$17,672	$552	$273	$36,353	$17,945
2027	$35,641	$16,917	$550	$261	$36,191	$17,178
2028	$35,482	$16,193	$547	$250	$36,029	$16,443
2029	$35,323	$15,501	$545	$239	$35,868	$15,740
2030	$35,164	$14,838	$543	$229	$35,707	$15,067
2031	$35,087	$14,236	$541	$220	$35,628	$14,455
2032	$35,009	$13,658	$540	$211	$35,550	$13,869
2033	$34,932	$13,104	$539	$202	$35,471	$13,306
2034	$34,855	$12,572	$538	$194	$35,393	$12,766
2035	$34,778	$12,062	$537	$186	$35,315	$12,248
2036	$34,701	$11,572	$535	$179	$35,237	$11,751
2037	$34,624	$11,102	$534	$171	$35,159	$11,274
2038	$34,548	$10,652	$533	$164	$35,081	$10,816
2039	$34,471	$10,219	$532	$158	$35,003	$10,377
2040	$34,394	$9,804	$531	$151	$34,925	$9,956
2041	$34,318	$9,406	$529	$145	$34,847	$9,551
2042	$34,241	$9,024	$528	$139	$34,770	$9,164
2043	$34,165	$8,658	$527	$134	$34,692	$8,792
2044	$34,089	$8,306	$526	$128	$34,615	$8,435
2045	$34,013	$7,969	$525	$123	$34,538	$8,092
2046	$33,816	$7,618	$522	$118	$34,337	$7,736
2047	$33,619	$7,283	$519	$112	$34,138	$7,395
2048	$33,423	$6,962	$516	$107	$33,938	$7,069
2049	$33,227	$6,655	$513	$103	$33,740	$6,757
2050	$33,032	$6,361	$510	$98	$33,542	$6,459
2051	$32,838	$6,081	$507	$94	$33,345	$6,174
2052	$32,644	$5,812	$504	$90	$33,148	$5,902
2053	$32,451	$5,556	$501	$86	$32,952	$5,641
2054	$32,259	$5,310	$498	$82	$32,756	$5,392
2055	$32,066	$5,076	$495	$78	$32,561	$5,154
2056	$31,875	$4,851	$492	$75	$32,367	$4,926
2057	$31,684	$4,637	$489	$72	$32,173	$4,708
2058	$31,494	$4,432	$486	$68	$31,980	$4,500
2059	$31,304	$4,235	$483	$65	$31,787	$4,301
2060	$31,115	$4,048	$480	$62	$31,595	$4,110
2061	$30,926	$3,869	$477	$60	$31,403	$3,928
2062	$30,738	$3,697	$474	$57	$31,212	$3,754
2063	$30,550	$3,533	$471	$55	$31,022	$3,588
2064	$30,363	$3,377	$468	$52	$30,832	$3,429
2065	$30,177	$3,227	$466	$50	$30,642	$3,277
Total Net Present Value =		$601,094		$9,274		**$610,368**

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 8, 2009
Last Revision By: D. Shiskowski

Subject: Florence Lake WWTF - Effluent Pump Station
to Common Pipe (i.e. shared with Westhills WWTF)
Option 3
Material Flows
and Carbon Footprint Analysis

Yellow-shaded cell denotes assumed/input values

Year	Wastewater ADWF		ADWF Friction Losses		TDH	Velocity	Pump Energy	Materials	GHG Sources	Total GHG Emissions
			Unit	Total				Electricity	Electricity Purchased	
	(m3/d)	(L/s)	(m/m)	(m)	(m)	(m/s)	(kW)	(kWh/yr)	(t CO2e/yr)	(t CO2e/yr)
2008										
2009										
2010										
2011										
2012										
2013										
2014										
2015	1,430	17	0.000127	0.38	20.4	0.17	4.7	20,706	1.5	1.5
2016	1,493	17	0.000138	0.41	20.4	0.18	4.9	21,651	1.6	1.6
2017	1,556	18	0.000148	0.45	20.4	0.19	5.2	22,600	1.6	1.6
2018	1,619	19	0.000160	0.48	20.5	0.19	5.4	23,553	1.7	1.7
2019	1,682	19	0.000171	0.51	20.5	0.20	5.6	24,510	1.8	1.8
2020	1,745	20	0.000184	0.55	20.6	0.21	5.8	25,472	1.8	1.8
2021	1,808	21	0.000196	0.59	20.6	0.22	6.0	26,439	1.9	1.9
2022	1,871	22	0.000209	0.63	20.6	0.23	6.3	27,411	2.0	2.0
2023	1,933	22	0.000222	0.67	20.7	0.23	6.5	28,387	2.0	2.0
2024	1,996	23	0.000236	0.71	20.7	0.24	6.7	29,369	2.1	2.1
2025	2,059	24	0.000249	0.75	20.7	0.25	6.9	30,356	2.2	2.2
2026	2,122	25	0.000264	0.79	20.8	0.26	7.2	31,348	2.3	2.3
2027	2,185	25	0.000278	0.84	20.8	0.26	7.4	32,346	2.3	2.3
2028	2,248	26	0.000293	0.88	20.9	0.27	7.6	33,349	2.4	2.4
2029	2,311	27	0.000309	0.93	20.9	0.28	7.8	34,359	2.5	2.5
2030	2,374	27	0.000324	0.97	21.0	0.29	8.1	35,374	2.5	2.5
2031	2,420	28	0.000336	1.01	21.0	0.29	8.2	36,115	2.6	2.6
2032	2,465	29	0.000348	1.04	21.0	0.30	8.4	36,860	2.7	2.7
2033	2,511	29	0.000360	1.08	21.1	0.30	8.6	37,608	2.7	2.7
2034	2,557	30	0.000372	1.12	21.1	0.31	8.8	38,360	2.8	2.8
2035	2,603	30	0.000385	1.15	21.2	0.31	8.9	39,115	2.8	2.8
2036	2,648	31	0.000397	1.19	21.2	0.32	9.1	39,873	2.9	2.9
2037	2,694	31	0.000410	1.23	21.2	0.32	9.3	40,635	2.9	2.9
2038	2,740	32	0.000423	1.27	21.3	0.33	9.5	41,401	3.0	3.0
2039	2,786	32	0.000436	1.31	21.3	0.34	9.6	42,170	3.0	3.0
2040	2,831	33	0.000449	1.35	21.3	0.34	9.8	42,943	3.1	3.1
2041	2,877	33	0.000463	1.39	21.4	0.35	10.0	43,719	3.1	3.1
2042	2,923	34	0.000477	1.43	21.4	0.35	10.2	44,500	3.2	3.2
2043	2,969	34	0.000491	1.47	21.5	0.36	10.3	45,284	3.3	3.3
2044	3,014	35	0.000505	1.51	21.5	0.36	10.5	46,072	3.3	3.3
2045	3,060	35	0.000519	1.56	21.6	0.37	10.7	46,864	3.4	3.4
2046	3,110	36	0.000535	1.60	21.6	0.37	10.9	47,740	3.4	3.4
2047	3,161	37	0.000551	1.65	21.7	0.38	11.1	48,620	3.5	3.5
2048	3,211	37	0.000567	1.70	21.7	0.39	11.3	49,506	3.6	3.6
2049	3,261	38	0.000584	1.75	21.8	0.39	11.5	50,396	3.6	3.6
2050	3,312	38	0.000601	1.80	21.8	0.40	11.7	51,292	3.7	3.7
2051	3,362	39	0.000618	1.85	21.9	0.40	11.9	52,193	3.8	3.8
2052	3,412	39	0.000635	1.90	21.9	0.41	12.1	53,099	3.8	3.8
2053	3,462	40	0.000652	1.96	22.0	0.42	12.3	54,010	3.9	3.9
2054	3,513	41	0.000670	2.01	22.0	0.42	12.5	54,927	4.0	4.0
2055	3,563	41	0.000688	2.06	22.1	0.43	12.8	55,849	4.0	4.0
2056	3,613	42	0.000706	2.12	22.1	0.43	13.0	56,776	4.1	4.1
2057	3,664	42	0.000724	2.17	22.2	0.44	13.2	57,709	4.2	4.2
2058	3,714	43	0.000743	2.23	22.2	0.45	13.4	58,648	4.2	4.2
2059	3,764	44	0.000761	2.28	22.3	0.45	13.6	59,593	4.3	4.3
2060	3,815	44	0.000780	2.34	22.3	0.46	13.8	60,543	4.4	4.4
2061	3,865	45	0.000799	2.40	22.4	0.46	14.0	61,499	4.4	4.4
2062	3,915	45	0.000819	2.46	22.5	0.47	14.3	62,461	4.5	4.5
2063	3,965	46	0.000838	2.51	22.5	0.48	14.5	63,429	4.6	4.6
2064	4,016	46	0.000858	2.57	22.6	0.48	14.7	64,402	4.6	4.6
2065	4,066	47	0.000878	2.63	22.6	0.49	14.9	65,382	4.7	4.7
Totals =								2,196,818	158	**158**

FLORENCE LAKE WWTF EFFLUENT PUMP STATION

static head =	20	m
friction C value =	120	
forcemain diameter =	350	mm
forcemain X-area =	0.0962	m^2
forcemain length =	3,000	m
pump efficiency =	70%	
fluid specific weight =	9.81	kN/m^3
fraction pumped =	50%	

Ref: water_reuse_analysis.xls

Note: Assumes one-half of effluent produced per year gets pumped to Humpback Reservoir.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 8, 2009
Last Revision By: D. Shiskowski

Subject: Florence Lake WWTF - Effluent Pump Station to Common Pipe (i.e. shared with Westhills WWTF) Option 3 Life Cycle Analysis

Yellow-shaded cell denotes assumed/input values

Year	Capital Costs (Note 1)		Operation & Maintenance Costs				GHG CO2e		Total	
			Electricity		Maintenance (Note 1)					
	Total Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value
2008										
2009										
2010										
2011										
2012										
2013										
2014		$0							$0	$0
2015		$0	$1,449	$1,101	$0	$0	$22	$17	$1,449	$1,101
2016		$0	$1,516	$1,107	$0	$0	$23	$17	$1,516	$1,107
2017		$0	$1,582	$1,111	$0	$0	$24	$17	$1,582	$1,111
2018		$0	$1,649	$1,114	$0	$0	$25	$17	$1,649	$1,114
2019		$0	$1,716	$1,114	$0	$0	$26	$17	$1,716	$1,114
2020		$0	$1,783	$1,114	$0	$0	$28	$17	$1,783	$1,114
2021		$0	$1,851	$1,112	$0	$0	$29	$17	$1,851	$1,112
2022		$0	$1,919	$1,108	$0	$0	$30	$17	$1,919	$1,108
2023		$0	$1,987	$1,103	$0	$0	$31	$17	$1,987	$1,103
2024		$0	$2,056	$1,098	$0	$0	$32	$17	$2,056	$1,098
2025		$0	$2,125	$1,091	$0	$0	$33	$17	$2,125	$1,091
2026		$0	$2,194	$1,083	$0	$0	$34	$17	$2,194	$1,083
2027		$0	$2,264	$1,075	$0	$0	$35	$17	$2,264	$1,075
2028		$0	$2,334	$1,065	$0	$0	$36	$16	$2,334	$1,065
2029		$0	$2,405	$1,055	$0	$0	$37	$16	$2,405	$1,055
2030		$0	$2,476	$1,045	$0	$0	$38	$16	$2,476	$1,045
2031		$0	$2,528	$1,026	$0	$0	$39	$16	$2,528	$1,026
2032		$0	$2,580	$1,007	$0	$0	$40	$16	$2,580	$1,007
2033		$0	$2,633	$988	$0	$0	$41	$15	$2,633	$988
2034		$0	$2,685	$969	$0	$0	$41	$15	$2,685	$969
2035		$0	$2,738	$950	$0	$0	$42	$15	$2,738	$950
2036		$0	$2,791	$931	$0	$0	$43	$14	$2,791	$931
2037		$0	$2,844	$912	$0	$0	$44	$14	$2,844	$912
2038		$0	$2,898	$894	$0	$0	$45	$14	$2,898	$894
2039		$0	$2,952	$875	$0	$0	$46	$14	$2,952	$875
2040		$0	$3,006	$857	$0	$0	$46	$13	$3,006	$857
2041		$0	$3,060	$839	$0	$0	$47	$13	$3,060	$839
2042		$0	$3,115	$821	$0	$0	$48	$13	$3,115	$821
2043		$0	$3,170	$803	$0	$0	$49	$12	$3,170	$803
2044		$0	$3,225	$786	$0	$0	$50	$12	$3,225	$786
2045		$0	$3,280	$769	$0	$0	$51	$12	$3,280	$769
2046		$0	$3,342	$753	$0	$0	$52	$12	$3,342	$753
2047		$0	$3,403	$737	$0	$0	$53	$11	$3,403	$737
2048		$0	$3,465	$722	$0	$0	$53	$11	$3,465	$722
2049		$0	$3,528	$707	$0	$0	$54	$11	$3,528	$707
2050		$0	$3,590	$691	$0	$0	$55	$11	$3,590	$691
2051		$0	$3,653	$677	$0	$0	$56	$10	$3,653	$677
2052		$0	$3,717	$662	$0	$0	$57	$10	$3,717	$662
2053		$0	$3,781	$647	$0	$0	$58	$10	$3,781	$647
2054		$0	$3,845	$633	$0	$0	$59	$10	$3,845	$633
2055		$0	$3,909	$619	$0	$0	$60	$10	$3,909	$619
2056		$0	$3,974	$605	$0	$0	$61	$9	$3,974	$605
2057		$0	$4,040	$591	$0	$0	$62	$9	$4,040	$591
2058		$0	$4,105	$578	$0	$0	$63	$9	$4,105	$578
2059		$0	$4,171	$564	$0	$0	$64	$9	$4,171	$564
2060		$0	$4,238	$551	$0	$0	$65	$9	$4,238	$551
2061		$0	$4,305	$539	$0	$0	$66	$8	$4,305	$539
2062		$0	$4,372	$526	$0	$0	$67	$8	$4,372	$526
2063		$0	$4,440	$514	$0	$0	$69	$8	$4,440	$514
2064		$0	$4,508	$501	$0	$0	$70	$8	$4,508	$501
2065		$0	$4,577	$489	$0	$0	$71	$8	$4,577	$489
Total Capital =	$0									
Total Net Present Value =		$0		$43,226		$0		$667		**$43,226**

Notes:
1. Capital cost and annual O&M cost included in Outfalls LCA.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 8, 2009
Last Revision By: D. Shiskowski

Subject: Westhills WWTF - Effluent Pump Station
to Common Pipe (i.e. shared with Florence Lake WWTF)
Option 3
Material Flows
and Carbon Footprint Analysis

Yellow-shaded cell denotes assumed/input values

Year	Wastewater ADWF		ADWF Friction Losses		TDH	Velocity	Pump Energy	Materials	GHG Sources	Total GHG Emissions
			Unit	Total				Electricity	Electricity Purchased	
	(m3/d)	(L/s)	(m/m)	(m)	(m)	(m/s)	(kW)	(kWh/yr)	(t CO2e/yr)	(t CO2e/yr)
2008										
2009										
2010										
2011										
2012										
2013										
2014										
2015	2,410	28	0.000059	0.03	25.0	0.14	9.8	42,855	3.1	3.1
2016	2,717	31	0.000073	0.04	25.0	0.16	11.0	48,321	3.5	3.5
2017	3,023	35	0.000089	0.04	25.0	0.18	12.3	53,792	3.9	3.9
2018	3,330	39	0.000107	0.05	25.1	0.20	13.5	59,268	4.3	4.3
2019	3,636	42	0.000126	0.06	25.1	0.21	14.8	64,749	4.7	4.7
2020	3,943	46	0.000146	0.07	25.1	0.23	16.0	70,237	5.1	5.1
2021	4,250	49	0.000168	0.08	25.1	0.25	17.3	75,731	5.5	5.5
2022	4,556	53	0.000191	0.10	25.1	0.27	18.5	81,233	5.8	5.8
2023	4,863	56	0.000216	0.11	25.1	0.29	19.8	86,741	6.2	6.2
2024	5,169	60	0.000241	0.12	25.1	0.30	21.1	92,258	6.6	6.6
2025	5,476	63	0.000269	0.13	25.1	0.32	22.3	97,782	7.0	7.0
2026	5,783	67	0.000297	0.15	25.1	0.34	23.6	103,316	7.4	7.4
2027	6,089	70	0.000327	0.16	25.2	0.36	24.9	108,858	7.8	7.8
2028	6,396	74	0.000358	0.18	25.2	0.38	26.1	114,410	8.2	8.2
2029	6,702	78	0.000390	0.20	25.2	0.40	27.4	119,972	8.6	8.6
2030	7,009	81	0.000424	0.21	25.2	0.41	28.7	125,544	9.0	9.0
2031	7,026	81	0.000426	0.21	25.2	0.41	28.7	125,848	9.1	9.1
2032	7,042	82	0.000428	0.21	25.2	0.42	28.8	126,152	9.1	9.1
2033	7,059	82	0.000430	0.21	25.2	0.42	28.9	126,457	9.1	9.1
2034	7,076	82	0.000431	0.22	25.2	0.42	28.9	126,761	9.1	9.1
2035	7,093	82	0.000433	0.22	25.2	0.42	29.0	127,066	9.1	9.1
2036	7,109	82	0.000435	0.22	25.2	0.42	29.1	127,370	9.2	9.2
2037	7,126	82	0.000437	0.22	25.2	0.42	29.1	127,675	9.2	9.2
2038	7,143	83	0.000439	0.22	25.2	0.42	29.2	127,980	9.2	9.2
2039	7,160	83	0.000441	0.22	25.2	0.42	29.3	128,284	9.2	9.2
2040	7,176	83	0.000443	0.22	25.2	0.42	29.4	128,589	9.3	9.3
2041	7,193	83	0.000445	0.22	25.2	0.42	29.4	128,894	9.3	9.3
2042	7,210	83	0.000447	0.22	25.2	0.43	29.5	129,198	9.3	9.3
2043	7,227	84	0.000449	0.22	25.2	0.43	29.6	129,503	9.3	9.3
2044	7,243	84	0.000451	0.23	25.2	0.43	29.6	129,808	9.3	9.3
2045	7,260	84	0.000452	0.23	25.2	0.43	29.7	130,113	9.4	9.4
2046	7,288	84	0.000456	0.23	25.2	0.43	29.8	130,631	9.4	9.4
2047	7,317	85	0.000459	0.23	25.2	0.43	29.9	131,150	9.4	9.4
2048	7,345	85	0.000462	0.23	25.2	0.43	30.1	131,668	9.5	9.5
2049	7,374	85	0.000466	0.23	25.2	0.43	30.2	132,187	9.5	9.5
2050	7,402	86	0.000469	0.23	25.2	0.44	30.3	132,706	9.6	9.6
2051	7,431	86	0.000472	0.24	25.2	0.44	30.4	133,225	9.6	9.6
2052	7,459	86	0.000476	0.24	25.2	0.44	30.5	133,744	9.6	9.6
2053	7,488	87	0.000479	0.24	25.2	0.44	30.7	134,263	9.7	9.7
2054	7,516	87	0.000482	0.24	25.2	0.44	30.8	134,782	9.7	9.7
2055	7,545	87	0.000486	0.24	25.2	0.44	30.9	135,301	9.7	9.7
2056	7,573	88	0.000489	0.24	25.2	0.45	31.0	135,820	9.8	9.8
2057	7,601	88	0.000493	0.25	25.2	0.45	31.1	136,340	9.8	9.8
2058	7,630	88	0.000496	0.25	25.2	0.45	31.2	136,859	9.9	9.9
2059	7,658	89	0.000499	0.25	25.2	0.45	31.4	137,379	9.9	9.9
2060	7,687	89	0.000503	0.25	25.3	0.45	31.5	137,899	9.9	9.9
2061	7,715	89	0.000506	0.25	25.3	0.45	31.6	138,419	10.0	10.0
2062	7,744	90	0.000510	0.25	25.3	0.46	31.7	138,939	10.0	10.0
2063	7,772	90	0.000513	0.26	25.3	0.46	31.8	139,459	10.0	10.0
2064	7,801	90	0.000517	0.26	25.3	0.46	32.0	139,979	10.1	10.1
2065	7,829	91	0.000520	0.26	25.3	0.46	32.1	140,499	10.1	10.1
Totals =								5,976,012	430	**430**

WESTHILLS WWTF EFFLUENT PUMP STATION

static head =	25	m
friction C value =	120	
forcemain diameter =	500	mm
forcemain X-area =	0.1963	m^2
forcemain length =	500	m
pump efficiency =	70%	
fluid specific weight =	9.81	kN/m^3
fraction pumped =	50%	

Ref: water_reuse_analysis.xls

Note: Assumes one-half of effluent produced per year gets pumped to Humpback Reservoir.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 8, 2009
Last Revision By: D. Shiskowski

Subject: Westhills WWTF - Effluent Pump Station to Common Pipe (i.e. shared with Florence WWTF) Option 3 Life Cycle Analysis

Yellow-shaded cell denotes assumed/input values

Year	Capital Costs (Note 1)		Operation & Maintenance Costs				GHG CO2e		Total	
			Electricity		Maintenance (Note 1)					
	Total Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value
2008										
2009										
2010										
2011										
2012										
2013										
2014		$0							$0	$0
2015		$0	$3,000	$2,280	$0	$0	$46	$35	$3,000	$2,280
2016		$0	$3,382	$2,472	$0	$0	$52	$38	$3,382	$2,472
2017		$0	$3,765	$2,646	$0	$0	$58	$41	$3,765	$2,646
2018		$0	$4,149	$2,803	$0	$0	$64	$43	$4,149	$2,803
2019		$0	$4,532	$2,944	$0	$0	$70	$45	$4,532	$2,944
2020		$0	$4,917	$3,071	$0	$0	$76	$47	$4,917	$3,071
2021		$0	$5,301	$3,184	$0	$0	$82	$49	$5,301	$3,184
2022		$0	$5,686	$3,284	$0	$0	$88	$51	$5,686	$3,284
2023		$0	$6,072	$3,372	$0	$0	$94	$52	$6,072	$3,372
2024		$0	$6,458	$3,448	$0	$0	$100	$53	$6,458	$3,448
2025		$0	$6,845	$3,514	$0	$0	$106	$54	$6,845	$3,514
2026		$0	$7,232	$3,570	$0	$0	$112	$55	$7,232	$3,570
2027		$0	$7,620	$3,617	$0	$0	$118	$56	$7,620	$3,617
2028		$0	$8,009	$3,655	$0	$0	$124	$56	$8,009	$3,655
2029		$0	$8,398	$3,685	$0	$0	$130	$57	$8,398	$3,685
2030		$0	$8,788	$3,708	$0	$0	$136	$57	$8,788	$3,708
2031		$0	$8,809	$3,574	$0	$0	$136	$55	$8,809	$3,574
2032		$0	$8,831	$3,445	$0	$0	$136	$53	$8,831	$3,445
2033		$0	$8,852	$3,321	$0	$0	$137	$51	$8,852	$3,321
2034		$0	$8,873	$3,201	$0	$0	$137	$49	$8,873	$3,201
2035		$0	$8,895	$3,085	$0	$0	$137	$48	$8,895	$3,085
2036		$0	$8,916	$2,973	$0	$0	$138	$46	$8,916	$2,973
2037		$0	$8,937	$2,866	$0	$0	$138	$44	$8,937	$2,866
2038		$0	$8,959	$2,762	$0	$0	$138	$43	$8,959	$2,762
2039		$0	$8,980	$2,662	$0	$0	$139	$41	$8,980	$2,662
2040		$0	$9,001	$2,566	$0	$0	$139	$40	$9,001	$2,566
2041		$0	$9,023	$2,473	$0	$0	$139	$38	$9,023	$2,473
2042		$0	$9,044	$2,384	$0	$0	$140	$37	$9,044	$2,384
2043		$0	$9,065	$2,297	$0	$0	$140	$35	$9,065	$2,297
2044		$0	$9,087	$2,214	$0	$0	$140	$34	$9,087	$2,214
2045		$0	$9,108	$2,134	$0	$0	$141	$33	$9,108	$2,134
2046		$0	$9,144	$2,060	$0	$0	$141	$32	$9,144	$2,060
2047		$0	$9,180	$1,989	$0	$0	$142	$31	$9,180	$1,989
2048		$0	$9,217	$1,920	$0	$0	$142	$30	$9,217	$1,920
2049		$0	$9,253	$1,853	$0	$0	$143	$29	$9,253	$1,853
2050		$0	$9,289	$1,789	$0	$0	$143	$28	$9,289	$1,789
2051		$0	$9,326	$1,727	$0	$0	$144	$27	$9,326	$1,727
2052		$0	$9,362	$1,667	$0	$0	$144	$26	$9,362	$1,667
2053		$0	$9,398	$1,609	$0	$0	$145	$25	$9,398	$1,609
2054		$0	$9,435	$1,553	$0	$0	$146	$24	$9,435	$1,553
2055		$0	$9,471	$1,499	$0	$0	$146	$23	$9,471	$1,499
2056		$0	$9,507	$1,447	$0	$0	$147	$22	$9,507	$1,447
2057		$0	$9,544	$1,397	$0	$0	$147	$22	$9,544	$1,397
2058		$0	$9,580	$1,348	$0	$0	$148	$21	$9,580	$1,348
2059		$0	$9,617	$1,301	$0	$0	$148	$20	$9,617	$1,301
2060		$0	$9,653	$1,256	$0	$0	$149	$19	$9,653	$1,256
2061		$0	$9,689	$1,212	$0	$0	$149	$19	$9,689	$1,212
2062		$0	$9,726	$1,170	$0	$0	$150	$18	$9,726	$1,170
2063		$0	$9,762	$1,129	$0	$0	$151	$17	$9,762	$1,129
2064		$0	$9,799	$1,090	$0	$0	$151	$17	$9,799	$1,090
2065		$0	$9,835	$1,052	$0	$0	$152	$16	$9,835	$1,052
Total Capital =	$0									
Total Net Present Value =		$0		$123,273		$0		$1,902		**$123,273**

Notes:
1. Capital cost and annual O&M cost included in Outfalls LCA.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 8, 2009
Last Revision By: D. Shiskowski

Subject: Common Forcemain to Humpback Reservoir
(Shared by Westhils and Florence Lake WWTFs)
Option 3
Material Flows
and Carbon Footprint Analysis

Yellow-shaded cell denotes assumed/input values

Year	Wastewater ADWF		ADWF Friction Losses		TDH	Velocity	Pump Energy	Materials	GHG Sources	Total GHG Emissions
			Unit	Total				Electricity	Electricity Purchased	
	(m3/d)	(L/s)	(m/m)	(m)	(m)	(m/s)	(kW)	(kWh/yr)	(t CO2e/yr)	(t CO2e/yr)
2008										
2009										
2010										
2011										
2012										
2013										
2014										
2015	3,840	44	0.000057	0.14	14.6	0.16	9.1	39,933	2.9	2.9
2016	4,210	49	0.000068	0.16	14.7	0.17	10.0	43,852	3.2	3.2
2017	4,579	53	0.000079	0.19	14.7	0.19	10.9	47,791	3.4	3.4
2018	4,949	57	0.000092	0.22	14.7	0.20	11.8	51,752	3.7	3.7
2019	5,318	62	0.000105	0.25	14.8	0.22	12.7	55,735	4.0	4.0
2020	5,688	66	0.000119	0.28	14.8	0.23	13.6	59,742	4.3	4.3
2021	6,057	70	0.000133	0.32	14.8	0.25	14.6	63,775	4.6	4.6
2022	6,427	74	0.000149	0.36	14.9	0.26	15.5	67,835	4.9	4.9
2023	6,796	79	0.000165	0.40	14.9	0.28	16.4	71,923	5.2	5.2
2024	7,166	83	0.000182	0.44	14.9	0.29	17.4	76,041	5.5	5.5
2025	7,535	87	0.000200	0.48	15.0	0.31	18.3	80,190	5.8	5.8
2026	7,905	91	0.000218	0.52	15.0	0.32	19.3	84,372	6.1	6.1
2027	8,274	96	0.000237	0.57	15.1	0.34	20.2	88,587	6.4	6.4
2028	8,644	100	0.000257	0.62	15.1	0.35	21.2	92,838	6.7	6.7
2029	9,013	104	0.000278	0.67	15.2	0.37	22.2	97,126	7.0	7.0
2030	9,383	109	0.000300	0.72	15.2	0.38	23.2	101,451	7.3	7.3
2031	9,445	109	0.000303	0.73	15.2	0.39	23.3	102,186	7.4	7.4
2032	9,508	110	0.000307	0.74	15.2	0.39	23.5	102,922	7.4	7.4
2033	9,570	111	0.000311	0.75	15.2	0.39	23.7	103,659	7.5	7.5
2034	9,633	111	0.000314	0.75	15.3	0.39	23.8	104,397	7.5	7.5
2035	9,695	112	0.000318	0.76	15.3	0.40	24.0	105,137	7.6	7.6
2036	9,758	113	0.000322	0.77	15.3	0.40	24.2	105,878	7.6	7.6
2037	9,820	114	0.000326	0.78	15.3	0.40	24.3	106,620	7.7	7.7
2038	9,883	114	0.000330	0.79	15.3	0.40	24.5	107,362	7.7	7.7
2039	9,945	115	0.000334	0.80	15.3	0.41	24.7	108,107	7.8	7.8
2040	10,008	116	0.000337	0.81	15.3	0.41	24.9	108,852	7.8	7.8
2041	10,070	117	0.000341	0.82	15.3	0.41	25.0	109,599	7.9	7.9
2042	10,133	117	0.000345	0.83	15.3	0.41	25.2	110,346	7.9	7.9
2043	10,195	118	0.000349	0.84	15.3	0.42	25.4	111,095	8.0	8.0
2044	10,258	119	0.000353	0.85	15.3	0.42	25.5	111,845	8.1	8.1
2045	10,320	119	0.000357	0.86	15.4	0.42	25.7	112,597	8.1	8.1
2046	10,399	120	0.000362	0.87	15.4	0.43	25.9	113,546	8.2	8.2
2047	10,478	121	0.000367	0.88	15.4	0.43	26.1	114,496	8.2	8.2
2048	10,556	122	0.000372	0.89	15.4	0.43	26.4	115,449	8.3	8.3
2049	10,635	123	0.000378	0.91	15.4	0.44	26.6	116,404	8.4	8.4
2050	10,714	124	0.000383	0.92	15.4	0.44	26.8	117,361	8.4	8.4
2051	10,793	125	0.000388	0.93	15.4	0.44	27.0	118,319	8.5	8.5
2052	10,871	126	0.000393	0.94	15.4	0.45	27.2	119,280	8.6	8.6
2053	10,950	127	0.000399	0.96	15.5	0.45	27.5	120,243	8.7	8.7
2054	11,029	128	0.000404	0.97	15.5	0.45	27.7	121,208	8.7	8.7
2055	11,108	129	0.000409	0.98	15.5	0.45	27.9	122,175	8.8	8.8
2056	11,186	129	0.000415	1.00	15.5	0.46	28.1	123,143	8.9	8.9
2057	11,265	130	0.000420	1.01	15.5	0.46	28.3	124,114	8.9	8.9
2058	11,344	131	0.000426	1.02	15.5	0.46	28.6	125,087	9.0	9.0
2059	11,423	132	0.000431	1.03	15.5	0.47	28.8	126,063	9.1	9.1
2060	11,501	133	0.000436	1.05	15.5	0.47	29.0	127,040	9.1	9.1
2061	11,580	134	0.000442	1.06	15.6	0.47	29.2	128,019	9.2	9.2
2062	11,659	135	0.000448	1.07	15.6	0.48	29.5	129,001	9.3	9.3
2063	11,738	136	0.000453	1.09	15.6	0.48	29.7	129,984	9.4	9.4
2064	11,816	137	0.000459	1.10	15.6	0.48	29.9	130,970	9.4	9.4
2065	11,895	138	0.000465	1.11	15.6	0.49	30.1	131,958	9.5	9.5
Totals =								5,187,402	373	**373**

COMMON PIPE PUMPING REQUIREMENT

static head =	14.5	m
friction C value =	120	
forcemain diameter =	600	mm
forcemain X-area =	0.2827	m^2
forcemain length =	2,400	m
pump efficiency =	70%	
fluid specific weight =	9.81	kN/m^3
fraction pumped =	50%	

Ref: water_reuse_analysis.xls

Note: Assumes one-half of effluent produced per year gets pumped to Humpback Reservoir.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 8, 2009
Last Revision By: D. Shiskowski

Subject: Common Forcemain to Humpback Reservoir (Shared by Westhils and Florence Lake WWTFs) Option 3 Life Cycle Analysis

Yellow-shaded cell denotes assumed/input values

Year	Capital Costs (Note 1)		Operation & Maintenance Costs				GHG CO2e		Total	
			Electricity		Maintenance (Note 1)					
	Total Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value
2008										
2009										
2010										
2011										
2012										
2013										
2014		$0							$0	$0
2015		$0	$2,795	$2,124	$0	$0	$43	$33	$2,795	$2,124
2016		$0	$3,070	$2,243	$0	$0	$47	$35	$3,070	$2,243
2017		$0	$3,345	$2,350	$0	$0	$52	$36	$3,345	$2,350
2018		$0	$3,623	$2,447	$0	$0	$56	$38	$3,623	$2,447
2019		$0	$3,901	$2,534	$0	$0	$60	$39	$3,901	$2,534
2020		$0	$4,182	$2,612	$0	$0	$65	$40	$4,182	$2,612
2021		$0	$4,464	$2,681	$0	$0	$69	$41	$4,464	$2,681
2022		$0	$4,748	$2,742	$0	$0	$73	$42	$4,748	$2,742
2023		$0	$5,035	$2,796	$0	$0	$78	$43	$5,035	$2,796
2024		$0	$5,323	$2,842	$0	$0	$82	$44	$5,323	$2,842
2025		$0	$5,613	$2,882	$0	$0	$87	$44	$5,613	$2,882
2026		$0	$5,906	$2,915	$0	$0	$91	$45	$5,906	$2,915
2027		$0	$6,201	$2,943	$0	$0	$96	$45	$6,201	$2,943
2028		$0	$6,499	$2,966	$0	$0	$100	$46	$6,499	$2,966
2029		$0	$6,799	$2,984	$0	$0	$105	$46	$6,799	$2,984
2030		$0	$7,102	$2,997	$0	$0	$110	$46	$7,102	$2,997
2031		$0	$7,153	$2,902	$0	$0	$110	$45	$7,153	$2,902
2032		$0	$7,205	$2,811	$0	$0	$111	$43	$7,205	$2,811
2033		$0	$7,256	$2,722	$0	$0	$112	$42	$7,256	$2,722
2034		$0	$7,308	$2,636	$0	$0	$113	$41	$7,308	$2,636
2035		$0	$7,360	$2,552	$0	$0	$114	$39	$7,360	$2,552
2036		$0	$7,411	$2,472	$0	$0	$114	$38	$7,411	$2,472
2037		$0	$7,463	$2,393	$0	$0	$115	$37	$7,463	$2,393
2038		$0	$7,515	$2,317	$0	$0	$116	$36	$7,515	$2,317
2039		$0	$7,567	$2,243	$0	$0	$117	$35	$7,567	$2,243
2040		$0	$7,620	$2,172	$0	$0	$118	$34	$7,620	$2,172
2041		$0	$7,672	$2,103	$0	$0	$118	$32	$7,672	$2,103
2042		$0	$7,724	$2,036	$0	$0	$119	$31	$7,724	$2,036
2043		$0	$7,777	$1,971	$0	$0	$120	$30	$7,777	$1,971
2044		$0	$7,829	$1,908	$0	$0	$121	$29	$7,829	$1,908
2045		$0	$7,882	$1,847	$0	$0	$122	$28	$7,882	$1,847
2046		$0	$7,948	$1,791	$0	$0	$123	$28	$7,948	$1,791
2047		$0	$8,015	$1,736	$0	$0	$124	$27	$8,015	$1,736
2048		$0	$8,081	$1,683	$0	$0	$125	$26	$8,081	$1,683
2049		$0	$8,148	$1,632	$0	$0	$126	$25	$8,148	$1,632
2050		$0	$8,215	$1,582	$0	$0	$127	$24	$8,215	$1,582
2051		$0	$8,282	$1,534	$0	$0	$128	$24	$8,282	$1,534
2052		$0	$8,350	$1,487	$0	$0	$129	$23	$8,350	$1,487
2053		$0	$8,417	$1,441	$0	$0	$130	$22	$8,417	$1,441
2054		$0	$8,485	$1,397	$0	$0	$131	$22	$8,485	$1,397
2055		$0	$8,552	$1,354	$0	$0	$132	$21	$8,552	$1,354
2056		$0	$8,620	$1,312	$0	$0	$133	$20	$8,620	$1,312
2057		$0	$8,688	$1,271	$0	$0	$134	$20	$8,688	$1,271
2058		$0	$8,756	$1,232	$0	$0	$135	$19	$8,756	$1,232
2059		$0	$8,824	$1,194	$0	$0	$136	$18	$8,824	$1,194
2060		$0	$8,893	$1,157	$0	$0	$137	$18	$8,893	$1,157
2061		$0	$8,961	$1,121	$0	$0	$138	$17	$8,961	$1,121
2062		$0	$9,030	$1,086	$0	$0	$139	$17	$9,030	$1,086
2063		$0	$9,099	$1,052	$0	$0	$140	$16	$9,099	$1,052
2064		$0	$9,168	$1,020	$0	$0	$141	$16	$9,168	$1,020
2065		$0	$9,237	$988	$0	$0	$143	$15	$9,237	$988
Total Capital =	$0									
Total Net Present Value =		$0		$105,211		$0		$1,623		**$105,211**

Notes:
1. Capital cost and annual O&M cost included in Outfalls LCA.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 7, 2009
Last Revision By: D. Shiskowski

Subject: Clover Point Wet-Weather Treatment Facility Option 3

Material Flows and Carbon Footprint Analysis

Yellow-shaded cell denotes assumed/input values

Year	Equivalent Population	Wastewater ADWF (to Mac/McL WWTF)		ADWF Friction Losses		TDH	Velocity	Pump Energy	Materials	GHG Sources	Total GHG Emissions
				Unit	Total				Electricity	Electricity Purchased	
	(pe)	(m3/d)	(L/s)	(m/m)	(m)	(m)	(m/s)	(kW)	(kWh/yr)	(t CO2e/yr)	(t CO2e/yr)
2008											
2009											
2010											
2011											
2012											
2013											
2014											
2015	87,569	24,128	279	0.001719	5.59	27.6	0.99	108.0	1,040,337	75	75
2016	87,916	24,020	278	0.001705	5.54	27.5	0.98	107.3	1,033,939	74	74
2017	88,264	23,912	277	0.001691	5.49	27.5	0.98	106.6	1,027,564	74	74
2018	88,611	23,804	276	0.001676	5.45	27.4	0.97	106.0	1,021,210	74	74
2019	88,958	23,695	274	0.001662	5.40	27.4	0.97	105.3	1,014,878	73	73
2020	89,305	23,587	273	0.001648	5.36	27.4	0.97	104.7	1,008,569	73	73
2021	89,653	23,479	272	0.001634	5.31	27.3	0.96	104.0	1,002,281	72	72
2022	90,000	23,371	270	0.001621	5.27	27.3	0.96	103.4	996,015	72	72
2023	90,347	23,263	269	0.001607	5.22	27.2	0.95	102.7	989,771	71	71
2024	90,694	23,155	268	0.001593	5.18	27.2	0.95	102.1	983,548	71	71
2025	91,042	23,047	267	0.001579	5.13	27.1	0.94	101.4	977,347	70	70
2026	91,389	22,939	265	0.001565	5.09	27.1	0.94	100.8	971,167	70	70
2027	91,736	22,830	264	0.001552	5.04	27.0	0.93	100.1	965,009	69	69
2028	92,083	22,722	263	0.001538	5.00	27.0	0.93	99.5	958,872	69	69
2029	92,431	22,614	262	0.001525	4.96	27.0	0.93	98.9	952,756	69	69
2030	92,778	22,506	260	0.001511	4.91	26.9	0.92	98.2	946,661	68	68
2031	93,253	22,465	260	0.001506	4.90	26.9	0.92	98.0	944,330	68	68
2032	93,729	22,423	260	0.001501	4.88	26.9	0.92	97.8	942,001	68	68
2033	94,204	22,382	259	0.001496	4.86	26.9	0.92	97.5	939,676	68	68
2034	94,680	22,340	259	0.001491	4.85	26.8	0.91	97.3	937,354	67	67
2035	95,155	22,299	258	0.001486	4.83	26.8	0.91	97.0	935,034	67	67
2036	95,631	22,257	258	0.001481	4.81	26.8	0.91	96.8	932,718	67	67
2037	96,106	22,216	257	0.001475	4.80	26.8	0.91	96.6	930,405	67	67
2038	96,582	22,174	257	0.001470	4.78	26.8	0.91	96.3	928,095	67	67
2039	97,057	22,133	256	0.001465	4.76	26.8	0.91	96.1	925,788	67	67
2040	97,533	22,091	256	0.001460	4.75	26.7	0.90	95.8	923,484	66	66
2041	98,008	22,050	255	0.001455	4.73	26.7	0.90	95.6	921,183	66	66
2042	98,484	22,008	255	0.001450	4.71	26.7	0.90	95.4	918,885	66	66
2043	98,959	21,967	254	0.001445	4.70	26.7	0.90	95.1	916,590	66	66
2044	99,435	21,925	254	0.001440	4.68	26.7	0.90	94.9	914,299	66	66
2045	99,910	21,884	253	0.001435	4.66	26.7	0.90	94.6	912,010	66	66
2046	100,009	21,794	252	0.001424	4.63	26.6	0.89	94.1	907,066	65	65
2047	100,109	21,705	251	0.001413	4.59	26.6	0.89	93.6	902,137	65	65
2048	100,208	21,615	250	0.001402	4.56	26.6	0.88	93.1	897,221	65	65
2049	100,308	21,525	249	0.001392	4.52	26.5	0.88	92.6	892,320	64	64
2050	100,407	21,435	248	0.001381	4.49	26.5	0.88	92.1	887,433	64	64
2051	100,506	21,346	247	0.001370	4.45	26.5	0.87	91.6	882,559	64	64
2052	100,606	21,256	246	0.001360	4.42	26.4	0.87	91.1	877,699	63	63
2053	100,705	21,166	245	0.001349	4.38	26.4	0.87	90.6	872,854	63	63
2054	100,805	21,076	244	0.001339	4.35	26.4	0.86	90.1	868,021	62	62
2055	100,904	20,987	243	0.001328	4.32	26.3	0.86	89.6	863,203	62	62
2056	101,003	20,897	242	0.001317	4.28	26.3	0.86	89.1	858,398	62	62
2057	101,103	20,807	241	0.001307	4.25	26.2	0.85	88.6	853,607	61	61
2058	101,202	20,717	240	0.001297	4.21	26.2	0.85	88.1	848,830	61	61
2059	101,302	20,628	239	0.001286	4.18	26.2	0.84	87.6	844,065	61	61
2060	101,401	20,538	238	0.001276	4.15	26.1	0.84	87.1	839,315	60	60
2061	101,500	20,448	237	0.001266	4.11	26.1	0.84	86.6	834,577	60	60
2062	101,600	20,358	236	0.001255	4.08	26.1	0.83	86.1	829,854	60	60
2063	101,699	20,269	235	0.001245	4.05	26.0	0.83	85.6	825,143	59	59
2064	101,799	20,179	234	0.001235	4.01	26.0	0.83	85.1	820,446	59	59
2065	101,898	20,089	233	0.001225	3.98	26.0	0.82	84.7	815,762	59	59
Totals =									47,032,286	3,386	**3,386**

CLOVER POINT WET-WEATHER TF ASSUMPTIONS

Dry-Weather Flow Pumping Station:

static head =	22.0	m
friction C value =	120	
forcemain diameter =	600	mm
forcemain X-area =	0.2827	m^2
forcemain length =	3,250	m
pump efficiency =	70%	
fluid specific weight =	9.81	kN/m^3

Ref: M. Maynard file est_Outfall&Interceptor Cost Estimates_20090206.xls.

Electricity:

wet-weather treatment and pumping adjustment = 0.10 x dry-weather flow pumping requirement

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 18, 2009
Last Revision By: D. Shiskowski

Subject: Clover Point Wet-Weather Treatment Facility Option 3 Life Cycle Analysis

Yellow-shaded cell denotes assumed/input values

Year	Capital Costs[1]		Operation & Maintenance Costs										GHG CO2e		Total	
			Labour		Electricity		Chemicals		Maintenance		Administration					
	Total Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value
2008																
2009																
2010																
2011																
2012																
2013																
2014	$145,960,800	$115,354,940													$145,960,800	$115,354,940
2015		$0	$75,000	$56,994	$72,824	$55,340	$157,105	$119,387	$1,459,608	$1,109,182	$100,000	$75,992	$1,124	$854	$1,865,660	$1,417,748
2016		$0	$75,000	$54,802	$72,376	$52,884	$156,401	$114,280	$1,459,608	$1,066,521	$100,000	$73,069	$1,117	$816	$1,864,501	$1,362,373
2017		$0	$75,000	$52,694	$71,929	$50,537	$155,697	$109,390	$1,459,608	$1,025,501	$100,000	$70,259	$1,110	$780	$1,863,344	$1,309,161
2018		$0	$75,000	$50,667	$71,485	$48,292	$154,992	$104,707	$1,459,608	$986,059	$100,000	$67,556	$1,103	$745	$1,862,188	$1,258,028
2019		$0	$75,000	$48,719	$71,041	$46,147	$154,288	$100,223	$1,459,608	$948,134	$100,000	$64,958	$1,096	$712	$1,861,034	$1,208,892
2020		$0	$75,000	$46,845	$70,600	$44,096	$153,584	$95,928	$1,459,608	$911,667	$100,000	$62,460	$1,089	$680	$1,859,881	$1,161,676
2021		$0	$75,000	$45,043	$70,160	$42,136	$152,880	$91,816	$1,459,608	$876,603	$100,000	$60,057	$1,082	$650	$1,858,730	$1,116,305
2022		$0	$75,000	$43,311	$69,721	$40,262	$152,176	$87,878	$1,459,608	$842,887	$100,000	$57,748	$1,076	$621	$1,857,581	$1,072,707
2023		$0	$75,000	$41,645	$69,284	$38,471	$151,472	$84,107	$1,459,608	$810,469	$100,000	$55,526	$1,069	$594	$1,856,433	$1,030,811
2024		$0	$75,000	$40,043	$68,848	$36,759	$150,768	$80,496	$1,459,608	$779,297	$100,000	$53,391	$1,062	$567	$1,855,286	$990,553
2025		$0	$75,000	$38,503	$68,414	$35,122	$150,064	$77,039	$1,459,608	$749,324	$100,000	$51,337	$1,056	$542	$1,854,142	$951,867
2026		$0	$75,000	$37,022	$67,982	$33,558	$149,360	$73,728	$1,459,608	$720,504	$100,000	$49,363	$1,049	$518	$1,852,998	$914,692
2027		$0	$75,000	$35,598	$67,551	$32,062	$148,656	$70,558	$1,459,608	$692,792	$100,000	$47,464	$1,042	$495	$1,851,856	$878,970
2028		$0	$75,000	$34,229	$67,121	$30,633	$147,952	$67,523	$1,459,608	$666,146	$100,000	$45,639	$1,036	$473	$1,850,716	$844,643
2029		$0	$75,000	$32,913	$66,693	$29,267	$147,247	$64,617	$1,459,608	$640,525	$100,000	$43,883	$1,029	$452	$1,849,577	$811,657
2030		$0	$75,000	$31,647	$66,266	$27,961	$146,543	$61,835	$1,459,608	$615,889	$100,000	$42,196	$1,022	$431	$1,848,440	$779,959
2031		$0	$75,000	$30,429	$66,103	$26,820	$146,273	$59,347	$1,459,608	$592,201	$100,000	$40,573	$1,020	$414	$1,848,004	$749,784
2032		$0	$75,000	$29,259	$65,940	$25,725	$146,003	$56,959	$1,459,608	$569,424	$100,000	$39,012	$1,017	$397	$1,847,569	$720,776
2033		$0	$75,000	$28,134	$65,777	$24,674	$145,733	$54,667	$1,459,608	$547,523	$100,000	$37,512	$1,015	$381	$1,847,134	$692,891
2034		$0	$75,000	$27,052	$65,615	$23,667	$145,463	$52,467	$1,459,608	$526,465	$100,000	$36,069	$1,012	$365	$1,846,698	$666,084
2035		$0	$75,000	$26,011	$65,452	$22,700	$145,193	$50,355	$1,459,608	$506,216	$100,000	$34,682	$1,010	$350	$1,846,264	$640,315
2036		$0	$75,000	$25,011	$65,290	$21,773	$144,923	$48,329	$1,459,608	$486,746	$100,000	$33,348	$1,007	$336	$1,845,829	$615,542
2037		$0	$75,000	$24,049	$65,128	$20,883	$144,653	$46,383	$1,459,608	$468,025	$100,000	$32,065	$1,005	$322	$1,845,395	$591,728
2038		$0	$75,000	$23,124	$64,967	$20,030	$144,383	$44,516	$1,459,608	$450,024	$100,000	$30,832	$1,002	$309	$1,844,960	$568,836
2039		$0	$75,000	$22,235	$64,805	$19,212	$144,113	$42,724	$1,459,608	$432,716	$100,000	$29,646	$1,000	$296	$1,844,526	$546,829
2040		$0	$75,000	$21,379	$64,644	$18,427	$143,843	$41,004	$1,459,608	$416,073	$100,000	$28,506	$997	$284	$1,844,093	$525,673
2041		$0	$75,000	$20,557	$64,483	$17,674	$143,573	$39,353	$1,459,608	$400,070	$100,000	$27,409	$995	$273	$1,843,659	$505,336
2042		$0	$75,000	$19,766	$64,322	$16,952	$143,303	$37,768	$1,459,608	$384,683	$100,000	$26,355	$992	$262	$1,843,226	$485,786
2043		$0	$75,000	$19,006	$64,161	$16,259	$143,033	$36,247	$1,459,608	$369,887	$100,000	$25,342	$990	$251	$1,842,793	$466,992
2044		$0	$75,000	$18,275	$64,001	$15,595	$142,763	$34,787	$1,459,608	$355,661	$100,000	$24,367	$987	$241	$1,842,360	$448,925
2045		$0	$75,000	$17,572	$63,841	$14,958	$142,493	$33,386	$1,459,608	$341,982	$100,000	$23,430	$985	$231	$1,841,927	$431,558
2046		$0	$75,000	$16,896	$63,495	$14,304	$141,909	$31,970	$1,459,608	$328,828	$100,000	$22,529	$980	$221	$1,840,991	$414,749
2047		$0	$75,000	$16,247	$63,150	$13,679	$141,325	$30,614	$1,459,608	$316,181	$100,000	$21,662	$974	$211	$1,840,056	$398,594
2048		$0	$75,000	$15,622	$62,806	$13,082	$140,740	$29,315	$1,459,608	$304,020	$100,000	$20,829	$969	$202	$1,839,123	$383,069
2049		$0	$75,000	$15,021	$62,462	$12,510	$140,156	$28,070	$1,459,608	$292,327	$100,000	$20,028	$964	$193	$1,838,190	$368,149
2050		$0	$75,000	$14,443	$62,120	$11,963	$139,571	$26,878	$1,459,608	$281,084	$100,000	$19,257	$958	$185	$1,837,258	$353,810
2051		$0	$75,000	$13,888	$61,779	$11,440	$138,987	$25,736	$1,459,608	$270,273	$100,000	$18,517	$953	$176	$1,836,327	$340,029
2052		$0	$75,000	$13,353	$61,439	$10,939	$138,403	$24,642	$1,459,608	$259,878	$100,000	$17,805	$948	$169	$1,835,397	$326,786
2053		$0	$75,000	$12,840	$61,100	$10,460	$137,818	$23,594	$1,459,608	$249,883	$100,000	$17,120	$943	$161	$1,834,469	$314,058
2054		$0	$75,000	$12,346	$60,762	$10,002	$137,234	$22,591	$1,459,608	$240,272	$100,000	$16,461	$937	$154	$1,833,541	$301,826
2055		$0	$75,000	$11,871	$60,424	$9,564	$136,649	$21,629	$1,459,608	$231,030	$100,000	$15,828	$932	$148	$1,832,614	$290,071
2056		$0	$75,000	$11,415	$60,088	$9,145	$136,065	$20,708	$1,459,608	$222,145	$100,000	$15,219	$927	$141	$1,831,688	$278,773
2057		$0	$75,000	$10,976	$59,752	$8,744	$135,481	$19,826	$1,459,608	$213,601	$100,000	$14,634	$922	$135	$1,830,763	$267,916
2058		$0	$75,000	$10,553	$59,418	$8,361	$134,896	$18,982	$1,459,608	$205,385	$100,000	$14,071	$917	$129	$1,829,839	$257,481
2059		$0	$75,000	$10,148	$59,085	$7,994	$134,312	$18,172	$1,459,608	$197,486	$100,000	$13,530	$912	$123	$1,828,916	$247,453
2060		$0	$75,000	$9,757	$58,752	$7,643	$133,728	$17,398	$1,459,608	$189,890	$100,000	$13,010	$906	$118	$1,827,994	$237,816
2061		$0	$75,000	$9,382	$58,420	$7,308	$133,143	$16,655	$1,459,608	$182,587	$100,000	$12,509	$901	$113	$1,827,073	$228,554
2062		$0	$75,000	$9,021	$58,090	$6,987	$132,559	$15,944	$1,459,608	$175,564	$100,000	$12,028	$896	$108	$1,826,153	$219,653
2063		$0	$75,000	$8,674	$57,760	$6,680	$131,974	$15,264	$1,459,608	$168,812	$100,000	$11,566	$891	$103	$1,825,233	$211,098
2064		$0	$75,000	$8,341	$57,431	$6,387	$131,390	$14,612	$1,459,608	$162,319	$100,000	$11,121	$886	$99	$1,824,315	$202,877
2065		$0	$75,000	$8,020	$57,103	$6,106	$130,806	$13,987	$1,459,608	$156,076	$100,000	$10,693	$881	$94	$1,823,398	$194,976
Total Capital =	$145,960,800															
Total Net Present Value =		$115,354,940		$1,281,346		$1,142,178		$2,518,391		$24,936,837		$1,708,461		$17,622		**$146,959,776**

CLOVER POINT WET-WEATHER TF ASSUMPTIONS

Labour:

number of facility manager(s) =	0	
number of operations staff =	0.5	
number of maintenance staff =	0.5	
number of administration staff =	0	
total staff =	1	persons

Wet-Weather CEPT Chemicals:

fraction of total annual ADWF treated = 25.0%

Ref: Allowance to account for potential costs.

Notes:
1. Excludes dry-weather flow forcemain. Included in CS Mods LCA.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 18, 2008
Last Revision By: D. Shiskowski

Subject: Outfalls (Saanich East, Royal Bay, Macaulay / McLoughlin, Ogden, Juan de Fuca, Windsor Park, Lang Cove, Roderick, Clover, and pipes to Humpack Reservoir and RB Outfall for the Westhills and Florence Lake facilities) Option 3 Life Cycle Analysis

Yellow-shaded cell denotes assumed/input values

Year	Capital Costs		Maintenance		Total	
	Total Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value
2008						
2009						
2010						
2011						
2012						
2013						
2014	$106,877,160	$84,466,572			$106,877,160	$84,466,572
2015		$0	$267,193	$203,045	$267,193	$203,045
2016		$0	$267,193	$195,235	$267,193	$195,235
2017		$0	$267,193	$187,726	$267,193	$187,726
2018		$0	$267,193	$180,506	$267,193	$180,506
2019		$0	$267,193	$173,563	$267,193	$173,563
2020		$0	$267,193	$166,888	$267,193	$166,888
2021		$0	$267,193	$160,469	$267,193	$160,469
2022		$0	$267,193	$154,297	$267,193	$154,297
2023		$0	$267,193	$148,363	$267,193	$148,363
2024		$0	$267,193	$142,656	$267,193	$142,656
2025		$0	$267,193	$137,170	$267,193	$137,170
2026		$0	$267,193	$131,894	$267,193	$131,894
2027		$0	$267,193	$126,821	$267,193	$126,821
2028		$0	$267,193	$121,943	$267,193	$121,943
2029		$0	$267,193	$117,253	$267,193	$117,253
2030		$0	$267,193	$112,743	$267,193	$112,743
2031		$0	$267,193	$108,407	$267,193	$108,407
2032		$0	$267,193	$104,238	$267,193	$104,238
2033		$0	$267,193	$100,229	$267,193	$100,229
2034		$0	$267,193	$96,374	$267,193	$96,374
2035		$0	$267,193	$92,667	$267,193	$92,667
2036		$0	$267,193	$89,103	$267,193	$89,103
2037		$0	$267,193	$85,676	$267,193	$85,676
2038		$0	$267,193	$82,381	$267,193	$82,381
2039		$0	$267,193	$79,212	$267,193	$79,212
2040		$0	$267,193	$76,165	$267,193	$76,165
2041		$0	$267,193	$73,236	$267,193	$73,236
2042		$0	$267,193	$70,419	$267,193	$70,419
2043		$0	$267,193	$67,711	$267,193	$67,711
2044		$0	$267,193	$65,107	$267,193	$65,107
2045		$0	$267,193	$62,602	$267,193	$62,602
2046		$0	$267,193	$60,195	$267,193	$60,195
2047		$0	$267,193	$57,879	$267,193	$57,879
2048		$0	$267,193	$55,653	$267,193	$55,653
2049		$0	$267,193	$53,513	$267,193	$53,513
2050		$0	$267,193	$51,455	$267,193	$51,455
2051		$0	$267,193	$49,476	$267,193	$49,476
2052		$0	$267,193	$47,573	$267,193	$47,573
2053		$0	$267,193	$45,743	$267,193	$45,743
2054		$0	$267,193	$43,984	$267,193	$43,984
2055		$0	$267,193	$42,292	$267,193	$42,292
2056		$0	$267,193	$40,665	$267,193	$40,665
2057		$0	$267,193	$39,101	$267,193	$39,101
2058		$0	$267,193	$37,597	$267,193	$37,597
2059		$0	$267,193	$36,151	$267,193	$36,151
2060		$0	$267,193	$34,761	$267,193	$34,761
2061		$0	$267,193	$33,424	$267,193	$33,424
2062		$0	$267,193	$32,138	$267,193	$32,138
2063		$0	$267,193	$30,902	$267,193	$30,902
2064		$0	$267,193	$29,714	$267,193	$29,714
2065		$0	$267,193	$28,571	$267,193	$28,571
Total Capital =	$106,877,160					
Total Net Present Value =		$84,466,572		$4,564,887		**$89,031,459**

Notes:

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 18, 2009
Last Revision By: D. Shiskowski

Subject: Conveyance System Modifications

Option 3
Life Cycle Analysis

Yellow-shaded cell denotes assumed/input values

Year	Capital Costs[1]		Maintenance		Total	
	Total Cost	Net Present Value	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value
2008						
2009						
2010						
2011						
2012						
2013						
2014	$87,902,880	$69,470,923			$87,902,880	$69,470,923
2015		$0	$219,757	$166,997	$219,757	$166,997
2016		$0	$219,757	$160,574	$219,757	$160,574
2017		$0	$219,757	$154,398	$219,757	$154,398
2018		$0	$219,757	$148,460	$219,757	$148,460
2019		$0	$219,757	$142,750	$219,757	$142,750
2020		$0	$219,757	$137,260	$219,757	$137,260
2021		$0	$219,757	$131,980	$219,757	$131,980
2022		$0	$219,757	$126,904	$219,757	$126,904
2023		$0	$219,757	$122,023	$219,757	$122,023
2024		$0	$219,757	$117,330	$219,757	$117,330
2025		$0	$219,757	$112,817	$219,757	$112,817
2026		$0	$219,757	$108,478	$219,757	$108,478
2027		$0	$219,757	$104,306	$219,757	$104,306
2028		$0	$219,757	$100,294	$219,757	$100,294
2029		$0	$219,757	$96,437	$219,757	$96,437
2030		$0	$219,757	$92,728	$219,757	$92,728
2031		$0	$219,757	$89,161	$219,757	$89,161
2032		$0	$219,757	$85,732	$219,757	$85,732
2033		$0	$219,757	$82,435	$219,757	$82,435
2034		$0	$219,757	$79,264	$219,757	$79,264
2035		$0	$219,757	$76,215	$219,757	$76,215
2036		$0	$219,757	$73,284	$219,757	$73,284
2037		$0	$219,757	$70,465	$219,757	$70,465
2038		$0	$219,757	$67,755	$219,757	$67,755
2039		$0	$219,757	$65,149	$219,757	$65,149
2040		$0	$219,757	$62,644	$219,757	$62,644
2041		$0	$219,757	$60,234	$219,757	$60,234
2042		$0	$219,757	$57,917	$219,757	$57,917
2043		$0	$219,757	$55,690	$219,757	$55,690
2044		$0	$219,757	$53,548	$219,757	$53,548
2045		$0	$219,757	$51,488	$219,757	$51,488
2046		$0	$219,757	$49,508	$219,757	$49,508
2047		$0	$219,757	$47,604	$219,757	$47,604
2048		$0	$219,757	$45,773	$219,757	$45,773
2049		$0	$219,757	$44,013	$219,757	$44,013
2050		$0	$219,757	$42,320	$219,757	$42,320
2051		$0	$219,757	$40,692	$219,757	$40,692
2052		$0	$219,757	$39,127	$219,757	$39,127
2053		$0	$219,757	$37,622	$219,757	$37,622
2054		$0	$219,757	$36,175	$219,757	$36,175
2055		$0	$219,757	$34,784	$219,757	$34,784
2056		$0	$219,757	$33,446	$219,757	$33,446
2057		$0	$219,757	$32,160	$219,757	$32,160
2058		$0	$219,757	$30,923	$219,757	$30,923
2059		$0	$219,757	$29,733	$219,757	$29,733
2060		$0	$219,757	$28,590	$219,757	$28,590
2061		$0	$219,757	$27,490	$219,757	$27,490
2062		$0	$219,757	$26,433	$219,757	$26,433
2063		$0	$219,757	$25,416	$219,757	$25,416
2064		$0	$219,757	$24,439	$219,757	$24,439
2065		$0	$219,757	$23,499	$219,757	$23,499
Total Capital =	$87,902,880					
Total Net Present Value =		$69,470,923		$3,754,467		**$73,225,390**

Notes:
1. Includes dry-weather Clover Point forcemain and Ogden and Macaulay / McLoughlin WWTF plant-related convenyance costs.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 7, 2009
Last Revision By: D. Shiskowski

Subject: Existing Trunk Sewer System

Option 3
Life Cycle Analysis

Yellow-shaded cell denotes assumed/input values

Year	Operation and Maintenance		Total	
	Total Annual Cost	Net Present Value	Total Annual Cost	Net Present Value
2008				
2009				
2010				
2011				
2012				
2013				
2014				
2015	$4,763,435	$3,619,819	$4,763,435	$3,619,819
2016	$4,787,252	$3,497,998	$4,787,252	$3,497,998
2017	$4,811,189	$3,380,277	$4,811,189	$3,380,277
2018	$4,835,245	$3,266,518	$4,835,245	$3,266,518
2019	$4,859,421	$3,156,587	$4,859,421	$3,156,587
2020	$4,883,718	$3,050,356	$4,883,718	$3,050,356
2021	$4,908,137	$2,947,700	$4,908,137	$2,947,700
2022	$4,932,677	$2,848,498	$4,932,677	$2,848,498
2023	$4,957,341	$2,752,635	$4,957,341	$2,752,635
2024	$4,982,127	$2,659,998	$4,982,127	$2,659,998
2025	$5,007,038	$2,570,479	$5,007,038	$2,570,479
2026	$5,032,073	$2,483,973	$5,032,073	$2,483,973
2027	$5,057,233	$2,400,378	$5,057,233	$2,400,378
2028	$5,082,520	$2,319,596	$5,082,520	$2,319,596
2029	$5,107,932	$2,241,532	$5,107,932	$2,241,532
2030	$5,133,472	$2,166,096	$5,133,472	$2,166,096
2031	$5,159,139	$2,093,199	$5,159,139	$2,093,199
2032	$5,184,935	$2,022,754	$5,184,935	$2,022,754
2033	$5,210,860	$1,954,681	$5,210,860	$1,954,681
2034	$5,236,914	$1,888,898	$5,236,914	$1,888,898
2035	$5,263,099	$1,825,330	$5,263,099	$1,825,330
2036	$5,289,414	$1,763,900	$5,289,414	$1,763,900
2037	$5,315,861	$1,704,538	$5,315,861	$1,704,538
2038	$5,342,440	$1,647,174	$5,342,440	$1,647,174
2039	$5,369,153	$1,591,740	$5,369,153	$1,591,740
2040	$5,395,998	$1,538,172	$5,395,998	$1,538,172
2041	$5,422,978	$1,486,407	$5,422,978	$1,486,407
2042	$5,450,093	$1,436,383	$5,450,093	$1,436,383
2043	$5,477,344	$1,388,044	$5,477,344	$1,388,044
2044	$5,504,730	$1,341,331	$5,504,730	$1,341,331
2045	$5,532,254	$1,296,190	$5,532,254	$1,296,190
2046	$5,559,915	$1,252,568	$5,559,915	$1,252,568
2047	$5,587,715	$1,210,414	$5,587,715	$1,210,414
2048	$5,615,653	$1,169,679	$5,615,653	$1,169,679
2049	$5,643,732	$1,130,315	$5,643,732	$1,130,315
2050	$5,671,950	$1,092,275	$5,671,950	$1,092,275
2051	$5,700,310	$1,055,516	$5,700,310	$1,055,516
2052	$5,728,812	$1,019,994	$5,728,812	$1,019,994
2053	$5,757,456	$985,667	$5,757,456	$985,667
2054	$5,786,243	$952,496	$5,786,243	$952,496
2055	$5,815,174	$920,441	$5,815,174	$920,441
2056	$5,844,250	$889,464	$5,844,250	$889,464
2057	$5,873,471	$859,530	$5,873,471	$859,530
2058	$5,902,839	$830,604	$5,902,839	$830,604
2059	$5,932,353	$802,651	$5,932,353	$802,651
2060	$5,962,015	$775,639	$5,962,015	$775,639
2061	$5,991,825	$749,535	$5,991,825	$749,535
2062	$6,021,784	$724,311	$6,021,784	$724,311
2063	$6,051,893	$699,935	$6,051,893	$699,935
2064	$6,082,152	$676,379	$6,082,152	$676,379
2065	$6,112,563	$653,617	$6,112,563	$653,617
Total Capital =				
Total Net Present Value =		$88,792,213		**$88,792,213**

Notes:

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski, D. Forgie
Last Revision: February 7, 2009
Last Revision By: D. Shiskowski

Subject: Combined Macaulay/McLoughln WWTF Solids Processing Systems,Royal Roads Organics Facility, Hartland Biosolids Drying Facility, and Industrial Biosolids Land Application / Willow Coppice Program Option 3 Material Flows and GHG Emissions

Note: **Coloured cells contain data linked to external spreadsheets**

Year	Materials											GHG Sources				GHG Offsets		Total GHG Emissions
	Electricity		Biogas (WW Sludges)			Biomethane (WW Sludges)	Diesel Fuel		Willow Coppice	Natural Gas	Dried WW Biosolids	Electricity Purchased[4]	Biogas Lost	Natural Gas Combusted	Diesel Fuel Combusted	Avoided Natural Gas Use via Biomethane	Avoided Coal Use via Dried WW Biosolids	
	WW Sludges (kWh/yr)	Total (kWh/yr)	Boiler (m3/yr)	for Biomethane (m3/yr)	System Loss (m3/yr)	Available for Sale (GJ/yr)	WW Sludges[1] (L/yr)	Total (L/yr)	(odt/yr)	WW Sludges (GJ/yr)	(dry t/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)	(t CO2e/yr)
2008																		
2009																		
2010																		
2011																		
2012																		
2013																		
2014																		
2015																		
2016	1,558,100	1,558,100	2,369,141	1,681,970	40,511	37,299	78,428	78,428	0	21,400	2,416	112	401	1,204	216	-2,098	-3,466	-3,631
2017	1,570,600	1,570,600	2,393,156	1,717,658	41,108	38,091	78,558	78,558	0	21,720	2,452	113	407	1,222	217	-2,142	-3,517	-3,702
2018	1,582,900	1,582,900	2,417,172	1,753,346	41,705	38,882	71,744	71,744	3,720	22,030	2,488	114	413	1,239	198	-2,187	-3,568	-3,792
2019	1,595,300	1,595,300	2,441,187	1,789,035	42,302	39,674	75,649	75,649	3,720	22,350	2,523	115	419	1,257	209	-2,231	-3,620	-3,852
2020	1,607,800	1,607,800	2,465,203	1,824,723	42,899	40,465	75,779	75,779	3,720	22,660	2,559	116	425	1,275	209	-2,276	-3,671	-3,923
2021	1,620,100	1,620,100	2,489,218	1,860,411	43,496	41,256	75,909	75,909	3,720	22,980	2,595	117	430	1,293	209	-2,320	-3,722	-3,993
2022	1,632,500	1,632,500	2,513,234	1,896,099	44,093	42,048	76,044	76,044	3,720	23,290	2,630	118	436	1,310	210	-2,365	-3,773	-4,064
2023	1,644,900	1,644,900	2,537,249	1,931,787	44,690	42,839	76,174	76,174	3,720	23,610	2,666	118	442	1,328	210	-2,409	-3,824	-4,135
2024	1,657,300	1,657,300	2,561,265	1,967,475	45,287	43,631	80,074	80,074	3,720	23,920	2,701	119	448	1,345	221	-2,454	-3,875	-4,195
2025	1,669,700	1,669,700	2,585,280	2,003,164	45,884	44,422	80,209	80,209	3,720	24,240	2,737	120	454	1,363	221	-2,499	-3,926	-4,266
2026	1,682,100	1,682,100	2,609,296	2,038,852	46,481	45,214	80,339	80,339	3,720	24,550	2,773	121	460	1,381	221	-2,543	-3,977	-4,337
2027	1,694,500	1,694,500	2,633,311	2,074,540	47,079	46,005	80,469	80,469	3,720	24,870	2,808	122	466	1,399	222	-2,588	-4,028	-4,407
2028	1,706,800	1,706,800	2,657,327	2,110,228	47,676	46,796	80,604	80,604	3,720	25,180	2,844	123	472	1,416	222	-2,632	-4,079	-4,478
2029	1,719,300	1,719,300	2,681,342	2,145,916	48,273	47,588	80,734	80,734	3,720	25,500	2,879	124	478	1,434	223	-2,677	-4,130	-4,549
2030	1,731,700	1,731,700	2,705,357	2,181,604	48,870	48,379	84,634	84,634	3,720	25,810	2,915	125	484	1,452	233	-2,721	-4,181	-4,609
2031	1,741,900	1,741,900	2,729,373	2,208,492	49,379	48,976	84,749	84,749	3,720	26,080	2,945	125	489	1,467	234	-2,755	-4,225	-4,665
2032	1,752,200	1,752,200	2,753,388	2,235,379	49,888	49,572	88,059	88,059	3,720	26,350	2,976	126	494	1,482	243	-2,788	-4,269	-4,712
2033	1,762,400	1,762,400	2,777,404	2,262,267	50,397	50,168	88,169	88,169	3,720	26,620	3,006	127	499	1,497	243	-2,822	-4,312	-4,768
2034	1,772,600	1,772,600	2,801,419	2,289,155	50,906	50,764	88,284	88,284	3,720	26,890	3,036	128	504	1,512	243	-2,855	-4,356	-4,824
2035	1,782,800	1,782,800	2,825,435	2,316,042	51,415	51,361	88,394	88,394	3,720	27,160	3,067	128	509	1,528	244	-2,889	-4,399	-4,880
2036	1,793,200	1,793,200	2,849,450	2,342,930	51,924	51,957	101,642	101,642	4,368	27,430	3,097	129	514	1,543	280	-2,922	-4,443	-4,899
2037	1,803,400	1,803,400	2,873,466	2,369,817	52,433	52,553	101,752	101,752	4,368	27,700	3,128	130	519	1,558	280	-2,956	-4,486	-4,955
2038	1,813,600	1,813,600	2,897,481	2,396,705	52,942	53,149	101,867	101,867	4,368	27,970	3,158	131	524	1,573	281	-2,989	-4,530	-5,011
2039	1,823,900	1,823,900	2,921,497	2,423,592	53,451	53,746	93,824	93,824	4,368	28,230	3,188	131	529	1,588	259	-3,023	-4,573	-5,090
2040	1,834,100	1,834,100	2,945,512	2,450,480	53,960	54,342	93,934	93,934	4,368	28,500	3,219	132	534	1,603	259	-3,056	-4,617	-5,145
2041	1,844,400	1,844,400	2,969,528	2,477,367	54,469	54,938	94,049	94,049	4,368	28,770	3,249	133	539	1,618	259	-3,090	-4,661	-5,201
2042	1,854,600	1,854,600	2,993,543	2,504,255	54,978	55,534	97,929	97,929	4,368	29,040	3,279	134	544	1,633	270	-3,124	-4,704	-5,247
2043	1,864,900	1,864,900	3,017,559	2,531,142	55,487	56,131	98,044	98,044	4,368	29,310	3,310	134	549	1,649	270	-3,157	-4,748	-5,303
2044	1,875,100	1,875,100	3,041,574	2,558,030	55,996	56,727	98,154	98,154	4,368	29,580	3,340	135	554	1,664	271	-3,191	-4,791	-5,358
2045	1,885,300	1,885,300	3,065,590	2,584,917	56,505	57,323	98,269	98,269	4,368	29,850	3,370	136	559	1,679	271	-3,224	-4,835	-5,414
2046	1,892,600	1,892,600	3,089,605	2,599,571	56,892	57,648	98,354	98,354	4,368	30,050	3,394	136	563	1,690	271	-3,242	-4,868	-5,450
2047	1,899,900	1,899,900	3,113,620	2,614,225	57,278	57,973	98,439	98,439	4,368	30,260	3,417	137	567	1,702	271	-3,261	-4,901	-5,485
2048	1,907,100	1,907,100	3,137,636	2,628,879	57,665	58,298	98,524	98,524	4,368	30,460	3,440	137	571	1,713	272	-3,279	-4,934	-5,520
2049	1,914,400	1,914,400	3,161,651	2,643,533	58,052	58,623	102,379	102,379	4,368	30,660	3,463	138	575	1,724	282	-3,297	-4,967	-5,545
2050	1,921,700	1,921,700	3,185,667	2,658,187	58,439	58,948	102,464	102,464	4,368	30,870	3,486	138	578	1,736	282	-3,316	-5,000	-5,580
2051	1,928,900	1,928,900	3,209,682	2,672,841	58,825	59,273	102,549	102,549	4,368	31,070	3,509	139	582	1,748	283	-3,334	-5,033	-5,616
2052	1,936,100	1,936,100	3,233,698	2,687,495	59,212	59,598	102,634	102,634	4,368	31,280	3,532	139	586	1,759	283	-3,352	-5,066	-5,651
2053	1,943,500	1,943,500	3,257,713	2,702,149	59,599	59,923	102,719	102,719	4,368	31,480	3,555	140	590	1,771	283	-3,370	-5,100	-5,686
2054	1,950,700	1,950,700	3,281,729	2,716,803	59,985	60,248	102,804	102,804	4,368	31,690	3,578	140	594	1,782	283	-3,389	-5,133	-5,721
2055	1,958,000	1,958,000	3,305,744	2,731,457	60,372	60,573	102,889	102,889	4,368	31,890	3,601	141	597	1,794	284	-3,407	-5,166	-5,757
2056	1,965,200	1,965,200	3,329,760	2,746,111	60,759	60,898	102,974	102,974	4,368	32,090	3,624	141	601	1,805	284	-3,425	-5,199	-5,792
2057	1,972,400	1,972,400	3,353,775	2,760,765	61,145	61,223	112,825	112,825	4,800	32,300	3,647	142	605	1,817	311	-3,443	-5,232	-5,800
2058	1,979,700	1,979,700	3,377,791	2,775,419	61,532	61,548	116,680	116,680	4,800	32,500	3,670	143	609	1,828	322	-3,462	-5,265	-5,826
2059	1,987,000	1,987,000	3,401,806	2,790,073	61,919	61,873	116,765	116,765	4,800	32,710	3,693	143	613	1,840	322	-3,480	-5,298	-5,861
2060	1,994,200	1,994,200	3,425,822	2,804,727	62,305	62,198	107,890	107,890	4,800	32,910	3,716	144	617	1,851	297	-3,498	-5,331	-5,921
2061	2,001,500	2,001,500	3,449,837	2,819,381	62,692	62,523	107,975	107,975	4,800	33,110	3,740	144	620	1,862	298	-3,517	-5,364	-5,956
2062	2,008,800	2,008,800	3,473,853	2,834,035	63,079	62,848	108,060	108,060	4,800	33,320	3,763	145	624	1,874	298	-3,535	-5,397	-5,991
2063	2,016,000	2,016,000	3,497,868	2,848,689	63,466	63,173	108,145	108,145	4,800	33,520	3,786	145	628	1,885	298	-3,553	-5,430	-6,027
2064	2,023,300	2,023,300	3,521,884	2,863,343	63,852	63,497	108,230	108,230	4,800	33,730	3,809	146	632	1,897	298	-3,571	-5,463	-6,062
2065	2,030,500	2,030,500	3,545,899	2,877,997	64,239	63,822	108,315	108,315	4,800	33,930	3,832	146	636	1,908	299	-3,590	-5,497	-6,097
Totals =	91,109,500	91,109,500	147,875,996	119,703,060	2,675,791	2,654,535	4,704,074	4,704,074	201,888	1,413,420	159,609	6,560	26,482	79,497	12,968	-149,303	-228,952	**-252,749**

Notes:
1. Includes transport of biosolids to land application site plus actual land application and coppice equipment.

3. Assumes that land applied biosolids are not off-setting commercial fertilizer use.
4. Negative values imply an off-set and are considered as an offset in the analysis.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski, D. Forgie
Last Revision: **February 18, 2009**
Last Revision By: D. Shiskowski

Subject: Combined Macaulay/McLoughln WWTF Solids Processing Systems,Royal Roads Organics Facility, Hartland Biosolids Drying Facility, and Industrial Biosolids Land Application / Willow Coppice Program

Option 3
Life Cycle Analysis

Yellow-shaded cell denotes assumed/input values
Note: Other coloured cells contain data linked to external spreadsheets

Year	Capital Costs			Operations & Maintenance Costs: Labour			Electricity		Natural Gas	
	WW Sludges[5]	**Total** Cost	Net Present Value	**WW Sludges**[1] Annual Cost	**Total** Annual Cost	Net Present Value	**Total** Annual Cost	Net Present Value	**Total** Annual Cost	Net Present Value
2008										
2009										
2010										
2011										
2012										
2013										
2014										
2015	$210,116,220	$210,116,220	$159,671,058							
2016		$0	$0	$1,085,769	$1,085,769	$793,361	$109,067	$79,694	$214,000	$156,368
2017		$0	$0	$1,085,769	$1,085,769	$762,847	$109,942	$77,244	$217,200	$152,602
2018		$0	$0	$1,067,885	$1,067,885	$721,425	$110,803	$74,855	$220,300	$148,827
2019		$0	$0	$1,067,885	$1,067,885	$693,677	$111,671	$72,539	$223,500	$145,181
2020		$0	$0	$1,067,885	$1,067,885	$666,998	$112,546	$70,296	$226,600	$141,534
2021		$0	$0	$1,067,885	$1,067,885	$641,344	$113,407	$68,109	$229,800	$138,012
2022		$0	$0	$1,067,885	$1,067,885	$616,677	$114,275	$65,991	$232,900	$134,494
2023		$0	$0	$1,067,885	$1,067,885	$592,958	$115,143	$63,935	$236,100	$131,098
2024		$0	$0	$1,067,885	$1,067,885	$570,152	$116,011	$61,939	$239,200	$127,711
2025		$0	$0	$1,067,885	$1,067,885	$548,223	$116,879	$60,003	$242,400	$124,442
2026		$0	$0	$1,067,885	$1,067,885	$527,138	$117,747	$58,123	$245,500	$121,186
2027		$0	$0	$1,067,885	$1,067,885	$506,863	$118,615	$56,300	$248,700	$118,044
2028		$0	$0	$1,067,885	$1,067,885	$487,369	$119,476	$54,527	$251,800	$114,918
2029		$0	$0	$1,067,885	$1,067,885	$468,624	$120,351	$52,814	$255,000	$111,903
2030		$0	$0	$1,067,885	$1,067,885	$450,600	$121,219	$51,149	$258,100	$108,907
2031		$0	$0	$1,067,885	$1,067,885	$433,269	$121,933	$49,471	$260,800	$105,813
2032		$0	$0	$1,067,885	$1,067,885	$416,605	$122,654	$47,850	$263,500	$102,797
2033		$0	$0	$1,067,885	$1,067,885	$400,581	$123,368	$46,277	$266,200	$99,856
2034		$0	$0	$1,067,885	$1,067,885	$385,174	$124,082	$44,755	$268,900	$96,989
2035		$0	$0	$1,067,885	$1,067,885	$370,360	$124,796	$43,281	$271,600	$94,195
2036		$0	$0	$1,092,000	$1,092,000	$364,157	$125,524	$41,859	$274,300	$91,473
2037		$0	$0	$1,092,000	$1,092,000	$350,151	$126,238	$40,478	$277,000	$88,820
2038		$0	$0	$1,092,000	$1,092,000	$336,684	$126,952	$39,142	$279,700	$86,237
2039		$0	$0	$1,071,000	$1,071,000	$317,509	$127,673	$37,850	$282,300	$83,691
2040		$0	$0	$1,071,000	$1,071,000	$305,297	$128,387	$36,598	$285,000	$81,242
2041		$0	$0	$1,071,000	$1,071,000	$293,555	$129,108	$35,388	$287,700	$78,857
2042		$0	$0	$1,071,000	$1,071,000	$282,264	$129,822	$34,215	$290,400	$76,536
2043		$0	$0	$1,071,000	$1,071,000	$271,408	$130,543	$33,082	$293,100	$74,276
2044		$0	$0	$1,071,000	$1,071,000	$260,969	$131,257	$31,983	$295,800	$72,077
2045		$0	$0	$1,071,000	$1,071,000	$250,932	$131,971	$30,920	$298,500	$69,938
2046		$0	$0	$1,071,000	$1,071,000	$241,281	$132,482	$29,846	$300,500	$67,698
2047		$0	$0	$1,071,000	$1,071,000	$232,001	$132,993	$28,809	$302,600	$65,549
2048		$0	$0	$1,071,000	$1,071,000	$223,078	$133,497	$27,806	$304,600	$63,445
2049		$0	$0	$1,071,000	$1,071,000	$214,498	$134,008	$26,839	$306,600	$61,405
2050		$0	$0	$1,071,000	$1,071,000	$206,248	$134,519	$25,905	$308,700	$59,448
2051		$0	$0	$1,071,000	$1,071,000	$198,315	$135,023	$25,002	$310,700	$57,532
2052		$0	$0	$1,071,000	$1,071,000	$190,688	$135,527	$24,130	$312,800	$55,693
2053		$0	$0	$1,071,000	$1,071,000	$183,353	$136,045	$23,291	$314,800	$53,893
2054		$0	$0	$1,071,000	$1,071,000	$176,301	$136,549	$22,478	$316,900	$52,166
2055		$0	$0	$1,071,000	$1,071,000	$169,521	$137,060	$21,694	$318,900	$50,476
2056		$0	$0	$1,071,000	$1,071,000	$163,001	$137,564	$20,937	$320,900	$48,839
2057		$0	$0	$1,096,154	$1,096,154	$160,412	$138,068	$20,205	$323,000	$47,268
2058		$0	$0	$1,096,154	$1,096,154	$154,243	$138,579	$19,500	$325,000	$45,732
2059		$0	$0	$1,096,154	$1,096,154	$148,310	$139,090	$18,819	$327,100	$44,257
2060		$0	$0	$1,073,077	$1,073,077	$139,604	$139,594	$18,161	$329,100	$42,815
2061		$0	$0	$1,073,077	$1,073,077	$134,234	$140,105	$17,526	$331,100	$41,418
2062		$0	$0	$1,073,077	$1,073,077	$129,072	$140,616	$16,914	$333,200	$40,078
2063		$0	$0	$1,073,077	$1,073,077	$124,107	$141,120	$16,321	$335,200	$38,768
2064		$0	$0	$1,073,077	$1,073,077	$119,334	$141,631	$15,750	$337,300	$37,510
2065		$0	$0	$1,073,077	$1,073,077	$114,744	$142,135	$15,198	$339,300	$36,281
Total Capital =	$210,116,220	$210,116,220								
Total Net Present Value =			$159,671,058			$17,509,516		$1,995,799		$4,288,293

Year	Chemicals			Trucking/Equipment[3]			Land Lease for Willow Coppice		Maintenance		Administration	
	WW Sludges Annual Cost	**Total** Annual Cost	Net Present Value	**WW Sludges**[2] Annual Cost	**Total** Annual Cost	Net Present Value	**Total** Annual Cost	Net Present Value	**Total** Annual Cost	Net Present Value	**Total** Annual Cost	Net Present Value
2008												
2009												
2010												
2011												
2012												
2013												
2014												
2015												
2016	$423,300	$423,300	$309,301	$849,850	$849,850	$620,977	$153,450	$112,124	$2,101,162	$1,535,299	$100,000	$73,069
2017	$429,800	$429,800	$301,972	$852,850	$852,850	$599,201	$153,450	$107,812	$2,101,162	$1,476,249	$100,000	$70,259
2018	$436,400	$436,400	$294,816	$594,650	$594,650	$401,724	$153,450	$103,665	$2,101,162	$1,419,470	$100,000	$67,556
2019	$441,900	$441,900	$287,050	$608,500	$608,500	$395,270	$153,450	$99,678	$2,101,162	$1,364,875	$100,000	$64,958
2020	$448,400	$448,400	$280,069	$611,000	$611,000	$381,629	$153,450	$95,844	$2,101,162	$1,312,380	$100,000	$62,460
2021	$455,000	$455,000	$273,261	$614,000	$614,000	$368,752	$153,450	$92,158	$2,101,162	$1,261,904	$100,000	$60,057
2022	$460,500	$460,500	$265,927	$617,000	$617,000	$356,302	$153,450	$88,614	$2,101,162	$1,213,369	$100,000	$57,748
2023	$467,000	$467,000	$259,309	$620,000	$620,000	$344,264	$153,450	$85,205	$2,101,162	$1,166,701	$100,000	$55,526
2024	$473,600	$473,600	$252,859	$633,450	$633,450	$338,204	$153,450	$81,928	$2,101,162	$1,121,828	$100,000	$53,391
2025	$479,100	$479,100	$245,957	$636,450	$636,450	$326,736	$153,450	$78,777	$2,101,162	$1,078,680	$100,000	$51,337
2026	$485,600	$485,600	$239,706	$639,450	$639,450	$315,651	$153,450	$75,747	$2,101,162	$1,037,193	$100,000	$49,363
2027	$492,200	$492,200	$233,619	$642,450	$642,450	$304,934	$153,450	$72,834	$2,101,162	$997,301	$100,000	$47,464
2028	$498,700	$498,700	$227,600	$645,450	$645,450	$294,575	$153,450	$70,033	$2,101,162	$958,943	$100,000	$45,639
2029	$504,200	$504,200	$221,260	$647,950	$647,950	$284,342	$153,450	$67,339	$2,101,162	$922,061	$100,000	$43,883
2030	$510,800	$510,800	$215,535	$661,750	$661,750	$279,229	$153,450	$64,749	$2,101,162	$886,597	$100,000	$42,196
2031	$516,200	$516,200	$209,436	$664,250	$664,250	$269,504	$153,450	$62,259	$2,101,162	$852,497	$100,000	$40,573
2032	$521,700	$521,700	$203,526	$723,950	$723,950	$282,428	$153,450	$59,864	$2,101,162	$819,708	$100,000	$39,012
2033	$526,100	$526,100	$197,349	$726,450	$726,450	$272,504	$153,450	$57,562	$2,101,162	$788,181	$100,000	$37,512
2034	$531,600	$531,600	$191,742	$728,950	$728,950	$262,924	$153,450	$55,348	$2,101,162	$757,867	$100,000	$36,069
2035	$537,100	$537,100	$186,275	$731,450	$731,450	$253,679	$153,450	$53,219	$2,101,162	$728,718	$100,000	$34,682
2036	$542,500	$542,500	$180,912	$1,054,700	$1,054,700	$351,719	$180,180	$60,086	$2,101,162	$700,690	$100,000	$33,348
2037	$548,000	$548,000	$175,717	$1,057,200	$1,057,200	$338,993	$180,180	$57,775	$2,101,162	$673,741	$100,000	$32,065
2038	$553,400	$553,400	$170,624	$1,059,200	$1,059,200	$326,571	$180,180	$55,553	$2,101,162	$647,828	$100,000	$30,832
2039	$558,900	$558,900	$165,692	$754,900	$754,900	$223,798	$180,180	$53,416	$2,101,162	$622,911	$100,000	$29,646
2040	$563,300	$563,300	$160,573	$757,400	$757,400	$215,903	$180,180	$51,362	$2,101,162	$598,953	$100,000	$28,506
2041	$568,800	$568,800	$155,905	$759,900	$759,900	$208,284	$180,180	$49,386	$2,101,162	$575,916	$100,000	$27,409
2042	$574,200	$574,200	$151,332	$773,250	$773,250	$203,792	$180,180	$47,487	$2,101,162	$553,766	$100,000	$26,355
2043	$579,700	$579,700	$146,905	$775,750	$775,750	$196,587	$180,180	$45,660	$2,101,162	$532,467	$100,000	$25,342
2044	$585,200	$585,200	$142,595	$778,250	$778,250	$189,635	$180,180	$43,904	$2,101,162	$511,988	$100,000	$24,367
2045	$590,600	$590,600	$138,376	$780,750	$780,750	$182,927	$180,180	$42,216	$2,101,162	$492,296	$100,000	$23,430
2046	$594,000	$594,000	$133,820	$782,750	$782,750	$176,342	$180,180	$40,592	$2,101,162	$473,361	$100,000	$22,529
2047	$598,300	$598,300	$129,604	$784,250	$784,250	$169,885	$180,180	$39,031	$2,101,162	$455,155	$100,000	$21,662
2048	$602,600	$602,600	$125,515	$786,250	$786,250	$163,767	$180,180	$37,530	$2,101,162	$437,649	$100,000	$20,829
2049	$607,000	$607,000	$121,569	$799,150	$799,150	$160,052	$180,180	$36,086	$2,101,162	$420,816	$100,000	$20,028
2050	$610,300	$610,300	$117,528	$801,150	$801,150	$154,281	$180,180	$34,698	$2,101,162	$404,631	$100,000	$19,257
2051	$614,700	$614,700	$113,823	$802,650	$802,650	$148,625	$180,180	$33,364	$2,101,162	$389,068	$100,000	$18,517
2052	$619,000	$619,000	$110,211	$804,650	$804,650	$143,265	$180,180	$32,080	$2,101,162	$374,104	$100,000	$17,805
2053	$622,400	$622,400	$106,554	$806,650	$806,650	$138,097	$180,180	$30,847	$2,101,162	$359,716	$100,000	$17,120
2054	$626,700	$626,700	$103,164	$808,650	$808,650	$133,115	$180,180	$29,660	$2,101,162	$345,880	$100,000	$16,461
2055	$631,100	$631,100	$99,892	$810,150	$810,150	$128,233	$180,180	$28,519	$2,101,162	$332,577	$100,000	$15,828
2056	$634,400	$634,400	$96,552	$812,150	$812,150	$123,605	$180,180	$27,422	$2,101,162	$319,786	$100,000	$15,219
2057	$638,800	$638,800	$93,483	$1,153,250	$1,153,250	$168,768	$198,000	$28,976	$2,101,162	$307,486	$100,000	$14,634
2058	$643,100	$643,100	$90,492	$1,166,200	$1,166,200	$164,099	$198,000	$27,861	$2,101,162	$295,660	$100,000	$14,071
2059	$646,500	$646,500	$87,472	$1,167,700	$1,167,700	$157,991	$198,000	$26,790	$2,101,162	$284,288	$100,000	$13,530
2060	$650,800	$650,800	$84,667	$832,600	$832,600	$108,319	$198,000	$25,759	$2,101,162	$273,354	$100,000	$13,010
2061	$655,100	$655,100	$81,948	$834,600	$834,600	$104,403	$198,000	$24,768	$2,101,162	$262,841	$100,000	$12,509
2062	$659,500	$659,500	$79,326	$836,600	$836,600	$100,628	$198,000	$23,816	$2,101,162	$252,731	$100,000	$12,028
2063	$662,800	$662,800	$76,656	$838,100	$838,100	$96,931	$198,000	$22,900	$2,101,162	$243,011	$100,000	$11,566
2064	$667,200	$667,200	$74,197	$840,100	$840,100	$93,425	$198,000	$22,019	$2,101,162	$233,664	$100,000	$11,121
2065	$671,500	$671,500	$71,804	$842,100	$842,100	$90,046	$198,000	$21,172	$2,101,162	$224,677	$100,000	$10,693
Total Net Present Value =			$8,483,475			$12,114,915		$2,685,494		$34,300,832		$1,632,469

Year	GHG CO2e[4]		Dried WW Biosolids Revenues		Biomethane Revenues		Woodchip Revenues (via Willow Coppice)		Total	
	Total Annual Cost	Net Present Value	**Total** Annual Rev	Net Present Value	**Total** Annual Rev	Net Present Value	**Total** Annual Rev	Net Present Value	**Total** Annual Cost	Net Present Value
2008										
2009										
2010										
2011										
2012										
2013										
2014										
2015									$210,116,220	$159,671,058
2016	-$54,469	-$39,800	-$66,917	-$48,896	-$372,994	-$272,543	$0	$0	$4,542,219	$3,318,955
2017	-$55,525	-$39,011	-$67,903	-$47,708	-$380,908	-$267,621	$0	$0	$4,545,837	$3,193,845
2018	-$56,877	-$38,424	-$68,890	-$46,539	-$388,822	-$262,674	-$372,000	-$251,310	$3,898,061	$2,633,390
2019	-$57,778	-$37,531	-$69,876	-$45,390	-$396,736	-$257,712	-$372,000	-$241,644	$3,911,678	$2,540,951
2020	-$58,843	-$36,753	-$70,862	-$44,260	-$404,651	-$252,744	-$372,000	-$232,350	$3,914,688	$2,445,102
2021	-$59,900	-$35,974	-$71,848	-$43,150	-$412,565	-$247,776	-$372,000	-$223,414	$3,918,391	$2,353,284
2022	-$60,964	-$35,205	-$72,834	-$42,060	-$420,479	-$242,816	-$372,000	-$214,821	$3,920,894	$2,264,219
2023	-$62,021	-$34,438	-$73,821	-$40,990	-$428,393	-$237,872	-$372,000	-$206,558	$3,924,505	$2,179,138
2024	-$62,930	-$33,599	-$74,807	-$39,940	-$436,307	-$232,948	-$372,000	-$198,614	$3,938,714	$2,102,911
2025	-$63,987	-$32,849	-$75,793	-$38,910	-$444,222	-$228,051	-$372,000	-$190,975	$3,941,325	$2,023,371
2026	-$65,052	-$32,111	-$76,779	-$37,900	-$452,136	-$223,187	-$372,000	-$183,630	$3,944,827	$1,947,278
2027	-$66,108	-$31,378	-$77,765	-$36,911	-$460,050	-$218,359	-$372,000	-$176,567	$3,948,538	$1,874,144
2028	-$67,173	-$30,657	-$78,752	-$35,941	-$467,964	-$213,573	-$372,000	-$169,776	$3,952,034	$1,803,657
2029	-$68,230	-$29,941	-$79,738	-$34,992	-$475,878	-$208,831	-$372,000	-$163,246	$3,954,152	$1,735,215
2030	-$69,139	-$29,173	-$80,724	-$34,062	-$483,793	-$204,139	-$372,000	-$156,967	$3,968,711	$1,674,619
2031	-$69,976	-$28,391	-$81,565	-$33,093	-$489,755	-$198,707	-$372,000	-$150,930	$3,972,384	$1,611,701
2032	-$70,681	-$27,574	-$82,406	-$32,148	-$495,718	-$193,390	-$372,000	-$145,125	$4,033,497	$1,573,554
2033	-$71,518	-$26,828	-$83,246	-$31,227	-$501,680	-$188,189	-$372,000	-$139,543	$4,036,170	$1,514,035
2034	-$72,356	-$26,098	-$84,087	-$30,329	-$507,643	-$183,101	-$372,000	-$134,176	$4,039,943	$1,457,164
2035	-$73,193	-$25,385	-$84,928	-$29,454	-$513,605	-$178,127	-$372,000	-$129,016	$4,043,716	$1,402,428
2036	-$73,487	-$24,506	-$85,769	-$28,602	-$519,568	-$173,264	-$436,800	-$145,663	$4,354,742	$1,452,208
2037	-$74,325	-$23,832	-$86,610	-$27,772	-$525,531	-$168,512	-$436,800	-$140,061	$4,358,515	$1,397,564
2038	-$75,162	-$23,174	-$87,451	-$26,963	-$531,493	-$163,869	-$436,800	-$134,674	$4,361,689	$1,344,790
2039	-$76,345	-$22,633	-$88,291	-$26,175	-$537,456	-$159,334	-$436,800	-$129,494	$4,037,223	$1,196,876
2040	-$77,182	-$22,001	-$89,132	-$25,408	-$543,418	-$154,906	-$436,800	-$124,513	$4,039,897	$1,151,605
2041	-$78,019	-$21,385	-$89,973	-$24,661	-$549,381	-$150,582	-$436,800	-$119,724	$4,043,677	$1,108,348
2042	-$78,701	-$20,742	-$90,814	-$23,934	-$555,344	-$146,362	-$436,800	-$115,120	$4,058,356	$1,069,588
2043	-$79,538	-$20,156	-$91,655	-$23,227	-$561,306	-$142,244	-$436,800	-$110,692	$4,062,136	$1,029,408
2044	-$80,375	-$19,585	-$92,495	-$22,538	-$567,269	-$138,226	-$436,800	-$106,434	$4,065,910	$990,735
2045	-$81,213	-$19,028	-$93,336	-$21,868	-$573,231	-$134,306	-$436,800	-$102,341	$4,069,583	$953,490
2046	-$81,746	-$18,416	-$93,975	-$21,171	-$576,481	-$129,873	-$436,800	-$98,405	$4,073,073	$917,604
2047	-$82,270	-$17,821	-$94,614	-$20,495	-$579,731	-$125,582	-$436,800	-$94,620	$4,077,071	$883,178
2048	-$82,803	-$17,247	-$95,253	-$19,840	-$582,980	-$121,428	-$436,800	-$90,981	$4,081,453	$850,122
2049	-$83,180	-$16,659	-$95,891	-$19,205	-$586,230	-$117,409	-$436,800	-$87,481	$4,096,999	$820,538
2050	-$83,705	-$16,119	-$96,530	-$18,589	-$589,480	-$113,519	-$436,800	-$84,117	$4,100,497	$789,653
2051	-$84,238	-$15,598	-$97,169	-$17,993	-$592,729	-$109,755	-$436,800	-$80,881	$4,104,479	$760,019
2052	-$84,762	-$15,092	-$97,808	-$17,414	-$595,979	-$106,112	-$436,800	-$77,771	$4,108,970	$731,587
2053	-$85,295	-$14,602	-$98,446	-$16,854	-$599,229	-$102,587	-$436,800	-$74,779	$4,112,467	$704,048
2054	-$85,820	-$14,127	-$99,085	-$16,311	-$602,478	-$99,176	-$436,800	-$71,903	$4,116,958	$677,708
2055	-$86,353	-$13,668	-$99,724	-$15,785	-$605,728	-$95,876	-$436,800	-$69,138	$4,120,948	$652,274
2056	-$86,886	-$13,224	-$100,363	-$15,275	-$608,978	-$92,683	-$436,800	-$66,479	$4,124,330	$627,701
2057	-$87,006	-$12,733	-$101,001	-$14,781	-$612,227	-$89,594	-$480,000	-$70,244	$4,468,199	$653,881
2058	-$87,384	-$12,296	-$101,640	-$14,302	-$615,477	-$86,605	-$480,000	-$67,542	$4,483,695	$630,912
2059	-$87,908	-$11,894	-$102,279	-$13,838	-$618,727	-$83,714	-$480,000	-$64,944	$4,486,793	$607,066
2060	-$88,812	-$11,554	-$102,918	-$13,389	-$621,976	-$80,917	-$480,000	-$62,446	$4,130,628	$537,381
2061	-$89,344	-$11,176	-$103,556	-$12,954	-$625,226	-$78,211	-$480,000	-$60,045	$4,135,017	$517,262
2062	-$89,869	-$10,810	-$104,195	-$12,533	-$628,476	-$75,594	-$480,000	-$57,735	$4,139,616	$497,920
2063	-$90,402	-$10,455	-$104,834	-$12,125	-$631,725	-$73,063	-$480,000	-$55,515	$4,142,498	$479,103
2064	-$90,927	-$10,112	-$105,473	-$11,729	-$634,975	-$70,614	-$480,000	-$53,379	$4,147,096	$461,187
2065	-$91,460	-$9,780	-$106,111	-$11,346	-$638,225	-$68,245	-$480,000	-$51,326	$4,151,479	$443,918
Total Net Present Value =		-$1,141,547		-$1,340,977		-$7,964,522		-$5,977,110		**$226,257,695**

Notes:
1. Copied from dnt_Organics_LCA_ds.xls, Alt1d - LCA.
3. Includes **diesel fuel**, driver, maintenance costs and same for coppice activities.
4. Excludes CO2e off-sets of commerical fertilizers by non-CRD end users (i.e. assumes that the CRD would not be able to sell these "credits"). Includes CO2 off-sets from sale of biomethane and dried WW sludges.
5. Includes biomethane upgrading and P recovery systems and willow coppice planting and harvesting equipment.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File:	20062935.04.E.03.06	**Subject:** Internal Recycling Systems
Prepared:	D. Shiskowski	
Last Revision:	**March 6, 2009**	Option 3
Last Revision By:	**D. Shiskowski**	
Checked:		

Yellow-shaded cell denotes assumed/input value

GENERIC ASSUMPTIONS

Saleable Reclaimed Water:

unit CRD potable water supply price (2008) = $ 0.90 /m3

Ref: Average 2008 consumption charge across the CRD, per the CRD web-site.

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: March 6, 2009
Last Revision By: D. Shiskowski

Subject: Total Core Area - Internal Recycle System
Capital Costs and Value of Water Saved via
Toilet Flushing Purposes.
Life Cycle Analysis
Option 3

Yellow-shaded cell denotes assumed/input values

Year	Total Core Area		Annual Volume of Internally Recycled Water (for toilet flushing)	Value of Internally Recycled Water (for toilet flushing)	
	Option 1 and 2 ADWF	Option 3 ADWF		Total	Net Present
	(m3/d)	(m3/d)	(m3/yr)	Annual Rev	Value
2008					
2009					
2010					
2011					
2012					
2013					
2014					
2015	111,202	111,202	0	$0	$0
2016	112,048	112,048	0	$0	$0
2017	112,895	112,895	0	$0	$0
2018	113,741	113,741	0	$0	$0
2019	114,588	114,588	0	$0	$0
2020	115,434	114,852	212,530	-$191,277	-$119,471
2021	116,280	115,116	425,059	-$382,553	-$229,752
2022	117,127	115,380	637,589	-$573,830	-$331,372
2023	117,973	115,644	850,118	-$765,106	-$424,836
2024	118,820	115,908	1,062,648	-$956,383	-$510,621
2025	119,666	116,172	1,275,177	-$1,147,660	-$589,178
2026	120,512	116,436	1,487,707	-$1,338,936	-$660,937
2027	121,359	116,701	1,700,236	-$1,530,213	-$726,304
2028	122,205	116,965	1,912,766	-$1,721,489	-$785,665
2029	123,052	117,229	2,125,295	-$1,912,766	-$839,386
2030	123,898	117,493	2,337,825	-$2,104,043	-$887,812
2031	124,581	117,766	2,487,426	-$2,238,684	-$908,293
2032	125,263	118,038	2,637,028	-$2,373,325	-$925,885
2033	125,946	118,311	2,786,629	-$2,507,966	-$940,780
2034	126,628	118,584	2,936,230	-$2,642,607	-$953,160
2035	127,311	118,856	3,085,832	-$2,777,249	-$963,196
2036	127,993	119,129	3,235,433	-$2,911,890	-$971,050
2037	128,676	119,402	3,385,034	-$3,046,531	-$976,874
2038	129,358	119,674	3,534,636	-$3,181,172	-$980,815
2039	130,041	119,947	3,684,237	-$3,315,813	-$983,007
2040	130,723	120,220	3,833,838	-$3,450,455	-$983,579
2041	131,406	120,492	3,983,440	-$3,585,096	-$982,654
2042	132,088	120,765	4,133,041	-$3,719,737	-$980,344
2043	132,771	121,038	4,282,642	-$3,854,378	-$976,759
2044	133,453	121,310	4,432,244	-$3,989,019	-$971,999
2045	134,136	121,583	4,581,845	-$4,123,661	-$966,161
2046	134,579	121,616	4,731,623	-$4,258,460	-$959,369
2047	135,023	121,649	4,881,400	-$4,393,260	-$951,671
2048	135,466	121,682	5,031,178	-$4,528,060	-$943,145
2049	135,909	121,715	5,180,956	-$4,662,860	-$933,868
2050	136,353	121,748	5,330,734	-$4,797,660	-$923,909
2051	136,796	121,781	5,480,511	-$4,932,460	-$913,335
2052	137,239	121,814	5,630,289	-$5,067,260	-$902,207
2053	137,682	121,847	5,780,067	-$5,202,060	-$890,584
2054	138,126	121,880	5,929,845	-$5,336,860	-$878,521
2055	138,569	121,913	6,079,622	-$5,471,660	-$866,068
2056	139,012	121,945	6,229,400	-$5,606,460	-$853,274
2057	139,456	121,978	6,379,178	-$5,741,260	-$840,182
2058	139,899	122,011	6,528,956	-$5,876,060	-$826,836
2059	140,342	122,044	6,678,733	-$6,010,860	-$813,273
2060	140,786	122,077	6,828,511	-$6,145,660	-$799,530
2061	141,229	122,110	6,978,289	-$6,280,460	-$785,642
2062	141,672	122,143	7,128,067	-$6,415,260	-$771,639
2063	142,115	122,176	7,277,844	-$6,550,060	-$757,551
2064	142,559	122,209	7,427,622	-$6,684,860	-$743,405
2065	143,002	122,242	7,577,400	-$6,819,660	-$729,226
Totals =				**-$171,123,041**	**-$37,653,125**

Notes:

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 18, 2009
Last Revision By: D. Shiskowski
Checked:

Subject: CFA and LCA Summary

Option 3

Year	Carbon Footprint			Operations and Maintenance						Revenues		Capital (excludes Internal Recycling Systems)		Total	
	Total Annual Emissions (t CO2e/yr)	Total Annual Costs	GHG CO2 Net Present Value	Total Annual Costs (end of WP WWTF)	Net Present Value (end of WP WWTF)	Total Annual Costs (remaining to end)	Net Present Value (remaining to end)	**Total Annual Costs**	**Net Present Value**	Total Annual Revenues	Net Present Value	Total Capital Cost	Net Present Value	Total Annual Cost	Net Present Value
2008															
2009															
2010															
2011															
2012															
2013															
2014												$1,560,896,100	$1,233,598,861	$1,560,896,100	$1,233,598,861
2015	-22,459	-$330,027	-$338,039	$13,756,786	$10,453,181	$13,271,118	$10,084,959	$27,027,904	$20,538,140	-$2,597,574	-$1,973,942	$210,116,220	$0	$234,216,524	$18,226,159
2016	-29,050	-$426,987	-$410,561	$13,763,975	$10,056,384	$18,349,946	$13,408,126	$32,113,921	$23,464,510	-$3,324,587	-$2,429,243	$0	$0	$28,362,347	$20,624,705
2017	-30,989	-$454,059	-$429,010	$13,771,166	$9,674,649	$18,405,876	$12,931,724	$32,177,043	$22,606,373	-$3,535,209	-$2,483,791	$0	$0	$28,187,774	$19,693,572
2018	-32,649	-$476,882	-$443,681	$13,778,360	$9,307,404	$18,182,833	$12,283,671	$31,961,194	$21,591,075	-$4,083,829	-$2,758,889	$0	$0	$27,400,483	$18,388,505
2019	-34,280	-$499,172	-$457,374	$13,785,557	$8,980,207	$18,248,859	$11,854,111	$32,034,416	$20,834,318	-$4,260,449	-$2,767,507	$0	$0	$27,274,795	$17,609,437
2020	-35,922	-$521,550	-$470,556	$13,792,756	$8,640,537	$18,304,570	$11,432,980	$32,097,326	$20,073,517	-$4,628,346	-$2,890,851	$0	$0	$26,947,430	$16,712,109
2021	-37,563	-$543,848	-$483,156	$13,799,960	$8,313,769	$18,361,094	$11,027,197	$32,161,054	$19,340,966	-$4,996,243	-$3,000,614	$0	$0	$26,620,963	$15,857,197
2022	-39,205	-$566,088	-$495,225	$13,807,167	$7,999,414	$18,416,555	$10,635,102	$32,223,722	$18,634,516	-$5,364,140	-$3,097,657	$0	$0	$26,293,494	$15,041,633
2023	-40,846	-$588,258	-$506,795	$13,814,379	$7,697,001	$18,473,246	$10,257,538	$32,287,624	$17,954,539	-$5,732,037	-$3,182,796	$0	$0	$25,967,330	$14,264,947
2024	-42,477	-$610,221	-$517,829	$13,821,595	$7,406,077	$18,540,517	$9,898,933	$32,362,112	$17,305,011	-$6,099,933	-$3,256,804	$0	$0	$25,651,958	$13,530,378
2025	-44,118	-$632,277	-$528,523	$13,828,817	$7,126,206	$18,596,469	$9,546,930	$32,425,286	$16,673,136	-$6,467,830	-$3,320,411	$0	$0	$25,325,179	$12,824,202
2026	-45,759	-$654,290	-$538,832	$13,836,043	$6,856,968	$18,653,453	$9,207,869	$32,489,497	$16,064,837	-$6,835,727	-$3,374,307	$0	$0	$24,999,480	$12,151,698
2027	-47,400	-$676,247	-$548,780	$13,843,276	$6,597,959	$18,710,771	$8,880,926	$32,554,047	$15,478,885	-$7,203,624	-$3,419,145	$0	$0	$24,674,176	$11,510,960
2028	-49,042	-$698,168	-$558,404	$13,850,515	$6,348,792	$18,768,014	$8,565,477	$32,618,529	$14,914,269	-$7,571,520	-$3,455,543	$0	$0	$24,348,840	$10,900,322
2029	-50,683	-$720,040	-$567,725	$13,857,760	$6,109,093	$18,824,006	$8,260,606	$32,681,766	$14,369,699	-$7,939,417	-$3,484,083	$0	$0	$24,022,310	$10,317,892
2030	-52,314	-$741,725	-$576,710	$14,250,394	$6,041,116	$19,163,773	$8,086,257	$33,414,167	$14,127,373	-$8,307,314	-$3,505,316	$65,672,880	$27,711,025	$90,038,008	$37,756,373
2031	-52,860	-$748,710	-$571,186	$14,260,322	$5,814,190	$19,205,475	$7,792,167	$33,465,797	$13,606,357	-$8,499,006	-$3,448,270	$0	$0	$24,218,082	$9,586,901
2032	-53,397	-$755,574	-$565,830	$14,270,250	$5,595,849	$19,304,615	$7,531,145	$33,574,865	$13,126,993	-$8,690,697	-$3,390,428	$0	$0	$24,128,594	$9,170,736
2033	-53,943	-$762,581	-$560,743	$14,280,179	$5,385,767	$19,345,578	$7,256,851	$33,625,757	$12,642,618	-$8,882,389	-$3,331,933	$0	$0	$23,980,787	$8,749,942
2034	-54,489	-$769,599	-$555,866	$14,290,109	$5,183,633	$19,387,772	$6,992,961	$33,677,881	$12,176,594	-$9,074,080	-$3,272,923	$0	$0	$23,834,202	$8,347,805
2035	-55,035	-$776,627	-$551,196	$14,300,039	$4,989,147	$19,430,099	$6,738,680	$33,730,138	$11,727,828	-$9,265,772	-$3,213,523	$0	$0	$23,687,739	$7,963,109
2036	-55,544	-$783,122	-$546,547	$14,309,970	$4,802,021	$19,844,067	$6,617,549	$34,154,037	$11,419,570	-$9,522,263	-$3,175,460	$0	$0	$23,848,652	$7,697,562
2037	-56,090	-$790,170	-$542,286	$14,319,902	$4,621,975	$19,886,660	$6,376,686	$34,206,561	$10,998,660	-$9,713,955	-$3,114,793	$0	$0	$23,702,436	$7,341,581
2038	-56,636	-$797,228	-$538,219	$14,329,834	$4,448,742	$19,928,786	$6,144,417	$34,258,620	$10,593,159	-$9,905,646	-$3,054,096	$0	$0	$23,555,746	$7,000,844
2039	-57,205	-$804,642	-$534,445	$14,339,768	$4,282,066	$19,643,754	$5,823,592	$33,983,521	$10,105,658	-$10,097,338	-$2,993,459	$0	$0	$23,081,541	$6,577,754
2040	-57,751	-$811,720	-$530,752	$14,349,702	$4,121,699	$19,685,650	$5,611,551	$34,035,352	$9,733,249	-$10,289,030	-$2,932,970	$0	$0	$22,934,602	$6,269,528
2041	-58,297	-$818,807	-$527,242	$14,359,637	$3,967,401	$19,728,789	$5,407,546	$34,088,426	$9,374,947	-$10,480,721	-$2,872,705	$0	$0	$22,788,898	$5,975,001
2042	-58,832	-$825,748	-$523,869	$14,369,573	$3,818,945	$19,782,808	$5,213,800	$34,152,381	$9,032,745	-$10,672,413	-$2,812,737	$0	$0	$22,654,220	$5,696,139
2043	-59,378	-$832,854	-$520,715	$14,379,509	$3,676,109	$19,826,221	$5,024,271	$34,205,731	$8,700,380	-$10,864,104	-$2,753,132	$0	$0	$22,508,773	$5,426,533
2044	-59,924	-$839,969	-$517,732	$14,389,447	$3,538,681	$19,869,766	$4,841,640	$34,259,212	$8,380,321	-$11,055,796	-$2,693,952	$0	$0	$22,363,448	$5,168,638
2045	-60,470	-$847,093	-$514,916	$14,542,250	$3,439,930	$19,922,334	$4,667,740	$34,464,584	$8,107,670	-$11,247,487	-$2,635,251	$15,185,040	$3,557,807	$37,555,044	$8,515,309
2046	-62,170	-$869,327	-$526,752	$14,547,632	$3,310,141	$19,960,513	$4,496,813	$34,508,144	$7,806,953	-$11,564,296	-$2,605,267	$0	$0	$22,074,521	$4,674,934
2047	-63,551	-$886,755	-$537,457	$14,553,014	$3,185,299	$19,999,334	$4,332,268	$34,552,348	$7,517,566	-$11,841,240	-$2,565,057	$0	$0	$21,824,354	$4,415,053
2048	-64,540	-$898,282	-$546,935	$14,558,398	$3,065,215	$20,038,692	$4,173,840	$34,597,090	$7,239,054	-$12,069,034	-$2,513,848	$0	$0	$21,629,773	$4,178,272
2049	-65,519	-$909,634	-$556,477	$14,563,783	$2,949,707	$20,089,201	$4,023,423	$34,652,983	$6,973,131	-$12,296,829	-$2,462,783	$0	$0	$21,446,521	$3,953,870
2050	-66,466	-$920,478	-$566,024	$14,569,169	$2,838,603	$20,127,954	$3,876,139	$34,697,123	$6,714,742	-$12,522,724	-$2,411,563	$0	$0	$21,253,921	$3,737,156
2051	-67,234	-$928,626	-$575,180	$14,574,557	$2,731,733	$20,167,346	$3,734,351	$34,741,903	$6,466,084	-$12,740,587	-$2,359,152	$0	$0	$21,072,690	$3,531,753
2052	-68,001	-$936,750	-$584,477	$14,579,946	$2,628,937	$20,207,385	$3,597,851	$34,787,330	$6,226,788	-$12,958,450	-$2,307,205	$0	$0	$20,892,131	$3,335,106
2053	-68,769	-$944,867	-$593,915	$14,585,336	$2,530,058	$20,246,584	$3,466,183	$34,831,920	$5,996,241	-$13,176,312	-$2,255,764	$0	$0	$20,710,741	$3,146,562
2054	-69,536	-$952,962	-$603,488	$14,590,727	$2,434,949	$20,286,917	$3,339,508	$34,877,645	$5,774,457	-$13,394,175	-$2,204,867	$0	$0	$20,530,508	$2,966,102
2055	-70,213	-$959,686	-$612,979	$14,596,120	$2,343,465	$20,326,906	$3,217,395	$34,923,026	$5,560,860	-$13,598,799	-$2,152,453	$0	$0	$20,364,541	$2,795,428
2056	-70,626	-$963,291	-$616,146	$14,601,514	$2,255,468	$20,366,436	$3,099,665	$34,967,951	$5,355,133	-$13,768,750	-$2,095,532	$0	$0	$20,235,909	$2,643,456
2057	-70,955	-$966,360	-$614,258	$14,606,910	$2,170,826	$20,789,391	$3,042,343	$35,396,300	$5,213,169	-$13,976,730	-$2,045,370	$0	$0	$20,453,210	$2,553,540
2058	-71,301	-$969,696	-$612,583	$14,612,306	$2,089,410	$20,841,179	$2,932,617	$35,453,485	$5,022,027	-$14,141,510	-$1,989,889	$0	$0	$20,342,279	$2,419,556
2059	-71,657	-$973,191	-$611,094	$14,617,705	$2,011,098	$20,880,868	$2,825,194	$35,498,573	$4,836,292	-$14,306,289	-$1,935,649	$0	$0	$20,219,093	$2,289,549
2060	-72,038	-$977,074	-$609,814	$14,623,104	$1,935,771	$20,561,826	$2,675,026	$35,184,930	$4,610,797	-$14,471,069	-$1,882,639	$0	$0	$19,736,787	$2,118,345
2061	-72,395	-$980,597	-$608,638	$14,628,505	$1,863,315	$20,603,120	$2,577,306	$35,231,626	$4,440,622	-$14,635,849	-$1,830,842	$0	$0	$19,615,180	$2,001,142
2062	-72,751	-$984,121	-$607,610	$14,633,907	$1,793,622	$20,644,768	$2,483,189	$35,278,676	$4,276,811	-$14,800,628	-$1,780,245	$0	$0	$19,493,926	$1,888,955
2063	-73,107	-$987,664	-$606,728	$14,639,311	$1,726,586	$20,684,864	$2,392,319	$35,324,175	$4,118,904	-$14,965,408	-$1,730,832	$0	$0	$19,371,103	$1,781,345
2064	-73,463	-$991,206	-$605,983	$14,644,716	$1,662,105	$20,726,821	$2,304,972	$35,371,538	$3,967,077	-$15,130,188	-$1,682,586	$0	$0	$19,250,143	$1,678,508
2065	-73,820	-$994,767	-$605,375	$14,650,123	$1,600,083	$20,768,728	$2,220,801	$35,418,850	$3,820,883	-$15,294,967	-$1,635,491	$0	$0	$19,129,116	$1,580,017
Totals =	**-2,872,720**	**-$40,099,616**	**-$27,774,655**	**n/a**	**n/a**	**n/a**	**n/a**	**$1,722,808,089**	**$565,635,508**	**-$508,862,310**	**-$136,543,565**	**$1,851,870,240**	**$1,264,867,693**	**$3,025,716,403**	**$1,666,184,981**

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: February 18, 2009
Last Revision By: D. Shiskowski
Checked:

Subject: Revenue Summary

Option 3

Year	Effluent / Wastewater Heat		Reclaimed Water Irrigation		Reclaimed Water "Value" Toilet Flushing		Dried WW Sludges		Biomethane		Woodchips		Total	
	Total Annual Revenues	Net Present Value	Total Annual Revenues	Net Present Value	Total Annual Revenues	Net Present Value	Total Annual Revenues	Net Present Value	Total Annual Revenues	Net Present Value	Total Annual Revenues	Net Present Value	Total Annual Revenues	Net Present Value
2008														
2009														
2010														
2011														
2012														
2013														
2014														
2015	-$2,411,392	-$1,832,460	-$186,182	-$141,483	$0	$0	$0	$0	$0	$0	$0	$0	-$2,597,574	-$1,973,942
2016	-$2,697,799	-$1,971,256	-$186,877	-$136,549	$0	$0	-$66,917	-$48,896	-$372,994	-$272,543	$0	$0	-$3,324,587	-$2,429,243
2017	-$2,898,825	-$2,036,676	-$187,573	-$131,786	$0	$0	-$67,903	-$47,708	-$380,908	-$267,621	$0	$0	-$3,535,209	-$2,483,791
2018	-$3,065,850	-$2,071,178	-$188,268	-$127,187	$0	$0	-$68,890	-$46,539	-$388,822	-$262,674	-$372,000	-$251,310	-$4,083,829	-$2,758,889
2019	-$3,232,874	-$2,100,013	-$188,964	-$122,747	$0	$0	-$69,876	-$45,390	-$396,736	-$257,712	-$372,000	-$241,644	-$4,260,449	-$2,767,507
2020	-$3,399,898	-$2,123,566	-$189,659	-$118,460	-$191,277	-$119,471	-$70,862	-$44,260	-$404,651	-$252,744	-$372,000	-$232,350	-$4,628,346	-$2,890,851
2021	-$3,566,923	-$2,142,201	-$190,354	-$114,322	-$382,553	-$229,752	-$71,848	-$43,150	-$412,565	-$247,776	-$372,000	-$223,414	-$4,996,243	-$3,000,614
2022	-$3,733,947	-$2,156,261	-$191,050	-$110,327	-$573,830	-$331,372	-$72,834	-$42,060	-$420,479	-$242,816	-$372,000	-$214,821	-$5,364,140	-$3,097,657
2023	-$3,900,971	-$2,166,071	-$191,745	-$106,469	-$765,106	-$424,836	-$73,821	-$40,990	-$428,393	-$237,872	-$372,000	-$206,558	-$5,732,037	-$3,182,796
2024	-$4,067,996	-$2,171,936	-$192,441	-$102,746	-$956,383	-$510,621	-$74,807	-$39,940	-$436,307	-$232,948	-$372,000	-$198,614	-$6,099,933	-$3,256,804
2025	-$4,235,020	-$2,174,146	-$193,136	-$99,151	-$1,147,660	-$589,178	-$75,793	-$38,910	-$444,222	-$228,051	-$372,000	-$190,975	-$6,467,830	-$3,320,411
2026	-$4,402,044	-$2,172,973	-$193,832	-$95,681	-$1,338,936	-$660,937	-$76,779	-$37,900	-$452,136	-$223,187	-$372,000	-$183,630	-$6,835,727	-$3,374,307
2027	-$4,569,069	-$2,168,674	-$194,527	-$92,331	-$1,530,213	-$726,304	-$77,765	-$36,911	-$460,050	-$218,359	-$372,000	-$176,567	-$7,203,624	-$3,419,145
2028	-$4,736,093	-$2,161,491	-$195,222	-$89,097	-$1,721,489	-$785,665	-$78,752	-$35,941	-$467,964	-$213,573	-$372,000	-$169,776	-$7,571,520	-$3,455,543
2029	-$4,903,117	-$2,151,653	-$195,918	-$85,975	-$1,912,766	-$839,386	-$79,738	-$34,992	-$475,878	-$208,831	-$372,000	-$163,246	-$7,939,417	-$3,484,083
2030	-$5,070,142	-$2,139,374	-$196,613	-$82,962	-$2,104,043	-$887,812	-$80,724	-$34,062	-$483,793	-$204,139	-$372,000	-$156,967	-$8,307,314	-$3,505,316
2031	-$5,119,687	-$2,077,192	-$197,315	-$80,056	-$2,238,684	-$908,293	-$81,565	-$33,093	-$489,755	-$198,707	-$372,000	-$150,930	-$8,499,006	-$3,448,270
2032	-$5,169,232	-$2,016,628	-$198,017	-$77,251	-$2,373,325	-$925,885	-$82,406	-$32,148	-$495,718	-$193,390	-$372,000	-$145,125	-$8,690,697	-$3,390,428
2033	-$5,218,777	-$1,957,651	-$198,719	-$74,543	-$2,507,966	-$940,780	-$83,246	-$31,227	-$501,680	-$188,189	-$372,000	-$139,543	-$8,882,389	-$3,331,933
2034	-$5,268,322	-$1,900,227	-$199,421	-$71,929	-$2,642,607	-$953,160	-$84,087	-$30,329	-$507,643	-$183,101	-$372,000	-$134,176	-$9,074,080	-$3,272,923
2035	-$5,317,867	-$1,844,324	-$200,123	-$69,406	-$2,777,249	-$963,196	-$84,928	-$29,454	-$513,605	-$178,127	-$372,000	-$129,016	-$9,265,772	-$3,213,523
2036	-$5,367,412	-$1,789,911	-$200,825	-$66,971	-$2,911,890	-$971,050	-$85,769	-$28,602	-$519,568	-$173,264	-$436,800	-$145,663	-$9,522,263	-$3,175,460
2037	-$5,416,957	-$1,736,955	-$201,527	-$64,620	-$3,046,531	-$976,874	-$86,610	-$27,772	-$525,531	-$168,512	-$436,800	-$140,061	-$9,713,955	-$3,114,793
2038	-$5,466,502	-$1,685,425	-$202,228	-$62,351	-$3,181,172	-$980,815	-$87,451	-$26,963	-$531,493	-$163,869	-$436,800	-$134,674	-$9,905,646	-$3,054,096
2039	-$5,516,047	-$1,635,289	-$202,930	-$60,161	-$3,315,813	-$983,007	-$88,291	-$26,175	-$537,456	-$159,334	-$436,800	-$129,494	-$10,097,338	-$2,993,459
2040	-$5,565,592	-$1,586,516	-$203,632	-$58,047	-$3,450,455	-$983,579	-$89,132	-$25,408	-$543,418	-$154,906	-$436,800	-$124,513	-$10,289,030	-$2,932,970
2041	-$5,615,137	-$1,539,076	-$204,334	-$56,007	-$3,585,096	-$982,654	-$89,973	-$24,661	-$549,381	-$150,582	-$436,800	-$119,724	-$10,480,721	-$2,872,705
2042	-$5,664,682	-$1,492,939	-$205,036	-$54,038	-$3,719,737	-$980,344	-$90,814	-$23,934	-$555,344	-$146,362	-$436,800	-$115,120	-$10,672,413	-$2,812,737
2043	-$5,714,228	-$1,448,074	-$205,738	-$52,137	-$3,854,378	-$976,759	-$91,655	-$23,227	-$561,306	-$142,244	-$436,800	-$110,692	-$10,864,104	-$2,753,132
2044	-$5,763,773	-$1,404,451	-$206,440	-$50,303	-$3,989,019	-$971,999	-$92,495	-$22,538	-$567,269	-$138,226	-$436,800	-$106,434	-$11,055,796	-$2,693,952
2045	-$5,813,318	-$1,362,042	-$207,142	-$48,533	-$4,123,661	-$966,161	-$93,336	-$21,868	-$573,231	-$134,306	-$436,800	-$102,341	-$11,247,487	-$2,635,251
2046	-$5,991,155	-$1,349,720	-$207,425	-$46,730	-$4,258,460	-$959,369	-$93,975	-$21,171	-$576,481	-$129,873	-$436,800	-$98,405	-$11,564,296	-$2,605,267
2047	-$6,129,127	-$1,327,695	-$207,707	-$44,994	-$4,393,260	-$951,671	-$94,614	-$20,495	-$579,731	-$125,582	-$436,800	-$94,620	-$11,841,240	-$2,565,057
2048	-$6,217,951	-$1,295,131	-$207,990	-$43,322	-$4,528,060	-$943,145	-$95,253	-$19,840	-$582,980	-$121,428	-$436,800	-$90,981	-$12,069,034	-$2,513,848
2049	-$6,306,774	-$1,263,108	-$208,273	-$41,713	-$4,662,860	-$933,868	-$95,891	-$19,205	-$586,230	-$117,409	-$436,800	-$87,481	-$12,296,829	-$2,462,783
2050	-$6,393,698	-$1,231,266	-$208,556	-$40,163	-$4,797,660	-$923,909	-$96,530	-$18,589	-$589,480	-$113,519	-$436,800	-$84,117	-$12,522,724	-$2,411,563
2051	-$6,472,590	-$1,198,518	-$208,839	-$38,670	-$4,932,460	-$913,335	-$97,169	-$17,993	-$592,729	-$109,755	-$436,800	-$80,881	-$12,740,587	-$2,359,152
2052	-$6,551,481	-$1,166,467	-$209,122	-$37,233	-$5,067,260	-$902,207	-$97,808	-$17,414	-$595,979	-$106,112	-$436,800	-$77,771	-$12,958,450	-$2,307,205
2053	-$6,630,372	-$1,135,109	-$209,405	-$35,850	-$5,202,060	-$890,584	-$98,446	-$16,854	-$599,229	-$102,587	-$436,800	-$74,779	-$13,176,312	-$2,255,764
2054	-$6,709,263	-$1,104,438	-$209,688	-$34,518	-$5,336,860	-$878,521	-$99,085	-$16,311	-$602,478	-$99,176	-$436,800	-$71,903	-$13,394,175	-$2,204,867
2055	-$6,774,916	-$1,072,351	-$209,971	-$33,235	-$5,471,660	-$866,068	-$99,724	-$15,785	-$605,728	-$95,876	-$436,800	-$69,138	-$13,598,799	-$2,152,453
2056	-$6,805,896	-$1,035,822	-$210,254	-$32,000	-$5,606,460	-$853,274	-$100,363	-$15,275	-$608,978	-$92,683	-$436,800	-$66,479	-$13,768,750	-$2,095,532
2057	-$6,831,704	-$999,759	-$210,537	-$30,810	-$5,741,260	-$840,182	-$101,001	-$14,781	-$612,227	-$89,594	-$480,000	-$70,244	-$13,976,730	-$2,045,370
2058	-$6,857,513	-$964,939	-$210,820	-$29,665	-$5,876,060	-$826,836	-$101,640	-$14,302	-$615,477	-$86,605	-$480,000	-$67,542	-$14,141,510	-$1,989,889
2059	-$6,883,321	-$931,317	-$211,102	-$28,562	-$6,010,860	-$813,273	-$102,279	-$13,838	-$618,727	-$83,714	-$480,000	-$64,944	-$14,306,289	-$1,935,649
2060	-$6,909,130	-$898,855	-$211,385	-$27,501	-$6,145,660	-$799,530	-$102,918	-$13,389	-$621,976	-$80,917	-$480,000	-$62,446	-$14,471,069	-$1,882,639
2061	-$6,934,938	-$867,512	-$211,668	-$26,478	-$6,280,460	-$785,642	-$103,556	-$12,954	-$625,226	-$78,211	-$480,000	-$60,045	-$14,635,849	-$1,830,842
2062	-$6,960,746	-$837,251	-$211,951	-$25,494	-$6,415,260	-$771,639	-$104,195	-$12,533	-$628,476	-$75,594	-$480,000	-$57,735	-$14,800,628	-$1,780,245
2063	-$6,986,555	-$808,034	-$212,234	-$24,546	-$6,550,060	-$757,551	-$104,834	-$12,125	-$631,725	-$73,063	-$480,000	-$55,515	-$14,965,408	-$1,730,832
2064	-$7,012,363	-$779,825	-$212,517	-$23,633	-$6,684,860	-$743,405	-$105,473	-$11,729	-$634,975	-$70,614	-$480,000	-$53,379	-$15,130,188	-$1,682,586
2065	-$7,038,172	-$752,592	-$212,800	-$22,755	-$6,819,660	-$729,226	-$106,111	-$11,346	-$638,225	-$68,245	-$480,000	-$51,326	-$15,294,967	-$1,635,491
Totals =	**-$276,287,157**	**-$80,236,337**	**-$10,298,033**	**-$3,371,494**	**-$171,123,041**	**-$37,653,125**	**-$4,419,929**	**-$1,340,977**	**-$26,545,351**	**-$7,964,522**	**-$20,188,800**	**-$5,977,110**	**-$508,862,310**	**-$136,543,565**

Capital Regional District - Core Area Wastewater Management Strategy: Program Development Phase, Distributed Wastewater Management Strategy Activity 036

File: 20062935.04.E.03.06
Prepared: D. Shiskowski
Last Revision: March 2, 2009
Last Revision By: D. Shiskowski

Subject: GHG Summary

Option 3

Year	GHG Sources					GHG Off-Sets			Total
	Electricity Consumption (t CO2e/yr)	Diesel Fuel Consumption[2] (t CO2e/yr)	Sludge Thickening Polymer Consumption[1] (t CO2e/yr)	Biogas Lost (t CO2e/yr)	Natural Gas Consumption (t CO2e/yr)	Avoided Natural Gas / Electricty Use via Wastewater-derived Heat[3] (t CO2e/yr)	Avoided Natural Gas Use Via Biomethane (t CO2e/yr)	Avoided Coal Use Via Dried Biosolids (t CO2e/yr)	(t CO2e/yr)
2008									
2009									
2010									
2011									
2012									
2013									
2014									
2015	2,456	59	21	0	0	-24,995	0	0	-22,459
2016	2,580	276	22	401	1,204	-27,969	-2,098	-3,466	-29,050
2017	2,593	278	23	407	1,222	-29,851	-2,142	-3,517	-30,989
2018	2,606	260	24	413	1,239	-31,436	-2,187	-3,568	-32,649
2019	2,619	272	25	419	1,257	-33,021	-2,231	-3,620	-34,280
2020	2,632	273	26	425	1,275	-34,605	-2,276	-3,671	-35,922
2021	2,645	275	27	430	1,293	-36,190	-2,320	-3,722	-37,563
2022	2,658	276	28	436	1,310	-37,775	-2,365	-3,773	-39,205
2023	2,671	278	28	442	1,328	-39,360	-2,409	-3,824	-40,846
2024	2,684	290	29	448	1,345	-40,945	-2,454	-3,875	-42,477
2025	2,697	291	30	454	1,363	-42,529	-2,499	-3,926	-44,118
2026	2,710	293	31	460	1,381	-44,114	-2,543	-3,977	-45,759
2027	2,723	294	32	466	1,399	-45,699	-2,588	-4,028	-47,400
2028	2,736	296	33	472	1,416	-47,284	-2,632	-4,079	-49,042
2029	2,750	297	34	478	1,434	-48,869	-2,677	-4,130	-50,683
2030	2,763	309	35	484	1,452	-50,453	-2,721	-4,181	-52,314
2031	2,771	311	35	489	1,467	-50,952	-2,755	-4,225	-52,860
2032	2,778	321	36	494	1,482	-51,451	-2,788	-4,269	-53,397
2033	2,786	322	36	499	1,497	-51,950	-2,822	-4,312	-53,943
2034	2,794	324	37	504	1,512	-52,449	-2,855	-4,356	-54,489
2035	2,802	325	38	509	1,528	-52,948	-2,889	-4,399	-55,035
2036	2,810	363	38	514	1,543	-53,447	-2,922	-4,443	-55,544
2037	2,818	364	39	519	1,558	-53,946	-2,956	-4,486	-56,090
2038	2,826	365	40	524	1,573	-54,445	-2,989	-4,530	-56,636
2039	2,833	344	40	529	1,588	-54,943	-3,023	-4,573	-57,205
2040	2,841	346	41	534	1,603	-55,442	-3,056	-4,617	-57,751
2041	2,849	347	42	539	1,618	-55,941	-3,090	-4,661	-58,297
2042	2,857	359	42	544	1,633	-56,440	-3,124	-4,704	-58,832
2043	2,865	360	43	549	1,649	-56,939	-3,157	-4,748	-59,378
2044	2,873	362	43	554	1,664	-57,438	-3,191	-4,791	-59,924
2045	2,881	363	44	559	1,679	-57,937	-3,224	-4,835	-60,470
2046	2,883	364	45	563	1,690	-59,604	-3,242	-4,868	-62,170
2047	2,885	365	45	567	1,702	-60,954	-3,261	-4,901	-63,551
2048	2,888	366	46	571	1,713	-61,910	-3,279	-4,934	-64,540
2049	2,890	377	46	575	1,724	-62,867	-3,297	-4,967	-65,519
2050	2,892	378	47	578	1,736	-63,782	-3,316	-5,000	-66,466
2051	2,894	379	48	582	1,748	-64,517	-3,334	-5,033	-67,234
2052	2,897	380	48	586	1,759	-65,252	-3,352	-5,066	-68,001
2053	2,899	380	49	590	1,771	-65,987	-3,370	-5,100	-68,769
2054	2,901	381	49	594	1,782	-66,723	-3,389	-5,133	-69,536
2055	2,904	382	50	597	1,794	-67,367	-3,407	-5,166	-70,213
2056	2,906	383	51	601	1,805	-67,748	-3,425	-5,199	-70,626
2057	2,908	411	51	605	1,817	-68,072	-3,443	-5,232	-70,955
2058	2,910	422	52	609	1,828	-68,396	-3,462	-5,265	-71,301
2059	2,913	423	52	613	1,840	-68,720	-3,480	-5,298	-71,657
2060	2,915	399	53	617	1,851	-69,044	-3,498	-5,331	-72,038
2061	2,917	400	53	620	1,862	-69,368	-3,517	-5,364	-72,395
2062	2,920	401	54	624	1,874	-69,692	-3,535	-5,397	-72,751
2063	2,922	402	55	628	1,885	-70,016	-3,553	-5,430	-73,107
2064	2,924	403	55	632	1,897	-70,340	-3,571	-5,463	-73,463
2065	2,927	404	56	636	1,908	-70,664	-3,590	-5,497	-73,820
Totals =	**143,003**	**17,292**	**2,047**	**26,482**	**79,497**	**-2,762,785**	**-149,303**	**-228,952**	**-2,872,720**

Notes:
1. Only refers to situation where thickened, undigested sludges are truck-transported to another site for processing.
2. Includes biosolids transport.
3. Accounts for GHGs associated with electricity needed to power heat pumps.