
**WEST BRANCH WWTP ALTERNATIVES
PRELIMINARY REVIEW**



VEENSTRA & KIMM, INC.

**Opinion of Cost for 2019 West Branch Facility Plan
West Branch, Iowa**

**Aero-Mod (detailed costs)
3/14/2019**

No.	Description	Unit	Unit Price*	Quantity	Extended Price
1	Mobilization/General Conditions	LS	\$600,000	1	\$600,000
2	Dewatering	LS	\$100,000	1	\$100,000
3	Earthwork (fill)	CY	\$20	5,000	\$100,000
4	New Influent Structure	LS	\$30,000	1	\$30,000
5	New Manhole Structures	EA	\$15,000	4	\$60,000
6	Influent Parshall Flume	LS	\$20,000	1	\$20,000
7	Screening & Wash Press Equipment	LS	\$228,000	1	\$228,000
8	Grit Removal Equipment	LS	\$186,000	1	\$186,000
9	Headworks/Blower/Lab Building (40'x50')	SF	\$200	2,000	\$400,000
10	Aero-Mod Equipment	LS	\$1,368,000	1	\$1,368,000
11	Aero-Mod Concrete Tanks	CY	\$1,000	1,168	\$1,168,000
12	Sludge Storage Tank	CY	\$1,000	353	\$353,000
13	Sludge Storage Equipment (mixer, pumps, load out)	LS	\$85,000	1	\$85,000
14	UV System	LS	\$157,000	1	\$157,000
15	UV Building (40'x12')	SF	\$150	480	\$72,000
16	Concrete UV Channel	LS	\$10,000	1	\$10,000
17	EQ Flow Splitter Structure	LS	\$30,000	1	\$30,000
18	EQ Pumps	EA	\$70,000	2	\$140,000
19	EQ Force Main (12")	LF	\$125	160	\$20,000
20	EQ Influent Structure	LS	\$15,000	1	\$15,000
21	EQ Overflow Structure	LS	\$15,000	2	\$30,000
22	In-Plant Piping (18")	LF	\$110	1,045	\$115,000
23	Generator (150 kW) & Transfer Switch	LS	\$160,000	1	\$160,000
24	Electrical	LS	\$400,000	1	\$400,000
25	Controls	LS	\$130,000	1	\$130,000
26	Rip-Rap	TON	\$55	0	\$0
27	Bentonite	LS		0	\$0
28	Road	SF	\$1.72	11,520	\$20,000
SUB-TOTAL					\$5,997,000
Contingency (15%)					\$900,000
CONSTRUCTION TOTAL					\$6,897,000
Land Acquisition					\$0
Eng., Leg., Adm. (18%)					\$1,242,000
PROJECT TOTAL					\$8,139,000

**Opinion of Cost for 2019 West Branch Facility Plan
West Branch, Iowa**

**Aero-Mod
3/14/2019**

No.	Description	Price
1	Headworks	\$834,000
2	Aero-Mod Treatment System	\$2,974,000
3	UV System	\$239,000
4	EQ Lift Station & Piping	\$235,000
5	Site Work & Piping	\$1,025,000
6	Generator (150 kW) & Transfer Switch	\$160,000
7	Electrical & Controls	\$530,000
SUB-TOTAL		\$5,997,000
Contingency (15%)		\$900,000
CONSTRUCTION TOTAL		\$6,897,000
Land Acquisition		\$0
Eng., Leg., Adm. (18%)		\$1,242,000
PROJECT TOTAL		\$8,139,000
EXPECTED O&M (20 YR PRESENT WORTH)		\$1,734,000
20 YEAR PRESENT WORTH VALUE OF PROJECT		\$9,873,000

Does not include biosolids removal from existing lagoons; biosolids assumed to be significantly reduced with current pilot study that uses microbial additions and super saturated oxygen to reduce sludge blanket

Aero-Mod O&M PW Calculations

O&M Expense	Annual Cost (\$/yr)	Notes
Aero-Mod Operational Costs	\$53,088	Assume 73 HP 24x7x365 to run Aero-Mod system and utilities rate of \$0.11/kW
EQ Pumps Operational Costs	\$349	Assume used 5 weeks/yr, 5 HP 24x7, \$0.11/kW
UV Operational Costs	\$7,260	Assume 12 kW @ 5500 hrs
Sampling/Testing Costs	\$10,000	
Additional Labor Hours to Run the Facility	\$20,000	Grade 3 operator: \$20,000 more per year in salary?
Screening & Grit	\$5,818	Assume 8 HP 24x7x365 and utilities rate of \$0.11/kW
Sludge Hauling	\$20,000	Assume 400,000 gal/yr @ \$0.05/gal
Interest Rate	3%	
Years	20	
Present Worth Factor	14.88	
20-Year Present Worth	\$1,733,437	
Annual O&M	\$116,514	

Existing O&M Expense	Annual Cost (\$/yr)	Notes
Interest Rate	3%	
Years	20	
Present Worth Factor	14.88	
20-Year Present Worth	\$0	

20-Year Present Worth

\$1,733,437



VEENSTRA & KIMM, INC.

AREO-MOD SITE PLAN
WEST BRANCH, IOWA
FIGURE 4-X

**Opinion of Cost for 2019 West Branch Facility Plan
West Branch, Iowa**

**SBR (detailed costs)
3/14/2019**

No.	Description	Unit	Unit Price*	Quantity	Extended Price
1	Mobilization/General Conditions	LS	\$480,000	1	\$480,000
2	Dewatering	LS	\$150,000	1	\$150,000
3	Earthwork (fill)	CY	\$20	7,000	\$140,000
4	New Influent Structure	LS	\$30,000	1	\$30,000
5	New Manhole Structures	EA	\$15,000	4	\$60,000
6	Influent Parshall Flume	LS	\$20,000	1	\$20,000
7	Screening & Wash Press Equipment	LS	\$228,000	1	\$228,000
8	Grit Removal Equipment	LS	\$186,000	1	\$186,000
9	Headworks/Blower/Lab Building (40'x50')	SF	\$200	2,000	\$400,000
10	SBR/ISAM Equipment	LS	\$657,000	1	\$657,000
11	SBR Concrete Tanks	CY	\$1,000	1,200	\$1,200,000
14	UV System	LS	\$157,000	1	\$157,000
15	UV Building (40'x12')	SF	\$150	480	\$72,000
16	Concrete UV Channel	LS	\$10,000	1	\$10,000
17	EQ Flow Splitter Structure	LS	\$30,000	1	\$30,000
18	EQ Pumps	EA	\$70,000	2	\$140,000
19	EQ Force Main (12")	LF	\$125	160	\$20,000
20	EQ Influent Structure	LS	\$15,000	1	\$15,000
21	EQ Overflow Structure	LS	\$15,000	2	\$30,000
22	In-Plant Piping (18")	LF	\$110	860	\$95,000
23	Generator (120 kW) & Transfer Switch	LS	\$130,000	1	\$130,000
24	Electrical	LS	\$400,000	1	\$400,000
25	Controls	LS	\$130,000	1	\$130,000
26	Rip-Rap	TON	\$55	0	\$0
27	Bentonite	LS		0	\$0
28	Road	SF	\$1.72	11,520	\$20,000
SUB-TOTAL					\$4,800,000
Contingency (15%)					\$720,000
CONSTRUCTION TOTAL					\$5,520,000
Land Acquisition					\$0
Eng., Leg., Adm. (18%)					\$994,000
PROJECT TOTAL					\$6,514,000

**Opinion of Cost for 2019 West Branch Facility Plan
West Branch, Iowa**

**SBR
3/14/2019**

No.	Description	Price
1	Headworks	\$834,000
2	SBR/ISAM Treatment System	\$1,857,000
3	UV System	\$239,000
4	EQ Lift Station & Piping	\$235,000
5	Site Work & Piping	\$975,000
6	Generator (120 kW) & Transfer Switch	\$130,000
7	Electrical & Controls	\$530,000
SUB-TOTAL		\$4,800,000
Contingency (15%)		\$720,000
CONSTRUCTION TOTAL		\$5,520,000
Land Acquisition		\$0
Eng., Leg., Adm. (18%)		\$994,000
PROJECT TOTAL		\$6,514,000
EXPECTED O&M (20 YR PRESENT WORTH)		\$1,330,000
20 YEAR PRESENT WORTH VALUE OF PROJECT		\$7,844,000

* Does not include biosolids removal from existing lagoons; biosolids assumed to be significantly reduced with current pilot study that uses microbial additions and super saturated oxygen to reduce sludge blanket

SBR O&M PW Calculations

O&M Expense	Annual Cost (\$/yr)	Notes
SBR Operational Costs	\$25,925	Estimated electrical usage from Lemna
EQ Pumps Operational Costs	\$349	Assume used 5 weeks/yr, 5 HP 24x7, \$0.11/kW
UV Operational Costs	\$7,260	Assume 12 kW @ 5500 hrs
Sampling/Testing Costs	\$10,000	
Additional Labor Hours to Run the Facility	\$20,000	Grade 3 operator: \$20,000 more per year in salary?
Screening & Grit	\$5,818	Assume 8 HP 24x7x365 and utilities rate of \$0.11/kW
Sludge Hauling	\$20,000	Assume 400,000 gal/yr @ \$0.05/gal
Interest Rate	3%	
Years	20	
Present Worth Factor	14.88	
20-Year Present Worth	\$1,329,322	
Annual O&M	\$89,351	

Existing O&M Expense	Annual Cost (\$/yr)	Notes
Interest Rate	3%	
Years	20	
Present Worth Factor	14.88	
20-Year Present Worth	\$0	

20-Year Present Worth (additional O&M)

\$1,329,322



VEENSTRA & KIMM, INC.

SBR SITE PLAN
WEST BRANCH, IOWA
FIGURE 4-X

**Opinion of Cost for 2019 Marengo Facility Plan
West Branch, Iowa**

**BioLac (detailed)
3/14/2019**

No.	Description	Unit	Unit Price	Quantity	Extended Price
1	Mobilization/General Conditions	LS	\$385,000	1	\$385,000
2	Dewatering	LS	\$50,000	1	\$50,000
3	Earthwork (fill)	CY	\$20	32,000	\$640,000
4	New Influent Structure	LS	\$30,000	1	\$30,000
5	New Manhole Structures	EA	\$15,000	0	\$0
6	Influent Parshall Flume	LS	\$20,000	1	\$20,000
7	Screening & Wash Press Equipment	LS	\$228,000	1	\$228,000
8	Grit Removal Equipment	LS	\$186,000	1	\$186,000
9	Headworks/Blower/Lab Building (40'x50')	SF	\$200	2,000	\$400,000
10	Biolac Equipment	LS	\$598,000	1	\$598,000
14	UV System	LS	\$157,000	1	\$157,000
15	UV Building (40'x12')	SF	\$150	480	\$72,000
16	Concrete UV Channel	LS	\$10,000	1	\$10,000
17	EQ Flow Splitter Structure	LS	\$30,000	1	\$30,000
18	EQ Pumps	EA	\$70,000	2	\$140,000
19	EQ Force Main (12")	LF	\$125	160	\$20,000
20	EQ Influent Structure	LS	\$15,000	1	\$15,000
21	EQ Overflow Structure	LS	\$15,000	1	\$15,000
22	In-Plant Piping (18")	LF	\$110	1,280	\$141,000
23	Generator (80 kW) & Transfer Switch	LS	\$90,000	1	\$90,000
24	Electrical	LS	\$400,000	1	\$400,000
25	Controls	LS	\$130,000	1	\$130,000
26	Rip-Rap	TON	\$55	730	\$41,000
27	Bentonite	LS	\$12,000	1	\$12,000
28	Road	SF	\$1.72	11,520	\$20,000
SUB-TOTAL					\$3,830,000
Contingency (15%)					\$575,000
CONSTRUCTION TOTAL					\$4,405,000
Land Acquisition					\$0
Eng., Leg., Adm. (18%)					\$793,000
PROJECT TOTAL					\$5,198,000

**Opinion of Cost for 2019 Marengo Facility Plan
West Branch, Iowa**

**BioLac
3/14/2019**

No.	Description	Price
1	Headworks	\$834,000
2	Biolac Treatment System	\$598,000
3	UV System	\$239,000
4	EQ Lift Station & Piping	\$220,000
5	Site Work & Piping	\$1,319,000
6	Generator (120 kW) & Transfer Switch	\$90,000
7	Electrical & Controls	\$530,000
SUB-TOTAL		\$3,830,000
Contingency (15%)		\$575,000
CONSTRUCTION TOTAL		\$4,405,000
Land Acquisition		\$0
Eng., Leg., Adm. (18%)		\$793,000
PROJECT TOTAL		\$5,198,000
EXPECTED O&M (20 YR PRESENT WORTH)		\$1,262,000
20 YEAR PRESENT WORTH VALUE OF PROJECT		\$6,460,000

* Does not include biosolids removal from existing lagoons; biosolids assumed to be significantly reduced with current pilot study that uses microbial additions and super saturated oxygen to reduce sludge blanket

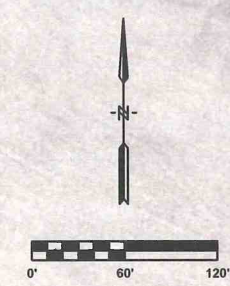
BioLac O&M PW Calculations

O&M Expense	Annual Cost (\$/yr)	Notes
BioLac Operational Costs	\$36,361	Assume 50 HP 24x7x365 to run BioLac system and utilities rate of \$0.11/kW
EQ Pumps Operational Costs	\$349	Assume used 5 weeks/yr, 5 HP 24x7, \$0.11/kW
UV Operational Costs	\$7,260	Assume 12 kW @ 5500 hrs
Sampling/Testing Costs	\$10,000	
Additional Labor Hours to Run the Facility	\$20,000	Grade 3 operator: \$20,000 more per year in salary?
Screening & Grit	\$5,818	Assume 8 HP 24x7x365 and utilities rate of \$0.11/kW
Sludge Hauling	\$5,000	Assume \$50,000 every 10 years
Interest Rate	3%	
Years	20	
Present Worth Factor	14.88	
20-Year Present Worth	\$1,261,431	
Annual O&M	\$84,788	

Existing O&M Expense	Annual Cost (\$/yr)	Notes
Interest Rate	3%	
Years	20	
Present Worth Factor	14.88	
20-Year Present Worth	\$0	

20-Year Present Worth (additional O&M)

\$1,261,431



KEY	
FORCE MAIN	
GRAVITY SEWER	
AIR LATERALS	
BAFFLE CURTAIN	
EFFLUENT SEWER	



VEENSTRA & KIMM, INC.

BIO-LAC SITE PLAN
WEST BRANCH, IOWA
FIGURE 4-X

**Opinion of Cost for 2019 West Branch Facility Plan
West Branch, Iowa**

**Lemna 2-Cell System (detailed costs)
3/14/2019**

No.	Description	Unit	Unit Price*	Quantity	Extended Price
1	Mobilization/General Conditions	LS	\$350,000	1	\$350,000
2	Dewatering	LS	\$50,000	1	\$50,000
3	New Influent Manhole	LS	\$30,000	1	\$30,000
4	Blower Building (20'x20')	SF	\$200	400	\$80,000
5	Lemna Earthwork (fill)	CY	\$20	0	\$0
6	Lemna Equipment	LS	\$1,859,000	1	\$1,859,000
7	Lift Station for Gravity Line	LS	\$100,000	1	\$100,000
8	UV System	LS	\$157,000	1	\$157,000
9	UV Building (40'x12')	SF	\$150	480	\$72,000
10	Concrete UV Channel	LS	\$10,000	1	\$10,000
11	In-Plant Piping (18")	LF	\$110	650	\$72,000
12	Lagoon Earthwork	CY	\$20		\$0
13	Lagoon Aeration System	LS	\$241,000		\$0
14	Generator (120 kW) & Transfer Switch	LS	\$130,000	1	\$130,000
15	Electrical	LS	\$250,000	1	\$250,000
16	Controls	LS	\$75,000	1	\$75,000
17	Bentonite	LS	\$45,000	1	\$45,000
18	Rip-Rap	TON	\$55	3,000	\$165,000
19	Road	SF	\$1.72	10,860	\$19,000
SUB-TOTAL					\$3,464,000
Contingency (15%)					\$520,000
CONSTRUCTION TOTAL					\$3,984,000
Land Acquisition					\$0
Eng., Leg., Adm. (18%)					\$718,000
PROJECT TOTAL					\$4,702,000

**Opinion of Cost for 2019 West Branch Facility Plan
West Branch, Iowa**

**Lemna 2-Cell System
3/14/2019**

No.	Description	Price
1	Lemna Treatment System	\$2,039,000
2	3rd Aerated Lagoon	\$0
3	UV System	\$239,000
5	Site Work & Piping	\$731,000
6	Generator (120 kW) & Transfer Switch	\$130,000
7	Electrical & Controls	\$325,000
SUB-TOTAL		\$3,464,000
Contingency (15%)		\$520,000
CONSTRUCTION TOTAL		\$3,984,000
Land Acquisition		\$0
Eng., Leg., Adm. (18%)		\$718,000
PROJECT TOTAL		\$4,702,000
EXPECTED O&M (20 YR PRESENT WORTH)		\$529,000
20 YEAR PRESENT WORTH VALUE OF PROJECT		\$5,231,000

* Does not include biosolids removal from existing lagoons; biosolids assumed to be significantly reduced with current pilot study that uses microbial additions and super saturated oxygen to reduce sludge blanket

Lemna 2-Cell System O&M PW Calculations

O&M Expense	Annual Cost (\$/yr)	Notes
Lemna Operational Costs	\$23,271	Assume 32 HP 24x7x365 to run Lemna blowers and utilities rate of \$0.11/kW
EQ Pumps Operational Costs		
UV Operational Costs	\$7,260	Assume 12 kW @ 5500 hrs
Sampling/Testing Costs	\$5,000	
Weeding		
Interest Rate	3%	
Years	20	
Present Worth Factor	14.88	
20-Year Present Worth	\$528,616	
Annual O&M	\$35,531	

Existing O&M Expense	Annual Cost (\$/yr)	Notes
Interest Rate	3%	
Years	20	
Present Worth Factor	14.88	
20-Year Present Worth	\$0	

20-Year Present Worth (additional O&M)

\$528,616

**Opinion of Cost for 2019 West Branch Facility Plan
West Branch, Iowa**

**Lemna 3-Cell System (detailed costs)
3/14/2019**

No.	Description	Unit	Unit Price*	Quantity	Extended Price
1	Mobilization/General Conditions	LS	\$500,000	1	\$500,000
2	Dewatering	LS	\$50,000	1	\$50,000
3	New Influent Manhole	LS	\$30,000	1	\$30,000
4	Blower Building (20'x20')	SF	\$200	400	\$80,000
4	Lemna Earthwork (fill)	CY	\$20	0	\$0
5	Lemna Equipment	LS	\$2,579,000	1	\$2,579,000
6	UV System	LS	\$157,000	1	\$157,000
7	UV Building (40'x12')	SF	\$150	480	\$72,000
8	Concrete UV Channel	LS	\$10,000	1	\$10,000
9	In-Plant Piping (18")	LF	\$110	800	\$88,000
10	Lagoon Earthwork	CY	\$20	30,500	\$610,000
11	Lagoon Aeration System	LS	\$141,000	1	\$141,000
12	Generator (170 kW) & Transfer Switch	LS	\$180,000	1	\$180,000
13	Electrical	LS	\$250,000	1	\$250,000
14	Controls	LS	\$75,000	1	\$75,000
15	Bentonite	LS	\$45,000	1	\$45,000
16	Rip-Rap	TON	\$55	3,000	\$165,000
17	Road	SF	\$1.72	10,860	\$19,000
SUB-TOTAL					\$5,051,000
Contingency (15%)					\$758,000
CONSTRUCTION TOTAL					\$5,809,000
Land Acquisition					\$0
Eng., Leg., Adm. (18%)					\$1,046,000
PROJECT TOTAL					\$6,855,000

**Opinion of Cost for 2019 West Branch Facility Plan
West Branch, Iowa**

**Lemna 3-Cell System
3/14/2019**

No.	Description	Price
1	Lemna Treatment System	\$2,659,000
2	3rd Aerated Lagoon	\$751,000
3	UV System	\$239,000
5	Site Work & Piping	\$897,000
6	Generator (170 kW) & Transfer Switch	\$180,000
7	Electrical & Controls	\$325,000
SUB-TOTAL		\$5,051,000
Contingency (15%)		\$758,000
CONSTRUCTION TOTAL		\$5,809,000
Land Acquisition		\$0
Eng., Leg., Adm. (18%)		\$1,046,000
PROJECT TOTAL		\$6,855,000
EXPECTED O&M (20 YR PRESENT WORTH)		\$957,000
20 YEAR PRESENT WORTH VALUE OF PROJECT		\$7,812,000

* Does not include biosolids removal from existing lagoons; biosolids assumed to be significantly reduced with current pilot study that uses microbial additions and super saturated oxygen to reduce sludge blanket

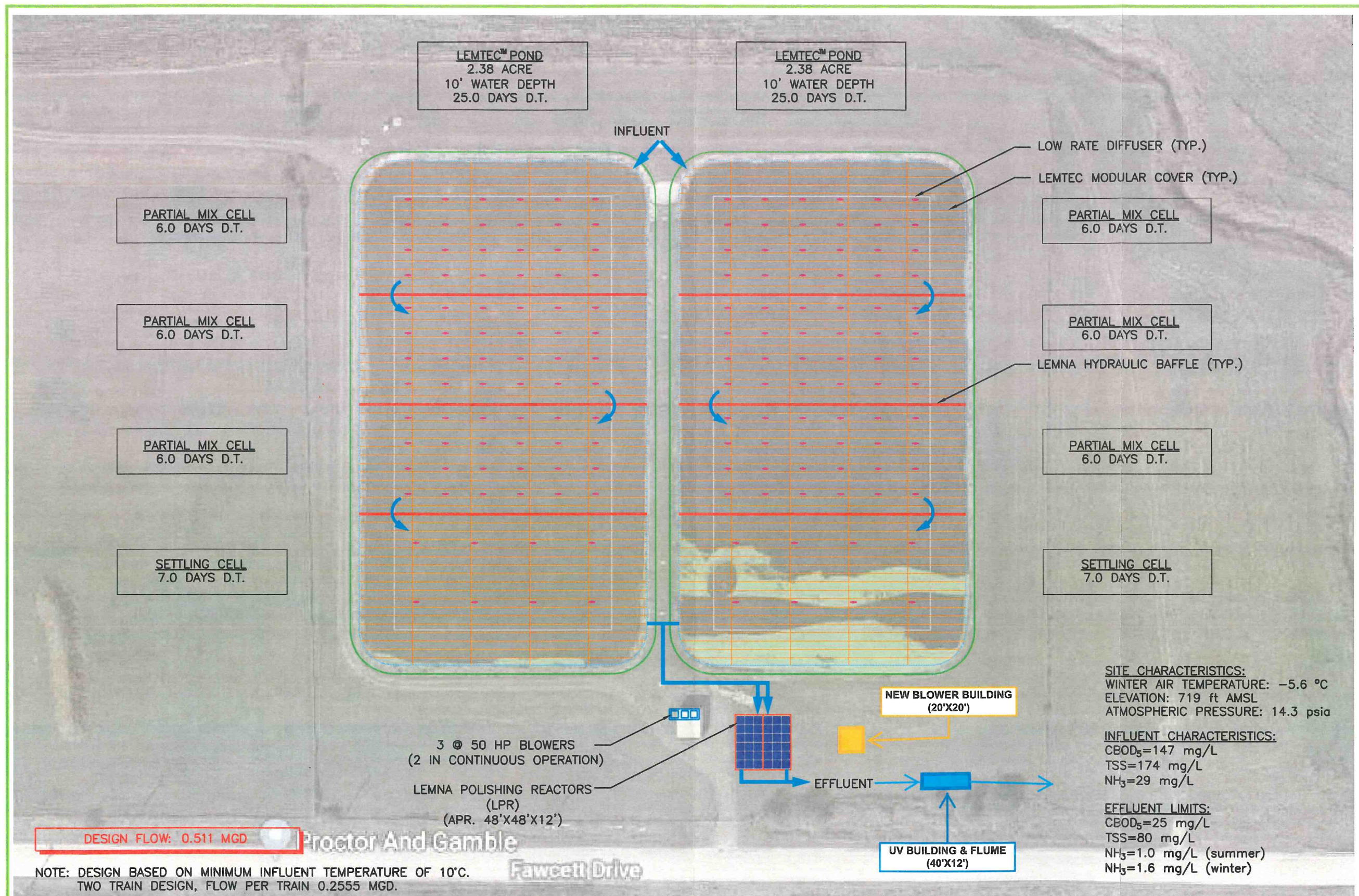
Lemna 3-Cell System O&M PW Calculations

O&M Expense	Annual Cost (\$/yr)	Notes
Lemna Operational Costs	\$46,543	Assume 64 HP 24x7x365 to run Lemna blowers and utilities rate of \$0.11/kW
Mechanical maintenance of Blowers	\$2,300	
UV Operational Costs	\$7,260	Assume 12 kW @ 5500 hrs
Sampling/Testing Costs	\$5,000	
Weeding Covers	\$3,203	Assume 30 minutes/day, 6 months/yr, \$35/hr
Interest Rate	3%	
Years	20	
Present Worth Factor	14.88	
20-Year Present Worth	\$956,698	
Annual O&M	\$64,305	

Existing O&M Expense	Annual Cost (\$/yr)	Notes
Interest Rate	3%	
Years	20	
Present Worth Factor	14.88	
20-Year Present Worth	\$0	

20-Year Present Worth (additional O&M)

\$956,698



NOTE: DESIGN BASED ON MINIMUM INFLUENT TEMPERATURE OF 10°C.
TWO TRAIN DESIGN, FLOW PER TRAIN 0.2555 MGD.

THIS DESIGN IS PROPRIETARY TO LEMNA ENVIRONMENTAL TECHNOLOGIES, INC. AND IS SOLELY INTENDED FOR APPLICATION AT WEST BRANCH, IA
BY LEMNA ENVIRONMENTAL TECHNOLOGIES, INC. THIS DESIGN CANNOT BE USED BY A THIRD PARTY NOR REPRODUCED, IN FULL OR IN PART, WITHOUT THE WRITTEN AUTHORIZATION OF LEMNA TECHNOLOGIES, INC.

DESIGN BY	DAP
APPROVED BY	JAM
SCALE	NOT TO SCALE
DATE	JANUARY 2019
SHEET NO.	1 OF 1

LEMTEC™ BIOLOGICAL TREATMENT PROCESS WEST BRANCH, IA

L·E·T
LEMNA ENVIRONMENTAL TECHNOLOGIES, INC.
4215 WHITE BEAR PARKWAY, SUITE 200 • MADRAS HEIGHTS, MN 55110
PHONE: 612-253-2000 FAX: 612-253-2003 WWW.LEMNAENVIRONMENTAL.COM

**Opinion of Cost for 2019 West Branch Facility Plan
West Branch, Iowa**

**Nitrox w/ 2 Aerated Lagoon Cells (detailed costs)
3/14/2019**

No.	Description	Unit	Unit Price*	Quantity	Extended Price
1	Mobilization/General Conditions	LS	\$545,000	1	\$545,000
2	Dewatering	LS	\$50,000	1	\$50,000
3	Earthwork (fill)	CY	\$20	2,000	\$40,000
4	New Influent Manhole	EA	\$30,000	1	\$30,000
5	Nitrox System	LS	\$1,144,000	2	\$2,288,000
6	Nitrox Concrete Tanks	CY	\$1,000	800	\$800,000
7	Nitrox Blower Building (20'x20')	SF	\$200	400	\$80,000
8	MARS Aeration System for 2 Lagoons	LS	\$217,000	1	\$217,000
9	New Baffles for Existing Lagoons	LF	\$65	1,920	\$125,000
10	Lift Station for Gravity Line	LS	\$100,000	1	\$100,000
11	UV System	LS	\$157,000	1	\$157,000
12	UV Building (40'x12')	SF	\$150	480	\$72,000
13	Concrete UV Channel	LS	\$10,000	1	\$10,000
14	In-Plant Piping (18")	LF	\$110	480	\$53,000
15	3rd Lagoon Earthwork	CY	\$20	0	\$0
16	Quiescent Cell Berm	CY	\$20	11,000	\$220,000
17	Generator (190 kW) & Transfer Switch	LS	\$200,000	1	\$200,000
18	Electrical	LS	\$250,000	1	\$250,000
19	Controls	LS	\$75,000	1	\$75,000
20	Bentonite	LS	\$53,000	1	\$53,000
21	Rip-Rap	TON	\$55	3,600	\$198,000
22	Road	SF	\$1.72	10,860	\$19,000
SUB-TOTAL					\$5,582,000
Contingency (15%)					\$838,000
CONSTRUCTION TOTAL					\$6,420,000
Land Acquisition					\$0
Eng., Leg., Adm. (18%)					\$1,156,000
PROJECT TOTAL					\$7,576,000

**Opinion of Cost for 2019 West Branch Facility Plan
West Branch, Iowa**

**Nitrox w/ 2 Aerated Lagoon Cells
3/14/2019**

No.	Description	Price
1	Nitrox Treatment System	\$3,488,000
2	MARS Aeration System	\$217,000
3	New Baffles for Existing Lagoons	\$125,000
4	UV System	\$239,000
5	Site Work & Piping	\$988,000
6	Generator (190 kW) & Transfer Switch	\$200,000
7	Electrical & Controls	\$325,000
SUB-TOTAL		\$5,582,000
Contingency (15%)		\$838,000
CONSTRUCTION TOTAL		\$6,420,000
Land Acquisition		\$0
Eng., Leg., Adm. (18%)		\$1,156,000
PROJECT TOTAL		\$7,576,000
EXPECTED O&M (20 YR PRESENT WORTH)		\$2,820,000
20 YEAR PRESENT WORTH VALUE OF PROJECT		\$10,396,000

Does not include biosolids removal from existing lagoons; biosolids assumed to be significantly reduced with current pilot study that uses microbial additions and super saturated oxygen to reduce sludge blanket

**Opinion of Cost for 2019 West Branch Facility Plan
West Branch, Iowa**

**Nitrox w/ 3 Aerated Lagoon Cells (detailed costs)
3/14/2019**

No.	Description	Unit	Unit Price*	Quantity	Extended Price
1	Mobilization/General Conditions	LS	\$420,000	1	\$420,000
2	Dewatering	LS	\$50,000	1	\$50,000
3	Earthwork (fill)	CY	\$20	2,000	\$40,000
4	New Influent Manhole	EA	\$30,000	1	\$30,000
5	Nitrox System	LS	\$1,144,000	1	\$1,144,000
6	Nitrox Concrete Tanks	CY	\$1,000	400	\$400,000
7	Nitrox Blower Building (20'x20')	SF	\$200	400	\$80,000
8	MARS Aeration System for 3 Lagoons	LS	\$222,000	1	\$222,000
9	UV System	LS	\$157,000	1	\$157,000
10	UV Building (40'x12')	SF	\$150	480	\$72,000
11	Concrete UV Channel	LS	\$10,000	1	\$10,000
12	In-Plant Piping (18")	LF	\$110	690	\$76,000
13	3rd Lagoon Earthwork	CY	\$20	30,500	\$610,000
14	Quiescent Cell Berm	CY	\$20	5,500	\$110,000
15	Generator (190 kW) & Transfer Switch	LS	\$200,000	1	\$200,000
16	Electrical	LS	\$250,000	1	\$250,000
17	Controls	LS	\$75,000	1	\$75,000
18	Bentonite	LS	\$53,000	1	\$53,000
19	Rip-Rap	TON	\$55	3,600	\$198,000
20	Road	SF	\$1.72	10,860	\$19,000
SUB-TOTAL					\$4,216,000
Contingency (15%)					\$633,000
CONSTRUCTION TOTAL					\$4,849,000
Land Acquisition					\$0
Eng., Leg., Adm. (18%)					\$873,000
PROJECT TOTAL					\$5,722,000

**Opinion of Cost for 2019 West Branch Facility Plan
West Branch, Iowa**

**Nitrox w/ 3 Aerated Lagoon Cells
3/14/2019**

No.	Description	Price
1	Nitrox Treatment System	\$1,734,000
2	MARS Aeration System	\$222,000
3	3rd Aerated Lagoon Earthwork	\$610,000
4	UV System	\$239,000
5	Site Work & Piping	\$886,000
6	Generator (190 kW) & Transfer Switch	\$200,000
7	Electrical & Controls	\$325,000
SUB-TOTAL		\$4,216,000
Contingency (15%)		\$633,000
CONSTRUCTION TOTAL		\$4,849,000
Land Acquisition		\$0
Eng., Leg., Adm. (18%)		\$873,000
PROJECT TOTAL		\$5,722,000
EXPECTED O&M (20 YR PRESENT WORTH)		\$2,820,000
20 YEAR PRESENT WORTH VALUE OF PROJECT		\$8,542,000

Does not include biosolids removal from existing lagoons; biosolids assumed to be significantly reduced with current pilot study that uses microbial additions and super saturated oxygen to reduce sludge blanket

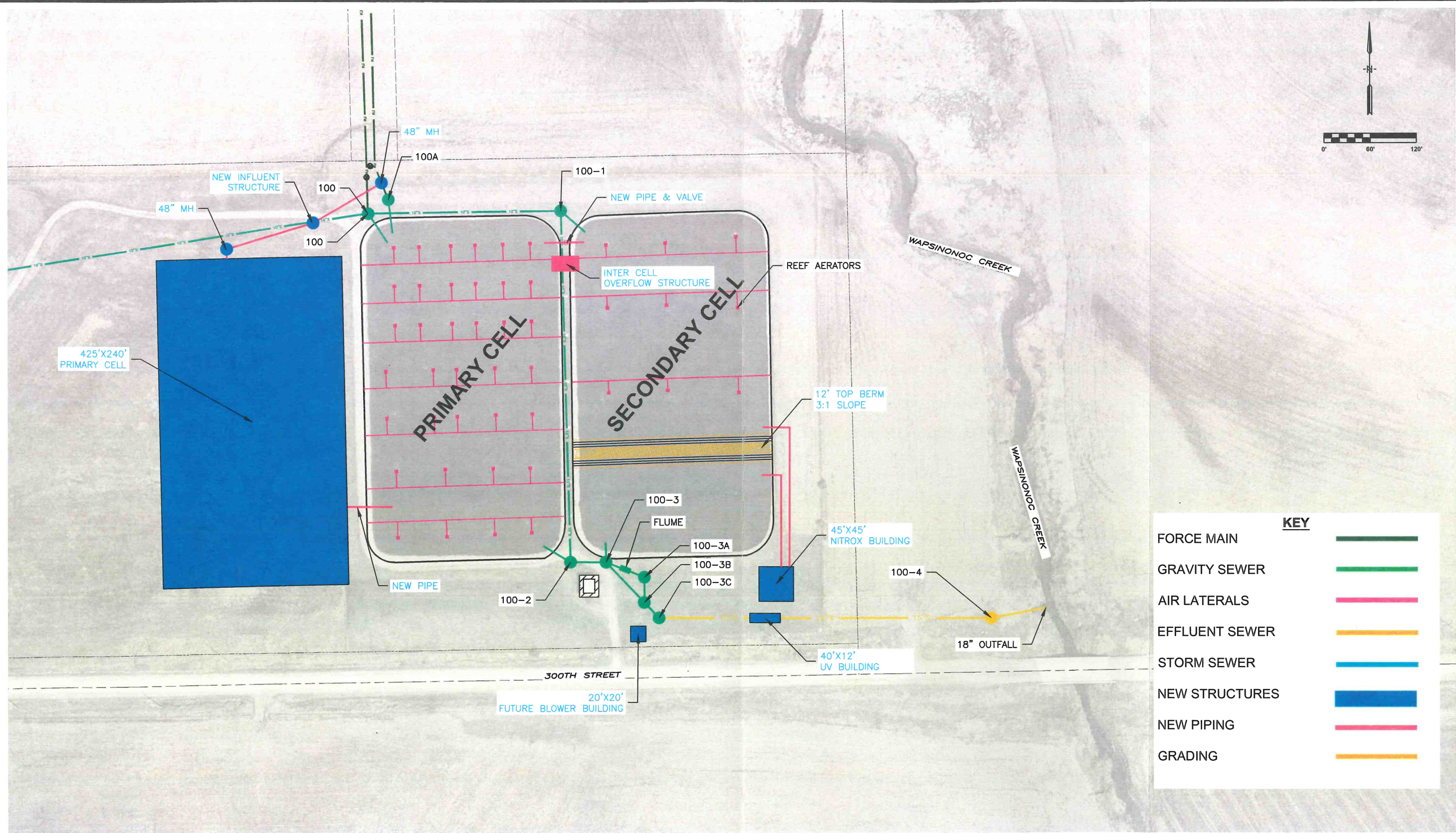
Nitrox O&M PW Calculations*

O&M Expense	Annual Cost (\$/yr)	Notes
Nitrox Operational Costs	\$90,904	Assume 125 HP 24x7x365 to run Nitrox blowers and utilities rate of \$0.11/kW
Heating Costs	\$40,000	From Nitrox O&M excel sheet (1.5 times Mechanicsville as a rough estimate)
EQ Pumps Operational Costs		
UV Operational Costs	\$7,260	Assume 12 kW @ 5500 hrs
Sampling/Testing Costs	\$5,000	
Additional Labor Hours to Run the Facility	\$5,000	
MARS Aeration System	\$36,361	Assume 2x 25 HP 24x7x365 to run MARS blowers and utilities rate of \$0.11/kW
Sludge Hauling	\$5,000	Assume \$50,000 every 10 years
Interest Rate	3%	
Years	20	
Present Worth Factor	14.88	
20-Year Present Worth	\$2,819,654	
Annual O&M	\$189,525	

Existing O&M Expense	Annual Cost (\$/yr)	Notes
Interest Rate	3%	
Years	20	
Present Worth Factor	14.88	
20-Year Present Worth	\$0	

20-Year Present Worth (additional O&M)

\$2,819,654



VEENSTRA & KIMM, INC.

NITROX SITE PLAN
WEST BRANCH, IOWA
FIGURE 4-X

**Opinion of Cost for 2019 West Branch Facility Plan
West Branch, Iowa**

**SAGR w/ 2 Aerated Lagoon Cells (detailed costs)
3/14/2019**

No.	Description	Unit	Unit Price*	Quantity	Extended Price
1	Mobilization/General Conditions	LS	\$415,000	1	\$415,000
2	Dewatering	LS	\$100,000	1	\$100,000
3	SAGR Earthwork (fill)	CY	\$20	25,000	\$500,000
4	New Influent Manhole	EA	\$30,000	1	\$30,000
5	SAGR Equipment & Lagoon Aeration System	LS	\$835,000	1	\$835,000
6	SAGR Rock	CY	\$45	11,220	\$505,000
7	SAGR Blower (20'x20')	SF	\$200	400	\$80,000
8	Mulch	CY	\$60	1,180	\$71,000
9	Non-Woven Geotextile Liner	SF	\$0.50	98,120	\$50,000
10	HDPE Liner (60 mil)	SF	\$0.60	60,280	\$37,000
11	Wall Framing & Sheathing	LF	\$15	2,150	\$33,000
12	SAGR Influent MH Structure	LS	\$20,000	1	\$20,000
13	SAGR Influent Flow Splitter Structure	EA	\$20,000	1	\$20,000
14	SAGR Piping and Valves	LS	\$61,000	1	\$61,000
15	SAGR Effluent Control Structures	EA	\$20,000	4	\$80,000
16	New Baffles for Existing Lagoons	LF	\$65	1,920	\$125,000
17	Lift Station for Gravity Line	LS	\$100,000	1	\$100,000
18	UV System	LS	\$157,000	1	\$157,000
19	UV Building (40'x12')	SF	\$150	480	\$72,000
20	Concrete UV Channel	LS	\$10,000	1	\$10,000
21	In-Plant Piping (18")	LF	\$110	1,370	\$151,000
22	Lagoon Earthwork	CY	\$20	0	\$0
23	Generator (90 kW) & Transfer Switch	LS	\$100,000	1	\$100,000
24	Electrical	LS	\$250,000	1	\$250,000
25	Controls	LS	\$100,000	1	\$100,000
26	Bentonite	LS	\$45,000	1	\$45,000
27	Rip-Rap	TON	\$55	3,000	\$165,000
28	Road	SF	\$1.72	17,460	\$31,000
SUB-TOTAL					\$4,143,000
Contingency (15%)					\$622,000
CONSTRUCTION TOTAL					\$4,765,000
Land Acquisition (2 ac)					\$30,000
Eng., Leg., Adm. (18%)					\$858,000
PROJECT TOTAL					\$5,653,000

**Opinion of Cost for 2019 West Branch Facility Plan
West Branch, Iowa**

**SAGR w/ 2 Aerated Lagoon Cells
3/14/2019**

No.	Description	Price
1	SAGR Treatment System	\$2,392,000
2	New Baffles for Existing Lagoons	\$125,000
3	UV System	\$239,000
4	Site Work & Piping	\$937,000
5	Generator (190 kW) & Transfer Switch	\$100,000
6	Electrical & Controls	\$350,000
SUB-TOTAL		\$4,143,000
Contingency (15%)		\$622,000
CONSTRUCTION TOTAL		\$4,765,000
Land Acquisition (2 ac)		\$30,000
Eng., Leg., Adm. (18%)		\$858,000
PROJECT TOTAL		\$5,653,000
EXPECTED O&M (20 YR PRESENT WORTH)		\$710,000
20 YEAR PRESENT WORTH VALUE OF PROJECT		\$6,363,000

* Does not include biosolids removal from existing lagoons; biosolids assumed to be significantly reduced with current pilot study that uses microbial additions and super saturated oxygen to reduce sludge blanket

**Opinion of Cost for 2019 West Branch Facility Plan
West Branch, Iowa**

**SAGR w/ 3 Aerated Lagoon Cells (detailed costs)
3/14/2019**

No.	Description	Unit	Unit Price*	Quantity	Extended Price
1	Mobilization/General Conditions	LS	\$475,000	1	\$475,000
2	Dewatering	LS	\$100,000	1	\$100,000
3	SAGR Earthwork (fill)	CY	\$20	25,000	\$500,000
4	New Influent Manhole	EA	\$30,000	1	\$30,000
5	SAGR Equipment & Lagoon Aeration System	LS	\$835,000	1	\$835,000
6	SAGR Rock	CY	\$45	11,220	\$505,000
7	SAGR Blower (20'x20')	SF	\$200	400	\$80,000
8	Mulch	CY	\$60	1,180	\$71,000
9	Non-Woven Geotextile Liner	SF	\$0.50	98,120	\$50,000
10	HDPE Liner (60 mil)	SF	\$0.60	60,280	\$37,000
11	Wall Framing & Sheathing	LF	\$15	2,150	\$33,000
12	SAGR Influent MH Structure	LS	\$20,000	1	\$20,000
13	SAGR Influent Flow Splitter Structure	EA	\$20,000	1	\$20,000
14	SAGR Piping and Valves	LS	\$61,000	1	\$61,000
15	SAGR Effluent Control Structures	EA	\$20,000	4	\$80,000
16	Baffle Replacement	LF	\$65	240	\$16,000
17	UV System	LS	\$157,000	1	\$157,000
18	UV Building (40'x12')	SF	\$150	480	\$72,000
19	Concrete UV Channel	LS	\$10,000	1	\$10,000
20	In-Plant Piping (18")	LF	\$110	2,630	\$290,000
21	Lagoon Earthwork	CY	\$20	30,500	\$610,000
22	Lagoon Aeration System	LF	\$90,000	0	\$0
23	Generator (90 kW) & Transfer Switch	LS	\$100,000	1	\$100,000
24	Electrical	LS	\$250,000	1	\$250,000
25	Controls	LS	\$100,000	1	\$100,000
26	Bentonite	LS	\$45,000	1	\$45,000
27	Rip-Rap	TON	\$55	3,000	\$165,000
28	Road	SF	\$1.72	17,460	\$31,000
SUB-TOTAL					\$4,743,000
Contingency (15%)					\$712,000
CONSTRUCTION TOTAL					\$5,455,000
Land Acquisition (2 ac)					\$30,000
Eng., Leg., Adm. (18%)					\$982,000
PROJECT TOTAL					\$6,467,000

**Opinion of Cost for 2019 West Branch Facility Plan
West Branch, Iowa**

**SAGR w/ 3 Aerated Lagoon Cells
3/14/2019**

No.	Description	Price
1	SAGR Treatment System	\$2,292,000
2	3rd Aerated Lagoon Earthwork	\$610,000
3	UV System	\$239,000
4	Site Work & Piping	\$1,152,000
5	Generator (190 kW) & Transfer Switch	\$100,000
6	Electrical & Controls	\$350,000
SUB-TOTAL		\$4,743,000
Contingency (15%)		\$712,000
CONSTRUCTION TOTAL		\$5,455,000
Land Acquisition (2 ac)		\$30,000
Eng., Leg., Adm. (18%)		\$982,000
PROJECT TOTAL		\$6,467,000
EXPECTED O&M (20 YR PRESENT WORTH)		\$710,000
20 YEAR PRESENT WORTH VALUE OF PROJECT		\$7,177,000

* Does not include biosolids removal from existing lagoons; biosolids assumed to be significantly reduced with current pilot study that uses microbial additions and super saturated oxygen to reduce sludge blanket

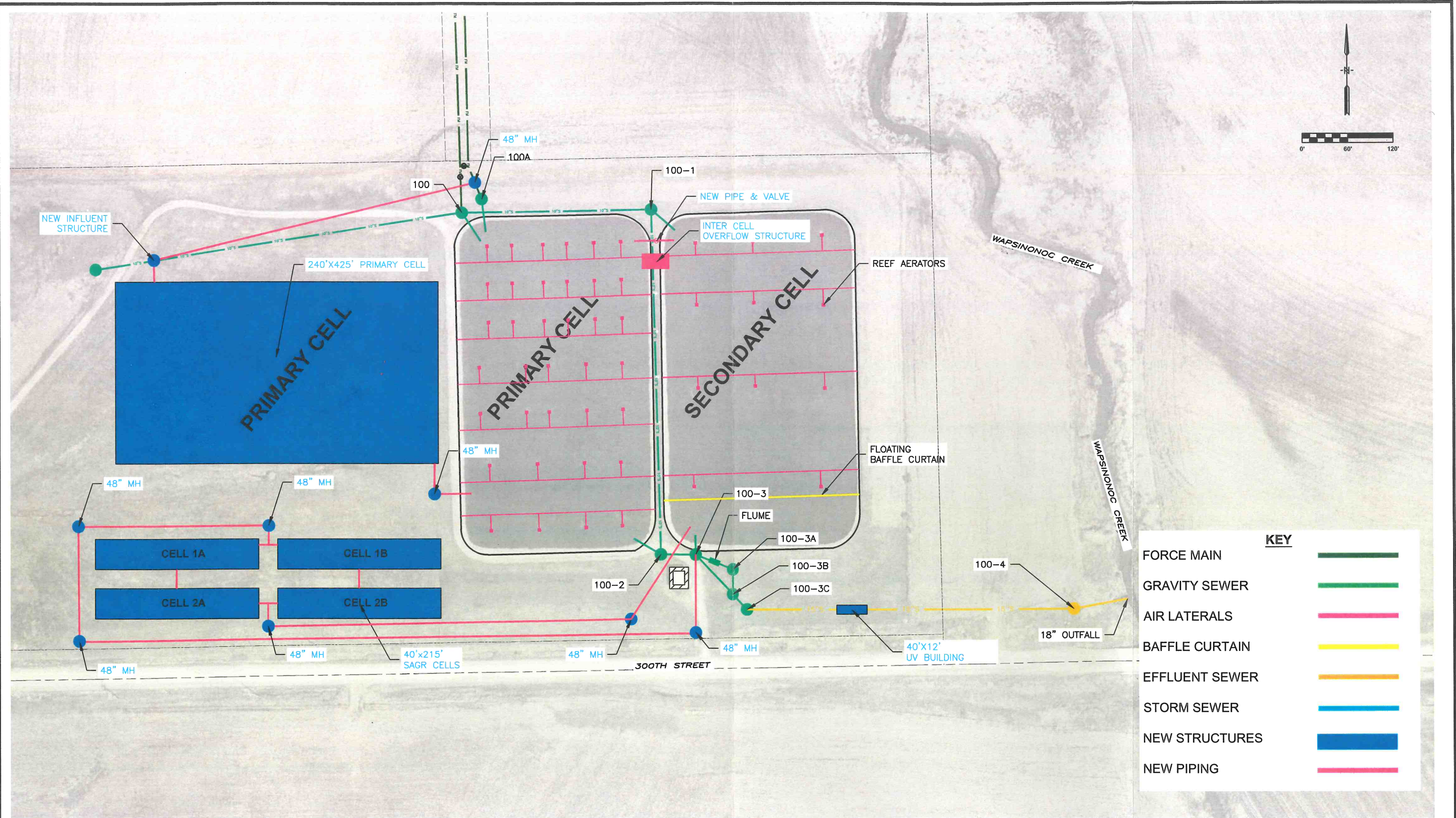
SAGR O&M PW Calculations

O&M Expense	Annual Cost (\$/yr)	Notes
SAGR Operational Costs	\$33,089	From SAGR Proposal
Diffuser Membrane Replacement	\$2,320	
UV Operational Costs	\$7,260	Assume 12 kW @ 5500 hrs
Sampling/Testing Costs	\$5,000	
Interest Rate	3%	
Years	20	
Present Worth Factor	14.88	
20-Year Present Worth	\$709,193	
Annual O&M	\$47,669	

Existing O&M Expense	Annual Cost (\$/yr)	Notes
Interest Rate	3%	
Years	20	
Present Worth Factor	14.88	
20-Year Present Worth	\$0	

20-Year Present Worth (additional O&M)

\$709,193



VEENSTRA & KIMM, INC.

SAGR SITE PLAN
WEST BRANCH, IOWA
FIGURE 4-X

**Opinion of Cost for 2019 West Branch Facility Plan
West Branch, Iowa**

**Gross-Wen w/ 2 Aerated Lagoon Cells (detailed)
3/14/2019**

No.	Description	Unit	Unit Price*	Quantity	Extended Price
1	Mobilization/General Conditions	LS	\$780,000	1	\$780,000
2	Dewatering	LS	\$50,000	1	\$50,000
3	Earthwork (fill)	CY	\$20	0	\$0
4	New Influent Manhole	LS	\$30,000	1	\$30,000
5	New Manhole Structures	EA	\$15,000	4	\$60,000
6	Influent Parshall Flume	LS	\$20,000	1	\$20,000
7	Screening & Wash Press Equipment	LS	\$228,000	1	\$228,000
8	Grit Removal Equipment	LS	\$186,000	1	\$186,000
9	Headworks/Blower/Lab Building (40'x50')	SF	\$200	2,000	\$400,000
10	Gross-Wen Equipment	LS	\$3,232,000	1	\$3,232,000
11	Greenhouse	LS	\$804,000	1	\$804,000
12	Concrete Reservoirs	CY	\$1,000	802	\$802,000
13	Lift Station for Gravity Line	LS	\$100,000	1	\$100,000
14	MARS Aeration System for 2 Lagoons	LS	\$217,000	1	\$217,000
15	Algae Drying Area	SF	\$1,000	0	\$0
16	UV System	LS	\$157,000	1	\$157,000
17	UV Building (40'x12')	SF	\$150	480	\$72,000
18	Concrete UV Channel	LS	\$10,000	1	\$10,000
19	In-Plant Piping (18")	LF	\$110	320	\$36,000
20	Lagoon Earthwork	CY	\$20	0	\$0
21	New Baffles for Existing Lagoons	LF	\$65	1,920	\$125,000
22	Generator (60 kW) & Transfer Switch	LS	\$70,000	1	\$70,000
23	Electrical	LS	\$400,000	1	\$400,000
24	Controls	LS	\$75,000	1	\$75,000
25	Bentonite	LS	\$45,000	1	\$45,000
26	Rip-Rap	TON	\$55	3,000	\$165,000
27	Road	SF	\$1.72	10,860	\$19,000
SUB-TOTAL					\$8,083,000
Contingency (15%)					\$1,213,000
CONSTRUCTION TOTAL					\$9,296,000
Land Acquisition					\$0
Eng., Leg., Adm. (18%)					\$1,674,000
PROJECT TOTAL					\$10,970,000

**Opinion of Cost for 2019 West Branch Facility Plan
West Branch, Iowa**

**Gross-Wen w/ 2 Aerated Lagoon Cells
3/14/2019**

No.	Description	Price
1	Headworks	\$834,000
2	Gross-Wen RAB Treatment System	\$4,938,000
3	New Baffles for Existing Lagoons	\$125,000
4	New Aeration System	\$217,000
5	UV System	\$239,000
6	Site Work & Piping	\$1,185,000
7	Generator (115 kW) & Transfer Switch	\$70,000
8	Electrical & Controls	\$475,000
SUB-TOTAL		\$8,083,000
Contingency (15%)		\$1,213,000
CONSTRUCTION TOTAL		\$9,296,000
Land Acquisition		\$0
Eng., Leg., Adm. (18%)		\$1,674,000
PROJECT TOTAL		\$10,970,000
EXPECTED O&M (20 YR PRESENT WORTH)		\$1,266,000
20 YEAR PRESENT WORTH VALUE OF PROJECT		\$12,236,000

* Does not include biosolids removal from existing lagoons; biosolids assumed to be significantly reduced with current pilot study that uses microbial additions and super saturated oxygen to reduce sludge blanket

* If Nano2 aeration system is desired, add \$855,000 to capital cost and \$600,000 to 20-Year O&M cost

**Opinion of Cost for 2019 West Branch Facility Plan
West Branch, Iowa**

**Gross-Wen w/ 3 Aerated Lagoon Cells (detailed)
3/14/2019**

No.	Description	Unit	Unit Price*	Quantity	Extended Price
1	Mobilization/General Conditions	LS	\$850,000	1	\$850,000
2	Dewatering	LS	\$50,000	1	\$50,000
3	Earthwork (fill)	CY	\$20	0	\$0
4	New Influent Manhole	LS	\$30,000	1	\$30,000
5	New Manhole Structures	EA	\$15,000	4	\$60,000
6	Influent Parshall Flume	LS	\$20,000	1	\$20,000
7	Screening & Wash Press Equipment	LS	\$228,000	1	\$228,000
8	Grit Removal Equipment	LS	\$186,000	1	\$186,000
9	Headworks/Blower/Lab Building (40'x50')	SF	\$200	2,000	\$400,000
10	Gross-Wen Equipment	LS	\$3,232,000	1	\$3,232,000
11	Greenhouse	LS	\$804,000	1	\$804,000
12	Concrete Reservoirs	CY	\$1,000	802	\$802,000
13	Algae-Drying-Area	SF	\$4,000	0	\$0
14	UV System	LS	\$157,000	1	\$157,000
15	UV Building (40'x12')	SF	\$150	480	\$72,000
16	Concrete UV Channel	LS	\$10,000	1	\$10,000
17	In-Plant Piping (18")	LF	\$110	320	\$36,000
18	Lagoon Earthwork	CY	\$20	30,500	\$610,000
19	MARS Aeration System for 3 Lagoons	LS	\$222,000	1	\$222,000
20	Generator (60 kW) & Transfer Switch	LS	\$70,000	1	\$70,000
21	Electrical	LS	\$400,000	1	\$400,000
22	Controls	LS	\$75,000	1	\$75,000
23	Bentonite	LS	\$45,000	1	\$45,000
24	Rip-Rap	TON	\$55	3,000	\$165,000
25	Road	SF	\$1.72	10,860	\$19,000
SUB-TOTAL					\$8,543,000
Contingency (15%)					\$1,282,000
CONSTRUCTION TOTAL					\$9,825,000
Land Acquisition					\$0
Eng., Leg., Adm. (18%)					\$1,769,000
PROJECT TOTAL					\$11,594,000

**Opinion of Cost for 2019 West Branch Facility Plan
West Branch, Iowa**

**Gross-Wen w/ 3 Aerated Lagoon Cells
3/14/2019**

No.	Description	Price
1	Headworks	\$834,000
2	Gross-Wen RAB Treatment System	\$4,838,000
3	3rd Aerated Lagoon Earthwork	\$610,000
4	New Aeration System	\$222,000
5	UV System	\$239,000
6	Site Work & Piping	\$1,255,000
7	Generator (115 kW) & Transfer Switch	\$70,000
8	Electrical & Controls	\$475,000
SUB-TOTAL		\$8,543,000
Contingency (15%)		\$1,282,000
CONSTRUCTION TOTAL		\$9,825,000
Land Acquisition		\$0
Eng., Leg., Adm. (18%)		\$1,769,000
PROJECT TOTAL		\$11,594,000
EXPECTED O&M (20 YR PRESENT WORTH)		\$1,266,000
20 YEAR PRESENT WORTH VALUE OF PROJECT		\$12,860,000

* Does not include biosolids removal from existing lagoons; biosolids assumed to be significantly reduced with current pilot study that uses microbial additions and super saturated oxygen to reduce sludge blanket

* If Nano2 aeration system is desired, add \$855,000 to capital cost and \$600,000 to 20-Year O&M cost

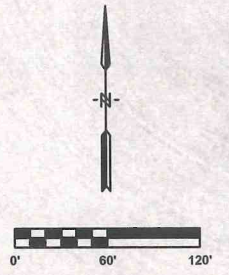
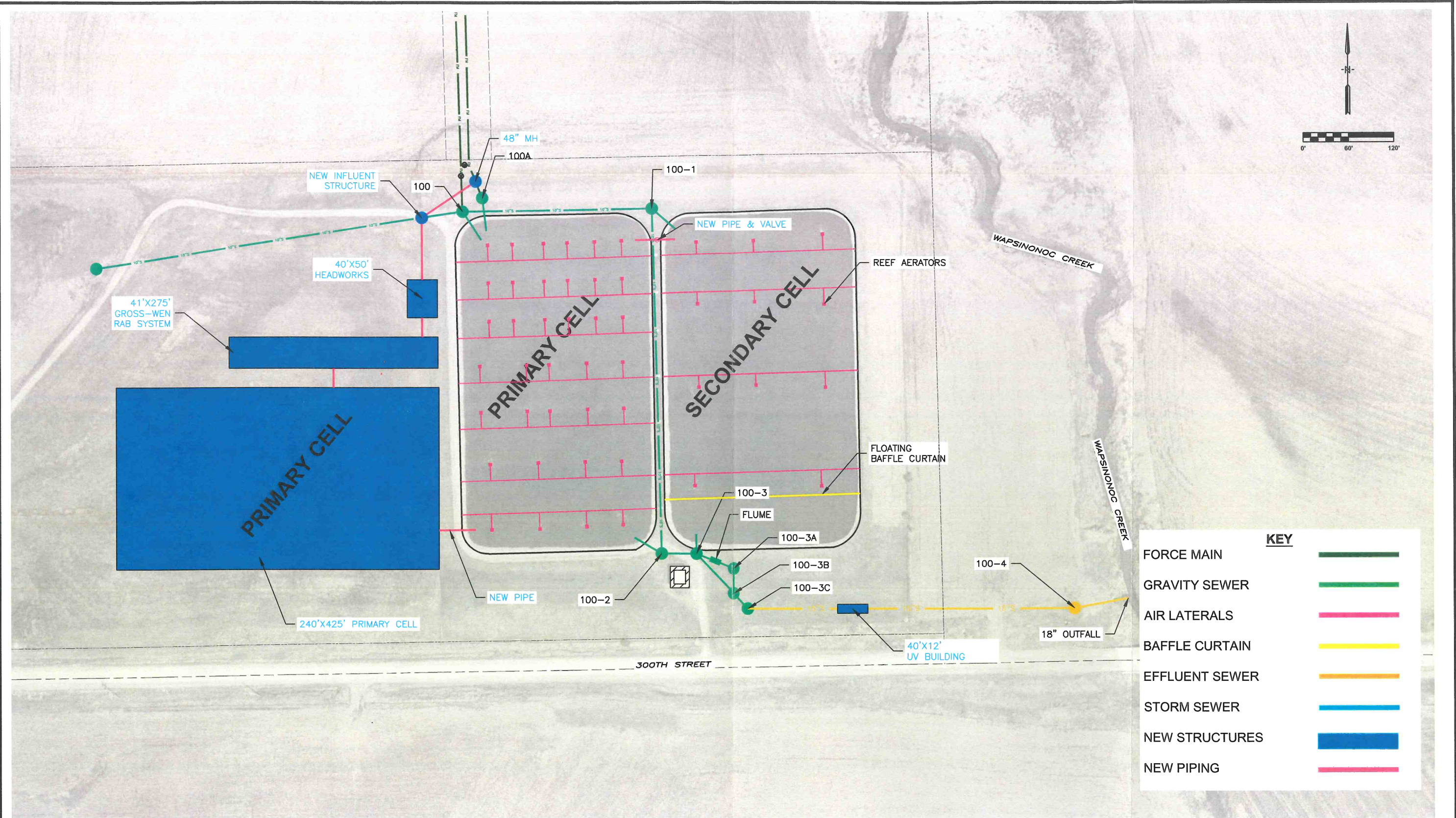
Gross-Wen

O&M Expense	Annual Cost (\$/yr)	Notes
Gross-Wen Operational Costs	\$24,537	From Gross-Wen Proposal
MARS Aeration System	\$36,361	Assume 2x 25 HP 24x7x365 to run MARS blowers and utilities rate of \$0.11/kW
Greenhouse Heating & Ventilation System	\$10,000	Just a guess. Fans are very little HP. Heaters would be where the cost is.
Greenhouse Maintenance	\$2,000	
UV Operational Costs	\$7,260	Assume 12 kW @ 5500 hrs
Sampling/Testing Costs	\$5,000	
Additional Labor Hours to Run the Facility	\$5,000	
Screening & Grit	\$5,818	Assume 8 HP 24x7x365 and utilities rate of \$0.11/kW
Reduced Aeration in Lagoons	-\$10,908	30% of MARS Aeration Annual Cost b/c RAB system reduce BOD by 70%
Interest Rate	3%	
Years	20	
Present Worth Factor	14.88	
20-Year Present Worth	\$1,265,595	
Annual O&M	\$85,068	

Existing O&M Expense	Annual Cost (\$/yr)	Notes
Interest Rate	3%	
Years	20	
Present Worth Factor	14.88	
20-Year Present Worth	\$0	

20-Year Present Worth (additional O&M)

\$1,265,595



KEY	
FORCE MAIN	
GRAVITY SEWER	
AIR LATERALS	
BAFFLE CURTAIN	
EFFLUENT SEWER	
STORM SEWER	
NEW STRUCTURES	
NEW PIPING	



VEENSTRA & KIMM, INC.

GROSS - WEN SITE PLAN
WEST BRANCH, IOWA
FIGURE 4-X

**Opinion of Cost for 2019 West Branch Facility Plan
West Branch, Iowa**

**Stormwater Wetland (detailed)
3/14/2019**

No.	Description	Unit	Unit Price*	Quantity	Extended Price
1	Mobilization	LS	\$50,000	1	\$50,000
2	Wetland Installation Cost	LS	\$450,000	1	\$450,000

SUB-TOTAL	\$500,000
Contingency (15%)	\$75,000
CONSTRUCTION TOTAL	\$575,000
Land Acquisition (10 Ac)	\$250,000
Eng., Leg., Adm. (18%)	\$104,000
PROJECT TOTAL	\$929,000

**Opinion of Cost for 2019 West Branch Facility Plan
West Branch, Iowa**

**Stormwater Wetland
3/14/2019**

No.	Description	Price
1	Wetland Construction	\$500,000

SUB-TOTAL	\$500,000
Contingency (15%)	\$75,000
CONSTRUCTION TOTAL	\$575,000
Land Acquisition (10 Acres)	\$250,000
Eng., Leg., Adm. (18%)	\$104,000
PROJECT TOTAL	\$929,000
EXPECTED O&M (20 YR PRESENT WORTH)	\$67,000
20 YEAR PRESENT WORTH VALUE OF PROJECT	\$996,000

Stormwater Wetland O&M PW Calculations

O&M Expense	Annual Cost (\$/yr)	Notes
Pump, Force Main & MH Maintenance	\$4,500	\$20K yr 1, \$10K yr 2, \$5K yr 3-10, \$2K yr 10-20
Interest Rate	3%	
Years	20	
Present Worth Factor	14.88	
20-Year Present Worth	\$66,949	
Annual O&M	\$4,500	

Existing O&M Expense	Annual Cost (\$/yr)	Notes
Interest Rate	3%	
Years	20	
Present Worth Factor	14.88	
20-Year Present Worth	\$0	

20-Year Present Worth (additional O&M)

\$66,949

**Summary of Wastewater Facility Improvement Options
West Branch, Iowa**

Options	Project Costs	20 Year Present Worth	Total	Annual O&M
Lemna 2-Cell System	\$4,702,000	\$529,000	\$ 5,231,000	\$36,000
SAGR (2 aerated lagoon cells)	\$5,653,000	\$710,000	\$ 6,363,000	\$48,000
BioLac	\$5,198,000	\$1,262,000	\$ 6,460,000	\$85,000
SAGR (3 aerated lagoon cells)	\$6,467,000	\$710,000	\$ 7,177,000	\$48,000
Lemna 3-Cell System	\$6,855,000	\$957,000	\$ 7,812,000	\$65,000
SBR	\$6,514,000	\$1,330,000	\$ 7,844,000	\$90,000
Nitrox (3 aerated lagoon cells)	\$5,722,000	\$2,820,000	\$ 8,542,000	\$190,000
Aero-Mod	\$8,139,000	\$1,734,000	\$ 9,873,000	\$117,000
Nitrox (2 aerated lagoon cells)	\$7,576,000	\$2,820,000	\$ 10,396,000	\$190,000
Gross-Wen (RAB) (2 aerated lagoon cells)	\$10,970,000	\$1,266,000	\$ 12,236,000	\$86,000
Gross-Wen (RAB) (3 aerated lagoon cells)	\$11,594,000	\$1,266,000	\$ 12,860,000	\$86,000
Stormwater Wetland	\$929,000	\$67,000	\$ 996,000	\$5,000

**Aeration Comparison
West Branch, Iowa**

2 Cell Aeration System

Aeration System	Equipment Price	Installed Price	Other Costs	Annual O&M	Total
MARS*	\$ 167,000	\$ 218,000		\$ 336,000	\$ 554,000
Lemna	\$ 324,000	\$ 422,000		\$ 336,000	\$ 758,000
SAGR	\$ 95,000	\$ 124,000		\$ 269,000	\$ 393,000
Nano2	\$ 762,000	\$ 991,000	\$ 30,000	\$ 331,000	\$ 1,322,000

\$30K for carport

3 Cell Aeration System

Aeration System	Equipment Price	Installed Price	Other Costs	Annual O&M	Total
MARS	\$ 171,000	\$ 223,000		\$ 336,000	\$ 559,000
Lemna*	\$ 334,000	\$ 435,000		\$ 336,000	\$ 771,000
SAGR*	\$ 98,000	\$ 128,000		\$ 269,000	\$ 397,000
Nano2	\$ 762,000	\$ 991,000	\$ 30,000	\$ 331,000	\$ 1,322,000

\$30K for carport

*Estimates

MARS Aeration O&M PW Calculations

O&M Expense	Annual Cost (\$/yr)	Notes
Blower Electricity Costs	\$21,156	40 HP
Filter/Belt/Oil change	\$300	
Blower Membrane Replacement	\$100	\$2,000 divided by 20 years
Motor Rebuild	\$1,000	\$20,000 divided by 20 years
Interest Rate	3%	
Years	20	
Present Worth Factor	14.88	
20-Year Present Worth	\$335,573	
Annual O&M	\$22,556	

Existing O&M Expense	Annual Cost (\$/yr)	Notes
Interest Rate	3%	
Years	20	
Present Worth Factor	14.88	
20-Year Present Worth	\$0	

20-Year Present Worth (additional O&M)

\$335,573

Lemna Aeration O&M PW Calculations

O&M Expense	Annual Cost (\$/yr)	Notes
Blower Electricity Costs	\$21,156	40 HP pump
Filter/Belt/Oil change	\$300	
Blower Membrane Replacement	\$100	\$2,000 divided by 20 years
Motor Rebuild	\$1,000	\$20,000 divided by 20 years
Interest Rate	3%	
Years	20	
Present Worth Factor	14.88	
20-Year Present Worth	\$335,573	
Annual O&M	\$22,556	

Existing O&M Expense	Annual Cost (\$/yr)	Notes
Interest Rate	3%	
Years	20	
Present Worth Factor	14.88	
20-Year Present Worth	\$0	

20-Year Present Worth (additional O&M)

\$335,573

Nano2 O&M PW Calculations

O&M Expense	Annual Cost (\$/yr)	Notes
Blower Electricity Costs	\$20,805	\$57/day pre-filter, IN units, oxygen generator and compressor
Filter/Belt/Oil change	\$300	
Blower Membrane Replacement	\$100	\$2,000 divided by 20 years
Motor Rebuild	\$1,000	\$20,000 divided by 20 years
Interest Rate	3%	
Years	20	
Present Worth Factor	14.88	
20-Year Present Worth	\$330,354	
Annual O&M	\$22,205	

Existing O&M Expense	Annual Cost (\$/yr)	Notes
Filter/Belt/Oil change	\$300	
Blower Membrane Replacement	\$100	\$2,000 divided by 20 years
Motor Rebuild	\$1,000	\$20,000 divided by 20 years
Interest Rate	3%	
Years	20	
Present Worth Factor	14.88	
20-Year Present Worth	\$20,828	

20-Year Present Worth (additional O&M)

\$330,354

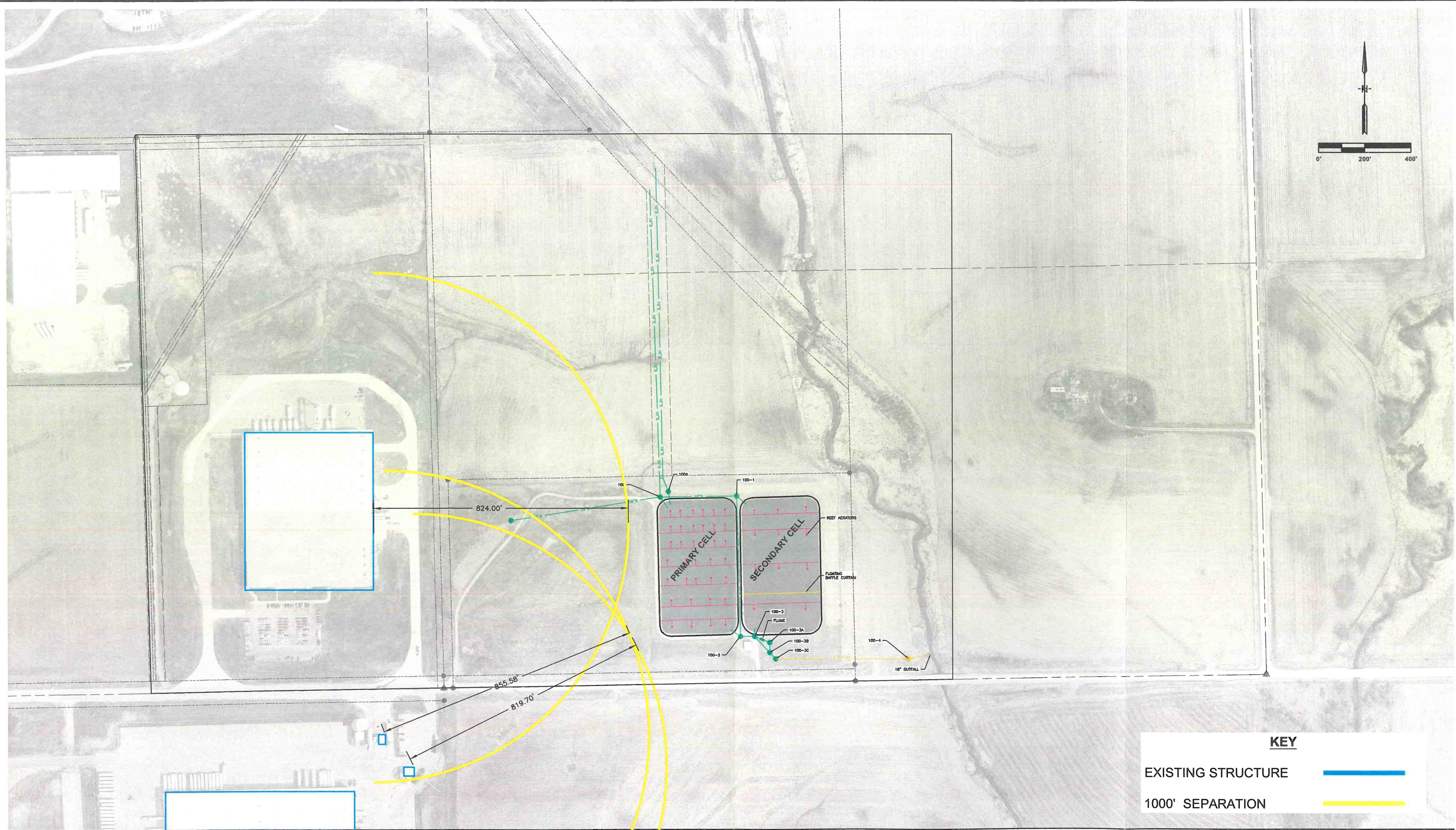
SAGR Aeration O&M PW Calculations

O&M Expense	Annual Cost (\$/yr)	Notes
Blower Electricity Costs	\$16,573	From SAGR Proposal
Filter/Belt/Oil change	\$473	
Motor Rebuild	\$1,000	\$20,000 divided by 20 years
Interest Rate	3%	
Years	20	
Present Worth Factor	14.88	
20-Year Present Worth	\$268,479	
Annual O&M	\$18,046	

Existing O&M Expense	Annual Cost (\$/yr)	Notes
Interest Rate	3%	
Years	20	
Present Worth Factor	14.88	
20-Year Present Worth	\$0	

20-Year Present Worth (additional O&M)

\$268,479



VEENSTRA & KIMM, INC.

KEY

- EXISTING STRUCTURE —
- 1000' SEPARATION —

**SITE SEPARATION
WEST BRANCH, IOWA
FIGURE 3-1**