

ZINK LAKE IMPROVEMENTS

Presentation to

Tulsa City Council Public Works Committee

August 30, 2023



CITY OF
Tulsa
A New Kind of Energy.

VISION
TULSA



TULSA CITY COUNCIL

Public Works Committee Meeting

2:30 PM, Wednesday, August 30, 2023

Discussion with the Director of Public Works, Director of Water and Sewer, City Consultants, and other City Representatives on the Zink Lake construction timeline and progress, planned and current initiatives regarding water quality, safety, and the user experience, and update on related capital improvements in the surrounding area. (Lakin) [PW 8/30/23] 23-702-1



- + Zink Lake Construction
 - History / Timeline / Progress
 - + Water Quality Initiatives
 - Background and Current Activities
 - Arkansas River / Permit types: Municipal Separate Storm Sewer System (MS4) Storm Water Management Program and Discharge Permits
 - Zink Lake Water Quality Initiatives
 - Project Goals / Water Quality Planning Working Group / Category of risks / Water Quality Plan framework components / Established programs – Communication & Education
 - + Related Capital Improvements
-
- + What is Next? Status updates, input, and feedback
 - October / November / December input and feedback
 - Adaptive Management approach for programming up to and after opening

Zink Lake Construction - History



+ Arkansas River Corridor Master Plan

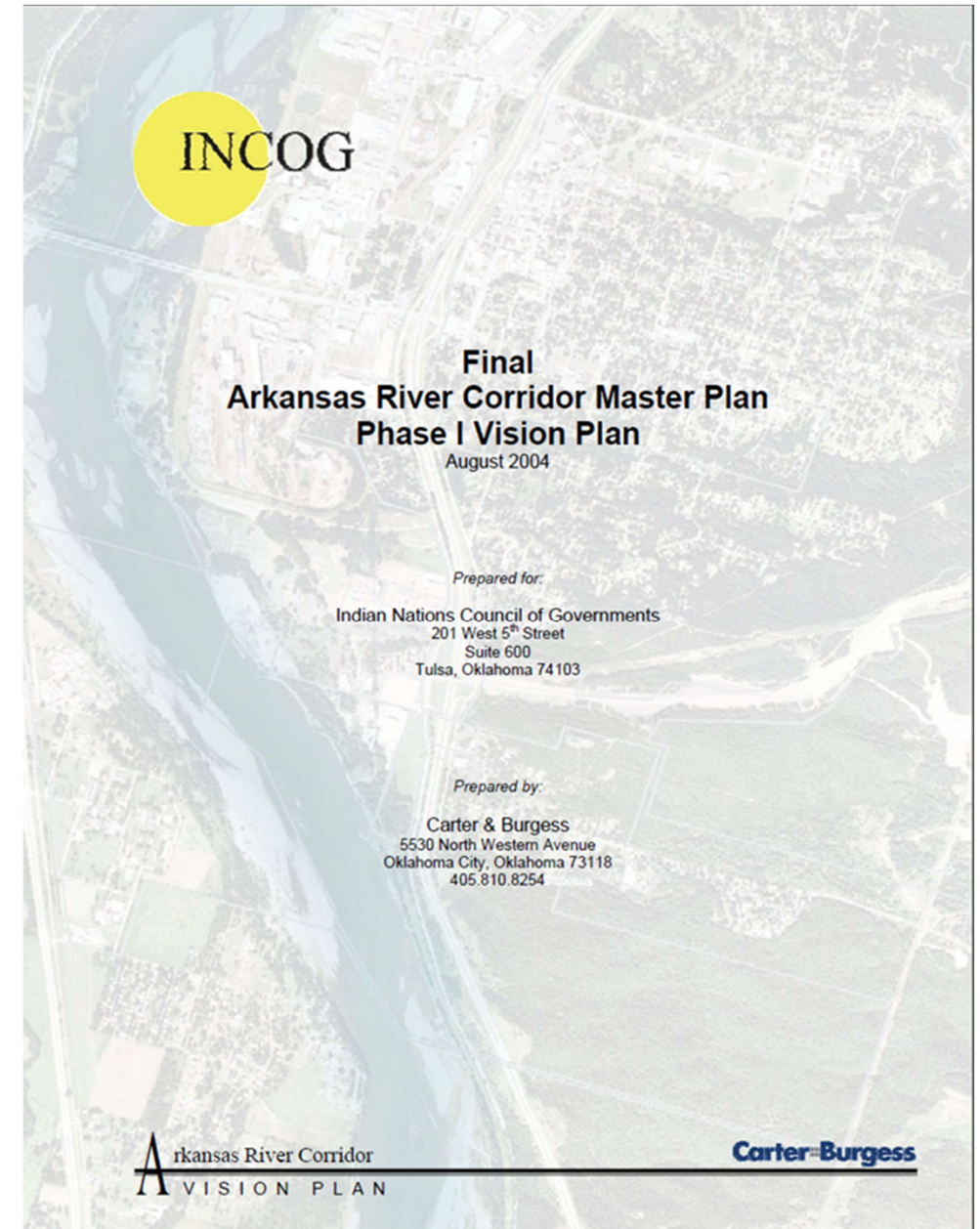
- Based on decades of discussions about Arkansas River improvement and development potential.
- Citizens, Federal, State, County, and local officials, US Army Corps of Engineers (USACE), and consults with TVA and many federal agencies including, but not limited to: Wildlife Conservation, ODEQ, OWRB, Southwestern Power Administration, US Geological Survey, US Fish and Wildlife, and others.
- Result was the adoption of the Arkansas River Corridor Master Plan
- Several reports and studies in phases ultimately made up the Master Plan
 - <https://riverprojectstulsa.info/>

Zink Lake Construction - History



+ Arkansas River Corridor Master Plan (cont'd)

- Phase I Vision Plan – stakeholders and citizens participation.
- Identified short-, mid-, and long-term projects for the 42 miles of Arkansas River in Tulsa County.
- Projects included low water dams and Riverside Development.
- Published 2004. 23 pages and 3 attachments.



Zink Lake Construction - History



+ Arkansas River Corridor Master Plan (cont'd)

- Phase II Arkansas River Corridor Master Plan – study by INCOG and USACE on the history and habitats of the River.
- This document presents potential low water dam locations, conceptual development and recreation areas along the banks of the river.
- Published 2005. 283 pages and 12 appendices.



Final
Arkansas River Corridor Master Plan
Phase II Master Plan and
Pre-Reconnaissance Study
October 2005

Volume I- Master Plan

Submitted to:
US Army Corps of Engineers
Tulsa District

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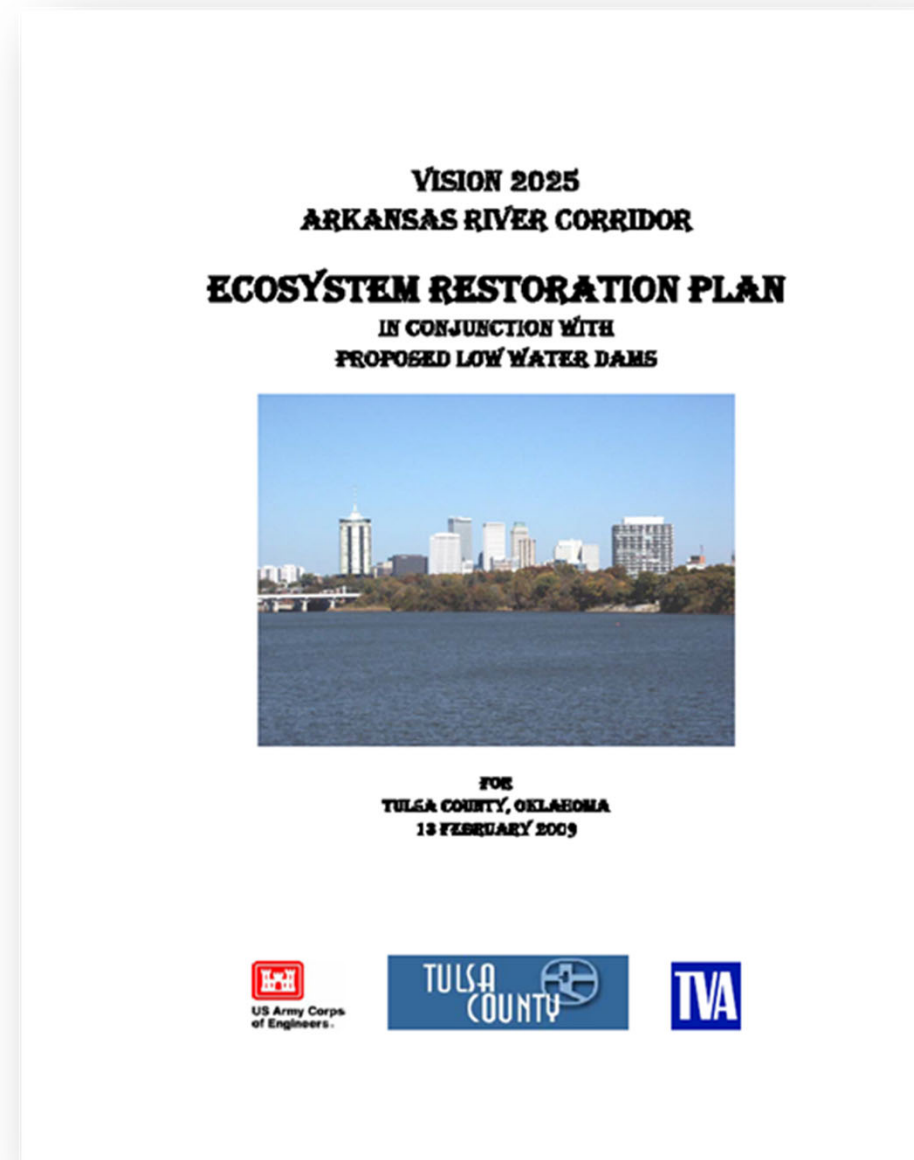
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Zink Lake Construction - History



+ Arkansas River Corridor Master Plan (cont'd)

- Phase III Ecosystem Restoration Plan – provides the baseline environmental data for the river corridor, i.e., flora and fauna, water quality, endangered species, and the initial cultural resources inventory and evaluation.
- Basis for data developed with stakeholder agencies regarding environmental and ecosystem for use with federal permitting.
- Published 2009. 76 pages and 5 environmental data reports.

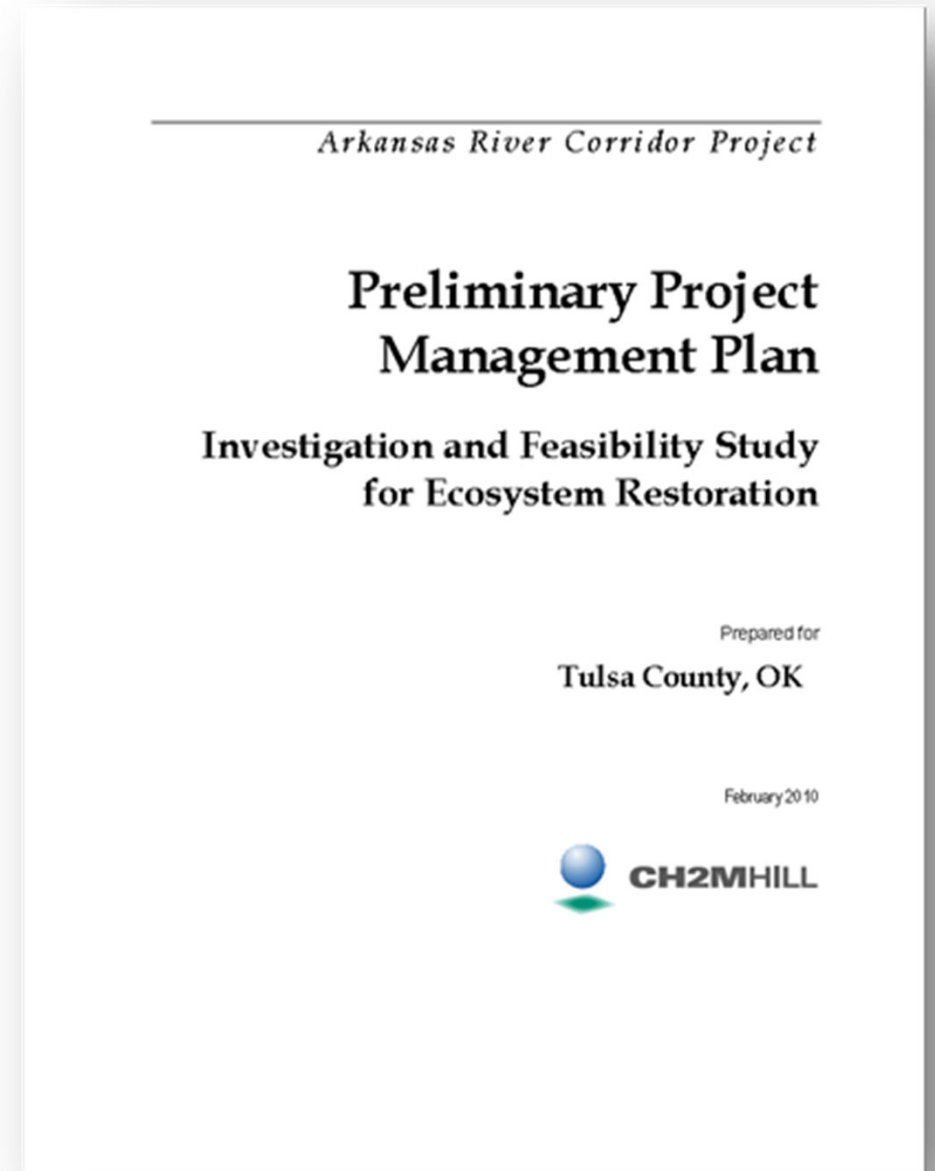


Zink Lake Construction - History



+ Arkansas River Corridor Master Plan cont'd

- Phase IV Preliminary Project Management Plan – guidelines and procedures for net phase of projects in the Arkansas River Corridor Projects.
- Identifies opportunities, problems, and constraints associated with three proposed low water dams in addition to Zink Lake: Sand Springs, South Tulsa/Jenks, and Bixby.
- Published 2010. 58 pages and 23 appendices plus the 2011 USGS Sediment Study.

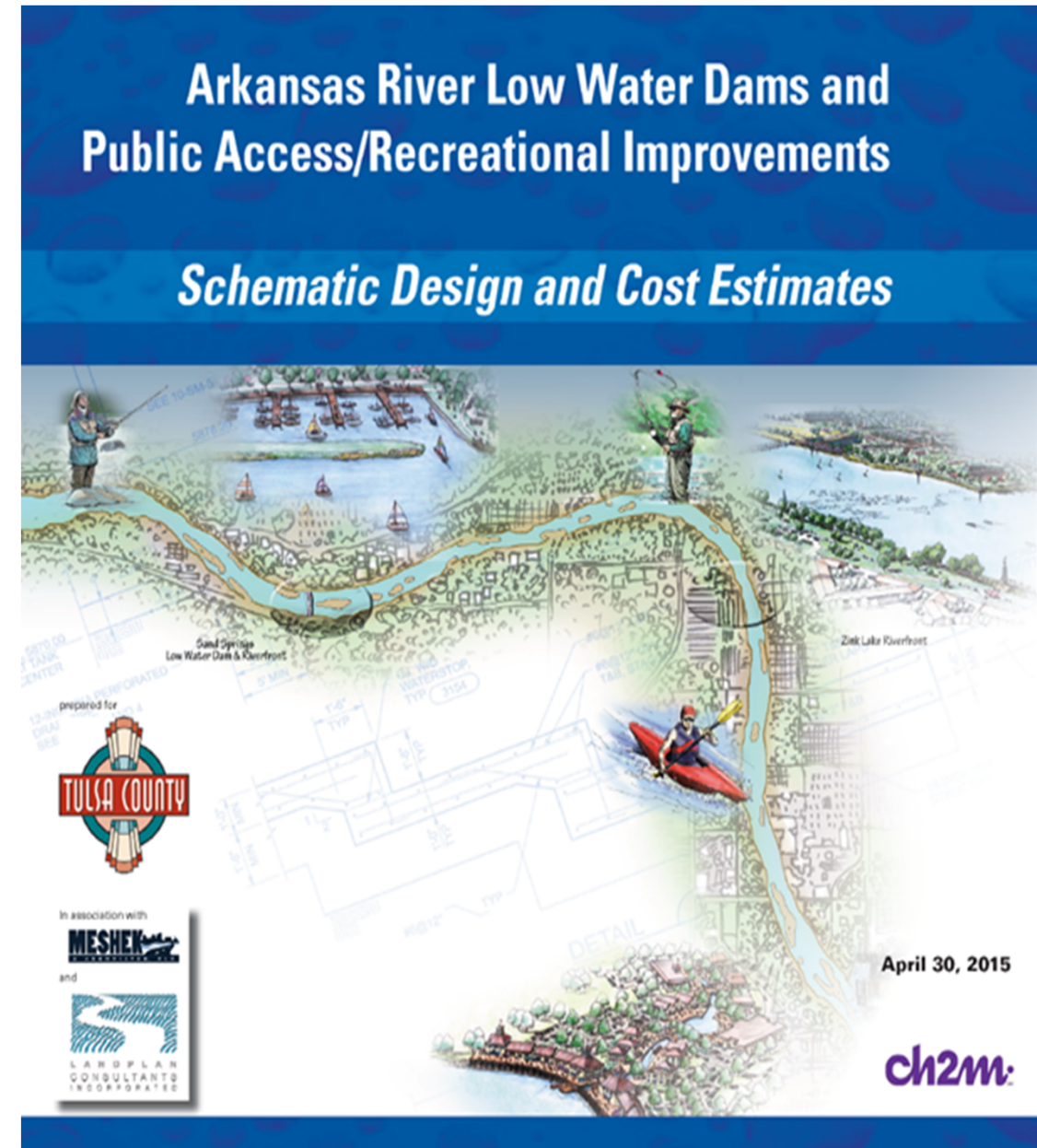


Zink Lake Construction - History



+ The Arkansas River Low Water Dams and Public Access / Recreational Improvement

- Schematic design processes, multiple project components, incorporates prior study results, including low water dams, public access, recreational amenities, bank stabilization, environmental improvements, and many other key elements.
- Published 2015. 60 pages, 8 appendices, and Final Presentation



Zink Lake Construction - History



- + **Arkansas River Corridor Feasibility Report and Integrated Environmental Assessment** Published 2018. 181 pages, 14 appendices
 - Habitat Evaluation Procedures – study of the aquatic ecosystem restoration components of the Arkansas River Corridor Master Plan. All performed and reviewed by federal stakeholder agencies.
 - Biological Resources
 - Cultural Resources
 - Hazardous, Toxic and Radiologic Waste (HTRW) Sand Springs Low Water Dam
 - Cost Estimates
 - Cost Effectiveness and Incremental Cost Analysis
 - Civil Engineering
 - Real Estate
 - Correspondence
 - Hydraulics and Hydrology
 - Geotechnical
 - Clean Water Act Compliance
 - Arkansas River Corridor 1,000 cfs Test from Keystone Dam
 - Climate Change Analysis
- + **These studies and additional data culminated in the issuance of federal 404 and 408 permits, respectively, for the Zink Lake Improvements.**

Zink Lake Construction - History



River Parks
Authority

Project Involvement

The Gathering
Place

USACE
SWPA
404 Permit Agencies
(environmental, cultural,
habitat, ODEQ, OWRB,
Wildlife Conservation, others)

Holly Frontier

New Pedestrian
Bridge

CITIZEN
STAKEHOLDERS

AEP / PSO



City of Tulsa
Tulsa County
INCOG
Regional Partners
CH2M HILL
PMg



Zink Lake Construction

- + Project Budget: \$48 Million (Vision Tulsa)
- + Design – CH2M HILL / Jacobs
- + Construction – Crossland Construction (2020-2024 anticipated)
- + Vision – the low water dams will enhance the Tulsa area's most visible, physical asset by maintaining more consistent water levels in the river: Sand Springs, Zink, and South Tulsa / Jenks sites
- + Zink Dam Project Description:
 - Improved dam safety
 - Increased lake depth / length ("Put water in the river")
 - Improved sediment management / passage
 - Improved operation / maintenance
 - Recreational opportunities / Enhance riverbank access
 - Environmental mitigation

Original Zink Dam



- + Intended to create a lake (water feature) in the heart of Tulsa
- + W.R. Holway and Associates (Engineer of Record)
- + Constructed in 1982
- + 7 feet in height (above river channel)
- + 1,030 feet in length
- + Ogee spillway design
- + 880' fixed dam
- + 5' high bascule gates: 3 50-foot sections
 - 1 west bank, 2 east bank

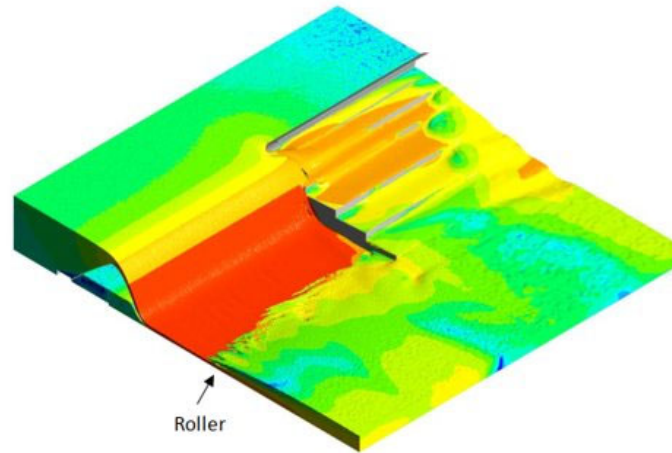
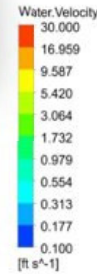
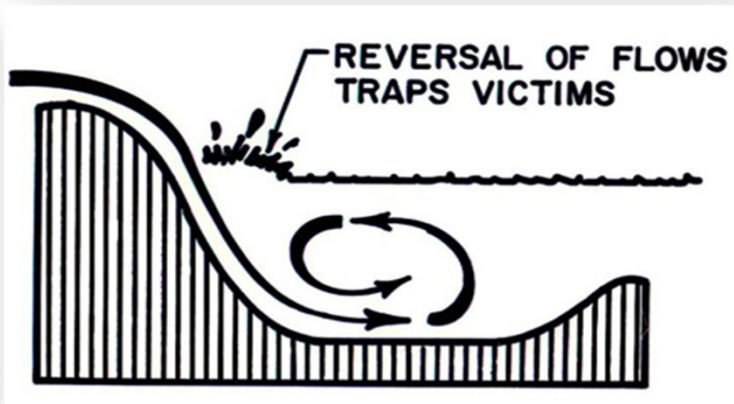
Improved Zink Dam



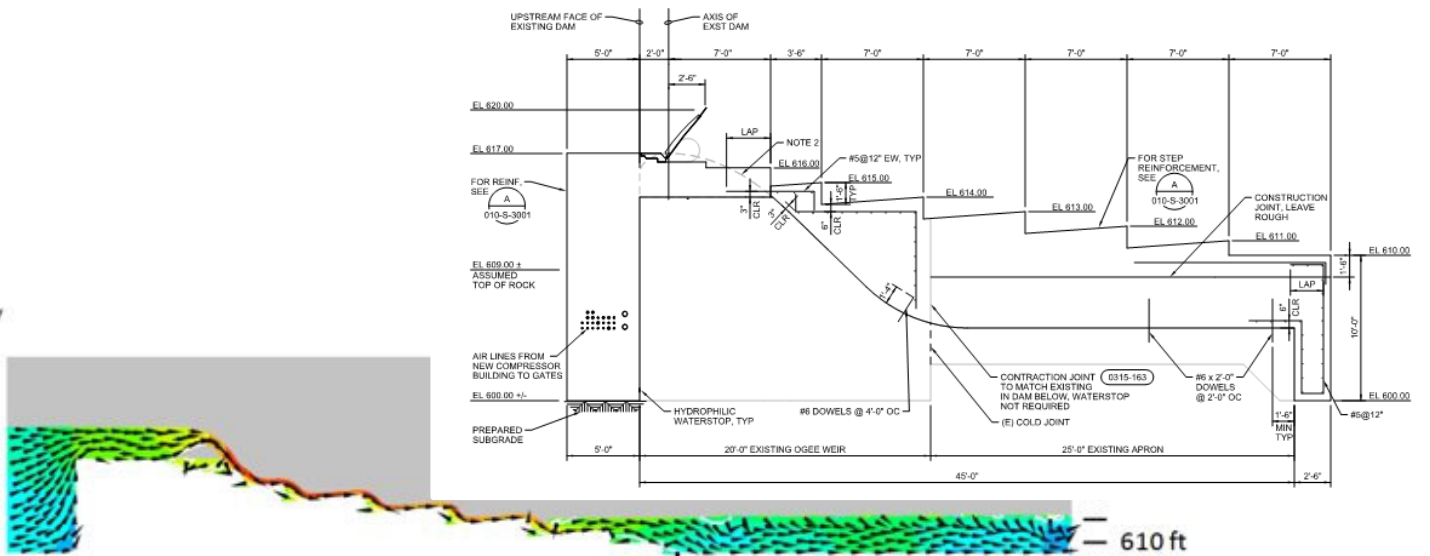
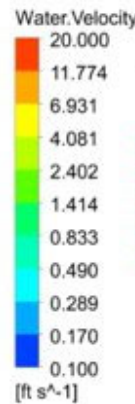
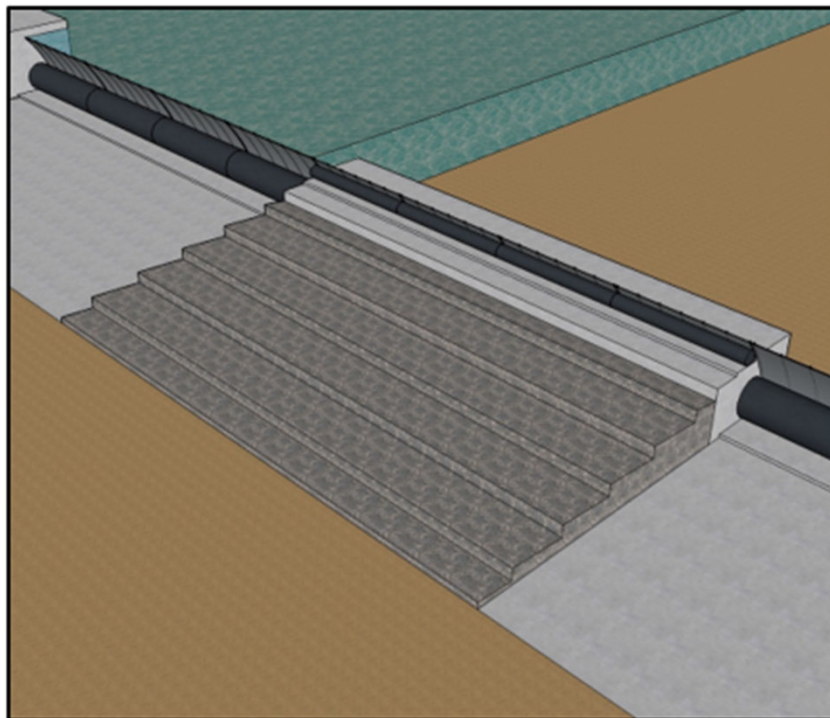
- + Public Access
- + "Bring People to the Water"
- + Enhanced safety – roller mitigation on fixed dam and crest gates
- + Increased pool depth to 10'
- + Improved O&M
- + Failure of previous bascule gates
- + Recreational Opportunity
 - + Zink Lake
 - + Whitewater Flume
 - + Trails on banks
- + Environmental Mitigation



Improved Dam Safety



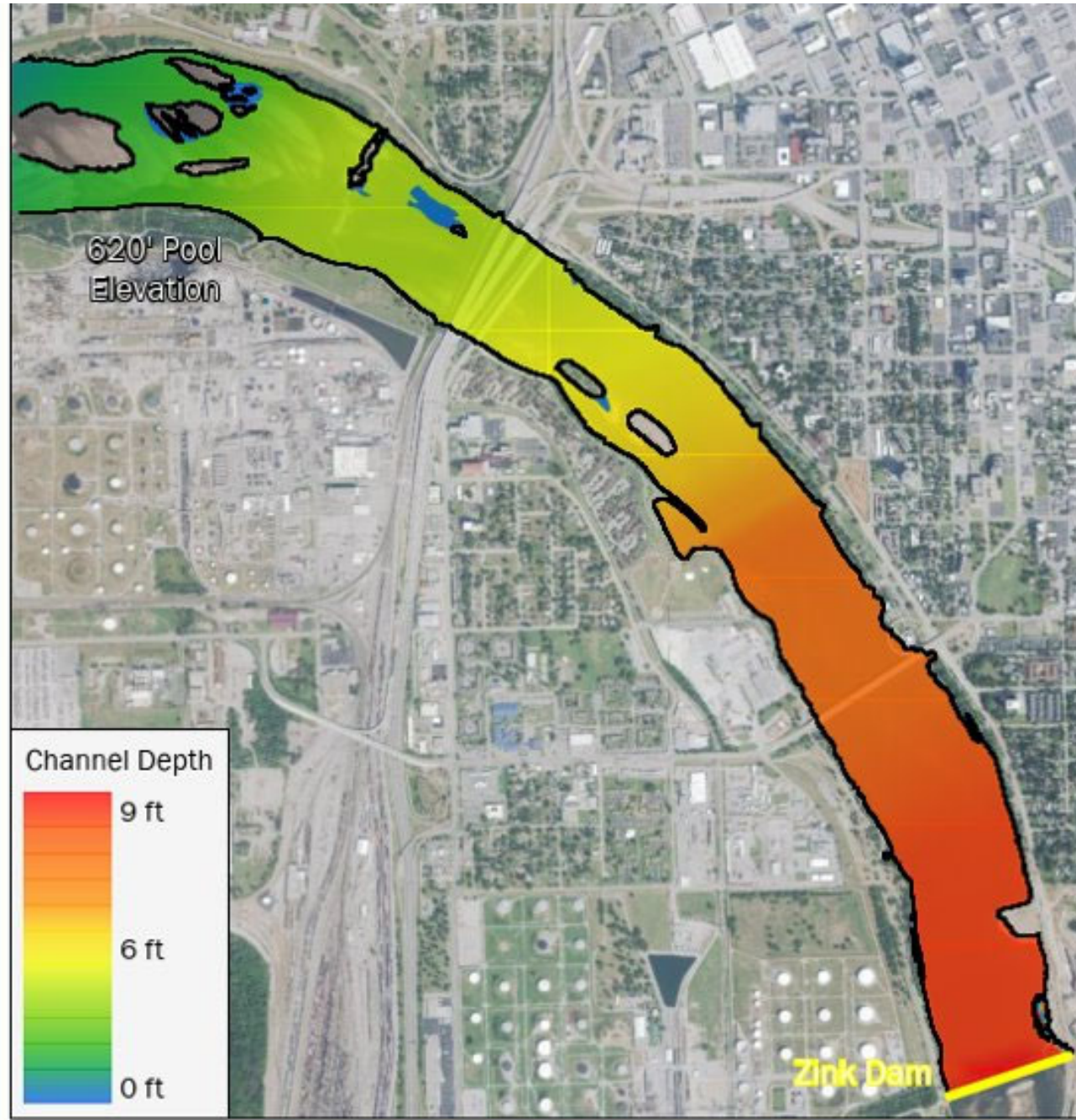
- Roller mitigation on fixed dam and crest gates
- 1:10 scale hydraulic model at Colorado State University Lab



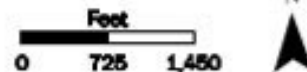


Increased Lake Depth

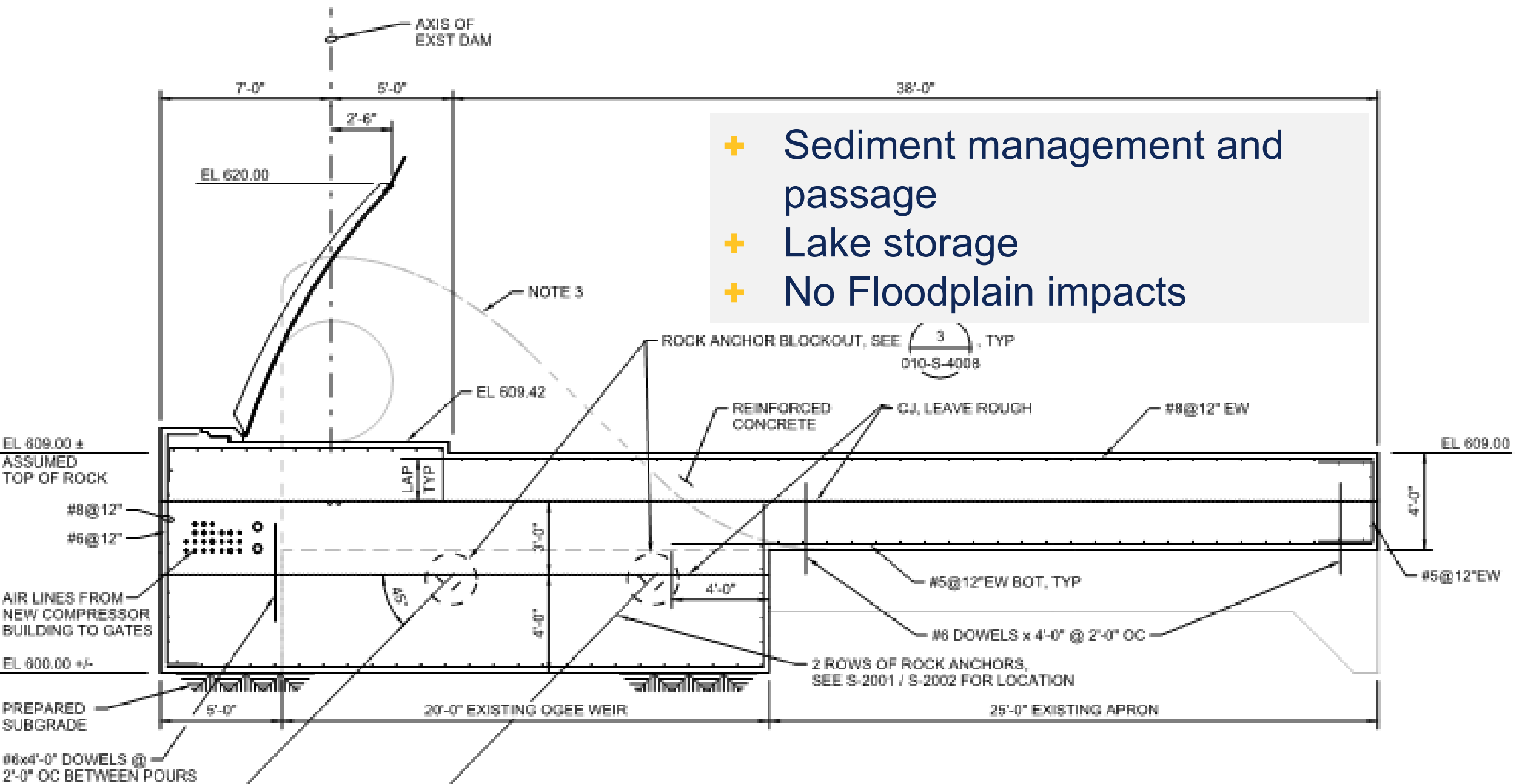
- + 2.5 miles of lake
 - + Increased pool depth to 10' at the face of the dam
 - + Original Zink Lake 7' deep at face of the dam
- + Debris identified during low or no flow
 - + Contractor reviewed lake area for construction debris
 - + Abandoned waterline removed
 - + Concrete with rebar – removal underway
 - + Misc. debris removed
 - + Additional inspections to be done prior to impounding lake



Zink Lake Depth Grid - Pool Elevation at 620'



Improved Sediment Management

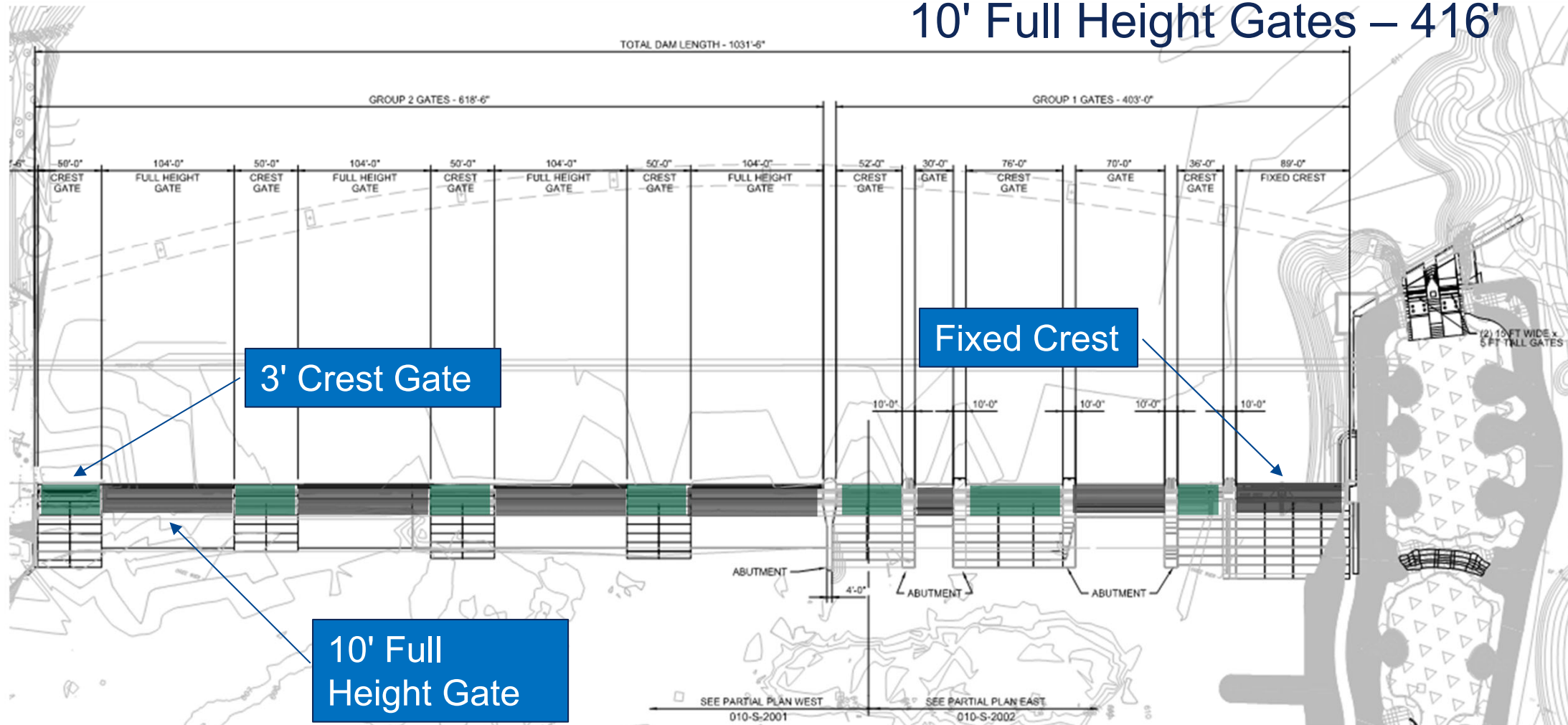


- + Sediment management and passage
- + Lake storage
- + No Floodplain impacts

Improved Sediment Management



- 3' Crest Gates – 364'
- 5' Flume Entrance Gates – 30'
- 7' Waveshaper Gates – 100'
- 10' Full Height Gates – 416'



3' Crest Gate

10' Full Height Gate

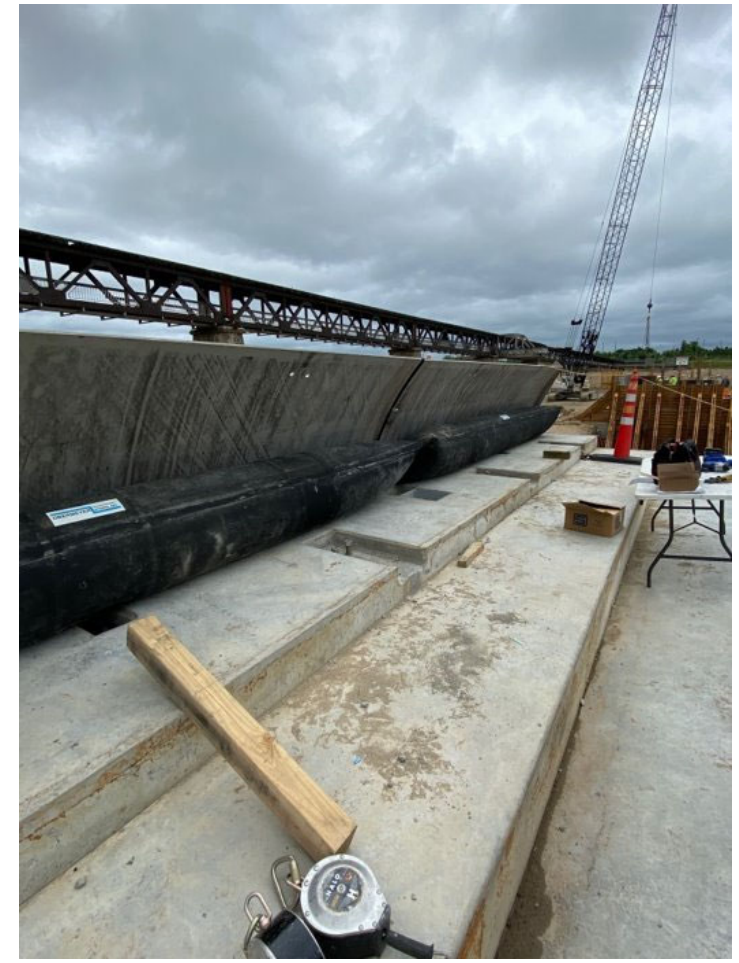
Fixed Crest

Improved Operations and Maintenance

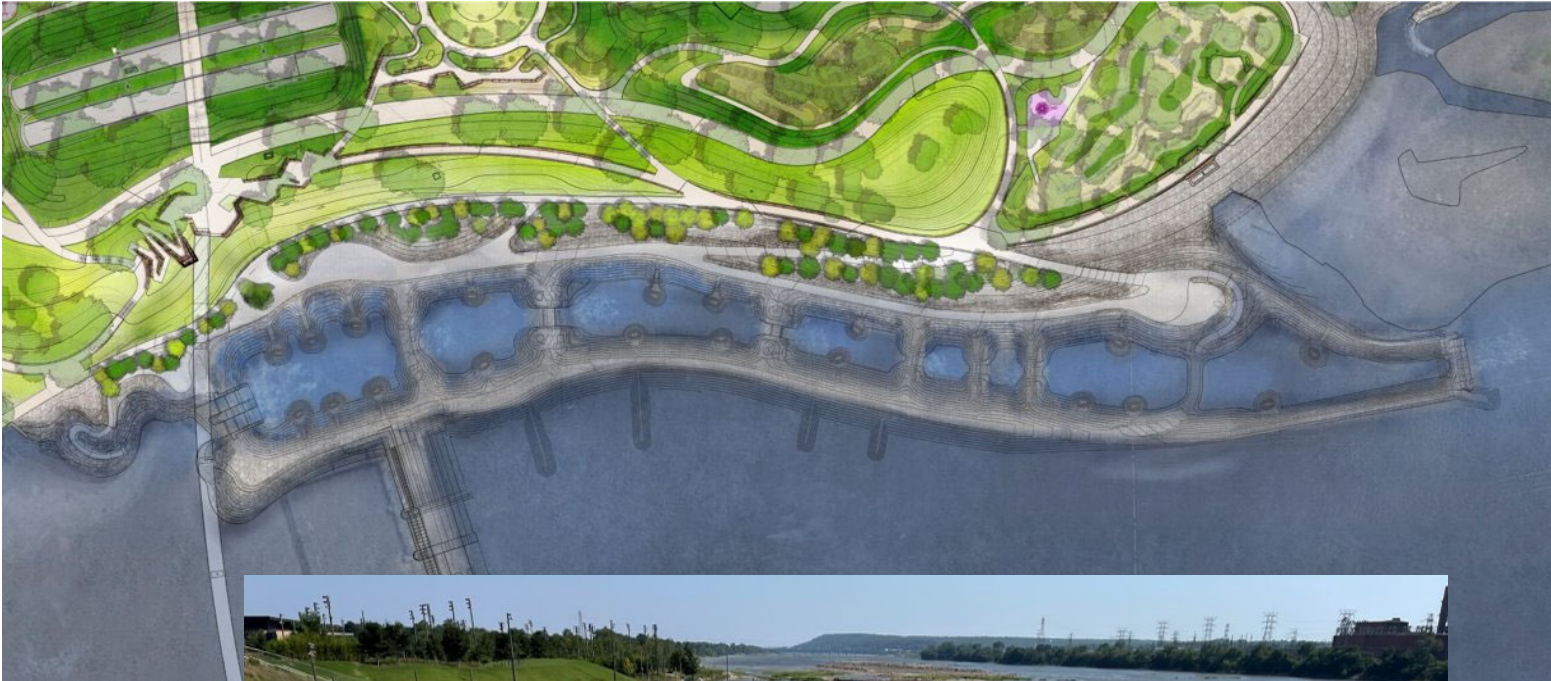


Bascule gates, installed in 1982

- + Failure of existing bascule gates and hardware
- + Stainless steel gates on inflated, rubber bladders



Recreation Opportunities

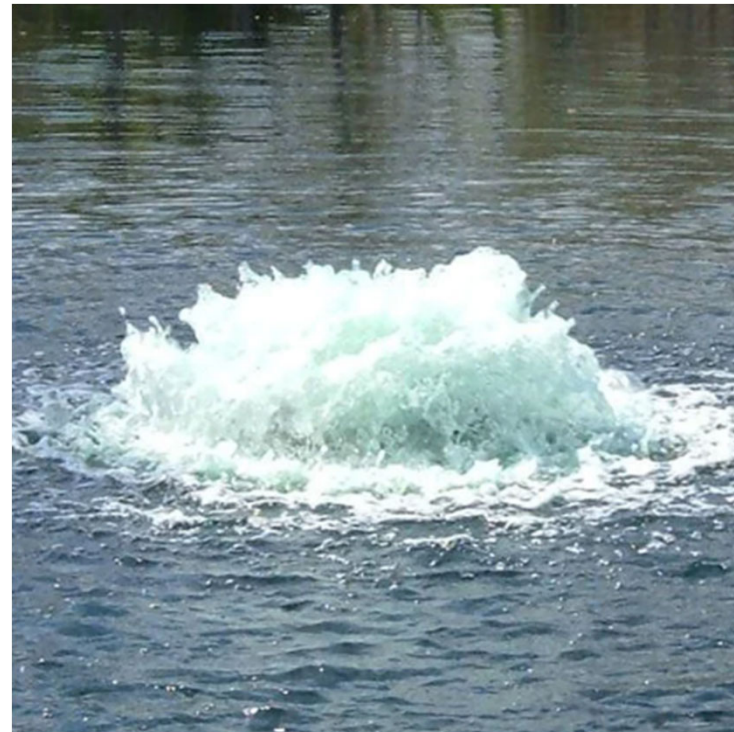


- + Zink Lake – increased length and increased pool depth to 10'
- + Whitewater flume
- + Paths and trails adjacent to water's edge
- + Pedestrian bridge connections with sidewalks/trails
- + Fishing from banks (no fishing in the flume)

Environmental Mitigation



Least Tern Island fill versus design as of 10 July 2023



- + Least Tern Island
 - Advanced construction
- + Mitigation of "fish kills"
 - Depth of lake
 - Sediment transport
 - Flume pool monitoring, aerators, and potable water hydrants
- + USACE 404 Permit
 - Purchased 4.56 Acres of wetland mitigation credits from Terra Foundation for \$250,800.

Zink Lake Construction - Timeline



	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24	Apr-24	May-24	Jun-24	Jul-24	Aug-24	Sep-24	Oct-24	Nov-24	Notes/dependencies		
Zink Dam Substantial Completion	[Yellow bar]																							
HFSTR Bank Stabilization					[Blue bar]																			6 to 8 months construction
Public Engagement	← [Blue arrow] →																							Ongoing and to continue
Water in the Lake - Water Quality Testing													[Blue bar]											
Zink Dam Rec Flume Tuning																								
Zink Dam Adaptive Mgmt (dam tuning)																								
West Bank Trail - Repair																								
23rd Street Parking																								
West Bank trail - Open																								
RPA - MOU - Operations Agreement	[Blue bar]																							
RPA - Hiring/onboarding																								
RPA - Dam Operations																								
HFSTR Bank Stabilization					[Blue bar]																			training concurrent with dam tuning 6 to 8 months construction
Pedestrian Bridge Substantial Completion	[Yellow bar]																							
AGP East Bank Restoration																								
Zink Dam/Rec Flume Open																							XX	Labor Day 2024
Pedestrian Bridge Open																							XX	Open concurrent with dam/flume

Zink Lake Construction - Progress



Phase 1 – East Bank Demo

- + Increase flow through east half of river while west half is coffered.

Zink Lake Construction - Progress

Phase 2 – West Bank Construction



- + Cofferdam
- + Maintaining cooling water for AEP/PSO
- + Shared access with pedestrian bridge
- + Fish relocation
- + October 2020 – April 2022















Compressor Building



Zink Lake Construction - Progress

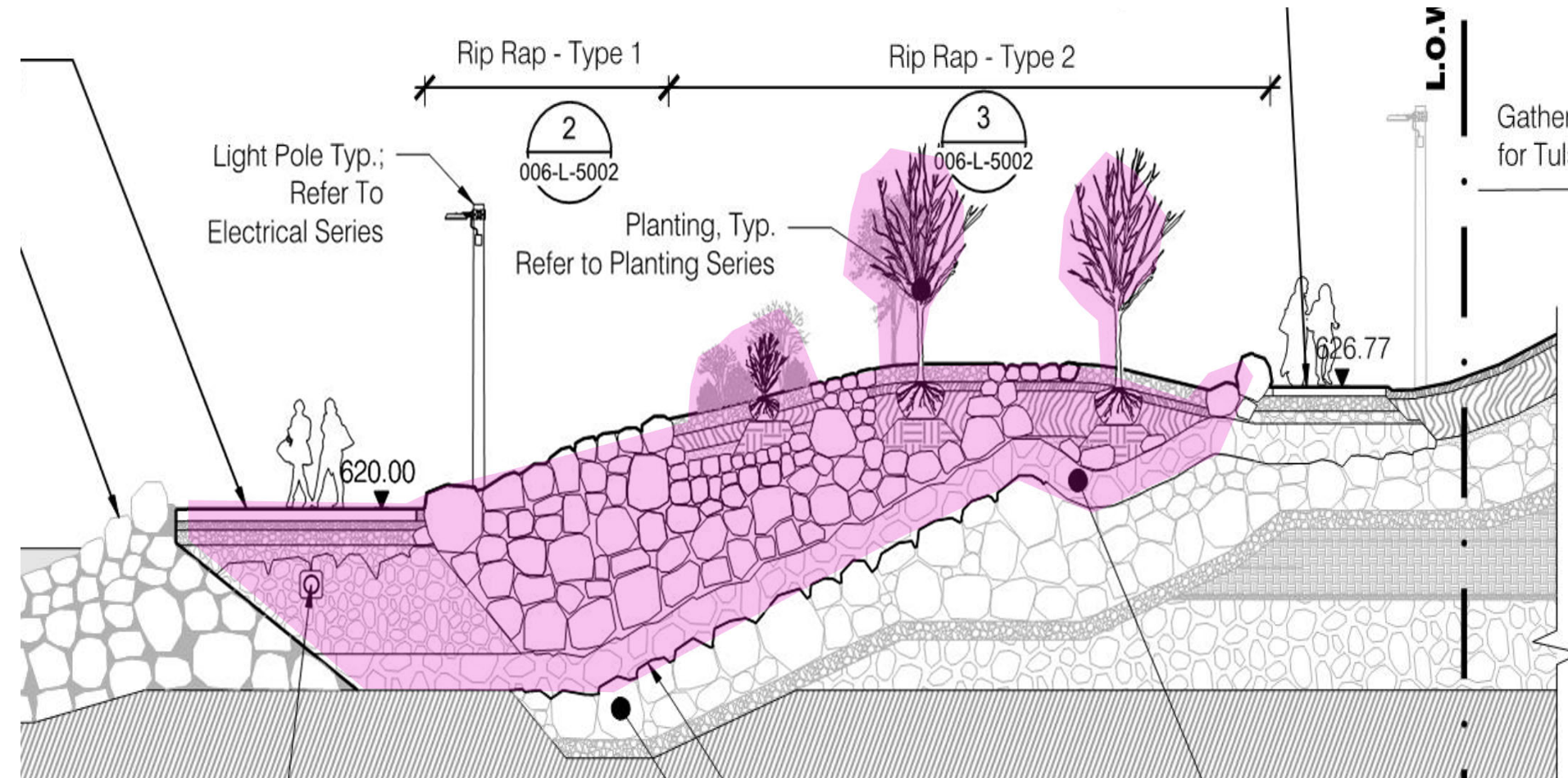


Phase 3 - East Bank Construction



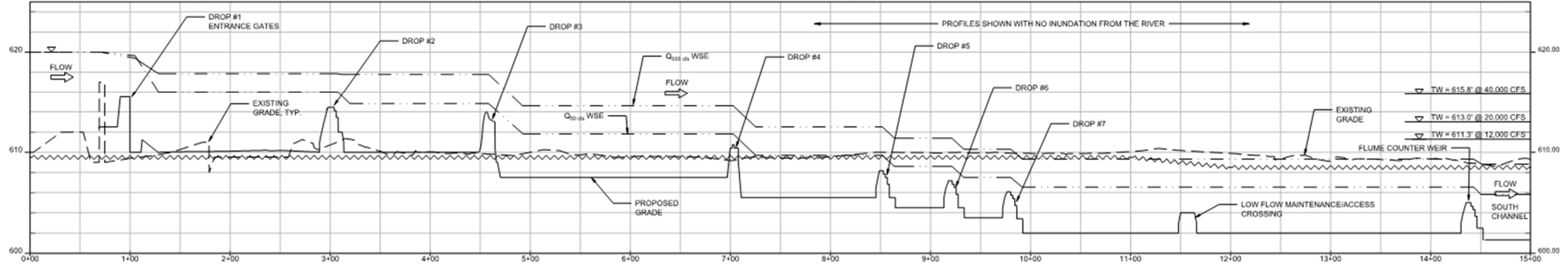
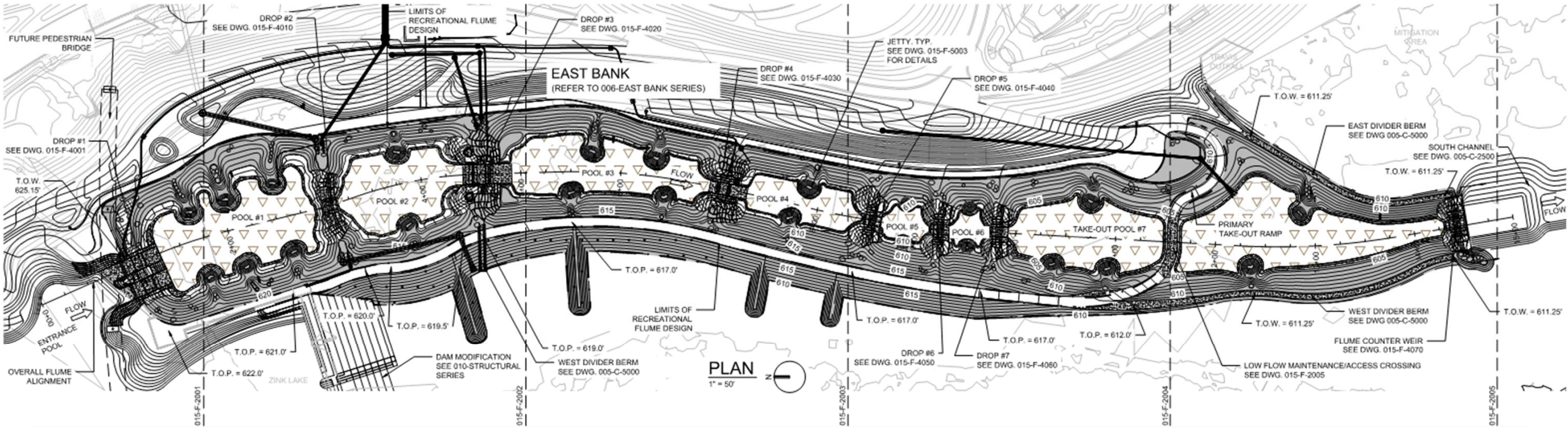
- + Cofferdam
- + Shared access with pedestrian bridge
- + Fish relocation
- + Construction access off Riverside Drive
- + Maintain traffic on River Parks trails

East Bank Design



- + Integrated with the Gathering Place
- + Gathering Place landscape architect design
- + Plantings raised above elevation 623
- + Trees at higher elevations near upper path
- + Plantings transition to shrubs and grasses closer to the flume

East Bank - Recreational Flume

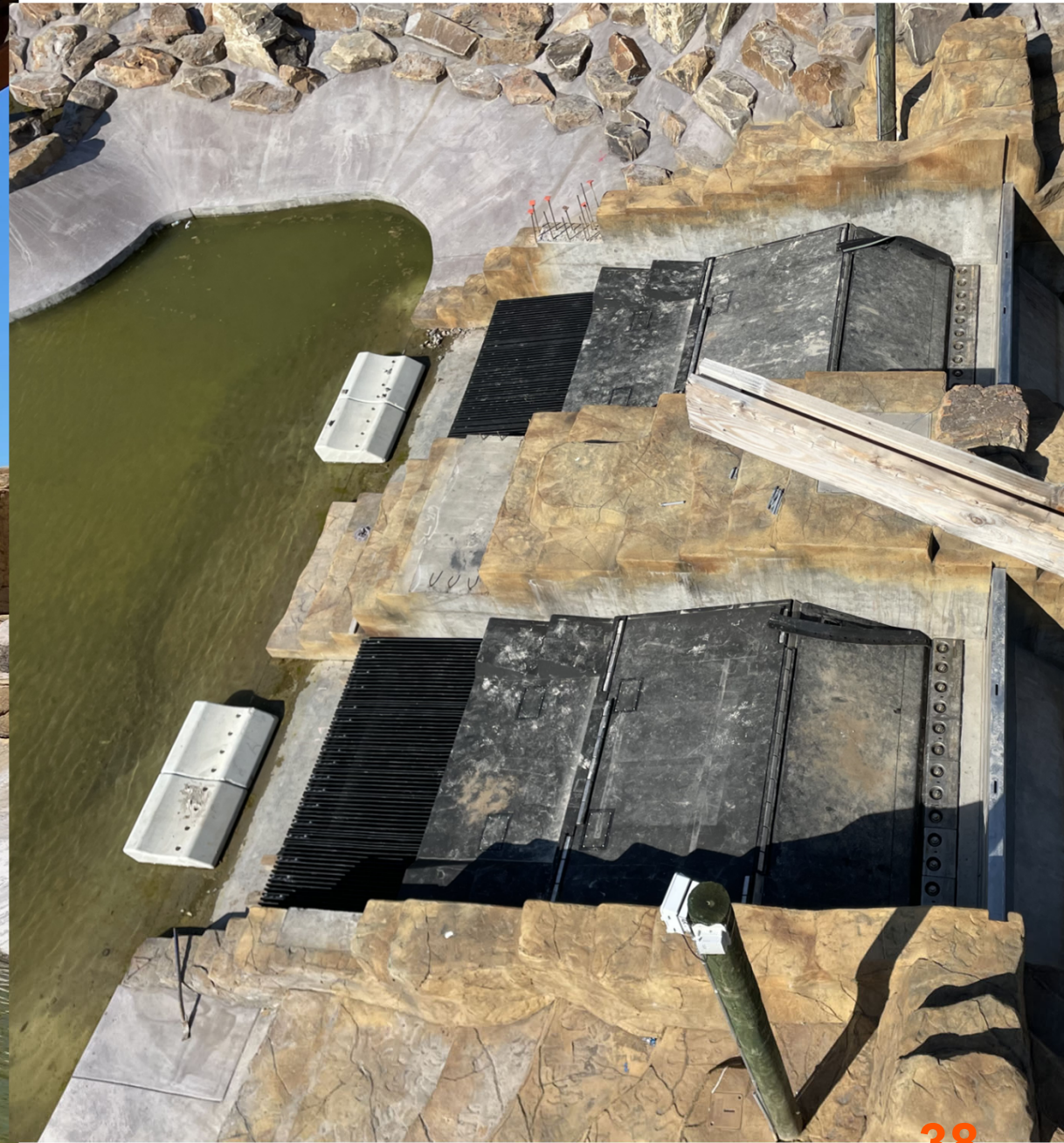


Total Length 1050'











Water Quality Initiatives

Background and Current Activities



- + Arkansas River is classified as a Prairie Braided Stream
- + A network of river channels separated by small, often temporary islands called braid bars. Tend to have high sediment loads with frequent flow variation.
- + Water Quality is like other streams & rivers across the state and Midwest.





Not a natural, free flowing river. Flows are regulated by discharges from Keystone dam.

Water Quality Standards (WQS) - Beneficial Uses



- + Beneficial Uses are set by Oklahoma Water Resource Board (OWRB)
- + For current and future uses

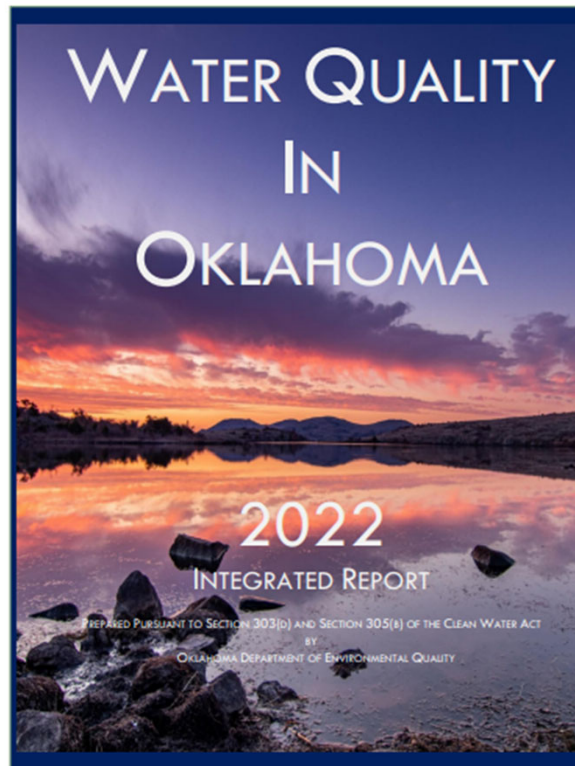


- + WID – 120420010010_10 (Arkansas River – Berryhill Cr. to Cherry Cr.)
 - Emergency Water Supply
 - Warm Water Aquatic Community
 - Agriculture
 - Primary Body Contact Recreation (PBCR)
 - Navigation
 - Aesthetics

Water Quality Standards – 303(d)



- + Requires states to develop a list of streams that do not meet WQS.
- + 2022 is the most recent list



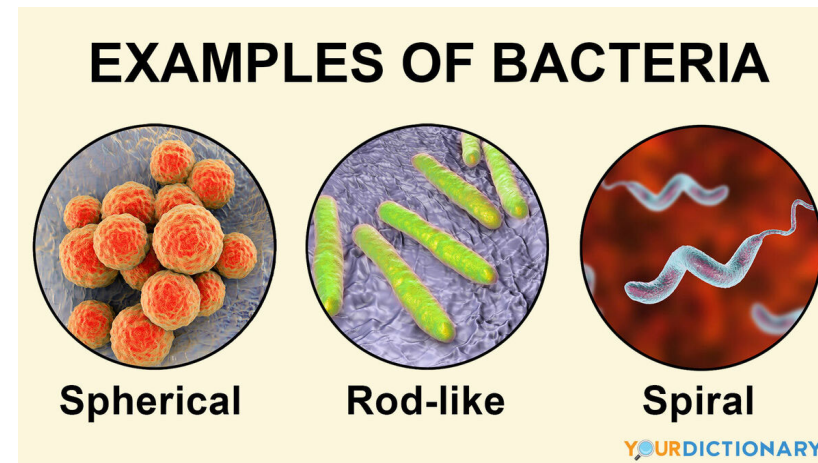
- + Arkansas River Zink lake segment -
 - Impaired for Cadmium
 - Historically impaired for bacteria

Water Quality - Bacteria



+ What is bacteria?

- Common single-celled organisms that are natural component of lakes, rivers, and streams
- Most are harmless to humans
- However certain bacteria, some of which normally inhabit the intestinal tract of warm-blooded animals, have the potential to cause sickness and disease
- High numbers often indicate harmful bacteria as well as other disease-causing microorganisms and viruses



Water Quality – Bacteria (con't)



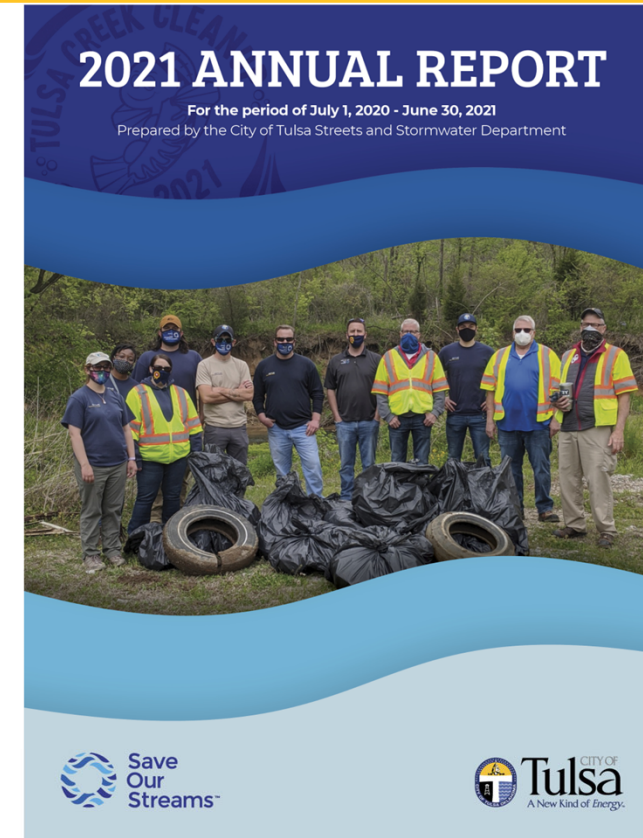
- + Fecal Indicator Bacteria (FIB)
 - + Health risk from water-borne pathogens is usually assessed from concentrations FIBs
- + Escherichia coli (E. coli), enterococci, and fecal coliform
- + Originate from the same sources as the pathogens (disease-causing microorganisms)
- + High numbers often indicate other harmful bacteria as well as other disease-causing microorganisms and viruses



Water Quality – MS4 Permit

+ Municipal Stormwater Discharge Permit (#OKS000201)

- Allows Tulsa to discharge rainwater that was collected in its stormwater system, into waters of the State of Oklahoma
- Requires the implementation of many programs and practices with the focus to reduce/eliminate pollution discharges into the storm sewer system
- Does not direct or require monitoring of the Arkansas River
- Some programs include surface water monitoring

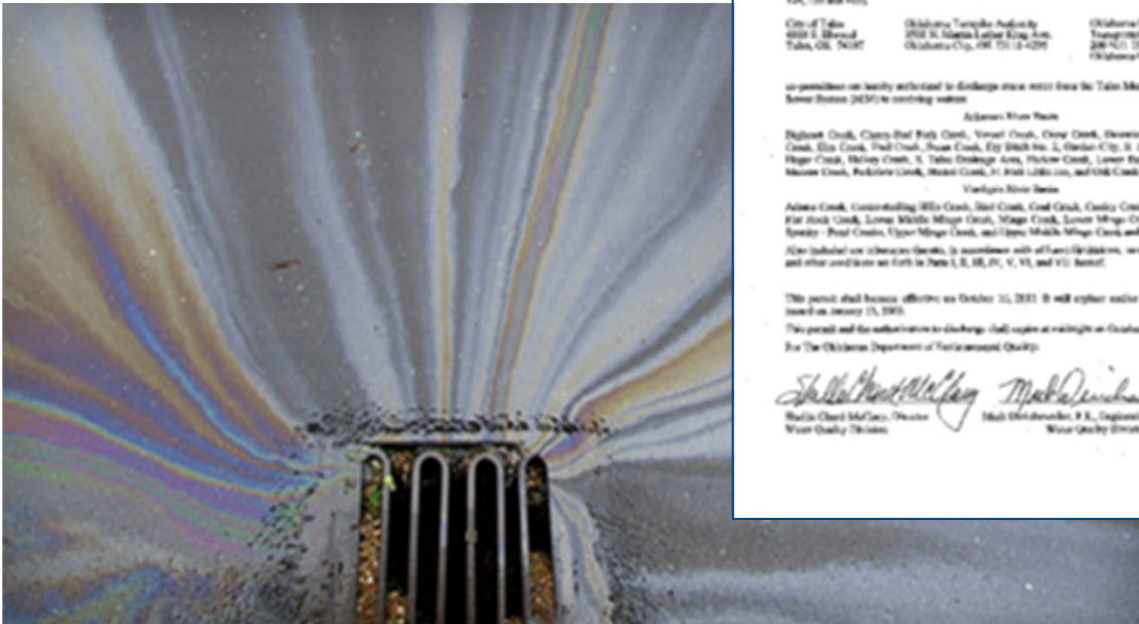


Water Quality – MS4 Permit



+ Municipal Stormwater Discharge Permit (#OKS000201)

- These monitoring programs are designed to determine the quality of the discharge from Tulsa's stormwater system into waters of the state
 - Permit compliance (WQS)
 - Illegal discharges
- Monitoring programs are not designed to regulate surface waters, or inform the public of potential risks
- Permit is up for renewal



Water Quality – Discharge Permits



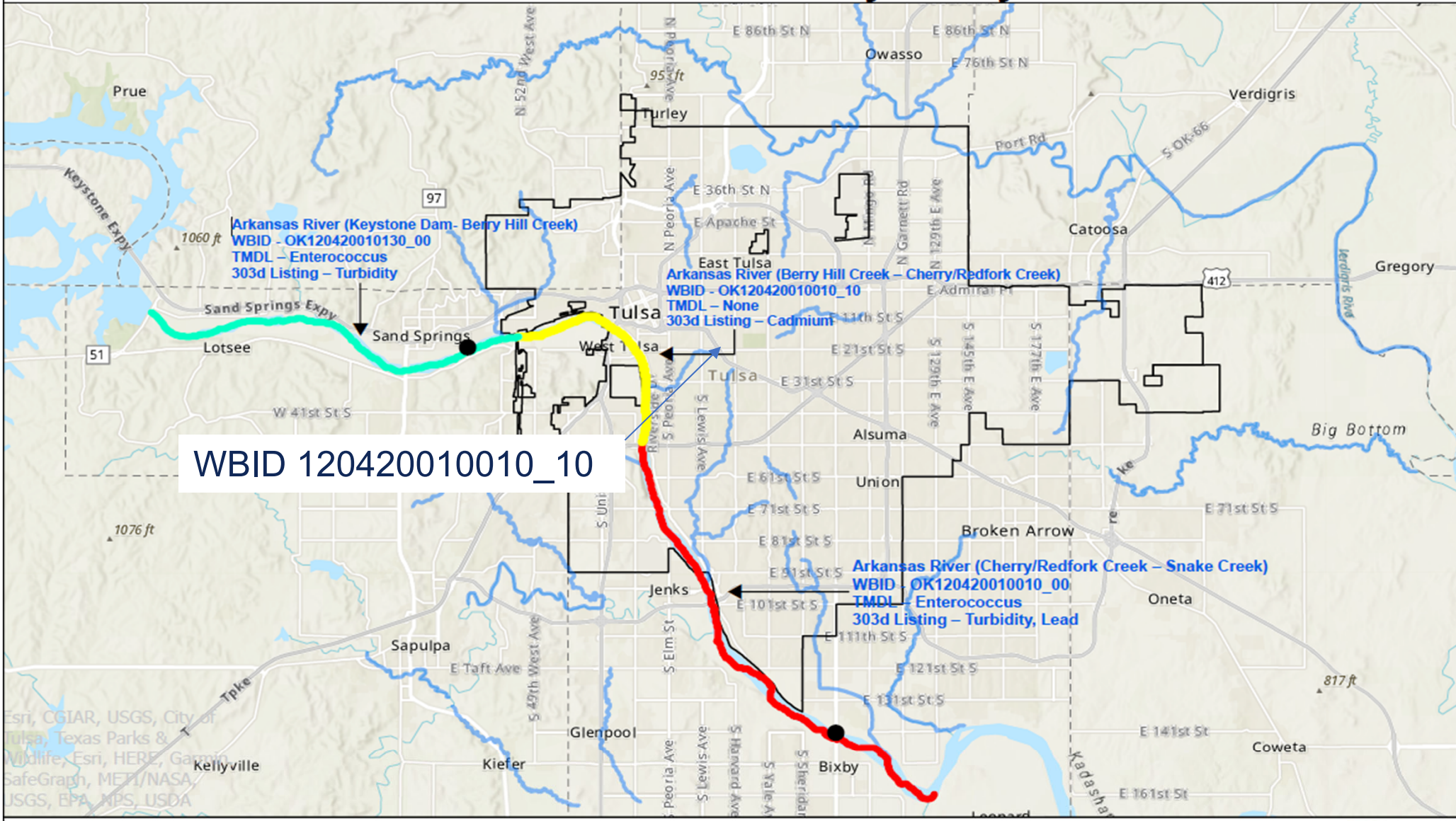
+ Oklahoma Pollutant Discharge Elimination System (OPDES)

- There are other OPDES permit holders
- Regulated very closely by ODEQ, Water Quality Division
- Examples of permit holders
 - PSO
 - City of Tulsa – Wastewater plants
 - Holly Frontier Sinclair Tulsa Refinery
 - Tulsa Tube Bending
 - Others
- These type of permits are different than a water quality program for recreational purposes on the Arkansas River.
- Some of the information may be utilized or correlated with data generated in the Zink Lake Water Quality Plan

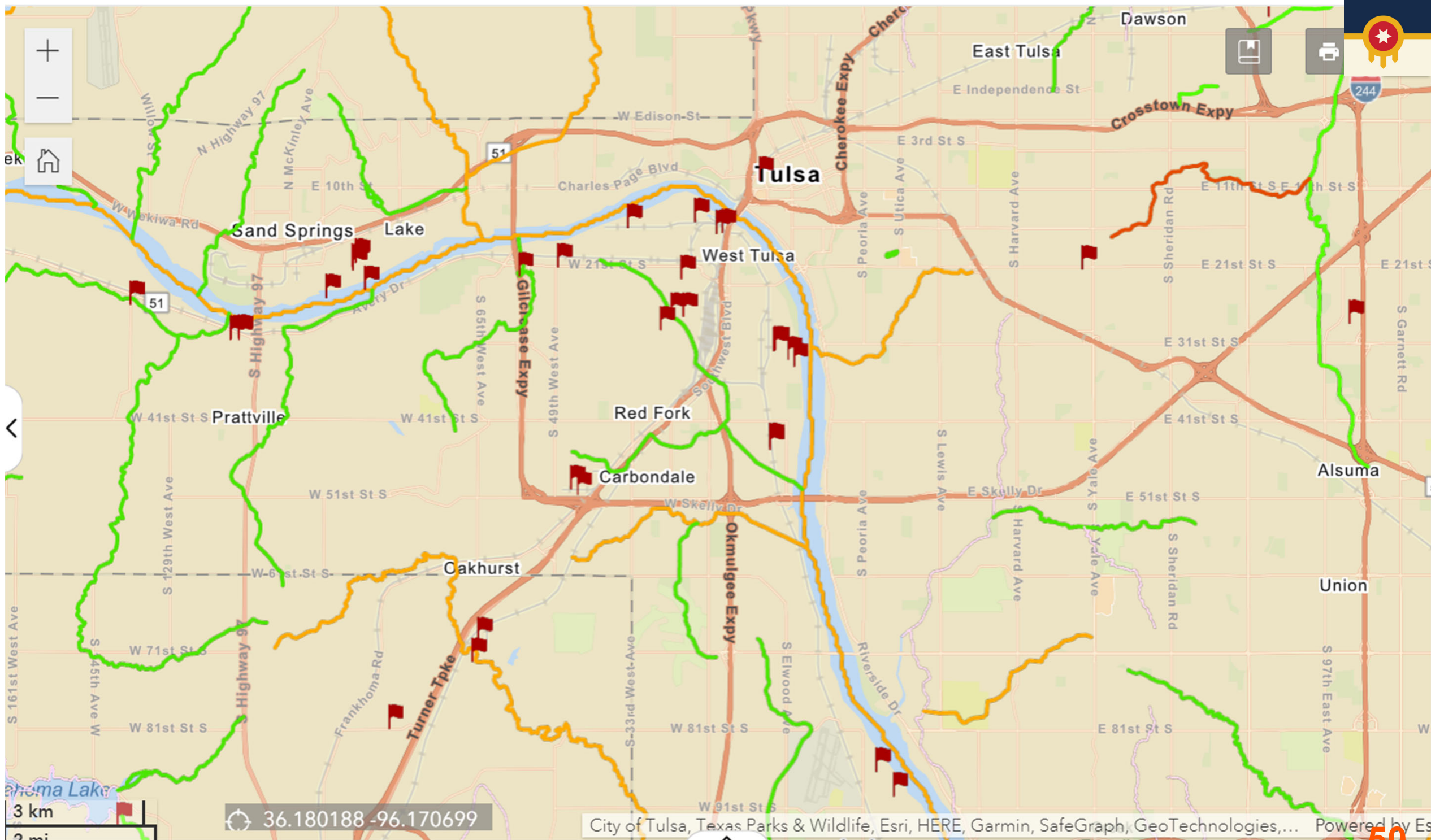




Arkansas River Water Quality – City of Tulsa



● City of Tulsa Arkansas River TMDL Preparation Sampling Site	2020 303d Waterbodies WBID	— All 2020 303d Waterbodies	□ Tulsa City Limits	 0 1/2 1 2 3 4 5 Miles	 N	
	— OK120420010010_00					
	— OK120420010010_10					
	— OK120420010130_00					



Water Quality – Discharge Permits



- + **Discharge Permits for Wastewater Treatment Plants (WWTPs)**
 - Outfalls from Southside WWTP (5300 S. Elwood Ave.) and Haikey Creek WWTP (11602 E. 151st St.) to Arkansas River permitted and regulated by ODEQ
 - A. **Effluent Limitations and Monitoring Requirements (Outfall 001)**

During the period beginning the effective date and lasting through date of expiration the permittee is authorized to discharge treated wastewater in accordance with the following limitations:

Effluent Characteristic		Discharge Limitations			Monitoring Requirements	
		Mass Loading (lb/day)	Concentrations (mg/l unless otherwise specified)		Frequency	Sample Type
			Monthly Avg.	Monthly Avg.		
Flow (mgd) [50050]	Year round	Report Monthly Average and Daily Maximum			Daily	Totalized
Biochemical Oxygen Demand-5 Day [00310]	Year round	10508.4	30	45	Daily	24-hr Comp
Total Suspended Solids [00530]	Year round	10508.4	30	45	Daily	24-hr Comp
<i>E. Coli</i> (MPN/100 ml) [51040]	May – Sep	---	126 Geo. Mean	406 Daily Max.	2/Week	Grab
	Oct – Apr	---	630 Geo. Mean	2030 Daily Max.	1/Week	
Total Residual Chlorine [50060]	Year round	---	Instantaneous Max.: No Measurable ^a		Daily	Grab
pH (standard unit) [00400]	Year round	---	6.5 – 9.0		Daily	Grab

Water Quality – Discharge Permits (con't)



+ Discharge Permits for Wastewater Treatment Plants (WWTPs)

- Quarterly acute and chronic Water Effluent Toxicity testing is performed at both plants:

1. Whole Effluent Toxicity Acute Test Reporting and Monitoring Requirements (Outfall TX1)

Effluent Characteristic			Reporting/Monitoring Requirements ^a		
Test	Critical Dilution ^f	Parameter	48-hour Min	Testing Frequency ^b	Sample Type
Routine Testing <i>Daphnia pulex</i> , 48-hour acute LC ₅₀ static renewal, freshwater	100%	Pass/Fail Survival [TIM3D]	Report	1/Quarter ^c	24-hr Comp
		LC ₅₀ Effluent Conc [TAM3D]	Report		
		% Mortality at 100% Effluent [TJM3D]	Report		
Routine Testing <i>Pimephales promelas</i> (Fathead minnow), 48-hour acute LC ₅₀ static renewal, freshwater	100%	Pass/Fail Survival [TIM6C]	Report	1/Quarter ^c	24-hr Comp
		LC ₅₀ Effluent Conc [TAM6C]	Report		
		% Mortality at 100% Effluent [TJM6C]	Report		
Retesting	Retest #1 [22415] ^d		Report	As Required ^e	24-hr Comp
	Retest #2 [22416] ^d		Report		

2. Whole Effluent Toxicity Chronic Test Reporting and Monitoring Requirements (Outfall TX1)

Effluent Characteristic			Reporting/Monitoring Requirements ^a		
Test	Critical Dilution ^f	Parameter	7-day Min	Testing Frequency ^b	Sample Type
Routine Testing <i>Ceriodaphnia dubia</i> , 7-day chronic NOEC static renewal, freshwater	15%	Pass/Fail Survival [TLP3B]	Report	1/Quarter ^c	24-hr Comp
		NOEC _L Survival [TOP3B]	Report		
		% Mortality at Critical Dilution [TJP3B]	Report		
		Pass/Fail Reproduction [TGP3B]	Report		
		NOEC _S Reproduction [TPP3B]	Report		
		% Coeff of Variation [TQP3B]	Report		
Routine Testing <i>Pimephales promelas</i> (Fathead minnow), 7-day chronic NOEC static renewal, freshwater	15%	Pass/Fail Survival [TLP6C]	Report	1/Quarter ^c	24-hr Comp
		NOEC _L Survival [TOP6C]	Report		
		% Mortality at Critical Dilution [TJP6C]	Report		
		Pass/Fail Growth [TGP6C]	Report		
		NOEC _S Growth [TPP6C]	Report		
		% Coeff of Variation [TQP6C]	Report		
Retesting	Retest #1 [22415] ^d		Report	As Required ^e	24-hr Comp
	Retest #2 [22416] ^d		Report		

Water Quality – Discharge Permits (con't)



+ Discharge Permits for Wastewater Treatment Plants (WWTPs)

- Additional stream surveillance is performed upstream and downstream of each WWTP discharge:

Stream Route	Site ID	Location	Frequency	Parameters (Lab analysis)	Parameters (Field analysis)	Reason for sampling
Arkansas River	AR3	46 th & Riverside	2x monthly	E. coli	pH, Temp., DO, Appearance, Odor, Conductivity	In accordance w/252:606-11-3(e) (upstream of SS)
Arkansas River	AR4	71 st St. bridge	2x monthly	E. coli	pH, Temp., DO, Appearance, Odor, Conductivity	In accordance w/252:606-11-3(e) (downstream of SS)
Arkansas River	AR6	US64 bridge (Bixby)	2x monthly	E. coli	pH, Temp., DO, Appearance, Odor, Conductivity	In accordance w/252:606-11-3(e) (upstream of HC)
Arkansas River	AR8	N. bank of Ark. River @ Indian Springs Sports Complex	2x monthly	E. coli	pH, Temp., DO, Appearance, Odor, Conductivity	In accordance w/252:606-11-3(e) (downstream of HC)

Water Quality Initiatives



- + Programming Committee Information
 - Establish Working Groups: Construction, Operations, Recreational Programming, Water Quality, Communication/Amenities – Complete
 - Recreational Activities Risk Categories (various working groups)
 - Physical
 - Chemical
 - Biological – today's focus

- + **WATER QUALITY PLAN – initial vs matured program**
 - *It is understood that the initial water quality plan components may be modified to improve and reflect actual needs and circumstances.*
 - *This effort as with all programming will be performed under an Adaptive Management approach – to bests address needs and circumstances.*
 - *A structured approach to decision making that emphasizes accountability in decision making. It is useful when there is uncertainty regarding the most appropriate strategy for managing resources.*

Water Quality Initiatives



- + Develop Project Components / Goals: Ongoing
 - Collection of data and inform the public and any potential users of the recreational areas associated with Zink Lake. Allow the public to make their own informed decision on accessing the water features.
 - Define risks associated with primary and secondary body contact water activities. This will include discussion of other surface water bodies.
 - Outreach and educate the public on what test results mean.

Water Quality Initiatives (con't)



- + Define water quality parameters:
 - The sampling utilizes the bacteriological indicator organisms Escherichia coli (E. Coli) for fresh water – Complete
 - Other parameters for being considered for other purposes, but are not limited to: turbidity, dissolved oxygen, pH, conductivity, temperature, flow rate, etc. - Ongoing
- + Sampling protocols for the tests:
 - Sampling sites, number of tests, frequency of tests – Ongoing
 - Approaches being investigated are more intensive sampling at fewer locations or less frequent monitoring at more locations.
 - More intensive sampling at fewer locations has historically shown better interpretation.
 - All methods of sample collection, preservation, and analysis used will be applied consistently and within established acceptable standards - Complete



Water Quality Initiatives (con't)

- + Sampling protocols for the tests: (con't)
 - Define bacterial criteria for recreational uses based on review of applicable water quality standards, established acceptable water quality programs, and water quality expert consultations.
 - Primary Body Contact Recreation – ODEQ Title 252 Chapter 730-5-16
 - Contacts and research with other entities utilizing water quality programs to date include: OKC, USACE, GRDA, ODEQ, OWRB, and USGS
 - Recreation use categories: Primary Body Contact and Secondary Body Contact – Complete
- + Water Quality Historical Reporting
 - Collection of information of known testing programs in the vicinity
 - Reviewing National Water Information/Inventory System (USGS)



Water Quality Initiatives (con't)

- + Water Quality Historical Reporting (con't)
 - A history of sampling helps provide the necessary background to evaluate long-term trends in water quality.

- + Water Quality Testing and Assessment Considerations: Ongoing
 - The approaches taken to develop "data points" for samples or group of samples taken represents a "snapshot" in time and should not be used without supporting information to characterize the water quality of the body of water.
 - Once historical data is developed with this plan, the feasibility of developing a predictive model that could be used to develop long-term correlations of turbidity with bacteria. This would allow for quicker publication of data for recreational users.
 - The data and its "snapshot" must be considered in view of Keystone releases, rainfall and runoff downstream of Keystone, temperatures, seasonal affects, and wildlife activity.



Water Quality Initiatives (con't)

- + Water Quality Testing and Assessment Considerations (con't): Ongoing
 - All natural waters support many different microorganisms. Some are parthenogenic to humans; however, most are not.
 - Water users will be made aware that murky or debris-strewn water which often occurs after storms for surface water bodies are a general indication of a poor water quality "snapshot"
 - Excessive stormwater runoff after heavy rains can carry pet waste, agricultural waste, fecal contaminants from brief sewage overflows, and/or chemicals associated with commercial / residential lawn care. The impact and/or duration of the effects of such events are affected by river flow conditions.
 - Other testing programs have noted the impacts of urban wildlife like birds nesting under bridges, e.g., pigeons, swallows, waterfowl, etc., squirrels, raccoons, rabbits, opossums, etc. contribute to the bacteria load.

Water Quality – Communication



- + Outreach and Communication with public
 - Onsite communication methods are being discussed, i.e., flagging, signs, lights, etc.
 - Website communication methods are being reviewed
 - The communication tool will be coordinated with City, County, and River Parks Authority
 - The communication must present data and contain an educational component that is simple and easy to interpret
 - Provide advisory warnings - "Rainfall runoff can carry pet waste, agricultural waste, fecal contaminants from brief sewage overflows, and other pollutants".



Water Quality – Communication (con't)



The screenshot shows the Orange County Water Atlas website. At the top, there are logos for "Orange County wateratlas" and "ORANGE COUNTY FLORIDA". A search bar is located in the top right corner. Below the logos is a navigation menu with the following items: HOME, DISCOVER, MAPS / DATA, LEARN, PARTICIPATE. The main heading is "WATER QUALITY DASHBOARD" with the subtitle "Current water quality conditions for lakes and rivers".

This dashboard reviews the most current water quality data for exceedances in 5 parameters, using Class III criteria from [Florida Administrative Code 62-302](#), to provide a snapshot of how a waterbody is doing. The parameters are Chlorophyll *a* corrected, *Escherichia coli*, Total Nitrogen, Total Phosphorus, and Secchi Depth. The colors on the dials represent the current state of the water quality based on the last data point reported. For more information on a specific lake, [visit the home page of the Water Atlas](#).

Open the Orange County Water Quality Dashboard

WATER QUALITY DASHBOARD

Orange County's newest data visualization tool

Legend

- Okay** Data point is in an acceptable range
- Caution** Data point is approaching an exceedance
- Impaired** Data point is at or above the exceedance criteria

Parameter	Value	Color
Chlorophyll <i>a</i> (µg/L)	3.6	Red
Total Nitrogen (mg/L)	0.44	Yellow
Total Phosphorus (µg/L)	0.012	Red
<i>Escherichia coli</i> (MPN/100ml)	1	Green
Secchi Depth (meters)	2.94	Green

Waterbody: Hidden, Lake
Date: 6/6/2018, 8:22:00 AM
Source: Orange County

Water Quality – Communication (con't)



WATER QUALITY DASHBOARD

Current water quality conditions for lakes and rivers

This dashboard reviews the most current water quality data for exceedances in 5 parameters, using Class III criteria from [Florida Administrative Code 62-302](#), to provide a snapshot of how a waterbody is doing. The parameters are Chlorophyll *a* corrected, *Escherichia coli*, Total Nitrogen, Total Phosphorus, and Secchi Depth. The colors on the dials represent the current state of the water quality based on the last data point reported. For more information on a specific lake, [visit the home page of the Water Atlas](#).

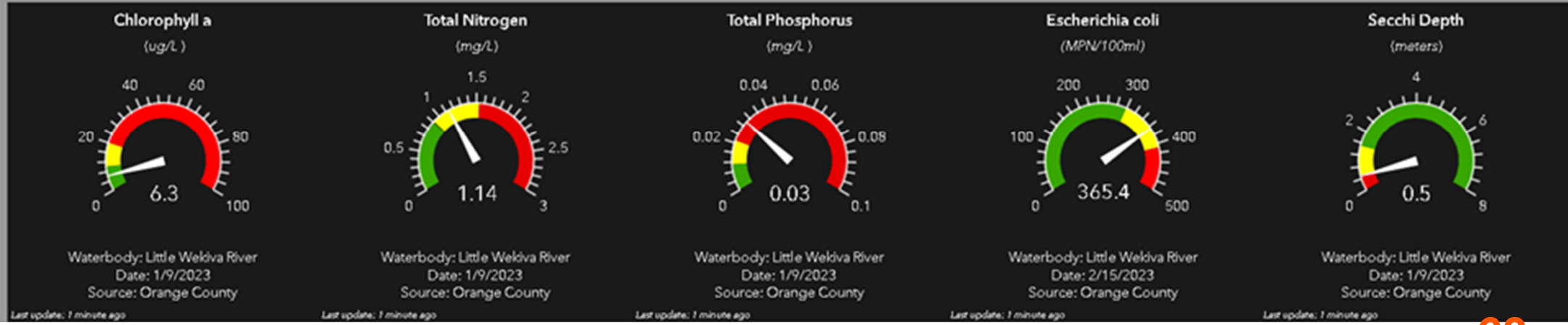
Water Quality – Communication (con't)



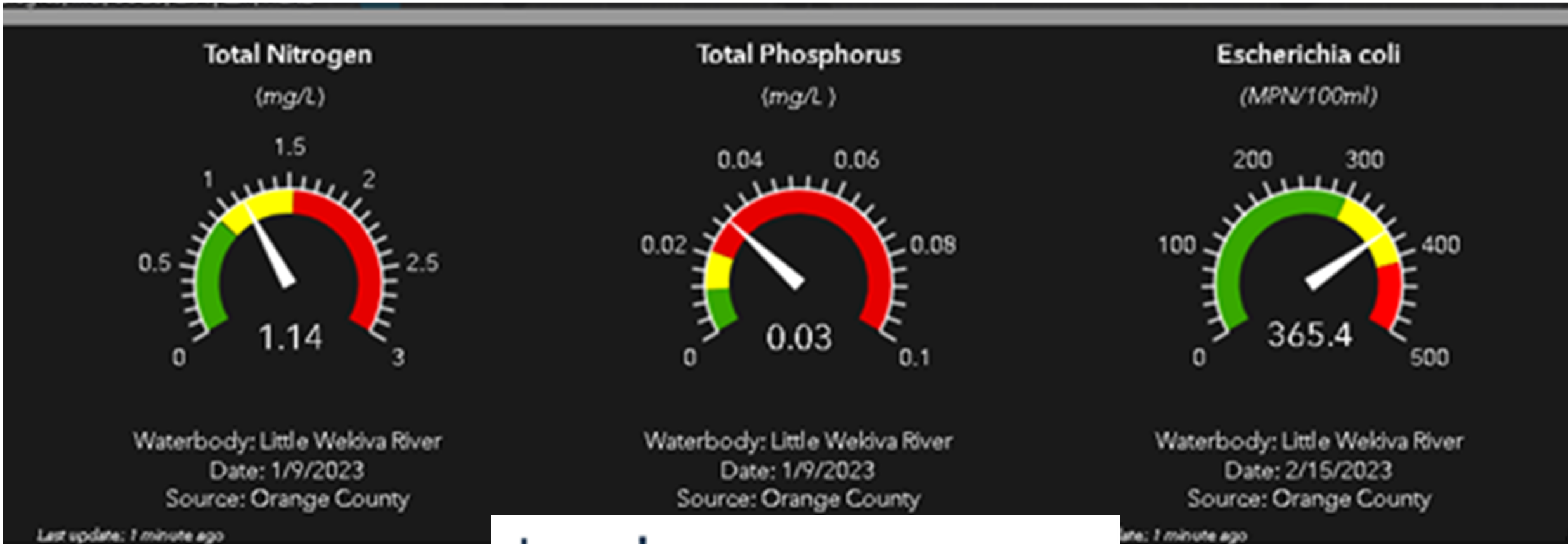
Sites

Select a site to see it on the map or open the left panel for filters by clicking on the bar with a blue triangle.

- Alden, Lake
- Anderson, Lake
- Apopka, Lake
- Avalon, Lake
- Baldwin, Lake
- Bass Lake
- Bay Lake
- Beaudair, Lake
- Berry, Lake
- Bessie, Lake
- Big (Sand), Lake
- Black Lake
- Blanche, Lake
- Blue Lake
- Boggy Creek - Beacon Park Blvd (BCG)
- Boggy Creek - S.R. 527 (BCE)
- Boggy Creek - S.R. 527A (BCB)
- Boggy Creek - S.R. 530 (BCC)
- Boggy Creek - Tradesport (BCA)
- Bryan, Lake
- Buchanan, Lake
- Bumby, Lake
- Burden, Lake
- Burkett, Lake
- Butler, Lake
- Carlton, Lake



Water Quality – Communication (con't)



Legend

- Okay** Data point is in an acceptable range
- Caution** Data point is approaching an exceedance
- Impaired** Data point is at or above the exceedance criteria

Water Quality – Communication (con't)



sara-bx.maps.arcgis.com/apps/MapSeries/index.html?appid=3a4ca132222e41589e6f41eebfe6d36d

San Antonio River Watershed Water Quality Viewer

San Antonio River Authority - Environmental Sciences

Water Quality | Primary Contact Recreation Use | Aquatic Life Use | General Use | Fish Consumption Use

San Antonio River Authority

Use filters below to help reduce the number of alternatives on the stations' map or search by station id on the right.

Current | Historic | Recreation

by Counties [Download data by County.](#)

by Watersheds [Download data by Watershed.](#)

Search by Station ID:

Stations Map

Current = Data Less than a year old, Historic = Older than one year, Recreation = Weekly

STATION
DESCRIPTION
Select a station on the map
SEGMENT
WATHERSHED

Courties: 9 Watersheds: 13 Stations: 263

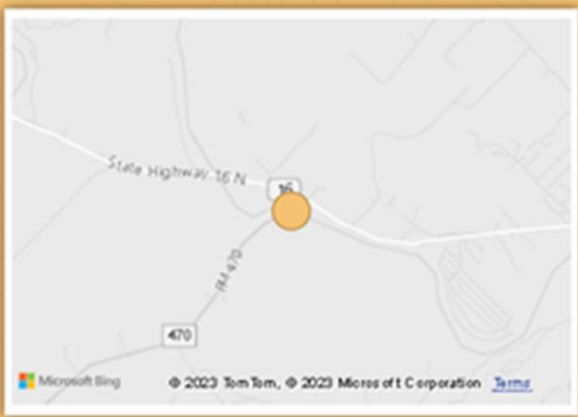
How Can I Help?

Water Quality – Communication (con't)



Station Name
Medina River At FM 470

Station ID
12832



Latitude: 29.73326 **Longitude:** -99.114554



Upstream



Downstream

- Bacteria
- Aquatic Community
- Nutrients
- Suspended and Dissolved Solids



DID YOU KNOW?

Human, pet and cattle bacteria sources are the ones we can most easily prevent.

How much?

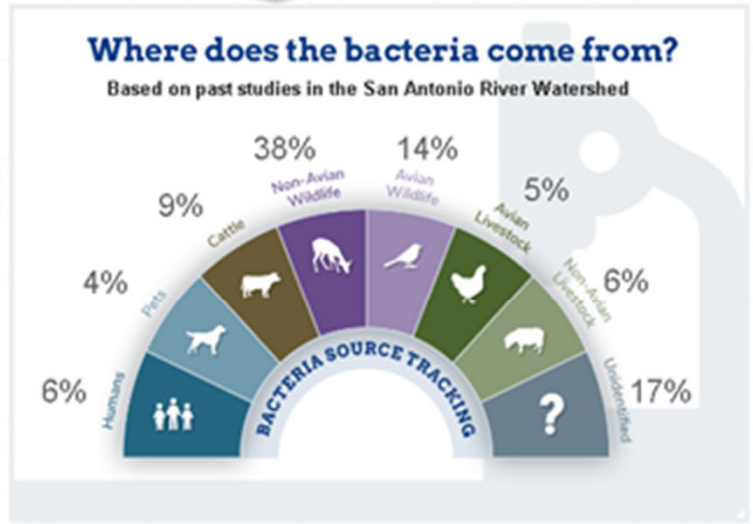
Primary and secondary recreation standards exceeded above 630 MPN/100 mL

Secondary Contact Recreation — up to 630 MPN/100ml

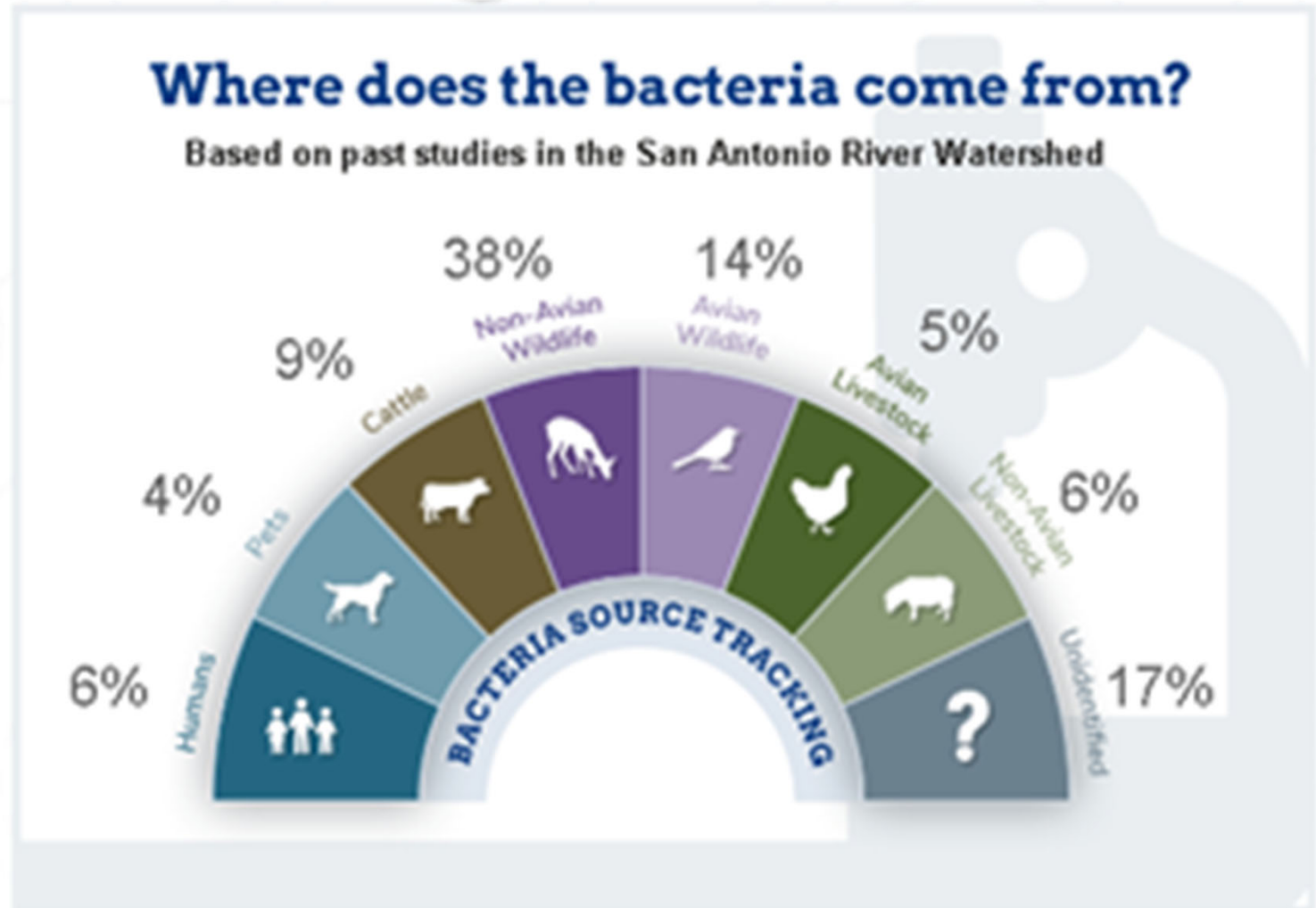
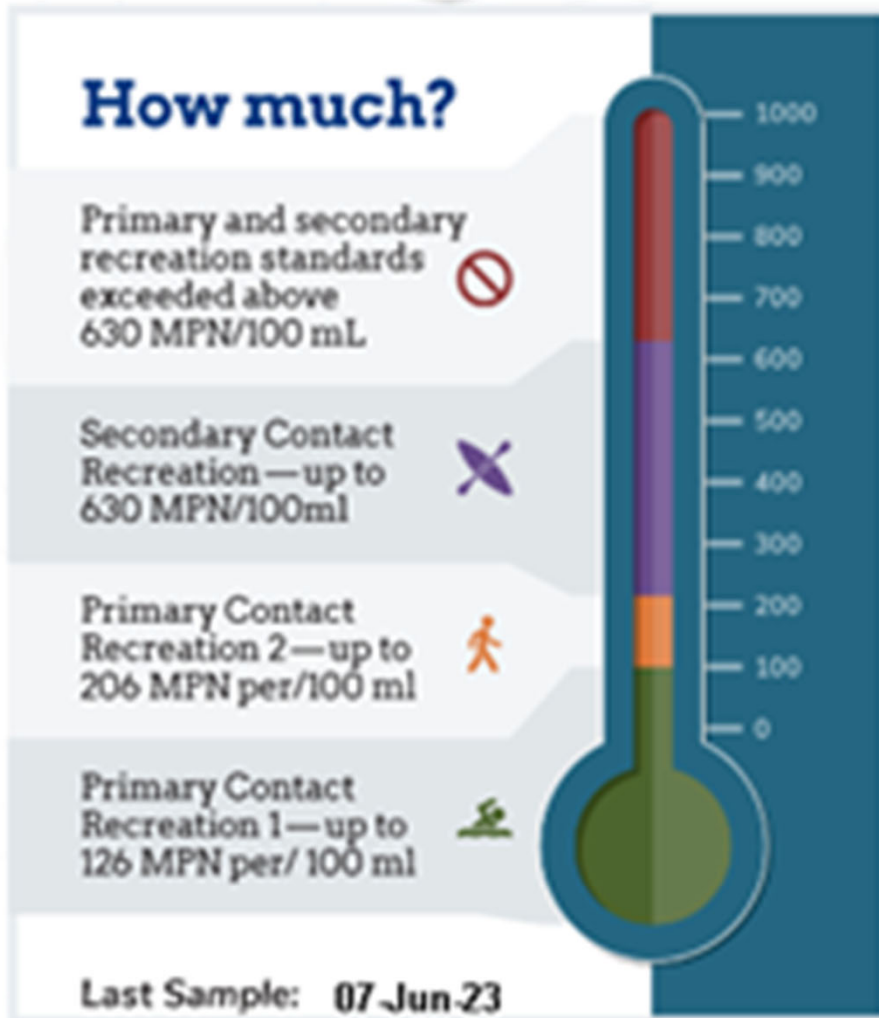
Primary Contact Recreation 2 — up to 206 MPN per/100 ml

Primary Contact Recreation 1 — up to 126 MPN per/ 100 ml

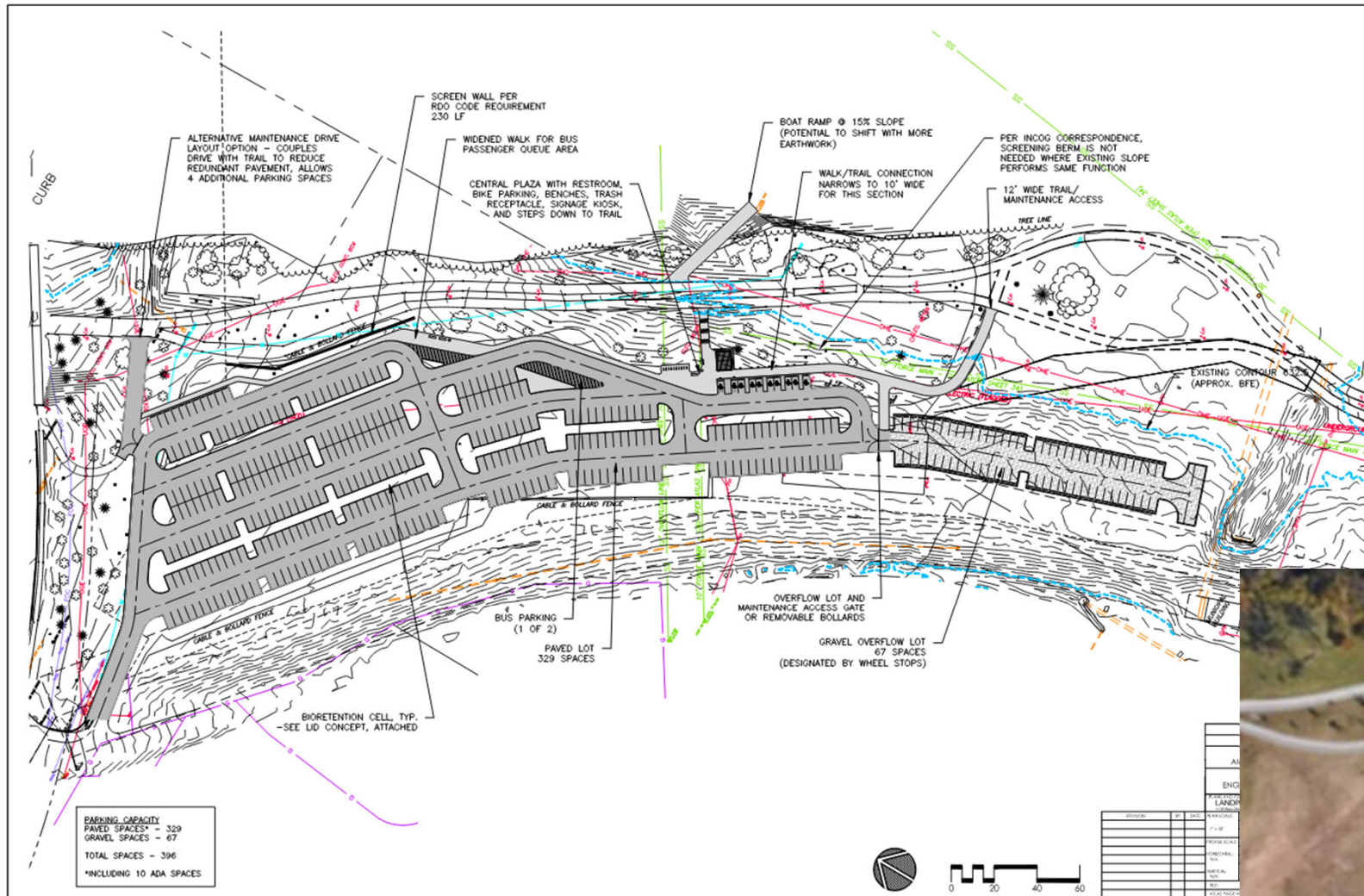
Last Sample: 07-Jun-23



Water Quality – Communication (con't)



Related Capital Improvements



- + 23rd Street Parking
 - Increased to 329 paved spaces
 - Plus 67 gravel overflow spaces
 - Previous parking lot contained 72 parking spaces



Related Capital Improvements

- + Restroom facility west and east
- + Lake access / waterfront
- + Recreational vendors / amenities
- + Additional parking, east and west side
- + Other – needs



Related Capital Improvements

- + More pics of restroom facilities WOKA, McCullough, others





Thank You

www.cityoftulsa.org
Search: Zink Dam and Lake
for project info and FAQs



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A New Kind of Energy.™