CITY OF GRINNELL WASTEWATER TREATMENT FACILITY IMPROVEMENTS

BY VEENSTRA & KIMM, INC.

MARCH 9, 2015

Grinnell
Jewel of the Prairie

V&K

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM PERMIT

- Better known as NPDES Discharge Permit
- Permit Granted by IDNR to Discharge Treated Wastewater into a Stream
- IDNR Regulates what can be Discharged
- City Received a New Permit that Contains Major Changes to what can be Discharged

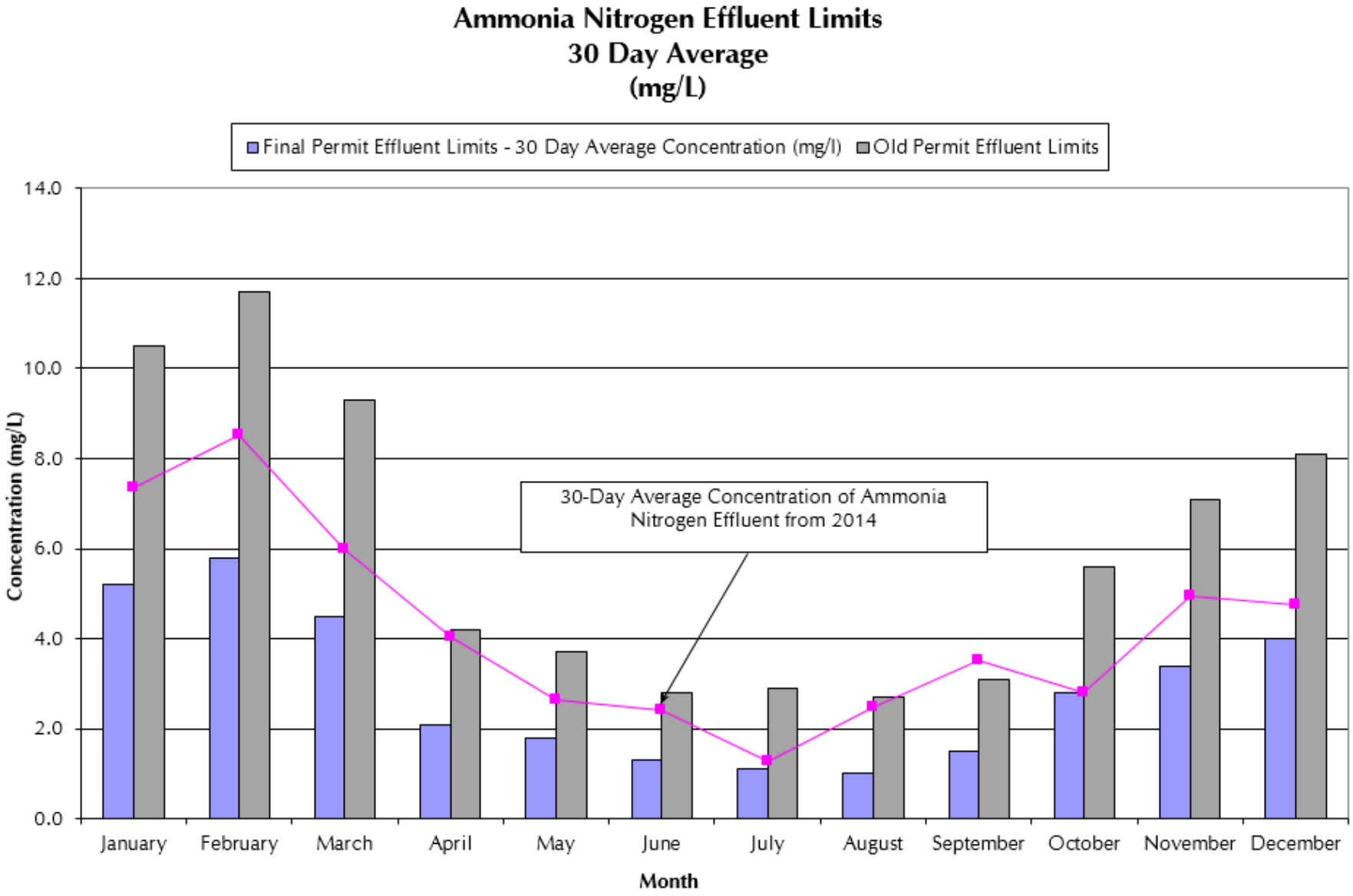
NEW IDNR REGULATIONS

- "Fishable and Swimmable"
  - Ammonia
  - E-coli
- Iowa Nutrients Reduction Strategy
  - Nitrogen
  - Phosphorous

FACILITY IMPROVEMENT REASONS

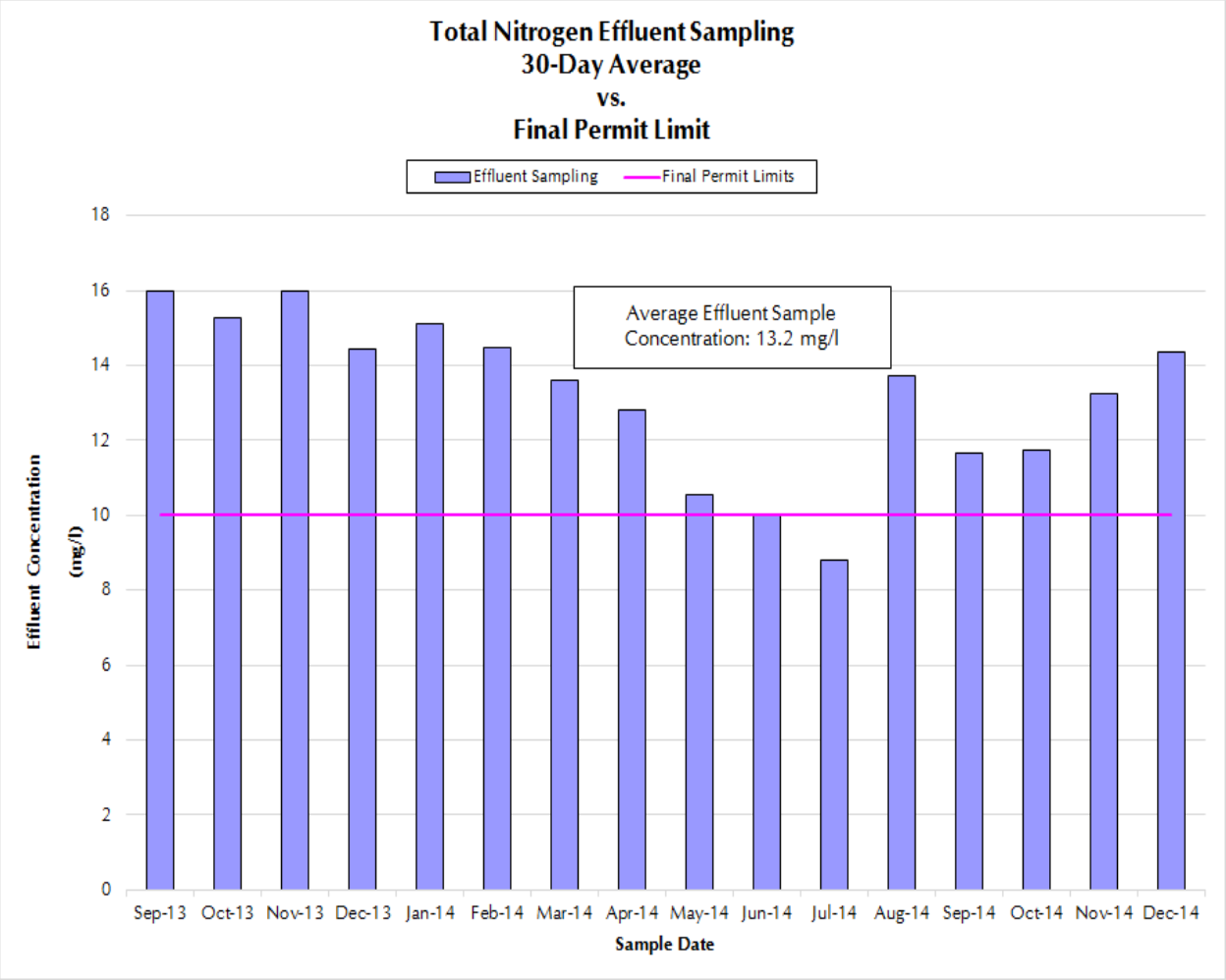
- New IDNR Regulations
  - Ammonia
  - E-coli
  - Nutrients
  - Chlorides and Sulfates
  - Wet Weather Flows
- Age of Facility
  - 1920s Trickling Filter
  - 1951 Primary Clarifiers, Administration Building, Digesters
  - 1986 Screening Building, Grit Building, Final Clarifiers
  - 1994 Sludge Storage Tank and Earthen EQ Basin

AMMONIA

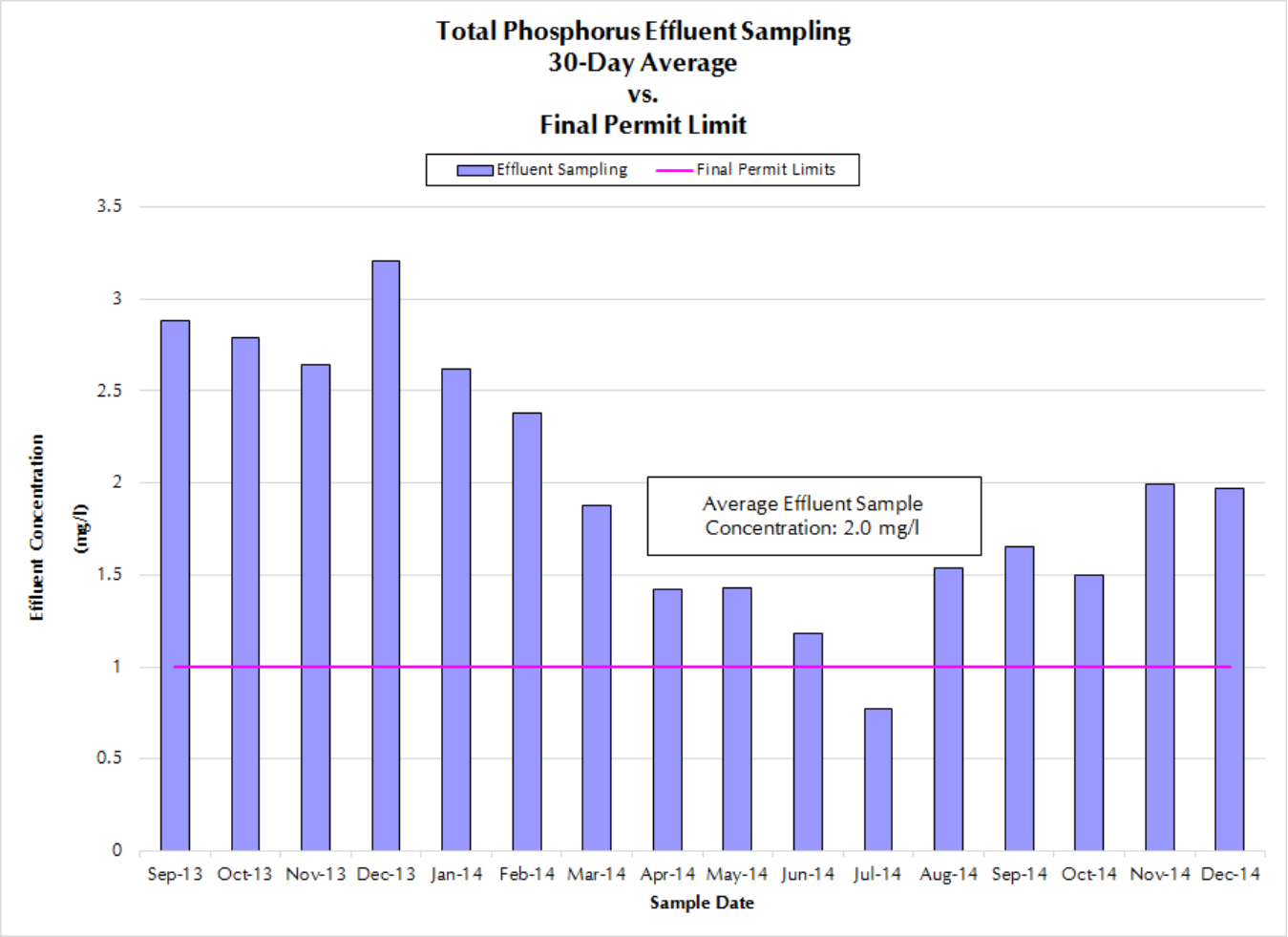

Ammonia Nitrogen Effluent Limits
30 Day Average
(mg/L)
Final Permit Effluent Limits - 30 Day Average Concentration (mg/l)
Old Permit Effluent Limits
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
Concentration (mg/L)
30-Day Average Concentration of Ammonia Nitrogen Effluent from 2014
January
February
March
April
May
June
July
August
September
October
November
December
Month

TOTAL NITROGEN

6

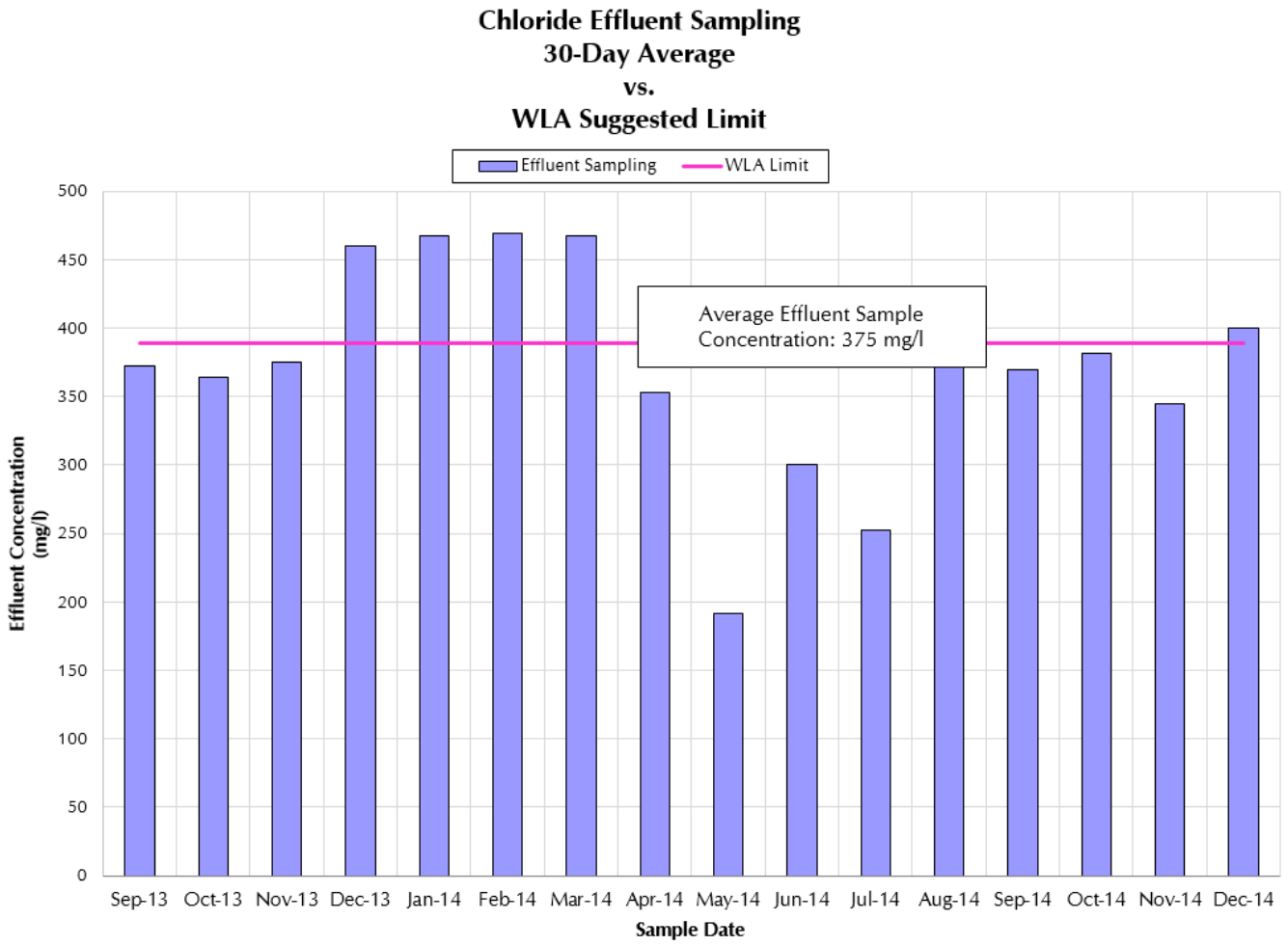


TOTAL PHOSPHOROUS



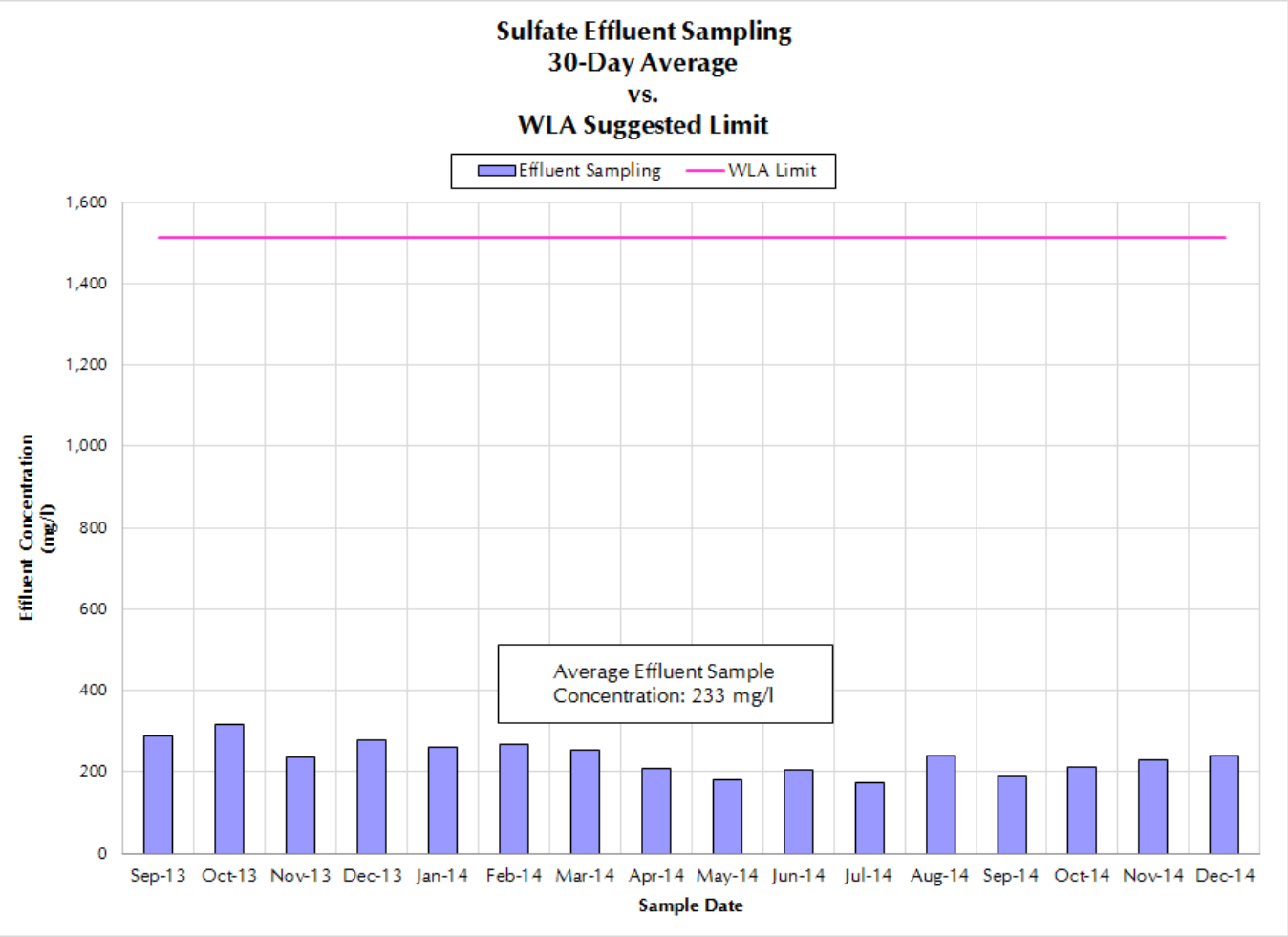
CHLORIDE

8


Chloride Effluent Sampling
30-Day Average
vs.
WLA Suggested Limit
Effluent Sampling
WLA Limit
Average Effluent Sample Concentration: 375 mg/l
Effluent Concentration (mg/l)
0
50
100
150
200
250
300
350
400
450
500
Sep-13
Oct-13
Nov-13
Dec-13
Jan-14
Feb-14
Mar-14
Apr-14
May-14
Jun-14
Jul-14
Aug-14
Sep-14
Oct-14
Nov-14
Dec-14
Sample Date

SULFATE

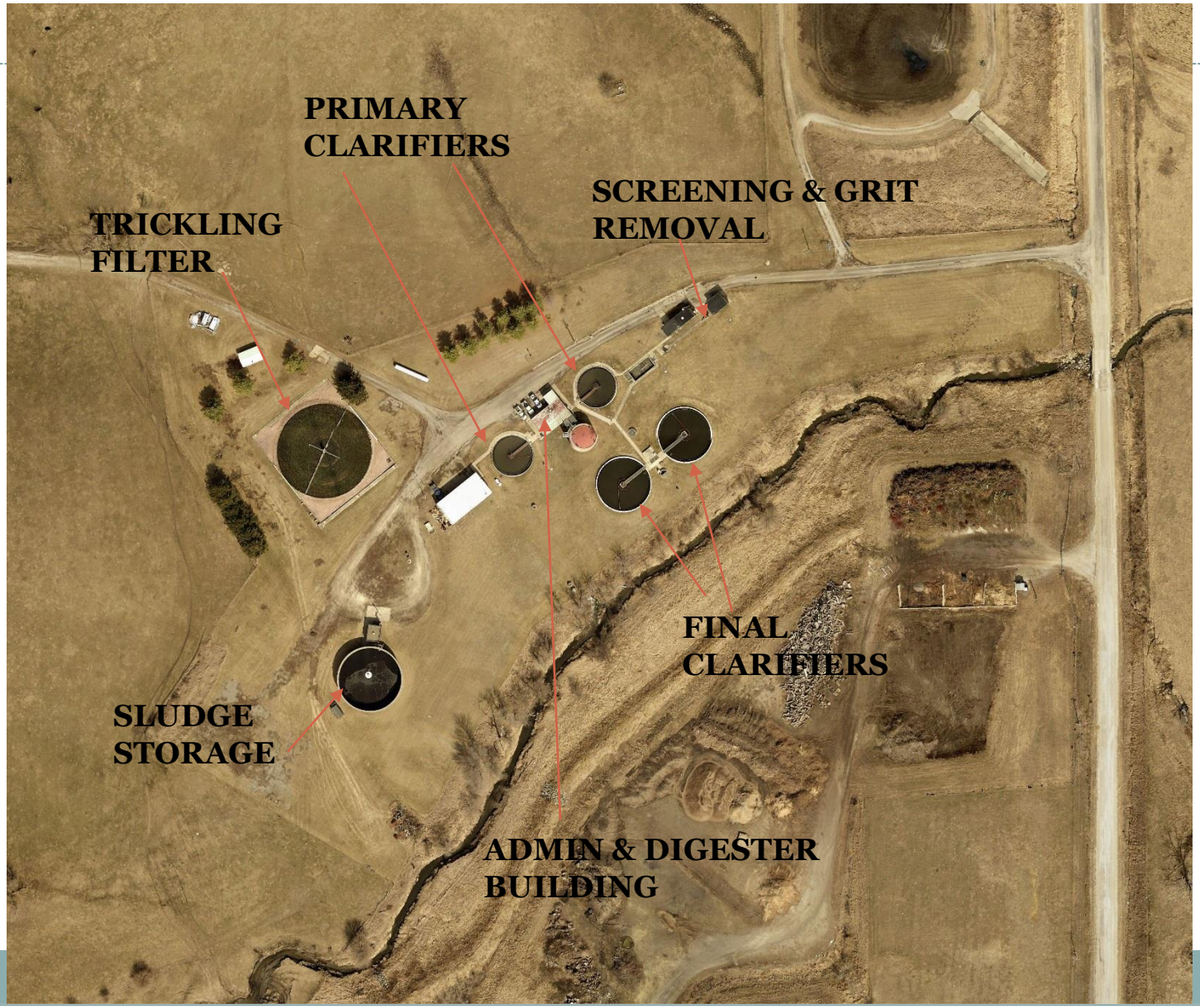
9


Sulfate Effluent Sampling
30-Day Average
vs.
WLA Suggested Limit
Effluent Sampling
WLA Limit
1,600
1,400
1,200
1,000
800
600
400
200
0
Effluent Concentration (mg/l)
Average Effluent Sample Concentration: 233 mg/l
Sep-13
Oct-13
Nov-13
Dec-13
Jan-14
Feb-14
Mar-14
Apr-14
May-14
Jun-14
Jul-14
Aug-14
Sep-14
Oct-14
Nov-14
Dec-14
Sample Date

TREATMENT FACILITY FLOWS

Parameter	Historical Flows	Existing Capacity
Flow	**Million Gallons per Day (mgd)**	**Million Gallons per Day (mgd)**
Average Dry Weather	1.33	1.37
Average Monthly Wet Weather	3.90	3.71
Maximum Day	5.74	5.00

WASTEWATER TREATMENT FACILITY



SCREENING BUILDING

- Issues
  - Equipment Age (1986)
  - Building not Insulated
  - Moisture

GRIT BUILDING

- Issues
  - Equipment Age (1986)
  - Building not Insulated
  - Moisture

PRIMARY CLARIFIERS

- Issues
  - Does not meet IDNR Standards (too small and too shallow)
  - Age of Tank and Equipment (1951)

TRICKLING FILTER

- Issues
  - Age of Structure (1920s)
  - Age of Equipment (1986)
  - Does not meet IDNR Standards (ammonia and nutrients)
  - No Redundancy

FINAL CLARIFIERS

- Issues
  - Age of Structure (1986)
  - Insufficient Tank Depth
  - Equipment in Need of Repair

DIGESTER

- Issues
  - Undersized Tank
  - Age of Equipment (1951)

SLUDGE STORAGE TANK

- Issues
  - Age of Equipment (1994)
  - Can't Mix Sludge

ADMINISTRATION BUILDING

- Issues
  - Lack of Second Restroom
  - Need for Storage
  - Need for Separate Electrical Room
  - Need for Locker Room
  - Need for Separate Laboratory
  - Need for Conference Room/ Break Room

EQUALIZATION BASIN

- Existing Capacity:
  7.5 million gallons
- Required Capacity:
  12.5 million gallons

DISINFECTION SYSTEM

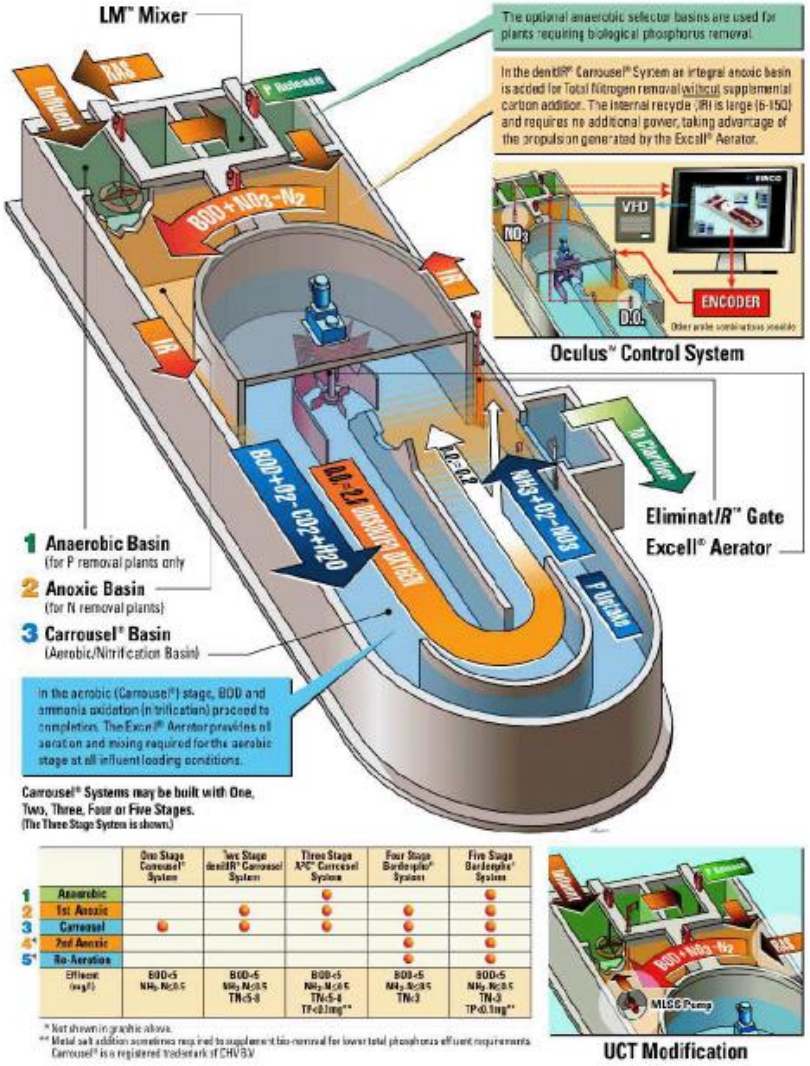
System Type	Project Cost	Annual O&M Costs	15 Year Present Worth
UV Disinfection	$502,000	$14,500	$675,100
Gas Chlorination/ Dechlorination	$1,084,000	$17,175	$1,289,034
Liquid Chlorination/ Dechlorination	$620,000	$42,860	$1,131,659
Present Worth Factor, 15 Year at 3% = 11.94			

BIOLOGICAL PROCESS TYPES EVALUATED

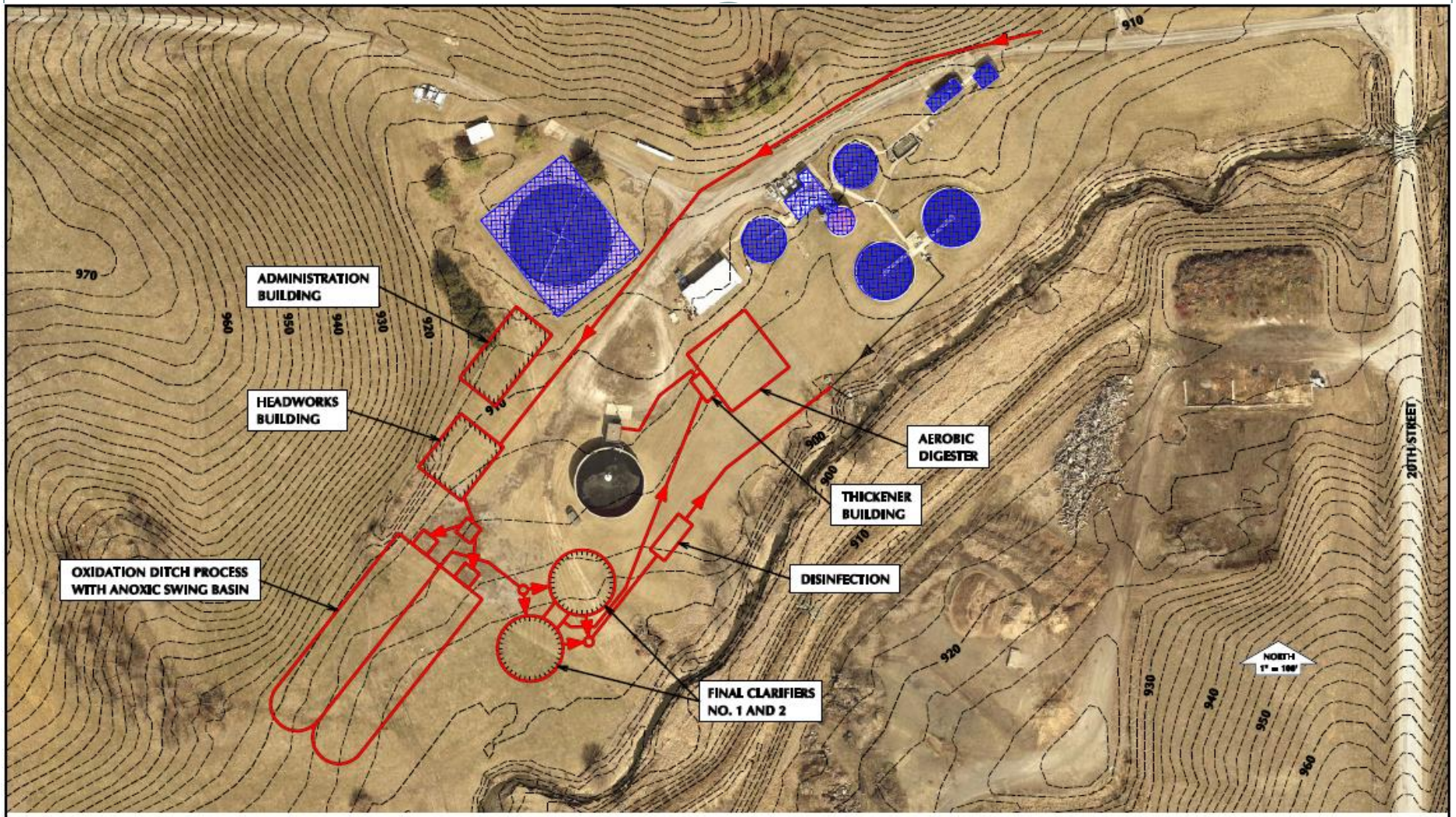
- Oxidation Ditch Process with Anoxic Swing Basin (Ovivo Carrousel)
- Conventional Activated Sludge Using Modified Ludzack – Ettinger Process (MLE)
- Trickling Filter Process with Fixed Bed Bioreactor (FBBR)

CARROUSEL PROCESS

OVIVO
Bringing water to life



CARROUSEL PROPOSED SITE LAYOUT



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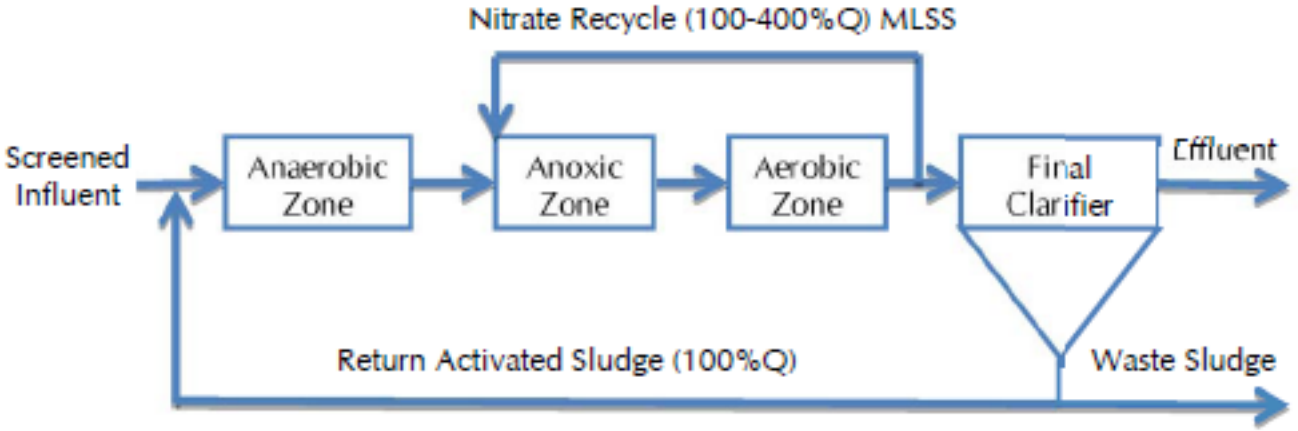
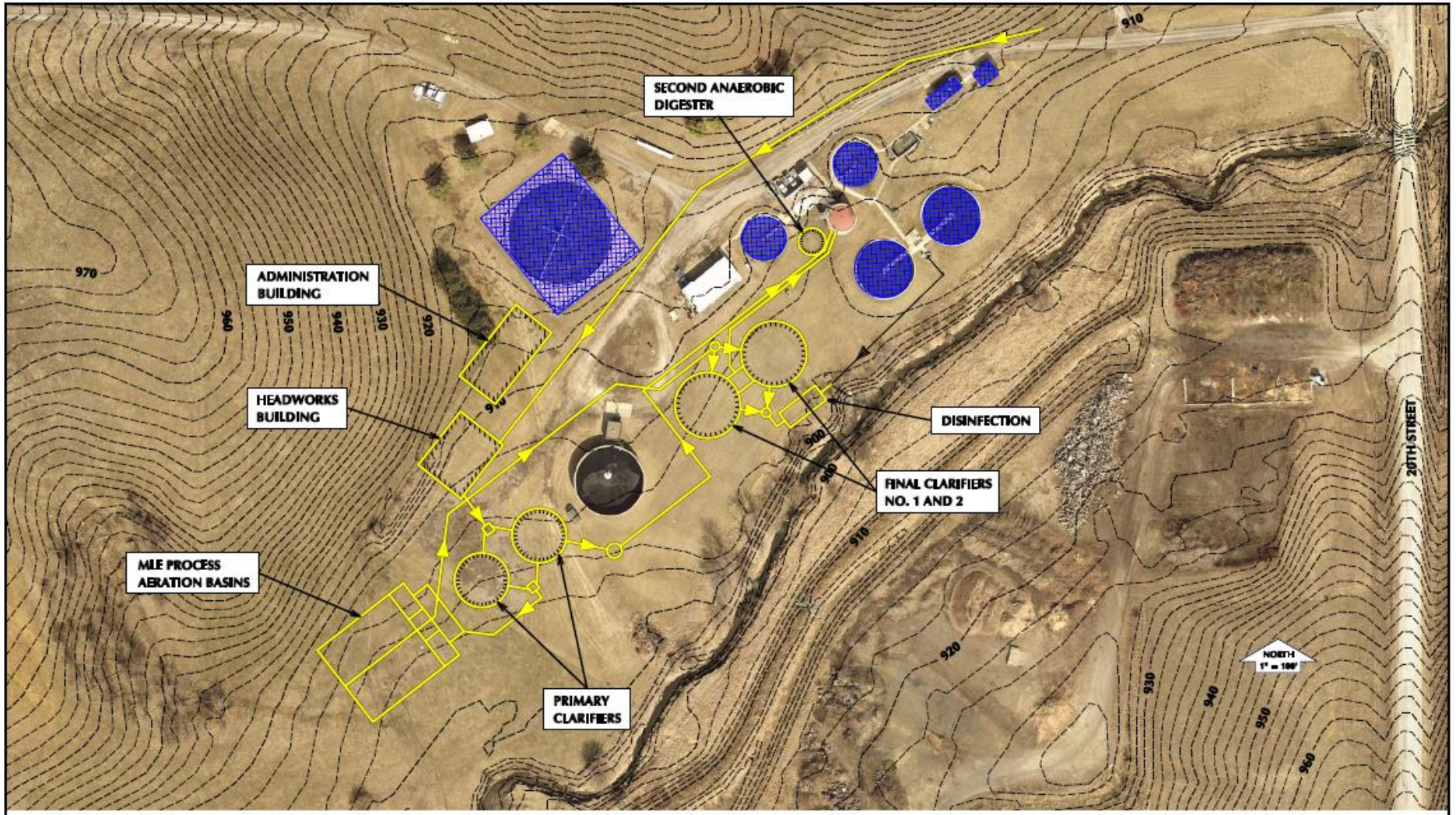
ALTERNATIVE NO. 1 LAYOUT
OXIDATION DITCH PROCESS WITH
ANOXIC SWING BASIN
FIGURE 7-2

MLE PROCESS


Nitrate Recycle (100-400%Q) MLSS
Screened Influent
Anaerobic Zone
Anoxic Zone
Aerobic Zone
Final Clarifier
Effluent
Return Activated Sludge (100%Q)
Waste Sludge

MLE PROPOSED SITE LAYOUT



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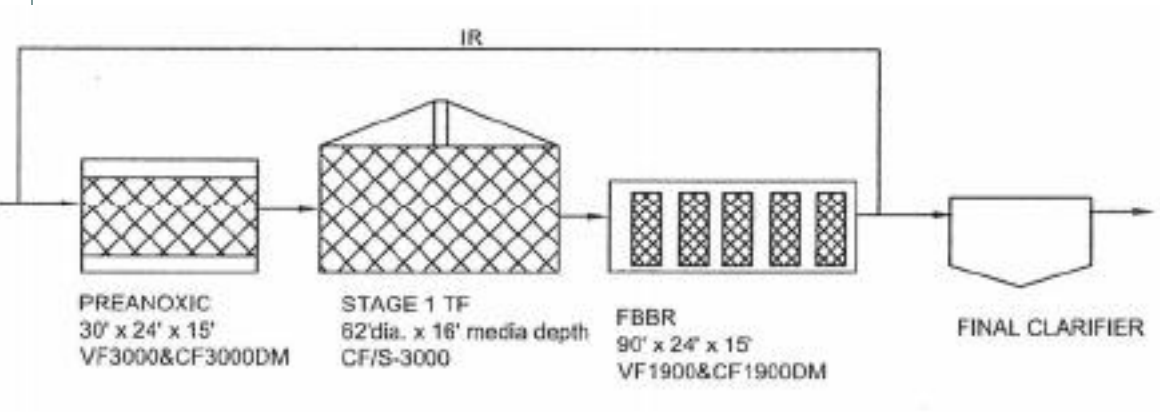
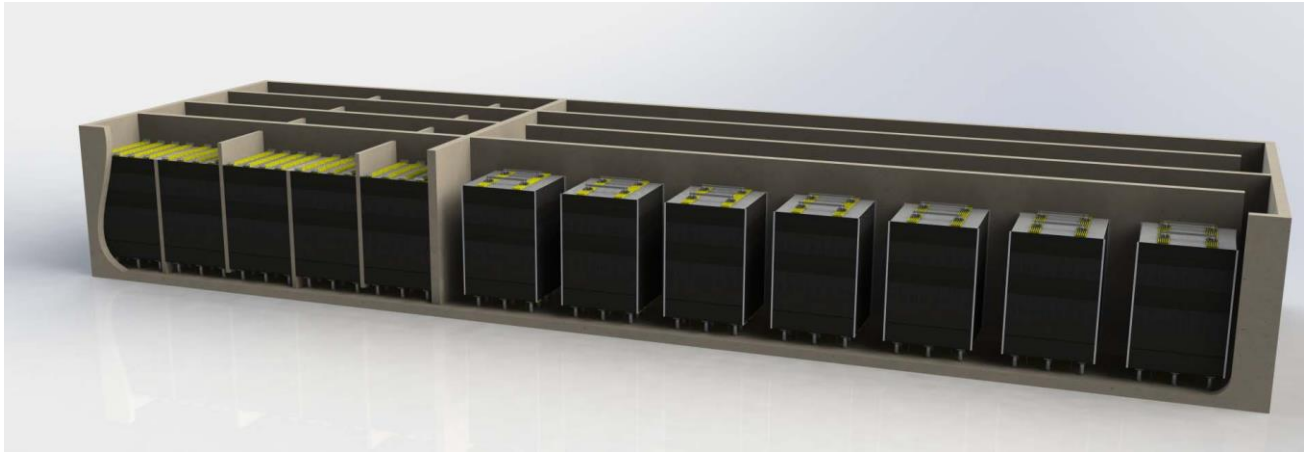
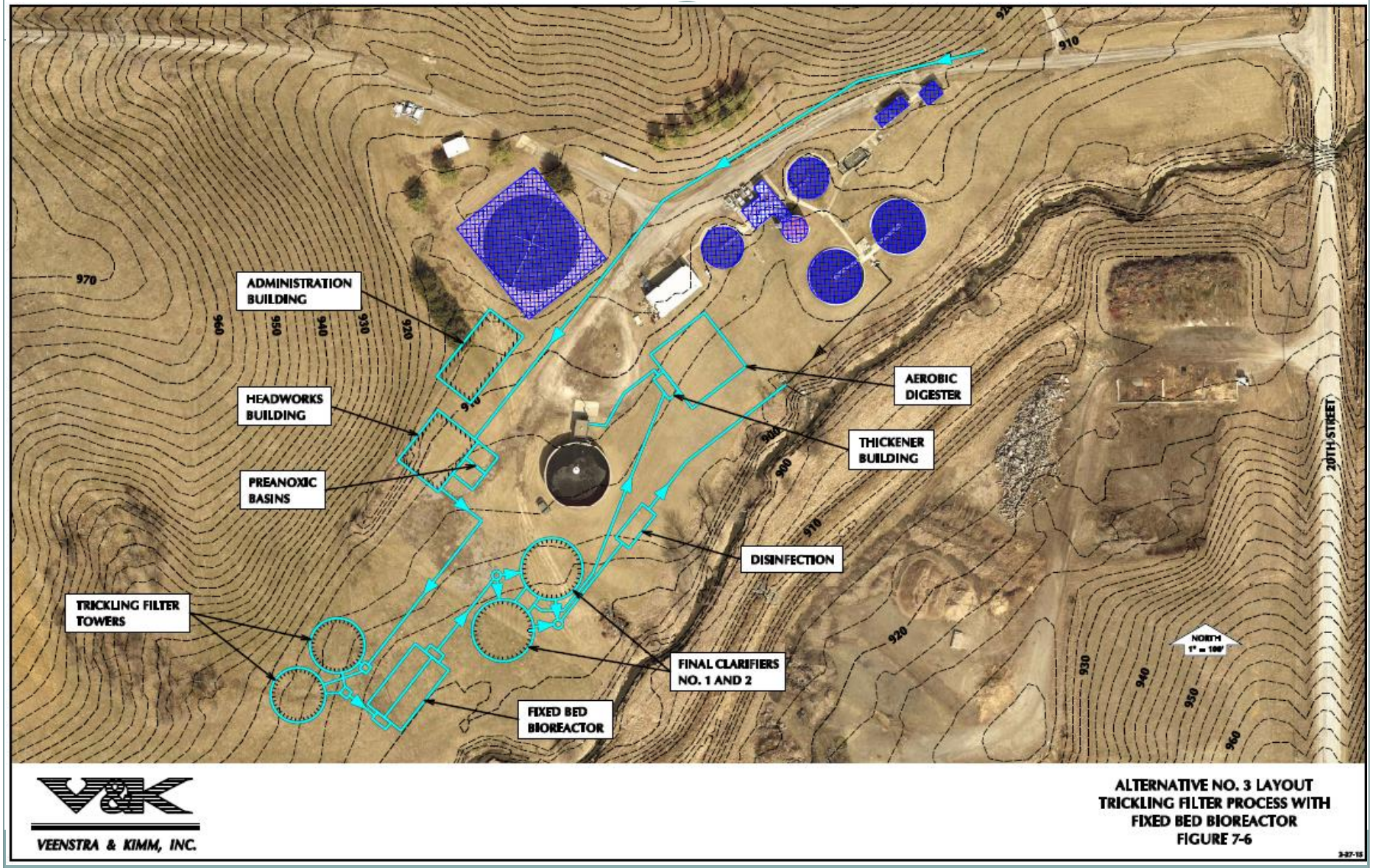
ALTERNATIVE NO. 2 LAYOUT
MLE PROCESS
FIGURE 7-4

TRICKLING FILTER & FBBR PROCESS





FBBR PROCESS SITE LAYOUT



EVALUATION OF ALTERNATIVES

System Type	Total Project Cost	Annual O&M Cost	20 Year Present Worth
Oxidation Ditch with Anoxic Swing Basin	$10,300,000	$44,920	$10,968,300
Conventional Activated Sludge with MLE	$10,150,000	$77,640	$11,305,000
Trickling Filter with FBBR	$11,750,000	$41,280	$12,364,100
Present Worth Factor, 20 Year @ 3% = 14.877			
Annual O&M Cost for System Type Only, not Total O&M Cost			

RECOMMENDED IMPROVEMENTS

Description		Estimated Cost
Demolition	$	50,000
Headworks	$	825,000
Oxidation Ditch	$	2,050,000
Final Clarifiers	$	1,080,000
UV Disinfection	$	380,000
Digester	$	1,225,000
Sludge Storage Tank	$	50,000
Administration Building	$	790,000
Electrical Supply	$	450,000
Instrumentation and Controls	$	500,000
Equalization Basin	$	230,000
Sitework Piping	$	150,000
Contingencies	$	1,170,000
Engineering, Legal & Administrative	$	1,350,000
Estimated Total Project Cost	$	10,300,000

IMPORTANT DATES

Activity	Date
Approval of Facility Plan by IDNR	May 31, 2015
Complete Design	March 1, 2016
Start Construction	June 1, 2016
Substantial Completion of Construction	December 1, 2017
Final Completion of Construction	June 1, 2018