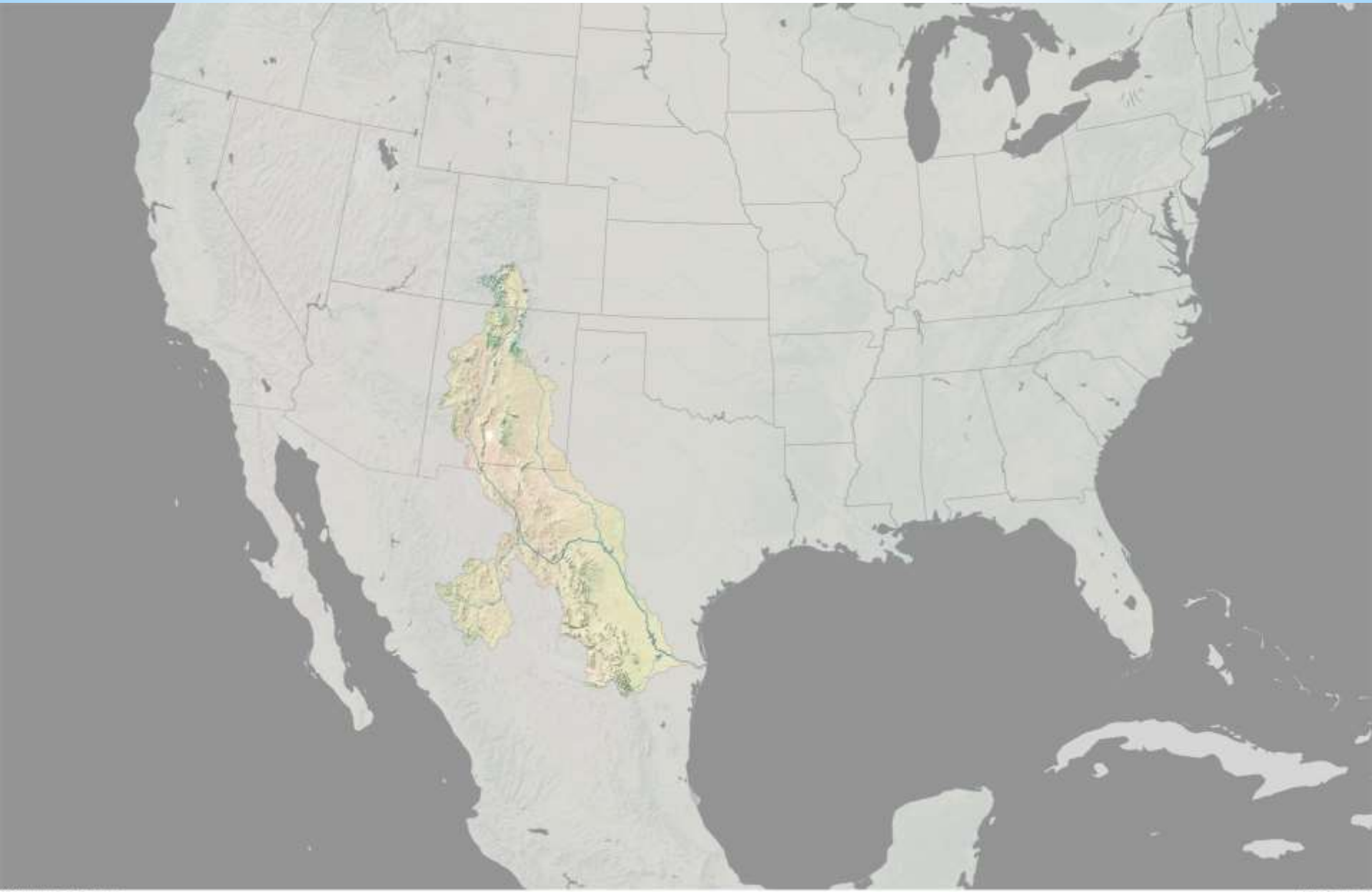
Lower Rio Grande/Río Bravo Water Quality Initiative (LRGWQI)

Wayne Belzer
Environmental Engineer
International Boundary and Water Commission, United States Section

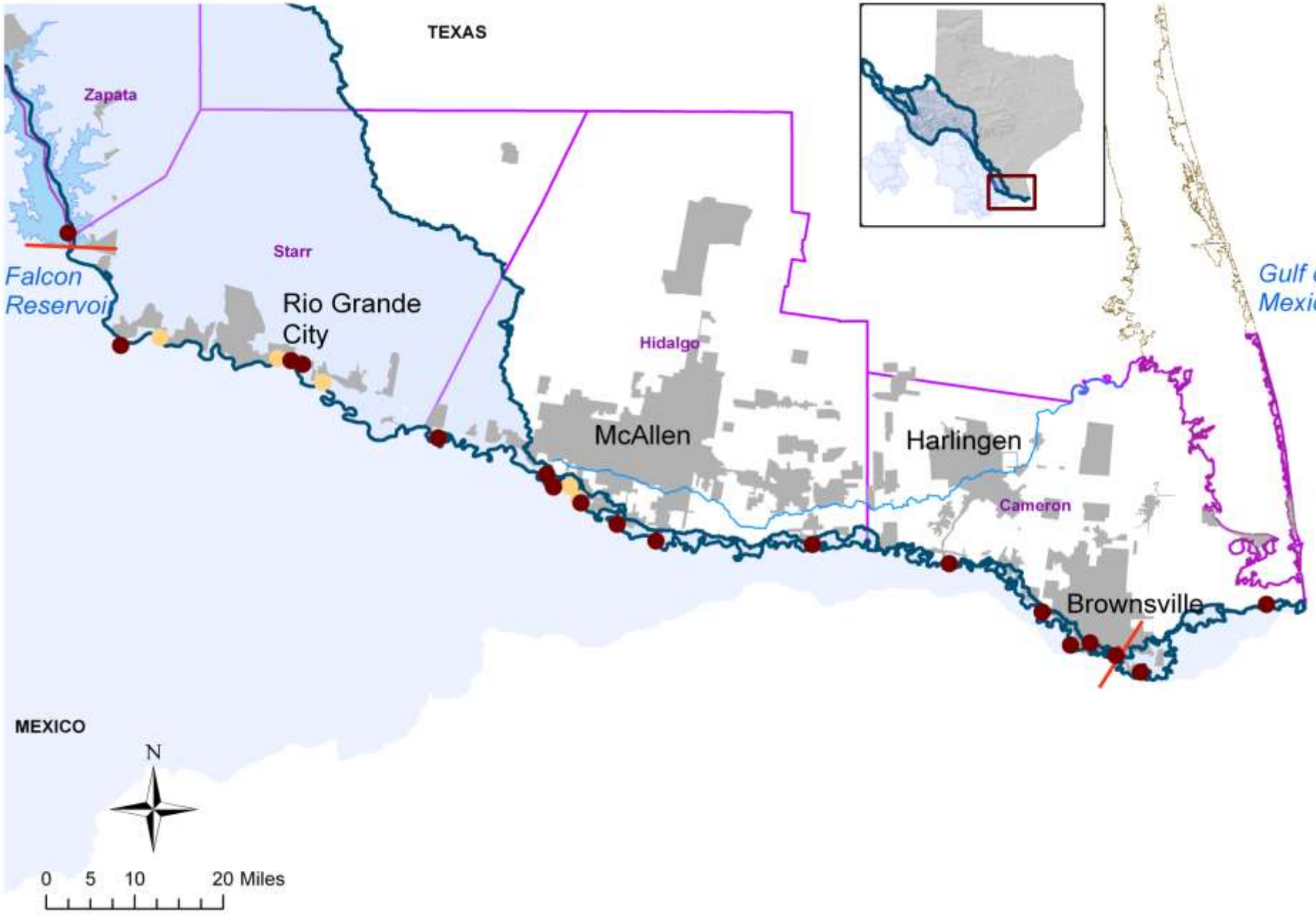
History of the IBWC

* Treaty of Guadalupe-Hidalgo of 1848 established the International Boundary between the U.S. and Mexico
* Convention of 1889 established the IBC to resolve boundary disputes.
* Convention of 1906 provided for distribution of surface waters between the two countries.
* Treaty of 1944 changed the name to IBWC and provided the mission to allocate waters, build dams, flood control, address sanitation.
* Treaty of 1970 resolved boundary differences for maintaining the Rio Grande and Colorado River boundaries.
* Commission consists of a Unites States and a Mexican Section.

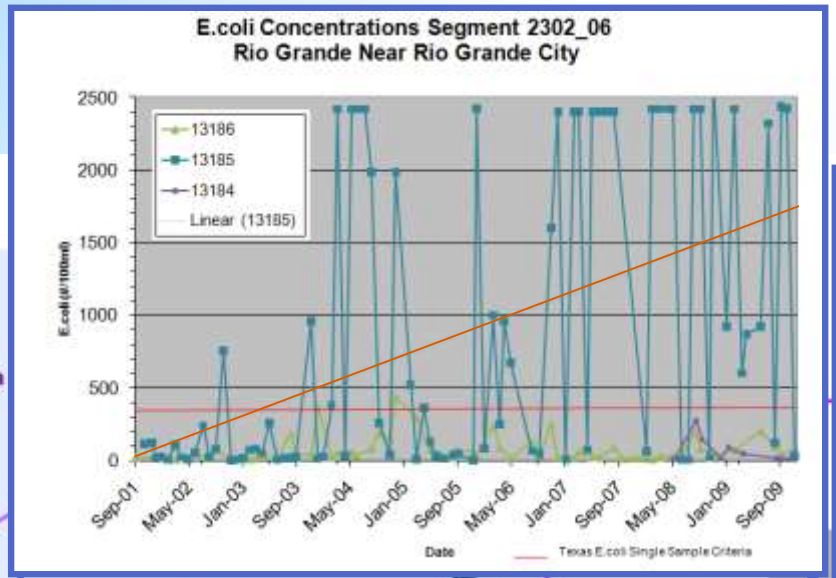

Water sources in the Southwest
NOAA Climate.gov

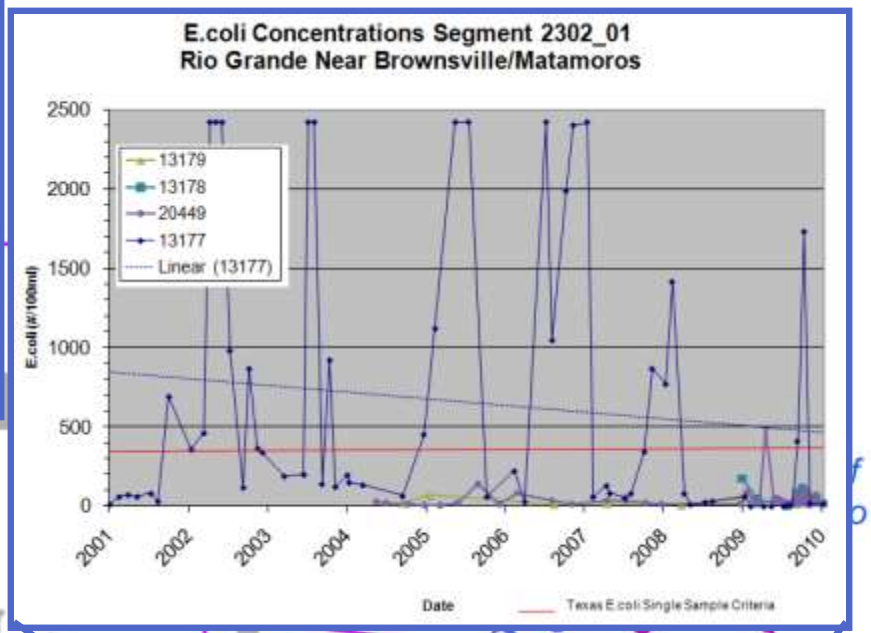
Monitoring Efforts in the Rio Grande Basin

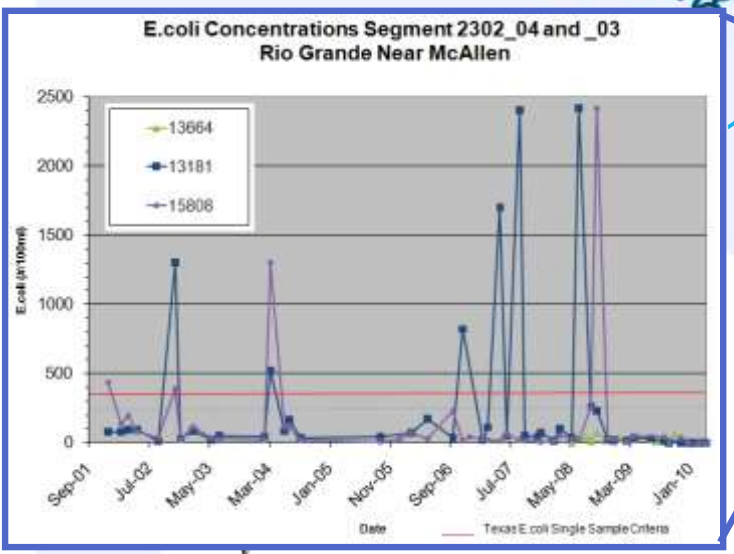
- IBWC has been sampling water quality for:
  - 1977: Joint Report of Engineers
  - Rio Grande Water Bulletin
  - Special projects under Minutes (i.e. Toxic Substances studies - IBWC Minute 289 and Laredo/NL study - Minute 297)
- In 1998 IBWC Rio Grande sampling efforts were merged with efforts by the State of Texas
- Samples for use by the US for Clean Water Act assessment requirements, permitting, and identification of water quality issues.


TEXAS
Zapata
Starr
Falcon
Reservoir
Rio Grande
City
Hidalgo
McAllen
Harlingen
Cameron
Brownsville
Gulf of
Mexico
MEXICO
N
0 5 10 20 Miles

* Bacteria - Lower RG



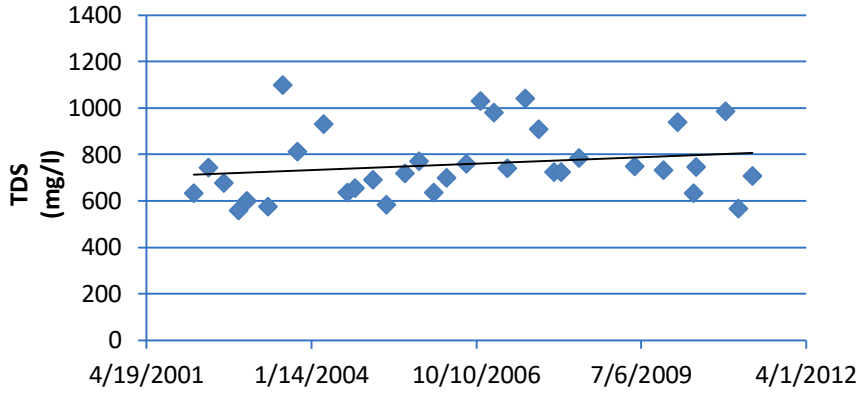




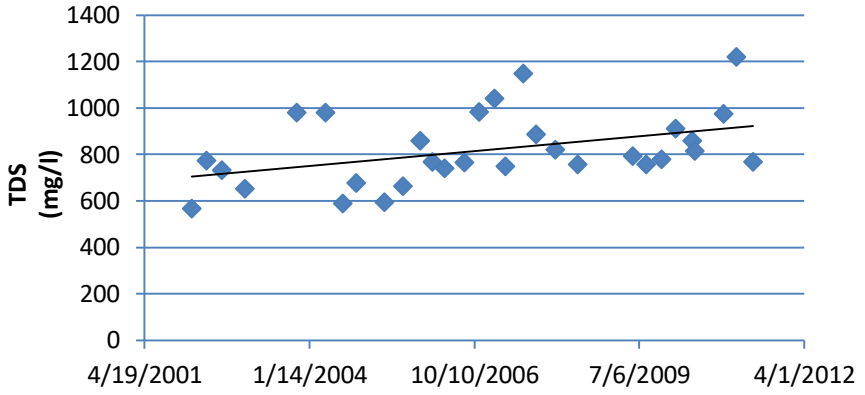
Zapata
Falcon Reservoir
Starr
Rio Grande City
Hidalgo
McAllen
Harlingen
Cameron
Brownsville
13186
13185
13184
13664
13181
15808
13179
20449
13178
13177

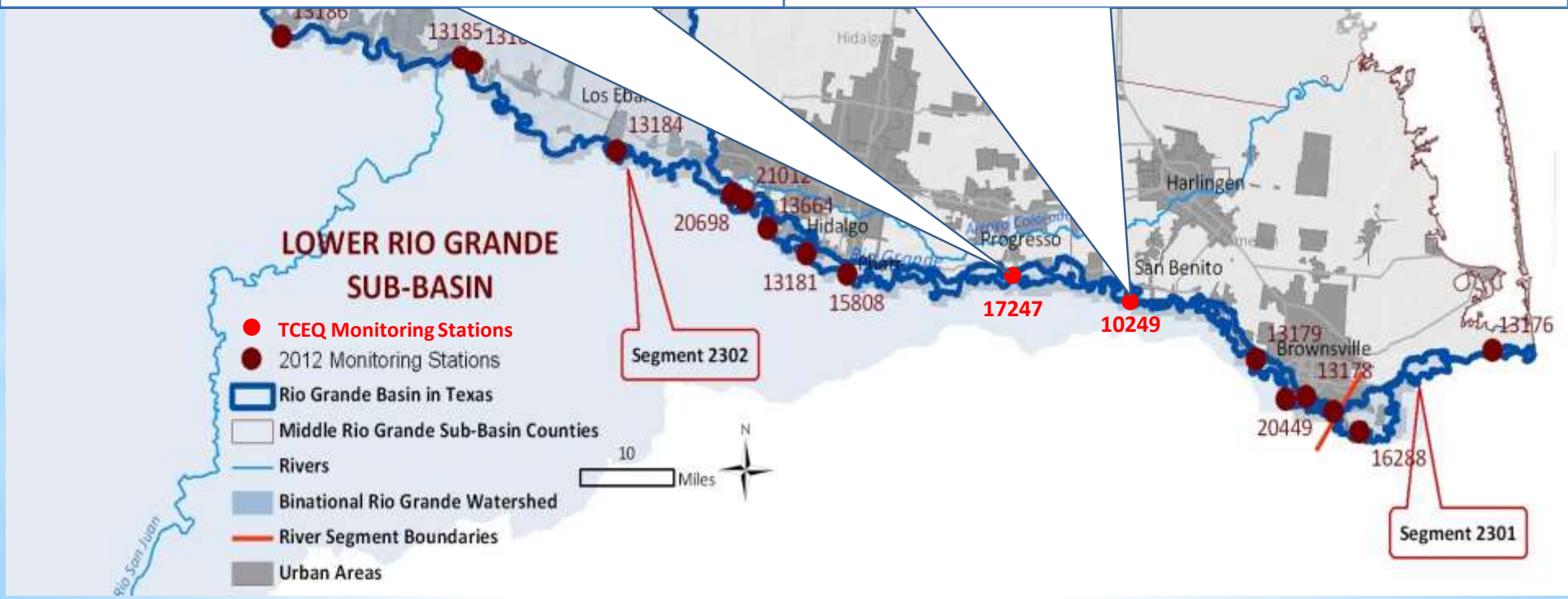
Total Dissolved Solids

Station 17247



Station 10249





Signed by authorized representative of both countries.

Developed binational agreement and framework.

*Terms of Reference

Objectives

* a. Address current and future water quality issues of the Lower Rio Bravo/Rio Grande.
* b. Implement management procedures and programs that enable affected parties to manage wastewater discharges and improve water quality conditions.
* c. Evaluate current wastewater discharge infrastructure and management strategies for the potential for improving the quality of effluent discharges into the Lower Rio Bravo/Rio Grande.
* d. Evaluate new mechanisms and strategies for system operations that could improve ambient water quality and address border sanitation concerns.
* e. Improve salinity management for return flows into the Lower Rio Bravo/Rio Grande.
* f. Based on the results of the evaluations carried out, implement programs and projects to meet these objectives as appropriate, and result in measurable and sustainable improvements in the ambient water quality of the Lower Rio Bravo/Rio Grande.

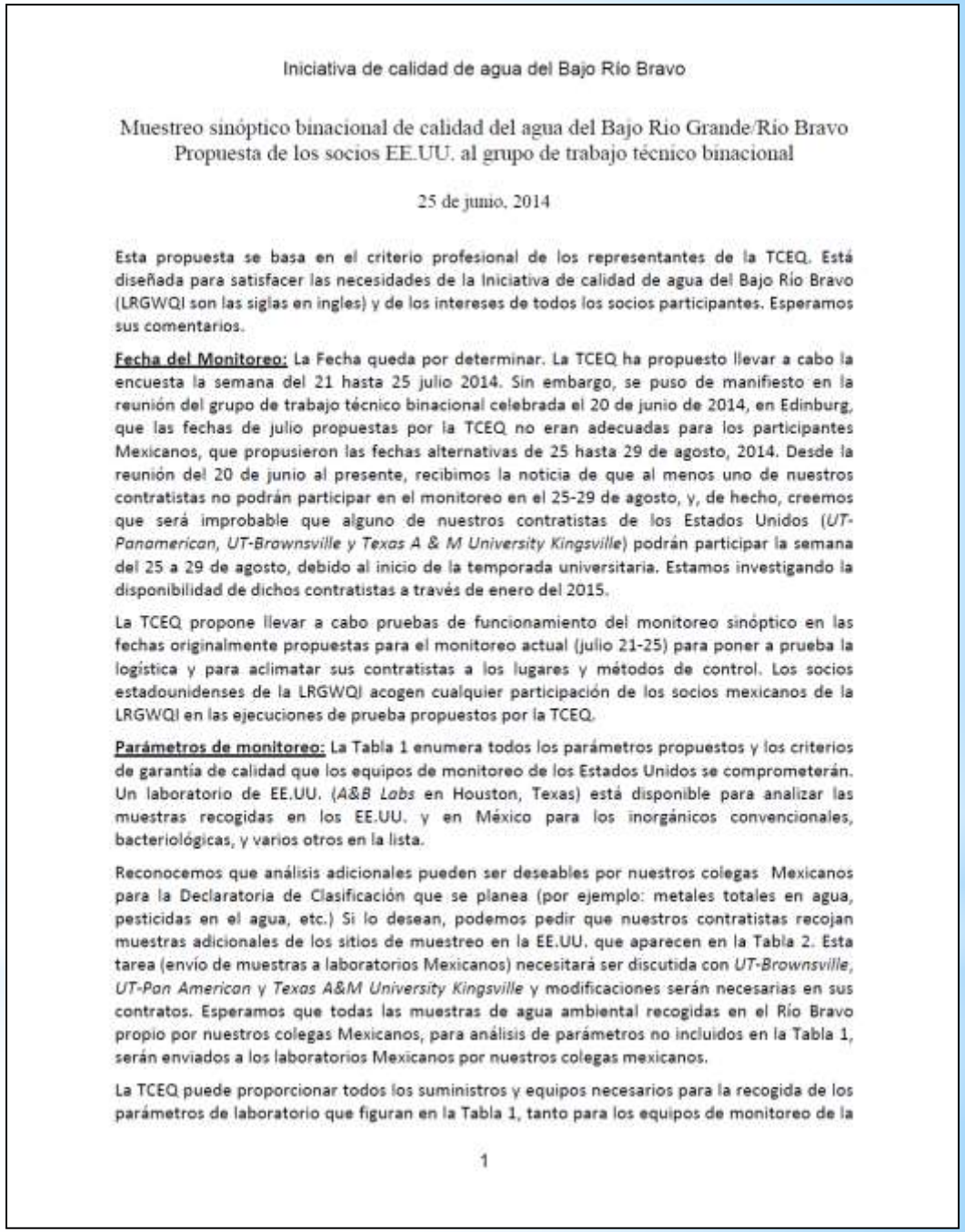
Support provided by state Universities in both countries and from BECC/COCEF

*Agencies

US Proposal for LRGWQI Binational Synoptic Survey June, 2014

* Proposes 53 binational sites total and 52 parameters to be measured/analyzed

* Proposes an exchange of water samples collected on opposite sides of the river for lab analysis in the US and Mexico



Iniciativa de calidad de agua del Bajo Río Bravo

Muestreo sinóptico binacional de calidad del agua del Bajo Rio Grande/Río Bravo
Propuesta de los socios EE.UU. al grupo de trabajo técnico binacional

25 de junio, 2014

Esta propuesta se basa en el criterio profesional de los representantes de la TCEQ. Está diseñada para satisfacer las necesidades de la Iniciativa de calidad de agua del Bajo Río Bravo (LRGWQI son las siglas en ingles) y de los intereses de todos los socios participantes. Esperamos sus comentarios.

Fecha del Monitoreo: La Fecha queda por determinar. La TCEQ ha propuesto llevar a cabo la encuesta la semana del 21 hasta 25 julio 2014. Sin embargo, se puso de manifiesto en la reunión del grupo de trabajo técnico binacional celebrada el 20 de junio de 2014, en Edinburg, que las fechas de julio propuestas por la TCEQ no eran adecuadas para los participantes Mexicanos, que propusieron las fechas alternativas de 25 hasta 29 de agosto, 2014. Desde la reunión del 20 de junio al presente, recibimos la noticia de que al menos uno de nuestros contratistas no podrán participar en el monitoreo en el 25-29 de agosto, y, de hecho, creemos que será improbable que alguno de nuestros contratistas de los Estados Unidos (*UT-Panamerican, UT-Brownsville y Texas A & M University Kingsville*) podrán participar la semana del 25 a 29 de agosto, debido al inicio de la temporada universitaria. Estamos investigando la disponibilidad de dichos contratistas a través de enero del 2015.

La TCEQ propone llevar a cabo pruebas de funcionamiento del monitoreo sinóptico en las fechas originalmente propuestas para el monitoreo actual (julio 21-25) para poner a prueba la logística y para aclimatar sus contratistas a los lugares y métodos de control. Los socios estadounidenses de la LRGWQI acogen cualquier participación de los socios mexicanos de la LRGWQI en las ejecuciones de prueba propuestos por la TCEQ.

Parámetros de monitoreo: La Tabla 1 enumera todos los parámetros propuestos y los criterios de garantía de calidad que los equipos de monitoreo de los Estados Unidos se comprometerán. Un laboratorio de EE.UU. (*A&B Labs* en Houston, Texas) está disponible para analizar las muestras recogidas en los EE.UU. y en México para los inorgánicos convencionales, bacteriológicas, y varios otros en la lista.

Reconocemos que análisis adicionales pueden ser deseables por nuestros colegas Mexicanos para la Declaratoria de Clasificación que se planea (por ejemplo: metales totales en agua, pesticidas en el agua, etc.) Si lo desean, podemos pedir que nuestros contratistas recojan muestras adicionales de los sitios de muestreo en la EE.UU. que aparecen en la Tabla 2. Esta tarea (envío de muestras a laboratorios Mexicanos) necesitará ser discutida con *UT-Brownsville, UT-Pan American* y *Texas A&M University Kingsville* y modificaciones serán necesarias en sus contratos. Esperamos que todas las muestras de agua ambiental recogidas en el Río Bravo propio por nuestros colegas Mexicanos, para análisis de parámetros no incluidos en la Tabla 1, serán enviados a los laboratorios Mexicanos por nuestros colegas mexicanos.

La TCEQ puede proporcionar todos los suministros y equipos necesarios para la recogida de los parámetros de laboratorio que figuran en la Tabla 1, tanto para los equipos de monitoreo de la

1

Pilot Project

- Phase 1
  - Historical data review
  - Identification of data gaps
  - Data collection
  - Data analysis and modeling
- Phase 2
  - Expanded sampling
  - Source Identification
  - Recommendations
  - Implementation
  - Development of a binational watershed protection plan

Watershed Protection Plan

* Develop recommendations by using the model to determine effective solutions.
* Recommendations come from scientific community, public input, emergent technologies, best management practices from other projects.
* Expected completion in 2018

Historical Data

* Historical data was shared between the two countries of all historical data available from all agencies for the years of 2000-2014

* Data was merged and analyzed for trends in the indicator parameters.

* Data was analyzed for changes over time and spatially

Synoptic Surveys

* Synoptic surveys were collected seasonally in 2015.
* Samples were collected by 6 binational teams that collected samples across 2 days
* Samples were split between the 2 countries for laboratory analysis
* Data used to calibrate the steady state model

LRGWQI Synoptic Surveys

* Goals:
  * Fulfill both binational & national monitoring objectives associated with the LRGWQI pilot project
  * Characterize water quality (synoptically) from Falcon Reservoir to the Gulf of Mexico and obtain input and calibration data to model water quality in the Lower Rio Grande/Río Bravo
* Objective
  * Collect water quality data of known quality in the main stem of the Lower Rio Grande/Río Bravo and all major tributaries and wastewater outfalls

Survey

* When: seasonal in 2015
* Sites: Main stem sites

  Wastewater outfall sites

  Tributary sites

Parameters:

DO, pH, Sp. Conductance and Temp (24-hr and instantaneous)

Bacteria (Fecal Colifom, E. coli, Enterococcus)

CBOD5 (filtered and unfiltered)

NH_3-N, NO_2+NO_3, TKN

Ortho-P, TP

TDS, Sulfate, Chlorides

TSS, VSS

Chlorophyll a

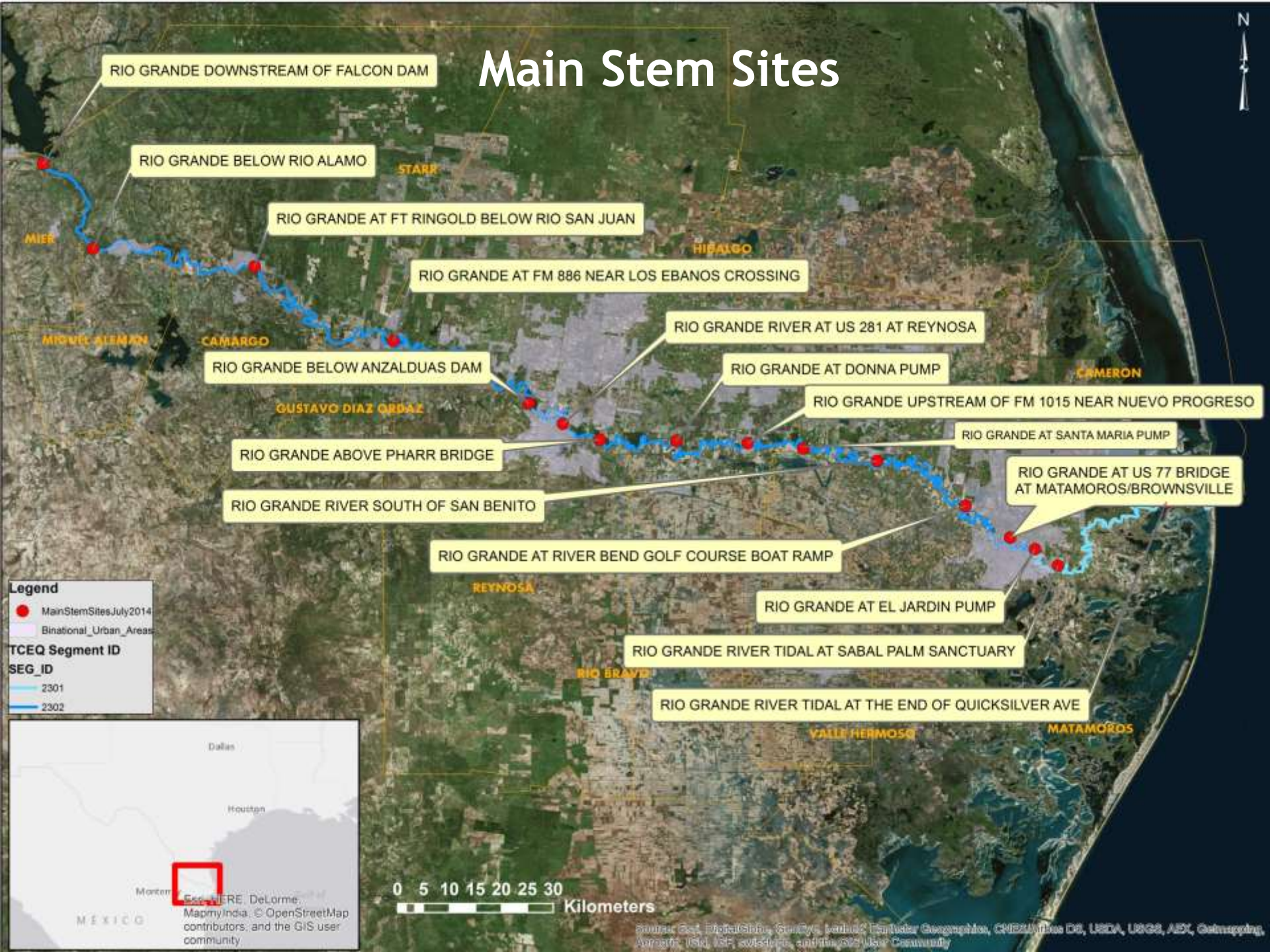
Transparency (Secchi)

Field Observations

Flow*

Synoptic Sampling Sites

* 16 main stem sites
* 3 tributaries in Mexico (Arroyo El Coronel, Río Alamo, Río San Juan)
* 1 tributary site in the U.S. (Arroyo Los Olmos)
* 7 drains in Mexico (Rancherias, Puertecitos, Huizache, El Morillo, El Anhelo, Los Fresnos, Los Indios)
* 16 wastewater outfalls in Mexico
* 12 wastewater outfall sites in the U.S.

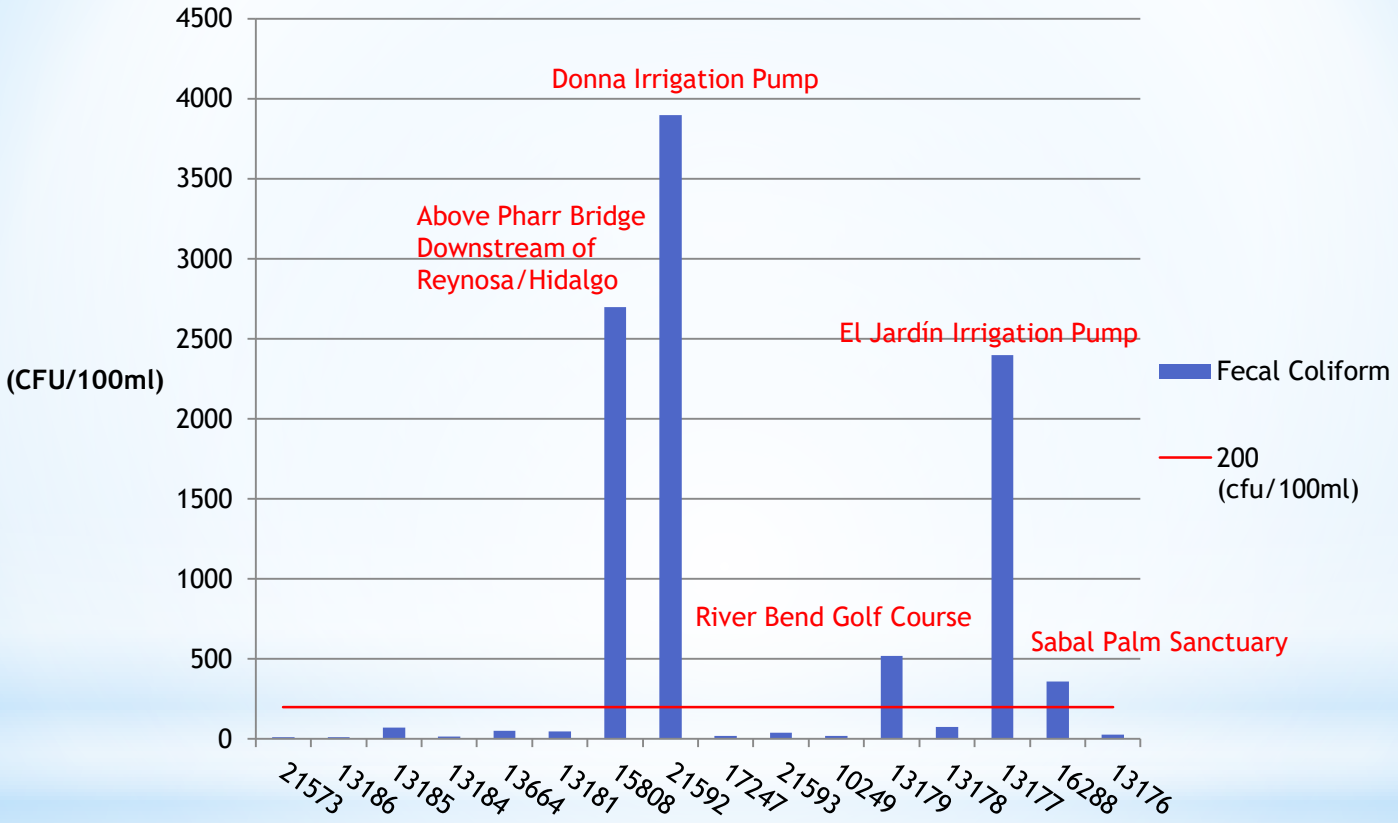

Main Stem Sites
RIO GRANDE DOWNSTREAM OF FALCON DAM
RIO GRANDE BELOW RIO ALAMO
RIO GRANDE AT FT RINGOLD BELOW RIO SAN JUAN
RIO GRANDE AT FM 886 NEAR LOS EBANOS CROSSING
RIO GRANDE RIVER AT US 281 AT REYNOSA
RIO GRANDE BELOW ANZALDUAS DAM
RIO GRANDE AT DONNA PUMP
RIO GRANDE UPSTREAM OF FM 1015 NEAR NUEVO PROGRESO
RIO GRANDE AT SANTA MARIA PUMP
RIO GRANDE ABOVE PHARR BRIDGE
RIO GRANDE AT US 77 BRIDGE AT MATAMOROS/BROWNSVILLE
RIO GRANDE RIVER SOUTH OF SAN BENITO
RIO GRANDE AT RIVER BEND GOLF COURSE BOAT RAMP
RIO GRANDE AT EL JARDIN PUMP
RIO GRANDE RIVER TIDAL AT SABAL PALM SANCTUARY
RIO GRANDE RIVER TIDAL AT THE END OF QUICKSILVER AVE
STARR
HIDALGO
CAMERON
MIER
MIGUEL ALEMAN
CAMARGO
GUSTAVO DIAZ ORDAZ
REYNOSA
RIO BRAVO
VALLE HERMOSO
MATAMOROS
N
Legend
MainStemSitesJuly2014
Binational_Urban_Areas
TCEQ Segment ID
SEG_ID
2301
2302
Dallas
Houston
MEXICO
0 5 10 15 20 25 30
Kilometers
Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community

Wastewater Outfall Sites

Synoptic Monitoring Site – Arroyo Los olmos

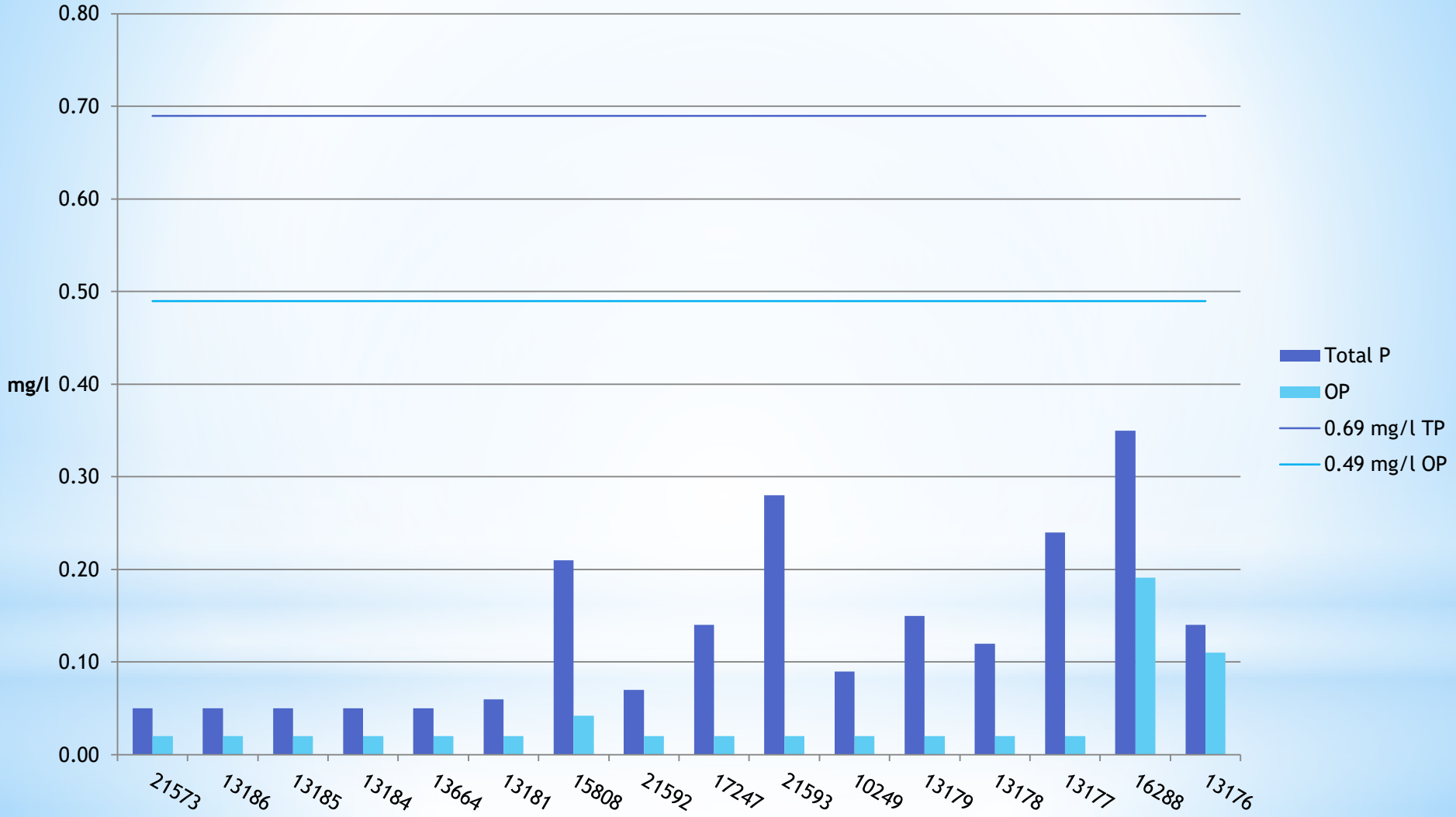
Main Stem Monitoring Stations

Bacteria - Fecal Coliform



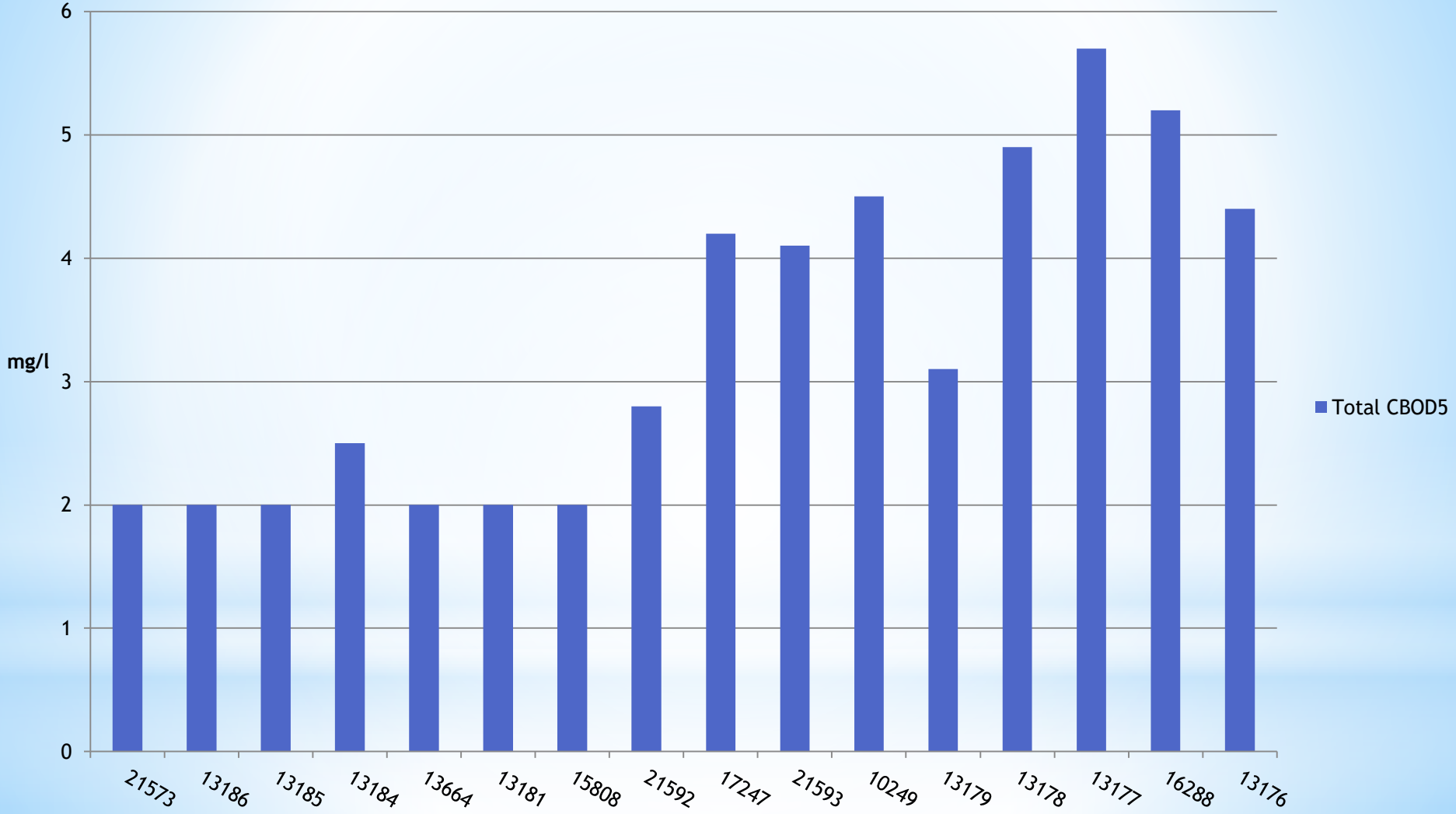
Main Stem Monitoring Stations

Nutrients - Orthophosphate and Total Phosphorus



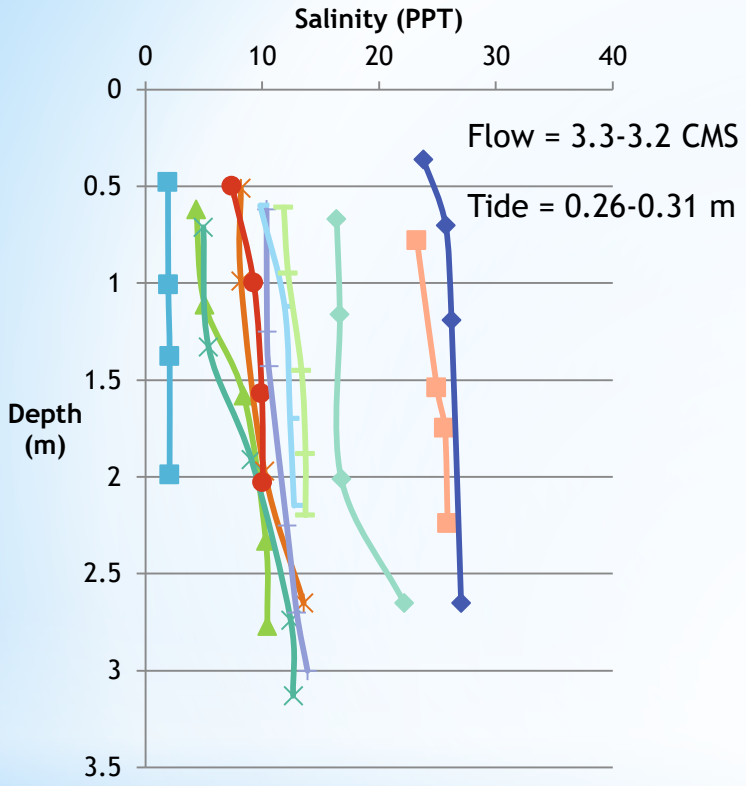
Main Stem Monitoring Stations

5-Day Carbonaceous Biochemical Oxygen Demand



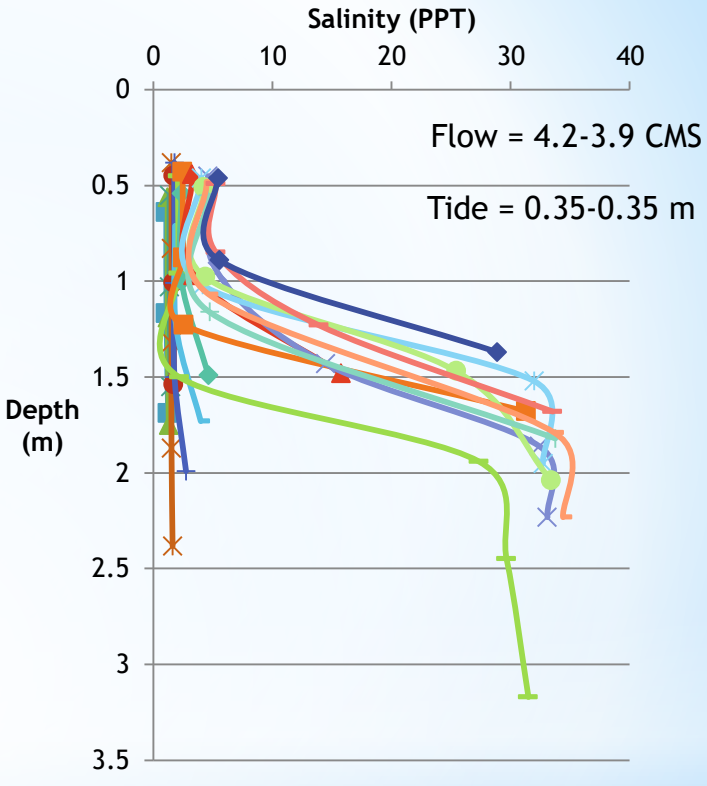
Salinity Profiles

Rio Grande Tidal 6/17/2014

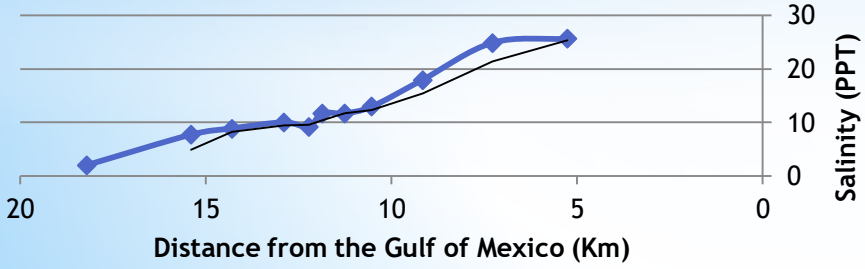


Salinity Profiles

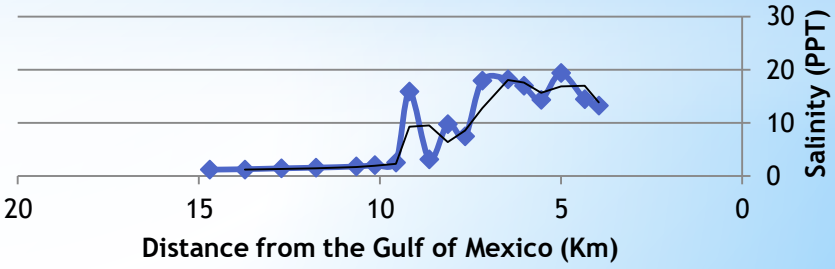
Rio Grande Tidal 7/18/2014



Depth-Averaged Longitudinal Salinity Gradient

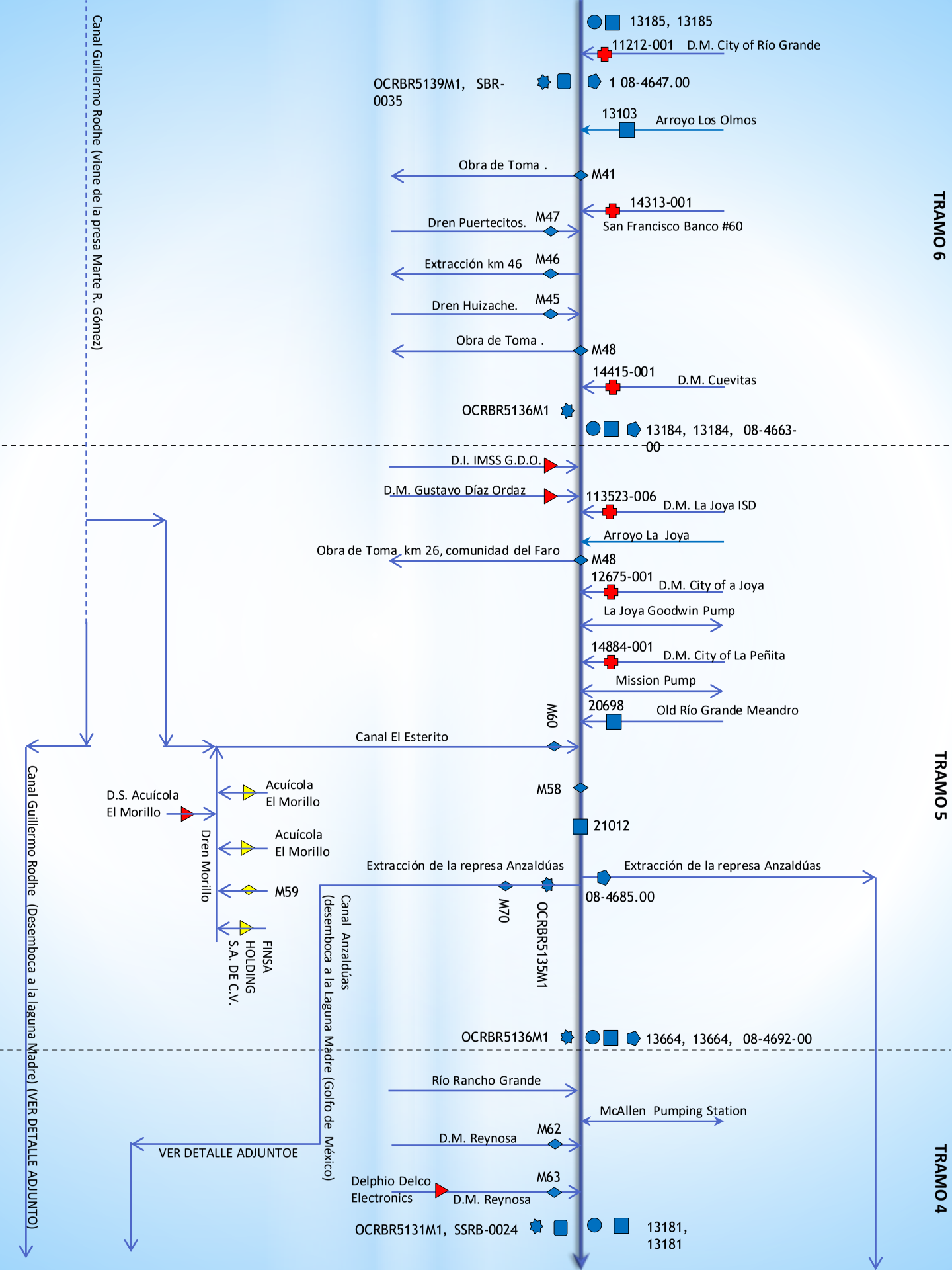


Depth-Averaged Longitudinal Salinity Gradient



LaQual Model

* Developed by State of Louisiana based on the Texas water quality model (Qual-TX)
* Simple 1 dimensional model
* Built in equations for water quality attenuation, sensitivities, impacts.
* Allows for rapid analysis of changes in parameters


TRAMO 6
TRAMO 5
TRAMO 4
13185, 13185
11212-001
D.M. City of Río Grande
OCRBR5139M1, SBR-0035
1 08-4647.00
13103
Arroyo Los Olmos
Obra de Toma .
M41
14313-001
Dren Puertecitos.
M47
San Francisco Banco #60
Extracción km 46
M46
Dren Huizache.
M45
Obra de Toma .
M48
14415-001
D.M. Cuevitas
OCRBR5136M1
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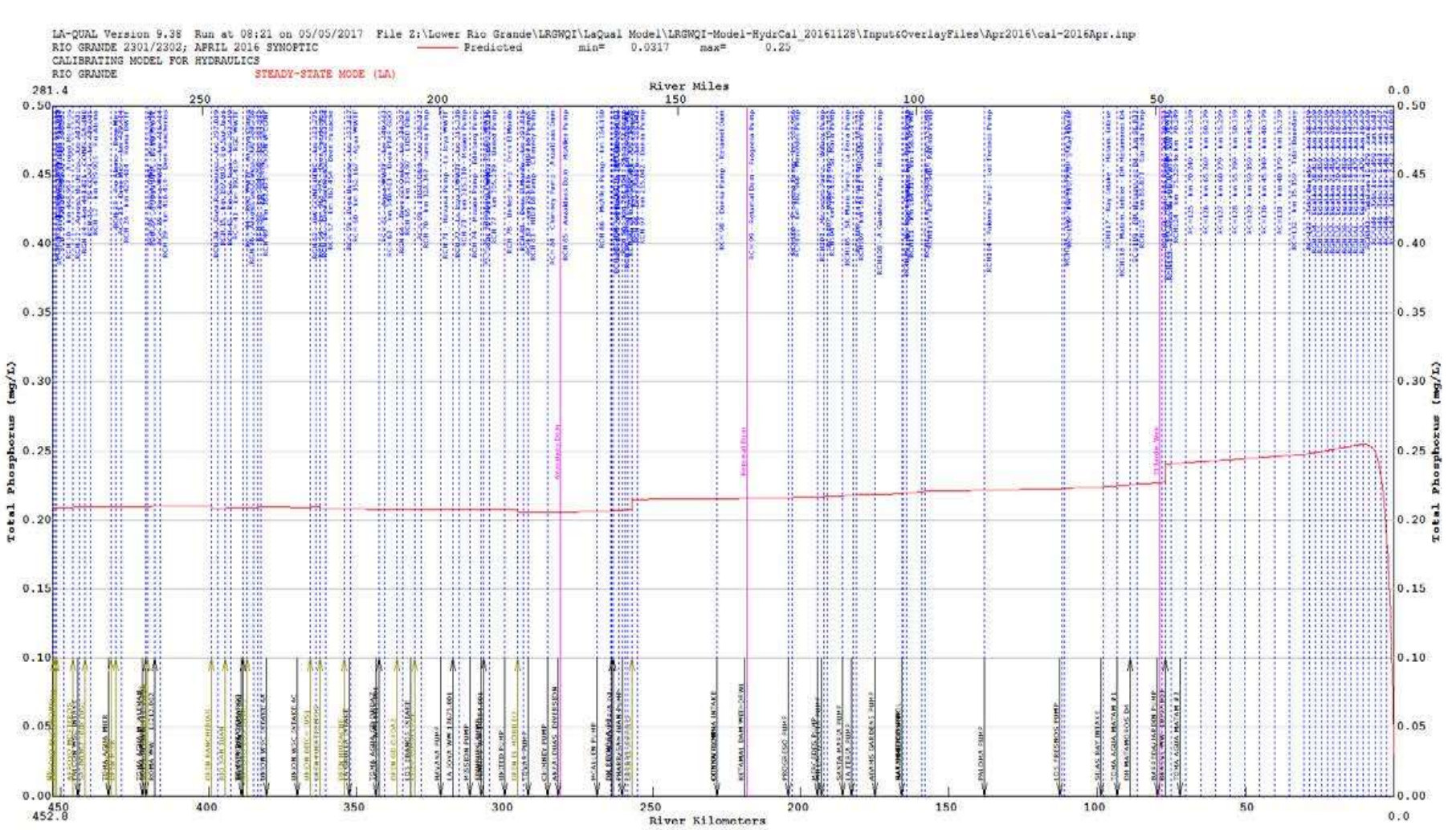
D.I. IMSS G.D.O.
D.M. Gustavo Díaz Ordaz
113523-006
D.M. La Joya ISD
Arroyo La Joya
Obra de Toma, km 26, comunidad del Faro
M48
12675-001
D.M. City of a Joya
La Joya Goodwin Pump
14884-001
D.M. City of La Peñita
Mission Pump
20698
Old Río Grande Meandro
M60
Canal El Esterito
Canal Guillermo Rodhe (viene de la presa Marte R. Gómez)
Canal Guillermo Rodhe (Desemboca a la laguna Madre) (VER DETALLE ADJUNTO)
D.S. Acuícola El Morillo
Acuícola El Morillo
Acuícola El Morillo
Dren Morillo
M59
FINSA HOLDING S.A. DE C.V.
M58
21012
Extracción de la represa Anzaldúas
M70
OCRBR5135M1
Extracción de la represa Anzaldúas
08-4685.00
Canal Anzaldúas (desemboca a la Laguna Madre (Golfo de México)
OCRBR5136M1
13664, 13664, 08-4692-00
Río Rancho Grande
McAllen Pumping Station
D.M. Reynosa
M62
VER DETALLE ADJUNTOE
Delphio Delco Electronics
M63
D.M. Reynosa
OCRBR5131M1, SSRB-0024
13181, 13181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RIO GRANDE 2301/2302; APRIL 2016 SYNOPTIC
Predicted min= 0.0317 max= 0.25
CALIBRATING MODEL FOR HYDRAULICS
RIO GRANDE
STEADY-STATE MODE (LA)
River Miles
281.4
250
200
150
100
50
0.0
Total Phosphorus (mg/L)
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
452.8
450
400
350
300
250
200
150
100
50
0.0
River Kilometers

Questions