APPENDIX 9G

BIOSOLIDS RECOMMENDED PLAN ALTERNATIVES – COST ESTIMATES

Milwaukee Metropolitan Sewerage District
2020 FACILITIES PLANNING

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%	

Summary of Capital Costs

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**

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TABLE 9G-1 SHEET 1 OF 11
RECOMMENDED BIOSOLIDS ALTERNATIVE 1 – LANDFILL
2020 TREATMENT REPORT
6/2/07 TR_9G.T001.07.06.02.cdr

Milwaukee Metropolitan Sewerage District

2020 FACILITIES PLANNING

JIWWTP TRANSMISSION LEVEL ELECTRICAL SERVICE CAPITAL COST

								Total Capital Cost =		Total Salvage Value =	<----- insert link to this cost on the Capital Cost Summary Worksheet							
								$27,980,000		$930,000								
DESCRIPTION	Quantity	Units	Unit Cost ($)	SUBTOTAL ($)	Un-designed Details (%)	Conting-ency (%)	Design, Bidding, & Oversite (%)	SUBTOTAL ($)	Life (Years)	Salvage Value ($)	Actual Unit Cost ($)	COST ADJUSTMENT Cost Year	ENR Index	Adjustment Factor	ADJUSTED UNIT COST ($)	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.xls*, 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
Manholes (SSsto 289)	4	each	$10,000	$40,000	20%	25%	35%	$80,000	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 289)	800	LF	$100	$80,000	20%	25%	35%	$160,000	20	$0	$100	2006	9700	1.03	$103	*138KVServiceOptionESTIMATE2.xls*, Tony Pohl (Automation Service & Design Inc.), email 05.05.06	TBD	200 Amp Feeders
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	$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 03.29.06 $0	$4,236,364	2006	9700	We Energies	$4,367,385	Alan Scrivner (AES Engineering), phone conversation 03.29.06 contingencies indicated by AES		
Division 16 Subtotal	**$24,700,000**																	

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Milwaukee Metropolitan Sewerage District

2020 FACILITIES PLANNING

D&D FACILITY DEMOLITION CAPITAL COST

								Total Capital Cost = $47,250,000		Total Salvage Value = $0	<----- insert link to this cost on the Capital Cost Summary Worksheet						
DESCRIPTION	Quantity	Units	Unit Cost ($)	SUBTOTAL ($)	Un-designed Details (%)	Conting-ency (%)	Design, Bidding, & Oversite (%)	SUBTOTAL ($)	Life (Years)	Salvage Value ($)	Actual Unit Cost ($)	COST ADJUSTMENT Cost Year	ENR Index	Adjustment Factor	ADJUSTED UNIT COST ($)	SOURCE	MANUFACTURER	COMMENTS
DIVISION 13: SPECIAL CONSTRUCTION																		
Facility Demolition	1	lump sum	$20,000,000	$20,000,000	40%	25%	35%	$47,250,000	20	$0	$20,000,000	2007	10000	1.00	$20,000,000	Symbiont and AES engineering judgment		
Division 13 Subtotal	**$47,250,000**																	

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TABLE 9G-1 SHEET 3 OF 11

RECOMMENDED BIOSOLIDS ALTERNATIVE 1 – LANDFILL

2020 TREATMENT REPORT

6/2/07 TR_9G.T001.07.06.02.cdr

Milwaukee Metropolitan Sewerage District

2020 FACILITIES PLANNING

INTERPLANT SLUDGE PIPELINE UPGRADES CAPITAL COSTS

Total Capital Cost = $1,740,000 | Total Salvage Value = $0

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

DESCRIPTION	Quantity	Units	Unit Cost ($)	SUBTOTAL ($)	Un-designed Details (%)	Conting-ency (%)	Design, Bidding, & Oversite (%)	SUBTOTAL ($)	Life (Years)	Salvage Value ($)	Actual Unit Cost ($)	COST ADJUSTMENT Cost Year	ENR Index	Adjustment Factor	ADJUSTED UNIT COST ($)	SOURCE	MANUFACTURER	COMMENTS
DIVISION 11: EQUIPMENT																		
JIWWTP and SSWWTP Hard Metal Pumps & Motors Rated for 300 psi	6	each	$93,000	$558,000	20%	25%	35%	$1,130,000	20	$0	$90,000	2006	9700	1.03	$92,784	Mickey (RDM), phone conversation 03.28.06	TBD	includes $5000 per pump for installation
Division 11 Subtotal	**$1,130,000**																	
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**																	

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TABLE 9G-1 SHEET 4 OF 11

RECOMMENDED BIOSOLIDS ALTERNATIVE 1 – LANDFILL

2020 TREATMENT REPORT

6/2/07 TR_9G.T001.07.06.02.cdr

Milwaukee Metropolitan Sewerage District
2020 FACILITIES PLANNING

New SSWWTP Gravity Belt Thickeners for WAS Thickening Capital Cost

Total Capital Cost = $18,730,000 | Total Salvage Value = $1,363,000

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

DESCRIPTION	Quantity	Units	Unit Cost ($)	SUBTOTAL ($)	Un-designed Details (%)	Conting-ency (%)	Design, Bidding, & Oversite (%)	SUBTOTAL ($)	Life (Years)	Salvage Value ($)	Actual Unit Cost ($)	COST ADJUSTMENT Cost Year	ENR Index	Adjustment Factor	ADJUSTED UNIT COST ($)	SOURCE	MANUFACTURER	COMMENTS
DIVISION 2: SITE CONSTRUCTION																		
Demolition	1	lump sum	$26,000	$26,000	40%	25%	35%	$50,000	20	$0	$22,500	2004	8620	1.16	$26,102	Frank Tiefert (ATI), Technical Memorandum 11.15.04 (forwarded via Kate Ziino (HNTB), fax 9.27.06)	TBD	+25% contractor O&P per Tech Memo (40% undesigned details also listed in memo)
Division 2 Subtotal	**$60,000**																	
DIVISION 4: MASONRY																		
Masonry Restoration - Cut and Repoint Brick	1	lump sum	$22,000	$22,000	40%	25%	35%	$50,000	20	$0	$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 O&P per Tech Memo (40% undesigned details also listed in memo)
Division 4 Subtotal	**$50,000**																	
DIVISION 11: EQUIPMENT																		
GBT Equipment	1	lump sum	$2,784,000	$2,784,000	40%	25%	35%	$6,580,000	20	$0	$2,400,000	2004	8620	1.16	$2,784,223	Frank Tiefert (ATI), Technical Memorandum 11.15.04 (forwarded via Kate Ziino (HNTB), fax 9.27.06)	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
Thickened Sludge Pumps	1	lump sum	$552,000	$552,000	40%	25%	35%	$1,300,000	20	$0	$476,250	2004	8620	1.16	$552,494	Frank Tiefert (ATI), Technical Memorandum 11.15.04 (forwarded via Kate Ziino (HNTB), fax 9.27.06)	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
Washwater Pumps	1	lump sum	$109,000	$109,000	40%	25%	35%	$260,000	20	$0	$93,750	2004	8620	1.16	$108,759	Frank Tiefert (ATI), Technical Memorandum 11.15.04 (forwarded via Kate Ziino (HNTB), fax 9.27.06)	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
Polymer System	1	lump sum	$313,000	$313,000	40%	25%	35%	$740,000	20	$0	$270,000	2004	8620	1.16	$313,225	Frank Tiefert (ATI), Technical Memorandum 11.15.04 (forwarded via Kate Ziino (HNTB), fax 9.27.06)	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
Division 11 Subtotal	**$8,880,000**																	
DIVISION 13: SPECIAL CONSTRUCTION																		
Building Modifications	1	lump sum	$281,000	$281,000	40%	25%	35%	$660,000	40	$121,000	$242,500	2004	8620	1.16	$281,323	Frank Tiefert (ATI), Technical Memorandum 11.15.04 (forwarded via Kate Ziino (HNTB), fax 9.27.06)	TBD	+25% contractor O&P per Tech Memo (40% undesigned details also listed in memo)
Relocate JIWWTP GBTs to SSWWTP	4	each	$70,000	$280,000	40%	25%	35%	$660,000	20	$0	$65,000	2005	9231	1.08	$70,415	*Biosolids Alternative Sizing Worksheets r4.xls* , Symbiont engineering judgment		
Thickening Building Expansion	8,000	sf	$298	$2,384,000	40%	25%	35%	$5,630,000	40	$1,036,000	$289	2006	9700	1.03	$298	*Turbine Building Cost COSTWORKS.xls* ; 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	1	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 Ziino (HNTB), fax 9.27.06)	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
Division 15 Subtotal	**$1,120,000**																	
DIVISION 16: ELECTRICAL																		
Instrumentation & Control	1	lump sum	$378,000	$378,000	40%	25%	35%	$890,000	20	$0	$326,250	2004	8620	1.16	$378,480	Frank Tiefert (ATI), Technical Memorandum 11.15.04 (forwarded via Kate Ziino (HNTB), fax 9.27.06)	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
Electrical	1	lump sum	$331,000	$331,000	40%	25%	35%	$760,000	20	$0	$285,000	2004	8620	1.16	$330,626	Frank Tiefert (ATI), Technical Memorandum 11.15.04 (forwarded via Kate Ziino (HNTB), fax 9.27.06)	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
Division 16 Subtotal	**$1,670,000**																	

Milwaukee Metropolitan Sewerage District

2020 FACILITIES PLANNING

SSWWTP DIGESTER REHABILITATION CAPITAL COST

								Total Capital Cost = $219,780,000		Total Salvage Value = $34,319,000	<----- insert link to this cost on the Capital Cost Summary Worksheet							
DESCRIPTION	Quantity	Units	Unit Cost ($)	SUBTOTAL ($)	Un-designed Details (%)	Conting-ency (%)	Design, Bidding, & Oversite (%)	SUBTOTAL ($)	Life (Years)	Salvage Value ($)	Actual Unit Cost ($)	COST ADJUSTMENT Cost Year	ENR Index	Adjustment Factor	ADJUSTED UNIT COST ($)	SOURCE	MANUFACTURER	COMMENTS
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	$2	2007	10000	1.00	$2	Symbiont engineering judgment	TBD	
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	$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
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	$13,650	2005	9231	1.08	$14,787	Rich Hussey (Ley Associates), email 07.26.05	Wemco-Hidrostal, D4K-HS	+30% for install
Recirculating Sludge Heat Exchangers -Sludge-Hot Water Systems	16	each	$42,000	$672,000	40%	25%	35%	$1,590,000	20	$0	$39,000	2005	9231	1.08	$42,249	*Biosolids Alternative Sizing Worksheets r4.xls* , Symbiont	Alfa Laval	+30% for install
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	$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
Digester Gas Safety Equipment	1	allowance	$1,625,000	$1,625,000	40%	25%	35%	$3,840,000	20	$0	$1,500,000	2005	9231	1.08	$1,624,959	Symbiont engineering judgment		
Division 11 Subtotal	**$32,960,000**																	
DIVISION 15: MECHANICAL																		
New Boiler	1	each	$134,000	$134,000	40%	25%	35%	$320,000	20	$0	$130,000	2006	9700	1.03	$134,021	Symbiont engineering judgment based on recent projects	TBD	
Division 15 Subtotal	**$320,000**																	

Milwaukee Metropolitan Sewerage District
2020 FACILITIES PLANNING

SSWWTP NEW DIGESTED SLUDGE GRAVITY BELT THICKENERS CAPITAL COST

Total Capital Cost = $4,240,000 | Total Salvage Value = $0

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

DESCRIPTION	Quantity	Units	Unit Cost ($)	SUBTOTAL ($)	Un-designed Details (%)	Conting-ency (%)	Design, Bidding, & Oversite (%)	SUBTOTAL ($)	Life (Years)	Salvage Value ($)	Actual Unit Cost ($)	COST ADJUSTMENT Cost Year	ENR Index	Adjustment Factor	ADJUSTED UNIT COST ($)	SOURCE	MANUFACTURER	COMMENTS
DIVISION 11: EQUIPMENT																		
2 meter Gravity Belt Thickener	4	each	$292,000	$1,168,000	20%	25%	35%	$2,370,000	20	$0	$270,000	2005	9231	1.08	$292,493	Bob Moser (UWS) phone conversation 3.23.06	TBD	
500 gpm Gravity Belt Thickener Feed Pumps	3	each	$59,000	$177,000	40%	25%	35%	$420,000	20	$0	$54,600	2005	9231	1.08	$59,149	Rich Hussey (Ley Associates), email 07.26.05	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 install
Progressing Cavity Gravity Belt Thickener Polymer Feed Pumps	3	each	$42,000	$126,000	40%	25%	35%	$300,000	20	$0	$39,000	2005	9231	1.08	$42,249	*Biosolids Alternative Sizing Worksheets r4.xls* Symbion!	Moyno or Netszch	200 gpm@40TDH, w/VFDs x1.3 installed
Progressing Cavity Thickened Sludge Transfer Pumps	3	each	$70,000	$210,000	40%	25%	35%	$500,000	20	$0	$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.(	Moyno or Netszch	250 gpm @ 140' TDH x2 for vfd x1.3 installed
Progressing Cavity GBT Bulk Polymer Transfer Pumps	1	each	$35,000	$35,000	40%	25%	35%	$80,000	20	$0	$32,500	2005	9231	1.08	$35,207	*Biosolids Alternative Sizing Worksheets r4.xls* Symbion!	Moyno or Netszch	10 gpm/3 HP, constant speed x1.3 installed
Progressing Cavity GBT Bulk Polymer Mix Pumps	1	each	$28,000	$28,000	40%	25%	35%	$70,000	20	$0	$26,000	2005	9231	1.08	$28,166	*Biosolids Alternative Sizing Worksheets r4.xls* Symbion!	Moyno or Netszch	5 gpm, 2 HP, DC adjustable speed x1.3 installed
Progressing Cavity Operational Storage Pumps	3	each	$70,000	$210,000	40%	25%	35%	$500,000	20	$0	$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.(	Moyno or Netszch	250 gpm @ 140' TDH x2 for vfd x1.3 installed
Division 11 Subtotal	**$4,240,000**																	

DIVISION 11: EQUIPMENT
2 meter Gravity Belt Thickener
500 gpm Gravity Belt Thickener Feed Pumps
Progressing Cavity Gravity Belt 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 Operational Storage Pumps

Milwaukee Metropolitan Sewerage District

2020 FACILITIES PLANNING

SSWWTP DEWATERING UPGRADES CAPITAL COST

								Total Capital Cost = $5,360,000		Total 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										
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 ($)	COST ADJUSTMENT Cost Year	ENR Index	Adjustment Factor	ADJUSTED UNIT COST ($)	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	

Milwaukee Metropolitan Sewerage District
2020 FACILITIES PLANNING

O&M COST ESTIMATE

Total 2020 MMSD Sludge Production (dt/yr) = 82,700 (raw sludge)

Total Annual O&M Cost = $34,160,000

JIWWTP Energy Costs

Natural Gas - Turbine Fuel	$0
Natural Gas - Direct Firing of Dryers	$0
Natural Gas - Minergy NOx Control & Startup	$0
Natural Gas - Other Plant Facilities	$5,445,000
Firm Electricity - Base Power Load	$2,984,000
Firm Electricity - Demand Charges	$2,251,000
Interruptible Electricity - Base Power Load	$0
Interruptible Electricity - Demand Charges	$0
Turbine Operation and Maintenance	$0
SUBTOTAL	**$10,660,000**

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	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® = 0% *% sold*
annual sludge volume (dt/year) = 0 *(raw)* = 0%

Item/Process	Process Unit Cost ($/dt)	Process Contribution Cost ($/dt raw)	Annual Cost $/yr
JIWWTP Thickening	$53.00	$0.00	$0
JIWWTP Dewatering/Drying	$191.30	$0.00	$0
JIWWTP Chaff Processing	$443.30	$0.00	$0
Milorganite® Warehouse/Shipping	$27.20	$0.00	$0
Biosolids Marketing	$61.70	$0.00	$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
Milorganite® Land Application	$135.10	$0.00	$0
Milorganite® Sales Revenue	-$155.80	$0.00	$0
SUBTOTAL		**$0**	**$0**

Glass Furnace Annual Operating Costs

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

Item/Process	Process Unit Cost ($/dt)	Process Contribution Cost ($/dt raw)	Annual Cost $/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
SUBTOTAL		**$0**	**$0**

Landfill Annual Operating & Maintenance Costs

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

Item/Process	Process Unit Cost ($/dt)	Process Contribution Cost ($/dt raw)	Annual Cost $/yr
IPS Pipeline Sludge Transfer	$3.20 *	$1.80	$149,000
SSWWTP WAS Thickening (energy included)	$82.40	$55.30	$4,573,000
SSWWTP Digestion (energy included)	$36.40	$36.40	$3,010,000
SSWWTP DS Thickening (energy included)	$82.40	$47.20	$3,903,000
SSWWTP Dewatering (energy included)	$115.00	$65.90	$5,450,000
Landfill System Staffing	per year	$11.20	$926,600
Cake Trucking & Landfilling	$145.30	$83.20	$8,881,000
SUBTOTAL		**$301**	**$24,892,460**

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

see Sheet 10, Energy Costs
see Sheet 10, Energy Costs
see Sheet 10, Energy Costs
see Sheet 10, Energy Costs
see Sheet 10, Energy Costs
see Sheet 10, Energy Costs
see Sheet 10, Energy Costs
see Sheet 10, Energy Costs
Turbine Operation and Maintenance per year $0.00 2006 9700 $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 value of additional digester gas based on values assumed on "JI Energy"
calculated $ value of additional digester gas based on values assumed on "JI Energy"

Milorganite® Annual Operating & Maintenance Costs

Process	Process Cost Value	Total Mass of Raw Sludge that Cost Value Applies to (tons)	% of Raw Sludge from Left Column Actually Sent to this Unit Process	% of Raw Sludge for this Alternative Sent to this Unit Process*	Alternative Process Cost/raw dry ton	Cost Year	ENR Index	2020 (2007) Process Cost/ton	Source of Cost Data
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
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	$2,960,952	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/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
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

Process	Process Cost Value	Total Mass of Raw Sludge that Cost Value Applies to (tons)	% of Raw Sludge from Left Column Actually Sent to this Unit Process	% of Raw Sludge for this Alternative Sent to this Unit Process*	Alternative Process Cost/raw dry ton	Cost Year	ENR Index	2020 (2007) Process Cost/ton	Source of Cost Data
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	2005	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	100%	0%	$0.00	2005	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 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
Minergy Liquid Oxygen Usage	$50,800	24,400	100%	0%	$0.00	2005	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	2005	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	2005	9700	$0.00	*Minergy GlassPack Proposal MMSD Hybrid 11 14 06 sm.pdf* , Bill Beres (Minergy) email 11.14.06
Minergy Staffing	$599,040	per year	per year	per year	$0.00	2005	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 11.17.05
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/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

Process	Process Cost Value	Total Mass of Raw Sludge that Cost Value Applies to (tons)	% of Raw Sludge from Left Column Actually Sent to this Unit Process	% of Raw Sludge for this Alternative Sent to this Unit Process*	Alternative Process Cost/raw dry ton	Cost Year	ENR Index	2020 (2007) Process Cost/ton	Source of Cost Data
IPS Pipeline Sludge Transfer	varies	varies	varies	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 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 Thickening (energy included)	$1,989,266	56,040	50%	57%	$40.68	2004	8620	$47.19	*Solids Cost 2004 UWSactual .XLS* , Bill Krill email 08.19.05; cost for JI GBT thickening
SSWWTP Dewatering	$52	1	100%	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 11.16.05
Landfill System Staffing	$868,560	per year	per year	per year	$868,560.00	2006	9700	$926,350.52	8 workers and 1 supervisor per Bill Krill, meeting 11.16.05; $48/hr/worker per Mark Kaminski & Bob Sander of MMSD, Bill Krill email 11.17.06
Cake Trucking & Landfilling	$122	1	100%	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

*linked to assumptions & total cost summary page

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ENERGY COSTS

TOTAL **$10,660,227** per year

GAS

	mmBTU	Current Rates	% Inflation to 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:
					Mark Kaminski (MMSD) email 4.5.06 (forwarded by Bill Krill (HNTB) email 4.5.06)

Transmission Electric Total $5,215,011

Interruptible Service

	Current Rates	% Inflation to 2007	Future Rates	Total	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

	Current Rates	% Inflation to 2007	Future 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

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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 installed facilities and well documented (connections to existing systems, etc.)	20%	Symbiont assumption
installed costs for major components are not well documented (eg. Installation cost is estimated)	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)	15%	Bill Krill (HNTB), phone conference 11.16.06
everything else	35%	Bill Krill (HNTB), phone conference 11.16.06

Milwaukee Metropolitan Sewerage District
2020 FACILITIES PLANNING

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	16,700	Finished Biosolids

Biosolids Influent Load Distribution

0%	Milorganite®		
100%	Glass Furnace	0%	Landfill

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

Summary of Capital 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**

MMSD
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Milwaukee Metropolitan Sewerage District

2020 FACILITIES PLANNING

JIWWTP TRANSMISSION LEVEL ELECTRICAL SERVICE CAPITAL COST

Total Capital Cost = $27,980,000 | Total Salvage Value = $930,000 | <----- insert link to this cost on the Capital Cost Summary Worksheet

DESCRIPTION	Quantity	Units	Unit Cost ($)	SUBTOTAL ($)	Un-designed Details (%)	Conting-ency (%)	Design, Bidding, & Oversite (%)	SUBTOTAL ($)	Life (Years)	Salvage Value ($)	Actual Unit Cost ($)	COST ADJUSTMENT Cost Year	ENR Index	Adjustment Factor	ADJUSTED UNIT COST ($)	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.xls*, 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
Manholes (SSsto 289)	4	each	$10,000	$40,000	20%	25%	35%	$80,000	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 289)	800	LF	$100	$80,000	20%	25%	35%	$160,000	20	$0	$100	2006	9700	1.03	$103	*138KVServiceOptionESTIMATE2.xls*, Tony Pohl (Automation Service & Design Inc.), email 05.05.06	TBD	200 Amp Feeders
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	$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 03.29.06	$4,236,364	2006	9700	We Energies	$4,367,088	Alan Scrivner (AES Engineering), phone conversa		
Division 16 Subtotal	**$24,700,000**																	

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JIWWTP COOLING WATER PUMP UPGRADES CAPITAL COSTS

Total Capital Cost = $600,000 | Total Salvage Value = $0

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

DESCRIPTION	Quantity	Units	Unit Cost ($)	SUBTOTAL ($)	Un-designed Details (%)	Conting-ency (%)	Design, Bidding, & Oversite (%)	SUBTOTAL ($)	Life (Years)	Salvage Value ($)	Actual Unit Cost ($)	COST ADJUSTMENT Cost Year	ENR Index	Adjustment Factor	ADJUSTED UNIT COST ($)	SOURCE	MANUFACTURER	COMMENTS
DIVISION 11: EQUIPMENT																		
New 3000 gpm, 173' TDH Vertical Turbine Cooling Water Pumps	2	each	$128,000	$256,0009	40%	25%	35%	$600,000	20	$0	$62,863	1990	4894	2.04	$128,44	JIWWTP North Utility Pump Station Designer Training Manual, January 1992	Fairbanks Morse Pump Corp.	+30% for installation (cost was listed for both pumps and thus is divided by 2 here)
Division 11 Subtotal	**$600,000**																	

Milwaukee Metropolitan Sewerage District

2020 FACILITIES PLANNING

D&D FACILITY UPGRADES CAPITAL COST

								Total Capital Cost =		Total Salvage Value =								
								$114,740,000		$0	<----- insert link to this cost on the Capital Cost Summary Worksheet								
DESCRIPTION	Quantity	Units	Unit Cost ($)	SUBTOTAL ($)	Un-designed Details (%)	Conting-ency (%)	Design, Bidding, & Oversite (%)	SUBTOTAL ($)	Life (Years)	Salvage Value ($)	Actual Unit Cost ($)	COST ADJUSTMENT Cost Year	ENR Index	Adjustment Factor	ADJUSTED UNIT COST ($)	SOURCE	MANUFACTURER	COMMENTS	
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	$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		
Unit Process 25 Upgrade	1	lump sum	$17,453,000	$17,453,000	40%	25%	35%	$41,230,000	20	$0	$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		
Unit Process 27 Upgrade	1	lump sum	$4,062,000	$4,062,000	40%	25%	35%	$9,600,000	20	$0	$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		
Unit Process 29 Upgrade	1	lump sum	$12,629,000	$12,629,000	40%	25%	35%	$29,840,000	20	$0	$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		
Unit Process 30 Upgrade	1	lump sum	$1,278,000	$1,278,000	40%	25%	35%	$3,020,000	20	$0	$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		
Unit Process 31 Upgrade	1	lump sum	$747,000	$747,000	40%	25%	35%	$1,760,000	20	$0	$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		
Unit Process 32 Upgrade	1	lump sum	$2,809,000	$2,809,000	40%	25%	35%	$6,640,000	20	$0	$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		
Miscellaneous Costs (drop chutes, etc.)	1	lump sum	$3,093,000	$3,093,000	40%	25%	35%	$7,310,000	20	$0	$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		
Division 13 Subtotal	$114,740,000																		

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Milwaukee Metropolitan Sewerage District
2020 FACILITIES PLANNING

NEW GLASS FURNACE PROCESS EQUIPMENT CAPITAL COST

Total Capital Cost = $67,580,000 | Total Salvage Value = $0 | <----- insert link to this cost on the Capital Cost Summary Worksheet

DESCRIPTION	Quantity	Units	Unit Cost ($)	SUBTOTAL ($)	Un-designed Details (%)	Conting-ency (%)	Design, Bidding, & Oversite (%)	SUBTOTAL ($)	Life (Years)	Salvage Value ($)	Actual Unit Cost ($)	COST ADJUSTMENT Cost Year	ENR Index	Adjustment Factor	ADJUSTED UNIT COST ($)	SOURCE	MANUFACTURER	COMMENTS
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	$34,549,280	2006	9700	1.03	$35,617,814	*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)	Minergy	
Dense Phase Conveyance System from Silos to Glass Furnace	1	lump sum	$616,000	$616,000	40%	25%	35%	$1,460,000	20	$0	n $598,000 (AES), 2006 mail 11.22.06)	2006	9700	1.03	$616,495	Dan Roe (Dynamic Air Inc.), email 1.26.06 (forwarded via Ala	Dynamic Air, Inc.	2 lines, +30% for installation
Division 13 Subtotal	**$67,580,000**																	

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Milwaukee Metropolitan Sewerage District

2020 FACILITIES PLANNING

NEW GLASS FURNACE BUILDINGS CAPITAL COST

								Total Capital Cost = $16,440,000		Total Salvage Value = $1,681,000	<----- insert link to this cost on the Capital Cost Summary Worksheet							
DESCRIPTION	Quantity	Units	Unit Cost ($)	SUBTOTAL ($)	Un-designed Details (%)	Conting-ency (%)	Design, Bidding, & Oversite (%)	SUBTOTAL ($)	Life (Years)	Salvage Value ($)	Actual Unit Cost ($)	COST ADJUSTMENT Cost Year	ENR Index	Adjustment Factor	ADJUSTED UNIT COST ($)	SOURCE	MANUFACTURER	COMMENTS
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	$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	
Oxygen Structure (4,900 sf)	1	lump sum	$995,000	$995,000	10%	25%	35%	$1,850,000	40	$340,000	$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	
Sitework and Utilities	1	lump sum	$3,740,000	$3,740,000	10%	25%	35%	$6,940,000	20	$0	$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	
Additional Equipment	1	lump sum	$97,000	$97,000	10%	25%	35%	$180,000	20	$0	$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	
Installation	1	lump sum	$97,000	$97,000	10%	25%	35%	$180,000	20	$0	$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	
Division 13 Subtotal	**$16,440,000**																	

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2020 FACILITIES PLANNING

INTERPLANT SLUDGE PIPELINE UPGRADES CAPITAL COSTS

Total Capital Cost = $2,870,000 | Total Salvage Value = $0 | <----- insert link to this cost on the Capital Cost Summary Worksheet

DESCRIPTION	Quantity	Units	Unit Cost ($)	SUBTOTAL ($)	Un-designed Details (%)	Conting-ency (%)	Design, Bidding, & Oversite (%)	SUBTOTAL ($)	Life (Years)	Salvage Value ($)	Actual Unit Cost ($)	COST ADJUSTMENT Cost Year	ENR Index	Adjustment Factor	ADJUSTED UNIT COST ($)	SOURCE	MANUFACTURER	COMMENTS
DIVISION 11: EQUIPMENT																		
JIWWTP and SSWWTP Hard Metal Pumps & Motors Rated for 300 psi	12	each	$93,000	$1,116,000	20%	25%	35%	$2,260,000	20	000 per pump for installation $0	$90,000	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	
Division 16 Subtotal	**$610,000**																	

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Milwaukee Metropolitan Sewerage District

2020 FACILITIES PLANNING

SSWWTP DIGESTER REHABILITATION CAPITAL COST

Total Capital Cost = $117,430,000 | Total Salvage Value = $17,159,000

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

DESCRIPTION	Quantity	Units	Unit Cost ($)	SUBTOTAL ($)	Un-designed Details (%)	Conting-ency (%)	Design, Bidding, & Oversite (%)	SUBTOTAL ($)	Life (Years)	Salvage Value ($)	Actual Unit Cost ($)	COST ADJUSTMENT Cost Year	ENR Index	Adjustment Factor	ADJUSTED UNIT COST ($)	SOURCE	MANUFACTURER	COMMENTS
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	$2	2007	10000	1.00	$2	Symbiont engineering judgment	TBD	
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	$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
New Digester Recirculation Pumps - 10 HP motors, 250 gpm @ 60' TDH	22	each	$15,000	$330,000	40%	25%	35%	$780,000	20	$0	$13,650	2005	9231	1.08	$14,787	Rich Hussey (Ley Associates), email 07.26.05	Wemco-Hidrostal, D4K-HS	+30% for install
Recirculating Sludge Heat Exchangers -Sludge-Hot Water Systems	11	each	$42,000	$462,000 2,249	40%	25%	35%	$1,090,000	20	$0	$39,000	2005	9231	1.08	$4	*Biosolids Alternative Sizing Worksheets r4.xls* , Symbiont	Alfa Laval	+30% for install
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	$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
Digester Gas Safety Equipment	1	allowance	$812,000	$812,000	40%	25%	35%	$1,920,000	20	$0	$750,000	2005	9231	1.08	$812,480	Symbiont engineering judgment		
Division 11 Subtotal	**$24,020,000**																	
DIVISION 15: MECHANICAL																		
New Boiler	1	each	$67,000	$67,000	40%	25%	35%	$160,000	20	$0	$65,000	2006	9700	1.03	$67,010	Symbiont engineering judgment based on recent projects	TBD	
Division 15 Subtotal	**$160,000**																	

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Milwaukee Metropolitan Sewerage District
2020 FACILITIES PLANNING

New SSWWTP Gravity Belt Thickeners for WAS Thickening Capital Cost

Total Capital Cost =	Total Salvage Value =
$7,580,000	$241,000

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

DESCRIPTION	Quantity	Units	Unit Cost ($)	SUBTOTAL ($)	Un-designed Details (%)	Contingency (%)	Design, Bidding, & Oversite (%)	SUBTOTAL ($)	Life (Years)	Salvage Value ($)	Actual Unit Cost ($)	COST ADJUSTMENT Cost Year	ENR Index	Adjustment Factor	ADJUSTED UNIT COST ($)	SOURCE	MANUFACTURER	COMMENTS
DIVISION 2: SITE CONSTRUCTION																		
Demolition	1	lump sum	$26,000	$26,000	40%	25%	35%	$60,000	20	[illegible]	[illegible]	2004	[illegible]	1.16	[illegible]	[illegible]		
Division 2 Subtotal	$60,000																	
DIVISION 4: MASONRY																		
Masonry Restoration - Cut and Repoint Brick	1	lump sum	$22,000	$22,000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	$18,750	[illegible]	[illegible]	[illegible]	$21,752	Frank Tiefert (		
Division 4 Subtotal	$50,000																	
DIVISION 11: EQUIPMENT																		
GBT Equipment	1	lump sum	$1,624,000	$1,624,000	40%	25%	35%	$3,840,000	20	[illegible]	[illegible]	[illegible]	8620	[illegible]	[illegible]	[illegible]		
Thickened Sludge Pumps	1	lump sum	$322,000	$322,000	[illegible]	[illegible]	[illegible]	[illegible]	20	TBD $0	[illegible]	[illegible]	[illegible]	[illegible]	$322,288	Frank Tiefert (ATI), Technical		
Washwater Pumps	1	lump sum	$63,000	$63,000	[illegible]	[illegible]	[illegible]	$150,000	TBD 20	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	$63,443	Frank Tiefert (ATI), Technical Memorandum		
Polymer System	1	lump sum	$183,000	$183,000	40%	25%	35%	$430,000	20	[illegible]	[illegible]	[illegible]	8620	TBD 1.16	[illegible]	[illegible]		
Division 11 Subtotal	$5,180,000																	
DIVISION 13: SPECIAL CONSTRUCTION																		
Building Modifications	1	lump sum	$281,000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	40	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	$281,323	Frank Tiefert (ATI), Tech		
Division 13 Subtotal	$660,000																	
DIVISION 15: MECHANICAL																		
Mechanical Piping	1	lump sum	$277,000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	40	TBD $120,000	[illegible]	[illegible]	[illegible]	[illegible]	$276,610	Frank Tiefert (ATI), Technical		
Division 15 Subtotal	$650,000																	
DIVISION 16: ELECTRICAL																		
Instrumentation & Control	1	lump sum	$221,000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	20	TBD $0	[illegible]	[illegible]	[illegible]	[illegible]	$220,780	Frank Tiefert (ATI), Technic		
Electrical	1	lump sum	$193,000	$193,000	40%	25%	35%	$460,000	20	[illegible]	[illegible]	[illegible]	8620	TBD 1.16	[illegible]	[illegible]		
Division 16 Subtotal	$980,000																	

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RECOMMENDED BIOSOLIDS ALTERNATIVE 2 – GLASS FURNACE TECHNOLOGY

2020 TREATMENT REPORT

Milwaukee Metropolitan Sewerage District
2020 FACILITIES PLANNING

O&M COST ESTIMATE

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

Total Annual O&M Cost = $31,510,000

JIWWTP Energy Costs

Item	Cost	Source / Notes
Natural Gas - Turbine Fuel	$0	see Sheet 11, Energy Costs
Natural Gas - Direct Firing of Dryers	$3,139,000	see Sheet 11, Energy Costs
Natural Gas - Glass Furnace NOx Control & Startup	$92,000	see Sheet 11, Energy Costs
Natural Gas - Other Plant Facilities	$5,445,000	see Sheet 11, Energy Costs
Firm Electricity - Base Power Load	$4,560,000	see Sheet 11, Energy Costs
Firm Electricity - Demand Charges	$2,714,000	see Sheet 11, Energy Costs
Interruptible Electricity - Base Power Load	$796,000	see Sheet 11, Energy Costs
Interruptible Electricity - Demand Charges	$1,000	see Sheet 11, Energy Costs
Turbine Operation and Maintenance	$0	Turbine Operation and Maintenance per year $0.00 2006 9700 $0.00 Bob Gavahan (Power Engineers Collaborative), email 3.27.06
SUBTOTAL	**$16,747,000**	

SSWWTP Digestion Gas Credit/Replacement

Item	Value	Units	Source
plus/minus amount of solids destroyed in digestion =	10,375	tons/year	calculated difference in tons removed in digester from the year 2004 *Solids Cost 2004 UWSactual .XLS*, Bill Krill email 08.19.05)
plus/minus amount of energy recovered from digestion process =	150,267	dtherm/year	calculated heat value of additional digester gas based on values assumed on "JI Energy"
VALUE OF ENERGY CHANGE IN TERMS OF COST OF EQUIVALENT GAS PURCHASE	**-$1,389,970**		calculated $ value of additional digester gas based on values assumed on "JI Energy"

Milorganite® Annual Operating & Maintenance Costs

% of sludge to Milorganite® = *0%* *% sold*
annual sludge volume (dt/year) = *0* *(raw)* = *0%*

Item/Process	Process Unit Cost ($/dt)	Process Contribution Cost ($/dt raw)	Annual Cost $/yr
JIWWTP Thickening	$53.00	$0.00	$0
JIWWTP Dewatering/Drying	$191.30	$0.00	$0
JIWWTP Chaff Processing	$443.30	$0.00	$0
Milorganite® Warehouse/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 Thickening (energy included)	$82.40	$0.00	$0
SSWWTP Digestion (energy included)	$36.40	$0.00	$0
Milorganite® Land Application	$135.10	$0.00	$0
Milorganite® Sales Revenue	-$155.80	$0.00	$0
SUBTOTAL		**$0**	**$0**

Process	Process Cost Data Value	Total Mass of Raw Sludge that Cost Value Applies to (tons)	% of Raw Sludge from Left Column Actually Sent to this Unit Process	% of Raw Sludge for this Alternative Sent to this Unit Process*	Alternative Process Cost/raw	Cost	ENR	2020 (2007)	Source
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
JIWWTP Chaff Processing	$928,541	56,040	84%	0%	$0.00	2004	8620	$0.00	*Solids Cost 2004 UWSactual .XLS*, Bill Krill email 08.19.0 5
Milorganite® Warehouse/Shipping	$1,108,821	56,040	84%	0%	$0.00	2004	8620	$0.00	*Solids Cost 2004 UWSactual .XLS*, Bill Krill email 08.19.0 5
Biosolids Marketing	$2,990,952	49,086	87%	0%	$0.00	2004	8620	$0.00	*Solids Cost 2004 UWSactual .XLS*, Bill Krill email 08.19.0 5
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 thickenin g
SSWWTP Digestion	$718,116	56,040	41%	0%	$0.00	2004	8620	$0.00	*Solids Cost 2004 UWSactual .XLS*, Bill Krill email 08.19.0 5
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 applicatio n
Milorganite® Sales Revenue	-$5,704,448	49,086	87%	0%	$0.00	2004	8620	$0.00	*Solids Cost 2004 UWSactual .XLS*, Bill Krill email 08.19.0 5

*linked to assumptions & total cost summary page

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*

Item/Process	Process Unit Cost ($/dt)	Process Contribution Cost ($/dt raw)	Annual Cost $/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
SUBTOTAL		**$199**	**$16,155,500**

Process	Process Cost Data Value	Total Mass of Raw Sludge that Cost Value Applies to (tons)	% of Raw Sludge from Left Column Actually Sent to this Unit Process	% of Raw Sludge for this Alternative Sent to this Unit Process*	Alternative Process Cost/raw	Cost	ENR	2020 (2007)	Source
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	84%	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 Hydroxide for Glass Furnace SO2 Control 71% $4.31 2006 9700	$147,000	$424 24,400	100						*Minergy GlassPack Proposal MMSD Hybrid 11 14 06 sm.pdf*, Bill Beres (Minergy) email 11.14.06
Ammonia for Glass Furnace Nox control 33	$10,800	24,400	100%	71%	$0.32	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 Rental 00 per year	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	100%	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	$195,200	24,400	100%	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	100%	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 Furnace Staffing 5 workers and 1 supervisor per Bill Krill meeting 11.16.06; $48/hr/worker per Mark Kaminski & Bob Sander of MMSD per Bill Krill email 11.17.06	$599,040	per year	per year	per year	$599,040.00	2006	9700	$617,567.01	
IPS Pipeline Sludge Transfer 2004 8620 $1.95	varies	varies	varies	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 thickenin g
SSWWTP Digestion	$718,116	56,040	41%	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

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

Item/Process	Process Unit Cost ($/dt)	Process Contribution Cost ($/dt raw)	Annual Cost $/yr
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
SUBTOTAL		**$0**	**$0**

Process	Process Cost Data Value	Total Mass of Raw Sludge that Cost Value Applies to (tons)	% of Raw Sludge from Left Column Actually Sent to this Unit Process	% of Raw Sludge for this Alternative Sent to this Unit Process*	Alternative Process Cost/raw	Cost	ENR	2020 (2007)	Source
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 thickenin g
SSWWTP Digestion	$68,003	2,168	100%	0%	$0.00	2004	8620	$0.00	*Solids Cost 2004 UWSactual .XLS*, Bill Krill email 08.19.0 5
SSWWTP DS Thickening (energy included) 0	$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 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
Landfill System Staffing per Bill Krill, meeting 11.16.06; $48/hr/worker per Mark Kaminski & Bob Sander of MMSD, Bill Krill email 11.17.06	$898,560	per year	per year	per year	$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 12.18.0

*linked to assumptions & total cost summary page

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

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

ENERGY COSTS

TOTAL **$16,746,807** per year

GAS

	mmBTU	Current Rates		% Inflation to 2007	Future Rates	Total	Required Energy Source:
direct firing of dryers	339,345	$9.250	$/Dtherm	0%	**$9.250 $/Dtherm**	$3,138,941	*GF Daily Heat & Mass Balance 2020 12.17 ALH.xls*, Symbiont
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	7028	$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

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	*GF 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

		Current Rates		% Inflation to 2007	Future Rates	Total	Required Energy Source:
Facilities Charge	1	$9,600	/year	8%	**$10,368 /year**	$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)

Interruptible Electric Total $796,560

Current Service

	Current Rates		% Inflation to 2007	Future 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

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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 installed facilities and well documented (connections to existing systems, etc.)	20%	Symbiont assumption
installed costs for major components are not well documented (eg. Installation cost is estimated)	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)	15%	Bill Krill (HNTB), phone conference 11.16.06
everything else	35%	Bill Krill (HNTB), phone conference 11.16.06

Milwaukee Metropolitan Sewerage District
2020 FACILITIES PLANNING

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

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**

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TABLE 9G-3 SHEET 1 OF 11

RECOMMENDED BIOSOLIDS PLAN ALTERNATIVE 3 – MAINTAIN EXISTING MILORGANITE® PROGRAM

2020 TREATMENT REPORT

Milwaukee Metropolitan Sewerage District

2020 FACILITIES PLANNING

JIWWTP TURBINE UPGRADES CAPITAL COST

Total Capital Cost = $16,460,000 | Total Salvage Value = $85,000

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

DESCRIPTION	Quantity	Units	Unit Cost ($)	SUBTOTAL ($)	Un-designed Details (%)	Conting-ency (%)	Design, Bidding, & Oversight (%)	SUBTOTAL ($)	Life (Years)	Salvage Value ($)	Actual Unit Cost ($)	COST ADJUSTMENT Cost Year	ENR Index	Adjustment Factor	ADJUSTED UNIT COST ($)	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	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 15: MECHANICAL																		
Exhaust Ductwork from Turbine Building to Existing Duct System - 120" special alloy exhaust pipe w/pile supports	500	lf	$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	$40,000	Symbiont engineering judgment 40%	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	engineering judgment 100%	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	7,200	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**																	

Milwaukee Metropolitan Sewerage District

2020 FACILITIES PLANNING

NEW TURBINE BUILDING CAPITAL COST

								Total Capital Cost =		Total Salvage Value =							
								$3,495,000		$1,684,000	<----- insert link to this cost on the Capital Cost Summary Worksheet						
DESCRIPTION	Quantity	Units	Unit Cost ($)	SUBTOTAL ($)	Un-designed Details (%)	Conting-ency (%)	Design, Bidding, & Oversight (%)	SUBTOTAL ($)	Life (Years)	Salvage Value ($)	Actual Unit Cost ($)	COST ADJUSTMENT Cost Year	ENR Index	Adjustment Factor	ADJUSTED UNIT COST ($)	SOURCE	MANUFACTURER	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	$8	RSMEANS COSTWORKS 2006 QTR 3; 02 220 250 5200	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	2006	9700	1.03	$2	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	$3	$1,500	20%	25%	35%	$3,000	40	$2,000	$3	2006	9700	1.03	$3	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	$3	$2,000	20%	25%	35%	$4,000	40	$2,000	$3	2006	9700	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	$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
Division 3 Subtotal	**$20,000**																	
DIVISION 13: SPECIAL CONSTRUCTION																		
Turbine Building	5,000	sf	$298	$1,490,000	20%	25%	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																		
Natural Gas Supply	500	LF	$36	$18,000	20%	25%	35%	$40,000	40	$20,000	$35	2006	9700	1.03	$36	RSMEANS COSTWORKS 2006 QTR 3; 15 107 620 2090	TBD	Pipe, steel, black, welded, 3" diameter, schedule 40
Instrument Air Supply	500	LF	$34	$17,000	20%	25%	35%	$30,000	40	$15,000	$33	2006	9700	1.03	$34	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	$166	$83,000	20%	25%	35%	$170,000	40	$85,000	$161	2006	9700	1.03	$166	RSMEANS COSTWORKS 2006 QTR 3; 15 107 620 2150	TBD	Pipe, steel, black, welded, 10" diameter, schedule 40
Potable Water Supply	500	LF	$34	$17,000	20%	25%	35%	$30,000	40	$15,000	$33	2006	9700	1.03	$34	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 Subtotal	**$280,000**																	
DIVISION 16: ELECTRICAL																		
Power Feed	1	ea	$62,000	$62,000	20%	25%	35%	$130,000	20	ew medium voltage transformers to new bldg	$60,000	2006	9700	1.03	$61,856	Symbiont estimate based on recent project	TBD	Estimate includes n
Division 16 Subtotal	**$130,000**																	

Turbine Building Cost COSTWORKS.xls

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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

Milwaukee Metropolitan Sewerage District

2020 FACILITIES PLANNING

D&D FACILITY UPGRADES CAPITAL COST

								Total Capital Cost =		Total Salvage Value =								
								$114,740,000		$0								
DESCRIPTION	Quantity	Units	Unit Cost ($)	SUBTOTAL ($)	Un-designed Details (%)	Conting-ency (%)	Design, Bidding, & Oversight (%)	SUBTOTAL ($)	Life (Years)	Salvage Value ($)	Actual Unit Cost ($)	COST ADJUSTMENT Cost Year	ENR Index	Adjustment Factor	ADJUSTED UNIT COST ($)	SOURCE	MANUFACTURER	COMMENTS
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	$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	
Unit Process 25 Upgrade	1	lump sum	$17,453,000	$17,453,000	40%	25%	35%	$41,230,000	20	$0	$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	
Unit Process 27 Upgrade	1	lump sum	$4,062,000	$4,062,000	40%	25%	35%	$9,600,000	20	$0	$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	
Unit Process 29 Upgrade	1	lump sum	$12,629,000	$12,629,000	40%	25%	35%	$29,840,000	20	$0	$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	
Unit Process 30 Upgrade	1	lump sum	$1,278,000	$1,278,000	40%	25%	35%	$3,020,000	20	$0	$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	
Unit Process 31 Upgrade	1	lump sum	$747,000	$747,000	40%	25%	35%	$1,760,000	20	$0	$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	
Unit Process 32 Upgrade	1	lump sum	$2,809,000	$2,809,000	40%	25%	35%	$6,640,000	20	$0	$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	
Miscellaneous Costs (drop chutes, etc.)	1	lump sum	$3,093,000	$3,093,000	40%	25%	35%	$7,310,000	20	$0	$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	
Division 13 Subtotal	**$114,740,000**																	

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

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TABLE 9G-3 SHEET 4 OF 11

RECOMMENDED BIOSOLIDS PLAN ALTERNATIVE 3 – MAINTAIN EXISTING MILORGANITE® PROGRAM

2020 TREATMENT REPORT

6/2/07 TR_9G.T003.07.06.02.cdr

Milwaukee Metropolitan Sewerage District

2020 FACILITIES PLANNING

NEW LOCOMOTIVE CAPITAL COSTS

Total Capital Cost = $3,050,000

Total Salvage Value = $0

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

DESCRIPTION	Quantity	Units	Unit Cost ($)	SUBTOTAL ($)	Un-designed Details (%)	Conting-ency (%)	Design, Bidding, & Oversight (%)	SUBTOTAL ($)	Life (Years)	Salvage Value ($)	Actual Unit Cost ($)	COST ADJUSTMENT Cost Year	COST ADJUSTMENT ENR Index	COST ADJUSTMENT Adjustment Factor	ADJUSTED UNIT COST ($)	SOURCE	MANUFACTURER	COMMENTS
DIVISION 11: EQUIPMENT																		
New Locomotive	1	lump sum	$1,289,000	$1,289,000	40%	25%	35%	$3,050,000	20	$0	$1,250,000	2006	9700	1.03	$1,288,660	Alan Scrivner (AES), email 4.05.06	TBD	
Division 11 Subtotal	**$3,050,000**																	

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TABLE 9G-3 SHEET 5 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

INTERPLANT SLUDGE PIPELINE UPGRADES CAPITAL COSTS

Total Capital Cost = $2,870,000 | Total Salvage Value = $0 | <----- insert link to this cost on the Capital Cost Summary Worksheet

DESCRIPTION	Quantity	Units	Unit Cost ($)	SUBTOTAL ($)	Un-designed Details (%)	Conting-ency (%)	Design, Bidding, & Oversight (%)	SUBTOTAL ($)	Life (Years)	Salvage Value ($)	Actual Unit Cost ($)	COST ADJUSTMENT Cost Year	ENR Index	Adjustment Factor	ADJUSTED UNIT COST ($)	SOURCE	MANUFACTURER	COMMENTS
DIVISION 11: EQUIPMENT																		
JIWWTP and SSWWTP Hard Metal Pumps & Motors Rated for 300 psi	12	each	$93,000	$1,116,000	20%	25%	35%	$2,260,000	20	000 per 50mp for installation	$90,000	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	
Division 16 Subtotal	**$610,000**																	

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TABLE 9G-3 SHEET 6 OF 11

RECOMMENDED BIOSOLIDS PLAN ALTERNATIVE 3 – MAINTAIN EXISTING MILORGANITE® PROGRAM

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Milwaukee Metropolitan Sewerage District
2020 FACILITIES PLANNING

SSWWTP DIGESTER REHABILITATION CAPITAL COST

								Total Capital Cost = $117,430,000		Total Salvage Value = $17,159,000	<----- insert link to this cost on the Capital Cost Summary Worksheet							
DESCRIPTION	Quantity	Units	Unit Cost ($)	SUBTOTAL ($)	Un-designed Details (%)	Conting-ency (%)	Design, Bidding, & Oversite (%)	SUBTOTAL ($)	Life (Years)	Salvage Value ($)	Actual Unit Cost ($)	COST ADJUSTMENT Cost Year	ENR Index	Adjustment Factor	ADJUSTED UNIT COST ($)	SOURCE	MANUFACTURER	COMMENTS
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	$2	2007	10000	1.00	$2	Symbiont engineering judgment	TBD	
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	$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
New Digester Recirculation Pumps - 10 HP motors, 250 gpm @ 60' TDH	22	each	$15,000	$330,000	40%	25%	35%	$780,000	20	$0	$13,650	2005	9231	1.08	$14,787	Rich Hussey (Ley Associates), email 07.26.05	Wemco-Hidrostal, D4K-HS	+30% for install
Recirculating Sludge Heat Exchangers -Sludge-Hot Water Systems	11	each	$42,000	$462,000	2,249 40%	25%	35%	$1,090,000	20	$0	$39,000	2005	9231	1.08	$4	*Biosolids Alternative Sizing Worksheets r4.xls* , Symbiont	Alfa Laval	+30% for install
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	$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
Digester Gas Safety Equipment	1	allowance	$812,000	$812,000	40%	25%	35%	$1,920,000	20	$0	$750,000	2005	9231	1.08	$812,480	Symbiont engineering judgment		
Division 11 Subtotal	**$24,020,000**																	
DIVISION 15: MECHANICAL																		
New Boiler	1	each	$67,000	$67,000	40%	25%	35%	$160,000	20	$0	$65,000	2006	9700	1.03	$67,010	Symbiont engineering judgment based on recent projects	TBD	
Division 15 Subtotal	**$160,000**																	

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Milwaukee Metropolitan Sewerage District
2020 FACILITIES PLANNING

New SSWWTP Gravity Belt Thickeners for WAS Thickening Capital Cost

Total Capital Cost =	Total Salvage Value =
$7,580,000	$241,000

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

DESCRIPTION	Quantity	Units	Unit Cost ($)	SUBTOTAL ($)	Un-designed Details (%)	Contingency (%)	Design, Bidding, & Oversite (%)	SUBTOTAL ($)	Life (Years)	Salvage Value ($)	Actual Unit Cost ($)	COST ADJUSTMENT Cost Year	ENR Index	Adjustment Factor	ADJUSTED UNIT COST ($)	SOURCE	MANUFACTURER	COMMENTS
DIVISION 2: SITE CONSTRUCTION																		
Demolition	1	lump sum	$26,000	$26,000	40%	25%	35%	$60,000	20	[illegible]	[illegible]	2004	[illegible]	1.16	[illegible]	[illegible]		
Division 2 Subtotal	**$60,000**																	
DIVISION 4: MASONRY																		
Masonry Restoration - Cut and Repoint Brick	1	lump sum	$22,000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	$18,750	[illegible]	[illegible]	[illegible]	$21,752	Frank Tiefert (		
Division 4 Subtotal	**$50,000**																	
DIVISION 11: EQUIPMENT																		
GBT Equipment	1	lump sum	$1,624,000	$1,624,000	40%	25%	35%	$3,840,000	20	[illegible]	[illegible]	[illegible]	8620	[illegible]	[illegible]	[illegible] for this alternatives		
Thickened Sludge Pumps	1	lump sum	$322,000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	20	$0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Frank Tiefert (ATI), Technical		
Washwater Pumps	1	lump sum	$63,000	$63,000	[illegible]	[illegible]	[illegible]	$150,000	20	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Frank Tiefert (ATI), Technical Memorandum		
Polymer System	1	lump sum	$183,000	$183,000	40%	25%	35%	$430,000	20	[illegible]	[illegible]	[illegible]	8620	1.16	[illegible]	[illegible] alternatives		
Division 11 Subtotal	**$5,180,000**																	
DIVISION 13: SPECIAL CONSTRUCTION																		
Building Modifications	1	lump sum	$281,000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	40	$121,000	[illegible]	[illegible]	[illegible]	[illegible]	$281,323	Frank Tiefert (ATI), Tech		
Division 13 Subtotal	**$660,000**																	
DIVISION 15: MECHANICAL																		
Mechanical Piping	1	lump sum	$277,000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	40	$120,000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible], Technical		
Division 15 Subtotal	**$650,000**																	
DIVISION 16: ELECTRICAL																		
Instrumentation & Control	1	lump sum	$221,000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	20	$0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible], Technic		
Electrical	1	lump sum	$193,000	$193,000	40%	25%	35%	$460,000	20	[illegible]	[illegible]	[illegible]	8620	1.16	[illegible]	[illegible] alternatives		
Division 16 Subtotal	**$980,000**																	

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RECOMMENDED BIOSOLIDS PLAN ALTERNATIVE 3 – MAINTAIN EXISTING MILORGANITE® PROGRAM

2020 TREATMENT REPORT

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Milwaukee Metropolitan Sewerage District

2020 FACILITIES PLANNING

O&M COST ESTIMATE

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

Total Annual O&M Cost = $37,780,000

JIWWTP Energy Costs

Item	Annual Cost	Source				
Natural Gas - Turbine Fuel	$10,541,000	see Sheet 10, Energy Costs				
Natural Gas - Direct Firing of Dryers	$5,116,000	see Sheet 10, Energy Costs				
Natural Gas - Minergy NOx Control & Startup	$0	see Sheet 10, Energy Costs				
Natural Gas - Other Plant Facilities	$5,445,000	see Sheet 10, Energy Costs				
Firm Electricity - Base Power Load	$7,000	see Sheet 10, Energy Costs				
Firm Electricity - Demand Charges	$0	see Sheet 10, Energy Costs				
Interruptible Electricity - Base Power Load	$0	see Sheet 10, Energy Costs				
Interruptible Electricity - Demand Charges	$0	see Sheet 10, Energy Costs				
Turbine Operation and Maintenance	$1,289,000	Turbine Operation and Maintenance (Power Engineers Collaborative) per email 3.27.06	$1,250,000.00	2006	9700	$1,288,659.79 Bob Gavah
SUBTOTAL	**$22,398,000**					

SSWWTP Digestion Gas Credit/Replacement

			Source
plus/minus amount of solids destroyed in digestion =	10,375	tons/year	calculated difference in tons removed in digester from the year 2004 (*Solids Cost 2004 UWSactual .XLS*, Bill Krill email 08.19.05)
plus/minus amount of energy recovered from digestion process =	150,267	dtherm/year	calculated heat value of additional digester gas based on values assumed on "JI Energy"
VALUE OF ENERGY CHANGE IN TERMS OF COST OF EQUIVALENT GAS PURCHASE	**-$1,389,970**		calculated $ value of additional digester gas based on values assumed on "JI Energy"

Milorganite® Annual Operating & Maintenance Costs

% of sludge to Milorganite® = *100%* *% sold*

annual sludge volume (dt/year) = *81,000* *(raw)* = *100%*

Item/Process	Process Unit Cost ($/dt)	Process Contribution Cost ($/dt raw)	Annual Cost $/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
SUBTOTAL		**$207**	**$16,767,000**

Milorganite® Annual Operating & Maintenance Costs

Process	Year	Index	Process Cost/ton	Source of Cost Data	Process Cost Value	Total Mass of Raw Sludge that Cost Value Applies to (tons)	% of Raw Sludge from Left Column Actually Sent to this Unit Process	% of Raw Sludge for this Alternative Sent to this Unit Process*	Alternative Process Cost/raw	Cost	ENR	2020 (2007)	
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 AES
JIWWTP Dewatering/Drying					$7,798,293	56,040	84%	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	84%	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	84%	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	87%	73%	$51.48	2004	8620	$59.72	*Solids Cost 2004 UWSactual .XLS*, Bill Krill email 08.19.05
IPS Pipeline Sludge Transfer	2004	8620	$1.95		varies	varies	varies	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%	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	41%	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	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					-$3,422,669	49,086	87%	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

% of sludge to glass furnace = *0%* *annual biosolids to Glass Furnace*

annual sludge volume (dt/year) = *0* *(raw)* = *0*

Item/Process	Process Unit Cost ($/dt)	Process Contribution Cost ($/dt raw)	Annual Cost $/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
SUBTOTAL		**$0**	**$0**

Glass Furnace Annual Operating Costs

Process	Year	Index	Process Cost/ton	Source of Cost Data	Process Cost Value	Total Mass of Raw Sludge that Cost Value Applies to (tons)	% of Raw Sludge from Left Column Actually Sent to this Unit Process	% of Raw Sludge for this Alternative Sent to this Unit Process*	Alternative Process Cost/raw	Cost	ENR	2020 (2007)	
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
Minergy Liquid Oxygen Tank & Vaporizer Rental	2006	9700	$25,000	year	$25,773.20	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 Staffing				Bill Krill meeting 11.16.06; $48/hr/worker per Mark Kaminski & Bob Sander of MMSD per Bill Krill email 11.17.06	$599,040	per year	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

% of sludge to landfill = *0%*

annual sludge volume (dt/year) = *0* *(raw)*

Item/Process	Process Unit Cost ($/dt)	Process Contribution Cost ($/dt raw)	Annual Cost $/yr
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
SUBTOTAL		**$0**	**$0**

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

Landfill Annual Operating & Maintenance Costs

Process	Year	Index	Process Cost/ton	Source of Cost Data	Process Cost Value	Total Mass of Raw Sludge that Cost Value Applies to (tons)	% of Raw Sludge from Left Column Actually Sent to this Unit Process	% of Raw Sludge for this Alternative Sent to this Unit Process*	Alternative Process Cost/raw	Cost	ENR	2020 (2007)	
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					$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 System Staffing				per Bill Krill, meeting 11.16.06; $48/hr/worker per Mark Kaminski & Bob Sander of MMSD, Bill Krill email 11.17.06	[illegible]	per year		per year	$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 assumptions & total cost summary page

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RECOMMENDED BIOSOLIDS PLAN ALTERNATIVE 3 – MAINTAIN EXISTING MILORGANITE® PROGRAM

2020 TREATMENT REPORT

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ENERGY COSTS

TOTAL

$21,108,990 per year

GAS

	mmBTU	Current Rates		% Inflation to 2007	Future Rates	Total	Required Energy Source:
direct firing of dryers	553092	$9.250	$/Dtherm	0%	**$9.250 $/Dtherm**	$5,116,101	*All Milo 5%Sold Daily Heat & Mass Balance 2020 ALH 12.17.xls*
turbine fuel	1139553.4	$9.250	$/Dtherm	0%	**$9.250 $/Dtherm**	$10,540,869	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

		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

		Current Rates		% Inflation to 2007	Future Rates	Total	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

		Current Rates		% Inflation 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

ASSUMPTIONS

MASS BALANCE

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

Percent of Milorganite® Raw Sludge that Goes to Digestion	63.00%
Percent of Minergy Raw Sludge that Goes to Digestion	0.00%
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

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 installed facilities and well documented (connections to existing systems, etc.)	20%	Symbiont assumption
installed costs for major components are not well documented (eg. Installation cost is estimated)	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)	15%	Bill Krill (HNTB), phone conference 11.16.06
everything else	35%	Bill Krill (HNTB), phone conference 11.16.06

Milwaukee Metropolitan Sewerage District
2020 FACILITIES PLANNING

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 Non-Annual Operation & Maintenance Costs

Process	Cost	ENR Index	Year	PW
Present Worth of Total Non-Annual Operation & Maintenance Costs				**$0**

Total Present Worth **$746,000,00 0**

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TABLE 9G-4 SHEET 1 OF 11
RECOMMENDED BIOSOLIDS PLAN ALTERNATIVE 4 – COMBINE MILORGANITE® PROGRAM WITH LAND APPLICATION
2020 TREATMENT REPORT
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Milwaukee Metropolitan Sewerage District

2020 FACILITIES PLANNING

JIWWTP TURBINE UPGRADES CAPITAL COST

								Total Capital Cost = $16,460,000		Total Salvage Value = $85,000	<----- insert link to this cost on the Capital Cost Summary Worksheet							
DESCRIPTION	Quantity	Units	Unit Cost ($)	SUBTOTAL ($)	Un-designed Details (%)	Conting-ency (%)	Design, Bidding, & Oversight (%)	SUBTOTAL ($)	Life (Years)	Salvage Value ($)	Actual Unit Cost ($)	COST ADJUSTMENT Cost Year	ENR Index	Adjustment Factor	ADJUSTED UNIT COST ($)	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	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 15: MECHANICAL																		
Exhaust Ductwork from Turbine Building to Existing Duct System - 120" special alloy exhaust pipe w/pile supports	500	lf	$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	$40,000	Symbiont engineering judgment 40%	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	engineering judgment 100%	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	7,200	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**																	

Milwaukee Metropolitan Sewerage District

2020 FACILITIES PLANNING

NEW TURBINE BUILDING CAPITAL COST

								Total Capital Cost =		Total Salvage Value =							
								$3,495,000		$1,684,000	<----- insert link to this cost on the Capital Cost Summary Worksheet							
DESCRIPTION	Quantity	Units	Unit Cost ($)	SUBTOTAL ($)	Un-designed Details (%)	Conting-ency (%)	Design, Bidding, & Oversight (%)	SUBTOTAL ($)	Life (Years)	Salvage Value ($)	Actual Unit Cost ($)	COST ADJUSTMENT Cost Year	ENR Index	Adjustment Factor	ADJUSTED UNIT COST ($)	SOURCE	MANUFACTURER	COMMENTS
DIVISION 2: SITE CONSTRUCTION																		
Asphalt removal for building install	694	SY	$8	$5,556	20%	25%	35%	$11,000	40	$6,000	$8	2006	9700	1.03	$8	RSMEANS COSTWORKS 2006 QTR 3; 02 220 250 5200	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	2006	9700	1.03	$2	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	$3	$1,500	20%	25%	35%	$3,000	40	$2,000	$3	2006	9700	1.03	$3	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	$3	$2,000	20%	25%	35%	$4,000	40	$2,000	$3	2006	9700	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	$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
Division 3 Subtotal	**$20,000**																	
DIVISION 13: SPECIAL CONSTRUCTION																		
Turbine Building	5,000	sf	$298	$1,490,000	*Turbine Building Cost COSTWORKS.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																		
Natural Gas Supply	500	LF	$36	$18,000	20%	25%	35%	$40,000	40	$20,000	$35	2006	9700	1.03	$36	RSMEANS COSTWORKS 2006 QTR 3; 15 107 620 2090	TBD	Pipe, steel, black, welded, 3" diameter, schedule 40
Instrument Air Supply	500	LF	$34	$17,000	20%	25%	35%	$30,000	40	$15,000	$33	2006	9700	1.03	$34	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	$166	$83,000	20%	25%	35%	$170,000	40	$85,000	$161	2006	9700	1.03	$166	RSMEANS COSTWORKS 2006 QTR 3; 15 107 620 2150	TBD	Pipe, steel, black, welded, 10" diameter, schedule 40
Potable Water Supply	500	LF	$34	$17,000	20%	25%	35%	$30,000	40	$15,000	$33	2006	9700	1.03	$34	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 Subtotal	**$280,000**																	
DIVISION 16: ELECTRICAL																		
Power Feed	1	ea	$62,000	$62,000	20%	25%	35%	$130,000	20	ew medium voltage transformers, conductors to new bldg	$60,000	2006	9700	1.03	$61,856	Symbiont estimate based on recent project	TBD	Estimate includes n
Division 16 Subtotal	**$130,000**																	

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

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Milwaukee Metropolitan Sewerage District

2020 FACILITIES PLANNING

D&D FACILITY UPGRADES CAPITAL COST

								Total Capital Cost =		Total Salvage Value =	<----- insert link to this cost on the Capital Cost Summary Worksheet							
								$114,740,000		$0								
DESCRIPTION	Quantity	Units	Unit Cost ($)	SUBTOTAL ($)	Un-designed Details (%)	Conting-ency (%)	Design, Bidding, & Oversight (%)	SUBTOTAL ($)	Life (Years)	Salvage Value ($)	Actual Unit Cost ($)	COST ADJUSTMENT Cost Year	ENR Index	Adjustment Factor	ADJUSTED UNIT COST ($)	SOURCE	MANUFACTURER	COMMENTS
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	$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	
Unit Process 25 Upgrade	1	lump sum	$17,453,000	$17,453,000	40%	25%	35%	$41,230,000	20	$0	$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	
Unit Process 27 Upgrade	1	lump sum	$4,062,000	$4,062,000	40%	25%	35%	$9,600,000	20	$0	$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	
Unit Process 29 Upgrade	1	lump sum	$12,629,000	$12,629,000	40%	25%	35%	$29,840,000	20	$0	$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	
Unit Process 30 Upgrade	1	lump sum	$1,278,000	$1,278,000	40%	25%	35%	$3,020,000	20	$0	$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	
Unit Process 31 Upgrade	1	lump sum	$747,000	$747,000	40%	25%	35%	$1,760,000	20	$0	$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	
Unit Process 32 Upgrade	1	lump sum	$2,809,000	$2,809,000	40%	25%	35%	$6,640,000	20	$0	$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	
Miscellaneous Costs (drop chutes, etc.)	1	lump sum	$3,093,000	$3,093,000	40%	25%	35%	$7,310,000	20	$0	$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	
Division 13 Subtotal	**$114,740,000**																	

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Milwaukee Metropolitan Sewerage District

2020 FACILITIES PLANNING

NEW LOCOMOTIVE CAPITAL COSTS

Total Capital Cost = $3,050,000

Total Salvage Value = $0

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

DESCRIPTION	Quantity	Units	Unit Cost ($)	SUBTOTAL ($)	Un-designed Details (%)	Conting-ency (%)	Design, Bidding, & Oversight (%)	SUBTOTAL ($)	Life (Years)	Salvage Value ($)	Actual Unit Cost ($)	COST ADJUSTMENT Cost Year	COST ADJUSTMENT ENR Index	COST ADJUSTMENT Adjustment Factor	ADJUSTED UNIT COST ($)	SOURCE	MANUFACTURER	COMMENTS
DIVISION 11: EQUIPMENT																		
New Locomotive	1	lump sum	$1,289,000	$1,289,000	40%	25%	35%	$3,050,000	20	$0	$1,250,000	2006	9700	1.03	$1,288,660	Alan Scrivner (AES), email 4.05.06	TBD	
Division 11 Subtotal	**$3,050,000**																	

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2020 FACILITIES PLANNING

INTERPLANT SLUDGE PIPELINE UPGRADES CAPITAL COSTS

Total Capital Cost = $2,870,000

Total Salvage Value = $0

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

DESCRIPTION	Quantity	Units	Unit Cost ($)	SUBTOTAL ($)	Un-designed Details (%)	Conting-ency (%)	Design, Bidding, & Oversight (%)	SUBTOTAL ($)	Life (Years)	Salvage Value ($)	Actual Unit Cost ($)	COST ADJUSTMENT Cost Year	ENR Index	Adjustment Factor	ADJUSTED UNIT COST ($)	SOURCE	MANUFACTURER	COMMENTS
DIVISION 11: EQUIPMENT																		
JIWWTP and SSWWTP Hard Metal Pumps & Motors Rated for 300 psi	12	each	$93,000	$1,116,000	20%	25%	35%	$2,260,000	20	000 per pump for installation	$90,000	2006	9700	1.03	$92,784	Mickey (RDM), phone conversation 03.28.06	TBD	includes $5
Division 11 Subtotal	**$2,260,000**									$0								
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**																	

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Milwaukee Metropolitan Sewerage District

2020 FACILITIES PLANNING

SSWWTP DIGESTER REHABILITATION CAPITAL COST

								Total Capital Cost = $117,430,000		Total Salvage Value = $17,159,000	<---- insert link to this cost on the Capital Cost Summary Worksheet						
DESCRIPTION	Quantity	Units	Unit Cost ($)	SUBTOTAL ($)	Un-designed Details (%)	Conting-ency (%)	Design, Bidding, & Oversite (%)	SUBTOTAL ($)	Life (Years)	Salvage Value ($)	Actual Unit Cost ($)	COST ADJUSTMENT Cost Year	ENR Index	Adjustment Factor	ADJUSTED UNIT COST ($)	SOURCE	MANUFACTURER	COMMENTS
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	$2	2007	10000	1.00	$2	Symbiont engineering judgment	TBD	
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	$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
New Digester Recirculation Pumps - 10 HP motors, 250 gpm @ 60' TDH	22	each	$15,000	$330,000	40%	25%	35%	$780,000	20	$0	$13,650	2005	9231	1.08	$14,787	Rich Hussey (Ley Associates), email 07.26.05	Wemco-Hidrostal, D4K-HS	+30% for install
Recirculating Sludge Heat Exchangers -Sludge-Hot Water Systems	11	each	$42,000	$462,000 2,249	40%	25%	35%	$1,090,000	20	$0	$39,000	2005	9231	1.08	$4	*Biosolids Alternative Sizing Worksheets r4.xls* , Symbiont	Alfa Laval	+30% for install
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	$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
Digester Gas Safety Equipment	1	allowance	$812,000	$812,000	40%	25%	35%	$1,920,000	20	$0	$750,000	2005	9231	1.08	$812,480	Symbiont engineering judgment		
Division 11 Subtotal	**$24,020,000**																	
DIVISION 15: MECHANICAL																		
New Boiler	1	each	$67,000	$67,000	40%	25%	35%	$160,000	20	$0	$65,000	2006	9700	1.03	$67,010	Symbiont engineering judgment based on recent projects	TBD	
Division 15 Subtotal	**$160,000**																	

Preserving The Environment • Improving Water Quality

Milwaukee Metropolitan Sewerage District

2020 FACILITIES PLANNING

New SSWWTP Gravity Belt Thickeners for WAS Thickening Capital Cost

Total Capital Cost =	Total Salvage Value =
$7,580,000	$241,000

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

DESCRIPTION	Quantity	Units	Unit Cost ($)	SUBTOTAL ($)	Un-designed Details (%)	Contingency (%)	Design, Bidding, & Oversite (%)	SUBTOTAL ($)	Life (Years)	Salvage Value ($)	Actual Unit Cost ($)	COST ADJUSTMENT Cost Year	ENR Index	Adjustment Factor	ADJUSTED UNIT COST ($)	SOURCE	MANUFACTURER	COMMENTS
DIVISION 2: SITE CONSTRUCTION																		
Demolition	1	lump sum	$26,000	$26,000	40%	25%	35%	$60,000	20	[illegible]	[illegible]	2004	[illegible]	1.16	[illegible]	[illegible]		
Division 2 Subtotal	**$60,000**																	
DIVISION 4: MASONRY																		
Masonry Restoration - Cut and Repoint Brick	1	lump sum	$22,000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	$21,752	Frank Tiefert (		
Division 4 Subtotal	**$50,000**																	
DIVISION 11: EQUIPMENT																		
GBT Equipment	1	lump sum	$1,624,000	$1,624,000	40%	25%	35%	$3,840,000	20	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] for this alternatives		
Thickened Sludge Pumps	1	lump sum	$322,000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	20	TBD $0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible], Technical		
Washwater Pumps	1	lump sum	$63,000	$63,000	[illegible]	[illegible]	[illegible]	$150,000	TBD 20	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] Tiefert (ATI), Technical Memorandum		
Polymer System	1	lump sum	$183,000	$183,000	40%	25%	35%	$430,000	20	[illegible]	[illegible]	[illegible]	8620	TBD 1.16	[illegible]	[illegible] alternatives		
Division 11 Subtotal	**$5,180,000**																	
DIVISION 13: SPECIAL CONSTRUCTION																		
Building Modifications	1	lump sum	$281,000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	40	TBD $121,000	[illegible]	[illegible]	[illegible]	[illegible]	$281,323	Frank Tiefert (ATI), Tech		
Division 13 Subtotal	**$660,000**																	
DIVISION 15: MECHANICAL																		
Mechanical Piping	1	lump sum	$277,000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	40	TBD $120,000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible], Technical		
Division 15 Subtotal	**$650,000**																	
DIVISION 16: ELECTRICAL																		
Instrumentation & Control	1	lump sum	$221,000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	20	TBD $0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible], Technic		
Electrical	1	lump sum	$193,000	$193,000	40%	25%	35%	$460,000	20	[illegible]	[illegible]	[illegible]	8620	TBD 1.16	[illegible]	[illegible] alternatives		
Division 16 Subtotal	**$980,000**																	

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TABLE 9G-4 SHEET 8 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

Milwaukee Metropolitan Sewerage District
2020 FACILITIES PLANNING

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

Item	Cost	Source
Natural Gas - Turbine Fuel	$10,541,000	see Sheet 10, Energy Costs
Natural Gas - Direct Firing of Dryers	$5,116,000	see Sheet 10, Energy Costs
Natural Gas - Minergy NOx Control & Startup	$0	see Sheet 10, Energy Costs
Natural Gas - Other Plant Facilities	$5,445,000	see Sheet 10, Energy Costs
Firm Electricity - Base Power Load	$7,000	see Sheet 10, Energy Costs
Firm Electricity - Demand Charges	$0	see Sheet 10, Energy Costs
Interruptible Electricity - Base Power Load	$0	see Sheet 10, Energy Costs
Interruptible Electricity - Demand Charges	$0	see Sheet 10, Energy Costs
Turbine Operation and Maintenance	$1,289,000	Turbine Operation and Maintenance per year $1,250,000.00 2006), email 3.27.069700 $1,288,659.79 Bob Gavahan (Power Engineers Collaborative
SUBTOTAL	**$22,398,000**	

SSWWTP Digestion Gas Credit/Replacement

Item	Value	Unit	Amount	Source
plus/minus amount of solids destroyed in digestion =	10,375	tons/year		calculated difference in tons removed in digester from the year 2004 *Solids Cost 2004 UWSactual .XLS*, Bill Krill email 08.19.05)
plus/minus amount of energy recovered from digestion process =	150,267	dtherm/year		s based on heat value of additional digester ga / calculated values assumed on "JI Energy"
VALUE OF ENERGY CHANGE IN TERMS OF COST OF EQUIVALENT GAS PURCHASE			**-$1,389,970**	calculated $ value of additional digester gas based on values assumed on "JI Energy"

Milorganite® Annual Operating & Maintenance Costs

% of sludge to Milorganite® = *100%* *% sold*
annual sludge volume (dt/year) = *81,000* *(raw)* = *45%*

Item/Process	Process Unit Cost ($/dt)	Process Contribution Cost ($/dt raw)	Annual Cost $/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	$162,0004
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
SUBTOTAL		**$241**	**$19,488,600**

Milorganite® Annual Operating & Maintenance Costs

Year	Process	Index	Process Cost/ton	Source of Cost Data	Process Cost Value	Total Mass of Raw Sludge that Cost Value Applies to (tons)	% of Raw Sludge from Left Column Actually Sent to this Unit Process	% of Raw Sludge for this Alternative Sent to this Unit Process*	Alternative Process Cost/raw	Cost	ENR	2020 (2007)	
	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	84%	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	84%	73%	$14.35	2004	8620	$16.65	*Solids Cost 2004 UWSactual .XLS*, Bill Krill email 08.19.0 5
	Milorganite® Warehouse/Shipping				$1,108,821	56,040	84%	73%	$17.14	2004	8620	$19.88	*Solids Cost 2004 UWSactual .XLS*, Bill Krill email 08.19.0 5
	Biosolids Marketing				$2,990,952	49,086	87%	33%	$23.17	2004	8620	$26.87	*Solids Cost 2004 UWSactual .XLS*, Bill Krill email 08.19.0 5
8620	IPS Pipeline Sludge Transfer		$1.95		varies	varies	varies	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 thickenin g
	SSWWTP Digestion				$718,116	56,040	41%	63%	$19.76	2004	8620	$22.93	*Solids Cost 2004 UWSactual .XLS*, Bill Krill email 08.19.0 5
	Milorganite® Land Application				$308,540	2,649	100%	37%	$42.54	2004	8620	$49.36	*Solids Cost 2004 UWSactual .XLS*, Bill Krill email 08.19.05; cost for SS filter cake land applicatio n
	Milorganite® Sales Revenue				-$5,704,448	49,086	87%	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

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

Item/Process	Process Unit Cost ($/dt)	Process Contribution Cost ($/dt raw)	Annual Cost $/yr dry ton
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
SUBTOTAL		**$0**	**$0**

Glass Furnace Annual Operating Costs

Year	Process	Index	Process Cost/ton	Source of Cost Data	Process Cost Value	Total Mass of Raw Sludge that Cost Value Applies to (tons)	% of Raw Sludge from Left Column Actually Sent to this Unit Process	% of Raw Sludge for this Alternative Sent to this Unit Process*	Alternative Process Cost/raw	Cost	ENR	2020 (2007)	
	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
	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
year	Minergy Liquid Oxygen Tank & Vaporizer Rental		$25,000.00	2006 9700 $25,773.20	$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 meeting 11.16.06; $48/hr/worker per Mark Kaminski & Bob Sander of MMSD per Bill Krill email 11.17.06	Minergy Staffing				$599,040	per year	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/ 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				$718,116	56,040	41%	0%	$0.00	2004	8620	$0.00	*Solids Cost 2004 UWSactual .XLS*, Bill Krill email 08.19.0 5

*linked to assumptions & total cost summary page

Landfill Annual Operating & Maintenance Costs

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

Item/Process	Process Unit Cost ($/dt)	Process Contribution Cost ($/dt raw)	Annual Cost $/yr dry ton
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
SUBTOTAL		**$0**	**$0**

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

Landfill Annual Operating & Maintenance Costs

Year	Process	Index	Process Cost/ton	Source of Cost Data	Process Cost Value	Total Mass of Raw Sludge that Cost Value Applies to (tons)	% of Raw Sludge from Left Column Actually Sent to this Unit Process	% of Raw Sludge for this Alternative Sent to this Unit Process*	Alternative Process Cost/raw	Cost	ENR	2020 (2007)	
	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 thickenin g
	SSWWTP Digestion				$68,003	2,168	100%	0%	$0.00	2004	8620	$0.00	*Solids Cost 2004 UWSactual .XLS*, Bill Krill email 08.19.0 5
	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 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
Supervisor per Bill Krill meeting 11.16.06; $48/hr/worker per Mark Kaminski & Bob Sander of MMSD, per Bill Krill email 11.17.06	Landfill System Staffing				$898,560	per year	per year	per year	$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 page

mmsd
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TABLE 9G-4 SHEET 9 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

ENERGY COSTS

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

GAS

	mmBTU	Current Rates		% Inflation to 2007	Future Rates	Total	Required Energy Source:
direct firing of dryers	553092	$9.250	$/Dtherm	0%	**$9.250 $/Dtherm**	$5,116,101	*All Milo 5%Sold Daily Heat & Mass Balance 2020 ALH 12.17.xls*
turbine fuel	1139553.4	$9.250	$/Dtherm	0%	**$9.250 $/Dtherm**	$10,540,869	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

		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

		Current Rates		% Inflation to 2007	Future Rates	Total	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

		Current Rates		% Inflation 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

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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

Percent of Milorganite® Raw Sludge that Goes to Digestion	63.00%
Percent of Minergy Raw Sludge that Goes to Digestion	0.00%
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

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 installed facilities and well documented (connections to existing systems, etc.)	20%	Symbiont assumption
installed costs for major components are not well documented (eg. Installation cost is estimated)	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)	15%	Bill Krill (HNTB), phone conference 11.16.06
everything else	35%	Bill Krill (HNTB), phone conference 11.16.06

Milwaukee Metropolitan Sewerage District
2020 FACILITIES PLANNING

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**

Summary of Non-Annual Operation & Maintenance Costs

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
Fabric filter bag replacement	32,000	9,700	10	$20,013
Present Worth of Total Non-Annual Operation & Maintenance Costs				**$160,000**
Total Present Worth				**$691,000,000**

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TABLE 9G-5 SHEET 1 OF 13
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Milwaukee Metropolitan Sewerage District
2020 FACILITIES PLANNING

JIWWTP TURBINE UPGRADES CAPITAL COST

Total Capital Cost = $16,460,000 | Total Salvage Value = $85,000

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

DESCRIPTION	Quantity	Units	Unit Cost ($)	SUBTOTAL ($)	Un-designed Details (%)	Conting-ency (%)	Design, Bidding, & Oversight (%)	SUBTOTAL ($)	Life (Years)	Salvage Value ($)	Actual Unit Cost ($)	COST ADJUSTMENT Cost Year	ENR Index	Adjustment Factor	ADJUSTED UNIT COST ($)	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	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 15: MECHANICAL																		
Exhaust Ductwork from Turbine Building to Existing Duct System - 120" special alloy exhaust pipe w/pile supports	500	lf	$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	$40,000	Symbiont engineering judgment 40%	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	engineering judgment 100%	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	7,200	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**																	

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JIWWTP COOLING WATER PUMP UPGRADES CAPITAL COSTS

Total Capital Cost = $600,000 | **Total Salvage Value =** $0

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

DESCRIPTION	Quantity	Units	Unit Cost ($)	SUBTOTAL ($)	Un-designed Details (%)	Conting-ency (%)	Design, Bidding, & Oversite (%)	SUBTOTAL ($)	Life (Years)	Salvage Value ($)	Actual Unit Cost ($)	COST ADJUSTMENT Cost Year	ENR Index	Adjustment Factor	ADJUSTED UNIT COST ($)	SOURCE	MANUFACTURER	COMMENTS
DIVISION 11: EQUIPMENT																		
New 3000 gpm, 173' TDH Vertical Turbine Cooling Water Pumps	2	each	$128,000	$256,0009	40%	25%	35%	$600,000	20	$0	$62,863	1990	4894	2.04	$128,44	JIWWTP North Utility Pump Station Designer Training Manual, January 1990	Fairbanks Morse Pump Corp.	+30% for installation (cost was listed for both pumps and thus is divided by 2 here)
Division 11 Subtotal	**$600,000**																	

mmsd
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Milwaukee Metropolitan Sewerage District

2020 FACILITIES PLANNING

D&D FACILITY UPGRADES CAPITAL COST

								Total Capital Cost =		Total Salvage Value =	<----- insert link to this cost on the Capital Cost Summary Worksheet							
								$114,740,000		$0								
DESCRIPTION	Quantity	Units	Unit Cost ($)	SUBTOTAL ($)	Un-designed Details (%)	Conting-ency (%)	Design, Bidding, & Oversite (%)	SUBTOTAL ($)	Life (Years)	Salvage Value ($)	Actual Unit Cost ($)	COST ADJUSTMENT Cost Year	ENR Index	Adjustment Factor	ADJUSTED UNIT COST ($)	SOURCE	MANUFACTURER	COMMENTS
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	$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	
Unit Process 25 Upgrade	1	lump sum	$17,453,000	$17,453,000	40%	25%	35%	$41,230,000	20	$0	$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	
Unit Process 27 Upgrade	1	lump sum	$4,062,000	$4,062,000	40%	25%	35%	$9,600,000	20	$0	$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	
Unit Process 29 Upgrade	1	lump sum	$12,629,000	$12,629,000	40%	25%	35%	$29,840,000	20	$0	$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	
Unit Process 30 Upgrade	1	lump sum	$1,278,000	$1,278,000	40%	25%	35%	$3,020,000	20	$0	$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	
Unit Process 31 Upgrade	1	lump sum	$747,000	$747,000	40%	25%	35%	$1,760,000	20	$0	$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	
Unit Process 32 Upgrade	1	lump sum	$2,809,000	$2,809,000	40%	25%	35%	$6,640,000	20	$0	$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	
Miscellaneous Costs (drop chutes, etc.)	1	lump sum	$3,093,000	$3,093,000	40%	25%	35%	$7,310,000	20	$0	$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	
Division 13 Subtotal	**$114,740,000**																	

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

Milwaukee Metropolitan Sewerage District

2020 FACILITIES PLANNING

NEW LOCOMOTIVE CAPITAL COSTS

Total Capital Cost = $3,050,000

Total Salvage Value = $0

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

DESCRIPTION	Quantity	Units	Unit Cost ($)	SUBTOTAL ($)	Un-designed Details (%)	Conting-ency (%)	Design, Bidding, & Oversite (%)	SUBTOTAL ($)	Life (Years)	Salvage Value ($)	Actual Unit Cost ($)	COST ADJUSTMENT Cost Year	COST ADJUSTMENT ENR Index	COST ADJUSTMENT Adjustment Factor	ADJUSTED UNIT COST ($)	SOURCE	MANUFACTURER	COMMENTS
DIVISION 11: EQUIPMENT																		
New Locomotive	1	lump sum	$1,289,000	$1,289,000	40%	25%	35%	$3,050,000	20	$0	$1,250,000	2006	9700	1.03	$1,288,660	Alan Scrivner (AES), email 4.05.06	TBD	
Division 11 Subtotal	**$3,050,000**																	

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2020 FACILITIES PLANNING

NEW GLASS FURNACE PROCESS EQUIPMENT CAPITAL COST

Total Capital Cost =	Total Salvage Value =
$32,650,000	$0

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

DESCRIPTION	Quantity	Units	Unit Cost ($)	SUBTOTAL ($)	Un-designed Details (%)	Conting-ency (%)	Design, Bidding, & Oversite (%)	SUBTOTAL ($)	Life (Years)	Salvage Value ($)	Actual Unit Cost ($)	COST ADJUSTMENT Cost Year	ENR Index	Adjustment Factor	ADJUSTED UNIT COST ($)	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	$27,500,000	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% Dan Roe (Dynamic Air Inc.), email 1.26.06 (forwarded via Alan Scrivner (AES), email 11.22.06)	25%	35%	$1,460,000	20	$0	$598,000	2006 Dynamic Air, 0% installation lines, 2	9700	1.033	$6			
Division 13 Subtotal	**$32,650,000**																	

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2020 FACILITIES PLANNING

NEW GLASS FURNACE AND TURBINE BUILDINGS CAPITAL COST

Total Capital Cost =	Total Salvage Value =
$11,395,000	$2,075,000

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

DESCRIPTION	Quantity	Units	Unit Cost ($)	SUBTOTAL ($)	Un-designed Details (%)	Conting-ency (%)	Design, Bidding, & Oversite (%)	SUBTOTAL ($)	Life (Years)	Salvage Value ($)	Actual Unit Cost ($)	COST ADJUSTMENT Cost Year	ENR Index	Adjustment Factor	ADJUSTED UNIT COST ($)	SOURCE	MANUFACTURER	COMMENTS
DIVISION 2: SITE CONSTRUCTION																		
Asphalt removal for building install	2,556	SY	$8	$20,444	20%	25%	35%	TBD $41,000	40	$8,000	$8	2006	9700	1.03	$8	RSMEANS COSTWORKS 2006 QTR 3; 02 22		
Concrete Repair	4,500	SF	$2	$9,000	20%	25%	35%	$18,000	40	$3,000	$2	2006	9700	1.03	$2	RSMEANS COSTWORKS 2006 QTR 3; 03 310 240 5010	TBD	Structura
Utility Trench Excavation	500	LF	$3	$1,500	20%	25%	35%	$3,000	40	$1,000	$3	2006	9700	1.03	$3	RSMEANS COSTWORKS 2006 QTR 3; 02 315 610 0610	TBD	Ex
Utility Trench Backfill	667	CY	$3	$2,000	20%	25%	35%	$4,000	40	$1,000	$3	2006	9700	1.03	$3	RSMEANS COSTWORKS 2006 QTR 3; 02 315 610 3090	TBD	Exca
Utility Trench Compaction	667	CY	$7	$4,667	20%	25%	35%	$9,000	40	$2,000	$6	2006	9700	1.03	$7	RSMEANS COSTWORKS 2006 QTR 3; 02 315 110 0800	TBD	Ba
Division 2 Subtotal	**$75,000**																	
DIVISION 3: CONCRETE																		
Aggregate pad	60	CY	$397	$23,820	20%	25%	35%	$50,000	40	$9,000	$385	2006	9700	1.03	$397	RSMEANS COSTWORKS 2006 QTR 3; 03 310 240 4260	TBD	Structural concrete,
Utility Trench Repair	56	CY	$196	$10,889	D 20%	25%	35%	$20,000	40	$4,000	$190	2006	9700	1.03	$196	RSMEANS COSTWORKS 2006 QTR 3; 03 310 240 4700	TB	
Division 3 Subtotal	**$70,000**																	
DIVISION 13: SPECIAL CONSTRUCTION																		
Melter/Turbine & Oxygen Buildings	23,475	sf	$228	$5,352,300	20%	25%	35%	$10,840,000	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
Division 13 Subtotal	**$10,840,000**																	
DIVISION 15: MECHANICAL																		
Natural Gas Supply	500	LF	$36	$18,000	20%	25%	35%	$40,000	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	20%	25%	35%	$30,000	40	$6,000	$33	2006	9700	1.03	$34	RSMEANS COSTWORKS 2006 QTR 3; 15 107 220 1200	TBD	P
Cooling Water Supply	500	LF	$166	$83,000	20%	25%	35%	$170,000	40	$31,000	$161	2006	9700	1.03	$166	RSMEANS COSTWORKS 2006 QTR 3; 15 107 620 2150	TBD	Pipe, steel, black, welded, 10" diameter, schedule 40
Potable Water Supply	500	LF	$34	$17,000	20%	25%	35%	$30,000	40	$6,000	$33	2006	9700	1.03	$34	RSMEANS COSTWORKS 2006 QTR 3; 15 107 220 1200	TBD	Pi
Building Drain	500	LF	$12	$6,000	20%	25%	35%	$10,000	40	$2,000	$12	2006	9700	1.03	$12	RSMEANS COSTWORKS 2006 QTR 3; 15 108 520 1940	TBD	Pipe, PVC, socket weld,
Division 15 Subtotal	**$280,000**																	
DIVISION 16: ELECTRICAL																		
Power Feed	1	ea	$62,000	$62,000	20%	25%	35%	$130,000	20	$0	$60,000	2006	9700	1.03	$61,856	Symbiont estimate based on recent project	TBD	Estimate includes n
Division 16 Subtotal	**$130,000**																	

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Milwaukee Metropolitan Sewerage District

2020 FACILITIES PLANNING

INTERPLANT SLUDGE PIPELINE UPGRADES CAPITAL COSTS

Total Capital Cost = $2,870,000

Total Salvage Value = $0

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

DESCRIPTION	Quantity	Units	Unit Cost ($)	SUBTOTAL ($)	Un-designed Details (%)	Conting-ency (%)	Design, Bidding, & Oversite (%)	SUBTOTAL ($)	Life (Years)	Salvage Value ($)	Actual Unit Cost ($)	COST ADJUSTMENT Cost Year	ENR Index	Adjustment Factor	ADJUSTED UNIT COST ($)	SOURCE	MANUFACTURER	COMMENTS
DIVISION 11: EQUIPMENT																		
JIWWTP and SSWWTP Hard Metal Pumps & Motors Rated for 300 psi	12	each	$93,000	$1,116,000	20%	25%	35%	$2,260,000	20	000 per pump for installation $0	$90,000	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	
Division 16 Subtotal	**$610,000**																	

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2020 FACILITIES PLANNING

SSWWTP DIGESTER REHABILITATION CAPITAL COST

								Total Capital Cost = $117,430,000		Total Salvage Value = $17,159,000	<---- insert link to this cost on the Capital Cost Summary Worksheet						
DESCRIPTION	Quantity	Units	Unit Cost ($)	SUBTOTAL ($)	Un-designed Details (%)	Conting-ency (%)	Design, Bidding, & Oversite (%)	SUBTOTAL ($)	Life (Years)	Salvage Value ($)	Actual Unit Cost ($)	COST ADJUSTMENT Cost Year	ENR Index	Adjustment Factor	ADJUSTED UNIT COST ($)	SOURCE	MANUFACTURER	COMMENTS
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	$2	2007	10000	1.00	$2	Symbiont engineering judgment	TBD	
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	$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
New Digester Recirculation Pumps - 10 HP motors, 250 gpm @ 60' TDH	22	each	$15,000	$330,000	40%	25%	35%	$780,000	20	$0	$13,650	2005	9231	1.08	$14,787	Rich Hussey (Ley Associates), email 07.26.05	Wemco-Hidrostal, D4K-HS	+30% for install
Recirculating Sludge Heat Exchangers -Sludge-Hot Water Systems	11	each	$42,000	$462,000 2,249	40%	25%	35%	$1,090,000	20	$0	$39,000	2005	9231	1.08	$4	*Biosolids Alternative Sizing Worksheets r4.xls* , Symbiont	Alfa Laval	+30% for install
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	$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
Digester Gas Safety Equipment	1	allowance	$812,000	$812,000	40%	25%	35%	$1,920,000	20	$0	$750,000	2005	9231	1.08	$812,480	Symbiont engineering judgment		
Division 11 Subtotal	**$24,020,000**																	
DIVISION 15: MECHANICAL																		
New Boiler	1	each	$67,000	$67,000	40%	25%	35%	$160,000	20	$0	$65,000	2006	9700	1.03	$67,010	Symbiont engineering judgment based on recent projects	TBD	
Division 15 Subtotal	**$160,000**																	

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

Milwaukee Metropolitan Sewerage District

2020 FACILITIES PLANNING

New SSWWTP Gravity Belt Thickeners for WAS Thickening Capital Cost

Total Capital Cost = $7,580,000 | Total Salvage Value = $241,000

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

DESCRIPTION	Quantity	Units	Unit Cost ($)	SUBTOTAL ($)	Un-designed Details (%)	Conting-ency (%)	Design, Bidding, & Oversite (%)	SUBTOTAL ($)	Life (Years)	Salvage Value ($)	Actual Unit Cost ($)	COST ADJUSTMENT Cost Year	ENR Index	Adjustment Factor	ADJUSTED UNIT COST ($)	SOURCE	MANUFACTURER	COMMENTS
DIVISION 2: SITE CONSTRUCTION																		
Demolition	1	lump sum	$26,000	$26,000	40%	25%	35%	$60,000	20	[illegible]	[illegible]	2004	[illegible]	1.16	[illegible]	[illegible]		
Division 2 Subtotal	**$60,000**																	
DIVISION 4: MASONRY																		
Masonry Restoration - Cut and Repoint Brick	1	lump sum	$22,000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	$21,752	Frank Tiefert (		
Division 4 Subtotal	**$50,000**																	
DIVISION 11: EQUIPMENT																		
GBT Equipment	1	lump sum	$1,624,000	$1,624,000	40%	25%	35%	$3,840,000	20	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
Thickened Sludge Pumps	1	lump sum	$322,000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	20	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
Washwater Pumps	1	lump sum	$63,000	$63,000	[illegible]	[illegible]	[illegible]	$150,000	20	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
Polymer System	1	lump sum	$183,000	$183,000	40%	25%	35%	$430,000	20	[illegible]	[illegible]	[illegible]	8620	1.16	[illegible]	[illegible]		
Division 11 Subtotal	**$5,180,000**																	
DIVISION 13: SPECIAL CONSTRUCTION																		
Building Modifications	1	lump sum	$281,000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	40	$121,000	[illegible]	[illegible]	[illegible]	[illegible]	$281,323	Frank Tiefert (ATI), Tech		
Division 13 Subtotal	**$660,000**																	
DIVISION 15: MECHANICAL																		
Mechanical Piping	1	lump sum	$277,000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	40	$120,000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
Division 15 Subtotal	**$650,000**																	
DIVISION 16: ELECTRICAL																		
Instrumentation & Control	1	lump sum	$221,000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	20	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
Electrical	1	lump sum	$193,000	$193,000	40%	25%	35%	$460,000	20	[illegible]	[illegible]	[illegible]	8620	1.16	[illegible]	[illegible]		
Division 16 Subtotal	**$980,000**																	

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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.cdr

Milwaukee Metropolitan Sewerage District
2020 FACILITIES PLANNING

O&M COST ESTIMATE

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

Total Annual O&M Cost = $32,740,000

JIWWTP Energy Costs

Natural Gas - Turbine Fuel	$10,541,000	see Sheet 12, Energy Costs
Natural Gas - Direct Firing of Dryers	$1,235,000	see Sheet 12, Energy Costs
Natural Gas - Glass Furnace NOx Control & Startup	$46,000	see Sheet 12, Energy Costs
Natural Gas - Other Plant Facilities	$5,445,000	see Sheet 12, Energy Costs
Firm Electricity - Base Power Load	$7,000	see Sheet 12, Energy Costs
Firm Electricity - Demand Charges	$0	see Sheet 12, Energy Costs
Interruptible Electricity - Base Power Load	$471,000	see Sheet 12, Energy Costs
Interruptible Electricity - Demand Charges	$1,000	see Sheet 12, Energy Costs
Turbine Operation and Maintenance	$1,289,000	see Sheet 12, Energy Costs
SUBTOTAL	**$19,035,000**	

SSWWTP Digestion Gas Credit/Replacement

plus/minus amount of solids destroyed in digestion =	10,375	tons/year	Source
plus/minus amount of energy recovered from digestion process =	150,267	dtherm/year	calculated difference in tons removed in digester from the year 2004 *Solids Cost 2004 UWSactual .XLS*, Bill Krill email 08.19.05)
VALUE OF ENERGY CHANGE IN TERMS OF COST OF EQUIVALENT GAS PURCHASE			**-$1,389,970** calculated value of additional digester gas based on values assumed on "JI Energy"

Milorganite® Annual Operating & Maintenance Costs

% of sludge to Milorganite® = 33% *% sold*
annual sludge volume (dt/year) = 26,730 *(raw)* = 100%

Item/Process	Process Unit Cost ($/dt)	Process Contribution Cost ($/dt raw)	Annual Cost $/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	
SUBTOTAL		**$204**	**$5,450,247**	

Glass Furnace Annual Operating Costs

% of sludge to glass furnace = 67% *annual biosolids to Glass Furnace*
annual sludge volume (dt/year) = 54,270 *(raw)* = 33,900

Item/Process	Process Unit Cost ($/dt)	Process Contribution Cost ($/dt raw)	Annual Cost $/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

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

Item/Process	Process Unit Cost ($/dt)	Process Contribution Cost ($/dt raw)	Annual Cost $/yr	dry ton
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	
SUBTOTAL		**$0**	**$0**	

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

Milorganite® Annual Operating & Maintenance Costs

Item/Process	Process Cost/ton	Source of Cost Data	Process Cost Value	Total Mass of Raw Sludge that Cost Value Applies to (tons)	% of Raw Sludge from Left Column Actually Sent to this Unit Process	% of Raw Sludge for this Alternative Sent to this Unit Process*	Alternative Process Cost/raw	Year	Process Index	Cost	ENR	2020 (2007)	
JIWWTP Thickening			$1,279,606	56,040	50%	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	84%	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	84%	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	84%	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	87%	97%	$68.62	2004	8620			$79.60	*Solids Cost 2004 UWSactual .XLS*, Bill Krill email 08.19.0 5
IPS Pipeline Sludge Transfer			varies	varies	varies	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%	0%	$0.04	2004	8620			$0.05	*Solids Cost 2004 UWSactual .XLS*, Bill Krill email 08.19.05; cost for JI GBT thickening
SSWWTP Digestion			$718,116	56,040	41%	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	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 applicatio n
Milorganite® Sales Revenue			-$5,704,448	49,086	87%	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

Item/Process	Process Cost/ton	Source of Cost Data	Process Cost Value	Total Mass of Raw Sludge that Cost Value Applies to (tons)	% of Raw Sludge from Left Column Actually Sent to this Unit Process	% of Raw Sludge for this Alternative Sent to this Unit Process*	Alternative Process Cost/raw	Year	Process Index	Cost	ENR	2020 (2007)	
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 for Glass Furnace SO2 Control	$6.25	2006	$907,000	$3.88	24,400	100							*Minergy GlassPack Proposal MMSD Hybrid 11 14 06 sm.pdf*, Bill Beres (Minergy) email 11.14.06
Ammonia 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
Glass Furnace Staffing	per year		$599,040	1.5	per year	per year	per year	$599,040.00	2006	9700		$617,567.0	
IPS Pipeline Sludge Transfer	$3.20		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

Item/Process	Process Cost/ton	Source of Cost Data	Process Cost Value	Total Mass of Raw Sludge that Cost Value Applies to (tons)	% of Raw Sludge from Left Column Actually Sent to this Unit Process	% of Raw Sludge for this Alternative Sent to this Unit Process*	Alternative Process Cost/raw	Year	Process Index	Cost	ENR	2020 (2007)	
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			$68,003		2,168	100%	0%	$0.00	2004	8620		$0.00	*Solids Cost 2004 UWSactual .XLS*, Bill Krill email 08.19.0 5
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 11.16.0 6
Landfill System Staffing	per year		$0	per year		per year	per year	$0.00	2006	9700		$0.00	8 workers and 1 su
Cake Trucking & Landfilling	$122		$0		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 12.1 8

*linked to assumptions & total cost summary page

Preserving The Environment • Improving Water Quality

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

	mmBTU	Current Rates		% Inflation to 2007	Future Rates	Total	Required Energy Source:
direct firing of dryers	133489	$9.250	$/Dtherm	0%	**$9.250 $/Dtherm**	$1,234,773	*Milo-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

		Current Rates		% Inflation to 2007	Future Rates	Total	Required Energy Source:
Facilities Charge	1	$9,600	/year	8%	**$10,368 /year**	$10,368	*Milo-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)

Interruptible Electric Total $472,001

Current Service

		Current Rates		% Inflation 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

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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 installed facilities and well documented (connections to existing systems, etc.)	20%	Symbiont assumption
installed costs for major components are not well documented (eg. Installation cost is estimated)	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)	15%	Bill Krill (HNTB), phone conference 11.16.06
everything else	35%	Bill Krill (HNTB), phone conference 11.16.06

Milwaukee Metropolitan Sewerage District
2020 FACILITIES PLANNING

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 Operation & Maintenance Costs				**$0**

Total Present Worth **$728,000,000**

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TABLE 9G-6 SHEET 1 OF 13

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

2020 TREATMENT REPORT

6/2/07 TR_9G.T006.07.06.02.cdr

Milwaukee Metropolitan Sewerage District
2020 FACILITIES PLANNING

JIWWTP TURBINE UPGRADES CAPITAL COST

Total Capital Cost = $16,460,000 | Total Salvage Value = $85,000

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

DESCRIPTION	Quantity	Units	Unit Cost ($)	SUBTOTAL ($)	Un-designed Details (%)	Conting-ency (%)	Design, Bidding, & Oversight (%)	SUBTOTAL ($)	Life (Years)	Salvage Value ($)	Actual Unit Cost ($)	COST ADJUSTMENT Cost Year	ENR Index	Adjustment Factor	ADJUSTED UNIT COST ($)	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	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 15: MECHANICAL																		
Exhaust Ductwork from Turbine Building to Existing Duct System - 120" special alloy exhaust pipe w/pile supports	500	lf	$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	$40,000	40%	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	40%	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	7,200	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**																	

Milwaukee Metropolitan Sewerage District

2020 FACILITIES PLANNING

NEW TURBINE BUILDING CAPITAL COST

								Total Capital Cost =		Total Salvage Value =	<---- insert link to this cost on the Capital Cost Summary Worksheet							
								$3,495,000		$1,684,000								
DESCRIPTION	Quantity	Units	Unit Cost ($)	SUBTOTAL ($)	Un-designed Details (%)	Conting-ency (%)	Design, Bidding, & Oversight (%)	SUBTOTAL ($)	Life (Years)	Salvage Value ($)	Actual Unit Cost ($)	COST ADJUSTMENT Cost Year	ENR Index	Adjustment Factor	ADJUSTED UNIT COST ($)	SOURCE	MANUFACTURER	COMMENTS
DIVISION 2: SITE CONSTRUCTION																		
Asphalt removal for building install	694	SY	$8	$5,556	20%	25%	35%	$11,000	40	$6,000	$8	2006	9700	1.03	$8	RSMEANS COSTWORKS 2006 QTR 3; 02 220 250 5200	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	2006	9700	1.03	$2	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	$3	$1,500	20%	25%	35%	$3,000	40	$2,000	$3	2006	9700	1.03	$3	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	$3	$2,000	20%	25%	35%	$4,000	40	$2,000	$3	2006	9700	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	$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
Division 3 Subtotal	**$20,000**																	
DIVISION 13: SPECIAL CONSTRUCTION																		
Turbine Building	5,000	sf	$298	$1,490,000	*Turbine Building Cost COSTWORKS.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																		
Natural Gas Supply	500	LF	$36	$18,000	20%	25%	35%	$40,000	40	$20,000	$35	2006	9700	1.03	$36	RSMEANS COSTWORKS 2006 QTR 3; 15 107 620 2090	TBD	Pipe, steel, black, welded, 3" diameter, schedule 40
Instrument Air Supply	500	LF	$34	$17,000	20%	25%	35%	$30,000	40	$15,000	$33	2006	9700	1.03	$34	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	$166	$83,000	20%	25%	35%	$170,000	40	$85,000	$161	2006	9700	1.03	$166	RSMEANS COSTWORKS 2006 QTR 3; 15 107 620 2150	TBD	Pipe, steel, black, welded, 10" diameter, schedule 40
Potable Water Supply	500	LF	$34	$17,000	20%	25%	35%	$30,000	40	$15,000	$33	2006	9700	1.03	$34	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 Subtotal	**$280,000**																	
DIVISION 16: ELECTRICAL																		
Power Feed	1	ea	$62,000	$62,000	20%	25%	35%	$130,000	20	ew medium voltage transformers, conductors to new bldg	$60,000	2006	9700	1.03	$61,856	Symbiont estimate based on recent project	TBD	Estimate includes n
Division 16 Subtotal	**$130,000**																	

Preserving The Environment • Improving Water Quality

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.T006.07.06.02.cdr

Milwaukee Metropolitan Sewerage District

2020 FACILITIES PLANNING

D&D FACILITY UPGRADES CAPITAL COST

								Total Capital Cost =		Total Salvage Value =	<----- insert link to this cost on the Capital Cost Summary Worksheet							
								$114,740,000		$0								
DESCRIPTION	Quantity	Units	Unit Cost ($)	SUBTOTAL ($)	Un-designed Details (%)	Conting-ency (%)	Design, Bidding, & Oversite (%)	SUBTOTAL ($)	Life (Years)	Salvage Value ($)	Actual Unit Cost ($)	COST ADJUSTMENT Cost Year	ENR Index	Adjustment Factor	ADJUSTED UNIT COST ($)	SOURCE	MANUFACTURER	COMMENTS
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	$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	
Unit Process 25 Upgrade	1	lump sum	$17,453,000	$17,453,000	40%	25%	35%	$41,230,000	20	$0	$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	
Unit Process 27 Upgrade	1	lump sum	$4,062,000	$4,062,000	40%	25%	35%	$9,600,000	20	$0	$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	
Unit Process 29 Upgrade	1	lump sum	$12,629,000	$12,629,000	40%	25%	35%	$29,840,000	20	$0	$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	
Unit Process 30 Upgrade	1	lump sum	$1,278,000	$1,278,000	40%	25%	35%	$3,020,000	20	$0	$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	
Unit Process 31 Upgrade	1	lump sum	$747,000	$747,000	40%	25%	35%	$1,760,000	20	$0	$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	
Unit Process 32 Upgrade	1	lump sum	$2,809,000	$2,809,000	40%	25%	35%	$6,640,000	20	$0	$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	
Miscellaneous Costs (drop chutes, etc.)	1	lump sum	$3,093,000	$3,093,000	40%	25%	35%	$7,310,000	20	$0	$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	
Division 13 Subtotal	**$114,740,000**																	

Preserving The Environment • Improving Water Quality

Milwaukee Metropolitan Sewerage District

2020 FACILITIES PLANNING

NEW LOCOMOTIVE CAPITAL COSTS

Total Capital Cost = $3,050,000

Total Salvage Value = $0

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

DESCRIPTION	Quantity	Units	Unit Cost ($)	SUBTOTAL ($)	Un-designed Details (%)	Conting-ency (%)	Design, Bidding, & Oversite (%)	SUBTOTAL ($)	Life (Years)	Salvage Value ($)	Actual Unit Cost ($)	COST ADJUSTMENT Cost Year	COST ADJUSTMENT ENR Index	COST ADJUSTMENT Adjustment Factor	ADJUSTED UNIT COST ($)	SOURCE	MANUFACTURER	COMMENTS
DIVISION 11: EQUIPMENT																		
New Locomotive	1	lump sum	$1,289,000	$1,289,000	40%	25%	35%	$3,050,000	20	$0	$1,250,000	2006	9700	1.03	$1,288,660	Alan Scrivner (AES), email 4.05.06	TBD	
Division 11 Subtotal	**$3,050,000**																	

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TABLE 9G-6 SHEET 5 OF 13

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

2020 TREATMENT REPORT

6/2/07 TR_9G.T006.07.06.02.cdr

Milwaukee Metropolitan Sewerage District

2020 FACILITIES PLANNING

INTERPLANT SLUDGE PIPELINE UPGRADES CAPITAL COSTS

Total Capital Cost = $2,870,000

Total Salvage Value = $0

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

DESCRIPTION	Quantity	Units	Unit Cost ($)	SUBTOTAL ($)	Un-designed Details (%)	Conting-ency (%)	Design, Bidding, & Oversite (%)	SUBTOTAL ($)	Life (Years)	Salvage Value ($)	Actual Unit Cost ($)	COST ADJUSTMENT Cost Year	ENR Index	Adjustment Factor	ADJUSTED UNIT COST ($)	SOURCE	MANUFACTURER	COMMENTS
DIVISION 11: EQUIPMENT																		
JIWWTP and SSWWTP Hard Metal Pumps & Motors Rated for 300 psi	12	each	$93,000	$1,116,000	20%	25%	35%	$2,260,000	20	000 per pump for installation $0	$90,000	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	
Division 16 Subtotal	**$610,000**																	

Preserving The Environment • Improving Water Quality

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.T006.07.06.02.cdr

Milwaukee Metropolitan Sewerage District

2020 FACILITIES PLANNING

SSWWTP DIGESTER REHABILITATION CAPITAL COST

								Total Capital Cost = $158,310,000		Total Salvage Value = $24,023,000	<---- insert link to this cost on the Capital Cost Summary Worksheet						
DESCRIPTION	Quantity	Units	Unit Cost ($)	SUBTOTAL ($)	Un-designed Details (%)	Conting-ency (%)	Design, Bidding, & Oversite (%)	SUBTOTAL ($)	Life (Years)	Salvage Value ($)	Actual Unit Cost ($)	COST ADJUSTMENT Cost Year	ENR Index	Adjustment Factor	ADJUSTED UNIT COST ($)	SOURCE	MANUFACTURER	COMMENTS
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	$2	2007	10000	1.00	$2	Symbiont engineering judgment	TBD	
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	$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
New Digester Recirculation Pumps - 10 HP motors, 250 gpm @ 60' TDH	26	each	$15,000	$390,000	40%	25%	35%	$920,000	20	$0	$13,650	2005	9231	1.08	$14,787	Rich Hussey (Ley Associates), email 07.26.05	Wemco-Hidrostal, D4K-HS	+30% for install
Recirculating Sludge Heat Exchangers -Sludge-Hot Water Systems	13	each	$42,000	$546,000 2,249	40%	25%	35%	$1,290,000	20	$0	$39,000	2005	9231	1.08	$4	*Biosolids Alternative Sizing Worksheets r4.xls* , Symbiont	Alfa Laval	+30% for install
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	$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
Digester Gas Safety Equipment	1	allowance	$1,137,000	$1,137,000	40%	25%	35%	$2,690,000	20	$0	$1,050,000	2005	9231	1.08	$1,137,472	Symbiont engineering judgment		
Division 11 Subtotal	**$27,600,000**																	
DIVISION 15: MECHANICAL																		
New Boiler	1	each	$67,000	$67,000	40%	25%	35%	$160,000	20	$0	$65,000	2006	9700	1.03	$67,010	Symbiont engineering judgment based on recent projects	TBD	
Division 15 Subtotal	**$160,000**																	

Preserving The Environment • Improving Water Quality

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.T006.07.06.02.cdr

Milwaukee Metropolitan Sewerage District
2020 FACILITIES PLANNING

New SSWWTP Gravity Belt Thickeners for WAS Thickening Capital Cost

Total Capital Cost =	Total Salvage Value =
$7,580,000	$241,000

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

DESCRIPTION	Quantity	Units	Unit Cost ($)	SUBTOTAL ($)	Un-designed Details (%)	Contingency (%)	Design, Bidding, & Oversite (%)	SUBTOTAL ($)	Life (Years)	Salvage Value ($)	Actual Unit Cost ($)	COST ADJUSTMENT Cost Year	ENR Index	Adjustment Factor	ADJUSTED UNIT COST ($)	SOURCE	MANUFACTURER	COMMENTS
DIVISION 2: SITE CONSTRUCTION																		
Demolition	1	lump sum	$26,000	$26,000	40%	25%	35%	$60,000	20	ded via Kate Ziino (HNTB), fax 9.27.06) [illegible]	[illegible]	2004	[illegible]	1.16	+25% contractor O&P [illegible]	Frank Tiefert (ATI), Technical Memorandum [illegible]		
Division 2 Subtotal	**$60,000**																	
DIVISION 4: MASONRY																		
Masonry Restoration - Cut and Repoint Brick	1	lump sum	$22,000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	$18,752	[illegible]	[illegible]	[illegible]	$21,752	Frank Tiefert (		
Division 4 Subtotal	**$50,000**																	
DIVISION 11: EQUIPMENT																		
GBT Equipment	1	lump sum	$1,624,000	$1,624,000	40%	25%	35%	$3,840,000	20	[illegible]	[illegible]	[illegible]	8620	[illegible]	[illegible]	[illegible] for this alternatives		
Thickened Sludge Pumps	1	lump sum	$322,000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	20	TBD $0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Frank Tiefert (ATI), Technical		
Washwater Pumps	1	lump sum	$63,000	$63,000	[illegible]	[illegible]	[illegible]	$150,000	TBD 20	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Frank Tiefert (ATI), Technical Memorandum		
Polymer System	1	lump sum	$183,000	$183,000	40%	25%	35%	$430,000	20	[illegible]	[illegible]	[illegible]	8620	TBD 1.16	[illegible]	[illegible] alternatives		
Division 11 Subtotal	**$5,180,000**																	
DIVISION 13: SPECIAL CONSTRUCTION																		
Building Modifications	1	lump sum	$281,000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	40	TBD $121,000	[illegible]	[illegible]	[illegible]	[illegible]	$281,323	Frank Tiefert (ATI), Tech		
Division 13 Subtotal	**$660,000**																	
DIVISION 15: MECHANICAL																		
Mechanical Piping	1	lump sum	$277,000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	40	TBD $120,000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Frank Tiefert (ATI), Technical		
Division 15 Subtotal	**$650,000**																	
DIVISION 16: ELECTRICAL																		
Instrumentation & Control	1	lump sum	$221,000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	20	TBD $0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Frank Tiefert (ATI), Technic		
Electrical	1	lump sum	$193,000	$193,000	40%	25%	35%	$460,000	20	[illegible]	[illegible]	[illegible]	8620	TBD 1.16	[illegible]	[illegible] alternatives		
Division 16 Subtotal	**$980,000**																	

Preserving The Environment • Improving Water Quality

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.T006.07.06.02.cdr

Milwaukee Metropolitan Sewerage District

2020 FACILITIES PLANNING

SSWWTP NEW DIGESTED SLUDGE GRAVITY BELT THICKENERS CAPITAL COST

								Total Capital Cost =		Total Salvage Value =							
								$3,420,000		$0	<---- insert link to this cost on the Capital Cost Summary Worksheet							
DESCRIPTION	Quantity	Units	Unit Cost ($)	SUBTOTAL ($)	Un-designed Details (%)	Conting-ency (%)	Design, Bidding, & Oversite (%)	SUBTOTAL ($)	Life (Years)	Salvage Value ($)	Actual Unit Cost ($)	COST ADJUSTMENT Cost Year	ENR Index	Adjustment Factor	ADJUSTED UNIT COST ($)	SOURCE	MANUFACTURER	COMMENTS
DIVISION 11: EQUIPMENT																		
2 meter Gravity Belt Thickener	2	each	$292,000	$584,000	versation 2223.06	25%	35%	$1,180,000	20	$0	$270,000	2005	9231	1.08	$292,493	Bob Moser (UWS) phone con	TBD	
500 gpm Gravity Belt Thickener Feed Pumps	2	each	$59,000	$118,000	sociates), email 07.26.05	25%	35%	$280,000	20	$0	$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
Progressing Cavity Gravity Belt Thickener Polymer Feed Pumps	2	each	$42,000	$84,000	40%	25%	35%	$200,000	20	$0	$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
Progressing Cavity Thickened Sludge Transfer Pumps	2	each	$70,000	$140,000	40%	25%	35%	$330,000	20	$0	$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
Progressing Cavity GBT Bulk Polymer Transfer Pumps	1	each	$35,000	$35,000	40%	25%	35%	$80,000	20	$0	$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
Progressing Cavity GBT Bulk Polymer Mix Pumps	1	each	$28,000	$28,000	40%	25%	35%	$70,000	20	$0	$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
Progressing Cavity Operational Storage Pumps	2	each	$70,000	$140,000	40%	25%	35%	$330,000	20	$0	$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
1 meter Gravity Belt Thickener	2	each	$165,000	$330,000	rsation 2223.06	25%	35%	$670,000	20	$0	$160,000	2006	9700	1.03	$164,948	Bob Moser (UWS) phone conve	TBD	
250 gpm Gravity Belt Thickener Feed Pumps	1	each	$30,000	$30,000	ciates), email 07.26.05	25%	35%	$70,000	20	$0	$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), x1.3 installed /2 for
Progressing Cavity Gravity Belt Thickener Polymer Feed Pumps	1	each	$21,000	$21,000	40%	25%	35%	$50,000	20	$0	$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
Progressing Cavity Thickened Sludge Transfer Pumps	1	each	$35,000	$35,000	40%	25%	35%	$80,000	20	$0	$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
Progressing Cavity Operational Storage Pumps	1	each	$35,000	$35,000	40%	25%	35%	$80,000	20	$0	$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
Division 11 Subtotal	**$3,420,000**																	

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

Milwaukee Metropolitan Sewerage District

2020 FACILITIES PLANNING

SSWWTP DEWATERING UPGRADES CAPITAL COST

Total Capital Cost =	Total Salvage Value =
$5,360,000	$0

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

DESCRIPTION	Quantity	Units	Unit Cost ($)	SUBTOTAL ($)	Un-designed Details (%)	Contingency (%)	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	$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**									

DESCRIPTION	Actual Unit Cost ($)	COST ADJUSTMENT Cost Year	ENR Index	Adjustment Factor	ADJUSTED UNIT COST ($)	SOURCE	MANUFACTURER	COMMENTS
Plate Repair Press #1	$313,500 Symbiont 12.06	2006	9700	TBD 1.03	$323,196	Review of United Water Services Plant Requested Projects for 2		
Plate Repair Press #2	$313,500 Symbiont 12.06	2006	9700	TBD 1.03	$323,196	Review of United Water Services Plant Requested Projects for 2		
Plate Repair Press #3	$313,500 Symbiont 12.06	2006	9700	TBD 1.03	$323,196	Review of United Water Services Plant Requested Projects for 2		
Plate Repair Press #4	$86,000 Symbiont 12.06	2006	9700 TBD	1.03	$88,660	Review of United Water Services Plant Requested Projects for 2005,		
Rebuild Presses#1, #2, #3, and #4	$1,180,000 cts for 2005, Symbiont 12.06	2006	9700	TBD 1.03	$1,216,495	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 TREATMENT REPORT

6/2/07 TR_9G.T006.07.06.02.cdr

Preserving The Environment • Improving Water Quality

Milwaukee Metropolitan Sewerage District
2020 FACILITIES PLANNING

O&M COST ESTIMATE

Total 2020 MMSD Sludge Production (dt/yr) = 82,300 (raw sludge)

Total Annual O&M Cost = $35,620,000

JIWWTP Energy Costs

Item	Cost	Source
Natural Gas - Turbine Fuel	$10,541,000	see Sheet 12, Energy Costs
Natural Gas - Direct Firing of Dryers	$0	see Sheet 12, Energy Costs
Natural Gas - Minergy NOx Control & Startup	$0	see Sheet 12, Energy Costs
Natural Gas - Other Plant Facilities	$5,445,000	see Sheet 12, Energy Costs
Firm Electricity - Base Power Load	$7,000	see Sheet 12, Energy Costs
Firm Electricity - Demand Charges	$0	see Sheet 12, Energy Costs
Interruptible Electricity - Base Power Load	$0	see Sheet 12, Energy Costs
Interruptible Electricity - Demand Charges	$0	see Sheet 12, Energy Costs
Turbine Operation and Maintenance	$1,289,000	Turbine Operation and Maintenance per year $1,250,000.00 2006), email 3.27.06 9700 $1,288,659.79 Bob Gavahan (Power Engineers Collaborative
SUBTOTAL	**$17,282,000**	

SSWWTP Digestion Gas Credit/Replacement

Item	Value	Units	Source
plus/minus amount of solids destroyed in digestion =	12,734	tons/year	calculated difference in tons removed in digester from the year 2004 (*Solids Cost 2004 UWSactual .XLS*, Bill Krill email 08.19.05)
plus/minus amount of energy recovered from digestion process =	150,267	dtherm/year	calculated heat value of additional digester gas based on values assumed on "JI Energy"
VALUE OF ENERGY CHANGE IN TERMS OF COST OF EQUIVALENT GAS PURCHASE	**-$1,389,970**		calculated $ value of additional digester gas based on values assumed on "JI Energy"

Milorganite® Annual Operating & Maintenance Costs

% of sludge to Milorganite® = *33%* *% sold*
annual sludge volume (dt/year) = *27,159* *(raw)* = *100%*

Item/Process	Process Unit Cost ($/dt)	Process Contribution Cost ($/dt raw)	Annual Cost $/yr
JIWWTP Thickening	$53.00	$37.10	$1,008,000
JIWWTP Dewatering/Drying	$191.30	$186.40	$5,062,000
JIWWTP Chaff Processing	$443.30	$22.20	$603,000
Milorganite® Warehouse/Shipping	$27.20	$26.50	$720,000
Biosolids Marketing	$81.70	$79.60	$2,162,000
IPS Pipeline Sludge Transfer (includes SS energy)	$3.20 *	$1.70	$46,000
SSWWTP WAS Thickening (energy included)	$82.40	$0.40	$11,000
SSWWTP Digestion (energy included)	$36.40	$2.20	$60,000
Milorganite® Land Application	$135.10	$0.00	$0
Milorganite® Sales Revenue	-$155.80	-$151.80	-$4,123,000
SUBTOTAL		**$204**	**$5,548,584**

Milorganite® Annual Operating & Maintenance Costs

Process / dry ton Year Index Process Cost/ton Source of Cost Data	Process Cost Data	Total Mass of Raw Sludge that Cost Value Applies to (tons)	% of Raw Sludge from Left Column Actually Sent to this Unit Process	% of Raw Sludge for this Alternative Sent to this Unit Process*	Alternative Process Cost/raw	Cost	ENR	2020 (2007)	Source
JIWWTP Thickening	$1,279,606	56,040	50%	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	84%	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	84%	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	84%	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	87%	97%	$68.62	2004	8620	$79.60	*Solids Cost 2004 UWSactual .XLS*, Bill Krill email 08.19.05
IPS Pipeline Sludge Transfer $1.70 (overlapping text: 4 8620)	varies	varies	varies	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	41%	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%	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%	97%	-$130.87	2004	8620	-$151.82	*Solids Cost 2004 UWSactual .XLS*, Bill Krill email 08.19.05

*linked to assumptions & total cost summary page

Glass Furnace Annual Operating Costs

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

Item/Process	Process Unit Cost ($/dt)	Process Contribution Cost ($/dt raw)	Annual Cost $/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
SUBTOTAL		**$0**	**$0**

Glass Furnace Annual Operating Costs

Process / dry ton Year Index Process Cost/ton Source of Cost Data	Process Cost Data	Total Mass of Raw Sludge that Cost Value Applies to (tons)	% of Raw Sludge from Left Column Actually Sent to this Unit Process	% of Raw Sludge for this Alternative Sent to this Unit Process*	Alternative Process Cost/raw	Cost	ENR	2020 (2007)	Source
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
Minergy Liquid Oxygen Tank & Vaporizer Rental (overlapping text: per year $25,700.00 2006 9700)	$25,700	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 Staffing (overlapping text: Bill Krill meeting 11.16.06; $48/hr/worker per Mark Kaminski & Bob Sander of MMSD per Bill Krill email 11.17.06)	$599,040	per year	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

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

Item/Process	Process Unit Cost ($/dt)	Process Contribution Cost ($/dt raw)	Annual Cost $/yr
IPS Pipeline Sludge Transfer	$3.20 *	$0.70	$39,000
SSWWTP WAS Thickening (energy included)	$82.40	$6.90	$380,000
SSWWTP Digestion (energy included)	$36.40	$36.40	$2,007,000
SSWWTP DS Thickening (energy included)	$82.40	$47.20	$2,603,000
SSWWTP Dewatering (energy included)	$115.00	$65.90	$3,634,000
Landfill System Staffing	per year	$16.79	$926,000
Cake Trucking & Landfilling	$145.30	$83.20	$4,588,000
SUBTOTAL		**$257**	**$14,176,382**

Landfill Annual Operating & Maintenance Costs

Process / dry ton Year Index Process Cost/ton Source of Cost Data	Process Cost Data	Total Mass of Raw Sludge that Cost Value Applies to (tons)	% of Raw Sludge from Left Column Actually Sent to this Unit Process	% of Raw Sludge for this Alternative Sent to this Unit Process*	Alternative Process Cost/raw	Cost	ENR	2020 (2007)	Source
IPS Pipeline Sludge Transfer	varies	varies	varies	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	50%	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 Thickening (energy included) $47.19 (overlapping text: 2004 8620)	$1,989,266	56,040	50%	57%	$40.68	2			*Solids Cost 2004 UWSactual .XLS*, Bill Krill email 08.19.05; cost for JI GBT thickening
SSWWTP Dewatering	$52	1	100%	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 System Staffing (overlapping text: 50.52 8 workers and 1 supervisor per Bill Krill, meeting 11.16.06; $48/hr/worker per Mark Kaminski & Bob Sander of MMSD, Bill Krill email 11.17.06)	$898,560	per year	per year	per year	$898,560.00	2006	9700	$926,3	
Cake Trucking & Landfilling	$122	1	100%	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

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

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TABLE 9G-6 SHEET 11 OF 13
RECOMMENDED BIOSOLIDS PLAN ALTERNATIVE 6 – COMBINE MILORGANITE® PROGRAM WITH LANDFILL DISPOSAL
2020 TREATMENT REPORT
6/2/07 TR_9G.T006.07.06.02.cdr

ENERGY COSTS

TOTAL

$15,992,889 per year

GAS

	mmBTU	Current Rates		% Inflation to 2007	Future Rates		Total	Required Energy Source:
direct firing of dryers		$9.250	$/Dtherm	0%	**$9.250**	**$/Dtherm**	$0	*Milo-LF Hybrid Daily Heat & Mass Balance 2020 ALH 12.01.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 $15,986,085

ELECTRICAL

Transmission Level Service

	Current Rates		% Inflation to 2007	Future Rates		Total	Required Energy Source:
Facilities Charge	$6,300	/year	8%	**$6,804**	**/year**	$0	
On Peak Energy Charge	$0.0603	/kWh	8%	**$0.0651**	**/kWh**	$0	
Off Peak Energy Charge	$0.0312	/kWh	8%	**$0.0337**	**/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

	Current Rates		% Inflation to 2007	Future Rates		Total	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

		Current Rates		% Inflation 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

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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 (tpy)	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

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 installed facilities and well documented (connections to existing systems, etc.)	20%	Symbiont assumption
installed costs for major components are not well documented (eg. Installation cost is estimated)	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)	15%	Bill Krill (HNTB), phone conference 11.16.06
everything else	35%	Bill Krill (HNTB), phone conference 11.16.06

APPENDIX 9H

GLASS FURNACE TECHNOLOGY PROPOSALS