2020 Facilities Plan Treatment Report

## **APPENDIX 9G**

## BIOSOLIDS RECOMMENDED PLAN ALTERNATIVES - COST ESTIMATES



#### **COST ESTIMATE SUMMARY**

## **General Description**

All treatment plant sludges are digested, dewatered using plate and frame presses and then taken to either landfill or land applied. The sludge is a Class B and is digested through a single-stage mesophilic digestion system. Construction requires 16 new GBT's for SSWWTP WAS thickening, 10 new digesters, and 4 new GBT's for digested sludge thickening.

**Biosolids Load** 

82,700 Influent Sludge 42,400 Finished Biosolids

Raw Sludge Influent Load Distribution

0% Milorganite®

0% Glass Furnace 100% Landfill

ENR Index = 10000 (assumed Milwaukee 2007)

Interest Rate per Year = 5.125%

JIWWTP ELECTRICAL SERVICE UPGRADES	\$27,980,000
JIWWTP DEWATERING AND DRYING FACILITY DEMOLITION	\$47,250,000
INTERPLANT SLUDGE PIPELINE UPGRADES	\$1,740,000
SSWWTP NEW GRAVITY BELT WAS THICKENERS	\$18,730,000
SSWWTP DIGESTER REHABILITATION	\$219,780,000
SSWWTP NEW GRAVITY BELT DIGESTED SLUDGE THICKENERS	\$4,240,000
SSWWTP DEWATERING UPGRADES	\$5,360,000
SALVAGE VALUE	-\$36,612,000

Total Capital Cost \$288,470,000

## **Summary of Annual Operation & Maintenance Costs**

Total Annual Cost \$34,160,000

Life Cycle Analysis

 Number of Years
 20

 Present Worth Factor
 12.331

Present Worth of Total Annual Operation & Maintenance Costs \$421,230,000

Summary of Non-Annual Operation & Maintenance Costs

Process Cost ENR Index Year PW

\$0 \$0 \$0

Present Worth of Total Non-Annual Operation & Maintenance Costs \$0

Total Present Worth \$710,000,000



TABLE 9G-1 SHEET 1 OF 11

RECOMMENDED BIOSOLIDS

ALTERNATIVE 1 – LANDFILL

IIIAA	NTD TD A NO	MISSION	LEVEL ELEC	TDICAL SED	VICE CAD	ITAL COS	т			
31771	WIF IRANG	NIOSION	LEVEL ELEC	I KICAL SEK	VICE CAP	IIAL COS		tal Capital Cost =	Tota	I Salvage Value =
								\$27,980,000		\$930,000
					Un-		Design,	. ,,		
					designed	Conting-	Bidding, &			
			Unit Cost	SUBTOTAL	Details	ency	Oversite	SUBTOTAL	Life	Salvage Value
DESCRIPTION	Quantity	Units	(\$)	(\$)	(%)	(%)	(%)	(\$)	(Years)	(\$)
	quantity		(4)	(4)	(70)	(70)	(70)	(4)	(Touro)	(4)
DIVISION 2: SITE CONSTRUCTION										
6-5" Concrete encased PVC Conduit ductbank (SS to Building 286)	3,800	LF	\$200	\$760,000	20%	25%	35%	\$1,540,000	40	\$770,000
Manholes (SSsto 286)	20	each	\$10,000	\$200,000	20%	25%	35%	\$410,000	20	\$0
Trenching, Pavement removal, Backfill and Patching (SS to 286)	3,800	LF	\$100	\$380,000	20%	25%	35%	\$770,000	20	\$0
6-5" Concrete encased PVC Conduit ductbank (SS to Building 289)	800	LF	\$200	\$160,000	20%	25%	35%	\$320,000	40	\$160,000
Manholes (SSsto 289)	4	each	\$10,000	\$40,000	20%	25%	35%	\$80,000	20	\$0
Trenching, Pavement removal, Backfill and Patching (SS to 289)	800	LF	\$100	\$80,000	20%	25%	35%	\$160,000	20	\$0
Division 2 Subtotal	\$3,280,000									
DIVISION 16: ELECTRICAL 500kcmil 1/c 15KV Copper (SS to 286)	68.400	LF	\$15	\$1,026,000	20%	25%	35%	\$2,080,000	20	\$0
Site Power Factor Correction	68,400		\$15 \$515.000	\$1,026,000 \$515.000	40%	25% 25%	35%	\$2,080,000	20	\$0 \$0
	1	each	,		40%	25% 25%	35%	\$1,220,000	20	\$0 \$0
Switchgear Upgrades Buildings 286 and 289 500kcmil 1/c 15KV Copper (SS to 289)	14.400	each LF	\$515,000 \$15	\$1,030,000 \$216,000	20%	25% 25%	35%	\$2,430,000 \$440.000	20	\$0
Control System Upgrades	14,400	each	\$1.031.000	\$216,000	40%	25% 25%	35%	\$2,440,000	20	\$0
New 138 KV Electrical Service from We Energies	1	each	\$3,943,000	\$3,943,000	20%	25% 25%	35%	\$2,440,000	20	\$0
New 138 KV Electrical Service from We Energies  New 138 KV Electrical Service from We Energies	1	each	\$3,943,000	\$3,943,000	10%	25% 25%	35%	\$7,980,000	20	tion 03.29.0660
New 130 NV Electrical Service Ironi We Energies	1	eacn	φ4,367,000	\$4,367,000	10%	25%	35%	\$0,110,000	20	uon 03.29.0050
Division 16 Subtotal	\$24,700,000		I							
Division to Subtotal	Ψ <u>~</u> ¬,100,000									

## ----- insert link to this cost on the Capital Cost Summary Worksheet

Unit Cost			STMENT	ADJUSTED			
	Cost Year	ENR Index	Adjustment Factor	UNIT COST (\$)	SOURCE	MANUFACTURER	COMMENTS
(\$)	real	IIIuex	1 dotor	(4)	COUNCE	MANOLAGIONER	COMMENTO
\$190	2006	9700	1.03	\$196	138KVServiceOptionESTIMATE2.xls, Tony Pohl (Automation Service & Design Inc.), email 05.05.06	TBD	200 Amp Feeders
\$10,000	2006	9700	1.03	\$10,309	138KVServiceOptionESTIMATE2.xls, Tony Pohl (Automation Service & Design Inc.), email 05.05.06	TBD	200 Amp Feeders
\$100	2006	9700	1.03	\$103	138KVServiceOptionESTIMATE2.xls, Tony Pohl (Automation Service & Design Inc.), email 05.05.06	TBD	200 Amp Feeders
\$190	2006	9700	1.03	\$196	138KVServiceOptionESTIMATE2.xls, Tony Pohl (Automation Service & Design Inc.), email 05.05.06	TBD	200 Amp Feeders
\$10,000	2006	9700	1.03	\$10,309	138KVServiceOptionESTIMATE2.xls, Tony Pohl (Automation Service & Design Inc.), email 05.05.06	TBD	200 Amp Feeders
\$100	2006	9700	1.03	\$103	138KVServiceOptionESTIMATE2.xls, Tony Pohl (Automation Service & Design Inc.), email 05.05.06	TBD	200 Amp Feeders
\$15	2006	9700	1.03	\$15	138KVServiceOptionESTIMATE2.xls, Tony Pohl (Automation Service & Design Inc.), email 05.05.06	ТВО	200 Amp Feeders
\$500,000	2006	9700	1.03	\$515,464	138KVServiceOptionESTIMATE2.xls, Tony Pohl (Automation Service & Design Inc.), email 05.05.06	TBD	
\$500,000	2006	9700	1.03	\$515,464	138KVServiceOptionESTIMATE2.xls, Tony Pohl (Automation Service & Design Inc.), email 05.05.06	TBD	
\$15			1.03	\$15	138KVServiceOptionESTIMATE2.x/s, Tony Pohl (Automation Service & Design Inc.), email 05.05.06	TBD	200 Amp Feeders
\$1,000,000			1.03	\$1,030,928	138KVServiceOptionESTIMATE2.xls, Tony Pohl (Automation Service & Design Inc.), email 05.05.06	TBD	
\$3,825,000				\$3,943,299	Alan Scrivner (AES Engineering), phone conversation 03.29.06	We Energies	contingencies indicated by
\$4,236,364	2006	9700	We1EM2ergies	\$4,367,385	Alan Scrivner (AES Enginementing)eptimeserudioaterslaby AES		
\$1,00 \$3,82	\$15 00,000 \$15 00,000 25,000	00,000 2006 \$15 2006 00,000 2006 25,000 2006	20,000     2006     9700       \$15     2006     9700       20,000     2006     9700       25,000     2006     9700	00,000         2006         9700         1.03           \$15         2006         9700         1.03           00,000         2006         9700         1.03           25,000         2006         9700         1.03	00,000         2006         9700         1.03         \$515,464           \$15         2006         9700         1.03         \$15           00,000         2006         9700         1.03         \$1,030,928           25,000         2006         9700         1.03         \$3,943,299	00,000         2006         9700         1.03         \$515,464         138KVServiceOptionESTIMATE2.xls, Tony Pohl (Automation Service & Design Inc.), email 05.05.06           \$15         2006         9700         1.03         \$15         138KVServiceOptionESTIMATE2.xls, Tony Pohl (Automation Service & Design Inc.), email 05.05.06           00,000         2006         9700         1.03         \$1,303,028         138KVServiceOptionESTIMATE2.xls, Tony Pohl (Automation Service & Design Inc.), email 05.05.06           25,000         2006         9700         1.03         \$3,943,299         Alan Scrivner (AES Engineering), phone conversation 03.29.06	200,000         2006         9700         1.03         \$515,464         138KVServiceOptionESTIMATE2.xls, Tony Pohl (Automation Service & Design Inc.), email 05.05.06         TBD           \$15         2006         9700         1.03         \$15         138KVServiceOptionESTIMATE2.xls, Tony Pohl (Automation Service & Design Inc.), email 05.05.06         TBD           00,000         2006         9700         1.03         \$1,303,928         138KVServiceOptionESTIMATE2.xls, Tony Pohl (Automation Service & Design Inc.), email 05.05.06         TBD           25,000         2006         9700         1.03         \$3,943,299         Alan Scrivner (AES Engineering), phone conversation 03.29.06         We Energies



		D&	D FACILIT	Y DEMOLITIC	ON CAPITAL	COST					
								Tot	al Capital Cost = \$47,250,000	Tota	Salvage Value = \$0
DESCRIPTION		Quantity	Units	Unit Cost (\$)	SUBTOTAL (\$)	Un- designed Details (%)	Conting- ency (%)	Design, Bidding, & Oversite (%)	SUBTOTAL (\$)	Life (Years)	Salvage Value (\$)
<b>DIVISION 13: SPECIAL CONSTRUCTION</b>											
Facility Demolition		1	lump sum	\$20,000,000	\$20,000,000	40%	25%	35%	\$47,250,000	20	\$0
D	Division 13 Subtotal	\$47,250,000									

<---- insert link to this cost on the Capital Cost Summary Worksheet

Actual	C	OST ADJU	STMENT	<b>ADJUSTED</b>			
Unit Cost (\$)	Year	ENR Index	Adjustment Factor	UNIT COST (\$)	SOURCE	MANUFACTURER	COMMENTS
\$20,000,000	2007	10000	1.00	\$20,000,000	Symbiont and AES engineering judgment		



	INTERPLAI	NT SLUDG	E PIPELINE L	PGRADES (	CAPITAL C	COSTS				
							Tot	al Capital Cost = \$1,740,000	Tota	I Salvage Value = \$0
DESCRIPTION	Quantity	Units	Unit Cost (\$)	SUBTOTAL (\$)	Un- designed Details (%)	Conting- ency (%)	Design, Bidding, & Oversite (%)	SUBTOTAL (\$)	Life (Years)	Salvage Value (\$)
DIVISION 11: EQUIPMENT										
JIWWTP and SSWWTP Hard Metal Pumps & Motors Rated for 300 psi  Division 11 Subtotal	\$1,130,000	each	\$93,000	\$558,000	20%	25%	35%	\$1,130,000	20:	\$0
	\$1,130,000									
DIVISION 16: ELECTRICAL Pipeline Cathodic Protection	1	allowance	\$258,000	\$258,000	40%	25%	35%	\$610,000	20	\$0
Division 16 Subtotal	\$610,000									

Actual Unit Cost (\$)	Cost Year	ENR Index	STMENT Adjustment Factor	ADJUSTED UNIT COST (\$)	SOURCE	MANUFACTURER	COMMENTS
\$90,000	2006	9700	1.03	\$92,784	Mickey (RDM), phone conversation 03.28.06	TBD	includes \$5000 per pump for installation
\$250,000	2006	9700	1.03	\$257,732	Symbiont engineering judgment	TBD	



				aukee Metropolitan Se 020 FACILITIES P															
	New	SSWWTP (	Gravity Be	elt Thickeners f	for WAS Thi	ckening (	Capital Co		tal Capital Cost =	Total S	Salvage Value =								
						Un- designed	Conting-	Design, Bidding, &	\$18,730,000	1	\$1,363,000	< insert link to Actual		on the Capi		ADJUSTED			
DESCRIPTION		Quantity	Units	Unit Cost (\$)	SUBTOTAL (\$)	Details (%)	ency (%)	Oversite (%)	SUBTOTAL (\$)	(Years)	Salvage Value (\$)	Unit Cost (\$)	Cost Year	ENR Index	Adjustment Factor	UNIT COST	SOURCE	MANUFACTURER	COMMENTS
DIVISION 2: SITE CONSTRUCTION				CENTRAL							1945	72.7734.55							
Demotition		1	lump sum	\$26,000	\$26,000	40%	25%	35%	\$60,000	20	\$0	\$22,500	2004	8620	1.16	\$26,102	Frank Tiefert (ATI), Technical Memorandum 11.15.04 (forwarded via Kate Zimo (HNTB), fax 9.27.06)	тво	+25% contractor Q&P per Tech Memo (40% undesigned details also listed in memo)
	Division 2 Subtotal	\$60,000																	
DIVISION 4: MASONRY				122000	200000				PERSONAL PROPERTY.		1993	awaran -		Visition	0.01590	E280075		10000	
Masonry Restoration - Cut and Repoint Brick		,	lump sum	\$22,000	\$22,000	40%	25%	35%	\$50,000	20	50	\$18,750	2004	8620	1.16	\$21,752	Frank Tiefert (ATI), Technical Memorandum 11.15.04 (forwarded via Kate Ziino (HNTB), fax 9.27.06)	TBD	+25% contractor GSP per Tech Memo (40% undesigned details also listed in memo)
	Division 4 Subtotal	\$50,000																	
DIVISION 11: EQUIPMENT GBT Equipment			lump sum	\$2,784,000	\$2.784,000	4006	25%	35%	\$6,580,000	20	50	\$2,400,000	2004	8620	1.16	\$2.784.222	Frank Tiefert (ATI), Technical Memorandum 11.15.04 (forwarded via Kate Ziino (HNTB), fax 9.27.05)	TBD	+25% contractor O&P per Tech Memo (40% undesigned details also listed in memo) *12/4 to account for 12 GBTS for this alternatives
GBI (zupulnimi) Thickened Sludge Pumps Washwater Pumps Polymer System		į	lump sum lump sum lump sum	\$552,000 \$109,000 \$313,000	\$552,000 \$109,000 \$313,000	40% 40% 40% 40%	25% 25% 25%	35% 35% 35% 35%	\$1,300,000 \$1,300,000 \$260,000 \$740,000	20 20	\$0 \$0 \$0	\$476.250 \$93.750 \$93.750 \$270,000	2004	8620 8620 8620	1.16 1.16 1.16	\$552,494 \$108,759	Frank Tiefert (ATI), Technical Memorandum 11.15.04 (flowarded via Kate Zimo (HNTB), fax 9.27.06) Frank Tiefert (ATI), Technical Memorandum 11.15.04 (flowarded via Kate Zimo (HNTB), fax 9.27.06) Frank Tiefert (ATI), Technical Memorandum 11.15.04 (flowarded via Kate Zimo (HNTB), fax 9.27.06) Frank Tiefert (ATI), Technical Memorandum 11.15.04 (flowarded via Kate Zimo (HNTB), fax 9.27.06)	TBD TBD TBD	42% contractor OSP per Tech Memo (40% undesigned details also listed in memo) *12/4 to account for 12 GBTs for this alternatives 42% contractor OSP per Tech Memo (40% undesigned details also listed in memo) *12/4 to account for 12 GBTs for this alternatives 425% contractor OSP per Tech Memo (40% undesigned details also listed in memo) *12/4 to account for 12 GBTs for this alternatives 425% contractor OSP per Tech Memo (40% undesigned details also listed in memo) *12/4 to account for 12 GBTs for this alternatives
	Division 11 Subtotal	\$8,880,000																	
DIVISION 13: SPECIAL CONSTRUCTION			4		60000000	-	-		726000000	- 12	2157235		-	hassani	1252	10000000		200	
Building Modifications			lump sum	\$281,000	\$281,000	40%	25%	35%	\$660,000	40	\$121,000	10000000		8620	1.16		Frank Tiefert (ATI), Technical Memorandum 11.15.04 (forwarded via Kate Zino (HNTB), fax 9.27.05).	TBD	+25% contractor O&P per Tech Memo (40% undesigned details also listed in memo)
Relocate JIWWTP GBTs to SSWWTP		4	éach	\$70,000	\$280,000	40%	25%	35%	\$660,000	20	\$0	15050000	2005	9231	1.08		Biosolids Alternative Sizing Worksheets r4.xls. Symbiont engineering judgment		
Thickening Building Expansion		8,000	si	\$298	\$2.384,000	40%	25%	35%	\$5,630,000	40	\$1.036,000	\$289	2006	9700	1.03	\$298	Turbine Building Cost COSTWORKS xts , RSMEANS Costworks 2006, Symbiont	TBD	Factory, 1 Story, Precast Concrete Panels / Steel Frame w/steel H section piles
	Division 13 Subtotal	\$6,950,000																	
DIVISION 15: MECHANICAL																			
Mechanical Piping		,	lump sum	\$474,000	\$474,000	40%	25%	35%	\$1,120,000	40	\$206,000	\$408,750	2004	8620	1.16	\$474,188	Frank Tiefert (ATI), Technical Memorandum 11.15.04 (forwarded via Kate Zlino (HNTB), fax 9.27.06)	TBO	•25% contractor QSP per Tech Memo (40% undesigned details also listed in memo) *12/4 to account for 12 GBTS for this alternatives
	Division 15 Subtotal	\$1,120,000																	
DIVISION 16: ELECTRICAL Instrumentation & Control Electrical		1	lump sum lump sum	\$378.000 \$331,000	\$378,000 \$331,000	40% 40%	25% 25%	35% 35%	\$890,000 \$780,000		\$0 \$0	\$326,250 \$285,000	2004 2004	8620 8620	1.16 1.16	\$378,480 \$330,626	Frank Tiefert (ATI), Technical Memorandum 11.15.04 (forwarded via Kate Ziino (HNTB), fax 9.27.06) Frank Tiefert (ATI), Technical Memorandum 11.15.04 (forwarded via Kate Ziino (HNTB), fax 9.27.06)	TBD TBD	+25% contractor O&P per Tech Memo (40% undesigned details also listed in memo) *12/4 to account for 12 GBTS for this alternatives +25% contractor O&P per Tech Memo (40% undesigned details also listed in memo) *12/4 to account for 12 GBTS for this alternatives
	Division 16 Subtotal	\$1 670 000																	



	SSWWT	P DIGESTI	ER REHABILI	TATION CAP	PITAL COS	ST				
	020000000000000000000000000000000000000						Tot	al Capital Cost = \$219,780,000	Tota	l Salvage Value = \$34,319,000
DESCRIPTION	Quantity	Units	Unit Cost(\$)	SUBTOTAL (\$)	Un- designed Details (%)	Conting- ency (%)	Design, Bidding, & Oversite (%)	SUBTOTAL (\$)	Life (Years)	Salvage Value (\$)
DIVISION 3: CONCRETE										
Ten New Covered & Insulated Digester Tanks with access equipment (125' diameter, 38' side water depth, 5' free board)	39,471,166	gallons	\$2	\$78,942,333	40%	25%	35%	\$186,500,000	40	\$34,319,000
Division 3 Subtotal	\$186,500,000	-								
DIVISION 11: EQUIPMENT										
New Digester Mixing Systems - External Draft Tube Mixers for 110' diameter	22	each	\$468,000	\$10,296,000	40%	25%	35%	\$24,320,000	20	\$0
New Digester Recirculation Pumps - 10 HP motors, 250 gpm @ 60' TDH	32	each	\$15,000	\$480,000	40%	25%	35%	\$1,130,000	20	\$0
Recirculating Sludge Heat Exchangers -Sludge-Hot Water Systems	16	each	\$42,000	\$672,000	40%	25%	35%	\$1,590,000	20	\$0
Storage Digester Sludge Transfer Pumps - 30 HP motors, VFD, 1200 gpm @ 60' TDH	16	each	\$55,000	\$880,000	40%	25%	35%	\$2,080,000	20	\$0
Digester Gas Safety Equipment	1	allowance	\$1,625,000	\$1,625,000	40%	25%	35%	\$3,840,000	20	\$0
Division 11 Subtotal	\$32,960,000									
DIVISION 15: MECHANICAL										
DIVISION 15: MECHANICAL New Boiler		each	\$134,000	\$134,000	40%	25%	35%	\$320,000	20	so
Division 15 Subtotal	\$320,000									

Actual Jnit Cost (\$)	Cost	ENR Index	Adjustment Factor	ADJUSTED UNIT COST (\$)	SOURCE	MANUFACTURER	COMMENTS
\$2	2007	10000	1.00	\$2	Symbiont engineering judgment	ТВО	
\$431,600	2005	9231	1.08	\$467,555	Wiscosin Project Triad Ebg EWT Mixer Budget Price 07-14-05 doc , 8ob Lacey (Energenecs), email 07.14.05	Eimoo, RDT+T	+30% for install
\$13,650	2005	9231	1.08	\$14,787 \$42,249	Rich Hussey (Ley Associates), email 07.26.05  Biosolids Alternative Sizing Worksheets 14.xts . Symbiont	Wemco-Hidrostal, D4K-HS  Alfa Laval	+30% for install
\$51,025	2005	9231	1.08	\$55,276	Rich Hussey (Ley Associates), email 07:28.05	Wemco-Hidrostal, E5K-S	+30% for install, +250% for VF
\$1,500,000	2005	9231	1.08	\$1,624,959	Symbiont engineering judgment		
						- 1	21
\$130,000	2006	9700	1.03	\$134,021	Symbiont engineering judgment based on recent projects	TBD	



							Tot	tal Capital Cost = \$4,240,000	Tota	il Salvage Value S
DESCRIPTION	Quantity	Units	Unit Cost (\$)	SUBTOTAL (\$)	Un- designed Details (%)	Conting- ency (%)	Design, Bidding, & Oversite (%)	SUBTOTAL (S)	Life (Years)	Salvage Value
DIVISION 11: EQUIPMENT										
meter Gravity Belt Thickener	4	each	\$292,000	\$1,168,000	20%	25%	35%	\$2,370,000	20	\$ \$ \$ \$ \$
00 gpm Gravity Belt Thickener Feed Pumps	3	each	\$59,000	\$177,000	40%	25%	35%	\$420,000	20	5
Progressing Cavity Gravity Belt Thickener Polymer Feed Pumps	3	each	\$42,000	\$126,000	40%	25%	35%	\$300,000	20	5
rogressing Cavity Thickened Sludge Transfer Pumps	3	each	\$70,000	\$210,000	40%	25%	35%	\$500,000	20	5
rogressing Cavity GBT Bulk Polymer Transfer Pumps	1	each	\$35,000	\$35,000	40%	25%	35%	\$80,000	20	1
rogressing Cavity GBT Bulk Polymer Mix Pumps	1	each	\$28,000	\$28,000	40%	25%	35%	\$70,000	20 20 20 20 20 20 20 20	
Progressing Cavity Operational Storage Pumps	4	each	\$70,000	\$210,000	40%	25%	35%	\$500,000	20	

Actual	C	OST ADJUS	STMENT	ADJUSTED			
Unit Cost (\$)	Year	ENR Index	Adjustment Factor	UNIT COST (\$)	SOURCE	MANUFACTURER	COMMENTS
\$270,000		9231	1.08			TBD Wernco	
\$54,600 \$39,000	2005	9231 9231	1.08	\$59,149		Wernco Moyno or Netszch	quote for 400 gpm at 60', 15 HP, x2 for vfd, x1.4 for large flow/pressure (500 gpm, 75' TDH, 20 HP), x1.3 installed 200 gpm@40 TDH, w/VFDs x1.3 installed
\$65,000	2005	9231	1.08			Moyno or Netszch	250 gpm @ 140' TDH x2 for vfd x1.3 installed
\$32,500	2005	9231	1.08	\$35,207	Biosolids Alternative Sizing Worksheets r4.xls, Symbioni	Moyno or Netszch	10 gpm/3 HP, constant speed x1.3 installed
\$26,000	2005	9231	1,08	\$28,166	Biosolids Alternative Sizing Worksheets r4.xls Symbioni	Moyno or Netszch	5 gpm, 2 HP, DC adjustable speed x1.3 installed
\$65,000	2005	9231	1.08	\$70,415	1874_001 pdf, David DeGroy (Van Bergen & Markson, Inc.) 7.29.05 (emailed by Lisa Williams (Symbiont) 7.29.0	Moyno or Netszch	250 gpm @ 140' TDH x2 for vfd x1.3 installed

DIVISION 11: EQUIPMENT
2 meter Gravity Beit Thickener
500 gpm Gravity Beit Thickener Feed Pumps
Progressing Cavity Gravity Beit Thickener Polymer Feed Pumps
Progressing Cavity Thickened Sludge Transfer Pumps
Progressing Cavity GBT Bulk Polymer Transfer Pumps
Progressing Cavity GBT Bulk Polymer Mix Pumps
Progressing Cavity GBT Bulk Polymer Mix Pumps
Progressing Cavity Operational Storage Pumps



	SSWW	TP DEWA	TERING UPG	RADES CAP	ITAL COS	Т					
							To	tal Capital Cost = \$5,360,000	Total Salvage Value = \$0		
DESCRIPTION Qua	antity	Units	Unit Cost	SUBTOTAL (\$)	Un- designed Details (%)	Conting- ency (%)	Design, Bidding, & Oversite (%)	SUBTOTAL (\$)	Life (Years)	Salvage Value (\$)	
DIVISION 11: EQUIPMENT											
Plate Repair Press #1	1	lump sum	\$323,000	\$323,000	40%	25%	35%	\$760,000	20 20	\$0	
Plate Repair Press #2	1	lump sum	\$323,000	\$323,000	40%	25%	35%	\$760,000		\$0	
Plate Repair Press #3	1	lump sum	\$323,000	\$323,000	40%	25%	35%	\$760,000	20	\$0	
Plate Repair Press #4	- 1	lump sum	\$89,000	\$89,000	40%	25%	35%	\$210,000	20	\$0	
Rebuild Presses#1, #2, #3, and #4	1	lump sum	\$1,216,000	\$1,216,000	40%	25%	35%	\$2,870,000	20	\$0	
Division 11 Subtotal \$5	5,360,000										

·	insert	link	to 1	this	cost	on	the	Capital	Cost	Summary	Worksheet	

Actual	C	OST ADJU	STMENT	ADJUSTED			
Unit Cost	Cost	ENR	Adjustment	UNIT COST			
(\$)	Year	Index	Factor	(\$)	SOURCE	MANUFACTURER	COMMENTS
\$313,500	2006	9700	1.03	\$323,196	Review of United Water Services Plant Requested Projects for 2005, Symbiont 12.06	TBD	
\$313,500	2006	9700	1.03	\$323,196	Review of United Water Services Plant Requested Projects for 2005, Symbiont 12:06	TBD	
\$313,500	2006	9700	1.03	\$323,196	Review of United Water Services Plant Requested Projects for 2005, Symbiont 12.06	TBD	
\$86,000	2006	9700	1.03	\$88,660	Review of United Water Services Plant Requested Projects for 2005, Symbiont 12.06	TBD	
\$1,180,000	2006	9700	1.03	\$1,216,495	Review of United Water Services Plant Requested Projects for 2005, Symbiont 12.06	TBD	



## 2020 FACILITIES PLANNING

## O&M COST ESTIMATE

82,700 (raw sludge)
Total Annual O&M Cost = Total 2020 MMSD Sludge Production (dt/yr) =

JIWWTP Energy Costs
Natural Gas - Turbine Fuel
Natural Gas - Direct Firing of Dryers Natural Gas - Minergy NOx Control & Startup Natural Gas - Other Plant Facilities

\$5,445,000 Natural Cas - Other Print Federalices
Firm Electricity - Base Power Load
Firm Electricity - Demand Charges
Interruptible Electricity - Base Power Load
Interruptible Electricity - Demand Charges
Turbine Operation and Maintenance \$2,984,000 \$2,251,000

SSWWTP Digestion Gas Credit/Replacement
plus/minus amount of solids destroyed in digestion = 23,235 tons/year
plus/minus amount of energy recovered from digestion process = 150,267 dherm/year
VALUE OF ENERGY CHANGE IN TERMS OF COST OF EQUIVALENT GAS PURCHASE -\$1,389,970

## Milorganite® Annual Operating & Maintenance Costs

% of studge to Milarganite® = 0% = 0% annual sludge volume (dt/year) = 0

Item/Process	Process Unit Cost (\$/dt)	Process Contribution Cost (\$/dt raw)	Annual Cost \$/yr
JIWWTP Thickening	\$53.00	\$0.00	S0
JIWWTP Dewatering/Drying	\$191.30	\$0.00	SO
JIWWTP Chaff Processing	\$443.30	\$0.00	SO
Milorganite® Warehouse/Shipping	\$27.20	\$0.00	SQ
Biosolids Marketing	\$81.70	\$0.00	\$0
IPS Pipeline Sludge Transfer (includes SS energy)	\$3.20 *	\$0.00	50
SSWWTP WAS Thickening (energy included)	\$82.40	\$0.00	SO
SSWWTP Digestion (energy included)	\$36.40	\$0.00	SO
Milorganite® Land Application	\$135.10	\$0.00	SU
Milorganite® Sales Revenue	-\$155.80	\$0.00	S0
SUBTOT	ΔΙ	\$0	SO.

#### Glass Furnace Annual Operating Costs

annual biosolids to Glass Furnace % of sludge to glass furnace = 0% annual sludge volume (dt/year) = 0

	Process Unit Cost	Process Contribution	Annual Cost
Item/Process	(\$/dt)	Cost (\$/dt raw)	S/yr
JIWWTP Thickening	\$53.00	\$0.00	SO
JIWWTP Dewatering/Drying	\$191,30	\$0.00	\$0
Sodium Hydroxide for Minergy SO2 Control	\$6.20	\$0.00	50
Ammonia for Minergy Nox control	\$0.50	\$0.00	50
Minergy Liquid Oxygen Tank & Vaporizer Rental	per year	2.1	\$0
Minergy Liquid Oxygen Usage	\$2.10	\$0.00	\$0
Minergy Equipment Maintenance	\$8.20	\$0.00	90
Minergy Ash Disposal	\$0.60	\$0.00	\$0
Minergy Staffing	per year	- 1	\$0
IPS Pipeline Sludge Transfer (includes SS energy)	\$3.20 *	\$0.00	50
SSWWTP WAS Thickening (energy included)	\$82.40	\$0.00	SO
SSWWTP Digestion (energy included)	\$36.40	\$0.00	SO
SUBTOT	AL	\$0	\$0

## **Landfill Annual Operating & Maintenance Costs**

\*Average of costs to pump WAS, primary sludge, and digested sludge

% of sludge to landfill = 100% annual sludge volume (dt/year) = 82,700

Process Unit Annual Cost \$/yr \$149,000 \$4,573,000 Item/Process
IPS Pipeline Sludge Transfer Cost (\$/dt raw) \$1.80 SSWWTP WAS Thickening (energy included) \$55.30 \$82.40 \$36.40 \$82.40 \$115.00 \$36.40 \$47.20 \$65.90 SSWWTP Digestion (energy included)
SSWWTP DS Thickening (energy included) \$3,010,000 SSWWTP Dewatering (energy included) \$5,450,000 Landfill System Staffing Cake Trucking & Landfilling per year \$145.30 \$11.20 \$83.20 \$926,000 \$6,881,000 SUBTOTAL \$24,892,460

see Sheet 10. Energy Costs see Sheet 10, Energy Costs see Sheet 10. Energy Costs

see Sheet 10. Energy Costs Turbine Operation and Maintenance \$0.00 Bob Gavahan (Power Engineers Collaborative), email 3.27.06

\$34,160,000

\$10,660,000

calculated difference in tons removed in digester from the year 2004 Solids Cost 2004 UWSactual XLS , Bill Krill email 08.19.05) calculated heat value of additional digester gas based on values assumed on "JI Energy" calculated S value of additional digester gas based on values assumed on "JI Energy"

## Milorganite® Annual Operating & Maintenance Costs

		Total Mass of Raw	% of Raw Sludge from	% of Raw Sludge for	Alternative			
armano i	Process	Sludge that Cost	Left Column Actually Sent	this Alternative Sent	Process	Cost	ENR	2020 (2007)
Process	Cost Value	Value Applies to (tons)	to this Unit Process	to this Unit Process*	Cost/raw dry ton	Year	Index	Process Cost/ton Source of Cost Data
JIWWTP Thickening	\$1,279,606	56,040	50%	6 0%	\$0.00	2004	B620	\$0.00 Solids Cost 2004 UWSactual .XLS , Bill Krill email 08.19.05; 50% assumed by AES
JIWWTP Dewatering/Drying	\$7,798,293	56,040	849	6 0%	\$0.00	2004	8620	\$0.00 Solids Cost 2004 UWSactual XLS , Bill Krill email 08.19.05; Symbiont calculations of energy cost based on Alan Scrivner (AES) email 12.6.06
JIWWTP Chaff Processing	\$928,541	56,040	84%	6 0%	\$0.00	2004	8620	\$0.00 Solids Cost 2004 UWSactual XLS , Bill Krill email 08.19.05
Milorganite® Warehouse/Shipping	\$1,108,821	56.040	849	6 0%	\$0.00	2004	8620	\$0.00 Solids Cost 2004 UWSectual .XLS , Bill Krill email 08:19.05
Biosolids Marketing	\$2,990,952	49.086	87%	6 0%	\$0.00	2004	8620	\$0.00 Solids Cost 2004 UWSectual XLS , Bill Krill email 08.19.05
IPS Pipeline Sludge Transfer	varies	varies	varie	s varies	\$0.00	2004	8620	\$0.00 Solids Cost 2004 UWSactual XLS , Bill Krill email 08 19.05; Symbiant calculations; estimated cost breakdown: DS \$1.83/dt, WAS \$5.31/dt, PS \$1.14/dt
SSWWTP WAS Thickening	\$1,989,266	56,040	50%	6 0%	\$0.00	2004	B620	\$0.00 Solids Cost 2004 UWSactual XLS , Bill Krill email 08.19.05; cost for JI GBT thickening
SSWWTP Digestion	\$718,116	56,040	419	6 0%	\$0.00	2004	B620	\$0.00 Solids Cost 2004 UWSactual .XLS , Bill Krill email 08.19.05
Milorganite® Land Application	\$308,540	2.649	100%	6 0%	\$0.00	2004	8620	\$0.00 Solids Cost 2004 UWSactual .XLS , Bill Krill email 08.19.05; cost for SS filter cake land application
Milorganite® Sales Revenue	-\$5,704,448	49.086	879	6 0%	\$0.00	2004	8620	\$0.00 Solids Cost 2004 UWSactual XLS , Bill Krill email 08.19.05
ADVIDUAL IN SURPRINCE OF STORE HER STORE				*linked to assumptions (	& total cost summary	page		

#### Glass Furnace Annual Operating Costs

		Total Mass of Raw	% of Raw Sludge from	% of Raw Sludge for	Alternative			
	Process	Sludge that Cost	Left Column Actually Sent	this Alternative Sent	Process	Cost	ENR	2020 (2007)
Process	Cost Value	Value Applies to (tons)	to this Unit Process	to this Unit Process*	Cost/raw dry ton	Year	Index	Process Cost/ton Source of Cost Data
JIWWTP Thickening	\$1,279,606	56,040	509	% 0%	\$0.00	2004	8620	\$0.00 Solids Cost 2004 UWSactual XLS , Bill Krill email 08.19.05; 50% assumed by AES
JIWWTP Dewatering/Drying	\$7,798,293	56.040	849	% 0%	\$0.00	2004	8620	\$0,00 Solids Cost 2004 UWSectual XLS, Bill Krill email 08.19.05; Symbiont calculations of energy cost based on Alan Scrivner (AES) email 12.6.06
Sodium Hydroxide for Minergy SO2 Control	\$147,000	24,400	1009	% 0%	\$0.00	2006	9700	\$0.00 Minergy GlassPack Proposal MMSD Hybrid 11 14 06 sm.pdf , Bill Beres (Minergy) email 11.14.06
Ammonia for Minergy Nox control	\$10,800	24,400	1009	% 0%	\$0.00	2006	9700	\$0.00 Minergy GlassPack Proposal MMSD Hybrid 11 14 06 sm.pdf , Bill Beres (Minergy) email 11.14.06
Minergy Liquid Oxygen Tank & Vaporizer Rental	\$25,000	per year	per yea	ar per year	\$25,000.00	2006	9700	\$25,773.20 Minergy GlassPack Proposal MMSD Hybrid 11 14 06 sm.pdf , Bill Beres (Minergy) email 11.14.06
Minergy Liquid Oxygen Usage	\$50,800	24,400	1009	% 0%	\$0.00	2006	9700	\$0.00 Minergy GlassPack Proposal MMSD Hybrid 11 14 06 sm.pdf , Bill Beres (Minergy) email 11.14.06
Minergy Equipment Maintenance	\$195,200	24.400	1009	% 0%	\$0.00	2006	9700	\$0.00 Minergy GlassPack Proposel MMSD Hybrid 11 14 06 sm.pdf , Bill Beres (Minergy) email 11.14.06
Minergy Ash Disposal	\$13,275	24.400	1009	% 0%	\$0.00	2006	9700	\$0.00 Minergy GlassPack Proposal MMSD Hybrid 11 14 05 sm.pdf , Bill Beres (Minergy) email 11.14.06
Minergy Staffing	\$599,040	per year	per yea	ar per year	\$0.00	2006	9700	\$0.00 5 workers and 1 supervisor per Bill Krill meeting 11.16.05; \$48/hr/worker per Mark Kaminski & Bob Sander of MMSD per Bill Krill email 11.17.06
IPS Pipeline Sludge Transfer	varies	varies	varie	s varies	\$0.00	2004	8620	\$0.00 Solids Cost 2004 UWSactual XLS, Bill Krill email 08 19.05; Symbiont calculations, estimated cost breakdown: DS \$1.83/dt. WAS \$5.31/dt. PS \$1.14/dt
SSWWTP WAS Thickening	\$1,989,266	56,040	509	% 0%	\$0.00	2004	8620	\$0.00 Solids Cost 2004 UWSactual XLS , Bill Krill email 08 19.05; cost for JI GBT thickening
SSWWTP Digestion	\$718,116	56.040	419	% 0%	\$0.00	2004	8620	\$0.00 Solids Cost 2004 UWSactual XLS , Bill Krill email 08.19.05
375				*linked to assumptions	& total cost summary	page		

## Landfill Annual Operating & Maintenance Costs

		Total Mass of Raw	% of Raw Sludge from	% of Raw Sludge for	Alternative			
	Process	Sludge that Cost	Left Column Actually Sent	this Alternative Sent	Process	Cost	ENR	2020 (2007)
Process	Cost Value	Value Applies to (tons)	to this Unit Process	to this Unit Process*	Cost/raw dry ton	Year	Index	Process Cost/ton Source of Cost Data
IPS Pipeline Sludge Transfer	varies	varies	varie	s varies	\$1.57	2004	8620	\$1.82 Solids Cost 2004 UWSactual XLS, Bill Krill email 08.19.05; Symbiont calculations, estimated cost breakdown: DS \$1.83/dt, WAS \$5.31/dt. PS \$1.14/dt
SSWWTP WAS Thickening	\$1,989,266	56,040	50%	67%	\$47.69	2004	8620	\$55.33 Solids Cost 2004 UWSectual .XLS , Bill Krill email 08.19.05; cost for JI GBT thickening
SSWWTP Digestion	\$68,003	2.168	1009	6 100%	\$31.37	2004	8620	\$35,39 Solids Cost 2004 UWSectual .XLS , Bill Krill email 08.19.05
SSWWTP DS Thickening (energy included)	\$1,989,266	56.040	509	% 57%	\$40.68	2004	8620	\$47.19 Solids Cost 2004 UWSectual XLS, Bill Krill email 08 19.05; cost for Jl GBT thickening
SSWWTP Dewatering	\$52	1	1009	6 57%	\$29.80	1987	4522	\$65.89 recessed-plate.pdf (EPA Biosolids Technology Fact Sheet (EPA 832-F-00-058), September 2000), Bill Krill email 11.16.08
Landfill System Staffing	\$898,560	per year	per yea	ar per year	\$898,560.00	2006	9700	\$926,350.52 8 workers and 1 supervisor per Bill Krill, meeting 11.16.08; \$48/fnr/worker per Mark Kaminski & Bob Sander of MMSD, Bill Krill email 11.17.06
Cake Trucking & Landfilling	\$122	1	1009	6 57%	\$70.15	2005	9231	\$83.24 MMSDPlanA.doc, Rick Pager (Waste Management), email 7.27.05 (forwarded by Alan Scrivner (AES), email 07.28.05); inflated to be on par with assumed electrical/gas rate inflation per Bill Krill meeting 12
The State Control of the Control of				*linked to assumptions	& total cost summary	page		



## **ENERGY COSTS**

TOTAL	\$10,660,227 per year

GAS	DTII	Current Rates	to 2007	Future Rates	Tabel	B
	mmBTU	Current Rates	10 2007	Future Rates	Total	Required Energy Source:
direct firing of dryers	0	\$9.250 \$/Dtherm	0%	\$9.250 \$/Dtherm		\$0
turbine fuel	0	\$9.250 \$/Dtherm	0%	\$9.250 \$/Dtherm		\$0 Tom Bachman (Triad Engineering, Inc. (Symbiont)), Technical Memorandum 5.17.05
other plant gas	588,672	\$9.250 \$/Dtherm	0%	\$9.250 \$/Dtherm		\$5,445,216 Current Rate Source:
NOx Control	0	\$9.250 \$/Dtherm	0%	\$9.250 \$/Dtherm		\$0 Mark Kaminski (MMSD) email 4.5.06 (forwarded by Bill Krill (HNTB) email 4.5.06)
Melter Start-Up	0	\$9.250 \$/Dtherm	0%	\$9.250 \$/Dtherm		\$0 Inflation Source:

Gas Total \$5,445,216

#### **ELECTRICAL**

Transmission Level Service		Current Rates	% Inflation to 2007	Future Rates	Total	Required Energy Source:
Facilities Charge	1	\$6,300 /year	8%	\$6,804 /year		\$6,804 Alan Scrivner (AES) emails 6.12.06 & 9.14.06 & 11.16.06 & 12.11.06
On Peak Energy Charge	23,652,000	\$0.0603 /kWh	8%	\$0.0651 /kWh		\$1,540,568
Off Peak Energy Charge	42,048,000	\$0.0312 /kWh	8%	\$0.0337 /kWh		\$1,416,849 Current Rate Source:
On-Peak Demand Charge	204,000	\$10.2160 /kW	8%	\$11.0333 /kW		\$2,250,789 Wisconsin Electric Power Company, Volume 19 Electric Rates, Rev. 5, Sheet 65, Issued 1/26/06
Customer Demand Charge	204,000	\$0.0000 /kw	8%	\$0.0000 /kw		\$0 Inflation Source:
A 0						Mark Kaminski (MMSD) email 4.5.06 (forwarded by Bill Krill (HNTB) email 4.5.06)
			Transmission	Electric Total \$5,215,0	011	
Interruptible Service			% Inflation			
		Current Rates	to 2007	Future Rates	Total	Required Energy Source:
Facilities Charge		\$9 600 /year	204	\$10 368 /vear		80

	Current Rates	to 2007	-uture Rates	lotal	Required Energy Source:
Facilities Charge	\$9,600 /year	8%	\$10,368 /year		\$0
On Peak Energy Charge	\$0.05574 /kWh	8%	\$0.0602 /kWh		\$0 Current Rate Source:
Off Peak Energy Charge	\$0.02990 /kWh	8%	\$0.0323 /kWh		\$0 Wisconsin Electric Power Company, Volume 19 Electric Rates, Rev. 3, Sheet 81.1-81.2, Issued 1/26/06
On-Peak Demand Charge	\$0.05024 /kW	8%	\$0.0543 /kW		\$0 Inflation Source:
Customer Demand Charge	\$0.000 /kw	8%	\$0.0000 /kw		\$0 Mark Kaminski (MMSD) email 4.5.06 (forwarded by Bill Krill (HNTB) email 4.5.06)

Interruptible Electric Total \$0

Current Service		% Inflation			
	Current Rates	to 2007 Fr	uture Rates	Total	
Facilities Charge	\$6,300 /year	8%	\$6,804 /year		\$0 Current Rate Source:
On Peak Energy Charge	\$0.0613 /kWh	8%	\$0.0662 /kWh		\$0 Wisconsin Electric Power Company, Volume 19 Electric Rates, Rev. 5, Sheet 65, Issued 1/26/06
Off Peak Energy Charge	\$0.0331 /kWh	8%	\$0.0357 /kWh		\$0
On-Peak Demand Charge	\$10.3800 /kW	8%	\$11.2104 /kW		\$0 Inflation Rate Source:
Customer Demand Charge	\$0.7600 /kw	8%	\$0.8208 /kw		\$0 Mark Kaminski (MMSD) email 4.5.06 (forwarded by Bill Krill (HNTB) email 4.5.06)

## SSWWTP DIGESTION ENERGY CREDIT

Density of VSS destroyed 15 cf/lb Alan Scrivner (AES) phone conversation 8.23.06
Heat Value of Offgas 600 BTU/cf Alan Scrivner (AES) phone conversation 8.23.06

Cost per ton VSS destroyed \$ 166.50 using cost of gas shown above



TABLE 9G-1 SHEET 10 OF 11

RECOMMENDED BIOSOLIDS PLAN

ALTERNATIVE 1 – LANDFILL

2020 TREATMENT REPORT 6/2/07

TR 9G.T001.07.06.02.cdr

## **ASSUMPTIONS**

## MASS BALANCE

Source: Appendix 9F, Biosolids Recommended Plan Alternatives – Mass Balances, Table 9F-1, Recommended Biosolids Plan Alternative 1 - Landfill

Percent of Milorganite® Raw Sludge that Goes to Digestion	0.00%
Percent of Minergy Raw Sludge that Goes to Digestion	0.00%
Percent of Landfill Raw Sludge that Goes to Digestion	100.00%
Percent of Milorganite® Raw Sludge that Becomes TWAS	0.00%
Percent of Minergy Raw Sludge that Becomes TWAS	0.00%
Percent of TSS Removed During Digestion	42.70%
Total Sludge to Digestion (tpy)	81024
Percent of Digested Sludge to Milorganite®	0.00%
Percent of Digested Sludge to Glass Furnace	0.00%
Percent of Digested Sludge to Landfill	100.00%
WAS to Digestion (tpy)	54430
WAS transferred from SSWWTP to JIWWTP (tpy)	0
Percent of WAS sent to JIWWTP to Milorganite®	0.00%
Percent of WAS sent to JIWWTP to Glass Furnace	0.00%
WAS transferred from JIWWTP to SSWWTP (tpy)	18667
Primary Sludge Transferred from JIWWTP to SSWWTP	26704

## **USEFUL LIFE**

Land	Permanent	
Sewer & Force Mains	50 years	Symbiont assumption
Structures, Piping, & Valves	40 years	Symbiont assumption
Process Equipment, Electrical, I&C	20 years	Symbiont assumption

## **UNDESIGNED DETAILS ALLOWANCE**

all inclusive firm bid price	0% Bill Krill (HNTB), phone conference 11.16.06
all major components have documented installed unit costs	10% Symbiont assumption
costs missing for some components, but other costs are for	20%
installed facilities and well documented (connections to existing	
systems, etc.)	Symbiont assumption
installed costs for major components are not well documented	40%
(eg. Installation cost is estimated)	Symbiont assumption

## CONTINGENCY

all inclusive firm bid price	0% Bill Krill (HNTB), phone conference 11.16.06
everything else	25% Bill Krill (HNTB), phone conference 11.16.06

## **DESIGN, BIDDING, & OVERSITE**

all inclusive firm bid price (design complete, no bidding)	15% Bill Krill (HNTB), phone conference 11.16.06
everything else	35% Bill Krill (HNTB), phone conference 11.16.06



TABLE 9G-1 SHEET 11 OF 11
RECOMMENDED BIOSOLIDS
ALTERNATIVE 1 – LANDFILL

#### **COST ESTIMATE SUMMARY**

## **General Description**

All treatment plant primary sludge is digested and then combined with all of the raw secondary sludge before feeding to the existing Milorganite® dryers. The dried product is then fed to the glass furnace process to be converted to energy and glass aggregate. Construction requires 2 - 80 tpd glass furnace lines, 7 new GBT's for SSWWTP WAS thickening, and 5 new digesters.

**Biosolids Load** 

81,000 Influent Sludge 16,70

16,700 Finished Biosolids

Biosolids Influent Load Distribution

0% Milorganite®

100% Glass Furnace 0% Landfill

ENR Index =

Interest Rate per Year =

10000 5.125% (assumed Milwaukee 2007)

Summary		O :	•
ISIImmarv	OΤ	Canitai	COSTS

JIWWTP ELECTRICAL SERVICE UPGRADES	\$27,980,000
JIWWTP COOLING WATER PUMP UPGRADES	\$600,000
JIWWTP DEWATERING AND DRYING FACILITY UPGRADES	\$114,740,000
JIWWTP NEW GLASS FURNACE PROCESS	\$67,580,000
JIWWTP NEW GLASS FURNACE BUILDINGS	\$16,440,000
INTERPLANT SLUDGE PIPELINE UPGRADES	\$2,870,000
SSWWTP NEW GRAVITY BELT WAS THICKENERS	\$7,580,000
SSWWTP DIGESTER REHABILITATION	\$117,430,000
SALVAGE VALUE	-\$20,011,000

Total Capital Cost \$335,210,000

## Summary of Annual Operation & Maintenance Costs

Total Annual Cost \$31,510,000

Life Cycle Analysis

Number of Years 20
Present Worth Factor 12.331

Present Worth of Total Annual Operation & Maintenance Costs

\$388,560,000

## Summary of Non-Annual Operation & Maintenance Costs

Process	Cost	ENR Index	Year	PW
Major unit refractory replacement	\$370,000	9,700	10	\$231,403
Fabric filter bag replacement	\$64,000	9,700	5	\$51,390
Fabric filter bag replacement	\$64,000	9,700	10	\$40,027

Present Worth of Total Non-Annual Operation & Maintenance Costs \$320,000

Total Present Worth \$724,000,000



TABLE 9G-2 SHEET 1 OF 12

RECOMMENDED BIOSOLIDS

ALTERNATIVE 2 – GLASS

FURNACE TECHNOLOGY

2020 TREATMENT REPORT

6/2/07 TR\_9G.T002.07.06.02.cdr

JIW	WTP TRANS	MISSION	LEVEL ELEC	TRICAL SER	VICE CAP	ITAL COS	ST.											
0111		,,,,,,	22122222	THIO/IL OLIV	7102 07 11			al Capital Cost =	Tota	Salvage Value =								
								\$27.980.000		\$930,000	< insert link	o this cos	t on the Cap	ital Cost Summ	arv Worksheet			
					Un-		Design,			, , , , , , ,								
					designed	Conting-	Bidding, &				Actual	(	COST ADJUS	STMENT	ADJUSTED			
			Unit Cost	SUBTOTAL	Details	ency	Oversite	SUBTOTAL	Life	Salvage Value	Unit Cost	Cost	ENR	Adjustment	UNIT COST			
DESCRIPTION	Quantity	Units	(\$)	(\$)	(%)	(%)	(%)	(\$)	(Years)	(\$)	(\$)	Year	Index	Factor	(\$)	SOURCE	MANUFACTURER	COMMENTS
DIVISION 2: SITE CONSTRUCTION																		
6-5" Concrete encased PVC Conduit ductbank (SS to Building 286)	3,800	LF	\$200	\$760,000	20%	25%	35%	\$1,540,000	40	\$770,000	\$190	2006	9700	1.03	\$196	138KVServiceOptionESTIMATE2.xls, Tony Pohl (Automation Service & Design Inc.), email 05.05.06	TBD	200 Amp Feeders
Manholes (SSsto 286)	20	each	\$10.000	\$200,000	20%	25%	35%	\$410,000	20	\$0	\$10,000	2006	9700	1.03	\$10.309	138KVServiceOptionESTIMATE2.xls, Tony Pohl (Automation Service & Design Inc.), email 05.05.06	TBD	200 Amp Feeders
Trenching, Pavement removal, Backfill and Patching (SS to 286)	3,800	LF	\$100	\$380,000	20%	25%	35%	\$770,000	20	\$0	\$100	2006	9700	1.03	\$103	138KVServiceOptionESTIMATE2.x/s, Tony Pohl (Automation Service & Design Inc.), email 05.05.06	TBD	200 Amp Feeders
6-5" Concrete encased PVC Conduit ductbank (SS to Building 289)	800	LF	\$200	\$160,000	20%	25%	35%	\$320,000	40	\$160,000	\$190	2006	9700	1.03	\$196	138KVServiceOptionESTIMATE2.xls, Tony Pohl (Automation Service & Design Inc.), email 05.05.06	TBD	200 Amp Feeders
M	,		040.000	<b>#</b> 40.000	000/	050/	050/	600.000	00		<b>640.000</b>	0000	0700	1.00	040.000	400///Q : 0 // FOTHATEO / T	TDD	000 4 5 1
Manholes (SSsto 289) Trenching, Pavement removal, Backfill and Patching (SS to 289)	800	each	\$10,000 \$100	\$40,000 \$80.000	20% 20%	25% 25%	35% 35%	\$80,000 \$160,000	20	\$0	\$10,000 \$100	2006 2006	9700 9700	1.03 1.03	\$10,309 \$103	138KVServiceOptionESTIMATE2.xls, Tony Pohl (Automation Service & Design Inc.), email 05.05.06 138KVServiceOptionESTIMATE2.xls, Tony Pohl (Automation Service & Design Inc.), email 05.05.06	TBD TBD	200 Amp Feeders 200 Amp Feeders
rending, Favelient removal, backin and Fatching (55 to 265)	800	LF	\$100	\$60,000	2076	2376	33%	\$100,000	20	φυ	\$100	2000	9700	1.03	\$103	I SONVOCIVICE OPILIONES THINKI EZ.XIS, TOTY POIN (AUTOMATION SERVICE & DESIGN INC.), CHICAN US.05.00	IBU	200 Amp reeders
Division 2 Subtotal	\$3,280,000		l															
DIVISION 16: ELECTRICAL																		
500kcmil 1/c 15KV Copper (SS to 286)	68,400	LF	\$15	\$1,026,000	20%	25%	35%	\$2,080,000	20	\$0	\$15	2006	9700	1.03	\$15	138KVServiceOptionESTIMATE2.xls, Tony Pohl (Automation Service & Design Inc.), email 05.05.06	TBD	200 Amp Feeders
Site Power Factor Correction	1	each	\$515,000	\$515,000	40%	25%	35%	\$1,220,000	20	\$0	\$500,000	2006	9700	1.03	\$515,464	138KVServiceOptionESTIMATE2.xls, Tony Pohl (Automation Service & Design Inc.), email 05.05.06	TBD	
Switchgear Upgrades Buildings 286 and 289	2	each	\$515,000	\$1,030,000	40%	25%	35%	\$2,430,000	20	\$0	\$500,000	2006	9700	1.03	\$515,464	138KVServiceOptionESTIMATE2.xls, Tony Pohl (Automation Service & Design Inc.), email 05.05.06	TBD	
500kcmil 1/c 15KV Copper (SS to 289)	14,400	LF	\$15	\$216,000	20%	25%	35%	\$440,000	20	\$0	\$15	2006	9700	1.03	\$15	138KVServiceOptionESTIMATE2.xls, Tony Pohl (Automation Service & Design Inc.), email 05.05.06	TBD	200 Amp Feeders
Control System Upgrades	1	each	\$1,031,000	\$1,031,000	40%	25%	35%	\$2,440,000	20	\$0	\$1,000,000	2006	9700	1.03	\$1,030,928	138KVServiceOptionESTIMATE2.xls, Tony Pohl (Automation Service & Design Inc.), email 05.05.06	TBD	
New 138 KV Electrical Service from We Energies	1	each	\$3,943,000	\$3,943,000	20%	25%	35%	\$7,980,000	20	\$0	\$3,825,000	2006	9700	1.03	\$3,943,299	Alan Scrivner (AES Engineering), phone conversation 03.29.06	We Energies	contingencies indicated by AES
New 138 KV Electrical Service from We Energies	1	each	\$4,367,000	\$4,367,000	10%	25%	35%	\$8,110,000	20	tion 03.25006	\$4,236,364	2006	9700	W.e3Energi	es \$4,367, <b>3261t</b> in	gentaires indicate(A.56) ATT@ineering), phone conversa		
Division 16 Subtotal	\$24,700,000										II .							



			e Metropolitan Se FACILITIES P	ewerage District PLANNING														
	JIWWTP COO	LING WAT	ER PUMP U	<b>IPGRADES</b>	CAPITAL (	COSTS												
							To	tal Capital Cost =	Tota	I Salvage Value =	11							
								\$600,000		\$0	< insert lin	k to this co	st on the Ca	oital Cost Summ	ary Worksheet			
					Un-		Design,				· [							
					designed	Conting-	Bidding, &				Actual		COST ADJ	JSTMENT	ADJUSTED			
			Unit Cost	SUBTOTAL	Details	ency	Oversite	SUBTOTAL	Life	Salvage Value	Unit Cost	Cost	ENR	Adjustment	UNIT COST			
DESCRIPTION	Quantity	Units	(\$)	(\$)	(%)	(%)	(%)	(\$)	(Years)	(\$)	(\$)	Year	Index	Factor	(\$)	SOURCE	MANUFACTURER	COMMENTS
DIVISION 11: EQUIPMENT  New 3000 gpm, 173' TDH Vertical Turbine Cooling Water Pumps  Division 11 Subtotal	2 ea	ich	\$128,000	\$256,0009	JIWW7#8%Jo	rth Utility P <b>asi%</b> p	Station De2596e	Training <b>\$\$ลิง</b> ( <b>ลิ</b> ติ(ปล	nuary 1920	\$0	\$62,81	63 1990	4894	2.04	\$128,44		Fairbanks Morse Pump Corp.	+30% for installation (cost was listed for both pumps and thus is divided by 2 here)



	D	&D FACIL	ITY UPGRADI	ES CAPITAL	COST					
							Tot	al Capital Cost =	Tota	I Salvage Value =
								\$114,740,000		\$0
					Un-		Design,			
					designed	Conting-	Bidding, &			
			Unit Cost	SUBTOTAL	Details	ency	Oversite	SUBTOTAL	Life	Salvage Value
DESCRIPTION	Quantity	Units	(\$)	(\$)	(%)	(%)	(%)	(\$)	(Years)	(\$)
DIVISION 13: SPECIAL CONSTRUCTION										
Unit Process 24 Upgrade	1	lump sum	\$6,495,000	\$6,495,000	40%	25%	35%	\$15,340,000	20	\$0
Unit Process 25 Upgrade	1	lump sum	\$17,453,000	\$17,453,000	40%	25%	35%	\$41,230,000	20	\$0
Unit Process 27 Upgrade	1	lump sum	\$4,062,000	\$4,062,000	40%	25%	35%	\$9,600,000	20	\$0
Unit Process 29 Upgrade	1	lump sum	\$12,629,000	\$12,629,000	40%	25%	35%	\$29,840,000	20	\$0
Unit Process 30 Upgrade	1	lump sum	\$1,278,000	\$1,278,000	40%	25%	35%	\$3,020,000	20	\$0
Unit Process 31 Upgrade	1	lump sum	\$747,000	\$747,000	40%	25%	35%	\$1,760,000	20	\$0
Unit Process 32 Upgrade	1	lump sum	\$2,809,000	\$2,809,000	40%	25%	35%	\$6,640,000	20	\$0
Miscellaneous Costs (drop chutes, etc.)	1	lump sum	\$3,093,000	\$3,093,000	40%	25%	35%	\$7,310,000	20	\$0
Division 13 Subtotal	\$114,740,000									

Actual	C	OST ADJU	STMENT	ADJUSTED			
Unit Cost	Cost	ENR	Adjustment	UNIT COST			
(\$)	Year	Index	Factor	(\$)	SOURCE	MANUFACTURER	COMMENTS
\$6,300,000	2006	9700	1.03	\$6,494,845	DD Facility Upgrade Estimate (npb edit 11-21-06).x/s , Review of Plant Projects reports and Symbiont engineering judgment	TBD	
\$16,929,000	2006	9700	1.03	\$17,452,577	DD Facility Upgrade Estimate (npb edit 11-21-06).xls , Review of Plant Projects reports and Symbiont engineering judgment	TBD	
\$3,940,000	2006	9700	1.03	\$4,061,856	DD Facility Upgrade Estimate (npb edit 11-21-06).xls , Review of Plant Projects reports and Symbiont engineering judgment	TBD	
\$12,250,000	2006	9700	1.03	\$12,628,866	DD Facility Upgrade Estimate (npb edit 11-21-06).xls , Review of Plant Projects reports and Symbiont engineering judgment	TBD	
\$1,240,000	2006	9700	1.03	\$1,278,351	DD Facility Upgrade Estimate (npb edit 11-21-06).xls , Review of Plant Projects reports and Symbiont engineering judgment	TBD	
\$725,000	2006	9700	1.03	\$747,423	DD Facility Upgrade Estimate (npb edit 11-21-06).xls , Review of Plant Projects reports and Symbiont engineering judgment	TBD	
\$2,725,000	2006	9700	1.03	\$2,809,278	DD Facility Upgrade Estimate (npb edit 11-21-06).xls , Review of Plant Projects reports and Symbiont engineering judgment	TBD	
\$3,000,000	2006	9700	1.03	\$3,092,784	DD Facility Upgrade Estimate (npb edit 11-21-06).xls , Review of Plant Projects reports and Symbiont engineering judgment	TBD	



	NEW GLASS FURNACE PROCESS	EQUIPMENT CAPITAL COST
--	---------------------------	------------------------

							To	tal Capital Cost =	Tota	I Salvage Value =
								\$67,580,000		\$0
					Un-		Design,			
					designed	Conting-	Bidding, &			
			Unit Cost	SUBTOTAL	Details	ency	Oversite	SUBTOTAL	Life	Salvage Value
DESCRIPTION	Quantity	Units	(\$)	(\$)	(%)	(%)	(%)	(\$)	(Years)	(\$)
DIVISION 13: SPECIAL CONSTRUCTION										
Glass Furnace Facility Equipment	1	lump sum	\$35,618,000	\$35,618,000	10%	25%	35%	\$66,120,000	20	\$0
Dense Phase Conveyance System from Silos to Glass Furnace	1	lump sum	\$616,000	\$616,000	40%	25%	35%	\$1,460,000	20	\$0
Division 13 Subtotal	\$67,580,000									

## ----- insert link to this cost on the Capital Cost Summary Worksheet

Actual Unit Cost (\$)	Cost Year	ENR Index	Adjustment Factor	ADJUSTED UNIT COST (\$)	SOURCE	MANUFACTURER	COMMENTS
\$34,549,280 n <b>%5586\00(</b> Af		9700 11.229 <b>06</b> p	1.03 1.03	\$35,617,814 \$616,495	Minergy MMSD Estimate-2006-03-27.pdf, Bill Beres (Minergy, GlassPack LLC), email 3.30.06 (forwarded via Alan Scrivner (AES), email 3.30.06)  Dan Roe (Dynamic Air Inc.), email 1.26.06 (forwarded via Ala	Minergy Dynamic Air, Inc.	2 lines, +30% for installation



	NEW (	GLASS FI	URNACE BUIL	DINGS CAPI	TAL COST	Ī					
							To	tal Capital Cost =	Total Salvage Value =		
								\$16,440,000		\$1,681,000	
					Un-		Design,				
					designed	Conting-	Bidding, &				
			Unit Cost	SUBTOTAL	Details	ency	Oversite	SUBTOTAL	Life	Salvage Value	
DESCRIPTION	Quantity	Units	(\$)	(\$)	(%)	(%)	(%)	(\$)	(Years)	(\$)	
DIVISION 13: SPECIAL CONSTRUCTION											
Melter Structure (15,000 sf)	1	lump sum	\$3,926,000	\$3,926,000	10%	25%	35%	\$7,290,000	40	\$1,341,000	
Oxygen Structure (4,900 sf)	1	lump sum	\$995,000	\$995,000	10%	25%	35%	\$1,850,000	40	\$340,000	
Sitework and Utilities	1	lump sum	\$3,740,000	\$3,740,000	10%	25%	35%	\$6,940,000	20	\$0	
Additional Equipment	1	lump sum	\$97,000	\$97,000	10%	25%	35%	\$180,000	20	\$0	
Installation	1	lump sum	\$97,000	\$97,000	10%	25%	35%	\$180,000	20	\$0	

## <---- insert link to this cost on the Capital Cost Summary Worksheet

	Actual	С	OST ADJU	STMENT	ADJUSTED			
	Unit Cost	Cost	ENR	Adjustment	UNIT COST	aguner.	MANUEACTURER	00445450
	(\$)	Year	Index	Factor	(\$)	SOURCE	MANUFACTURER	COMMENTS
∥	\$3,808,687	2006	9700	1.03	\$3,926,481	Minergy MMSD Estimate-2006-03-27.pdf, Bill Beres (Minergy, GlassPack LLC), email 3.30.06 (forwarded via Alan Scrivner (AES), email 3.30.06)	TBD	
∥	\$965,445	2006	9700	1.03	\$995,304	Minergy MMSD Estimate-2006-03-27.pdf, Bill Beres (Minergy, GlassPack LLC), email 3.30.06 (forwarded via Alan Scrivner (AES), email 3.30.06)	TBD	
∥	\$3,627,976	2006	9700	1.03	\$3,740,181	Minergy MMSD Estimate-2006-03-27.pdf, Bill Beres (Minergy, GlassPack LLC), email 3.30.06 (forwarded via Alan Scrivner (AES), email 3.30.06)	TBD	
∥	\$94,185	2006	9700	1.03	\$97,098	Minergy MMSD Estimate-2006-03-27.pdf, Bill Beres (Minergy, GlassPack LLC), email 3.30.06 (forwarded via Alan Scrivner (AES), email 3.30.06)	TBD	
∥	\$94,185	2006	9700	1.03	\$97,098	Minergy MMSD Estimate-2006-03-27.pdf, Bill Beres (Minergy, GlassPack LLC), email 3.30.06 (forwarded via Alan Scrivner (AES), email 3.30.06)	TBD	
∥								
∥								
∥								



	INTERPLA	NT SLUDG	E PIPELINE U	JPGRADES (	CAPITAL C	COSTS												
		02020					To	tal Capital Cost = \$2,870,000	Tota	al Salvage Value =	< insert link to	o this cost	on the Capi	tal Cost Summa	ry Worksheet			
					Un- designed	Conting-	Design, Bidding, &				Actual		OST ADJUS		ADJUSTED			
DESCRIPTION	Quantity	Units	Unit Cost (\$)	SUBTOTAL (\$)	Details (%)	ency (%)	Oversite (%)	SUBTOTAL (\$)	Life (Years)	Salvage Value (\$)	Unit Cost (\$)	Cost Year	ENR Index	Adjustment Factor	UNIT COST (\$)	SOURCE	MANUFACTURER	COMMENTS
DIVISION 11: EQUIPMENT																		
JIWWTP and SSWWTP Hard Metal Pumps & Motors Rated for 300 psi	12		\$93,000	\$1,116,000	20%	25%	35%	\$2,260,000	20	000 per <b>§0</b> mp	or installa <b>\$96</b> ,000	2006	9700	1.03	\$92,784	Mickey (RDM), phone conversation 03.28.06	TBD	includes \$5
Division 11 Subtotal	\$2,260,000																	
DIVISION 16: ELECTRICAL Pipeline Cathodic Protection	1	allowance	\$258,000	\$258,000	40%	25%	35%	\$610,000	20	\$0	\$250,000	2006	9700	1.03	\$257,732	Symbiont engineering judgment	TBD	



	SSWWT	P DIGES	TER REHABIL	ITATION CAP	ITAL CO	ST				
							То	tal Capital Cost =	Tota	Salvage Value =
								\$117,430,000		\$17,159,000
					Un- designed	Conting-	Design, Bidding, &			
DESCRIPTION	Quantity	Units	Unit Cost (\$)	SUBTOTAL (\$)	Details (%)	ency (%)	Oversite (%)	SUBTOTAL (\$)	Life (Years)	Salvage Value (\$)
DIVISION 3: CONCRETE										
Five New Covered & Insulated Digester Tanks with access equipment (125' diameter, 38' side water depth, 5' free board)	19,735,583	gallons	\$2	\$39,471,166	40%	25%	35%	\$93,250,000	40	\$17,159,000
Division 3 Subtotal	\$93,250,000									
DIVISION 11: EQUIPMENT										
New Digester Mixing Systems - External Draft Tube Mixers for 110' diameter	17	each	\$468,000	\$7,956,000	40%	25%	35%	\$18,800,000	20	\$0
New Digester Recirculation Pumps - 10 HP motors, 250 gpm @ 60' TDH	22	each	\$15,000	\$330,000	40%	25%	35%	\$780,000	20	\$0
Recirculating Sludge Heat Exchangers -Sludge-Hot Water Systems	11	each	\$42,000	\$462,000 2,24	49 40%	25%	35%	\$1,090,000	20	\$0
Storage Digester Sludge Transfer Pumps - 30 HP motors, VFD, 1200 gpm @ 60' TDH	11	each	\$55,000	\$605,000	40%	25%	35%	\$1,430,000	20	\$0
Digester Gas Safety Equipment	1	allowance	\$812,000	\$812,000	40%	25%	35%	\$1,920,000	20	\$0
Division 11 Subtotal	\$24,020,000									
DIVISION 15: MECHANICAL										
New Boiler	1	each	\$67,000	\$67,000	40%	25%	35%	\$160,000	20	\$0
Division 15 Subtotal	\$160,000		I							
Division 15 Subtotal	φ160,000									

00	< insert link to	this cost	on the Cap	ital Cost Summar	y Worksheet			
	Actual	С	OST ADJU	STMENT	ADJUSTED			
•	Unit Cost (\$)	Cost Year	ENR Index	Adjustment Factor	UNIT COST (\$)	SOURCE	MANUFACTURER	COMMENTS
_	(*)		maox	- dotoi	(+)		- III III III III III III III III III I	
00	\$2	2007	10000	1.00	\$2	Symbiont engineering judgment	TBD	
<b>6</b> 0	\$431,600	2005	9231	1.08	\$467,555	Wiscosin Project Triad Ebg EWT Mixer Budget Price 07-14-05.doc , Bob Lacey (Energenecs), email 07.14.05	Eimco, RDT-T	+30% for install
60	\$13,650	2005	9231	1.08	\$14,787	Rich Hussey (Ley Associates), email 07.26.05	Wemco-Hidrostal, D4K-HS	+30% for install
0	\$39,000	2005	9231	1.08	\$4	Biosolids Alternative Sizing Worksheets r4.xls , Symbiont	Alfa Laval	+30% for install
0	\$51,025	2005	9231	1.08	\$55,276	Rich Hussey (Ley Associates), email 07.26.05	Wemco-Hidrostal, E5K-S	+30% for install, +250% for VFD
60	\$750,000	2005	9231	1.08	\$812,480	Symbiont engineering judgment		
0	\$65,000	2006	9700	1.03	\$67,010	Symbiont engineering judgment based on recent projects	TBD	



												1												
				ee Metropolitan Se D FACILITIES P																				
	New	SSWWTP (	Gravity Belt	Thickeners f	or WAS Thic	kening Ca	pital Cost	7.4.10		T-1-10-														
									apital Cost = \$7,580,000	Total Sa	lvage Value = \$241,000	< insert l	ink to this co	st on the Ca	pital Cost Summ	ary Worksheet								
							Conting- B	Design, idding, &				Actual		COST ADJ		ADJUSTED								
DESCRIPTION		Quantity	Units	Unit Cost (\$)	SUBTOTAL (\$)	Details (%)	ency ( (%)	Oversite S (%)		Life Sa Years)	alvage Value (\$)	Unit Cos (\$)	t Cost Year			UNIT COST (\$)	_		SOURCE		 MANUFACTURER		COMMENTS	
DIVISION 2: SITE CONSTRUCTION		1	L.,,,,,,	\$26,000	£26,000	400/	250/	250/	\$60,000	20	ded via Kat@Ziin	(LINTE) #97	1500 OC 2004	86ZED	1.16	1250/896-469	20&Prpek Tösfef/(ANTó),(48	194s wind b & Bours als also the	- 45.45.04.JS					
Demolition			lump sum	\$26,000	\$26,000	40%	25%	35%	\$60,000	20	ded via Kalekziini	. ((TIVI D), 1945.2:	SERUOO) 2004	8 80.20	1.16	+25% совинию	с Оогтник пестетиципод-че	rca i lingare enginerin enercii	rs alisto asserquiai weeliilo)					
	Division 2 Subtotal	\$60,000																						
DIVISION 4: MASONRY Masonry Restoration - Cut and Repoint Brick		1	lump sum	\$22,000	\$22,0000), 1	Technical4016mora	andum <b>25%</b> 5.04 (f	orwan <b>in</b> wa Kat	te Ziirûs6(HMMB), fa.	(9.272 <b>0</b> 6)	T₩D	\$18,	75625% <b>2664</b>	adtesig <b>Mis2</b> (ple	etaTeschi <b>sc</b> e (440°	<b>śnem</b> o) \$21,752	2 Frank Tiefert (							
	Division 4 Subtotal	\$50,000																						
DIVISION 11: EQUIPMENT GBT Equipment Thickened Sludge Pumps Washwater Pumps Polymer System	Division 11 Subtotal	\$5,180,000	lump sum lump sum lump sum lump sum	\$1,624,000 \$322,000 \$63,000 \$183,000	\$322,000Me	morandu40%1.15.		Kate325160 (HNT	\$3,840,000 (B), \$3,669,20006) (.06)\$150,000 \$430,000	20 TE TBD 20	BD \$0	+25%287 ontractor (\$\$#,	18403or O&1904 1686 Tech 2004	er Tech <b>8101210</b> st ho (14101%11012101b)	te¢Hi0%nenhtak§tignGl estignGBTbeta6s also	375etails \$322,288 bliste \$63,443	Frank Tiefert (ATI), Te Frank Tiefert (ATI), Te	echnical echnical Memorandu	widsi§r@B Tetails also listec n hTetali5.0ks∳flisted in memo					
DIVISION 13: SPECIAL CONSTRUCTION																								
Building Modifications		1	lump sum	\$281,000	\$281,0 <b>00</b> al l	Memoran <b>tū</b> i⁄in 11.	.15.04 ( <b>255%</b> arded	via K <b>36</b> 9∕Ziino (H	INTEN)6660;02027.06)	40	TBD\$121,000	+25242	:560 <sup>:</sup> actor20 <b>84</b>	P petall <b>äääää</b>	el <b>iste (#lib%hdrûte</b> )sig	ned d \$281,323	Frank Tiefert (ATI), Te	ech						
	Division 13 Subtotal	\$660,000																						
DIVISION 15: MECHANICAL Mechanical Piping		1	lump sum	\$277,000	\$277,00 <b>0</b> 1er	norandur <b>≜0%</b> .15.	04 (forw <b>25f%l</b> ed via	Kate <b>35</b> 5% (HNT)	B), faja6\$02;070006)	40 TE	3D \$120,000	+25%\$23181	Alabor O SPOPH	er Techi <b>862in</b> te	e (410%nentte)stigne E	Betail \$276,610	Frank Tiefert (ATI), Te	echnical						
	Division 15 Subtotal	\$650,000																						
DIVISION 16: ELECTRICAL Instrumentation & Control Electrical	Division 16 Subtotal	\$980,000	lump sum lump sum	\$221,000 \$193,000	\$221,@00Mei \$193,000		.04 (fon <b>25/d</b> ed via 25%		(B), (35,20,27006) \$460,000	20 TE 20	BD \$0 orwarded <b>\\$4</b> Ka	+25% \$690 ts Ziino ( <b>I-\$168</b>	(Biddor O&29(pi )25ax 9.272064	er Tescheldellend 1 8620	e(440%ne <b>rld#</b> 91gr@6	3 Taeta \$220,780 +\$592,6911	D Frank Tiefert (ATI), Te Bracknecks Repertitati Mee	echnic robr(i <del>tál)/Mendeslijnálí</del>	<b>ोगोर्क1व115. शेरू</b> ई listed in memo	o)				



#### O&M COST ESTIMATE

81,000 (raw sludge)

Total Annual O&M Cost = \$31,510,000 Total 2020 MMSD Sludge Production (dt/yr) = JIWWTP Energy Costs JIWW I P E.NERGY COSTS
Natural Gas - Turbine Fuel
Natural Gas - Turbine Fuel
Natural Gas - Class Furnace NOx Control & Startup
Natural Gas - Other Plant Facilities
Firm Electricity - Base Power Load
Firm Electricity - Demand Charges
Interruptible Electricity - Base Power Load
Interruptible Electricity - Demand Charges
Turbine Operation and Maintenance
SUBTIC \$3,139,000 \$92,000 \$5,445,000 \$4,560,000 \$2,714,000 \$796,000 \$1,000 \$0 \$16,747,000

 SSWWTP Digestion Gas Credit/Replacement

 plus/minus amount of solids destroyed in digestion =
 10,375
 tonsi/year

 plus/minus amount of energy recovered from digestion process =
 150,267
 diherm/year

 VALUE OF ENERGY CHANGE IN TERMS OF COST OF EQUIVALENT
 GAS PURCHASE
 -\$1,389,970

SUBTOTAL

#### Milorganite® Annual Operating & Maintenance Costs

% of sludge to Milorganite® = 0%

	annual sludge volume (dt/year) =	0 (1	raw) =	0%
		Process Unit	Process	
		Cost	Contribution	Annual Cost
Item/Process		(\$/dt)	Cost (\$/dt raw)	\$/yr
JIWWTP Thickening	g	\$53.00	\$0.00	\$0
JIWWTP Dewaterin	g/Drying	\$191.30	\$0.00	\$0
JIWWTP Chaff Prod	cessing	\$443.30	\$0.00	\$0
Milorganite® Wareh	nouse/Shipping	\$27.20	\$0.00	\$0
Biosolids Marketing		\$81.70	\$0.00	\$0
IPS Pipeline Sludge	Transfer (includes SS energy)	\$3.20 *	\$0.00	\$0
SSWWTP WAS Thi	ckening (energy included)	\$82.40	\$0.00	\$0
SSWWTP Digestion	n (energy included)	\$36.40	\$0.00	\$0
Milorganite® Land A	Application	\$135.10	\$0.00	\$0
Milorganite® Sales	Revenue	-\$155.80	\$0.00	\$0
	SURTOTAL	ı	\$0	\$0

## Glass Furnace Annual Operating Costs

% of sludge to glass furnace =	100%	annual biosolids to	Glass Furnace
annual sludge volume (dt/year) =	81,000	(raw) =	57,900
	Process Unit	Process	
	Cost	Contribution	Annual Cost
Item/Process	(\$/dt)	Cost (\$/dt raw)	\$/yr
JIWWTP Thickening	\$53.00	\$13.80	\$1,118,000
JIWWTP Dewatering/Drying	\$191.30	\$139.80	\$11,324,000
Sodium Hydroxide for Glass Furnace SO2 Control	\$6.20	\$4.40	\$356,000
Ammonia for Glass Furnace Nox control	\$0.50	\$0.30	\$24,000
Glass Furnace Liquid Oxygen Tank & Vaporizer Rental	per year	\$0.32	\$26,000
Glass Furnace Liquid Oxygen Usage	\$2.10	\$1.50	\$122,000
Glass Furnace Equipment Maintenance	\$8.20	\$5.90	\$478,000
Glass Furnace Ash Disposal	\$0.60	\$0.40	\$32,000
Glass Furnace Staffing	per year	\$7.63	\$618,000
IPS Pipeline Sludge Transfer (includes SS energy)	\$3.20	* \$2.00	\$162,000
SSWWTP WAS Thickening (energy included)	\$82.40	\$0.50	\$41,000
SSWWTP Digestion (energy included)	\$36.40	\$22.90	\$1,855,000
SUBTOTA	ı	\$199	\$16 155 500

## **Landfill Annual Operating & Maintenance Costs**

Average of costs to pump WAS, primary sludge, and digested sludge

annual sludge volume (dt/year) = 0

Process Unit Contribution Cost (\$/dt raw) \$0.00 Annual Cost \$/yr \$0 Item/Process
IPS Pipeline Sludge Transfer IPS Pipeline Sludge Transfer SSWMTP WAS Thickening (energy included) SSWMTP Digestion (energy included) SSWMTP DS Thickening (energy included) SSWMTP Dewatering (energy included) Landfill System Staffing \$82.40 \$36.40 \$82.40 \$115.00 \$0.00 \$0.00 \$0.00 per year \$145.30 \$0.00 Cake Trucking & Landfilling SUBTOTAL

see Sheet 11, Energy Costs Turbine Operation and Maintenance \$0.00 2006 \$0.00 Bob Gavahan (Power Engineers Collaborative), email 3.27.06

Source calculated difference in tons removed in digester from the year 2004 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05)

calculated heat valuesetiadditionalsdigestreedan "JI Energy" calculated \$ value of additional digester gas based on values assumed on "JI Energy"

### Milorganite® Annual Operating & Maintenance Costs

		T						
		Total Mass of Raw	% of Raw Sludge from	% of Raw Sludge for	Alternative			
	Process	Sludge that Cost	Left Column Actually Sent	this Alternative Sent	Process	Cost	ENR	2020 (2007)
Prodrogetscen Year Index F	Process Cost/ton Source of CooodsDatalue	Value Applies to (tons)	to this Unit Process	to this Unit Process*	Cost/raw			
JIWWTP Thickening	\$1,279,606	56,040	50%	0%	\$0.00	2004	8620	\$0.00 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05; 50% assumed by AES
JIWWTP Dewatering/Drying	\$7,798,293	56,040	84%	0%	\$0.00	2004	8620	\$0.00 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05; Symbiont calculations of energy cost based on Alan Scrivner (AES) email 12.6. 0
JIWWTP Chaff Processing	\$928,541	56,040	84%	0%	\$0.00	2004	8620	\$0.00 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05
Milorganite® Warehouse/Shipping	\$1,108,821	56,040	84%	0%	\$0.00	2004	8620	\$0.00 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05
Biosolids Marketing	\$2,990,952	49,086	87%	0%	\$0.00	2004	8620	\$0.00 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05
IPS Pipeline Sludge Transfer	varies	varies	varies	varies	\$0.00	2004	8620	\$0.00 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05; Symbiont calculations; estimated cost breakdown: DS \$1.83/dt, WAS \$5.31/dt, PS \$1.14/d
SSWWTP WAS Thickening	\$1,989,266	56,040	50%	0%	\$0.00	2004	8620	\$0.00 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05; cost for JI GBT thickening
SSWWTP Digestion	\$718,116	56,040	41%	0%	\$0.00	2004	8620	\$0.00 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05
Milorganite® Land Application	\$308,540	2,649	100%	0%	\$0.00	2004	8620	\$0.00 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05; cost for SS filter cake land application
Milorganite® Sales Revenue	-\$5,704,448	49,086	87%	0%	\$0.00	2004	8620	\$0.00 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05
*linked to assumptions & total cost summary page								

## Glass Furnace Annual Operating Costs

Proce	Total Mass of R			Alternative Process	Cost	ENR	2020 (2007)
					CUSI	LINIX	2020 (2007)
			to this Unit Process*	Cost/raw			
JIWWTP Thickening \$1,2	9,606	56,040 50%	6 26%	\$11.87	2004	8620	\$13.77 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05; 50% assumed by AE S
JIWWTP Dewatering/Drying \$7,7	98,293	56,040 849	6 73%	\$120.54	2004	8620	\$139.84 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05; Symbiont calculations of energy cost based on Alan Scrivner (AES) email 12.6. 0
Sodium Hydro Mide for Glass Furnac #1502 Control \$4.31 20065	47, <b>970</b> 0 \$4	2 <b>41</b> 4400 100					Minergy GlassPack Proposal MMSD Hybrid 11 14 06 sm.pdf, Bill Beres (Minergy) email 11.14.06
Ammonia for Glass3Furnace Nox control	10,800	24,400 1009	6 71%	\$0.32	2006	9700	\$0. Minergy GlassPack Proposal MMSD Hybrid 11 14 06 sm.pdf, Bill Beres (Minergy) email 11.14.06
Glass Furn@ce Liquid Oxygen Tanek yeela/aporizer Rental per year\$	25,0 per year	\$25,000.00 2006 9700	\$25,773.20				Minergy GlassPack Proposal MMSD Hybrid 11 14 06 sm.pdf, Bill Beres (Minergy) email 11.14.06
Glass Furnace Liquid Oxygen Usage	50,800	24,400 1009	6 71%	\$1.49	2006	9700	\$1.53 Minergy GlassPack Proposal MMSD Hybrid 11 14 06 sm.pdf, Bill Beres (Minergy) email 11.14.06
Glass Furnace Equipment Maintenance \$	95,200	24,400 1009	6 71%	\$5.72	2006	9700	\$5.90 Minergy GlassPack Proposal MMSD Hybrid 11 14 06 sm.pdf, Bill Beres (Minergy) email 11.14.06
Glass Furnace Ash Disposal	13,275	24,400 1009	6 71%	\$0.39	2006	9700	\$0.40 Minergy GlassPack Proposal MMSD Hybrid 11 14 06 sm.pdf, Bill Beres (Minergy) email 11.14.06
Glass Furnabevotatisingand 1 supervisor per Bill Krill meeting 11.16.06\$	99/04@orker per Mark Kap	meinsyleia&BobSanderofMMSDepreyreB	ill Krill email 11.1pe06ear	\$599,040.00	2006	9700	\$617,567.01
IPS Pipteline SI86@6 Transfer \$1.95	varies	varies varie	s varies	\$1.68	20		Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05; Symbiont calculations; estimated cost breakdown: DS \$1.83/dt, WAS \$5.31/dt, PS \$1.14/d
SSWWTP WAS Thickening \$1,9	89,266	56,040 50%	i 1%	\$0.45	2004	8620	\$0.52 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05; cost for JI GBT thickenin g
SSWWTP Digestion \$1	18,116	56,040 419	63%	\$19.76	2004	8620	\$22.93 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.0 5
			*linked to assumptions &	& total cost summary	page		

## **Landfill Annual Operating & Maintenance Costs**

			Total Mass of Raw	% of Raw Sludge from	% of Raw Sludge for	Alternative			
		Process	Sludge that Cost	Left Column Actually Sent	this Alternative Sent	Process	Cost	ENR	2020 (2007)
	Producesson Year Index Process Cost/ton Source of C	CosotsDa⁄aalue	Value Applies to (tons)	to this Unit Process	to this Unit Process*	Cost/raw			
•	IPS Pipeline Sludge Transfer	varies	varies	varie	s varies	\$0.00	2004	8620	\$0.00 Solids Cost 2004 UWSactual XLS, Bill Krill email 08.19.05; Symbiont calculations; estimated cost breakdown: DS \$1.83/dt, WAS \$5.31/dt, PS \$1.14/ d
	SSWWTP WAS Thickening	\$1,989,266	56,040	50%	0%	\$0.00	2004	8620	\$0.00 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05; cost for JI GBT thickenin g
)	SSWWTP Digestion	\$68,003	2,168	1009	6 0%	\$0.00	2004	8620	\$0.00 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.0 5
	SSWWTP DS Thicker@ng (energy included)	\$1,989,266	56,040	50%	6 0%	\$0.00	2004	8620	\$0.0 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05; cost for JI GBT thickenin g
	SSWWTP Dewatering	\$52	1	1009	0%	\$0.00	1987	4522	\$0.00 recessed-plate.pdf (EPA Biosolids Technology Fact Sheet (EPA 832-F-00-058), September 2000), Bill Krill email 11.16.0 6
1	Landfillp@yeitem pataffillgKrill, meeting 11.16.06; \$48/hr/worker pe	r Marl\$ <b>89æ;666</b> ki	& Bob Sander of MAMA ar	Bill Krill email 11.17.06er yea	r per year	\$0.00	2006	9700	\$0.00 8 workers and 1 su
	Cake Trucking & Landfilling	\$122	1	1009	0%	\$0.00	2005	9231	\$0.00 MMSDPlanA.doc, Rick Pager (Waste Management), email 7.27.05 (forwarded by Alan Scrivner (AES), email 07.28.05); inflated to be on par with assumed electrical/gas rate inflation per Bill Krill meeting 12.18.0
. 11					*linked to accumptions	& total cost summan	nane		



## **ENERGY COSTS**

TOTAL \$16,746,807 per year

GAS			% Inflation			
	mmBTU	Current Rates	to 2007	Future Rates	Total	Required Energy Source:
direct firing of dryers	339,345	5 \$9.250 \$/Dtherm	0%	\$9.250 \$/Dtherm		\$3,138,941GF Daily Heat & Mass Balance 2020 12.17 ALH.xls, Symbiont
turbine fuel	(	9.250 \$/Dtherm	0%	\$9.250 \$/Dtherm		\$0 Tom Bachman (Triad Engineering, Inc. (Symbiont)), Technical Memorandum 5.17.05
other plant gas	588,672	2 \$9.250 \$/Dtherm	0%	\$9.250 \$/Dtherm		\$5,445,216 Current Rate Source:
NOx Control	7028	3 \$9.250 \$/Dtherm	0%	\$9.250 \$/Dtherm		\$65,009 Mark Kaminski (MMSD) email 4.5.06 (forwarded by Bill Krill (HNTB) email 4.5.06)
Melter Start-Up	2880	9.250 \$/Dtherm	0%	\$9.250 \$/Dtherm		\$26,640 Inflation Source:

Gas Total \$8,675,806

#### **ELECTRICAL**

LLLOTTIONL				
Transmission Level Service		% Inflation		
	Current Rates	to 2007 Future Rates	Total	Required Energy Source:
Facilities Charge	1 \$6,300 /year	8% \$6,804 /year		\$6,804GF Daily Heat & Mass Balance 2020 12.17 ALH.xls, Symbiont;
On Peak Energy Charge	36,416,291 \$0.0603 /kWh	8% \$0.0651 /kWh		\$2,371,968 Alan Scrivner (AES) emails 6.12.06 & 9.14.06 & 11.16.06
Off Peak Energy Charge	64,740,072 \$0.0312 /kWh	8% \$0.0337 /kWh		\$2,181,481 Current Rate Source:
On-Peak Demand Charge	246,000 \$10.2160 /kW	8% \$11.0333 /kW		\$2,714,187 Wisconsin Electric Power Company, Volume 19 Electric Rates, Rev. 5, Sheet 65, Issued 1/26/06
Customer Demand Charge	246,000 \$0.0000 /kw	8% \$0.0000 /kw		\$0 Inflation Source:
				Mark Kaminski (MMSD) email 4.5.06 (forwarded by Bill Krill (HNTB) email 4.5.06)
		Transmission Electric Total \$7,274	,440	
Interruptible Service		% Inflation		
Interruptible dervice	Current Rates	to 2007 Future Rates	Total	Required Energy Source:
Facilities Charge	1 \$9,600 /year	8% \$10,368 /year	Total	\$10,368 GF Daily Heat & Mass Balance 2020 12.17 ALH.xls. Symbiont
On Peak Energy Charge	6677287.92 \$0.05574 /kWh	8% \$0.0602 /kWh		\$401.967 Current Rate Source:
Off Peak Energy Charge	11870734.08 \$0.02990 /kWh	8% \$0.0323 /kWh		\$383,330 Wisconsin Electric Power Company, Volume 19 Electric Rates, Rev. 3, Sheet 81.1-81.2, Issued 1/26/06
On-Peak Demand Charge	16500 \$0.05024 /kW	8% \$0.0543 /kW		\$895 Inflation Source:
Customer Demand Charge	16500 \$0.000 /kw	8% \$0.0000 /kw		\$0 Mark Kaminski (MMSD) email 4.5.06 (forwarded by Bill Krill (HNTB) email 4.5.06)
3				· · · · · · · · · · · · · · · · · · ·
		Interruptible Electric Total \$796	,560	
Current Service		% Inflation		
<u> </u>	Current Rates	to 2007 Future Rates	Total	
Facilities Charge	\$6,300 /year	8% \$6,804 /year	10101	\$0 Current Rate Source:
On Peak Energy Charge	\$0,0613 /kWh	8% \$0.0662 /kWh		\$0 Wisconsin Electric Power Company, Volume 19 Electric Rates, Rev. 5, Sheet 65, Issued 1/26/06
Off Peak Energy Charge	\$0.0331 /kWh	8% \$0.0357 /kWh		\$0
On-Peak Demand Charge	\$10.3800 /kW	8% \$11.2104 /kW		\$0 Inflation Rate Source:
Customer Demand Charge	\$0.7600 /kw	8% \$0.8208 /kw		\$0 Mark Kaminski (MMSD) email 4.5.06 (forwarded by Bill Krill (HNTB) email 4.5.06)
· ·		·		

#### SSWWTP DIGESTION ENERGY CREDIT

Density of VSS destroyed	15 cf/lb	Alan Scrivner (AES) phone conversation 8.23.06
Heat Value of Offgas	600 BTU/cf	Alan Scrivner (AES) phone conversation 8.23.06

Cost per ton VSS destroyed \$ 166.50 using cost of gas shown above



TABLE 9G-2 SHEET 11 OF 12
RECOMMENDED BIOSOLIDS
ALTERNATIVE 2 – GLASS
FURNACE TECHNOLOGY
2020 TREATMENT REPORT

TR\_9G.T002.07.06.02.cdr

6/2/07

## **ASSUMPTIONS**

## **MASS BALANCE**

Source: Appendix 9F, Biosolids Recommended Plan Alternatives – Mass Balances, Table 9F-2, Recommended Biosolids Alternative 2 - Glass Fusion Technology

Percent of Milorganite® Raw Sludge that Goes to Digestion	0.00%
Percent of Glass Furnace Raw Sludge that Goes to Digestion	63.00%
Percent of Landfill Raw Sludge that Goes to Digestion	0.00%
Percent of Milorganite® Raw Sludge that Becomes TWAS	0.00%
Percent of Glass Furnace Raw Sludge that Becomes TWAS	26.00%
Percent of TSS Removed During Digestion	42.70%
Total Sludge to Digestion (tpy)	50906
Percent of Digested Sludge to Milorganite®	0.00%
Percent of Digested Sludge to Glass Furnace	100.00%
Percent of Digested Sludge to Landfill	0.00%
WAS to Digestion (tpy)	509
WAS transferred from SSWWTP to JIWWTP (tpy)	9979
Percent of WAS sent to JIWWTP to Milorganite®	0.00%
Percent of WAS sent to JIWWTP to Glass Furnace	100.00%
WAS transferred from JIWWTP to SSWWTP (tpy)	0
Primary Sludge Transferred from JIWWTP to SSWWTP	26222

## **USEFUL LIFE**

Land	Permanent	
Sewer & Force Mains	50 years	Symbiont assumption
Structures, Piping, & Valves	40 years	Symbiont assumption
Process Equipment, Electrical, I&C	20 years	Symbiont assumption

## **UNDESIGNED DETAILS ALLOWANC E**

all inclusive firm bid price	0% Bill Krill (HNTB), phone conference 11.16.06
all major components have documented installed unit costs	10% Symbiont assumption
costs missing for some components, but other costs are for	20%
installed facilities and well documented (connections to existing	
systems, etc.)	Symbiont assumption
installed costs for major components are not well documented	40%
(eg. Installation cost is estimated)	Symbiont assumption

## **CONTINGENCY**

all inclusive firm bid price	0% Bill Krill (HNTB), phone conference 11.16.06
everything else	25% Bill Krill (HNTB), phone conference 11.16.06

## **DESIGN, BIDDING, & OVERSITE**

all inclusive firm bid price (design complete, no bidding)	15% Bill Krill (HNTB), phone conference 11.16.06
everything else	35% Bill Krill (HNTB), phone conference 11.16.06



TABLE 9G-2 SHEET 12 OF 12
RECOMMENDED BIOSOLIDS
ALTERNATIVE 2 – GLASS
FURNACE TECHNOLOGY
2020 TREATMENT REPORT

6/2/07 TR\_9G.T002.07.06.02.cdr

## **COST ESTIMATE SUMMARY**

#### **General Description**

All treatment plant primary sludge is digested and then combined with the raw secondary sludge to produce a Classic Milorganite®. With the loss of LeSaffre Yeast, the blended sludge is expected to have a nitrogen content of approximately 5%, which is less than the current 6% N guarantee. Construction requires 7 new GBT's for SSWWTP WAS thickening, and 5 new digesters.

Biosolids Load			
81,000	Influent Sludge	53,800	Finished Biosolids
Biosolids Influent Load Distribution			
100%	Milorganite®		
0%	Glass Furnace	0%	Landfill

ENR Index = 10000 (assumed Milwaukee 2007)
Interest Rate per Year = 5.125%

Summary of Capital Costs	
Sammary or Supriar Socio	
JIWWTP TURBINE UPGRADES	\$16,460,000
JIWWTP TURBINE BUILDING	\$3,495,000
JIWWTP DEWATERING AND DRYING FACILITY UPGRADES	\$114,740,000
JIWWTP NEW LOCOMOTIVE	\$3,050,000
INTERPLANT SLUDGE PIPELINE UPGRADES	\$2,870,000
SSWWTP NEW GRAVITY BELT WAS THICKENERS	\$7,580,000
SSWWTP DIGESTER REHABILITATION	\$117,430,000
SALVAGE VALUE	-\$19,169,000
Total Capital Cost	\$246,460,000

## Summary of Annual Operation & Maintenance Costs

Total Annual Cost \$37,780,000

Life Cycle Analysis

 Number of Years
 20

 Present Worth Factor
 12.331

Present Worth of Total Annual Operation & Maintenance Costs \$465,870,000

Summary of Non-Annual Operation & Maintenance Costs

Process Cost ENR Index Year PW

Present Worth of Total Non-Annual Operation & Maintenance Costs \$0

Total Present Worth \$712,000,000



TABLE 9G-3 SHEET 1 OF 11

RECOMMENDED BIOSOLIDS PLAN ALTERNATIVE 3 – MAINTAIN EXISTING MILORGANITE® PROGRAM

2020 TREATMENT REPORT

	J۱\	WWTP TUR	BINE UPGRA	DES CAPITA	L COST														
							Tot	al Capital Cost =	Total	Salvage Value =									
								\$16,460,000		\$85,000	< insert lir	ık to this	cost on the	e Capital	Cost Summary	y Worksheet			
					Un-		Design,												
					designed	Conting-	Bidding, &				Actual	_		ADJUST		ADJUSTED			
DESCRIPTION	Quantity	Units	Unit Cost (\$)	SUBTOTAL (\$)	Details (%)	ency (%)	Oversight (%)	SUBTOTAL (\$)	Life (Years)	Salvage Value (\$)	Unit Cost (\$)	Cos		NR / dex	Adjustment Factor	UNIT COST (\$)	SOURCE	MANUFACTURER	COMMENTS
DESCRIPTION	Quantity	Omis	(4)	(4)	(70)	(70)	(70)	(4)	(Tears)	(4)	- (*)		ai 1110	uex	1 actor	(4)	SOURCE	MANOTACTORER	COMMENTS
DIVISION 2: SITE CONSTRUCTION																			
Trenching, Pavement Removal, Backfill and Patching for Electrical Duct	800	LF	\$60	\$48,000	20%	25%	35%	\$100,000	20	\$0	\$	60 200	97	700	1.03	\$62	TurbineOptionESTIMATE.xls, Tony Pohl (Automation Service & Design Inc.), email 3.28.06	TBD	
Manholes for Electrical Duct	4	each	\$10,000	\$40,000	20%	25%	35%	\$80,000	40	\$40,000	\$10,0	00 200	06 97	700	1.03	\$10,309	TurbineOptionESTIMATE.xls, Tony Pohl (Automation Service & Design Inc.), email 3.28.06	TBD	
	2400.000																		
Division 2 Subtotal	\$180,000	1																	
DIVISION 11: EQUIPMENT																			
14.4 MW Combustion Turbine Generator	1	each	\$4,709,000	\$4,709,000	10%	25%	35%	\$8,740,000	20	\$0	\$4,567,2			700	1.03		Solar 130 Installed Cost 24MAR06.xls, Robert Gavahan (PEC), email 03.27.06	Solar Titan 130	cost for two CTs divided by 2
Station Control System for Turbine	1	each	\$278,000	\$278,000	10%	25%	35%	\$520,000	20	\$0	\$270,0			700	1.03	\$278,351	Solar 130 Installed Cost 24MAR06.xls, Robert Gavahan (PEC), email 03.27.06	Solar Titan 130	cost for two CTs divided by 2
Turbine Commissioning Parts, Startup, Site Testing	1	each	\$99,000	\$99,000	10%	25%	35%	\$180,000	20	\$0	\$96,10			700	1.03	\$99,072	Solar 130 Installed Cost 24MAR06.xls, Robert Gavahan (PEC), email 03.27.06	Solar Titan 130	cost for two CTs divided by 2
Turbine Shipping Turbine Construction Estimate	1	each each	\$122,000 \$1.811.000	\$122,000 \$1,811,000	10% 10%	25% 25%	35% 35%	\$230,000 \$3,360,000	20	\$0 \$0	\$118,0 \$1,756.6			700 700	1.03 1.03	\$121,701	Solar 130 Installed Cost 24MAR06.xls, Robert Gavahan (PEC), email 03.27.06 Solar 130 Installed Cost 24MAR06.xls, Robert Gavahan (PEC), email 03.27.06	Solar Titan 130 Solar Titan 130	cost for two CTs divided by 2 cost for two CTs divided by 2
Division 11 Subtotal	\$13.030.000																		
Division in Subtotal	<b>\$15,050,000</b>																		
DIVISION 15: MECHANICAL																			
Exhaust Ductwork from Turbine Building to Existing Duct System - 120" special alloy exhaust pipe w/pile supports	500	) If	\$1,000	\$500,000	40%	25%	35%	\$1,180,000	20	\$0	\$7	50 200	06 97	700	1.03	\$773	Symbiont engineering judgment	TBD	
Fuel Gas and Fuel Oil Piping to Turbine Building	1	allowance	\$40,000	\$40.000	engineer4/0g/jud	amont 25%	35%	\$90,000	40	\$45,000	\$39.0	00 200	16 97	700	1.03	\$40,206	Sumh	TBD	
			940,000	940,00 <b>0</b> 111	ендинестводу	gment 23%	33 /6	\$50,000	40	φ <del>1</del> 0,000	\$55,0	50 250	30	700	1.00	940,200	Symb	155	
Division 15 Subtotal	\$1,270,000	)																	
DIVISION 16: ELECTRICAL																			
Connections to Existing Plant Control System	1	allowance	\$103,000	\$103,000 e	ngineerin <b>49</b> 04gn	nent 25%	35%	\$240,000	20	\$0	\$100,0	00 200	06 97	700	1.03	\$103,093	Symbiont	TBD	
3-4" Concrete encased PVC Conduit ductbank	800	LF	\$80	\$64,000	20%	25%	35%	\$130,000	20	\$0		80 200		700	1.03	\$82		TBD	
350kcmil 1/c 15KV Copper	7,200	LF	\$20	\$144,000	20%	25%	35%	\$290,000	20	\$0	\$	20 200		700	1.03	\$21	TurbineOptionESTIMATE.xls, Tony Pohl (Automation Service & Design Inc.), email 3.28.06	TBD	
Switchgear and MCC for Turbine	1	each	\$709,000	\$709,000	10%	25%	35%	\$1,320,000	20	\$0	\$687,5	00 200	06 97	700	1.03	\$708,763	Solar 130 Installed Cost 24MAR06.xls, Robert Gavahan (PEC), email 03.27.06	Solar Titan 130	cost for two CTs divided by 2
Division 16 Subtotal	\$1,980,000										<u> </u>								



TABLE 9G-3 SHEET 2 OF 11 RECOMMENDED BIOSOLIDS PLAN **ALTERNATIVE 3 – MAINTAIN EXISTING** MILORGANITE® PROGRAM

		NEW	TURBINE BUI	LDING CA	PITAL COS	ST													
								Total Cap	oital Cost =	Total	Salvage Value =	1							
									\$3,495,000		\$1,684,000	< insert link	to this cost	on the Capita	al Cost Summai	ry Worksheet			
						Un-		esign,											
						-	-	ding, &				Actual		OST ADJUST		ADJUSTED			
DESCRIPTION		0	Unit Co						(\$)		Salvage Value	Unit Cost	Cost		Adjustment	UNIT COST	SOURCE	MANUFACTURES	COMMENTS
DESCRIPTION		Quantity U	nits (\$)		(\$)	(%)	(%) (	(%)	(\$)	(Years)	(\$)	(\$)	Year	Index	Factor	(\$)	SOURCE	MANUFACTURE	COMMENTS
DIVISION 2: SITE CONSTRUCTION																			
Ashphalt removal for building install		694 SY		\$8	\$5,556	20%	25%	35%	\$11,000	40	\$6,000	\$8	2006	9700	1.03		RSMEANS COSTWORKS 2006 QTR 3; 02 220 250 5200	TBD TBD TBD TBD TBD	Site demolition, remove concrete, mesh reinforced, to 6" thick, excludes hauling and disposal fees
Concrete Repair		4,500 SF		\$2	\$9,000	20%	25%	35%	\$18,000	40	\$9,000	\$2		9700	1.03		RSMEANS COSTWORKS 2006 QTR 3; 03 310 240 5010	TBD	Structural concrete, in place, slab on grade, 6" thick, includes textured finish only
Utility Trench Excavation		500 LF			\$1,500	20% 20%	25%	35%	\$3,000	40	\$2,000	\$3		9700	1.03		RSMEANS COSTWORKS 2006 QTR 3; 02 315 610 0610	TBD	Excavating, trench, concrete curb, steel forms, 6' to 10' deep, 1 1/2 C.Y. bucket, hydraulic backhoe, excludes sheeting or dewatering
Utility Trench Backfill		667 CY			\$2,000	20%	25%	35%	\$4,000	40	\$2,000	\$3			1.03	\$3	RSMEANS COSTWORKS 2006 QTR 3; 02 315 610 3090	TBD	Excavating, trench backfill, 2-1/4 C.Y. bucket, 100' haul, front end loader, wheel mounted, excludes sheeting or dewatering
Utility Trench Compaction		667 CY		\$7	\$4,667	20%	25%	35%	\$9,000	40	\$5,000	\$6	2006	9700	1.03	\$7	RSMEANS COSTWORKS 2006 QTR 3; 02 315 110 0800	TBD	Backfill, 12" layers, compaction in layers, hand tamp, add to above
	Division 2 Subtotal	\$45,000																	
DIVISION 3: CONCRETE																			
Utility Trench Repair		56 CY		\$196	\$10,889	20%	25%	35%	\$20,000	40	\$10,000	\$190	2006	9700	1.03	\$106	RSMEANS COSTWORKS 2006 QTR 3; 03 310 240 4700	TRD	Structural concrete, in place, slab on grade, 6" thick, includes forms(4 uses) and reinforcing steel
Ounty Henor Repair		30 01		ψ130	\$10,005	2070	2570	3370	\$20,000	40	\$10,000	φισο	2000	3700	1.00	ψ130	NOMEANO COOTWONIC 2000 QTV 3, 03 310 240 4700	100	Official activates, in place, slab off grade, of mick, includes forms (4 dises) and fellinorcing steel
	Division 3 Subtotal	\$20,000							1										
DIVISION 13: SPECIAL CONSTRUCTION																			
Turbine Building		5,000 sf		\$298 \$1	1,490,00 <b>T</b> urbine B	Buil@0%Cost CC	ST24900RKS.xls	35%	\$3,020,000	40	\$1,510,000	\$289	2006	9700	1.03	\$298	RSMEANS COSTWORKS 2006 QTR 3;	TBD	Factory, 1 Story, Precast Concrete Panels / Steel Frame w/steel H section piles
*																			
	Division 13 Subtotal	\$3,020,000																	
DIVISION 15: MECHANICAL																	DOMESTIC COOTMODIVE 2000 OTD 6 45 407 200 2000		F
Natural Gas Supply		500 LF			\$18,000	20%	25%	35%	\$40,000	40	\$20,000	\$35		9700	1.03		RSMEANS COSTWORKS 2006 QTR 3; 15 107 620 2090	TBD	Pipe, steel, black, welded, 3" diameter, schedule 40
Instrument Air Supply		500 LF			\$17,000	20%	25%	35%	\$30,000	40	\$15,000	\$33		9700	1.03		RSMEANS COSTWORKS 2006 QTR 3; 15 107 220 1200	TBD	Pipe, brass, plain end, regular weight, 1-1/2" diameter
Cooling Water Supply		500 LF			\$83,000	20% 20%	25%	35%	\$170,000	40	\$85,000	\$161		9700	1.03		RSMEANS COSTWORKS 2006 QTR 3; 15 107 620 2150	TBD TBD TBD	Pipe, steel, black, welded, 10" diameter, schedule 40
Potable Water Supply		500 LF			\$17,000	20%	25%	35%	\$30,000	40	\$15,000	\$33			1.03		RSMEANS COSTWORKS 2006 QTR 3; 15 107 220 1200	TBD	Pipe, brass, plain end, regular weight, 1-1/2" diameter
Building Drain		500 LF		\$12	\$6,000	20%	25%	35%	\$10,000	40	\$5,000	\$12	2006	9700	1.03	\$12	RSMEANS COSTWORKS 2006 QTR 3; 15 108 520 1940	TBD	Pipe, PVC, socket weld, SCH 40, 4" diameter
	Division 15 Culti-1-1	\$280,000																	
	Division 15 Subtotal	\$200,000																	
DIVISION 16: ELECTRICAL																			
Power Feed		1 ea	\$60	2,000	\$62,000	20%	25%	35%	\$130,000	20	ew medi@an ∨o	age transf860\000	con@0006rs	to n <b>97/06</b> lda	1.03	\$61,856	Symbiont estimate based on recent project	TBD	Estimate includes n
		·		,												+,000	,		
	Division 46 Cultural	6430.000																	



TABLE 9G-3 SHEET 3 OF 11 RECOMMENDED BIOSOLIDS PLAN **ALTERNATIVE 3 – MAINTAIN EXISTING** MILORGANITE® PROGRAM
2020 TREATMENT REPORT
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	D8	D FACILI	TY UPGRADE	S CAPITAL (	COST					
							Tot	al Capital Cost =	Tota	I Salvage Value =
								\$114,740,000		\$0
					Un-		Design,			
					designed	Conting-	Bidding, &			
			Unit Cost	SUBTOTAL	Details	ency	Oversight	SUBTOTAL	Life	Salvage Value
DESCRIPTION	Quantity	Units	(\$)	(\$)	(%)	(%)	(%)	(\$)	(Years)	(\$)
DIVISION 13: SPECIAL CONSTRUCTION										
Unit Process 24 Upgrade	1	lump sum	\$6,495,000	\$6,495,000	40%	25%	35%	\$15,340,000	20	\$0
Unit Process 25 Upgrade	1	lump sum	\$17,453,000	\$17,453,000	40%	25%	35%	\$41,230,000	20	\$0
Unit Process 27 Upgrade	1	lump sum	\$4,062,000	\$4,062,000	40%	25%	35%	\$9,600,000	20	\$0
Unit Process 29 Upgrade	1	lump sum	\$12,629,000	\$12,629,000	40%	25%	35%	\$29,840,000	20	\$0
Unit Process 30 Upgrade	1	lump sum	\$1,278,000	\$1,278,000	40%	25%	35%	\$3,020,000	20	\$0
Unit Process 31 Upgrade	1	lump sum	\$747,000	\$747,000	40%	25%	35%	\$1,760,000	20	\$0
Unit Process 32 Upgrade	1	lump sum	\$2,809,000	\$2,809,000	40%	25%	35%	\$6,640,000	20	\$0
Miscellaneous Costs (drop chutes, etc.)	1	lump sum	\$3,093,000	\$3,093,000	40%	25%	35%	\$7,310,000	20	\$0
Division 42 Cultural	£44.4.7.40.000									

## <---- insert link to this cost on the Capital Cost Summary Worksheet

Actual	COST ADJUSTMENT ADJUSTED						
Unit Cost	Cost	ENR	Adjustment	UNIT COST			
(\$)	Year	Index	Factor	(\$)	SOURCE	MANUFACTURER	COMMENTS
\$6.300.000	2006	9700	1.03	\$6,494,845	DD Facility Upgrade Estimate (npb edit 11-21-06).xls , Review of Plant Projects reports and Symbiont engineering judgment	TBD	
\$16,929,000	2006	9700	1.03	\$17,452,577	DD Facility Upgrade Estimate (npb edit 11-21-06).xls , Review of Plant Projects reports and Symbiont engineering judgment	TBD	
\$3,940,000	2006	9700	1.03	\$4,061,856	DD Facility Upgrade Estimate (npb edit 11-21-06).xls , Review of Plant Projects reports and Symbiont engineering judgment	TBD	
\$12,250,000	2006	9700	1.03	\$12,628,866	DD Facility Upgrade Estimate (npb edit 11-21-06).xls , Review of Plant Projects reports and Symbiont engineering judgment	TBD	
\$1,240,000	2006	9700	1.03	\$1,278,351	DD Facility Upgrade Estimate (npb edit 11-21-06).xls , Review of Plant Projects reports and Symbiont engineering judgment	TBD	
\$725,000	2006	9700	1.03	\$747,423	DD Facility Upgrade Estimate (npb edit 11-21-06).xls , Review of Plant Projects reports and Symbiont engineering judgment	TBD	
\$2,725,000	2006	9700	1.03	\$2,809,278	DD Facility Upgrade Estimate (npb edit 11-21-06).xls , Review of Plant Projects reports and Symbiont engineering judgment	TBD	
\$3,000,000	2006	9700	1.03	\$3,092,784	DD Facility Upgrade Estimate (npb edit 11-21-06).xls , Review of Plant Projects reports and Symbiont engineering judgment	TBD	



TABLE 9G-3 SHEET 4 OF 11 RECOMMENDED BIOSOLIDS PLAN **ALTERNATIVE 3 – MAINTAIN EXISTING** MILORGANITE® PROGRAM

		NEW LC	COMOTIVE C	APITAL COS	STS					
							To	tal Capital Cost =	Tota	I Salvage Value =
								\$3,050,000		\$0
		Design,								
					designed	Conting-	Bidding, &			
			Unit Cost	SUBTOTAL	Details	ency	Oversight	SUBTOTAL	Life	Salvage Value
DESCRIPTION	Quantity	Units	(\$)	(\$)	(%)	(%)	(%)	(\$)	(Years)	(\$)
DIVISION 11: EQUIPMENT										
New Locomotive	1	lump sum	\$1,289,000	\$1,289,000	40%	25%	35%	\$3,050,000	20	\$0
Division 11 Subtotal	\$2.050.000									
Division 11 Subtotal	\$3,050,000									

## <---- insert link to this cost on the Capital Cost Summary Worksheet

Actual	c	OST ADJU	STMENT	ADJUSTED			
Unit Cost (\$)	Cost Year	ENR Index	Adjustment Factor	UNIT COST (\$)	SOURCE	MANUFACTURER	COMMENTS
\$1,250,000	2006	9700	1.03	\$1,288,660	Alan Scrivner (AES), email 4.05.06	TBD	



TABLE 9G-3 SHEET 5 OF 11

RECOMMENDED BIOSOLIDS PLAN

ALTERNATIVE 3 – MAINTAIN EXISTING

MILORGANITE® PROGRAM

	INTERPLAN	NT SLUDGE	E PIPELINE U	PGRADES C	APITAL C	OSTS												
							Tot	al Capital Cost =	Tota	al Salvage Value =	1							
								\$2,870,000		\$0	< insert link to	o this cost	on the Capi	ital Cost Summar	y Worksheet			
					Un- designed	Conting-	Design, Bidding, &				Actual		OST ADJUS	STMENT	ADJUSTED			
			Unit Cost	SUBTOTAL	Details	ency	Oversight	SUBTOTAL	Life	Salvage Value	Unit Cost	Cost	ENR	Adjustment	UNIT COST			
DESCRIPTION	Quantity	Units	(\$)	(\$)	(%)	(%)	(%)	(\$)	(Years)	(\$)	(\$)	Year	Index	Factor	(\$)	SOURCE	MANUFACTURER	COMMENTS
DIVISION 11: EQUIPMENT																		
JIWWTP and SSWWTP Hard Metal Pumps & Motors Rated for 300	12	each	\$93,000	\$1,116,000	20%	25%	35%	\$2,260,000	20	000 per <b>\$0</b> mp	for installa <b>\$90</b> ,000	2006	9700	1.03	\$92,784	Mickey (RDM), phone conversation 03.28.06	TBD	includes \$5
psi																		
Division 11 Subtotal	\$2,260,000																	
DIVISION 16: ELECTRICAL																		
Pipeline Cathodic Protection	1	allowance	\$258,000	\$258,000	40%	25%	35%	\$610,000	20	\$0	\$250,000	2006	9700	1.03	\$257,732	Symbiont engineering judgment	TBD	
Division 16 Subtotal	\$610,000										П							



TABLE 9G-3 SHEET 6 OF 11 RECOMMENDED BIOSOLIDS PLAN **ALTERNATIVE 3 – MAINTAIN EXISTING** MILORGANITE® PROGRAM
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	SSWWT	P DIGEST	TER REHABILI	TATION CAP	ITAL COS	ST				
							То	tal Capital Cost =	Tota	Salvage Value =
					Un-		Design,	\$117,430,000		\$17,159,000
					designed	Conting-	Bidding, &			
			Unit Cost	SUBTOTAL	Details	ency	Oversite	SUBTOTAL	Life	Salvage Value
DESCRIPTION	Quantity	Units	(\$)	(\$)	(%)	(%)	(%)	(\$)	(Years)	(\$)
DIVISION 3: CONCRETE										
Five New Covered & Insulated Digester Tanks with access equipment (125' diameter, 38' side water depth, 5' free board)	19,735,583	gallons	\$2	\$39,471,166	40%	25%	35%	\$93,250,000	40	\$17,159,000
Division 3 Subtotal	\$93,250,000									
DIVISION 11: EQUIPMENT										
New Digester Mixing Systems - External Draft Tube Mixers for 110' diameter	17	each	\$468,000	\$7,956,000	40%	25%	35%	\$18,800,000	20	\$0
New Digester Recirculation Pumps - 10 HP motors, 250 gpm @ 60' TDH	22	each	\$15,000	\$330,000	40%	25%	35%	\$780,000	20	\$0
Recirculating Sludge Heat Exchangers -Sludge-Hot Water Systems	11	each	\$42,000	\$462,00 <b>2</b> ,24	9 40%	25%	35%	\$1,090,000	20	\$0
Storage Digester Sludge Transfer Pumps - 30 HP motors, VFD, 1200 gpm @ 60' TDH	11	each	\$55,000	\$605,000	40%	25%	35%	\$1,430,000	20	\$0
Digester Gas Safety Equipment	1	allowance	\$812,000	\$812,000	40%	25%	35%	\$1,920,000	20	\$0
Division 11 Subtotal	\$24,020,000			l						
DIVISION 15: MECHANICAL New Boiler	_ 1	each	\$67,000	\$67,000	40%	25%	35%	\$160,000	20	\$0
		Cauli	φοτ,σου	ψ07,000	70 /0	25/6	5576	ψ100,000		40
Division 15 Subtotal	\$160,000			1						

00	< insert link to	this cost	on the Capi	tal Cost Summar	y Worksheet			
•	Actual Unit Cost	C Cost	OST ADJU	STMENT Adjustment	ADJUSTED UNIT COST			
_	(\$)	Year	Index	Factor	(\$)	SOURCE	MANUFACTURER	COMMENTS
00	\$2	2007	10000	1.00	\$2	Symbiont engineering judgment	TBD	
\$0	\$431,600	2005	9231	1.08	\$467,555	Wiscosin Project Triad Ebg EWT Mixer Budget Price 07-14-05.doc , Bob Lacey (Energenecs), email 07.14.05	Eimco, RDT-T	+30% for install
\$0	\$13,650	2005	9231	1.08	\$14,787	Rich Hussey (Ley Associates), email 07.26.05	Wemco-Hidrostal, D4K-HS	+30% for install
0	\$39,000	2005	9231	1.08	\$4	Biosolids Alternative Sizing Worksheets r4.xls , Symbiont	Alfa Laval	+30% for install
\$0	\$51,025	2005	9231	1.08	\$55,276	Rich Hussey (Ley Associates), email 07.26.05	Wemco-Hidrostal, E5K-S	+30% for install, +250% for VFD
\$0	\$750,000	2005	9231	1.08	\$812,480	Symbiont engineering judgment		
\$0	\$65.000	2006	9700	4.02	¢67.010	Cumbinat angionaring judgment board on recent assists	TBD	
φU	\$65,000	2006	9700	1.03	\$67,010	Symbiont engineering judgment based on recent projects	טאו	



TABLE 9G-3 SHEET 7 OF 11 RECOMMENDED BIOSOLIDS PLAN **ALTERNATIVE 3 – MAINTAIN EXISTING** MILORGANITE® PROGRAM
2020 TREATMENT REPORT
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	Milwaukee Metropolitan Sewerage District 2020 FACILITIES PLANNING											1												
	Nev	v SSWWTP	Gravity Be	elt Thickeners	for WAS T	hickening (	Capital Cos		t-1 0 t-1 0t	Total	I Cabana Value al													
						Un-		Design,	tal Capital Cost = \$7,580,000		Salvage Value = \$241,000	< insert link	to this cos	st on the Cap	oital Cost Summ	nary Worksheet								
DESCRIPTION		Quantity	Units	Unit Cost (\$)	SUBTOTAL	designed Details (%)	Conting- ency (%)	Bidding, & Oversite (%)	SUBTOTAL (\$)	Life (Years)	Salvage Value (\$)	Actual Unit Cost (\$)			Adjustment	ADJUST		SOURCE		MANUFAC	CTUBER		COMMENTS	
DIVISION 2: SITE CONSTRUCTION		Quantity	Onits	(*)	(4)	(76)	(76)	(76)	(\$)	(Tears)	(\$)	(*)	Teal	index	Factor	(\$)		SOURCE		MANOPAC	CTOKEK		COMMENTS	
Demolition	Division 2 Subtotal	\$60,000	lump sum	\$26,000	\$26,0	00 40%	25%	35%	\$60,000	20	ded via Kato≨ttiin	o (HNTB), fa <b>829,57</b> 0	006) 2004	8 <b>6720</b> D	1.16	+25% cor <b>826</b> ;	9208.FF parrkTEidfelddgfAlE) (4D66huniclaishgeand	britetidilsrailso 115; BHJ (forwerno)	)					
DIVISION 4: MASONRY	Division 2 Subtotal	\$60,000																						
Masonry Restoration - Cut and Repoint Brick		1	lump sum	\$22,000	\$22 <b>,</b> @	DO, Technical 40%	norandum 12565.	04 (forwar <b>dist</b> évia	Kate Ziin <b>.\$⊕≬00B</b>	), fax 9.27 <b>.26</b> )	T₿D	\$18,7 <del>5</del>	<b>2</b> 5% <b>c200</b> 4a	besign <b>8.62</b> pet	aTechskolekstek (40 9	% neumo) \$21.	52 Frank Tiefert (							
	Division 4 Subtotal	\$50,000																						
DIVISION 11: EQUIPMENT GBT Equipment Thickened Sludge Pumps Wastwater Pumps Polymer System		1 1 1 1	lump sum lump sum lump sum lump sum	\$1,624,000 \$322,000 \$63,000 \$183,000	\$322,0 \$63,0	0001emorandur#401% 00 11.15.04 (#£9%)	.15.04 (forw266%e arded via K286%Z	d via Kate <b>Z5ñ6</b> (F iino (HNT <b>B)5fá</b> x 9	\$3,840,000 HNTB), fa <b>8/79/2,700</b> 9.27.06) \$150,000 \$430,000	5) 20 TBD 20	TBD \$0 +250% (	+25%\$237it;8t contractor O\$54p88	Bor O& 270 (04) of 18Tech 1212-0140	Techs 16120 o	(40 %emdétligidek Tyidető dietzőlláráltsz	lob eletaoilent 1826/272 aar 17s GeBTS foeldali	3025°F.combr.Bilder (28Ff ljödf-Glätotliddishler) (4 BBS S (fördink: Bildentsflytik), Technical Hamel 48terrifdands Tiefert (ATI), Technical Memor Affractfr.80A.FT peter (f.4AT 1), dinch (4056 Andee	orandum						
	Division 11 Subtotal	\$5,180,000																						
DIVISION 13: SPECIAL CONSTRUCTION																								
Building Modifications		1	lump sum	\$281,000	\$281, <b>6</b>	ûdai Memoran <b>d0%</b>	11.15.04 (f@ <del>600</del> an	ded via Ka36 2dino	o (HNTB)\$ <b>660,9020</b>	.06) 40	TBD\$121,000	+2\$248;60	Cactor 2020 Pa	peta <b>Te083N</b> de	<b>steo(40°9kolumlö</b> ∲sigi	ned d \$281,	23 Frank Tiefert (ATI), Tech							
	Division 13 Subtotal	\$660,000																						
DIVISION 15: MECHANICAL Mechanical Piping	Division 15 Subtotal	\$650,000	lump sum	\$277,000	\$277,0	00emorandun40%	15.04 (forw <b>2696</b> 0	d via Kate <b>236%</b> (H	INTB), fa\$6527000	40	TBD \$120,000	+25% \$886;43	8r O&PQD#	Teatslüidibliba	40 Yoeumdi) Sigri4etd	oidetaolunt (6276)	BTIS (diff-ratalisk all leufema tj. (AUS), Technical							
DIVISION 16: ELECTRICAL	Pistotane et noisivia	000,000																						
Instrumentation & Control Electrical	Division 16 Subtotal	1 1 1 \$980,000	lump sum lump sum	\$221,000 \$193,000					HNTB), fa <b>\$592,700</b> 6 \$460,000		TBD \$0 orwarded v <b>B</b> 0Ka	+25%\$ <b>:190</b> t36t Zlino (H <b>S)169,25</b>	ObrÖ&290βefr Ø9.272060)4	Techs districted 8620	( <b>46% eumde) SE</b> (Velot TBD 1.16	i <b>d dietz</b> ount 1922/01 +297932	BUS (firthis allefent(Měs), Technic 16fact6rah&Fipsfer(TeAff)),dimch(4056),Modes	slightduraldtuisialkin (FsGBTS)	fferritis): alternatives					



TABLE 9G-3 SHEET 8 OF 11 RECOMMENDED BIOSOLIDS PLAN **ALTERNATIVE 3 – MAINTAIN EXISTING** MILORGANITE® PROGRAM
2020 TREATMENT REPORT
6/2/07 TR\_9G

## 2020 FACILITIES PLANNING

## O&M COST ESTIMATE

81,000 (raw sludge)

Total Annual O&M Cost = \$37,780,000 Total 2020 MMSD Sludge Production (dt/yr) =

	+,,
	640 544 000
	\$10,541,000
	\$5,116,000
	\$0
	\$5,445,000
	\$7,000
	\$0
	\$0
	\$0
	\$1,289,000
L	\$22,398,000
	L

SSWWTP Digestion Gas Credit/Replacement
plus/minus amount of solids destroyed in digestion = 10,375 tons/year
plus/minus amount of energy recovered from digestion process = 150,267 dtherm/year
VALUE OF ENERGY CHANGE IN TERMS OF COST OF EQUIVALENT GAS PURCHASE -\$1,389,970

## Milorganite® Annual Operating & Maintenance Costs

% of sludge to Milorganite® =	100%			% sold
annual sludge volume (dt/year) =	81,000	(raw)	=	100%

	Process Unit	Process	
	Cost	Contribution	Annual Cost
Item/Process	(\$/dt)	Cost (\$/dt raw)	\$/yr
JIWWTP Thickening	\$53.00	\$13.80	\$1,118,000
JIWWTP Dewatering/Drying	\$191.30	\$139.80	\$11,324,000
JIWWTP Chaff Processing	\$443.30	\$16.70	\$1,353,000
Milorganite® Warehouse/Shipping	\$27.20	\$19.90	\$1,612,000
Biosolids Marketing	\$81.70	\$59.70	\$4,836,000
IPS Pipeline Sludge Transfer (includes SS energy)	\$3.20 *	\$2.00	\$162,000
SSWWTP WAS Thickening (energy included)	\$82.40	\$0.50	\$41,000
SSWWTP Digestion (energy included)	\$36.40	\$22.90	\$1,855,000
Milorganite® Land Application	\$135.10	\$0.00	\$0
Milorganite® Sales Revenue	-\$93.50	-\$68.30	-\$5,532,000
SUBTOTA	AL	\$207	\$16,767,000

#### Glass Furnace Annual Operating Costs

% of sludge to glass furnace = 0% annual biosolids to Glass Furnace = 0 annual sludge volume (dt/year) = 0

	Process Unit Cost	Process Contribution	Annual Cost
Item/Process	(\$/dt)	Cost (\$/dt raw)	\$/yr
JIWWTP Thickening	\$53.00	\$0.00	\$0
JIWWTP Dewatering/Drying	\$191.30	\$0.00	\$0
Sodium Hydroxide for Minergy SO2 Control	\$6.20	\$0.00	\$0
Ammonia for Minergy Nox control	\$0.50	\$0.00	\$0
Minergy Liquid Oxygen Tank & Vaporizer Rental	per year	-	\$0
Minergy Liquid Oxygen Usage	\$2.10	\$0.00	\$0
Minergy Equipment Maintenance	\$8.20	\$0.00	\$0
Minergy Ash Disposal	\$0.60	\$0.00	\$0
Minergy Staffing	per year	-	\$0
IPS Pipeline Sludge Transfer (includes SS energy)	\$3.20 *	\$0.00	\$0
SSWWTP WAS Thickening (energy included)	\$82.40	\$0.00	\$0
SSWWTP Digestion (energy included)	\$36.40	\$0.00	\$0
SUBTOTA	<b>AL</b>	\$0	\$0

### Landfill Annual Operating & Maintenance Costs

% of sludge to landfill = 0% annual sludge volume (dt/year) = 0

Cost (\$/dt) \$3.20 Contribution Annual Cost Item/Process
IPS Pipeline Sludge Transfer
SSWWTP WAS Thickening (energy included)
SSWWTP Digestion (energy included)
SSWWTP DS Thickening (energy included) Cost (\$/dt raw) \$0.00 \$/yr \$82.40 \$0.00 \$36.40 \$82.40 \$0.00 \$0.00 \$0.00 \$115.00 SSWWTP Dewatering (energy included) Landfill System Staffing Cake Trucking & Landfilling SUBTOTAL

see Sheet 10, Energy Costs see Sheet 10, Energy Costs
see Sheet 10, Energy Costs
Turbine Operationra(RolleintEmplaneers Collaborative)penyela8.27.06 \$1,250,000.00 \$1,288,659.79 Bob Gavah

calculated difference in tons removed in digester from the year 2004 *Solids Cost 2004 UWSactual .XLS*, Bill Krill email 08.19.05) calculated heat value and additional disparter (in "JI Energy" calculated \$ value of additional digester gas based on values assumed on "JI Energy"

## Milorganite® Annual Operating & Maintenance Costs

			Total Mass of Raw	% of Raw Sludge from	% of Raw Sludge for	Alternative				
		Process	Sludge that Cost	Left Column Actually Sent	this Alternative Sent	Process	Cost	ENR	2020 (2007)	
Prodomyskon Year Index	Process Cost/ton	Schoose Walkiest D	atà/alue Applies to (tons)	to this Unit Process	to this Unit Process*	Cost/raw				
JIWWTP Thickening		\$1,279,606	56,040	509	6 26%	\$11.87	2004	8620	\$13.77 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05; 50% assumed by AES	
JIWWTP Dewatering/Drying		\$7,798,293	56,040	849	% 73%	\$120.54	2004	8620	\$139.84 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05; Symbiont calculations of energy cost based on Alan Scrivner (AES) email 12.6.06	
JIWWTP Chaff Processing		\$928,541	56,040	849	% 73%	\$14.35	2004	8620	\$16.65 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05	
Milorganite® Warehouse/Shipping		\$1,108,821	56,040	849	% 73%	\$17.14	2004	8620	\$19.88 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05	
Biosolids Marketing		\$2,990,952	49,086	879	% 73%	\$51.48	2004	8620	\$59.72 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05	
IPS Pipeline Sludig20Transfer	\$1.95	varies	varies	varie	es varies	\$1.68	20		Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05; Symbiont calculations; estimated cost breakdown: DS \$1.83/dt, WAS \$5.31/dt, PS \$1.14/dt	
SSWWTP WAS Thickening		\$1,989,266	56,040	50%	6 1%	\$0.45	2004	8620	\$0.52 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05; cost for JI GBT thickening	
SSWWTP Digestion		\$718,116	56,040	419	% 63%	\$19.76	2004	8620	\$22.93 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05	
Milorganite® Land Application		\$308,540	2,649	1009	% 0%	\$0.00	2004	8620	\$0.00 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05; cost for SS filter cake land application	
Milorganite® Sales Revenue		-\$3,422,669	49,086	879	% 73%	-\$58.91	2004	8620	-\$68.34 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05 *60% to account for reduced value from reduced Nitrogen content per Alan Scrivner (AES) email 12.12.06	
	*linked to assumptions & total cost summary page									

#### Glass Furnace Annual Operating Costs

	To	tal Mass of Raw	% of Raw Sludge from	% of Raw Sludge for	Alternative			
	Process S	ludge that Cost	Left Column Actually Sent	this Alternative Sent	Process	Cost	ENR	2020 (2007)
Prodeston Year Index Process Cost/ton	Soloose Walloest Data/alu	e Applies to (tons)	to this Unit Process	to this Unit Process*	Cost/raw			
JIWWTP Thickening	\$1,279,606	56,040	50%	0%	\$0.00	2004	8620	\$0.00 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05; 50% assumed by AES
JIWWTP Dewatering/Drying	\$7,798,293	56,040	84%	0%	\$0.00	2004	8620	\$0.00 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05; Symbiont calculations of energy cost based on Alan Scrivner (AES) email 12.6.06
Sodium Hydroxide 1000 Minergy SO2 Control	\$147,000	24,400	100%	0%	\$0.00	2006	9700	\$0 Minergy GlassPack Proposal MMSD Hybrid 11 14 06 sm.pdf, Bill Beres (Minergy) email 11.14.06
Ammonia for Minergy Nox control	\$10,800	24,400	100%	0%	\$0.00	2006	9700	\$0.00 Minergy GlassPack Proposal MMSD Hybrid 11 14 06 sm.pdf, Bill Beres (Minergy) email 11.14.06
Minergy LiqueidrOxygen 16215k0801V.2010 orize2 67046ntal 97	700 \$25, <b>\$226</b> ,773.20	per year	per year	per				Minergy GlassPack Proposal MMSD Hybrid 11 14 06 sm.pdf, Bill Beres (Minergy) email 11.14.06
Minergy Liquid Oxygen Usage	\$50,800	24,400	100%	0%	\$0.00	2006	9700	\$0.00 Minergy GlassPack Proposal MMSD Hybrid 11 14 06 sm.pdf, Bill Beres (Minergy) email 11.14.06
Minergy Equipment Maintenance	\$195,200	24,400	100%	0%	\$0.00	2006	9700	\$0.00 Minergy GlassPack Proposal MMSD Hybrid 11 14 06 sm.pdf, Bill Beres (Minergy) email 11.14.06
Minergy Ash Disposal	\$13,275	24,400	100%	0%	\$0.00	2006	9700	\$0.00 Minergy GlassPack Proposal MMSD Hybrid 11 14 06 sm.pdf, Bill Beres (Minergy) email 11.14.06
Minergy Staffingeeting 11.16.06; \$48/hr/worker per N	1ark Kam\$599,248bb Sand	derofMMSDo <b>pecye2ali</b> tk	Krill email 11.17.06 per year	per year	\$0.00	2006	9700	\$0.00 5 workers and 1 supervisor per Bil
IPS Pipeline Sludge Transfer	varies	varies	varies	varies	\$0.00	2004	8620	\$0.00 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05; Symbiont calculations; estimated cost breakdown: DS \$1.83/dt, WAS \$5.31/dt, PS \$1.14/dt
SSWWTP WAS Thickening	\$1,989,266	56,040	50%	0%	\$0.00	2004	8620	\$0.00 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05; cost for JI GBT thickening
SSWWTP Digestion	\$718,116	56,040	41%	0%	\$0.00	2004	8620	\$0.00 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05
*linked to assumptions & total cost summary page								

### Landfill Annual Operating & Maintenance Costs

		Total Mass of Raw	% of Raw Sludge from	% of Raw Sludge for	Alternative			
	Process	Sludge that Cost	Left Column Actually Sent	this Alternative Sent	Process	Cost	ENR	2020 (2007)
Prodession Year Index Process Cost/to	on Socionose WaliGest Da	atà/alue Applies to (tons)	to this Unit Process	to this Unit Process*	Cost/raw			
IPS Pipeline Sludge Transfer	varies	varies	varies	s varies	\$0.00	2004	8620	\$0.00 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05; Symbiont calculations; estimated cost breakdown: DS \$1.83/dt, WAS \$5.31/dt, PS \$1.14/dt
SSWWTP WAS Thickening	\$1,989,266	56,040	50%	0%	\$0.00	2004	8620	\$0.00 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05; cost for JI GBT thickening
SSWWTP Digestion	\$68,003	2,168	100%	0%	\$0.00	2004	8620	\$0.00 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05
SSWWTP DS Thickening (energy included)	\$1,989,266	56,040	50%	0%	\$0.00	2004	8620	\$0.0 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05; cost for JI GBT thickening
SSWWTP Dewatering	\$52	1	100%	0%	\$0.00	1987	4522	\$0.00 recessed-plate.pdf (EPA Biosolids Technology Fact Sheet (EPA 832-F-00-058), September 2000), Bill Krill email 11.16.06
Landfill SystesorStaffBit Krill, meeting 11.16.06; \$4	18/hr/worke <b>\$\$98,1566</b> k h	Kaminski & Bob Sperdyeearf N	MMSD, Bill Krill emaibet yle7al	e per yea	\$0.00	2006	9700	\$0.00 8 workers and 1 su
Cake Trucking & Landfilling	\$122	1	100%	0%	\$0.00	2005	9231	\$0.00 MMSDPlanA.doc, Rick Pager (Waste Management), email 7.27.05 (forwarded by Alan Scrivner (AES), email 07.28.05); inflated to be on par with assumed electrical/gas rate inflation per Bill Krill meeting 12.18.06
				*linked to accumptions	8 total cost summari	naga		



6/2/07

## **ENERGY COSTS**

**TOTAL** \$21,108,990 per year

GAS			% Inflation		
	mmBTU Cu	irrent Rates	to 2007 <b>Fι</b>	uture Rates	Total Required Energy Source:
direct firing of dryers	553092	\$9.250 \$/Dtherm	0%	\$9.250 \$/Dtherm	\$5,116,101All Milo 5%Sold Daily Heat & Mass Balance 2020 ALH 12.17.xls
turbine fuel	1139553.4	\$9.250 \$/Dtherm	0%	\$9.250 \$/Dtherm	\$10,540,869 Tom Bachman (Triad Engineering, Inc. (Symbiont)), Technical Memorandum 5.17.05
other plant gas	588,672	\$9.250 \$/Dtherm	0%	\$9.250 \$/Dtherm	\$5,445,216 Current Rate Source:
NOx Control	0	\$9.250 \$/Dtherm	0%	\$9.250 \$/Dtherm	\$0 Mark Kaminski (MMSD) email 4.5.06 (forwarded by Bill Krill (HNTB) email 4.5.06)
Melter Start-Up	0	\$9.250 \$/Dtherm	0%	\$9.250 \$/Dtherm	\$0 Inflation Source:

Gas Total \$21,102,186

#### **ELECTRICAL**

Transmission Level Service  Facilities Charge On Peak Energy Charge Off Peak Energy Charge On-Peak Demand Charge Customer Demand Charge	Current Rates 0 \$6,300 /year 0 \$0.0603 /kWh 0 \$0.0312 /kWh 0 \$10.2160 /kW 0 \$0.0000 /kw	% Inflation to 2007 Future Rates  8% \$6,804 /year  8% \$0.0651 /kWh  8% \$0.0337 /kWh  8% \$11.0333 /kW  8% \$0.0000 /kw  Transmission Electric Total	Total \$0	Required Energy Source:  \$0  \$0  \$0  Current Rate Source:  Wisconsin Electric Power Company, Volume 19 Electric Rates, Rev. 5, Sheet 65, Issued 1/26/06  Inflation Source:  Mark Kaminski (MMSD) email 4.5.06 (forwarded by Bill Krill (HNTB) email 4.5.06)
Interruptible Service Facilities Charge On Peak Energy Charge Off Peak Energy Charge On-Peak Demand Charge Customer Demand Charge	Current Rates \$9,600 /year \$0.05574 /kWh \$0.02990 /kWh \$0.05024 /kW \$0.000 /kw	No continued by the continue of the continue	Total	Required Energy Source:  \$0  \$0 Current Rate Source:  \$0 Wisconsin Electric Power Company, Volume 19 Electric Rates, Rev. 3, Sheet 81.1-81.2, Issued 1/26/06  \$0 Inflation Source:  \$0 Mark Kaminski (MMSD) email 4.5.06 (forwarded by Bill Krill (HNTB) email 4.5.06)
		Interruptible Electric Total	\$0	
Current Service  Facilities Charge On Peak Energy Charge Off Peak Energy Charge On-Peak Demand Charge Customer Demand Charge	Current Rates 1 \$6,300 /year \$0.0613 /kWh \$0.0331 /kWh \$10.3800 /kW \$0.7600 /kw	No.0507	Total	\$6,804 Current Rate Source: \$0 Wisconsin Electric Power Company, Volume 19 Electric Rates, Rev. 5, Sheet 65, Issued 1/26/06 \$0 \$0 Inflation Rate Source: \$0 Mark Kaminski (MMSD) email 4.5.06 (forwarded by Bill Krill (HNTB) email 4.5.06)

#### SSWWTP DIGESTION ENERGY CREDIT

Density of VSS destroyed

15 cf/lb

Alan Scrivner (AES) phone conversation 8.23.06

Heat Value of Offgas

600 BTU/cf

Alan Scrivner (AES) phone conversation 8.23.06

Cost per ton VSS destroyed \$ 166.50 using cost of gas shown above



TABLE 9G-3 SHEET 10 OF 11

RECOMMENDED BIOSOLIDS PLAN ALTERNATIVE 3 – MAINTAIN EXISTING MILORGANITE® PROGRAM

2020 TREATMENT REPORT 6/2/07

7 TR 9G.T003.07.06.02.cdr

## **ASSUMPTIONS**

#### **MASS BALANCE**

Source: Appendix 9F, Biosolids Recommended Plan Alternatives – Mass Balances, Table 9F-3, Recommended Biosolids Plan Alternative 3 - Maintain Existing Milorganite® Program

63.00% Percent of Milorganite® Raw Sludge that Goes to Digestion 0.00% Percent of Minergy Raw Sludge that Goes to Digestion Percent of Landfill Raw Sludge that Goes to Digestion 0.00% Percent of Milorganite® Raw Sludge that Becomes TWAS 26.00% Percent of Minergy Raw Sludge that Becomes TWAS 0.00% Percent of TSS Removed During Digestion 42.70% Total Sludge to Digestion (tpy) 50906 Percent of Digested Sludge to Milorganite® 100.00% Percent of Digested Sludge to Glass Furnace 0.00% Percent of Digested Sludge to Landfill 0.00% WAS to Digestion (tpy) 509 WAS transferred from SSWWTP to JIWWTP (tpy) 9979 Percent of WAS sent to JIWWTP to Milorganite® 100.00% Percent of WAS sent to JIWWTP to Glass Furnace 0.00% WAS transferred from JIWWTP to SSWWTP (tpy) 0 Primary Sludge Transferred from JIWWTP to SSWWTP 26222

#### **USEFUL LIFE**

LandPermanentSewer & Force Mains50 yearsSymbiont assumptionStructures, Piping, & Valves40 yearsSymbiont assumptionProcess Equipment, Electrical, I&C20 yearsSymbiont assumption

## **UNDESIGNED DETAILS ALLOWANC E**

all inclusive firm bid price all major components have documented installed unit costs costs missing for some components, but other costs are for installed facilities and well documented (connections to existing systems, etc.)

installed costs for major components are not well documented (eg. Installation cost is estimated)

 $0\%\,$  Bill Krill (HNTB), phone conference 11.16.06

10% Symbiont assumption

20%

Symbiont assumption

40%

Symbiont assumption

## CONTINGENCY

all inclusive firm bid price 0% Bill Krill (HNTB), phone conference 11.16.06 everything else 25% Bill Krill (HNTB), phone conference 11.16.06

## **DESIGN, BIDDING, & OVERSITE**

all inclusive firm bid price (design complete, no bidding)

everything else

15% Bill Krill (HNTB), phone conference 11.16.06

35% Bill Krill (HNTB), phone conference 11.16.06



TABLE 9G-3 SHEET 3 OF 11

RECOMMENDED BIOSOLIDS PLAN ALTERNATIVE 3 – MAINTAIN EXISTING MILORGANITE® PROGRAM

2020 TREATMENT REPORT

6/2/07 TR\_9G.T003.07.06.02.cdr

### **COST ESTIMATE SUMMARY**

## **General Description**

All treatment plant primary sludge is digested and then combined with raw secondary sludge for the production of Classic Milorganite®. The blend of raw secondary and digested sludge is adjusted to make as much Milorganite® meeting the 6% Nitrogen guarantee as possible, with the remaining sludge made into a blend that does not meet the guarantee. The 6% is sold at current prices while the rest is sold at below market or land applied. Construction requires 7 new GBT's for SSWWTP WAS thickening and 5 new digesters.

Biosolids Load 81,000	Influent Sludge	53,800	Finished Biosolids
Biosolids Influent Load Distribution			
100%	Milorganite®		
0%	Glass Furnace	0%	Landfill

ENR Index = 10000 (assumed Milwaukee 2007)
Interest Rate per Year = 5.125%

Summary of Capital Costs	
JIWWTP TURBINE UPGRADES	\$16,460,000
JIWWTP TURBINE BUILDING	\$3,495,000
JIWWTP DEWATERING AND DRYING FACILITY UPGRADES	\$114,740,000
JIWWTP NEW LOCOMOTIVE	\$3,050,000
INTERPLANT SLUDGE PIPELINE UPGRADES	\$2,870,000
SSWWTP NEW GRAVITY BELT WAS THICKENERS	\$7,580,000
SSWWTP DIGESTER REHABILITATION	\$117,430,000
SALVAGE VALUE	-\$19,169,000

Total Capital Cost \$246,460,000

## **Summary of Annual Operation & Maintenance Costs**

Total Annual Cost \$40,500,000

Life Cycle Analysis

 Number of Years
 20

 Present Worth Factor
 12.331

Present Worth of Total Annual Operation & Maintenance Costs

\$499,410,000

Summary of	<u>of Non-Annual</u>	Operation	& Maint	enance	Costs

Process Cost ENR Index Year PW

Present Worth of Total Non-Annual Operation & Maintenance Costs

Total Present Worth \$746,000,00 0



TABLE 9G-4 SHEET 1 OF 11

RECOMMENDED BIOSOLIDS PLAN ALTERNATIVE 4 – COMBINE MILORGANITE® PROGRAM WITH LAND APPLICATION

2020 TREATMENT REPORT

6/2/07

\$0

	JIWWTP TURBINE UPGRADES CAPITAL COST																	
							То	tal Capital Cost =	Tota	I Salvage Value =								
								\$16,460,000		\$85,000	< insert link t	this cost	t on the Capi	tal Cost Summa	ry Worksheet			
					Un-		Design,											
					designed	Conting-	Bidding, &				Actual		COST ADJUS		ADJUSTED			
DESCRIPTION	Quantity	Units	Unit Cost (\$)	SUBTOTAL (\$)	Details (%)	ency (%)	Oversight (%)	SUBTOTAL (\$)	Life (Years)	Salvage Value (\$)	Unit Cost (\$)	Cost Year	ENR Index	Adjustment Factor	UNIT COST (\$)	SOURCE	MANUFACTURER	COMMENTS
DESCRIPTION	Quantity	Onits	(4)	(Ψ)	(70)	(70)	(70)	(4)	(Tears)	(4)	(4)	Ieai	IIIuex	1 actor	(4)	SOUNCE	MANOTACTORER	COMMENTS
DIVISION 2: SITE CONSTRUCTION																		
Trenching, Pavement Removal, Backfill and Patching for Electrical Duct	800	LF	\$60	\$48,000	20%	25%	35%	\$100,000	20	\$0	\$60	2006	9700	1.03	\$62	TurbineOptionESTIMATE.xls, Tony Pohl (Automation Service & Design Inc.), email 3.28.06	TBD	
Manholes for Electrical Duct	4	each	\$10,000	\$40,000	20%	25%	35%	\$80,000	40	\$40,000	\$10,000	2006	9700	1.03	\$10,309	TurbineOptionESTIMATE.xls, Tony Pohl (Automation Service & Design Inc.), email 3.28.06	TBD	
Division 2 Subtotal	\$180,000																	
DIVISION 11: EQUIPMENT																		
14.4 MW Combustion Turbine Generator	1	each	\$4,709,000	\$4,709,000	10%	25%	35%	\$8,740,000	20	\$0	\$4,567,250	2006	9700	1.03	\$4,708,505	Solar 130 Installed Cost 24MAR06.xls, Robert Gavahan (PEC), email 03.27.06	Solar Titan 130	cost for two CTs divided by 2
Station Control System for Turbine	1	each	\$278,000	\$278,000	10%	25%	35%	\$520,000	20	\$0	\$270,000	2006	9700	1.03	\$278,351	Solar 130 Installed Cost 24MAR06.xls, Robert Gavahan (PEC), email 03.27.06	Solar Titan 130	cost for two CTs divided by 2
Turbine Commissioning Parts, Startup, Site Testing	1	each	\$99,000	\$99,000	10%	25%	35%	\$180,000	20	\$0	\$96,100	2006	9700	1.03	\$99,072	Solar 130 Installed Cost 24MAR06.xls, Robert Gavahan (PEC), email 03.27.06	Solar Titan 130	cost for two CTs divided by 2
Turbine Shipping	1	each	\$122,000	\$122,000	10%	25%	35%	\$230,000	20	\$0	\$118,050	2006	9700	1.03	\$121,701	Solar 130 Installed Cost 24MAR06.xls, Robert Gavahan (PEC), email 03.27.06	Solar Titan 130	cost for two CTs divided by 2
Turbine Construction Estimate	1	each	\$1,811,000	\$1,811,000	10%	25%	35%	\$3,360,000	20	\$0	\$1,756,650	2006	9700	1.03	\$1,810,979	Solar 130 Installed Cost 24MAR06.xls, Robert Gavahan (PEC), email 03.27.06	Solar Titan 130	cost for two CTs divided by 2
Division 11 Subtotal	\$13,030,000																	
Division in Custotta	<b>ψ10,000,000</b>																	
DIVISION 15: MECHANICAL																		
Exhaust Ductwork from Turbine Building to Existing Duct System - 120" special alloy exhaust pipe w/pile supports	500	If	\$1,000	\$500,000	40%	25%	35%	\$1,180,000	20	\$0	\$750	2006	9700	1.03	\$773	Symbiont engineering judgment	TBD	
Fuel Gas and Fuel Oil Piping to Turbine Building	1	allowance	\$40,000	\$40,00 <b>6</b> n	tengineer40g/jud	Igment 25%	35%	\$90,000	40	\$45,000	\$39,000	2006	9700	1.03	\$40,206	Symb	TBD	
Division 15 Subtotal	\$1,270,000																	
DIVISION 16: ELECTRICAL																		
Connections to Existing Plant Control System	1	allowance	\$103,000		ngineerin <b>49</b> 64gr		35%	\$240,000	20	\$0	\$100,000	2006	9700	1.03	\$103,093	Symbiont	TBD	
3-4" Concrete encased PVC Conduit ductbank	800		\$80	\$64,000	20%	25%	35%	\$130,000	20	\$0	\$80	2006	9700	1.03	\$82	TurbineOptionESTIMATE.xls, Tony Pohl (Automation Service & Design Inc.), email 3.28.06	TBD	
350kcmil 1/c 15KV Copper	7,200		\$20	\$144,000	20%	25%	35%	\$290,000	20	\$0	\$20	2006	9700	1.03	\$21	TurbineOptionESTIMATE.xls, Tony Pohl (Automation Service & Design Inc.), email 3.28.06	TBD	OT POLICE
Switchgear and MCC for Turbine	1	each	\$709,000	\$709,000	10%	25%	35%	\$1,320,000	20	\$0	\$687,500	2006	9700	1.03	\$708,763	Solar 130 Installed Cost 24MAR06.xls, Robert Gavahan (PEC), email 03.27.06	Solar Titan 130	cost for two CTs divided by 2
Division 16 Subtotal	\$1.980.000																	
DIVISION TO SUDICIAN	\$1,500,000										П							



TABLE 9G-4 SHEET 2 OF 11

RECOMMENDED BIOSOLIDS PLAN ALTERNATIVE 4 – COMBINE MILORGANITE® PROGRAM WITH LAND APPLICATION

		NEW TURB	INE BUILDIN	IG CAPITAL (	COST													
							Tota	Capital Cost = \$3.495.000	Total	\$1,684,000	< ineart link	k to this cost	on the Canits	I Cost Summar	w Workshoot			
					Un-		Design,	<b>\$3,433,000</b>		\$1,004,000	IIIdelt IIIIK	k to tills cost	on the Capita	ii oost oullilliai	y Worksheet			
					designed	-	Bidding, &				Actual		COST ADJUST		ADJUSTED			
DESCRIPTION		Quantity Units	Unit Cost (\$)	SUBTOTAL (\$)	Details (%)	ency (%)	Oversight (%)	SUBTOTAL (\$)	Life (Years)	Salvage Value (\$)	Unit Cost (\$)	Cost Year	ENR Index	Adjustment Factor	UNIT COST (\$)	SOURCE	MANUFACTURE	COMMENTS
DIVISION 2: SITE CONSTRUCTION										1.7								
Asphalt removal for building install Concrete Repair		694 SY 4,500 SF	\$8 \$2	\$5,556 \$9,000	20% 20%	25% 25%	35% 35%	\$11,000 \$18,000	40 40	\$6,000 \$9,000	\$8		9700 9700	1.03	\$8 \$2	RSMEANS COSTWORKS 2006 QTR 3; 03 310 240 5010	TBD TBD TBD TBD TBD	Site demolition, remove concrete, mesh reinforced, to 6" thick, excludes hauling and disposal fees Structural concrete, in place, slab on grade, 6" thick, includes textured finish only
Utility Trench Excavation Utility Trench Backfill		500 LF 667 CY	\$3 \$3	\$1,500 \$2,000	20% 20%	25% 25%	35% 35%	\$3,000 \$4,000	40 40	\$2,000 \$2,000	\$3 \$3			1.03 1.03	\$3 \$3	RSMEANS COSTWORKS 2006 QTR 3; 02 315 610 0610 RSMEANS COSTWORKS 2006 QTR 3; 02 315 610 3090	TBD TBD	Excavating, trench, concrete curb, steel forms, 6' to 10' deep, 1 1/2 C.Y. bucket, hydraulic backhoe, excludes sheeting or dewatering Excavating, trench backfill, 2-1/4 C.Y. bucket, 100' haul, front end loader, wheel mounted, excludes sheeting or dewatering
Utility Trench Compaction		667 CY	\$7	\$4,667	20%	25% 25%	35%	\$9,000	40	\$5,000	\$6	6 2006		1.03	\$7	RSMEANS COSTWORKS 2006 QTR 3; 02 315 110 0800	TBD	Backfill, 12" layers, compaction in layers, hand tamp, add to above
	Division 2 Subtotal	\$45,000																
DIVISION 3: CONCRETE Utility Trench Repair		56 CY	\$196	\$10,889	20%	25%	35%	\$20,000	40	\$10,000	\$190	0 2006	9700	1.03	\$196	RSMEANS COSTWORKS 2006 QTR 3: 03 310 240 4700	TBD	Structural concrete, in place, slab on grade, 6" thick, includes forms(4 uses) and reinforcing steel
		440.000																
	Division 3 Subtotal	\$20,000																
DIVISION 13: SPECIAL CONSTRUCTION																		
Turbine Building		5,000 sf	\$298	\$1,490,00 <b>1</b> urb	bine Buil <b>@6%</b> Cos	st COST <b>26</b> 1224R	S.xls 35%	\$3,020,000	40	\$1,510,000	\$289	9 2006	9700	1.03	\$298	RSMEANS COSTWORKS 2006 QTR 3;	TBD	Factory, 1 Story, Precast Concrete Panels / Steel Frame w/steel H section piles
	Division 13 Subtotal	\$3,020,000																
DIVISION 15: MECHANICAL																		
Natural Gas Supply Instrument Air Supply Cooling Water Supply Potable Water Supply		500 LF 500 LF 500 LF 500 LF	\$36 \$34 \$166 \$34	\$18,000 \$17,000 \$83,000 \$17,000	20% 20% 20% 20%	25% 25% 25% 25%	35% 35% 35% 35%	\$40,000 \$30,000 \$170,000 \$30,000	40 40 40 40	\$20,000 \$15,000 \$85,000 \$15,000	\$33 \$33 \$16 \$33	3 2006 1 2006 3 2006	9700 9700 9700	1.03 1.03 1.03 1.03	\$34 \$166 \$34	RSMEANS COSTWORKS 2006 QTR 3; 15 107 620 2150 RSMEANS COSTWORKS 2006 QTR 3; 15 107 220 1200	TBD TBD TBD TBD	Pipe, steel, black, welded, 3" diameter, schedule 40 Pipe, brass, plain end, regular weight, 1-1/2" diameter Pipe, steel, black, welded, 10" diameter, schedule 40 Pipe, brass, plain end, regular weight, 1-1/2" diameter
Building Drain		500 LF	\$12	\$6,000	20%	25%	35%	\$10,000	40	\$5,000	\$12	2 2006	9700	1.03	\$12	RSMEANS COSTWORKS 2006 QTR 3; 15 108 520 1940	TBD	Pipe, PVC, socket weld, SCH 40, 4* diameter
	Division 15 Subtotal	\$280,000																
DIVISION 16: ELECTRICAL																		
Power Feed		1 ea	\$62,000	\$62,000	20%	25%	35%	\$130,000	20	ew medi <b>ୱିର</b> vol	age trans <b>16601,00</b> 0	16. con@10016rs	to n <b>97/06</b> ldg	1.03	\$61,856	Symbiont estimate based on recent project	TBD	Estimate includes n



TABLE 9G-4 SHEET 3 OF 11 RECOMMENDED BIOSOLIDS PLAN **ALTERNATIVE 4 – COMBINE MILORGANITE®** PROGRAM WITH LAND APPLICATION

## 2020 FACILITIES PLANNING

## D&D FACILITY UPGRADES CAPITAL COST

							Total Capita		Tota	I Salvage Value =
								\$114,740,000		\$0
					Un-		Design,			<u>.</u>
					designed	Conting-	Bidding, &			
			Unit Cost	SUBTOTAL	Details	ency	Oversight	SUBTOTAL	Life	Salvage Value
DESCRIPTION	Quantity	Units	(\$)	(\$)	(%)	(%)	(%)	(\$)	(Years)	(\$)
DIVISION 13: SPECIAL CONSTRUCTION										
Unit Process 24 Upgrade	1	lump sum	\$6,495,000	\$6,495,000	40%	25%	35%	\$15,340,000	20	\$0
Unit Process 25 Upgrade	1	lump sum	\$17,453,000	\$17,453,000	40%	25%	35%	\$41,230,000	20	\$0
Unit Process 27 Upgrade	1	lump sum	\$4,062,000	\$4,062,000	40%	25%	35%	\$9,600,000	20	\$0
Unit Process 29 Upgrade	1	lump sum	\$12,629,000	\$12,629,000	40%	25%	35%	\$29,840,000	20	\$0
Unit Process 30 Upgrade	1	lump sum	\$1,278,000	\$1,278,000	40%	25%	35%	\$3,020,000	20	\$0
Unit Process 31 Upgrade	1	lump sum	\$747,000	\$747,000	40%	25%	35%	\$1,760,000	20	\$0
Unit Process 32 Upgrade	1	lump sum	\$2,809,000	\$2,809,000	40%	25%	35%	\$6,640,000	20	\$0
Miscellaneous Costs (drop chutes, etc.)	1	lump sum	\$3,093,000	\$3,093,000	40%	25%	35%	\$7,310,000	20	\$0
Division 13 Subtotal	\$114,740,000									

## ---- insert link to this cost on the Capital Cost Summary Worksheet

Actual	С	OST ADJU	ISTMENT	ADJUSTED			
Unit Cost	Cost	ENR	Adjustment	UNIT COST			
(\$)	Year	Index	Factor	(\$)	SOURCE	MANUFACTURER	COMMENTS
\$6,300,000	2006	9700	1.03	\$6,494,845	DD Facility Upgrade Estimate (npb edit 11-21-06).xls, Review of Plant Projects reports and Symbiont engineering judgment	TBD	
\$16,929,000	2006	9700	1.03	\$17,452,577	DD Facility Upgrade Estimate (npb edit 11-21-06).xls, Review of Plant Projects reports and Symbiont engineering judgment	TBD	
\$3,940,000	2006	9700	1.03	\$4,061,856	DD Facility Upgrade Estimate (npb edit 11-21-06).xls, Review of Plant Projects reports and Symbiont engineering judgment	TBD	
\$12,250,000	2006	9700	1.03	\$12,628,866	DD Facility Upgrade Estimate (npb edit 11-21-06).xls, Review of Plant Projects reports and Symbiont engineering judgment	TBD	
\$1,240,000	2006	9700	1.03	\$1,278,351	DD Facility Upgrade Estimate (npb edit 11-21-06).xls, Review of Plant Projects reports and Symbiont engineering judgment	TBD	
\$725,000	2006	9700	1.03	\$747,423	DD Facility Upgrade Estimate (npb edit 11-21-06).xls, Review of Plant Projects reports and Symbiont engineering judgment	TBD	
\$2,725,000	2006	9700	1.03	\$2,809,278	DD Facility Upgrade Estimate (npb edit 11-21-06).xls, Review of Plant Projects reports and Symbiont engineering judgment	TBD	
\$3,000,000	2006	9700	1.03	\$3,092,784	DD Facility Upgrade Estimate (npb edit 11-21-06).xls, Review of Plant Projects reports and Symbiont engineering judgment	TBD	



TABLE 9G-4 SHEET 4 OF 11 RECOMMENDED BIOSOLIDS PLAN **ALTERNATIVE 4 – COMBINE MILORGANITE®** PROGRAM WITH LAND APPLICATION

		NEW LO	DCOMOTIVE C	APITAL COS	STS					
							To	tal Capital Cost =	Tota	al Salvage Value =
								\$3,050,000		\$0
					Un-		Design,			
					designed	Conting-	Bidding, &			
	<b>.</b>		Unit Cost	SUBTOTAL	Details	ency	Oversight	SUBTOTAL	Life	Salvage Value
DESCRIPTION	Quantity	Units	(\$)	(\$)	(%)	(%)	(%)	(\$)	(Years)	(\$)
DIVISION 11: EQUIPMENT										
New Locomotive	1	lump sum	\$1,289,000	\$1,289,000	40%	25%	35%	\$3,050,000	20	\$0
Division 11 Subtot	al \$3,050,000		1							
	, ,									

## <---- insert link to this cost on the Capital Cost Summary Worksheet

Actual	c	OST ADJU	STMENT	ADJUSTED			
Unit Cost (\$)	Cost Year	ENR Index	Adjustment Factor	UNIT COST (\$)	SOURCE	MANUFACTURER	COMMENTS
\$1,250,000	2006	9700	1.03	\$1,288,660	Alan Scrivner (AES), email 4.05.06	TBD	



TABLE 9G-4 SHEET 5 OF 11 RECOMMENDED BIOSOLIDS PLAN **ALTERNATIVE 4 – COMBINE MILORGANITE®** PROGRAM WITH LAND APPLICATION

	INTERPLAN	IT SLUDGE	E PIPELINE U	PGRADES C	APITAL C	OSTS												
							Tot	al Capital Cost =	Tota	al Salvage Value =	1							
								\$2,870,000		\$0	< insert link to	this cost	on the Capi	tal Cost Summai	y Worksheet			
					Un- designed	Conting-	Design, Bidding, &				Actual	C	OST ADJUS	TMENT	ADJUSTED			
			Unit Cost	SUBTOTAL	Details	ency	Oversight	SUBTOTAL	Life	Salvage Value	Unit Cost	Cost	ENR	Adjustment	UNIT COST			
DESCRIPTION	Quantity	Units	(\$)	(\$)	(%)	(%)	(%)	(\$)	(Years)	(\$)	(\$)	Year	Index	Factor	(\$)	SOURCE	MANUFACTURER	COMMENTS
DIVISION 11: EQUIPMENT																		
JIWWTP and SSWWTP Hard Metal Pumps & Motors Rated for 300	12	each	\$93,000	\$1,116,000	20%	25%	35%	\$2,260,000	20	000 per <b>\$0</b> mp	for installa <b>\$90</b> ,000	2006	9700	1.03	\$92,784	Mickey (RDM), phone conversation 03.28.06	TBD	includes \$5
psi																		
Division 11 Subtotal	\$2,260,000																	
DIVISION 16: ELECTRICAL Pipeline Cathodic Protection	1	allowance	\$258,000	\$258,000	40%	25%	35%	\$610,000	20	\$0	\$250,000	2006	9700	1.03	\$257 732	Symbiont engineering judgment	TBD	
i ipeline datriodic i fotection		allowarice	Ψ200,000	Ψ200,000	4070	2070	0070	ψ010,000	20	Ψ	Ψ230,000	2000	3700	1.00	Ψ201,102	Symbolic engineering jaagment	100	
Division 16 Subtotal	\$610,000																	



TABLE 9G-4 SHEET 6 OF 11 RECOMMENDED BIOSOLIDS PLAN **ALTERNATIVE 4 – COMBINE MILORGANITE®** PROGRAM WITH LAND APPLICATION

							Tot	al Capital Cost =	Tota	l Salvage Value =
								\$117,430,000		\$17,159,000
270227701			Unit Cost	SUBTOTAL	Un- designed Details	Conting- ency	Design, Bidding, & Oversite	SUBTOTAL	Life	Salvage Value
DESCRIPTION	Quantity	Units	(\$)	(\$)	(%)	(%)	(%)	(\$)	(Years)	(\$)
DIVISION 3: CONCRETE										
Five New Covered & Insulated Digester Tanks with access equipment (125' diameter, 38' side water depth, 5' free board)	19,735,583	gallons	\$2	\$39,471,166	40%	25%	35%	\$93,250,000	40	\$17,159,000
Division 3 Subtotal	\$93,250,000									
DIVISION 11: EQUIPMENT										
New Digester Mixing Systems - External Draft Tube Mixers for 110' diameter	17	each	\$468,000	\$7,956,000	40%	25%	35%	\$18,800,000	20	\$
New Digester Recirculation Pumps - 10 HP motors, 250 gpm @ 60'	22	each	\$15,000	\$330,000	40%	25%	35%	\$780,000	20	\$
Recirculating Sludge Heat Exchangers -Sludge-Hot Water Systems	11	each	\$42,000	\$462,000 2,2	249 40%	25%	35%	\$1,090,000	20	S
Storage Digester Sludge Transfer Pumps - 30 HP motors, VFD, 1200 gpm @ 60' TDH	11	each	\$55,000	\$605,000	40%	25%	35%	\$1,430,000	20	\$
Digester Gas Safety Equipment	1	allowance	\$812,000	\$812,000	40%	25%	35%	\$1,920,000	20	\$
Division 11 Subtotal	\$24,020,000									
Division 11 Subtotal	φ <b>24</b> ,020,000									
DIVISION 15: MECHANICAL										
New Boiler	1	each	\$67,000	\$67,000	40%	25%	35%	\$160,000	20	\$
Division 15 Subtotal	\$160,000									

00	< insert link to	this cost	on the Cap	ital Cost Summar	y Worksheet			
	Actual Unit Cost	Cost	OST ADJU ENR	STMENT Adjustment	ADJUSTED UNIT COST			
_	(\$)	Year	Index	Factor	(\$)	SOURCE	MANUFACTURER	COMMENTS
00	\$2	2007	10000	1.00	\$2	Symbiont engineering judgment	TBD	
\$0	\$431,600	2005	9231	1.08	\$467,555	Wiscosin Project Triad Ebg EWT Mixer Budget Price 07-14-05.doc , Bob Lacey (Energenecs), email 07.14.05	Eimco, RDT-T	+30% for install
\$0	\$13,650	2005	9231	1.08	\$14,787	Rich Hussey (Ley Associates), email 07.26.05	Wemco-Hidrostal, D4K-HS	+30% for install
\$0	\$39,000	2005	9231	1.08	\$4	Biosolids Alternative Sizing Worksheets r4.xls , Symbiont	Alfa Laval	+30% for install
\$0	\$51,025	2005	9231	1.08	\$55,276	Rich Hussey (Ley Associates), email 07.26.05	Wemco-Hidrostal, E5K-S	+30% for install, +250% for VFD
\$0	\$750,000	2005	9231	1.08	\$812,480	Symbiont engineering judgment		
\$0	\$65,000	2006	9700	1.03	\$67,010	Symbiont engineering judgment based on recent projects	TBD	



TABLE 9G-4 SHEET 7 OF 11 RECOMMENDED BIOSOLIDS PLAN **ALTERNATIVE 4 – COMBINE MILORGANITE®** PROGRAM WITH LAND APPLICATION

												7											
				aukee Metropolitan		ct																	
	Nev	w SSWWTP	Gravity Be	It Thickeners	for WAS TI	hickening C	apital Cos		al Capital Cost =	Tota	I Salvage Value =												
						Un-		Design,	\$7,580,000		\$241,000	< insert link			tal Cost Summa								
DESCRIPTION		Quantity	Units	Unit Cost (\$)	SUBTOTAL (\$)	designed Details (%)	Conting- ency (%)	Bidding, & Oversite (%)	SUBTOTAL (\$)	Life (Years)	Salvage Value (\$)	Actual Unit Cost (\$)		COST ADJUS ENR Index	Adjustment Factor	ADJUSTEI UNIT COST (\$)		SOURCE		MANUFACTURER		COMMENTS	
DIVISION 2: SITE CONSTRUCTION		Quantity	Onits	(4)	(4)	(70)	(70)	(/6)	(4)	(Teals)	(4)	(3)	Teal	illuex	T actor	(*)	_	SOURCE		MAROTACTORER		COMMENTS	
Demolition	Division 2 Subtotal	\$60,000	lump sum	\$26,000	\$26,00	00 40%	25%	35%	\$60,000	20	ded via Kat <b>⊚</b> Ziin	(HNTB), f <b>s\$∠2,50</b>	006) 2004	867200	1.16	+25% cor <b>92</b> 6;tt	20.8. Př. panrk Těledríshtá (skřiží ),408é huni dalí slágenem rahrtá ülera f	alsotissed (lie meumo)					
DIVISION 4: MASONRY		\$60,000																					
Masonry Restoration - Cut and Repoint Brick		1	lump sum	\$22,000	\$22, <b>6</b> T	00, Technical <b>40%</b>	orandum 12565.	04 (forwar <b>ds6t</b> /wia	Kate Ziin <b>≎(ii)∜0B</b>	I), fax 9.27.206)	T₿D	\$18,75	25% c200reat	esigû <b>86</b> 2 <b>p</b> etaTi	e citistel dilateri(40 You	<b>em</b> o) \$21,7	2 Frank Tiefert (						
	Division 4 Subtotal	\$50,000																					
DIVISION 11: EQUIPMENT GBT Equipment		1	lump sum	\$1,624,000	\$1,624,00	00 40%	25%	35%	\$3,840,000	20	1.15.04 (for\$@ard	de Ivia Ka <b>84,Z00</b> 0,00	@NTB)2 <b>0:04</b> 9	.27.0 <b>6</b> )620	1.11BD	\$1,624,1	025%Fcankr Tüster O(&FlipeTeTürchi dalekhen(4003io dunde)	###@Wickelook allocations and the property of the control of the c	alternatives				
Thickened Sludge Pumps Washwater Pumps Polymer System		1 1 1	lump sum lump sum lump sum	\$322,000 \$63,000 \$183,000	\$63,00	00 11.15.04 (400%)	arded via K25%Z	d via Kate <b>Zīiń</b> e (H liino (HNTB)5fáx 9 35%	(NTB), 186/1962,9006 (.27.06) \$150,000 \$430,000	TBD 20	TBD \$0 +250% orwarded v@0Ka	+25%\$20nt(act	tor Oszoper 8Tech 1202040 9.272080)4	Te <b>chshibble</b> d4 (40 <b>%6600)</b> \$73 8620 T	(0) Ya eumolog Strig Metalo (Metalo dueta di (6) na il Saor ( (BD 1.16	detaolsnt \$63/22/32  TsGBTS fojt03/4 +25782-3	WS (férátnik Bikdents(水砂), Technical Macristawic Tiefert (ATI), Technical Memorandum fő-acifő-é9AFT pefertfe(4ff )), dimch (40% Modustig) felakulad	eddolesidlisiq (Fs@iBTis:rfoerttis); alternative	ves				
	Division 11 Subtotal	\$5,180,000																					
DIVISION 13: SPECIAL CONSTRUCTION Building Modifications		1	lump sum	\$281,000	\$281,06	adai Memoran <b>d0‰</b>	11.15.04 (f <b>@5</b> %a)	rded via Ka <b>llé Z</b> iind	o (HNTB <b>)\$6600 90207</b>	7.06) 40	TBD \$121,000	+2 <b>\$%</b> 4&\$@	Octor 2004 p	<b>TedB30d</b> isto	<b>ed,40%a&amp;m6è</b> }signe	ed d \$281,3	3 Frank Tiefert (ATI), Tech						
	Division 13 Subtotal	\$660,000																					
DIVISION 15: MECHANICAL Mechanical Piping	Division 15 Subtotal	\$650.000	lump sum	\$277,000	\$277,00	00emorandun40%	15.04 (forw <b>atitle</b> d	d via Kate <b>Z35%</b> (H	NTB), fa <b>\$6</b> 5 <b>27006</b>	40	TBD \$120,000	+25% \$8889;43	6r Ö&⊉qaa+	Techsiddiátod 41	0 % eumdijs 8 By Metols d	detxilunt f\$27636	TS (d <sup>ir</sup> rthisk illedresk (ARIS), Technical						
DIVISION 16: ELECTRICAL	DIVISION 15 SUBTOTAL	000,000																					
Instrumentation & Control Electrical		1	lump sum lump sum	\$221,000 \$193,000	\$221,#00 \$193,00				INTB), fa <b>\$52,2,006</b> \$460,000		TBD \$0 orwarded v <b>§</b> 0Ka	+25%%t90t36t ate Ziino (HNT69,25	©or O&2P0194er 29 9.2720060)4	Techs <b>edian</b> e(4 8620 T	<b>6) % eimd∲\$6) kleid</b> oo BD 1.16	detzount \$220(3) +25192;8	NS fórránis Alledrata(Alla), Technic Gactóráða Fipder (1481 1), dímen (403), Machaslíghidadrád	<b>ddubēdišu (FsGið Tis fluritis)</b> alternative	res				
	Division 16 Subtotal	\$980 000																					



TABLE 9G-4 SHEET 8 OF 11 RECOMMENDED BIOSOLIDS PLAN **ALTERNATIVE 4 – COMBINE MILORGANITE®** PROGRAM WITH LAND APPLICATION 2020 TREATMENT REPORT 6/2/07

O&M COST ESTIMATE Total 2020 MMSD Sludge Production (dt/yr) = 81,000 (raw sludge)

Total Annual O&M Cost = \$40,500,000 JIWWTP Energy Costs
Natural Gas - Turbine Fuel Natural Gas - Turbine Fuel
Natural Gas - Direct Firing of Dryers
Natural Gas - Minergy NOx Control & Startup
Natural Gas - Other Plant Facilities
Firm Electricity - Base Power Load
Firm Electricity - Demand Charges
Interruptible Electricity - Base Power Load
Interruptible Electricity - Bernand Charges
Turbine Operation and Maintenance \$10.541.000 \$5,116,000 \$0 \$5,445,000 \$7,000

SSWWTP Digestion Gas Credit/Replacement
plus/minus amount of solids destroyed in digestion = 10,375 tons/year
plus/minus amount of energy recovered from digestion process = 150,267 dtherm/year
VALUE OF ENERGY CHANGE IN TERMS OF COST OF EQUIVALENT GAS PURCHASE -\$1,389,970

Milorganite® Annual Operating & Maintenance Costs

% of sludge to Milorganite® = 100% = 45%

	Process Unit	Process	
	Cost	Contribution	Annual Cost
Item/Process	(\$/dt)	Cost (\$/dt raw)	\$/yr dry ton
JIWWTP Thickening	\$53.00	\$13.80	\$1,118,000
JIWWTP Dewatering/Drying	\$191.30	\$139.80	\$11,324,000
JIWWTP Chaff Processing	\$443.30	\$16.70	\$1,353,000
Milorganite® Warehouse/Shipping	\$27.20	\$19.90	\$1,612,000
Biosolids Marketing	\$81.70	\$26.90	\$2,179,000
IPS Pipeline Sludge Transfer (includes SS energy)	\$3.20 *	\$2.00	\$162,00 <b>0</b> 4
SSWWTP WAS Thickening (energy included)	\$82.40	\$0.50	\$41,000
SSWWTP Digestion (energy included)	\$36.40	\$22.90	\$1,855,000
Milorganite® Land Application	\$135.10	\$49.40	\$4,001,000
Milorganite® Sales Revenue	-\$155.80	-\$51.30	-\$4,155,000
SUBTOTA	L	\$241	\$19,488,600

## Glass Furnace Annual Operating Costs

% of sludge to glass furnace = 0% annual sludge volume (dt/year) = 0 annual biosolids to Glass Furnace

	Process Unit Cost	Process Contribution	Annual Cost	
Item/Process		Cost (\$/dt raw)		
	(\$/dt)		\$/yr dry to	
JIWWTP Thickening	\$53.00	\$0.00	\$1	J
JIWWTP Dewatering/Drying	\$191.30	\$0.00	\$	O
Sodium Hydroxide for Minergy SO2 Control	\$6.20	\$0.00	\$	0
Ammonia for Minergy Nox control	\$0.50	\$0.00	\$	0
Minergy Liquid Oxygen Tank & Vaporizer Rental	per year	-	\$0	)
Minergy Liquid Oxygen Usage	\$2.10	\$0.00	\$	0
Minergy Equipment Maintenance	\$8.20	\$0.00	\$	0
Minergy Ash Disposal	\$0.60	\$0.00	\$1	O
Minergy Staffing	per year	-	\$	0 1
IPS Pipeline Sludge Transfer (includes SS energy)	\$3.20 *	\$0.00	\$1	δ
SSWWTP WAS Thickening (energy included)	\$82.40	\$0.00	\$1	Û
SSWWTP Digestion (energy included)	\$36.40	\$0.00	\$	0
SUBTOTAL	-	\$0	\$1	D

## Landfill Annual Operating & Maintenance Costs

% of sludge to landfill = 0%

Process Unit Item/Process
IPS Pipeline Sludge Transfer
SSWMTP WAS Thickening (energy included)
SSWMTP Digestion (energy included)
SSWMTP Dis Thickening (energy included)
SSWMTP Dewatering (energy included)
Landfill System Staffing Cost (\$/dt raw) \$0.00 \$3.20 \$82.40 \$36.40 \$82.40 \$115.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 Cake Trucking & Landfilling SUBTOTAL Average of costs to pump WAS, primary sludge, and digested sludge

see Sheet 10, Energy Costs Turbine Operation and Maintenance

2006 ), email 3.27.069700

Source calculated difference in tons removed in digester from the year 2004 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05)

basiedleteddhes vasuuméddediffdhfartiggpster ga calculated \$ value of additional digester gas based on values assumed on "JI Energy"

### Milorganite® Annual Operating & Maintenance Costs

		Total Mass of Raw	% of Raw Sludge from	% of Raw Sludge for	Alternative			
	Process	Sludge that Cost	Left Column Actually Sent	this Alternative Sent	Process	Cost	ENR	2020 (2007)
YellrocessIndex Process Cost/ton Source of	Cost DataCost Value	Value Applies to (tons)	to this Unit Process	to this Unit Process*	Cost/raw			
JIWWTP Thickening	\$1,279,606	56,040	50%	26%	\$11.87	2004	8620	\$13.77 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05; 50% assumed by AE S
JIWWTP Dewatering/Drying	\$7,798,293	56,040	849	6 73%	\$120.54	2004	8620	\$139.84 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05; Symbiont calculations of energy cost based on Alan Scrivner (AES) email 12.6. 0
JIWWTP Chaff Processing	\$928,541	56,040	849	6 73%	\$14.35	2004	8620	\$16.65 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05
Milorganite® Warehouse/Shipping	\$1,108,821	56,040	849	6 73%	\$17.14	2004	8620	\$19.88 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05
Biosolids Marketing	\$2,990,952	49,086	879	6 33%	\$23.17	2004	8620	\$26.87 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.0 5
862% Pipeline Sludg&Tr@sfer	varies	varies	varie	s varies	\$1.68	20		Solids Cost 2004 UWSactual XLS, Bill Krill email 08.19.05; Symbiont calculations; estimated cost breakdown: DS \$1.83/dt, WAS \$5.31/dt, PS \$1.14/d
SSWWTP WAS Thickening	\$1,989,266	56,040	50%	1%	\$0.45	2004	8620	\$0.52 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05; cost for JI GBT thickening
SSWWTP Digestion	\$718,116	56,040	419	63%	\$19.76	2004	8620	\$22.93 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05
Milorganite® Land Application	\$308,540	2,649	1009	6 37%	\$42.54	2004	8620	\$49.36 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05; cost for SS filter cake land application
Milorganite® Sales Revenue	-\$5,704,448	49,086	879	6 33%	-\$44.18	2004	8620	-\$51.26 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.0 5
				*linked to assumptions	& total cost summary	page /		

## Glass Furnace Annual Operating Costs

			Total Mass of Raw	% of Raw Sludge from	% of Raw Sludge for	Alternative			
		Process	Sludge that Cost	Left Column Actually Sent	this Alternative Sent	Process	Cost	ENR	2020 (2007)
n	YeBrocessIndex Process Cost/ton Source of Cost D	ataCost Value	Value Applies to (tons)	to this Unit Process	to this Unit Process*	Cost/raw			
. 1	JIWWTP Thickening	\$1,279,606	56,040	50%	0%	\$0.00	2004	8620	\$0.00 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05; 50% assumed by AE S
	JIWWTP Dewatering/Drying	\$7,798,293	56,040	84%	0%	\$0.00	2004	8620	\$0.00 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05; Symbiont calculations of energy cost based on Alan Scrivner (AES) email 12.6. 0
	Sôdium Hydroxide for Minergy SO2 Control	\$147,000	24,400	100%	0%	\$0.00	2006	9700	\$0 Minergy GlassPack Proposal MMSD Hybrid 11 14 06 sm.pdf, Bill Beres (Minergy) email 11.14.06
	Ammonia for Minergy Nox control	\$10,800	24,400	100%	0%	\$0.00	2006	9700	\$0.00 Minergy GlassPack Proposal MMSD Hybrid 11 14 06 sm.pdf, Bill Beres (Minergy) email 11.14.06
yea	r Miner@\$25i,@io@l.@oxyge2002@nk & Van760@izer Rental\$25,7	73.20 \$25,000	per year	per year	per				Minergy GlassPack Proposal MMSD Hybrid 11 14 06 sm.pdf, Bill Beres (Minergy) email 11.14.06
	Minergy Liquid Oxygen Usage	\$50,800	24,400	100%	0%	\$0.00	2006	9700	\$0.00 Minergy GlassPack Proposal MMSD Hybrid 11 14 06 sm.pdf, Bill Beres (Minergy) email 11.14.06
	Minergy Equipment Maintenance	\$195,200	24,400	100%	0%	\$0.00	2006	9700	\$0.00 Minergy GlassPack Proposal MMSD Hybrid 11 14 06 sm.pdf, Bill Beres (Minergy) email 11.14.06
	Minergy Ash Disposal	\$13,275	24,400	100%	0%	\$0.00	2006	9700	\$0.00 Minergy GlassPack Proposal MMSD Hybrid 11 14 06 sm.pdf, Bill Beres (Minergy) email 11.14.06
Krill	medMingefgy1St@ffing48/hr/worker per Mark Kaminski & Bo	ob Sand <b>65991040</b> S	D per Bill Krill em <b>pierl t</b> /efair.0	6 per year	r per year	\$0.00	2006	9700	\$0.00 5 workers and 1 supervisor per Bil
	IPS Pipeline Sludge Transfer	varies	varies	varies	varies	\$0.00	2004	8620	\$0.00 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05; Symbiont calculations; estimated cost breakdown: DS \$1.83/dt, WAS \$5.31/dt, PS \$1.14/d
	SSWWTP WAS Thickening	\$1,989,266	56,040	50%	0%	\$0.00	2004	8620	\$0.00 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05; cost for JI GBT thickening
	SSWWTP Digestion	\$718,116	56,040	41%	0%	\$0.00	2004	8620	\$0.00 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05
					*linked to assumptions	& total cost summary	page		

## **Landfill Annual Operating & Maintenance Costs**

		Total Mass of Raw	% of Raw Sludge from	% of Raw Sludge for	Alternative			
	Process	Sludge that Cost	Left Column Actually Sent	t this Alternative Sent	Process	Cost	ENR	2020 (2007)
YearocessIndex Process Cost/ton Source of	f Cost DataCost Value	Value Applies to (tons)	to this Unit Process	to this Unit Process*	Cost/raw			
IPS Pipeline Sludge Transfer	varies	varies	varie	es varie	\$0.00	2004	8620	\$0.00 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05; Symbiont calculations; estimated cost breakdown: DS \$1.83/dt, WAS \$5.31/dt, PS \$1.14/d
SSWWTP WAS Thickening	\$1,989,266	56,040	50%	% 0%	\$0.00	2004	8620	\$0.00 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05; cost for JI GBT thickenin g
SSWWTP Digestion	\$68,003	2,168	1009	% 09	\$0.00	2004	8620	\$0.00 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05
SSW0VTP DS Thickening (energy included)	\$1,989,266	56,040	50%	% 09	\$0.00	2004	8620	\$0.0 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05; cost for JI GBT thickenin g
SSWWTP Dewatering	\$52	1	100%	6 0%	\$0.00	1987	4522	\$0.00 recessed-plate.pdf (EPA Biosolids Technology Fact Sheet (EPA 832-F-00-058), September 2000), Bill Krill email 11.16.0 6
i or peaBdfilK6NysteeetStgffingl6.06; \$48/hr/worker p	per Mark Kamin \$898 560 \$	Sander of MMSD, pBail y ferälre	mail 11.17.06 per yea	ar per yea	\$0.00	2006	9700	\$0.00 8 workers and 1 su
Cake Trucking & Landfilling	\$122	1	1009	6 0%	\$0.00	2005	9231	\$0.00 MMSDPlanA.doc , Rick Pager (Waste Management), email 7.27.05 (forwarded by Alan Scrivner (AES), email 07.28.05); inflated to be on par with assumed electrical/gas rate inflation per Bill Krill meeting 12.18
				*linked to assumptions	& total cost summar	y page		



6/2/07

## **ENERGY COSTS**

TOTAL \$21,108,990 per year

GAS			% Inflation			
	mmBTU	Current Rates	to 2007	Future Rates	Total	Required Energy Source:
direct firing of dryers	553092	\$9.250 \$/Dtherm	0%	\$9.250 \$/Dtherm	\$5,116,10	All Milo 5%Sold Daily Heat & Mass Balance 2020 ALH 12.17.xls
turbine fuel	1139553.4	\$9.250 \$/Dtherm	0%	\$9.250 \$/Dtherm	\$10,540,86	9 Tom Bachman (Triad Engineering, Inc. (Symbiont)), Technical Memorandum 5.17.05
other plant gas	588,672	9.250 \$/Dtherm	0%	\$9.250 \$/Dtherm	\$5,445,21	6 Current Rate Source:
NOx Control	0	\$9.250 \$/Dtherm	0%	\$9.250 \$/Dtherm	\$(	Mark Kaminski (MMSD) email 4.5.06 (forwarded by Bill Krill (HNTB) email 4.5.06)
Melter Start-Up	0	\$9.250 \$/Dtherm	0%	\$9.250 \$/Dtherm	\$(	O Inflation Source:
				Gas Total \$21,102,186	3	

### **ELECTRICAL**

Transmission Level Service  Facilities Charge On Peak Energy Charge Off Peak Energy Charge On-Peak Demand Charge Customer Demand Charge	Current Rates 0 \$6,300 /year 0 \$0.0603 /kWh 0 \$0.0312 /kWh 0 \$10.2160 /kW 0 \$0.0000 /kw	% Inflation to 2007 Future Rates  8% \$6,804 /year 8% \$0.0651 /kWh 8% \$0.0337 /kWh 8% \$11.0333 /kW 8% \$0.0000 /kw  Transmission Electric Total	Total \$0	Required Energy Source:  \$0  \$0  \$0  Current Rate Source:  Wisconsin Electric Power Company, Volume 19 Electric Rates, Rev. 5, Sheet 65, Issued 1/26/06  Inflation Source:  Mark Kaminski (MMSD) email 4.5.06 (forwarded by Bill Krill (HNTB) email 4.5.06)
Interruptible Service  Facilities Charge On Peak Energy Charge Off Peak Energy Charge On-Peak Demand Charge Customer Demand Charge	Current Rates \$9,600 /year \$0.05574 /kWh \$0.02990 /kWh \$0.05024 /kW \$0.000 /kw	% Inflation to 2007 Future Rates  8% \$10,368 /year  8% \$0.0602 /kWh  8% \$0.0323 /kWh  8% \$0.0543 /kW  8% \$0.0000 /kw	Total	Required Energy Source:  \$0  \$0 Current Rate Source:  \$0 Wisconsin Electric Power Company, Volume 19 Electric Rates, Rev. 3, Sheet 81.1-81.2, Issued 1/26/06  \$0 Inflation Source:  \$0 Mark Kaminski (MMSD) email 4.5.06 (forwarded by Bill Krill (HNTB) email 4.5.06)
Current Service		Interruptible Electric Total  % Inflation	\$0	
Facilities Charge On Peak Energy Charge Off Peak Energy Charge On-Peak Demand Charge Customer Demand Charge	Current Rates 1 \$6,300 /year \$0.0613 /kWh \$0.0331 /kWh \$10.3800 /kW \$0.7600 /kw	to 2007 Future Rates 8% \$6,804 /year 8% \$0.0662 /kWh 8% \$0.0357 /kWh 8% \$11.2104 /kW 8% \$0.8208 /kw	Total	\$6,804 Current Rate Source:  \$0 Wisconsin Electric Power Company, Volume 19 Electric Rates, Rev. 5, Sheet 65, Issued 1/26/06  \$0 Inflation Rate Source:  \$0 Mark Kaminski (MMSD) email 4.5.06 (forwarded by Bill Krill (HNTB) email 4.5.06)

#### SSWWTP DIGESTION ENERGY CREDIT

Density of VSS destroyed

15 cf/lb

Alan Scrivner (AES) phone conversation 8.23.06

Heat Value of Offgas

600 BTU/cf

Alan Scrivner (AES) phone conversation 8.23.06

Cost per ton VSS destroyed \$ 166.50 using cost of gas shown above



TABLE 9G-4 SHEET 10 OF 11

RECOMMENDED BIOSOLIDS PLAN ALTERNATIVE 4 – COMBINE MILORGANITE® PROGRAM WITH LAND APPLICATION

2020 TREATMENT REPORT

6/2/07 TR\_9G.T004.07.06.02.cdr

## **ASSUMPTIONS**

## **MASS BALANCE**

Source: Appendix 9F, Biosolids Recommended Plan Alternatives – Mass Balances, Table 9F-4, Recommended Biosolids Plan Alternative 4 - Combine Milorganite® Program with Land Application

63.00%
0.00%
0.00%
26.00%
0.00%
42.70%
50906
100.00%
0.00%
0.00%
509
9979
100.00%
0.00%
0
26222

### **USEFUL LIFE**

Land	Permanent	
Sewer & Force Mains	50 years	Symbiont assumption
Structures, Piping, & Valves	40 years	Symbiont assumption
Process Equipment, Electrical, I&C	20 years	Symbiont assumption

## **UNDESIGNED DETAILS ALLOWANC E**

all inclusive firm bid price all major components have documented installed unit costs	0% Bill Krill (HNTB), phone conference 11.16.06 10% Symbiont assumption
costs missing for some components, but other costs are for	20%
installed facilities and well documented (connections to existing systems, etc.)	Symbiont assumption
installed costs for major components are not well documented	40%
(eg. Installation cost is estimated)	Symbiont assumption

### CONTINGENCY

all inclusive firm bid price	0% Bill Krill (HNTB), phone conference 11.16.06
everything else	25% Bill Krill (HNTB), phone conference 11.16.06

## **DESIGN, BIDDING, & OVERSITE**

all inclusive firm bid price (design complete, no bidding)	15% Bill Krill (HNTB), phone conference 11.16.06
everything else	35% Bill Krill (HNTB), phone conference 11.16.06



TABLE 9G-4 SHEET 2 OF 11

RECOMMENDED BIOSOLIDS PLAN ALTERNATIVE 4 – COMBINE MILORGANITE® PROGRAM WITH LAND APPLICATION

2020 TREATMENT REPORT

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### **COST ESTIMATE SUMMARY**

### **General Description**

All treatment plant primary sludge is digested and then combined with raw secondary sludge. The sludge blend is controlled to produce some classic Milorganite® meeting the 6% nitrogen guarantee while the remaining blend is dried and fed to the Glass Furnace to capture energy and glass aggregate. Construction requires 7 new GBT's for

Biosolids Load 81,000	Influent Sludge	33,700	Finished Biosolids
Biosolids Influent Load Distribution			
33%	Milorganite®	0%	Dewatered Cake Agrilife
67%	Glass Furnace	0%	Landfill

ENR Index = 10000 (assumed Milwaukee 2007)
Interest Rate per Year = 5.125%

Summary of Capital Costs	
JIWWTP TURBINE UPGRADES	\$16,460,000
JIWWTP COOLING WATER PUMP UPGRADES	\$600,000
JIWWTP DEWATERING AND DRYING FACILITY UPGRADES	\$114,740,000
JIWWTP NEW LOCOMOTIVE	\$3,050,000
JIWWTP NEW GLASS FURNACE PROCESS	\$32,650,000
JIWWTP NEW GLASS FURNACE AND TURBINE BUILDINGS	\$11,395,000
INTERPLANT SLUDGE PIPELINE UPGRADES	\$2,870,000
SSWWTP NEW GRAVITY BELT WAS THICKENERS	\$7,580,000
SSWWTP DIGESTER REHABILITATION	\$117,430,000
SALVAGE VALUE	-\$19,560,000

Total Capital Cost \$287,220,000

## Summary of Annual Operation & Maintenance Costs

Total Annual Cost \$32,740,000

Life Cycle Analysis

 Number of Years
 20

 Present Worth Factor
 12.331

Present Worth of Total Annual Operation & Maintenance Costs \$403,720,000

Process	Cost	ENR Index	Year	PW
Major unit refractory replacement	185,000	9,700	10	\$115,702
Fabric filter bag replacement	32,000	9,700	5	\$25,695
abric filter bag replacement	32,000	9,700	10	\$20,013
Present Worth of Total Non-Annual C	Operation & Maintena	nce Costs		\$160,000



TABLE 9G-5 SHEET 1 OF 13

RECOMMENDED BIOSOLIDS PLAN ALTERNATIVE 5 – COMBINE MILORGANITE® PROGRAM WITH GLASS FURNACE TECHNOLOGY

2020 TREATMENT REPORT

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	JIWV	NTP TURE	BINE UPGRA	DES CAPITA	L COST													
							Tot	al Capital Cost =	Tota	I Salvage Value =								
								\$16,460,000		\$85,000	< insert link to	this cost	on the Capi	ital Cost Summar	y Worksheet			
					Un-		Design,											
					designed	Conting-	Bidding, &				Actual		OST ADJUS		ADJUSTED			
DESCRIPTION	Quantity	Units	Unit Cost (\$)	SUBTOTAL (\$)	Details (%)	ency (%)	Oversight (%)	SUBTOTAL (\$)	Life (Years)	Salvage Value (\$)	Unit Cost (\$)	Cost Year	ENR Index	Adjustment Factor	UNIT COST (\$)	SOURCE	MANUFACTURER	COMMENTS
DIVIDION O DITE CONSTRUCTION																		
DIVISION 2: SITE CONSTRUCTION  Trenching, Pavement Removal, Backfill and Patching for Electrical	800	IE	\$60	\$48,000	20%	25%	35%	\$100,000	20	\$0	\$60	2006	9700	1.03	\$62	TurbineOptionESTIMATE.xls, Tony Pohl (Automation Service & Design Inc.), email 3.28.06	TBD	
Duct	000	Li	φου	Ψ40,000	20 /6	2576	3378	\$100,000	20	ΨU	φου	2000	3700	1.03	Ψ02	Taibine Option L3 Thirt L.xis, Tony Form (Automation Service & Design Inc.), email 3.20.00	IBD	
Manholes for Electrical Duct	4	each	\$10,000	\$40,000	20%	25%	35%	\$80,000	40	\$40,000	\$10,000	2006	9700	1.03	\$10,309	TurbineOptionESTIMATE.xls, Tony Pohl (Automation Service & Design Inc.), email 3.28.06	TBD	
Division 2 Subtotal	\$180,000																	
DIVISION 11: EQUIPMENT																		
14.4 MW Combustion Turbine Generator		each	\$4,709,000	\$4,709,000	10%	25% 25%	35%	\$8,740,000	20	\$0 \$0	\$4,567,250	2006	9700 9700	1.03 1.03	\$4,708,505	Solar 130 Installed Cost 24MAR06.xls, Robert Gavahan (PEC), email 03.27.06	Solar Titan 130	cost for two CTs divided by 2
Station Control System for Turbine Turbine Commissioning Parts, Startup, Site Testing		each each	\$278,000 \$99,000	\$278,000 \$99,000	10% 10%	25% 25%	35% 35%	\$520,000 \$180,000	20 20 20	\$0 \$0	\$270,000 \$96,100	2006 2006	9700	1.03	\$278,351 \$99,072	Solar 130 Installed Cost 24MAR06.xls, Robert Gavahan (PEC), email 03.27.06 Solar 130 Installed Cost 24MAR06.xls, Robert Gavahan (PEC), email 03.27.06	Solar Titan 130 Solar Titan 130	cost for two CTs divided by 2 cost for two CTs divided by 2
Turbine Shipping		each	\$122,000	\$122,000	10%	25%	35%	\$230,000	20	\$0	\$118,050	2006	9700	1.03	\$121,701	Solar 130 Installed Cost 24MAR06.xls, Robert Gavahan (PEC), email 03.27.06	Solar Titan 130	cost for two CTs divided by 2
Turbine Construction Estimate		each	\$1,811,000	\$1,811,000	10%	25%	35%	\$3,360,000	20	\$0	\$1,756,650	2006	9700	1.03	\$1,810,979	Solar 130 Installed Cost 24MAR06.xls, Robert Gavahan (PEC), email 03.27.06	Solar Titan 130	cost for two CTs divided by 2
Division 11 Subtotal	\$13,030,000																	
DIVISION 15: MECHANICAL																		
Exhaust Ductwork from Turbine Building to Existing Duct System -	500	lf	\$1,000	\$500,000	40%	25%	35%	\$1,180,000	20	\$0	\$750	2006	9700	1.03	\$773	Symbiont engineering judgment	TBD	
120" special alloy exhaust pipe w/pile supports																		
Fuel Gas and Fuel Oil Piping to Turbine Building	1	allowance	\$40,000	\$40,00 <b>6</b> nt	engineer400%jud	gment 25%	35%	\$90,000	40	\$45,000	\$39,000	2006	9700	1.03	\$40,206	Symb	TBD	
Division 15 Subtotal	\$1,270,000																	
DIVISION 16: ELECTRICAL																		
Connections to Existing Plant Control System	1	allowance	\$103,000	\$103,000 er	ngineerin <b>g 90</b> 6gn	nent 25%	35%	\$240,000	20	\$0	\$100,000	2006	9700	1.03	\$103,093	Symbiont	TBD	
3-4" Concrete encased PVC Conduit ductbank	800	LF	\$80	\$64,000	20%	25%	35%	\$130,000	20	\$0	\$80	2006	9700	1.03	\$82	TurbineOptionESTIMATE.xls, Tony Pohl (Automation Service & Design Inc.), email 3.28.06	TBD	
350kcmil 1/c 15KV Copper		LF .	\$20	\$144,000	20%	25%	35%	\$290,000	20	\$0	\$20	2006	9700	1.03	\$21	TurbineOptionESTIMATE.xls, Tony Pohl (Automation Service & Design Inc.), email 3.28.06	TBD	
Switchgear and MCC for Turbine	1	each	\$709,000	\$709,000	10%	25%	35%	\$1,320,000	20	\$0	\$687,500	2006	9700	1.03	\$708,763	Solar 130 Installed Cost 24MAR06.xls, Robert Gavahan (PEC), email 03.27.06	Solar Titan 130	cost for two CTs divided by 2
Division 16 Subtotal	\$1,980,000																	
											l)							



TABLE 9G-5 SHEET 2 OF 13 RECOMMENDED BIOSOLIDS PLAN

**ALTERNATIVE 5 – COMBINE** MILORGANITE® PROGRAM WITH GLASS FURNACE TECHNOLOGY
2020 TREATMENT REPORT
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			aukee Metropolitan 9 020 FACILITIES																
	JIWWTP C	OOLING W	ATER PUMP	<b>UPGRADES</b>	CAPITAL (	COSTS													
							To	otal Capital Cost =	Tota	l Salvage Value =	П								
								\$600,000		\$0	< insert li	nk to this co	ost on the C	apital Cost	Summary	Worksheet			
					Un-		Design,												
					designed	Conting-	Bidding, &				Actual		COST AD	JUSTMENT		ADJUSTED			
			Unit Cost	SUBTOTAL	Details	ency	Oversite	SUBTOTAL	Life	Salvage Value	Unit Cos					UNIT COST			
DESCRIPTION	Quantity	Units	(\$)	(\$)	(%)	(%)	(%)	(\$)	(Years)	(\$)	(\$)	Yea	r Index	x Fa	actor	(\$)	SOURCE	MANUFACTURER	COMMENTS
DIVISION 11: EQUIPMENT																			
New 3000 gpm, 173' TDH Vertical Turbine Cooling Water Pumps	2	each	\$128,000	\$256,000	9 JIWW <b>749</b> %	orth Utility P256%	Station De356ae	Training \$600,000,00a	nuary 19 <b>22</b>	\$0	\$62,8	63 1990	0 4894	. 2	2.04	\$128,44		Fairbanks Morse Pump Corp.	+30% for installation (cost was listed for both pumps and thus is divided by 2 here)
J			,			, , , , , , ,		3,.,.,.	, , , , , ,							,			, , , , , , , , , , , , , , , , , , , ,
Division 11 Subtotal	\$600,000										I								



TABLE 9G-5 SHEET 3 OF 13 RECOMMENDED BIOSOLIDS PLAN **ALTERNATIVE 5 – COMBINE** MILORGANITE® PROGRAM WITH GLASS FURNACE TECHNOLOGY
2020 TREATMENT REPORT
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## D&D FACILITY UPGRADES CAPITAL COST

							To	tal Capital Cost =	Tota	Salvage Value =
								\$114,740,000		\$0
			Unit Cost	SUBTOTAL	Un- designed Details	Conting- ency	Design, Bidding, & Oversite	SUBTOTAL	Life	Salvage Value
DESCRIPTION	Quantity	Units	(\$)	(\$)	(%)	(%)	(%)	(\$)	(Years)	(\$)
DIVISION 13: SPECIAL CONSTRUCTION										
Unit Process 24 Upgrade	1	lump sum	\$6,495,000	\$6,495,000	40%	25%	35%	\$15,340,000	20	\$0
Unit Process 25 Upgrade	1	lump sum	\$17,453,000	\$17,453,000	40%	25%	35%	\$41,230,000	20	\$0
Unit Process 27 Upgrade	1	lump sum	\$4,062,000	\$4,062,000	40%	25%	35%	\$9,600,000	20	\$0
Unit Process 29 Upgrade	1	lump sum	\$12,629,000	\$12,629,000	40%	25%	35%	\$29,840,000	20	\$0
Unit Process 30 Upgrade	1	lump sum	\$1,278,000	\$1,278,000	40%	25%	35%	\$3,020,000	20	\$0
Unit Process 31 Upgrade	1	lump sum	\$747,000	\$747,000	40%	25%	35%	\$1,760,000	20	\$0
Unit Process 32 Upgrade	1	lump sum	\$2,809,000	\$2,809,000	40%	25%	35%	\$6,640,000	20	\$0
Miscellaneous Costs (drop chutes, etc.)	1	lump sum	\$3,093,000	\$3,093,000	40%	25%	35%	\$7,310,000	20	\$0
Division 13 Subtotal	\$114,740,000									

## --- insert link to this cost on the Capital Cost Summary Worksheet

	Actual	C	OST ADJU	STMENT	ADJUSTED			
ι	Jnit Cost	Cost	ENR	Adjustment	UNIT COST			
l	(\$)	Year	Index	Factor	(\$)	SOURCE	MANUFACTURER	COMMENTS
	\$6,300,000	2006	9700	1.03	\$6,494,845	DD Facility Upgrade Estimate (npb edit 11-21-06).xls, Review of Plant Projects reports and Symbiont engineering judgment	TBD	
5	\$16,929,000	2006	9700	1.03	\$17,452,577	DD Facility Upgrade Estimate (npb edit 11-21-06).xls, Review of Plant Projects reports and Symbiont engineering judgment	TBD	
	\$3,940,000	2006	9700	1.03	\$4,061,856	DD Facility Upgrade Estimate (npb edit 11-21-06).xls, Review of Plant Projects reports and Symbiont engineering judgment	TBD	
5	\$12,250,000	2006	9700	1.03	\$12,628,866	DD Facility Upgrade Estimate (npb edit 11-21-06).xls, Review of Plant Projects reports and Symbiont engineering judgment	TBD	
	\$1,240,000	2006	9700	1.03	\$1,278,351	DD Facility Upgrade Estimate (npb edit 11-21-06).xls, Review of Plant Projects reports and Symbiont engineering judgment	TBD	
	\$725,000	2006	9700	1.03	\$747,423	DD Facility Upgrade Estimate (npb edit 11-21-06).xls, Review of Plant Projects reports and Symbiont engineering judgment	TBD	
	\$2,725,000	2006	9700	1.03	\$2,809,278	DD Facility Upgrade Estimate (npb edit 11-21-06).xls, Review of Plant Projects reports and Symbiont engineering judgment	TBD	
	\$3,000,000	2006	9700	1.03	\$3,092,784	DD Facility Upgrade Estimate (npb edit 11-21-06).xls, Review of Plant Projects reports and Symbiont engineering judgment	TBD	



TABLE 9G-5 SHEET 4 OF 13

RECOMMENDED BIOSOLIDS PLAN
ALTERNATIVE 5 – COMBINE
MILORGANITE® PROGRAM WITH
GLASS FURNACE TECHNOLOGY

		NEW LC	COMOTIVE C	<b>APITAL COS</b>	TS					
							To	tal Capital Cost =	Tota	l Salvage Value =
								\$3,050,000		\$0
					Un-		Design,			
					designed	Conting-	Bidding, &			
DECORIDATION	0	1114	Unit Cost	SUBTOTAL	Details	ency	Oversite	SUBTOTAL	Life	Salvage Value
DESCRIPTION	Quantity	Units	(\$)	(\$)	(%)	(%)	(%)	(\$)	(Years)	(\$)
DIVISION 11: EQUIPMENT										
New Locomotive	1	lump sum	\$1,289,000	\$1,289,000	40%	25%	35%	\$3,050,000	20	\$0
Division 11 S	Subtotal \$3,050,000									

## <---- insert link to this cost on the Capital Cost Summary Worksheet

Actual Unit Cost	Cost	OST ADJU	JSTMENT Adjustment	ADJUSTED UNIT COST			
(\$)	Year	Index	Factor	(\$)	SOURCE	MANUFACTURER	COMMENTS
\$1,250,000	2006	9700	1.03	\$1,288,660	Alan Scrivner (AES), email 4.05.06	TBD	



TABLE 9G-5 SHEET 5 OF 13

RECOMMENDED BIOSOLIDS PLAN

ALTERNATIVE 5 – COMBINE

MILORGANITE® PROGRAM WITH

GLASS FURNACE TECHNOLOGY

			nukee Metropolitan : 020 FACILITIES															
N	EW GLAS	S FURNAC	CE PROCESS	EQUIPMEN	IT CAPITA	AL COST												
	-							tal Capital Cost =	Tota	al Salvage Value =								
								\$32,650,000	)	\$0	< insert li	nk to this co	st on the C	apital Cost Summ	ary Worksheet			
					Un-		Design,											
			Unit Cost	SUBTOTAL	designed Details	Conting-	Bidding, &	SUBTOTAL	Life	Salvage Value	Actual Unit Cos			JUSTMENT	ADJUSTED UNIT COST			
DESCRIPTION	Quantity	Units	(\$)	(\$)	(%)	(%)	Oversite (%)	(\$)	(Years)	(\$)	(\$)	Year		Factor	(\$)	SOURCE	MANUFACTURER	COMMENTS
DIVISION 13: SPECIAL CONSTRUCTION																		
Glass Furnace Facility Equipment		1 lump sum	\$28,351,000	\$28,351,000	0%	0%	10%	\$31,190,000	20	\$0	\$27,500,	2006	9700	1.03	\$28,350,515	Minergy GlassPack Proposal MMSD Hybrid 11 14 06 sm.pdf, Bill Beres (Minergy) email 11.14.06	Minergy	includes 10% OH & general cost, 15% for subcontractor work, 7% general contractor markup on subcontracts
Dense Phase Conveyance System from Silos to Glass Furnace		1 lump sum	\$616,000	\$616,000	16,49540%	an Roe (Dy2152%)	nic Air Inc.),3651% ai	1.26.06\$ (f;4/6/09/00/06	d via Alan <b>30</b> ri	vner (AES), ema\$011	.22.06) \$598,	000 D <b>2006</b>	h0:%A/inp <b>ening</b> 0:		\$6	, , , , , , , , , , , , , , , , , , ,		
Division 13 Subtotal	\$32,650,00	0												_				



TABLE 9G-5 SHEET 6 OF 13 RECOMMENDED BIOSOLIDS PLAN **ALTERNATIVE 5 – COMBINE** MILORGANITE® PROGRAM WITH GLASS FURNACE TECHNOLOGY
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	NE	W GLASS FURNACE	AND TURBIN	IE BUILDING	S CAPITAL	LCOST											
							Total Capital Cos	t = Total	Salvage Value =								
							\$11,395,0	100	\$2,075,000	< insert link	to this cost or	n the Capita	I Cost Summary We	orksheet			
					Un-		esign,										
						-	dding, &			Actual		OST ADJUST		ADJUSTED			
DESCRIPTION		Quantity Units	Unit Cost (\$)	SUBTOTAL (\$)	Details (%)		versite SUBTOTAL (%) (\$)	. Life (Years)	Salvage Value (\$)	Unit Cost	Cost Year	ENR Index	Adjustment U Factor	UNIT COST	SOURCE	MANUFACTURER	COMMENTS
DIVISION 2: SITE CONSTRUCTION						(7-7)	(11)		(+)	(+)	- <del></del> .			(+)			
Asphalt removal for building install		2,556 SY	\$8	\$20,444	0 250 52200%	25%	35% TBD\$41,0	000 <b>48</b> ite	demolition,\$82,0020ve c	oncrete, mesh re	force 22,010/66" thi	ick97600cludes	s haulift@and disposa	al fees \$8	RSMEANS COSTWORKS 2006 QTR 3; 02 22		
Concrete Repair		4,500 SF	\$2	\$9,000			rade,35% thick, include \$16x1	0.00@d finish on#y0	\$3,000	\$2	2006	9700	1.03	\$2	RSMEANS COSTWORKS 2006 QTR 3; 03 310 240 5010	TBD TBD TBD	Structura
Utility Trench Excavation		500 LF	\$3	\$1,500	cava20%, tren	nch, co <b>25%</b> te curb,	, ste@1570/rms, 6' to 10'd&@40	00 1/2 C.Y. balcket,	, hydraulic <b>\$40,00</b> e, e	cludes sheeting6	ir dew <b>2006</b> ng	9700	1.03		RSMEANS COSTWORKS 2006 QTR 3; 02 315 610 0610	TBD	Ex
Utility Trench Backfill Utility Trench Compaction		667 CY 667 CY	\$3 \$7	\$2,000 \$4,667			buc86%100' haul, fron\$4,6		ounted, excl\$itl#£99hee \$2,000	ng or dewaterin	2006	9700 9700	1.03 1.03		RSMEANS COSTWORKS 2006 QTR 3; 02 315 610 3090 RSMEANS COSTWORKS 2006 QTR 3; 02 315 110 0800	TBD TBD	Exca Ra
Utility Trench Compaction		667 CY	\$7	\$4,667	скиц%2" іа	iyers, commaction in	n lay265% hand tamp, a\$9,10	suabove 40	\$2,000	\$6	2006	9700	1.03	\$7	RSMEANS COSTWORKS 2006 QTR 3; 02 315 110 0800	IBD	ва
	Division 2 Subtotal	\$75,000															
DIVISION 3: CONCRETE																	
Aggregate pad		60 CY	\$397	\$23,820	20%	25%	35% \$50,0	000 40	\$9,000@ace	grade wall, 1\$2385	ick x 2000h, in	ncl <b>9769</b> form	s(4 ustes) reinforcing	q steel, a\$120917	nishRBMEANS COSTWORKS 2006 QTR 3; 03 310 240 4260	TBD	Structural concrete,
Utility Trench Repair		56 CY	\$196	\$10,889	D 20%		con36%, in place, sl\$200	0@rade, 6" thield, in					1.03		RSMEANS COSTWORKS 2006 QTR 3; 03 310 240 4700	ТВ	
	Division 3 Subtotal	\$70,000															
DIVISION 13: SPECIAL CONSTRUCTION																	
Melter/Turbine & Oxygen Buildings		23,475 sf	\$228	\$5,352,300	06 OTG92: Tu	urhina-CESSuildina (	Cost3566STWOR6506840,0	000 40	\$1,995,000	\$221	2006	9700	1.03	\$228	RSMEANS COSTWORKS 20	TBD	Factory, 1 Story, Precast Concrete Panels / Steel Frame w/steel H section piles
Wester/Turbine & Oxygen Buildings		23,473	Ψ220	ψ5,552,500	00 022000, 70	inbine-castalanding (	DOSIGNADO FEFO (CONTRACTO)	40	\$1,333,000	Ψ22 Ι	2000	3700	1.00	9220	NOMEANO COSTWORNO 20	100	raciony, raciony, recast condete ranes / Steer rane water racialon piles
	Division 13 Subtotal	\$10,840,000															
DIVISION 15: MECHANICAL																	
Natural Gas Supply		500 LF	\$36	\$18,000	, <b>20</b> 961, bla	ack, wel2566, 3" diar	mete35% hedule 40 \$40,0	000 40	\$7,000	\$35	2006	9700	1.03	\$36	RSMEANS COSTWORKS 2006 QTR 3; 15 107 620 2090	TBD	Pipe
Instrument Air Supply		500 LF	\$34	\$17,000			weig85%-1/2" diamet680,0		\$6,000	\$33		9700	1.03		RSMEANS COSTWORKS 2006 QTR 3; 15 107 220 1200	TBD TBD	P
Cooling Water Supply		500 LF	\$166	\$83,000	20%	25%	35% \$170,0		\$31,000	\$161		9700	1.03		RSMEANS COSTWORKS 2006 QTR 3; 15 107 620 2150	TBD	Pipe, steel, black, welded, 10" diameter, schedule 40
Potable Water Supply		500 LF	\$34 \$12	\$17,000			weig36,%1-1/2" diamet660,0		\$6,000	\$33		9700	1.03		RSMEANS COSTWORKS 2006 QTR 3; 15 107 220 1200	TBD TBD	Pi Bio DVC and attended
Building Drain		500 LF	\$12	\$6,000	20%	25%	35% \$10,0	40	\$290000 40	4" diameter \$12	2006	9700	1.03	\$12	RSMEANS COSTWORKS 2006 QTR 3; 15 108 520 1940	IRD	Pipe, PVC, socket weld,
	Division 15 Subtotal	\$280,000															
DIVISION 16: ELECTRICAL Power Feed		4	eco oco	#c0.ccc	200/	250/	250/ 2400/	000		e transfor <b>\$60,</b> \$00	2	0700	4.00	BC4 050	Combined california hazard an accordance of	TDD	Estimate includes n
Power reed		1 ea	\$62,000	\$62,000	20%	25%	35% \$130,0	000 20	ew medium@blta	e transformed AD (d)	oricul <b>czors</b> tóne	nw an and	1.03	\$61,856	Symbiont estimate based on recent project	TBD	Estimate includes it
	Division 16 Subtotal	\$130,000															



TABLE 9G-5 SHEET 7 OF 13 RECOMMENDED BIOSOLIDS PLAN **ALTERNATIVE 5 – COMBINE** MILORGANITE® PROGRAM WITH **GLASS FURNACE TECHNOLOGY** 

	INTERPLAI	NT SLUDGI	E PIPELINE U	JPGRADES C	APITAL C	OSTS												
							Tot	tal Capital Cost =	Tota	al Salvage Value =								
							Declar	\$2,870,000		\$0	< insert link t	o this cost	on the Capi	ital Cost Summar	y Worksheet			
					Un- designed	Conting-	Design, Bidding, &				Actual	c	OST ADJUS	STMENT	ADJUSTED			
			Unit Cost	SUBTOTAL	Details	ency	Oversite	SUBTOTAL	Life	Salvage Value	Unit Cost	Cost	ENR	Adjustment	UNIT COST			
DESCRIPTION	Quantity	Units	(\$)	(\$)	(%)	(%)	(%)	(\$)	(Years)	(\$)	(\$)	Year	Index	Factor	(\$)	SOURCE	MANUFACTURER	COMMENTS
DIVISION 11: EQUIPMENT																		
JIWWTP and SSWWTP Hard Metal Pumps & Motors Rated for 300	12	each	\$93,000	\$1,116,000	20%	25%	35%	\$2,260,000	20	000 per <b>60</b> mp	for installa <b>\$96</b> ,000	2006	9700	1.03	\$92,784	Mickey (RDM), phone conversation 03.28.06	TBD	includes \$5
psi																		
Division 11 Subtotal	\$2,260,000																	
DIVISION 16: ELECTRICAL																		
Pipeline Cathodic Protection  Division 16 Subtotal	\$610,000	allowance	\$258,000	\$258,000	40%	25%	35%	\$610,000	20	\$0	\$250,000	2006	9700	1.03	\$257,732	Symbiont engineering judgment	TBD	



TABLE 9G-5 SHEET 8 OF 13

RECOMMENDED BIOSOLIDS PLAN

ALTERNATIVE 5 – COMBINE

MILORGANITE® PROGRAM WITH

GLASS FURNACE TECHNOLOGY

	SSWWT	P DIGES	TER REHABIL	ITATION CAP	ITAL CO	ST				
							То	tal Capital Cost =	Tota	I Salvage Value =
								\$117,430,000		\$17,159,000
					Un-	0	Design,			
			Unit Cost	SUBTOTAL	designed Details	Conting- ency	Bidding, & Oversite	SUBTOTAL	Life	Salvage Value
DESCRIPTION	Quantity	Units	(\$)	(\$)	(%)	(%)	(%)	(\$)	(Years)	(\$)
DIVISION 3: CONCRETE										
Five New Covered & Insulated Digester Tanks with access equipment (125' diameter, 38' side water depth, 5' free board)	19,735,583	gallons	\$2	\$39,471,166	40%	25%	35%	\$93,250,000	40	\$17,159,000
Division 3 Subtotal	\$93,250,000									
DIVISION 11: EQUIPMENT										
New Digester Mixing Systems - External Draft Tube Mixers for 110' diameter	17	each	\$468,000	\$7,956,000	40%	25%	35%	\$18,800,000	20	\$0
New Digester Recirculation Pumps - 10 HP motors, 250 gpm @ 60' TDH	22	each	\$15,000	\$330,000	40%	25%	35%	\$780,000	20	\$0
Recirculating Sludge Heat Exchangers -Sludge-Hot Water Systems	11	each	\$42,000	\$462,000 2,24	49 40%	25%	35%	\$1,090,000	20	\$0
Storage Digester Sludge Transfer Pumps - 30 HP motors, VFD, 1200 gpm @ 60' TDH	11	each	\$55,000	\$605,000	40%	25%	35%	\$1,430,000	20	\$0
Digester Gas Safety Equipment	1	allowance	\$812,000	\$812,000	40%	25%	35%	\$1,920,000	20	\$0
Division 11 Subtotal	\$24,020,000		1							
DIVISION 15: MECHANICAL										
New Boiler	1	each	\$67,000	\$67,000	40%	25%	35%	\$160,000	20	\$0
Division 15 Subtotal	\$160,000									
Division 15 Subtotal	\$100,000									

Actual		OST ADJU		ADJUSTED			
Unit Cost (\$)	Cost Year	ENR Index	Adjustment Factor	UNIT COST (\$)	SOURCE	MANUFACTURER	COMMENTS
\$2	2007	10000	1.00	\$2	Symbiont engineering judgment	TBD	
\$431,600	2005	9231	1.08	\$467,555	Wiscosin Project Triad Ebg EWT Mixer Budget Price 07-14-05.doc , Bob Lacey (Energenees), email 07.14.05	Eimco, RDT-T	+30% for install
\$13,650	2005	9231	1.08	\$14,787	Rich Hussey (Ley Associates), email 07.26.05	Wemco-Hidrostal, D4K-HS	+30% for install
\$39,000	2005	9231	1.08	\$4	Biosolids Alternative Sizing Worksheets r4.xls , Symbiont	Alfa Laval	+30% for install
\$51,025	2005	9231	1.08	\$55,276	Rich Hussey (Ley Associates), email 07.26.05	Wemco-Hidrostal, E5K-S	+30% for install, +250% for V
\$750,000	2005	9231	1.08	\$812,480	Symbiont engineering judgment		



TABLE 9G-5 SHEET 9 OF 13 RECOMMENDED BIOSOLIDS PLAN **ALTERNATIVE 5 – COMBINE MILORGANITE® PROGRAM WITH GLASS FURNACE TECHNOLOGY** 

												7											
				aukee Metropolitan		ct																	
New SSWWTP Gravity Belt Thickeners for WAS Thickening Capital Cost  Total Capital Cost = Total Salvage Value =																							
						Un-		Design,	\$7,580,000		\$241,000	< insert link			tal Cost Summa								
DESCRIPTION		Quantity	Units	Unit Cost (\$)	SUBTOTAL (\$)	designed Details (%)	Conting- ency (%)	Bidding, & Oversite (%)	SUBTOTAL (\$)	Life (Years)	Salvage Value (\$)	Actual Unit Cost (\$)		COST ADJUS ENR Index	Adjustment Factor	ADJUSTEI UNIT COST (\$)		SOURCE		MANUFACTURER		COMMENTS	
DIVISION 2: SITE CONSTRUCTION		Quantity	Onits	(4)	(4)	(70)	(70)	(/6)	(4)	(Teals)	(4)	(3)	Teal	illuex	T actor	(*)	_	SOURCE		MAROTACTORER		COMMENTS	
Demolition	Division 2 Subtotal	\$60,000	lump sum	\$26,000	\$26,00	00 40%	25%	35%	\$60,000	20	ded via Kat <b>⊚</b> Ziin	(HNTB), f <b>s\$∠2,50</b>	006) 2004	867200	1.16	+25% cor <b>92</b> 6;tt	20.8. Př. panrk Těledríshtá (skřiží ),408é huni dalí slágenem rahrtá ülera f	alsotissed (lie meumo)					
DIVISION 4: MASONRY		\$60,000																					
Masonry Restoration - Cut and Repoint Brick		1	lump sum	\$22,000	\$22, <b>6</b> T	00, Technical <b>40%</b>	orandum 12565.	04 (forwar <b>ds6t</b> /wia	Kate Ziin <b>≎(ii)∜0B</b>	I), fax 9.27.206)	T₿D	\$18,75	25% c200reat	esigû <b>86</b> 2 <b>p</b> etaTi	e citistel dilateri(40 You	emo) \$21,7	2 Frank Tiefert (						
	Division 4 Subtotal	\$50,000																					
DIVISION 11: EQUIPMENT GBT Equipment		1	lump sum	\$1,624,000	\$1,624,00	00 40%	25%	35%	\$3,840,000	20	1.15.04 (for\$@ard	de Ivia Ka <b>84,Z00</b> 0,00	@NTB)2 <b>0:04</b> 9	.27.0 <b>6</b> )620	1.11BD	\$1,624,1	025%Fcankr Tüster O(&FlipeTeTürchi dalekhen(4003io dunde)	###@Wickelook allocations and the property of the control of the c	alternatives				
Thickened Sludge Pumps Washwater Pumps Polymer System		1 1 1	lump sum lump sum lump sum	\$322,000 \$63,000 \$183,000	\$63,00	00 11.15.04 (400%)	arded via K25%Z	d via Kate <b>Zīiń</b> e (H liino (HNTB)5fáx 9 35%	(NTB), 186/1962,9006 (.27.06) \$150,000 \$430,000	TBD 20	TBD \$0 +250% orwarded v@0Ka	+25%\$20nt(act	tor Oszoper 8Tech 1202040 9.272080)4	Te <b>chshibble</b> d4 (40 <b>%6600)</b> \$73 8620 T	(0) Ya eumolog Strig Metalo (Metalo dueta di (6) na il Saor ( (BD 1.16	detaolsnt \$63/22/32  TsGBTS fojt03/4 +25782-3	WS (férátnik Bikdents(水砂), Technical Macristawic Tiefert (ATI), Technical Memorandum fő-acifő-é9AFT pefertfe(4ff )), dimch (40% Modustig) felakulad	eddolesidlisiq (Fs@iBTis:rfoerttis); alternative	ves				
	Division 11 Subtotal	\$5,180,000																					
DIVISION 13: SPECIAL CONSTRUCTION Building Modifications		1	lump sum	\$281,000	\$281,06	adai Memoran <b>d0‰</b>	11.15.04 (f <b>@5</b> %a)	rded via Ka <b>llé Z</b> iind	o (HNTB <b>)\$6600 90207</b>	7.06) 40	TBD \$121,000	+2 <b>\$%</b> 4&\$@	Octor 2004 p	<b>TedB30d</b> isto	<b>ed,40%a&amp;m6è</b> }signe	ed d \$281,3	3 Frank Tiefert (ATI), Tech						
	Division 13 Subtotal	\$660,000																					
DIVISION 15: MECHANICAL Mechanical Piping	Division 15 Subtotal	\$650.000	lump sum	\$277,000	\$277,00	00emorandun40%	15.04 (forw <b>atitle</b> d	d via Kate <b>Z35%</b> (H	NTB), fa <b>\$6</b> 5 <b>27006</b>	40	TBD \$120,000	+25% \$8889;43	6r Ö&⊉qaa+	Techsiddiátod 41	0 % eumdii) s By Netol d	detxilunt f\$27636	TS (d <sup>ir</sup> rthisk illedresk (ARIS), Technical						
DIVISION 16: ELECTRICAL	DIVISION 15 SUBTOTAL	000,000																					
Instrumentation & Control Electrical		1	lump sum lump sum	\$221,000 \$193,000	\$221,#00 \$193,00				INTB), fa <b>\$52,2,006</b> \$460,000		TBD \$0 orwarded v <b>§</b> 0Ka	+25%%t90t36t ate Ziino (HNT69,25	©or O&2P0194er 29 9.2720060)4	Techs <b>edian</b> e(4 8620 T	<b>6) % eimd∲\$6) kleid</b> oo BD 1.16	detzount \$220(3) +25192;8	NS fórránis Alledrata(Alla), Technic Gactóráða Fipder (1481 1), dímen (403), Machaslíghidadrád	<b>ddubēdišu (FsGið Tis fluritis)</b> alternative	res				
	Division 16 Subtotal	\$980 000																					



TABLE 9G-5 SHEET 10 OF 13 RECOMMENDED BIOSOLIDS PLAN **ALTERNATIVE 5 – COMBINE** MILORGANITE® PROGRAM WITH GLASS FURNACE TECHNOLOGY
2020 TREATMENT REPORT
6/2/07 TR\_9G.T005.07.06.02.cc

#### O&M COST ESTIMATE

	Total Annual O&M Cost =	\$32,740,000
JIWWTP Energy Costs		
Natural Gas - Turbine Fuel		\$10,541,000
Natural Gas - Direct Firing of Dryers		\$1,235,000
Natural Gas - Glass Furnace NOx Control & Startup		\$46,000
Natural Gas - Other Plant Facilities		\$5,445,000
Firm Electricity - Base Power Load		\$7,000
Firm Electricity - Demand Charges		\$0
Interruptible Electricity - Base Power Load		\$471,000
Interruptible Electricity - Demand Charges		\$1,000
Turbine Operation and Maintenance		\$1,289,000
SUBTOTAL		\$19,035,000
SSWWTP Digestion Gas Credit/Replacem	ent	

WTP Digestion Gas Credit/Replacement
plus/minus amount of solids destroyed in digestion = 10,375 tons/year
plus/minus amount of energy recovered from digestion process = 150,267 dtherm/year
VALUE OF ENERGY CHANGE IN TERMS OF COST OF EQUIVALENT GAS PURCHASE -\$1.389.970

### Milorganite® Annual Operating & Maintenance Costs

% of sludge to Milorganite® = 33%

SUBTOTAL

Total 2020 MMSD Sludge Production (dt/yr) = 81,000 (raw sludge)

% of sludge to Milorganite® =	33%		% sold
annual sludge volume (dt/year) =	26,730	(raw) =	100%
	Process Unit	Process	
	Cost	Contribution	Annual Cost
Item/Process	(\$/dt)	Cost (\$/dt raw)	\$/yr dry ton
JIWWTP Thickening	\$53.00	\$37.10	\$992,000
JIWWTP Dewatering/Drying	\$191.30	\$186.40	\$4,982,000
JIWWTP Chaff Processing	\$443.30	\$22.20	\$593,000
Milorganite® Warehouse/Shipping	\$27.20	\$26.50	\$708,000
Biosolids Marketing	\$81.70	\$79.60	\$2,128,000
IPS Pipeline Sludge Transfer (includes SS energy)	\$3.20	* \$1.70	\$45,0004
SSWWTP WAS Thickening (energy included)	\$82.40	\$0.00	\$0
SSWWTP Digestion (energy included)	\$36.40	\$2.20	\$59,000
Milorganite® Land Application	\$135.10	\$0.00	\$0
Milorganite® Sales Revenue	-\$155.80	-\$151.80	-\$4,058,000
SURTOTA	1	\$204	\$5.450.247

\$204

## Glass Furnace Annual Operating Costs

% of sludge to glass furnace =	67%	annual biosolids to Gla	ass Furnace
annual sludge volume (dt/year) =	54,270	(raw) =	33,900
	Process Unit	Process	
	Cost	Contribution	Annual Cost
Item/Process	(\$/dt)	Cost (\$/dt raw)	\$/yr dry ton
JIWWTP Thickening	\$53.00	\$2.10	\$114,000
JIWWTP Dewatering/Drying	\$191.30	\$116.20	\$6,306,000
Sodium Hydroxide for Glass Furnace SO2 Control	\$6.20	\$3.90	\$212,000
Ammonia for Glass Furnace Nox control	\$0.50	\$0.30	\$16,000
Glass Furnace Liquid Oxygen Tank & Vaporizer Rental	per year	\$0.48	\$26,000
Glass Furnace Liquid Oxygen Usage	\$2.10	\$1.30	\$71,000
Glass Furnace Equipment Maintenance	\$8.20	\$5.20	\$282,000
Glass Furnace Ash Disposal	\$0.60	\$0.40	\$22,000
Glass Furnace Staffing	per year	\$11.39	\$618,000
IPS Pipeline Sludge Transfer (includes SS energy)	\$3.20	* \$2.10	\$114,00004
SSWWTP WAS Thickening (energy included)	\$82.40	\$0.80	\$43,000
SSWWTP Digestion (energy included)	\$36.40	\$33.50	\$1,818,000
SUBTOTAL		\$178	\$9,641,966

## **Landfill Annual Operating & Maintenance Costs**

annual sludge volume (dt/year) = 0

	Process Unit	Process		
	Cost	Contribution	Annual Cost	
Item/Process	(\$/dt)	Cost (\$/dt raw)	\$/yr	dry to
IPS Pipeline Sludge Transfer	\$3.20 *	\$0.00		\$0
SSWWTP WAS Thickening (energy included)	\$82.40	\$0.00		\$0
SSWWTP Digestion (energy included)	\$36.40	\$0.00		\$0
SSWWTP DS Thickening (energy included)	\$82.40	\$0.00		\$0
SSWWTP Dewatering (energy included)	\$115.00	\$0.00		\$0
Landfill System Staffing	per year			\$0
Cake Trucking & Landfilling	\$145.30	\$0.00		\$0
SUBTO	TAL	\$0		\$0

see Sheet 12, Energy Costs Turbine Operation and Maintenance

\$1,288,659.79 Bob Gavahan (Power Engineers Collaborative

\$5,450,247

Source calculated difference in tons removed in digester from the year 2004 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05) s daseithted value satissum ed detrio de Enligent e gas based on values assumed on "JI Energy"

### Milorganite® Annual Operating & Maintenance Costs

		Total Mass of Raw	% of Raw Sludge from	% of Pow Studge for	Alternative					
	_									
	Process	Sludge that Cost	Left Column Actually Sent	this Alternative Sent	Process	Cost	ENR	2020 (2007)		
Yearcess Index Process Cost/ton	Source of Cost DatGost Value	Value Applies to (tons)	to this Unit Process	to this Unit Process*	Cost/raw					
JIWWTP Thickening	\$1,279,606	56,040	509	% 70%	\$31.97	2004	8620	\$37.09 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05; 50% assumed by AE S		
JIWWTP Dewatering/Drying	\$7,798,293	56,040	849	% 97%	\$160.68	2004	8620	\$186.40 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05; Symbiont calculations of energy cost based on Alan Scrivner (AES) email 12.6. 0		
JIWWTP Chaff Processing	\$928,541	56,040	849	% 97%	\$19.13	2004	8620	\$22.19 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.0 5		
Milorganite® Warehouse/Shipping	\$1,108,821	56,040	849	% 97%	\$22.85	2004	8620	\$26.50 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.0 5		
Biosolids Marketing	\$2,990,952	49,086	879	% 97%	\$68.62	2004	8620	\$79.60 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.0 5		
862\$ Pipeline Sludg&Transfer	varies	varies	varie	s varies	\$1.49	200		Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05; Symbiont calculations; estimated cost breakdown: DS \$1.83/dt, WAS \$5.31/dt, PS \$1.14/d		
SSWWTP WAS Thickening	\$1,989,266	56,040	50%	6 0%	\$0.04	2004	8620	\$0.05 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05; cost for JI GBT thickenin g		
SSWWTP Digestion	\$718,116	56,040	419	% 6%	\$1.88	2004	8620	\$2.18 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.0 5		
Milorganite® Land Application	\$308,540	2,649	1009	6 0%	\$0.00	2004	8620	\$0.00 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05; cost for SS filter cake land application		
Milorganite® Sales Revenue	-\$5,704,448	49,086	879	% 97%	-\$130.87	2004	8620	-\$151.82 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.0 5		
*linked to assumptions & total cost summary page										

## Glass Furnace Annual Operating Costs

		Total Mass of Raw	% of Raw Sludge from	% of Raw Sludge for	Alternative						
	Process	Sludge that Cost	Left Column Actually Sent	this Alternative Sent	Process	Cost	ENR	2020 (2007)			
Yearcess Index Process Cost/ton Source of Cost Da	at6ost Value	Value Applies to (tons)	to this Unit Process	to this Unit Process*	Cost/raw						
JIWWTP Thickening	\$1,279,606	56,040	50%	4%	\$1.83	2004	8620	\$2.12 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05; 50% assumed by AE S			
JIWWTP Dewatering/Drying	\$7,798,293	56,040	84%	61%	\$100.12	2004	8620	\$116.15 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05; Symbiont calculations of energy cost based on Alan Scrivner (AES) email 12.6. 0			
%Sodium Hydroxide fdf234ass Furnace S\$2.76ontrd2006	95/10407,000	\$3.88 24,400	100					Minergy GlassPack Proposal MMSD Hybrid 11 14 06 sm.pdf, Bill Beres (Minergy) email 11.14.06			
Ar@nonia for Glass Furnace Nox control	\$10,800	24,400	100%	62%	\$0.28	2006	9700	\$0. Minergy GlassPack Proposal MMSD Hybrid 11 14 06 sm.pdf, Bill Beres (Minergy) email 11.14.06			
Glass Furnace Liquid Oxygen Tank & Vaporizer R e	\$25,000	per year	per year	per year	\$25,000.00	2006	9700	\$25,773.20 Minergy GlassPack Proposal MMSD Hybrid 11 14 06 sm.pdf, Bill Beres (Minergy) email 11.14.06			
Glass Furnace Liquid Oxygen Usage	\$50,800	24,400	100%	62%	\$1.30	2006	9700	\$1,34 Minergy GlassPack Proposal MMSD Hybrid 11 14 06 sm.pdf, Bill Beres (Minergy) email 11.14.06			
Glass Furnace Equipment Maintenance	\$195,200	24,400	100%	62%	\$5.00	2006	9700	\$5.15 Minergy GlassPack Proposal MMSD Hybrid 11 14 06 sm.pdf, Bill Beres (Minergy) email 11.14.06			
Glass Furnace Ash Disposal	\$13,275	24,400	100%	62%	\$0.34	2006	9700	\$0.35 Minergy GlassPack Proposal MMSD Hybrid 11 14 06 sm.pdf, Bill Beres (Minergy) email 11.14.06			
50/laskeFsianade Staffingsor per Bill Krill meeting 11.16.0	6; \$48 <b>\$599</b> @a <b>4</b> @r	per Mark Kaminskie&y&ab	Sander of MMSD pepBillyKalle	email 11.17.06 per year	\$599,040.00	2006	9700	\$617,567.0			
8P20Pipeline Sludge \$2206sfer	varies	varies	varies	varies	\$1.78	20		Solids Cost 2004 UWSactual XLS, Bill Krill email 08.19.05; Symbiont calculations; estimated cost breakdown: DS \$1.83/dt, WAS \$5.31/dt, PS \$1.14/d			
SSWWTP WAS Thickening	\$1,989,266	56,040	50%	1%	\$0.65	2004	8620	\$0.76 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05; cost for JI GBT thickening			
SSWWTP Digestion	\$718,116	56,040	41%	92%	\$28.86	2004	8620	\$33.48 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.0 5			
*linked to assumptions & total cost summary page											

## **Landfill Annual Operating & Maintenance Costs**

		IOIAI Wass OI Raw	% of Raw Sludge Ironi	% of Raw Sludge for	Alternative			
	Process	Sludge that Cost	Left Column Actually Sent	this Alternative Sent	Process	Cost	ENR	2020 (2007)
Yearcess Index Process Cost/ton Source of C	ost Dat6ost Value	Value Applies to (tons)	to this Unit Process	to this Unit Process*	Cost/raw			
IPS Pipeline Sludge Transfer	varies	varies	varies	s varies	\$0.00	2004	8620	\$0.00 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05; Symbiont calculations; estimated cost breakdown: DS \$1.83/dt, WAS \$5.31/dt, PS \$1.14/ d
SSWWTP WAS Thickening	\$1,989,266	56,040	50%	0%	\$0.00	2004	8620	\$0.00 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05; cost for JI GBT thickenin g
SSWWTP Digestion	\$68,003	2,168	100%	6 0%	\$0.00	2004	8620	\$0.00 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.0 5
SSWWITP DS Thickening (energy included)	\$1,989,266	56,040	50%	6 0%	\$0.00	2004	8620	\$0.0 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05; cost for JI GBT thickenin g
SSWWTP Dewatering	\$52	1	100%	0%	\$0.00	1987	4522	\$0.00 recessed-plate.pdf (EPA Biosolids Technology Fact Sheet (EPA 832-F-00-058), September 2000), Bill Krill email 11.16.0 6
sor þ <b>an&amp;fill Kristene&amp;ta</b> @fin <b>lo</b> .16.06; \$48/hr/worker per	Mark Kami <b>689885B0</b> b	Sander of MMSDpeBilletarill	email 11.17.06 per yea	r per yea	\$0.00	2006	9700	\$0.00 8 workers and 1 su
Cake Trucking & Landfilling	\$122	1	100%	0%	\$0.00	2005	9231	\$0.00 MMSDPlanA.doc, Rick Pager (Waste Management), email 7.27.05 (forwarded by Alan Scrivner (AES), email 07.28.05); inflated to be on par with assumed electrical/gas rate inflation per Bill Krill meeting 12.18
				*linked to assumptions	& total cost summary			



TABLE 9G-5 SHEET 11 OF 13 **RECOMMENDED BIOSOLIDS PLAN ALTERNATIVE 5 – COMBINE MILORGANITE® PROGRAM WITH GLASS FURNACE TECHNOLOGY** 

2020 TREATMENT REPORT 6/2/07

TR\_9G.T005.07.06.02.cdr

### **ENERGY COSTS**

**TOTAL** \$17,745,488 per year

GAS			% Inflation	ı		
	mmBTU	Current Rates	to 2007	Future Rates	Total	Required Energy Source:
direct firing of dryers	133489	9 \$9.250 \$/Dtherm	0%	\$9.250 \$/Dtherm		\$1,234,773Milo-GF Hybrid Daily Heat & Mass Balance 2020 12.01 ALH.xls
turbine fuel	1139553.4	\$9.250 \$/Dtherm	0%	\$9.250 \$/Dtherm	\$	10,540,869 Tom Bachman (Triad Engineering, Inc. (Symbiont)), Technical Memorandum 5.17.05
other plant gas	588,672	9.250 \$/Dtherm	0%	\$9.250 \$/Dtherm		\$5,445,216 Current Rate Source:
NOx Control	3514	\$9.250 \$/Dtherm	0%	\$9.250 \$/Dtherm		\$32,505 Mark Kaminski (MMSD) email 4.5.06 (forwarded by Bill Krill (HNTB) email 4.5.06)
Melter Start-Up	1440	\$9.250 \$/Dtherm	0%	\$9.250 \$/Dtherm		\$13,320 Inflation Source:
				_		

Gas Total \$17,266,682

#### **ELECTRICAL**

Transmission Level Service	Current Rates	% Inflation to 2007 Future Rates	Total	Required Energy Source:
Facilities Charge	0 \$6,300 /year	8% \$6,804 /year		\$0
On Peak Energy Charge	0 \$0.0603 /kWh	8% \$0.0651 /kWh		\$0
Off Peak Energy Charge	0 \$0.0312 /kWh	8% \$0.0337 /kWh		\$0 Current Rate Source:
On-Peak Demand Charge	0 \$10.2160 /kW	8% \$11.0333 /kW		\$0 Wisconsin Electric Power Company, Volume 19 Electric Rates, Rev. 5, Sheet 65, Issued 1/26/06
Customer Demand Charge	0 \$0.0000 /kw	8% \$0.0000 /kw		\$0 Inflation Source:
				Mark Kaminski (MMSD) email 4.5.06 (forwarded by Bill Krill (HNTB) email 4.5.06)
		Transmission Electric Total	\$0	
Interruptible Service		% Inflation		
Interruptible dervice	Current Rates	to 2007 Future Rates	Total	Required Energy Source:
Facilities Charge	1 \$9,600 /year	8% \$10,368 /year	iotai	\$10,368Milo-GF Hybrid Daily Heat & Mass Balance 2020 12.01 ALH.xls
On Peak Energy Charge	3917599.6 \$0.05574 /kWh	8% \$0.0602 /kWh		\$235.836 Current Rate Source:
Off Peak Energy Charge	6964621.4 \$0.02990 /kWh	8% \$0.0323 /kWh		\$224,902 Wisconsin Electric Power Company, Volume 19 Electric Rates, Rev. 3, Sheet 81.1-81.2, Issued 1/26/06
On-Peak Demand Charge	16500 \$0.05024 /kW	8% \$0.0543 /kW		\$895 Inflation Source:
Customer Demand Charge	16500 \$0.000 /kw	8% \$0.0000 /kw		\$0 Mark Kaminski (MMSD) email 4.5.06 (forwarded by Bill Krill (HNTB) email 4.5.06)
			2.001	
		Interruptible Electric Total \$47	2,001	
Current Service		% Inflation		
	Current Rates	to 2007 Future Rates	Total	
Facilities Charge	1 \$6,300 /year	8% \$6,804 /year		\$6,804 Current Rate Source:
On Peak Energy Charge	\$0.0613 /kWh	8% \$0.0662 /kWh		\$0 Wisconsin Electric Power Company, Volume 19 Electric Rates, Rev. 5, Sheet 65, Issued 1/26/06
Off Peak Energy Charge	\$0.0331 /kWh	8% \$0.0357 /kWh		\$0
On-Peak Demand Charge	\$10.3800 /kW	8% \$11.2104 /kW		\$0 Inflation Rate Source:
Customer Demand Charge	\$0.7600 /kw	8% \$0.8208 /kw		\$0 Mark Kaminski (MMSD) email 4.5.06 (forwarded by Bill Krill (HNTB) email 4.5.06)

#### SSWWTP DIGESTION ENERGY CREDIT

Density of VSS destroyed 15 cf/lb Alan Scrivner (AES) phone conversation 8.23.06 Heat Value of Offgas 600 BTU/cf Alan Scrivner (AES) phone conversation 8.23.06

Cost per ton VSS destroyed \$ 166.50 using cost of gas shown above



TABLE 9G-5 SHEET 12 OF 13

RECOMMENDED BIOSOLIDS PLAN ALTERNATIVE 5 – COMBINE MILORGANITE® PROGRAM WITH GLASS FURNACE TECHNOLOGY

2020 TREATMENT REPORT

6/2/07 TR\_9G.T005.07.06.02.cdr

## **ASSUMPTIONS**

### **MASS BALANCE**

Source: Appendix 9F, Biosolids Recommended Plan Alternatives – Mass Balances, Table 9F-5, Recommended Biosolids Plan Alternative 5 - Combine Milorganite® Program with Glass Furnace Technology

Percent of Milorganite® Raw Sludge that Goes to Digestion	6.00%
Percent of Glass Furnace Raw Sludge that Goes to Digestion	92.00%
Percent of Landfill Raw Sludge that Goes to Digestion	
Percent of Milorganite® Raw Sludge that Becomes TWAS	70.00%
Percent of Glass Furnace Raw Sludge that Becomes TWAS	4.00%
Percent of TSS Removed During Digestion	42.70%
Total Sludge to Digestion (tpy)	50906
Percent of Digested Sludge to Milorganite®	3.25%
Percent of Digested Sludge to Glass Furnace	96.75%
Percent of Digested Sludge to Landfill	
WAS to Digestion (tpy)	509
WAS transferred from SSWWTP to JIWWTP (tpy)	9979
Percent of WAS sent to JIWWTP to Milorganite®	70.00%
Percent of WAS sent to JIWWTP to Glass Furnace	30.00%
WAS transferred from JIWWTP to SSWWTP (tpy)	
Primary Sludge Transferred from JIWWTP to SSWWTP	26222

## **USEFUL LIFE**

Land	Permanent	
Sewer & Force Mains	50 years	Symbiont assumption
Structures, Piping, & Valves	40 years	Symbiont assumption
Process Equipment, Electrical, I&C	20 years	Symbiont assumption

## **UNDESIGNED DETAILS ALLOWANC E**

all inclusive firm bid price	0% Bill Krill (HNTB), phone conference 11.16.06
all major components have documented installed unit costs	10% Symbiont assumption
costs missing for some components, but other costs are for	20%
installed facilities and well documented (connections to existing	
systems, etc.)	Symbiont assumption
installed costs for major components are not well documented	40%
(eg. Installation cost is estimated)	Symbiont assumption

## **CONTINGENCY**

all inclusive firm bid price	0% Bill Krill (HNTB), phone conference 11.16.06
everything else	25% Bill Krill (HNTB), phone conference 11.16.06

## **DESIGN, BIDDING, & OVERSITE**

all inclusive firm bid price (design complete, no bidding)	
everything else	

15%	Bill	Krill	(HNTB),	phone	conference	11.16.06
35%	Bill	Krill	(HNTB).	phone	conference	11.16.06



TABLE 9G-5 SHEET 13 OF 13
RECOMMENDED BIOSOLIDS PLAN
ALTERNATIVE 5 – COMBINE
MILORGANITE® PROGRAM WITH
GLASS FURNACE TECHNOLOGY

2020 TREATMENT REPORT

6/2/07 TR\_9G.T005.07.06.02.cdr

### **COST ESTIMATE SUMMARY**

### **General Description**

A combination of Milorganite® and landfill of dewatered digested sludge. Milorganite® is made from a blend of raw WAS and digested sludge at a ratio that allows the Milorganite® 6% Nitrogen guarantee to be maintained. All

Biosolids Load			
82,300	Influent Sludge	52,600	Finished Biosolids
Raw Sludge Influent Load Distribution			
33%	Milorganite®	0%	Dewatered Cake Agrilife
0%	Glass Furnace	67%	Landfill

ENR Index = 10000 (assumed Milwaukee 2007)
Interest Rate per Year = 5.125%

Summary of Capital Costs	
JIWWTP TURBINE UPGRADES	\$16,460,000
JIWWTP TURBINE BUILDING	\$3,495,000
JIWWTP DEWATERING AND DRYING FACILITY UPGRADES	\$114,740,000
JIWWTP NEW LOCOMOTIVE	\$3,050,000
INTERPLANT SLUDGE PIPELINE UPGRADES	\$2,870,000
SSWWTP NEW GRAVITY BELT WAS THICKENERS	\$7,580,000
SSWWTP DIGESTER REHABILITATION	\$158,310,000
SSWWTP NEW GRAVITY BELT DIGESTED SLUDGE THICKENERS	\$3,420,000
SSWWTP DEWATERING UPGRADES	\$5,360,000
SALVAGE VALUE	-\$26,033,000

Total Capital Cost \$289,250,000

## Summary of Annual Operation & Maintenance Costs

Total Annual Cost \$35,620,000

Life Cycle Analysis

Number of Years 20
Present Worth Factor 12.331

Present Worth of Total Annual Operation & Maintenance Costs \$439,240,000

Summary of Non-Annual Operation & Maintenance Costs												
Process	Cost	ENR Index	Year	PW								
				\$0								
				\$0								
				\$0								
Present Worth of Total Non-Annual Ope	ration & Mainter	nance Costs		\$0								

Total Present Worth \$728,000,000



TABLE 9G-6 SHEET 1 OF 13

RECOMMENDED BIOSOLIDS PLAN ALTERNATIVE 6 – COMBINE MILORGANITE® PROGRAM WITH LANDFILL DISPOSAL

2020 TREATMENT REPORT

6/2/07

	JIWWTP TI	JRBINE UPGRA	DES CAPITA	L COST													
						Tot	al Capital Cost =	Tota	I Salvage Value =								
				Un-		Design,	\$16,460,000		\$85,000	< insert link to	this cost	on the Cap	ital Cost Summai	ry Worksheet			
				designed	Conting-	Bidding, &				Actual	(	OST ADJU	STMENT	ADJUSTED			
		Unit Cost	SUBTOTAL	Details	ency	Oversight	SUBTOTAL	Life	Salvage Value	Unit Cost	Cost	ENR	Adjustment	UNIT COST			
DESCRIPTION	Quantity Units	(\$)	(\$)	(%)	(%)	(%)	(\$)	(Years)	(\$)	(\$)	Year	Index	Factor	(\$)	SOURCE	MANUFACTURER	COMMENTS
DIVISION 2: SITE CONSTRUCTION																	
Trenching, Pavement Removal, Backfill and Patching for Electrical Duct	800 LF	\$60	\$48,000	20%	25%	35%	\$100,000	20	\$0	\$60	2006	9700	1.03	\$62	TurbineOptionESTIMATE.xls, Tony Pohl (Automation Service & Design Inc.), email 3.28.06	TBD	
Manholes for Electrical Duct	4 each	\$10,000	\$40,000	20%	25%	35%	\$80,000	40	\$40,000	\$10,000	2006	9700	1.03	\$10,309	TurbineOptionESTIMATE.xls, Tony Pohl (Automation Service & Design Inc.), email 3.28.06	TBD	
Division 2 Subtotal	\$180,000																
DIVISION 11: EQUIPMENT																	
14.4 MW Combustion Turbine Generator	1 each	\$4,709,000	\$4,709,000	10%	25%	35%	\$8,740,000	20	\$0	\$4,567,250	2006	9700	1.03	\$4,708,505	Solar 130 Installed Cost 24MAR06.xls, Robert Gavahan (PEC), email 03.27.06	Solar Titan 130	cost for two CTs divided by 2
Station Control System for Turbine	1 each	\$278,000	\$278,000	10%	25%	35%	\$520,000	20	\$0	\$270,000	2006	9700	1.03	\$278,351	Solar 130 Installed Cost 24MAR06.xls, Robert Gavahan (PEC), email 03.27.06	Solar Titan 130	cost for two CTs divided by 2
Turbine Commissioning Parts, Startup, Site Testing Turbine Shipping	1 each 1 each	\$99,000 \$122,000	\$99,000 \$122,000	10% 10%	25% 25%	35% 35%	\$180,000 \$230,000	20 20	\$0 \$0	\$96,100 \$118,050	2006 2006	9700 9700	1.03 1.03	\$99,072 \$121,701	Solar 130 Installed Cost 24MAR06.xls, Robert Gavahan (PEC), email 03.27.06 Solar 130 Installed Cost 24MAR06.xls, Robert Gavahan (PEC), email 03.27.06	Solar Titan 130 Solar Titan 130	cost for two CTs divided by 2 cost for two CTs divided by 2
Turbine Construction Estimate  Division 11 Subtotal	1 each	\$1,811,000	\$1,811,000	10%	25%	35%	\$3,360,000	20	\$0	\$1,756,650	2006	9700	1.03	\$1,810,979	Solar 130 Installed Cost 24MAR06.xls, Robert Gavahan (PEC), email 03.27.06	Solar Titan 130	cost for two CTs divided by 2
Division 11 Subtotal	\$13,030,000																
DIVISION 15: MECHANICAL														_			
Exhaust Ductwork from Turbine Building to Existing Duct System - 120" special alloy exhaust pipe w/pile supports	500 If	\$1,000	\$500,000	40%	25%	35%	\$1,180,000	20	\$0	\$750	2006	9700	1.03	\$773	Symbiont engineering judgment	TBD	
Fuel Gas and Fuel Oil Piping to Turbine Building	1 allowance	\$40,000	\$40,00 <b>6</b> nt	engineer40 <b>9</b> /judg	gment 25%	35%	\$90,000	40	\$45,000	\$39,000	2006	9700	1.03	\$40,206	Symb	TBD	
Division 15 Subtotal	\$1,270,000																
DIVISION 16: ELECTRICAL																	
Connections to Existing Plant Control System	1 allowance		\$103,000 er	ngineerin <b>#966</b> gm		35%	\$240,000	20	\$0	\$100,000	2006	9700	1.03	\$103,093		TBD	
3-4" Concrete encased PVC Conduit ductbank	800 LF	\$80	\$64,000	20%	25%	35%	\$130,000	20	\$0	\$80	2006	9700	1.03	\$82		TBD	
350kcmil 1/c 15KV Copper Switchgear and MCC for Turbine	7,200 LF 1 each	\$20 \$709,000	\$144,000 \$709,000	20% 10%	25% 25%	35% 35%	\$290,000 \$1,320,000	20 20	\$0 \$0	\$20 \$687,500	2006 2006	9700 9700	1.03 1.03	\$21 \$708,763	TurbineOptionESTIMATE.xls, Tony Pohl (Automation Service & Design Inc.), email 3.28.06 Solar 130 Installed Cost 24MAR06.xls, Robert Gavahan (PEC), email 03.27.06	TBD Solar Titan 130	cost for two CTs divided by 2
Switchgear and MCC for Turblife	i each	\$709,000	\$109,000	10%	25%	35%	\$1,32U,UUU	20	\$0	\$007,500	2006	9700	1.03	\$100,763	ouar 130 installed Gust 24MAROU.XIS, Robert Gavarian (PEG), email 03.27.06	Solar Illan 130	cost for two CTs divided by 2
Division 16 Subtotal	\$1,980,000																



TABLE 9G-6 SHEET 2 OF 13

RECOMMENDED BIOSOLIDS PLAN **ALTERNATIVE 6 – COMBINE MILORGANITE®** PROGRAM WITH LANDFILL DISPOSAL
2020 TREATMENT REPORT
6/2/07 TR\_9G.T006.07

		NEW TIID	BINE BUILDIN	IC CADITAL C	TPO														
		NEW TOR	BINE BUILDIN	IG CAPITAL C	Un-		Total	Capital Cost = \$3,495,000	Total Sal	vage Value = \$1,684,000	< insert link	to this cost	on the Capita	I Cost Summary	y Worksheet				
			Unit Cost	SUBTOTAL	Details	ency		SUBTOTAL		Ivage Value	Actual Unit Cost	Cost		Adjustment	ADJUSTED UNIT COST				
DESCRIPTION		Quantity Units	(\$)	(\$)	(%)	(%)	(%)	(\$)	(Years)	(\$)	(\$)	Year	Index	Factor	(\$)	SOURCE		MANUFACTURER	COMMENTS
DIVISION 2: SITE CONSTRUCTION Asphalt removal for building install Concrete Repair Utility Trench Excavation Utility Trench Backfill Utility Trench Compaction	Division 2 Subtotal	694 SY 4,500 SF 500 LF 667 CY 545,000	\$8 \$2 \$3 \$3 \$7	\$5,556 \$9,000 \$1,500 \$2,000 \$4,667	20% 20% 20% 20% 20%	25% 25% 25% 25% 25%	35% 35% 35% 35% 35%	\$11,000 \$18,000 \$3,000 \$4,000 \$9,000	40 40 40 40 40	\$6,000 \$9,000 \$2,000 \$2,000 \$5,000	\$8 \$3 \$3 \$6	3 2006 3 2006	9700	1.03 1.03 1.03 1.03 1.03	\$8 \$2 \$3 \$3 \$7	RSMEANS COSTWORKS 2006 QTR 3; 02 315 610 06 RSMEANS COSTWORKS 2006 QTR 3; 02 315 610 30	010 610 090	TBD TBD TBD TBD TBD	Site demolition, remove concrete, mesh reinforced, to 6" thick, excludes hauling and disposal fees Structural concrete, in place, slab on grade, 6" thick, includes textured finish only Excavaling, trench, concrete curb, steel forms, 6" to 10" deep, 1 172 C.Y. Ducket, flydraulic backhoe, excludes sheeting or dewatering Excavaling, trench backfil, 2-14 C.Y. Ducket, 100" haul, front end loader, wheel mounted, excludes sheeting or dewatering Backfill, 12" layers, compaction in layers, hand tamp, add to above
DIVISION 3: CONCRETE																			
Utility Trench Repair		56 CY	\$196	\$10,889	20%	25%	35%	\$20,000	40	\$10,000	\$190	2006	9700	1.03	\$196	RSMEANS COSTWORKS 2006 QTR 3; 03 310 240 47	700	TBD	Structural concrete, in place, slab on grade, 6" thick, includes forms(4 uses) and reinforcing steel
	Division 3 Subtotal	\$20,000																	
DURANCE OFFICE CONSTRUCTION																			
DIVISION 13: SPECIAL CONSTRUCTION Turbine Building		5,000 sf	\$298	\$1,490,00 <b>T</b> urb	oine Buil <b>@6%</b> Cos	t COST <b>M</b> NRKS	S.xls 35%	\$3,020,000	40	\$1,510,000	\$289	9 2006	9700	1.03	\$298	RSMEANS COSTWORKS 2006 QTR 3;		TBD	Factory, 1 Story, Precast Concrete Panels / Steel Frame w/steel H section piles
	Division 13 Subtotal	\$3,020,000																	
DIVISION 15: MECHANICAL																			
Natural Cas Supply Instrument Air Supply Cooling Water Supply Potable Water Supply Building Drain		500 LF 500 LF 500 LF 500 LF 500 LF	\$36 \$34 \$166 \$34 \$12	\$18,000 \$17,000 \$83,000 \$17,000 \$6,000	20% 20% 20% 20% 20% 20%	25% 25% 25% 25% 25%	35% 35% 35% 35% 35% 35%	\$40,000 \$30,000 \$170,000 \$30,000 \$10,000	40 40 40 40 40	\$20,000 \$15,000 \$85,000 \$15,000 \$5,000	\$38 \$33 \$16 \$33 \$12	2006 1 2006 3 2006	9700 9700 9700	1.03 1.03 1.03 1.03 1.03	\$34 \$166 \$34	RSMEANS COSTWORKS 2006 GTR 3; 15 107 620 26 RSMEANS COSTWORKS 2006 GTR 3; 15 107 220 12 RSMEANS COSTWORKS 2006 GTR 3; 15 107 620 21 RSMEANS COSTWORKS 2006 GTR 3; 15 107 220 12 RSMEANS COSTWORKS 2006 GTR 3; 15 108 520 19	200 150 200	TBD TBD TBD TBD TBD	Pipe, steel, black, welded, 3" diameter, schedule 40 Pipe, brass, plain end, regular weight, 1-1/2" diameter Pipe, steel, black, welded, 10" diameter, schedule 40 Pipe, brass, plain end, regular weight, 1-1/2" diameter Pipe, PVC, socket weld, SCH 40, 4" diameter
	Division 15 Subtotal	\$280,000																	
DIVISION 16: ELECTRICAL																			
Power Feed		1 ea	\$62,000	\$62,000	20%	25%	35%	\$130,000	20	ew medi <b>ୱିଷ</b> vol	age trans <b>1860),0</b> 00	8. con@@@@f6rs	to n <b>97/06</b> ldg	1.03	\$61,856	Symbiont estimate based on recent project		TBD	Estimate includes n
	Division 16 Subtotal	\$130,000																	



TABLE 9G-6 SHEET 3 OF 13 RECOMMENDED BIOSOLIDS PLAN **ALTERNATIVE 6 – COMBINE MILORGANITE®** PROGRAM WITH LANDFILL DISPOSAL
2020 TREATMENT REPORT
6/2/07 TR\_9G.T006.07

## D&D FACILITY UPGRADES CAPITAL COST

							Total Capital Cost =		Tota	I Salvage Value =
								\$114,740,000		\$0
			Unit Cost	SUBTOTAL	Un- designed Details	Conting- ency	Design, Bidding, & Oversite	SUBTOTAL	Life	Salvage Value
DESCRIPTION	Quantity	Units	(\$)	(\$)	(%)	(%)	(%)	(\$)	(Years)	(\$)
DIVISION 13: SPECIAL CONSTRUCTION										
Unit Process 24 Upgrade	1	lump sum	\$6,495,000	\$6,495,000	40%	25%	35%	\$15,340,000	20	\$0
Unit Process 25 Upgrade	1	lump sum	\$17,453,000	\$17,453,000	40%	25%	35%	\$41,230,000	20	\$0
Unit Process 27 Upgrade	1	lump sum	\$4,062,000	\$4,062,000	40%	25%	35%	\$9,600,000	20	\$0
Unit Process 29 Upgrade	1	lump sum	\$12,629,000	\$12,629,000	40%	25%	35%	\$29,840,000	20	\$0
Unit Process 30 Upgrade	1	lump sum	\$1,278,000	\$1,278,000	40%	25%	35%	\$3,020,000	20	\$0
Unit Process 31 Upgrade	1	lump sum	\$747,000	\$747,000	40%	25%	35%	\$1,760,000	20	\$0
Unit Process 32 Upgrade	1	lump sum	\$2,809,000	\$2,809,000	40%	25%	35%	\$6,640,000	20	\$0
Miscellaneous Costs (drop chutes, etc.)	1	lump sum	\$3,093,000	\$3,093,000	40%	25%	35%	\$7,310,000	20	\$0
Division 13 Subtotal	\$114,740,000									

## ---- insert link to this cost on the Capital Cost Summary Worksheet

Actual	С	OST ADJU	ISTMENT	ADJUSTED				
Unit Cost	Cost	ENR	Adjustment	UNIT COST				
(\$)	Year	Index	Factor	(\$)	SOURCE	MANUFACTURER	COMMENTS	
\$6,300,000	2006	9700	1.03	\$6,494,845	DD Facility Upgrade Estimate (npb edit 11-21-06).xls, Review of Plant Projects reports and Symbiont engineering judgment	TBD		
\$16,929,000	2006	9700	1.03	\$17,452,577	DD Facility Upgrade Estimate (npb edit 11-21-06).xls, Review of Plant Projects reports and Symbiont engineering judgment	TBD		
\$3,940,000	2006	9700	1.03	\$4,061,856	DD Facility Upgrade Estimate (npb edit 11-21-06).xls, Review of Plant Projects reports and Symbiont engineering judgment	TBD		
\$12,250,000	2006	9700	1.03	\$12,628,866	DD Facility Upgrade Estimate (npb edit 11-21-06).xls, Review of Plant Projects reports and Symbiont engineering judgment	TBD		
\$1,240,000	2006	9700	1.03	\$1,278,351	DD Facility Upgrade Estimate (npb edit 11-21-06).xls, Review of Plant Projects reports and Symbiont engineering judgment	TBD		
\$725,000	2006	9700	1.03	\$747,423	DD Facility Upgrade Estimate (npb edit 11-21-06).xls, Review of Plant Projects reports and Symbiont engineering judgment	TBD		
\$2,725,000	2006	9700	1.03	\$2,809,278	DD Facility Upgrade Estimate (npb edit 11-21-06).xls, Review of Plant Projects reports and Symbiont engineering judgment	TBD		
\$3,000,000	2006	9700	1.03	\$3,092,784	DD Facility Upgrade Estimate (npb edit 11-21-06).xls, Review of Plant Projects reports and Symbiont engineering judgment	TBD		



TABLE 9G-6 SHEET 4 OF 13

RECOMMENDED BIOSOLIDS PLAN

ALTERNATIVE 6 – COMBINE MILORGANITE®

PROGRAM WITH LANDFILL DISPOSAL

2020 TREATMENT REPORT 6/2/07

		NEW LC	COMOTIVE C	APITAL COS	STS					
							To	tal Capital Cost =	Tota	I Salvage Value =
								\$3,050,000		\$0
					Un-		Design,			_
					designed	Conting-	Bidding, &			
			Unit Cost	SUBTOTAL	Details	ency	Oversite	SUBTOTAL	Life	Salvage Value
DESCRIPTION	Quantity	Units	(\$)	(\$)	(%)	(%)	(%)	(\$)	(Years)	(\$)
DIVISION 11: EQUIPMENT										
New Locomotive	1	lump sum	\$1,289,000	\$1,289,000	40%	25%	35%	\$3,050,000	20	\$0
Division 11 Subtotal	\$3,050,000									
Division 11 Subtotal	<b>\$3,030,000</b>									

## <---- insert link to this cost on the Capital Cost Summary Worksheet

A - 4 1		00T AD III	IOTMENT	AD HIOTED			
 Actual Unit Cost (\$)	Cost Year	ENR Index	Adjustment Factor	ADJUSTED UNIT COST (\$)	SOURCE	MANUFACTURER	COMMENTS
\$1,250,000	2006	9700	1.03	\$1,288,660	Alan Scrivner (AES), email 4.05.06	TBD	



TABLE 9G-6 SHEET 5 OF 13

RECOMMENDED BIOSOLIDS PLAN

ALTERNATIVE 6 – COMBINE MILORGANITE®

PROGRAM WITH LANDFILL DISPOSAL

	INTERPLANT SLUDGE PIPELINE UPGRADES CAPITAL COSTS																	
	INTERPLAI	NT SLUDGI	E PIPELINE U	JPGRADES C	APITAL C	OSTS												
							Tot	tal Capital Cost =	Tota	al Salvage Value =								
							Declar	\$2,870,000		\$0	< insert link to this cost on the Capital Cost Summary Worksheet			y Worksheet				
					Un- designed	Conting-	Design, Bidding, &				Actual	Actual COST ADJUSTMENT		ADJUSTED				
			Unit Cost	SUBTOTAL	Details	ency	Oversite	SUBTOTAL	Life	Salvage Value	Unit Cost	Cost	ENR	Adjustment	UNIT COST			
DESCRIPTION	Quantity	Units	(\$)	(\$)	(%)	(%)	(%)	(\$)	(Years)	(\$)	(\$)	Year	Index	Factor	(\$)	SOURCE	MANUFACTURER	COMMENTS
DIVISION 11: EQUIPMENT																		
JIWWTP and SSWWTP Hard Metal Pumps & Motors Rated for 300	12	each	\$93,000	\$1,116,000	20%	25%	35%	\$2,260,000	20	000 per <b>60</b> mp	for installa <b>\$96</b> ,000	2006	9700	1.03	\$92,784	Mickey (RDM), phone conversation 03.28.06	TBD	includes \$5
psi																		
Division 11 Subtotal	\$2,260,000																	
DIVISION 16: ELECTRICAL																		
Pipeline Cathodic Protection  Division 16 Subtotal	\$610,000	allowance	\$258,000	\$258,000	40%	25%	35%	\$610,000	20	\$0	\$250,000	2006	9700	1.03	\$257,732	Symbiont engineering judgment	TBD	



TABLE 9G-6 SHEET 6 OF 13 RECOMMENDED BIOSOLIDS PLAN **ALTERNATIVE 6 – COMBINE MILORGANITE®** PROGRAM WITH LANDFILL DISPOSAL
2020 TREATMENT REPORT
6/2/07 TR\_9G.T006.07

SSWWTP DIGESTER REHABILITATION CAPITAL COST										
							То	tal Capital Cost =	Tota	Salvage Value =
								\$158,310,000		\$24,023,000
					Un- designed	Conting-	Design, Bidding, &			
DESCRIPTION	Quantity	Units	Unit Cost (\$)	SUBTOTAL (\$)	Details (%)	ency (%)	Oversite (%)	SUBTOTAL (\$)	Life (Years)	Salvage Value (\$)
DIVISION 3: CONCRETE										
Seven New Covered & Insulated Digester Tanks with access equipment (125' diameter, 38' side water depth, 5' free board)	27,629,817	gallons	\$2	\$55,259,633	40%	25%	35%	\$130,550,000	40	\$24,023,000
Division 3 Subtotal	\$130,550,000									
DIVISION 11: EQUIPMENT										
New Digester Mixing Systems - External Draft Tube Mixers for 110' diameter	19	each	\$468,000	\$8,892,000	40%	25%	35%	\$21,010,000	20	\$0
New Digester Recirculation Pumps - 10 HP motors, 250 gpm @ 60' TDH	26	each	\$15,000	\$390,000	40%	25%	35%	\$920,000	20	\$0
Recirculating Sludge Heat Exchangers -Sludge-Hot Water Systems	13	each	\$42,000	\$546,000 2,2	49 40%	25%	35%	\$1,290,000	20	\$0
Storage Digester Sludge Transfer Pumps - 30 HP motors, VFD, 1200 gpm @ 60' TDH	13	each	\$55,000	\$715,000	40%	25%	35%	\$1,690,000	20	\$0
Digester Gas Safety Equipment	1	allowance	\$1,137,000	\$1,137,000	40%	25%	35%	\$2,690,000	20	\$0
Division 11 Subtotal	\$27,600,000									
	<b>42.</b> ,300,000									
DIVISION 15: MECHANICAL New Boiler			807.000	607.000	40%	25%	35%	6400 000	20	#0
New Boller	1	each	\$67,000	\$67,000	40%	25%	35%	\$160,000	20	\$0
Division 15 Subtotal	\$160,000									

1	< insert link to	tnis cost	on the Cap					
	Actual	C	OST ADJU		ADJUSTED			
	Unit Cost (\$)	Cost Year	ENR Index	Adjustment Factor	UNIT COST (\$)	SOURCE	MANUFACTURER	COMMENTS
-								
)	\$2	2007	10000	1.00	\$2	Symbiont engineering judgment	TBD	
)	\$431,600	2005	9231	1.08	\$467,555	Wiscosin Project Triad Ebg EWT Mixer Budget Price 07-14-05.doc , Bob Lacey (Energenecs), email 07.14.05	Eimco, RDT-T	+30% for install
)	\$13,650	2005	9231	1.08	\$14,787	Rich Hussey (Ley Associates), email 07.26.05	Wemco-Hidrostal, D4K-HS	+30% for install
)	\$39,000	2005	9231	1.08	\$4	Biosolids Alternative Sizing Worksheets r4.xls , Symbiont	Alfa Laval	+30% for install
)	\$51,025	2005	9231	1.08	\$55,276	Rich Hussey (Ley Associates), email 07.26.05	Wemco-Hidrostal, E5K-S	+30% for install, +250% for VFD
)	\$1,050,000	2005	9231	1.08	\$1,137,472	Symbiont engineering judgment		
)	\$65,000	2006	9700	1.03	\$67,010	Symbiont engineering judgment based on recent projects	TBD	



TABLE 9G-6 SHEET 7 OF 13 RECOMMENDED BIOSOLIDS PLAN **ALTERNATIVE 6 – COMBINE MILORGANITE®** PROGRAM WITH LANDFILL DISPOSAL
2020 TREATMENT REPORT
6/2/07 TR\_9G.T006.07

2020 FACILITIES PLANNING  New SSWWTP Gravity Belt Thickeners for WAS Thickening Capital Co	st		
New SSWWTP Gravity Belt Thickeners for WAS Thickening Capital Co.	st		
•			
Un-	Total Capital Cost =   Total Salvage Value =   \$7,580,000 \$241,000	41,000 - Insert link to this cost on the Capital Cost Summary Worksheet	
designed Conting- Unit Cost SUBTOTAL Details ency	Bidding, & Oversite SUBTOTAL Life Salvage Value	Actual COST AD JUSTMENT AD JUSTED  falue Unit Cost Cost ENR Adjustment UNIT COST  (\$) Year Index Factor (\$) SOURCE MANUFACTURER COMMENTS	
DESCRIPTION Quantity Units (\$) (\$) (%) (%) DIVISION 2: SITE CONSTRUCTION	(%) (\$) (Years) (\$)	(\$) Tear Index Factor (\$) SOURCE MANUFACTURER COMMENTS	
Demolition         1         lump sum         \$26,000         \$26,000         40%         25%	35% \$60,000 20 ded via Kats£iline	Katis@dino_PhYTB), fisig22_ER@lio_) 2004 85280 1.16 +25% cordsiti;fisi(20_8P partition) fision (the final of the final of	
DIVISION 4: MASONRY	04 (forward <b>656</b> via Kate Ziin <b>65(9N*08</b> ), fax 9.27 <b>.06</b> ) TSO	TSO \$18,75/25% c2000-tablestij08/67/datiniTecateAd ethstitel(40 Hoermo) \$21,752 Frank Tiefert (	
Division 4 Subtotal   \$50,000	35% \$3,840,000 20 1.15.04 (for@ident id via Kate 2566 (HNTB), fs%98.2005) 20 TBD \$0	(forsikarde) via Kišlė "Nidokojėlik TB) 20049.27 (106):20 1.TiBD \$1,624,13925°) Fizanta Tatafar Qikir įbje Fidiratridulishtar ryklitikar disculisratiktur (Ils Geld'TS for this alternatives \$ \$0 +25% \$2070 field für O \$2070 field fidiciol. 440° kve melyktūryklada dectualant \$83.02 (2083 5 (first his Stelectos) [48]. Technical	
Washwater Pumps	iino (HNTE3)5% x 9.27.06) \$150,000 TBD 20 +253% c	+250% contractor OSSIpiteReck P0004004 of Yillebilde(s) 82/4404 dectaller in Risk PSGBSTS (right)4480ter (Risk) Refer (ATT), Technical Memorandum ad v80/Kate Zino (HSTS9,398 9.27/200)4 8620 TBD 1.16 +2595.23/45-ccler-s/bit-Piper (401) Million (405) Minorus/gridate dedicition/sin/(PSGBTS risentitis) alternatives	
DIVISION 13: SPECIAL CONSTRUCTION			
Building Modifications 1 1 iump sum \$281,0864 Memoran46/96/11.15.04 (1925/96)	rded via Kabbi Szino (HNTB); 5660,91207.06) 40 TBD \$121,000	+25% 40% statis ctor 2008 pate 1608 800 time 40 140 140 140 140 140 140 140 140 140	
Division 13 Subtotal \$660,000			
DIVISION 15: MECHANICAL  Mechanical Piping  1 lump sum \$277,000 \$277,000emiorandum40%15.04 (forwalddid)  Division 15 Subtotal \$650,000	d via Kate 236% (HNTB), fa\$45697306) 40 TBD \$120,000	20,000 +25% \$888 sk38/ O8 PQNM Toold \$888800 40 % emdy \$8/4dd detail.unt 16P76333TS foil ribids all liefered (ASS), Technical	
DIVISION 16: ELECTRICAL			
Instrumentation & Control   1	id via Kate <b>26ris</b> (HNTB), fa <b>5c92.006</b> ) 20 TBD \$0 35% \$460,000 20 orwarded <b>49</b> 0Kat	S0 +25% \$2090; d3(2); Q&RQ)plar To-cit statistical 407% camdy triggly 4dd dectacunt \$22,000 FB S (first trik 3 libraris (AES)), Technic ed v8UKste Zino (HSTE), 259 9.27 ZIR) 4 8620 TBD 1.16 +2395; 260 faccier shalf Piper (q61 ty/direct q405k NordesSignicide addicites/Discr (FsGBTS from this); alternatives	



TABLE 9G-6 SHEET 8 OF 13 RECOMMENDED BIOSOLIDS PLAN **ALTERNATIVE 6 – COMBINE MILORGANITE®** PROGRAM WITH LANDFILL DISPOSAL
2020 TREATMENT REPORT
6/2/07 TR\_9G.T006.07

SSWWTP NEW DIGESTED SLUDGE GRAVITY BELT THICKENERS CAPITAL COST										
							Tot	al Capital Cost =	Tota	Salvage Value =
								\$3,420,000		\$0
					Un-		Design,			
					designed	Conting-	Bidding, &			
			Unit Cost	SUBTOTAL	Details	ency	Oversite	SUBTOTAL	Life	Salvage Value
DESCRIPTION	Quantity	Units	(\$)	(\$)	(%)	(%)	(%)	(\$)	(Years)	(\$)
DIVISION 11: EQUIPMENT										l
2 meter Gravity Belt Thickener	2	each	\$292.000	\$584.000	versation28.263.0	6 25%	35%	\$1,180,000	20	\$0
500 gpm Gravity Belt Thickener Feed Pumps	2	each	\$59,000	\$118,000	sociates #@mail	07.26.025%	35%	\$280,000	20	\$0
Progressing Cavity Gravity Belt Thickener Polymer Feed Pumps	2	each	\$42,000	\$84,000	40%	25%	35%	\$200,000	20	\$0
Progressing Cavity Thickened Sludge Transfer Pumps	2	each	\$70,000	\$140,000	40%	25%	35%	\$330,000	20	\$0
Progressing Cavity GBT Bulk Polymer Transfer Pumps	1	each	\$35,000	\$35,000	40%	25%	35%	\$80,000	20	\$0
Progressing Cavity GBT Bulk Polymer Mix Pumps	1	each	\$28,000	\$28,000	40%	25%	35%	\$70,000	20	\$0
Progressing Cavity Operational Storage Pumps	2	each	\$70,000	\$140,000	40%	25%	35%	\$330,000	20	\$0
1 meter Gravity Belt Thickener	2	each	\$165,000	\$330,000	rsation 3223606	25%	35%	\$670,000	20	\$0
250 gpm Gravity Belt Thickener Feed Pumps	1	each	\$30,000	\$30,000	ciates), e4036 0	7.26.05 25%	35%	\$70,000	20	\$0
Progressing Cavity Gravity Belt Thickener Polymer Feed Pumps	1	each	\$21,000	\$21,000	40%	25%	35%	\$50,000	20	\$0
Progressing Cavity Thickened Sludge Transfer Pumps	1	each	\$35,000	\$35,000	40%	25%	35%	\$80,000	20	\$0
Progressing Cavity Operational Storage Pumps	1	each	\$35,000	\$35,000	40%	25%	35%	\$80,000	20	\$0
Division 11 Subtotal	\$2,420,000									
Division 11 Subtotal	\$3,420,000									

 insert link to	this cos	on the	Capital	Cost Su	mmarv	Worksheet	

Actual							
Unit Cost	Cost	ENR	Adjustment	UNIT COST			
(\$)	Year	Index	Factor	(\$)	SOURCE	MANUFACTURER	COMMENTS
\$270,000	2005	9231	1.08	\$292,493	Bob Moser (UWS) phone con	TBD	
\$54,600	2005	9231	1.08	\$59,149	Rich Hussey (Ley As	Wemco	quote for 400 gpm at 60', 15 HP, x2 for vfd, x1.4 for large flow/pressure (500 gpm, 75' TDH, 20 HP), x1.3 installed
\$39,000	2005	9231	1.08	\$42,249	Biosolids Alternative Sizing Worksheets r4.xls, Symbion t	Moyno or Netszch	200 gpm@40'TDH, w/VFDs x1.3 installed
\$65,000	2005	9231	1.08	\$70,415	1874_001.pdf, David DeGroy (Van Bergen & Markson, Inc.) 7.29.05 (emailed by Lisa Williams (Symbiont) 7.29.05	Moyno or Netszch	250 gpm @ 140' TDH x2 for vfd x1.3 installed
\$32,500	2005	9231	1.08	\$35,207	Biosolids Alternative Sizing Worksheets r4.xls, Symbion t	Moyno or Netszch	10 gpm/3 HP, constant speed x1.3 installed
\$26,000	2005	9231	1.08	\$28,166	Biosolids Alternative Sizing Worksheets r4.xls, Symbion t	Moyno or Netszch	5 gpm, 2 HP, DC adjustable speed x1.3 installed
\$65,000	2005	9231	1.08	\$70,415	1874_001.pdf, David DeGroy (Van Bergen & Markson, Inc.) 7.29.05 (emailed by Lisa Williams (Symbiont) 7.29.05	Moyno or Netszch	250 gpm @ 140' TDH x2 for vfd x1.3 installed
\$160,000	2006	9700	1.03	\$164,948	Bob Moser (UWS) phone conve	TBD	
\$27,300	2005	9231	1.08	\$29,574	Rich Hussey (Ley Asso	Wemco	quote for 400 gpm at 60', 15 HP, x2 for vfd, x1.4 for large flow/pressure (500 gpm, 75' TDH, 20 HP), x1.256stgdied /2 for
\$19,500	2005	9231	1.08	\$21,124	Biosolids Alternative Sizing Worksheets r4.xls, Symbion t	Moyno or Netszch	200 gpm@40'TDH, w/VFDs x1.3 installed /2 for 100 gpm
\$32,500	2005	9231	1.08	\$35,207	1874_001.pdf, David DeGroy (Van Bergen & Markson, Inc.) 7.29.05 (emailed by Lisa Williams (Symbiont) 7.29.05	Moyno or Netszch	250 gpm @ 140' TDH x2 for vfd x1.3 installed /2 for 125 gpm
\$32,500	2005	9231	1.08	\$35,207	1874_001.pdf, David DeGroy (Van Bergen & Markson, Inc.) 7.29.05 (emailed by Lisa Williams (Symbiont) 7.29.05	Moyno or Netszch	250 gpm @ 140' TDH x2 for vfd x1.3 installed /2 for 125 gpm



TABLE 9G-6 SHEET 9 OF 13 RECOMMENDED BIOSOLIDS PLAN **ALTERNATIVE 6 – COMBINE MILORGANITE®** PROGRAM WITH LANDFILL DISPOSAL

	SSWWTP DEWATERING UPGRADES CAPITAL COST										
							To	tal Capital Cost =	Tota	I Salvage Value =	
								\$5,360,000		\$0	
					Un-		Design,				
					designed	Conting-	Bidding, &				
			Unit Cost	SUBTOTAL	Details	ency	Oversite	SUBTOTAL	Life	Salvage Value	
DESCRIPTION	Quantity	Units	(\$)	(\$)	(%)	(%)	(%)	(\$)	(Years)	(\$)	
DIVISION 11: EQUIPMENT											
Plate Repair Press #1	1	lump sum	\$323,000	\$323,000	40%	25%	35%	\$760,000	20	\$0	
Plate Repair Press #2	1	lump sum	\$323,000	\$323,000	40%	25%	35%	\$760,000	20	\$0	
Plate Repair Press #3	1	lump sum	\$323,000	\$323,000	40%	25%	35%	\$760,000	20	\$0	
Plate Repair Press #4	1	lump sum	\$89,000	\$89,000	40%	25%	35%	\$210,000	20	\$0	
Rebuild Presses#1, #2, #3, and #4	1	lump sum	\$1,216,000	\$1,216,000	40%	25%	35%	\$2,870,000	20	\$0	
Division 11 Subtotal	\$5,360,000										

----- insert link to this cost on the Capital Cost Summary Worksheet

Actual Unit Cost (\$)	Cost Year	OST ADJI ENR Index	Ad	NT ljustment Factor	ADJUSTED UNIT COST (\$)	SOURCE	MANUFACTURER	COMMENTS
\$35,35,06bi \$35,35,06bi \$35,35,06bi \$96,1500nt \$44,4 80;2000 5	ont 2/02/066 ont 2/02/066 12.026/06	9700 9700 9700 9700TB 12.096700	TBD TBD TBD	1.03 1.03 1.03 1.03 TBO	\$323,196 \$323,196 \$323,196 \$88,660 \$1,216,495	Review of United Water Services Plant Requested Projects for 2 Review of United Water Services Plant Requested Projects for 2 Review of United Water Services Plant Requested Projects for 2 Review of United Water Services Plant Requested Projects for 2005, Review of United Water Services Plant Requested Projects for 2005, Review of United Water Services Plant Requested Proj		



TABLE 9G-6 SHEET 10 OF 13

RECOMMENDED BIOSOLIDS PLAN ALTERNATIVE 6 – COMBINE MILORGANITE® PROGRAM WITH LANDFILL DISPOSAL

## 2020 FACILITIES PLANNING

### O&M COST ESTIMATE

82,300 (raw sludge)
Total Annual O&M Cost = Total 2020 MMSD Sludge Production (dt/yr) = \$35,620,000

JIWWTP Energy Costs Natural Gas - Turbine Fuel
Natural Gas - Direct Firing of Dryers
Natural Gas - Minergy NOx Control & Startup
Natural Gas - Other Plant Facilities
Firm Electricity - Base Power Load
Firm Electricity - Demand Charges \$5,445,000 \$7,000 Interruptible Electricity - Base Power Load Interruptible Electricity - Demand Charges Turbine Operation and Maintenance \$1,289,000 SUBTOTAL \$17,282,000

SSWWTP Digestion Gas Credit/Replacement
plus/minus amount of solids destroyed in digestion = 12,734 tons/year
plus/minus amount of energy recovered from digestion process = 150,267 dtherm/year
VALUE OF ENERGY CHANGE IN TERMS OF COST OF EQUIVALENT GAS PURCHASE

### Milorganite® Annual Operating & Maintenance Costs

% of sludge to Milorganite® = 33%

% of sludge to glass furnace = 0%

27,139 (1	aw) –	100%
Process Unit	Process	
Cost	Contribution	Annual Cost
(\$/dt)	Cost (\$/dt raw)	\$/yr
\$53.00	\$37.10	\$1,008,000
\$191.30	\$186.40	\$5,062,000
\$443.30	\$22.20	\$603,000
\$27.20	\$26.50	\$720,000
\$81.70	\$79.60	\$2,162,000
\$3.20 *	\$1.70	\$46,000
\$82.40	\$0.40	\$11,000
\$36.40	\$2.20	\$60,000
\$135.10	\$0.00	\$0
-\$155.80	-\$151.80	-\$4,123,000
AL	\$204	\$5,548,584
	Process Unit Cost (\$/dt) \$53.00 \$191.30 \$443.30 \$27.20 \$81.70 \$3.20 \$82.40 \$36.40 \$135.10 \$-5155.80	Process Unit Cost (\$\sideta(\text{sid})\) \$53.00 \$37.10 \$191.30 \$186.40 \$443.30 \$22.20 \$27.20 \$26.50 \$81.70 \$79.60 \$3.20 \$1.70 \$82.40 \$0.40 \$36.40 \$2.20 \$135.10 \$0.00 \$-\$155.80 \$-\$515.80

### Glass Furnace Annual Operating Costs

annual sludge volume (dt/year) =	0 (	raw)	0
	Process Unit	Process	
	Cost	Contribution	Annual Cost
Item/Process	(\$/dt)	Cost (\$/dt raw)	\$/yr
JIWWTP Thickening	\$53.00	\$0.00	\$0
JIWWTP Dewatering/Drying	\$191.30	\$0.00	\$0
Sodium Hydroxide for Minergy SO2 Control	\$6.20	\$0.00	\$0
Ammonia for Minergy Nox control	\$0.50	\$0.00	\$0
Minergy Liquid Oxygen Tank & Vaporizer Rental	per year	-	\$0
Minergy Liquid Oxygen Usage	\$2.10	\$0.00	\$0
Minergy Equipment Maintenance	\$8.20	\$0.00	\$0
Minergy Ash Disposal	\$0.60	\$0.00	\$0
Minergy Staffing	per year	-	\$0
IPS Pipeline Sludge Transfer (includes SS energy)	\$3.20 *	\$0.00	\$0
SSWWTP WAS Thickening (energy included)	\$82.40	\$0.00	\$0
SSWWTP Digestion (energy included)	\$36.40	\$0.00	\$0

annual biosolids to Glass Furnace

## **Landfill Annual Operating & Maintenance Costs**

% of sludge to landfill = 67% annual sludge volume (dt/year) = 55,141

Annual Cost \$/yr \$39,000 Item/Process
IPS Pipeline Sludge Transfer
SSWWTP WAS Thickening (energy included) \$82.40 SSWWTP Digestion (energy included)
SSWWTP DS Thickening (energy included) \$36.40 \$47.20 \$2,007,000 \$2,603,000 SSWWTP Dewatering (energy included)
Landfill System Staffing
Cake Trucking & Landfilling \$115.00 \$65.90 \$3,634,000 \$16.79 \$83.20 \$257 \$926,000 \$4,588,000 \$14,176,382

see Sheet 12, Energy Costs Turbine Operation and Maintenance 2006 ), email 3.27.06 9700 \$1,288,659.79 Bob Gavahan (Power Engineers Collaborative \$1,250,000.00

see Sheet 12, Energy Costs see Sheet 12, Energy Costs

calculated difference in tons removed in digester from the year 2004 \$olids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05) calculated heat tracked directables assignment in the year 2004 points out 2004 calculated heat tracked directables assignment in a large and a difference of the calculated \$ value of additional digester gas based on values assumed on "JI Energy"

### Milorganite® Annual Operating & Maintenance Costs

۱			Total Mass of Raw	% of Raw Sludge from	% of Raw Sludge for	Alternative			
1		Process	Sludge that Cost	Left Column Actually Sent	this Alternative Sent	Process	Cost	ENR	2020 (2007)
	drPtocess Year Index Process Cost/ton	Source@6@ddalData	Value Applies to (tons)	to this Unit Process	to this Unit Process*	Cost/raw			
	JIWWTP Thickening	\$1,279,606	56,040	50%	6 70%	\$31.97	2004	8620	\$37.09 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05; 50% assumed by AES
	JIWWTP Dewatering/Drying	\$7,798,293	56,040	849	6 97%	\$160.68	2004	8620	\$186.40 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05; Symbiont calculations of energy cost based on Alan Scrivner (AES) email 12.6.06
	JIWWTP Chaff Processing	\$928,541	56,040	849	6 97%	\$19.13	2004	8620	\$22.19 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05
	Milorganite® Warehouse/Shipping	\$1,108,821	56,040	849	6 97%	\$22.85	2004	8620	\$26.50 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05
	Biosolids Marketing	\$2,990,952	49,086	879	6 97%	\$68.62	2004	8620	\$79.60 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05
	IPStPipeli8625Judge Transfer \$1.70	varies	varies	varie	s varies	\$1.47	200		Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05; Symbiont calculations; estimated cost breakdown: DS \$1.83/dt, WAS \$5.31/dt, PS \$1.14/dt
	SSWWTP WAS Thickening	\$1,989,266	56,040	50%	1%	\$0.36	2004	8620	\$0.42 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05; cost for JI GBT thickening
	SSWWTP Digestion	\$718,116	56,040	419	6%	\$1.88	2004	8620	\$2.18 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05
	Milorganite® Land Application	\$308,540	2,649	100%	6 0%	\$0.00	2004	8620	\$0.00 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05; cost for SS filter cake land application
	Milorganite® Sales Revenue	-\$5,704,448	49,086	879	6 97%	-\$130.87	2004	8620	-\$151.82 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05
1					*linked to assumptions	& total cost summary	page		

### Glass Furnace Annual Operating Costs

		Total Mass of Raw %	of Raw Sludge from	% of Raw Sludge for	Alternative				
	Process	Sludge that Cost Let	ft Column Actually Sent	this Alternative Sent	Process	Cost	ENR	2020 (2007)	
driPtoness Year Index Process Cost/ton Sou	rce@o6s£òoáalDeata	Value Applies to (tons)	to this Unit Process	to this Unit Process*	Cost/raw				
JIWWTP Thickening	\$1,279,606	56,040	50%	0%	\$0.00	2004	8620	\$0.00 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05; 50% assumed by AES	
JIWWTP Dewatering/Drying	\$7,798,293	56,040	84%	0%	\$0.00	2004	8620	\$0.00 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05; Symbiont calculations of energy cost based on Alan Scrivner (AES) email 12.6.06	
Sodium Hydroxide for Minergy SO2 Control	\$147,000	24,400	100%	0%	\$0.00	2006	9700	\$0 Minergy GlassPack Proposal MMSD Hybrid 11 14 06 sm.pdf, Bill Beres (Minergy) email 11.14.06	
Ammonia for Minergy Nox control	\$10,800	24,400	100%	0%	\$0.00	2006	9700	\$0.00 Minergy GlassPack Proposal MMSD Hybrid 11 14 06 sm.pdf, Bill Beres (Minergy) email 11.14.06	
Minergyeautquid Oxysgetii, 07anoli08. Vap2002er Rensei700	\$ <b>\$25</b> 57 <b>03</b> 020	per year	per year	per				Minergy GlassPack Proposal MMSD Hybrid 11 14 06 sm.pdf, Bill Beres (Minergy) email 11.14.06	
Minergy Liquid Oxygen Usage	\$50,800	24,400	100%	0%	\$0.00	2006	9700	\$0.00 Minergy GlassPack Proposal MMSD Hybrid 11 14 06 sm.pdf, Bill Beres (Minergy) email 11.14.06	
Minergy Equipment Maintenance	\$195,200	24,400	100%	0%	\$0.00	2006	9700	\$0.00 Minergy GlassPack Proposal MMSD Hybrid 11 14 06 sm.pdf, Bill Beres (Minergy) email 11.14.06	
Minergy Ash Disposal	\$13,275	24,400	100%	0%	\$0.00	2006	9700	\$0.00 Minergy GlassPack Proposal MMSD Hybrid 11 14 06 sm.pdf, Bill Beres (Minergy) email 11.14.06	
Minlekgijl Staffling 11.16.06; \$48/hr/worker per Mark K	aminski \$5 <b>99</b> @\$@n	der of MMSD per Beilt t∕erällremail	11.17.06 per yea	r per year	\$0.00	2006	9700	\$0.00 5 workers and 1 supervisor per Bil	
IPS Pipeline Sludge Transfer	varies	varies	varies	s varies	\$0.00	2004	8620	\$0.00 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05; Symbiont calculations; estimated cost breakdown: DS \$1.83/dt, WAS \$5.31/dt, PS \$1.14/dt	
SSWWTP WAS Thickening	\$1,989,266	56,040	50%	0%	\$0.00	2004	8620	\$0.00 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05; cost for JI GBT thickening	
SSWWTP Digestion	\$718,116	56,040	41%	0%	\$0.00	2004	8620	\$0.00 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05	
	*linked to assumptions & total cost summary page								

## **Landfill Annual Operating & Maintenance Costs**

		Total Mass of Raw	% of Raw Sludge from	% of Raw Sludge for	Alternative			
	Process	Sludge that Cost	Left Column Actually Sent	this Alternative Sent	Process	Cost	ENR	2020 (2007)
dr Ptocess Year Index Process Cost/to	on Source@o6stokalDeata	Value Applies to (tons)	to this Unit Process	to this Unit Process*	Cost/raw			
IPS Pipeline Sludge Transfer	varies	varies	varie	es varies	\$0.63	2004	8620	\$0.74 Solids Cost 2004 UWSactual XLS, Bill Krill email 08.19.05; Symbiont calculations; estimated cost breakdown: DS \$1.83/dt, WAS \$5.31/dt, PS \$1.14/dt
SSWWTP WAS Thickening	\$1,989,266	56,040	509	% 8%	\$5.97	2004	8620	\$6.93 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05; cost for JI GBT thickening
SSWWTP Digestion	\$68,003	2,168	100	% 100%	\$31.37	2004	8620	\$36.39 Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05
SSWWTP DS Thibleening (8626gy included)	\$47.19 \$1,989,266	56,040	509	% 57%	\$40.68	2		Solids Cost 2004 UWSactual .XLS, Bill Krill email 08.19.05; cost for JI GBT thickening
SSWWTP Dewatering	\$52	1	1009	% 57%	\$29.80	1987	4522	\$65.89 recessed-plate.pdf (EPA Biosolids Technology Fact Sheet (EPA 832-F-00-058), September 2000), Bill Krill email 11.16.06
Landfill 592sterw 3 teeffing nd 1 supervisor per B	3ill Krill, meeting \$8.985,560 \$	48/hr/worker per Marky Kaar	minski & Bob Sander opfelvllylet	MD, Bill Kill email 1ptet7ye6	\$898,560.00	2006	9700	\$926,3
Cake Trucking & Landfilling	\$122	1	1009	% 57%	\$70.15	2005	9231	\$83.24 MMSDPlanA.doc, Rick Pager (Waste Management), email 7.27.05 (forwarded by Alan Scrivner (AES), email 07.28.05); inflated to be on par with assumed electrical/gas rate inflation per Bill Krill meeting 12.18.06
*linked to assumptions & total cost summary page								



## **ENERGY COSTS**

GAS

**TOTAL** \$15,992,889 per year

% Inflation

GAS		/0 IIIIau011		
	mmBTU Current Rates	to 2007 Future Rates	Total	Required Energy Source:
direct firing of dryers	\$9.250 \$/Dth	erm 0% \$9.250 \$/Dther		\$0Milo-LF Hybrid Daily Heat & Mass Balance 2020 ALH 12.01.xls
turbine fuel	1139553.4 \$9.250 \$/Dth	erm 0% \$9.250 \$/Dther	m S	\$10,540,869 Tom Bachman (Triad Engineering, Inc. (Symbiont)), Technical Memorandum 5.17.05
other plant gas	588,672 \$9.250 \$/Dth	erm 0% \$9.250 \$/Dther	m	\$5,445,216 Current Rate Source:
NOx Control	0 \$9.250 \$/Dth	erm 0% \$9.250 \$/Dther	m	\$0 Mark Kaminski (MMSD) email 4.5.06 (forwarded by Bill Krill (HNTB) email 4.5.06)
Melter Start-Up	0 \$9.250 \$/Dth	erm 0% \$9.250 \$/Dther	m	\$0 Inflation Source:
		Gas Total \$15,98	86,085	
ELECTRICAL				
Transmission Level Service		% Inflation		
	Current Rates	to 2007 Future Rates	Total	Required Energy Source:
Facilities Charge	\$6,300 /year			\$0
On Peak Energy Charge	\$0.0603 /kWh			\$0
Off Peak Energy Charge	\$0.0312 /kWh			\$0 Current Rate Source:
On-Peak Demand Charge	\$10.2160 /kW	8% \$11.0333 /kW		\$0 Wisconsin Electric Power Company, Volume 19 Electric Rates, Rev. 5, Sheet 65, Issued 1/26/06
Customer Demand Charge	\$0.0000 /kw	8% \$0.0000 /kw		\$0 Inflation Source:
				Mark Kaminski (MMSD) email 4.5.06 (forwarded by Bill Krill (HNTB) email 4.5.06)
		Transmission Electric Total	\$0	
Interruptible Service		% Inflation		
	Current Rates	to 2007 Future Rates	Total	Required Energy Source:
Facilities Charge	\$9,600 /year			\$0
On Peak Energy Charge	\$0.05574 /kWh			\$0 Current Rate Source:
Off Peak Energy Charge	\$0.02990 /kWh			\$0 Wisconsin Electric Power Company, Volume 19 Electric Rates, Rev. 3, Sheet 81.1-81.2, Issued 1/26/06
On-Peak Demand Charge	\$0.05024 /kW	8% \$0.0543 /kW		\$0 Inflation Source:
Customer Demand Charge	\$0.000 /kw	8% \$0.0000 /kw		\$0 Mark Kaminski (MMSD) email 4.5.06 (forwarded by Bill Krill (HNTB) email 4.5.06)
		Interruptible Electric Total	\$0	
		0/ 1 5 4		
Current Service	015 :	% Inflation	T. ( . )	
E 11111 OI	Current Rates	to 2007 Future Rates	Total	40.004.0
Facilities Charge	1 \$6,300 /year			\$6,804 Current Rate Source:
On Peak Energy Charge	\$0.0613 /kWh			\$0 Wisconsin Electric Power Company, Volume 19 Electric Rates, Rev. 5, Sheet 65, Issued 1/26/06
Off Peak Energy Charge	\$0.0331 /kWh	8% \$0.0357 /kWh		\$0

\$0 Inflation Rate Source:

#### SSWWTP DIGESTION ENERGY CREDIT

On-Peak Demand Charge

**Customer Demand Charge** 

Density of VSS destroyed 15 cf/lb Alan Scrivner (AES) phone conversation 8.23.06
Heat Value of Offgas 600 BTU/cf Alan Scrivner (AES) phone conversation 8.23.06

8%

8%

\$11.2104 /kW

\$0.8208 /kw

\$10.3800 /kW

\$0.7600 /kw

Cost per ton VSS destroyed \$ 166.50 using cost of gas shown above



TABLE 9G-6 SHEET 12 OF 13

RECOMMENDED BIOSOLIDS PLAN

ALTERNATIVE 6 – COMBINE MILORGANITE®

PROGRAM WITH LANDFILL DISPOSAL

2020 TREATMENT REPORT

\$0 Mark Kaminski (MMSD) email 4.5.06 (forwarded by Bill Krill (HNTB) email 4.5.06)

6/2/07 TR\_9G.T006.07.06.02.cdr

## **ASSUMPTIONS**

#### MASS BALANCE

Source: Appendix 9F, Biosolids Recommended Plan Alternatives – Mass Balances, Table 9F-6, Recommended Biosolids Plan Alternative 6 - Combine Milorganite® Program with Landfill Disposal

Percent of Milorganite® Raw Sludge that Goes to Digestion 6.00% Percent of Minergy Raw Sludge that Goes to Digestion 0.00% Percent of Landfill Raw Sludge that Goes to Digestion 100.00% Percent of Milorganite® Raw Sludge that Becomes TWAS 70.00% Percent of Minergy Raw Sludge that Becomes TWAS 0.00% Percent of TSS Removed During Digestion 42.70% Total Sludge to Digestion (tpy) 56430 Percent of Digested Sludge to Milorganite® 2.90% Percent of Digested Sludge to Glass Furnace 0.00% Percent of Digested Sludge to Landfill 97.10% WAS to Digestion (tpv) 4749 WAS transferred from SSWWTP to JIWWTP (tpy) 6985 Percent of WAS sent to JIWWTP to Milorganite® 100.00% Percent of WAS sent to JIWWTP to Glass Furnace 0.00% WAS transferred from JIWWTP to SSWWTP (tpy) 1231 Primary Sludge Transferred from JIWWTP to SSWWTP 25871

### **USEFUL LIFE**

LandPermanentSewer & Force Mains50 yearsSymbiont assumptionStructures, Piping, & Valves40 yearsSymbiont assumptionProcess Equipment, Electrical, I&C20 yearsSymbiont assumption

### **UNDESIGNED DETAILS ALLOWANCE**

all inclusive firm bid price
all major components have documented installed unit costs
costs missing for some components, but other costs are for
installed facilities and well documented (connections to existing
systems, etc.)
Symbiont assumption
Symbiont assumption

Symbiont assumption

40%

## CONTINGENCY

all inclusive firm bid price 0% Bill Krill (HNTB), phone conference 11.16.06 everything else 25% Bill Krill (HNTB), phone conference 11.16.06

### **DESIGN, BIDDING, & OVERSITE**

(eg. Installation cost is estimated)

all inclusive firm bid price (design complete, no bidding)

15% Bill Krill (HNTB), phone conference 11.16.06

35% Bill Krill (HNTB), phone conference 11.16.06



TABLE 9G-6 SHEET 2 OF 13

RECOMMENDED BIOSOLIDS PLAN ALTERNATIVE 6 – COMBINE MILORGANITE® PROGRAM WITH LANDFILL DISPOSAL

Symbiont assumption

2020 TREATMENT REPORT

6/2/07 TR\_9G.T006.07.06.02.cdr

2020 Facilities Plan Treatment Report

## **APPENDIX 9H**

# GLASS FURNACE TECHNOLOGY PROPOSALS

