Memorandum

CITY OF DALLAS

DATE February 4, 2016

TO The Honorable Members of the Transportation and Trinity River Project Committee:
Lee M. Kleinman (Chair), Deputy Mayor Pro Tem Erik Wilson (Vice-Chair), Sandy Greyson, Mayor Pro Tem Monica R. Alonzo, Adam Medrano, and Casey Thomas II

SUBJECT Long Range Water Supply Plan Implementation: Integrated Pipeline Project (IPL)

On Monday, February 8, 2016, you will be briefed on Long Range Water Supply Plan Implementation: Integrated Pipeline Project (IPL). The briefing materials are attached for your review.

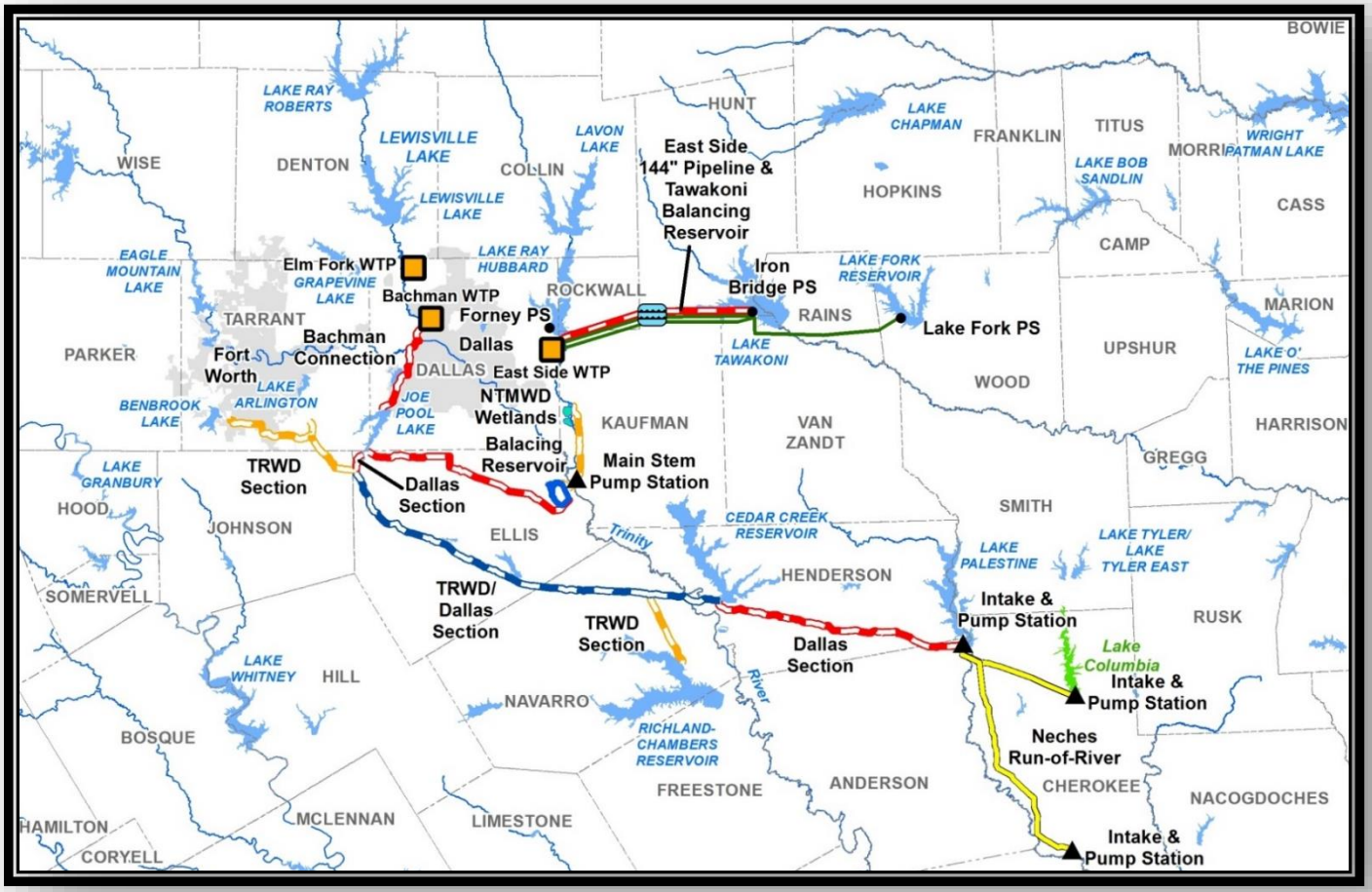
Please feel free to contact me if you have any questions or concerns.

Mark McDaniel
Assistant City Manager

c: Honorable Mayor and Members of the City Council
A.C. Gonzalez, City Manager
Warren M.S. Ernst, City Attorney
Craig D. Kinton, City Auditor
Rosa A. Rios, City Secretary
Daniel F. Solis, Administrative Judge
Ryan S. Evans, First Assistant City Manager
Eric D. Campbell, Assistant City Manager
Jill A. Jordan, P.E., Assistant City Manager
Joey Zapata, Assistant City Manager
Jeanne Chipperfield, Chief Financial Officer
Sana Syed, Public Information Officer
Elsa Cantu, Assistant to the City Manager – Mayor & Council

INTEGRATED PIPELINE PROJECT (IPL)

Long Range Water Supply Plan Implementation

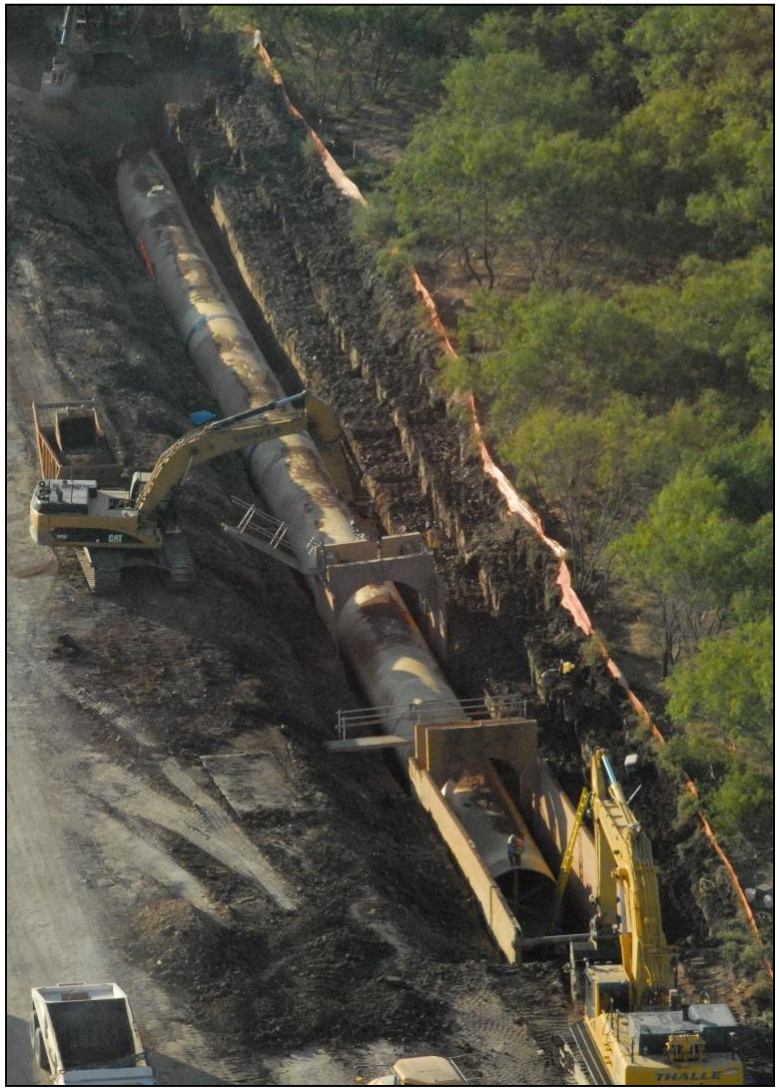


Transportation & Trinity River Project Committee
February 8, 2016

ECONOMIC VIBRANCY
CLEAN, HEALTHY ENVIRONMENT
E - GOV

Purpose

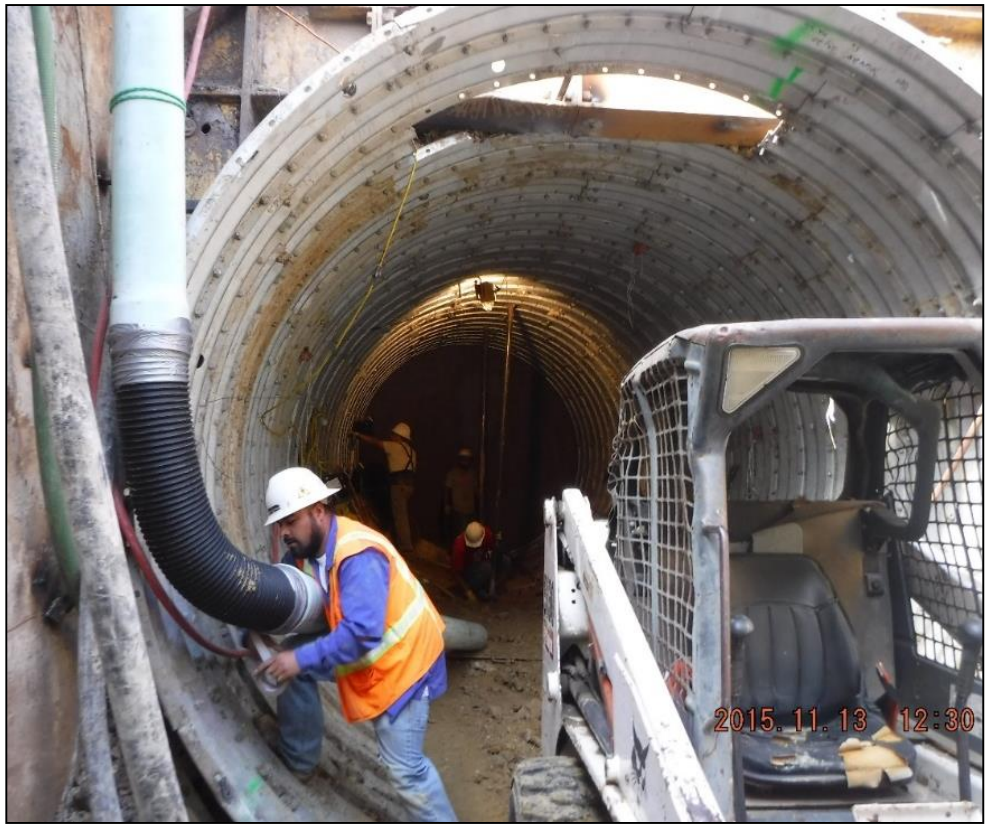
- Provide background on the establishment of the Utilities' service area;
- Update on the implementation of Dallas' 2014 Long Range Water Supply Plan (LRWSP); and
- Update on progress of the Integrated Pipeline Project (IPL), a joint project between the City of Dallas and the Tarrant Regional Water District



Installation of Pipe for Segment 15-2 in Ellis County

Outline

- Dallas Water Utilities Origins
- Establishment of Service Area
- Long Range Water Supply Planning
- Implementation of Previous LRWSP
- Water Management Strategies
- IPL Background
- IPL Agreements
- IPL Progress
- Appendix



Tunnel under Farm to Market 985 near Lake Bardwell in Ellis County

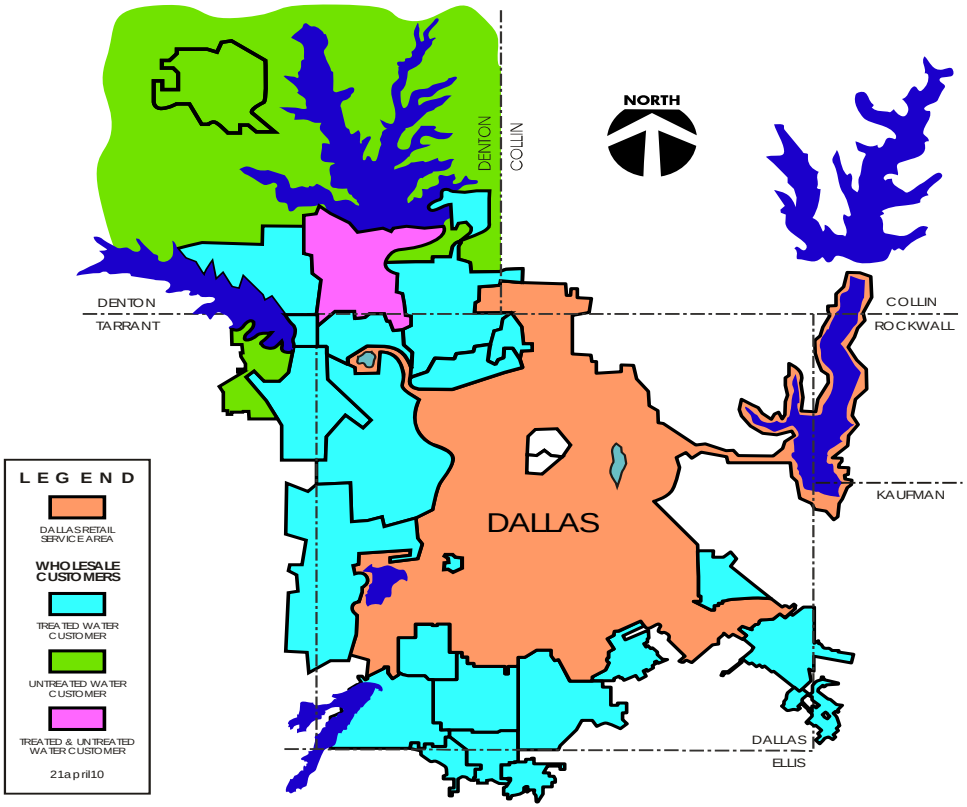
Origins

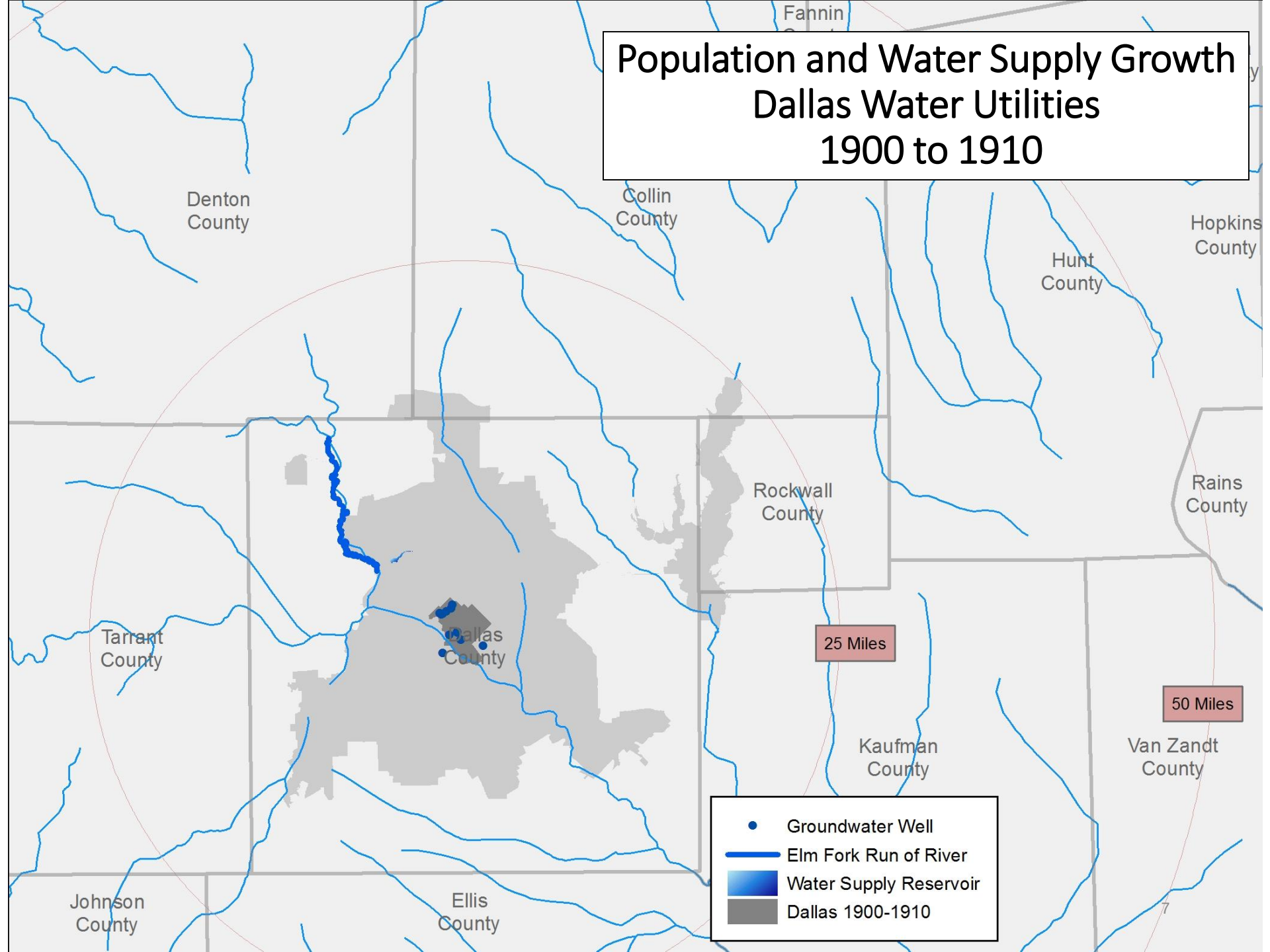
Establishment of City of Dallas Water Utilities – Enterprise Fund

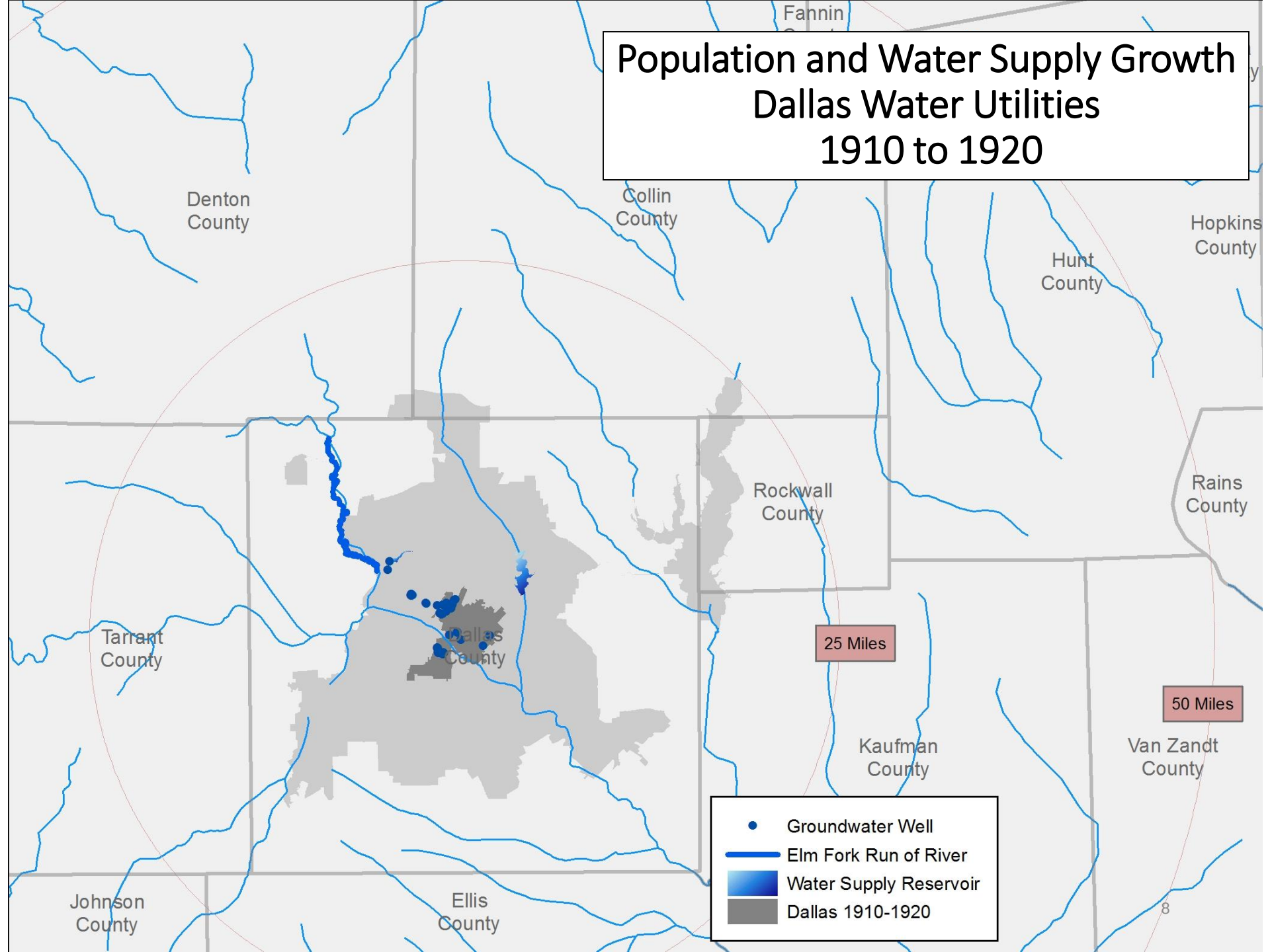
- Water Supply Company was founded in 1881
- Dallas City Charter, Chapter II, Section 34, Powers of the City provides for the right to erect, own, maintain and operate a waterworks and sanitary sewer system, or any part thereof, for the use of the city and its inhabitants, and to regulate such system
- In 1882 Dallas City Council voted that a separate water fund be established and that Water Department funds be separated from the General Fund
- The ordinance established the Department a non-profit corporation within the City structure, and is still in place today

Dallas: A Regional Water Supplier for Over 75 Years

- Under the Texas Constitution and State law, all surface water is owned by the State of Texas
- Dallas' 1959 Long Range Water Supply Plan was updated in 1975, 1989, 2000, 2005 and 2014
  - The 1959 study recommended that Dallas supply water to surrounding cities
- Dallas has been granted extensive water rights by the State in return for its promise to serve a defined area approved by Council and included in the State water plan which includes customer cities




Population and Water Supply Growth
Dallas Water Utilities
1900 to 1910
Fannin
Denton
County
Collin
County
Hopkins
County
Hunt
County
Rockwall
County
Rains
County
Tarrant
County
Dallas
County
25 Miles
50 Miles
Kaufman
County
Van Zandt
County
Johnson
County
Ellis
County
Groundwater Well
Elm Fork Run of River
Water Supply Reservoir
Dallas 1900-1910


Population and Water Supply Growth
Dallas Water Utilities
1910 to 1920
Fannin
Denton
County
Collin
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Hopkins
County
Hunt
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Rockwall
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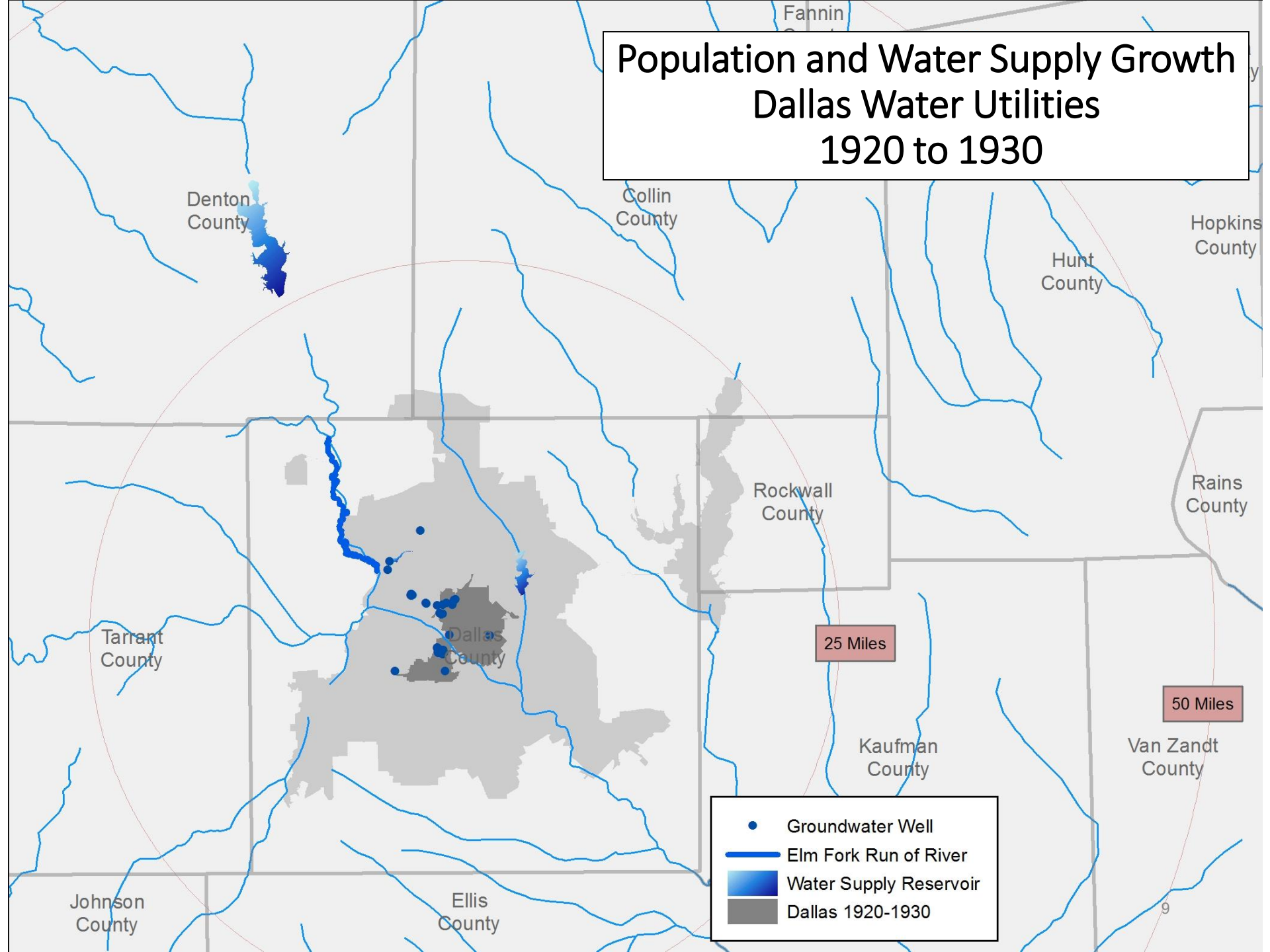
Rains
County
Tarrant
County
Dallas
County
25 Miles
50 Miles
Kaufman
County
Van Zandt
County
Johnson
County
Ellis
County
Groundwater Well
Elm Fork Run of River
Water Supply Reservoir
Dallas 1910-1920


Population and Water Supply Growth
Dallas Water Utilities
1920 to 1930
Fannin
Denton
County
Collin
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Hopkins
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Hunt
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Rockwall
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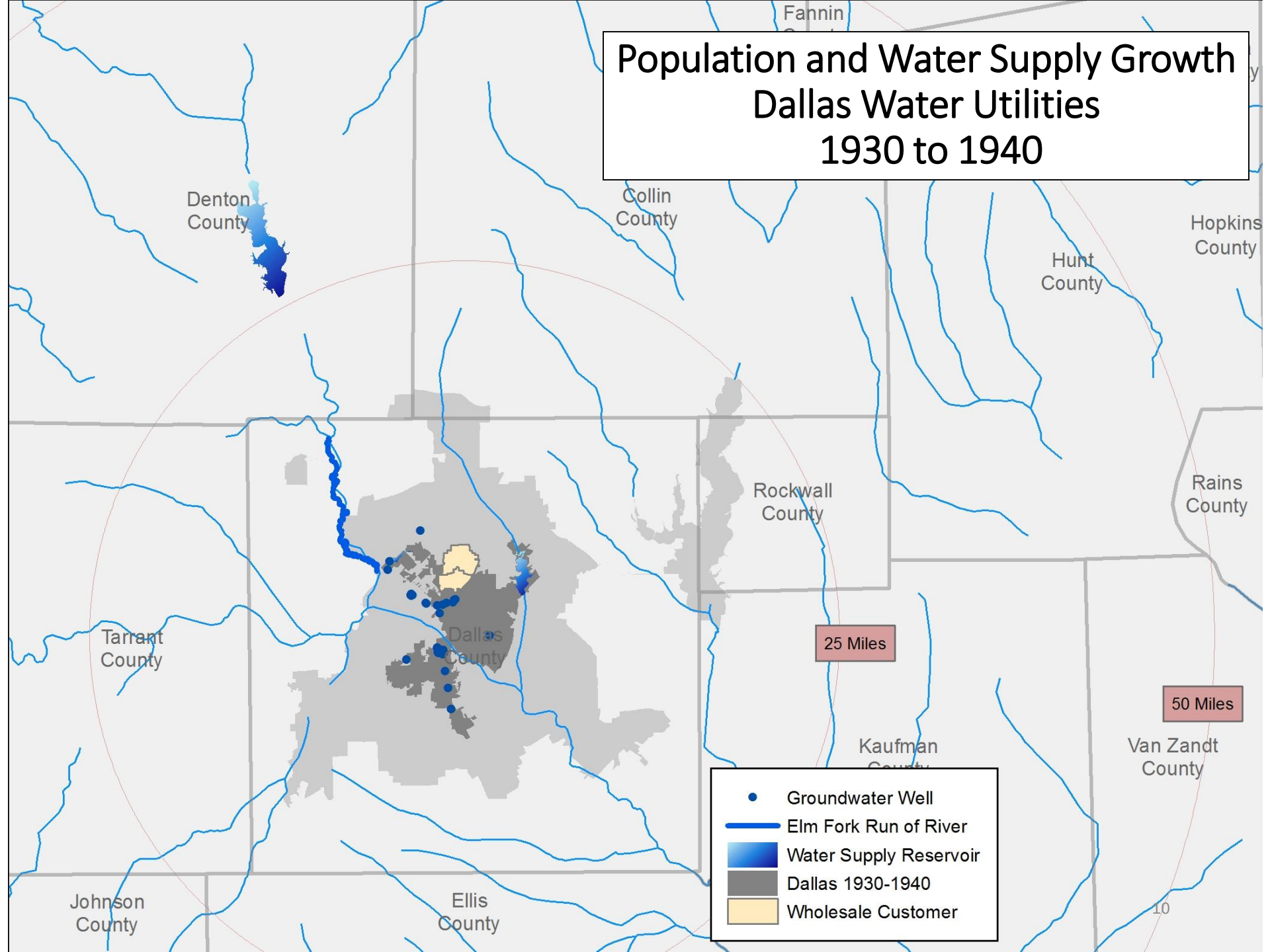
Rains
County
Tarrant
County
Dallas
County
25 Miles
50 Miles
Kaufman
County
Van Zandt
County
Johnson
County
Ellis
County
Groundwater Well
Elm Fork Run of River
Water Supply Reservoir
Dallas 1920-1930
9


Population and Water Supply Growth
Dallas Water Utilities
1930 to 1940
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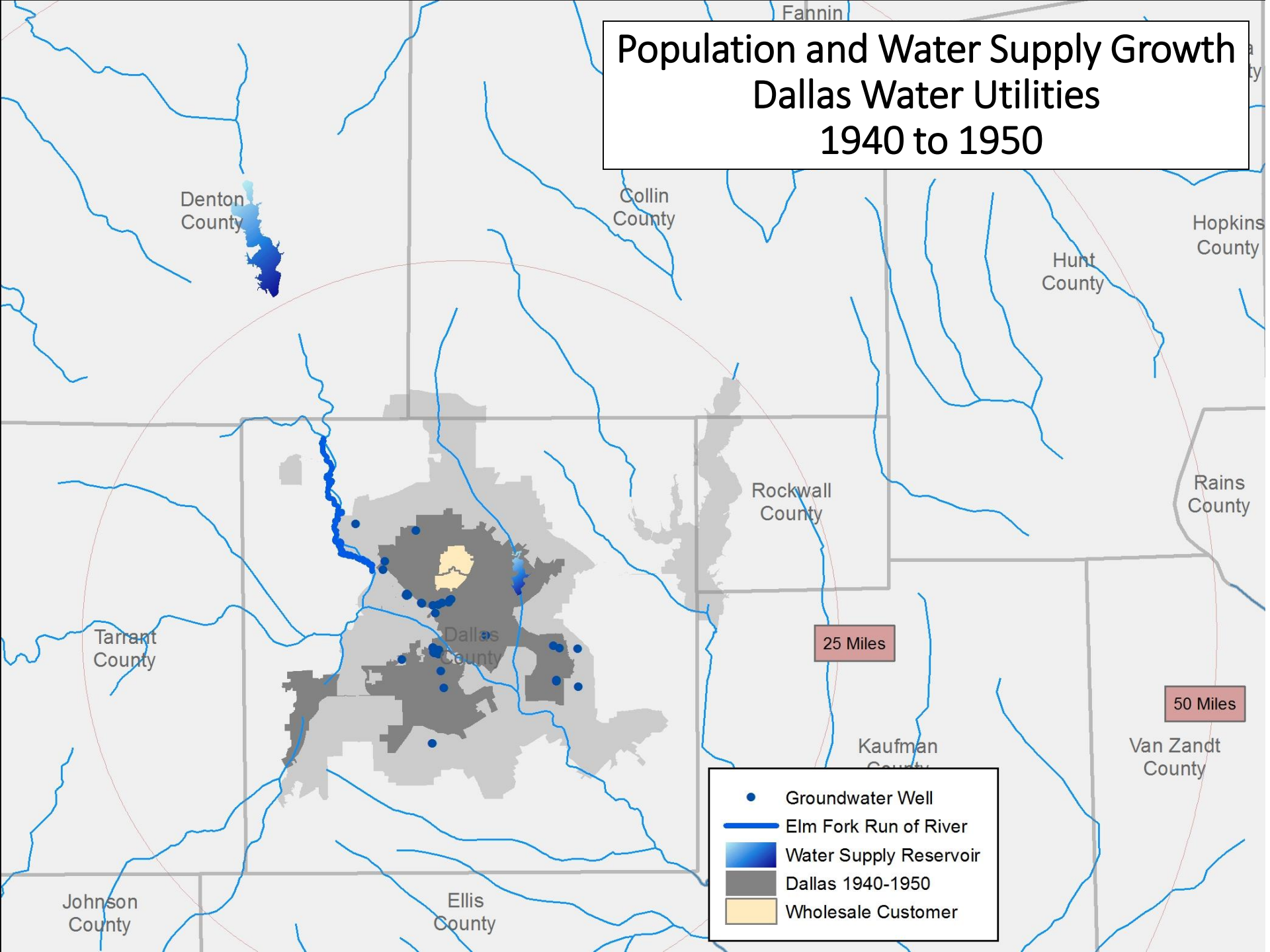
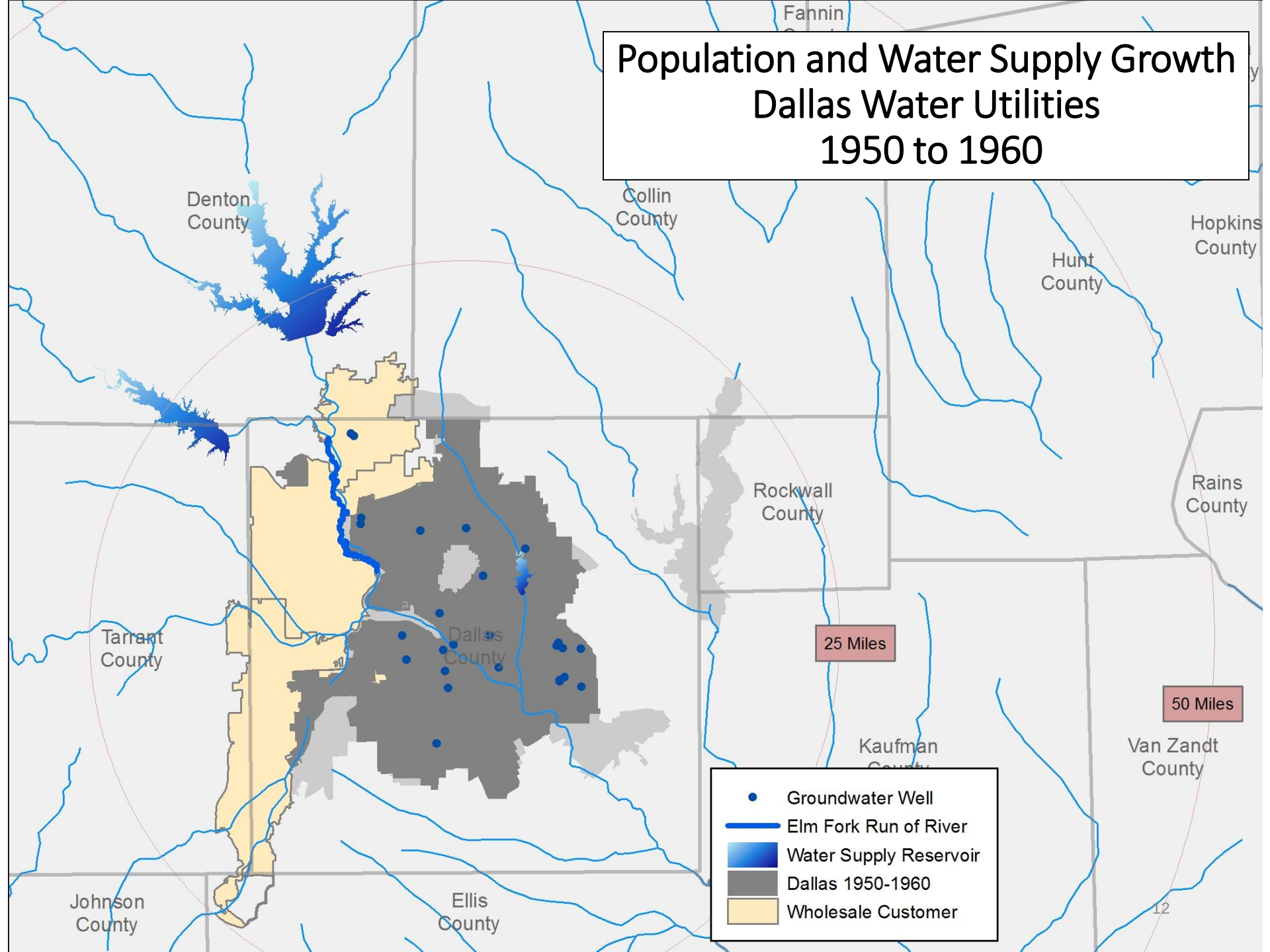
Denton
County
Collin
County
Hopkins
County
Hunt
County
Rockwall
County
Rains
County
Tarrant
County
Dallas
County
25 Miles
50 Miles
Kaufman
Van Zandt
County
Johnson
County
Ellis
County
Groundwater Well
Elm Fork Run of River
Water Supply Reservoir
Dallas 1930-1940
Wholesale Customer


Population and Water Supply Growth
Dallas Water Utilities
1940 to 1950
Fannin
Denton County
Collin County
Hopkins County
Hunt County
Rockwall County
Rains County
Tarrant County
Dallas County
25 Miles
50 Miles
Kaufman
Van Zandt County
Johnson County
Ellis County
Groundwater Well
Elm Fork Run of River
Water Supply Reservoir
Dallas 1940-1950
Wholesale Customer


Population and Water Supply Growth
Dallas Water Utilities
1950 to 1960
Fannin
Denton
County
Collin
County
Hopkins
County
Hunt
County
Rockwall
County
Rains
County
Tarrant
County
Dallas
County
25 Miles
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Van Zandt
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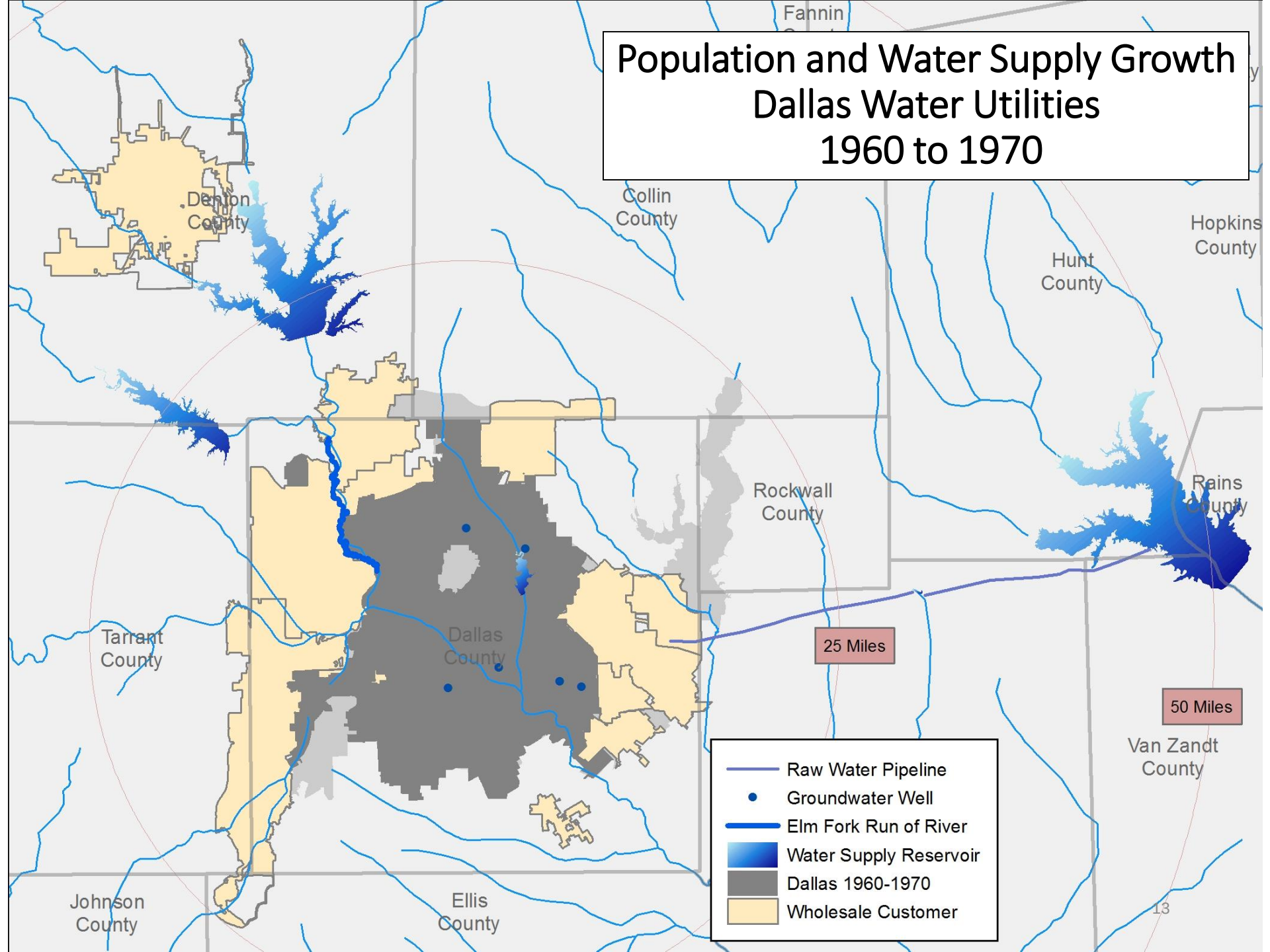
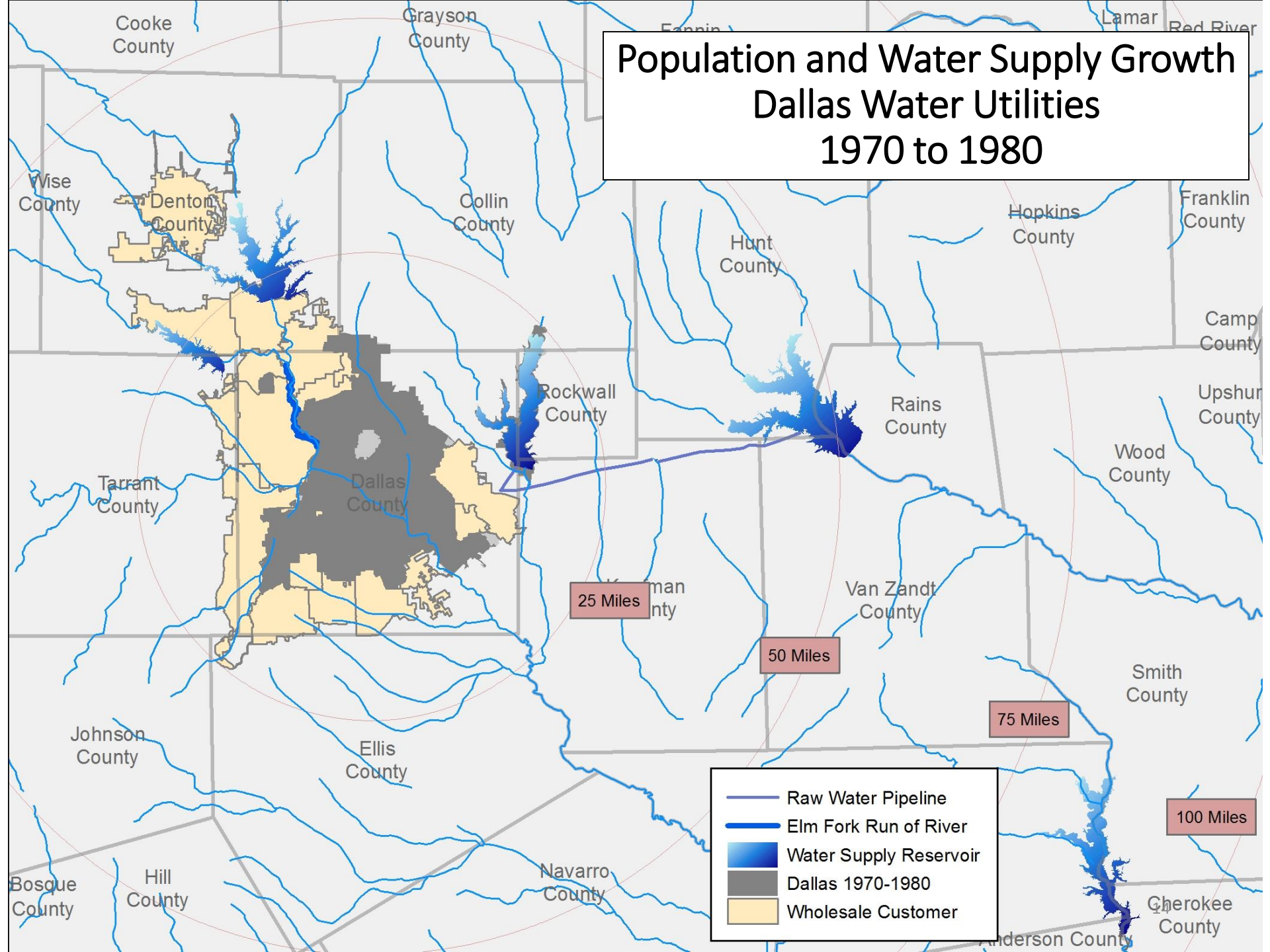
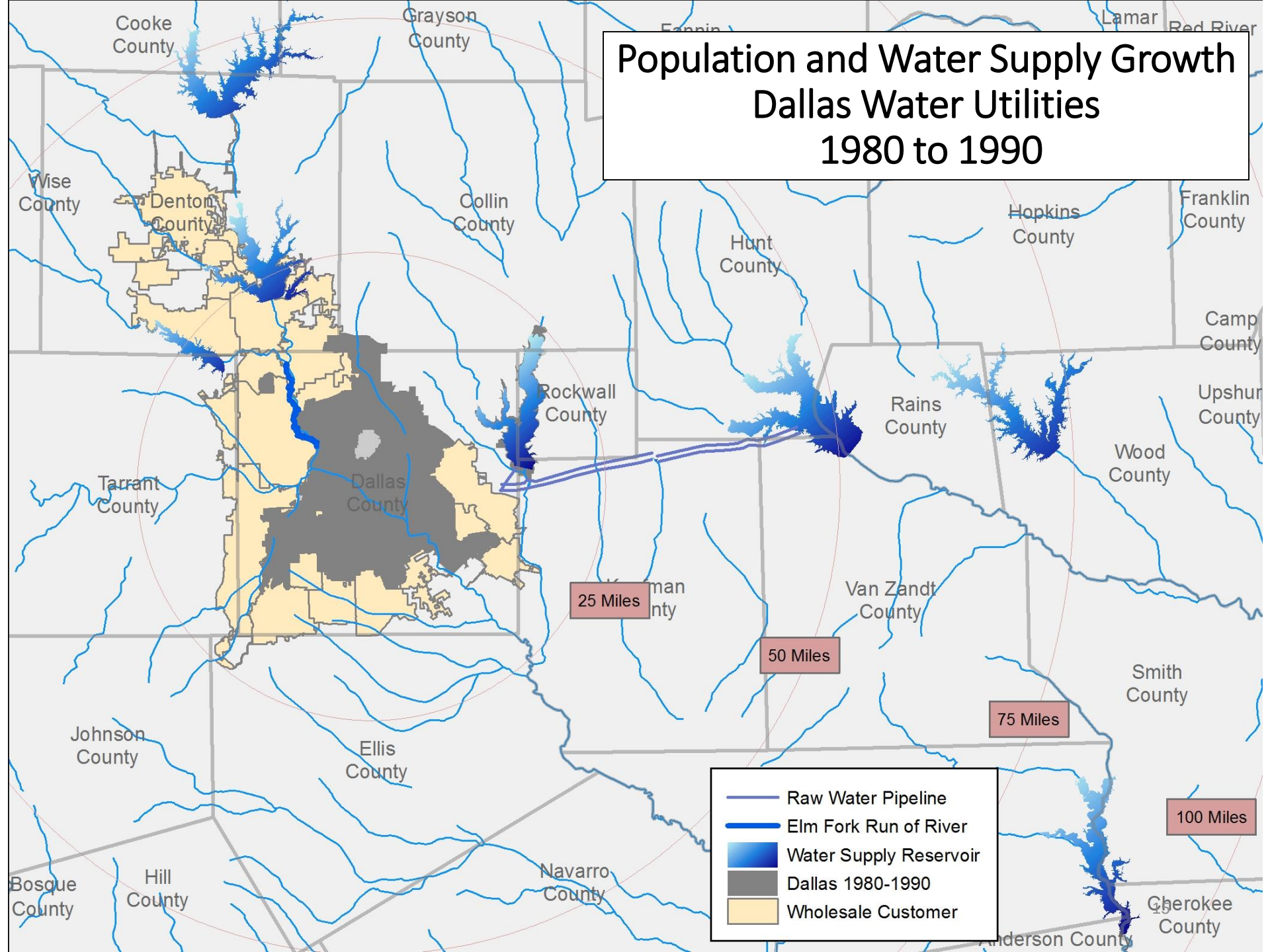
Groundwater Well
Elm Fork Run of River
Water Supply Reservoir
Dallas 1950-1960
Wholesale Customer


Population and Water Supply Growth
Dallas Water Utilities
1960 to 1970
Fannin
Collin
County
Denton
County
Hopkins
County
Hunt
County
Rockwall
County
Rains
County
Tarrant
County
Dallas
County
25 Miles
50 Miles
Van Zandt
County
Johnson
County
Ellis
County
Raw Water Pipeline
Groundwater Well
Elm Fork Run of River
Water Supply Reservoir
Dallas 1960-1970
Wholesale Customer


Population and Water Supply Growth
Dallas Water Utilities
1970 to 1980
Cooke County
Grayson County
Lamar
Red River
Wise County
Denton County
Collin County
Hopkins County
Franklin County
Hunt County
Camp County
Rockwall County
Rains County
Upshur County
Wood County
Tarrant County
Dallas County
25 Miles
Van Zandt County
50 Miles
Smith County
75 Miles
Johnson County
Ellis County
100 Miles
Raw Water Pipeline
Elm Fork Run of River
Water Supply Reservoir
Dallas 1970-1980
Wholesale Customer
Bosque County
Hill County
Navarro County
Cherokee County
Anderson County


Population and Water Supply Growth
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1980 to 1990
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Wholesale Customer
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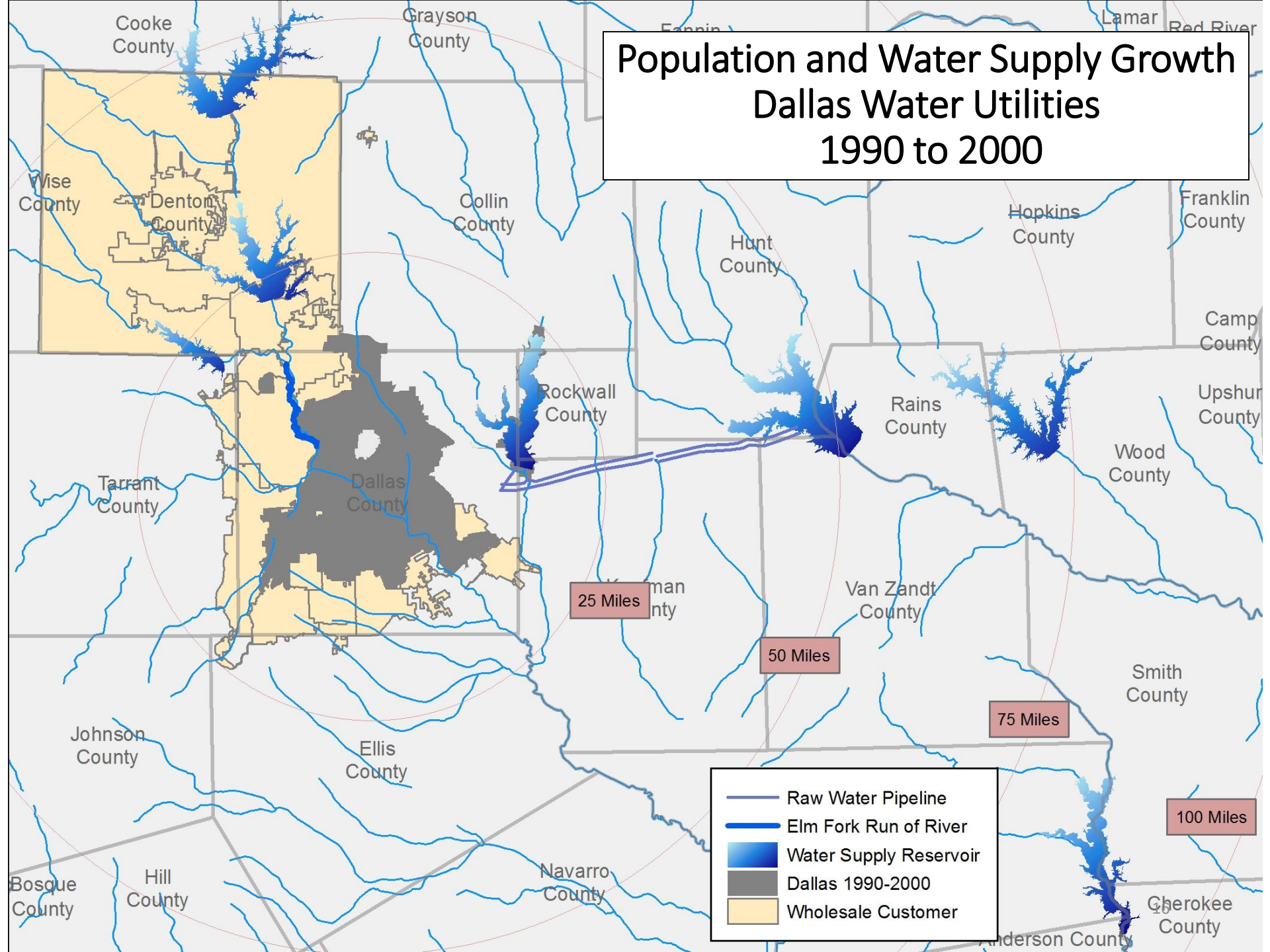
Hill County
Navarro County
Cherokee County
Anderson County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1990 to 2000
Cooke County
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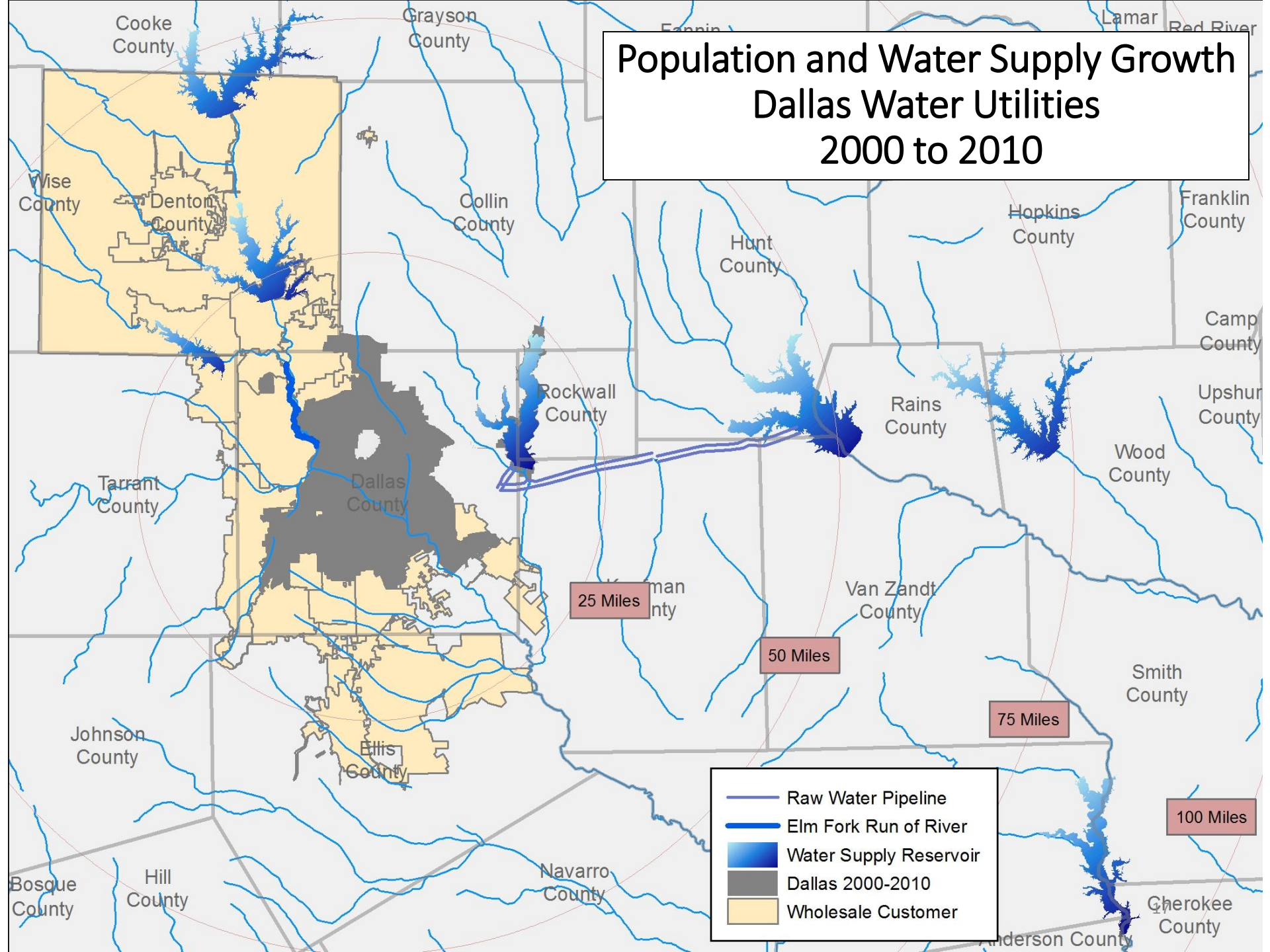
Cherokee County
Anderson County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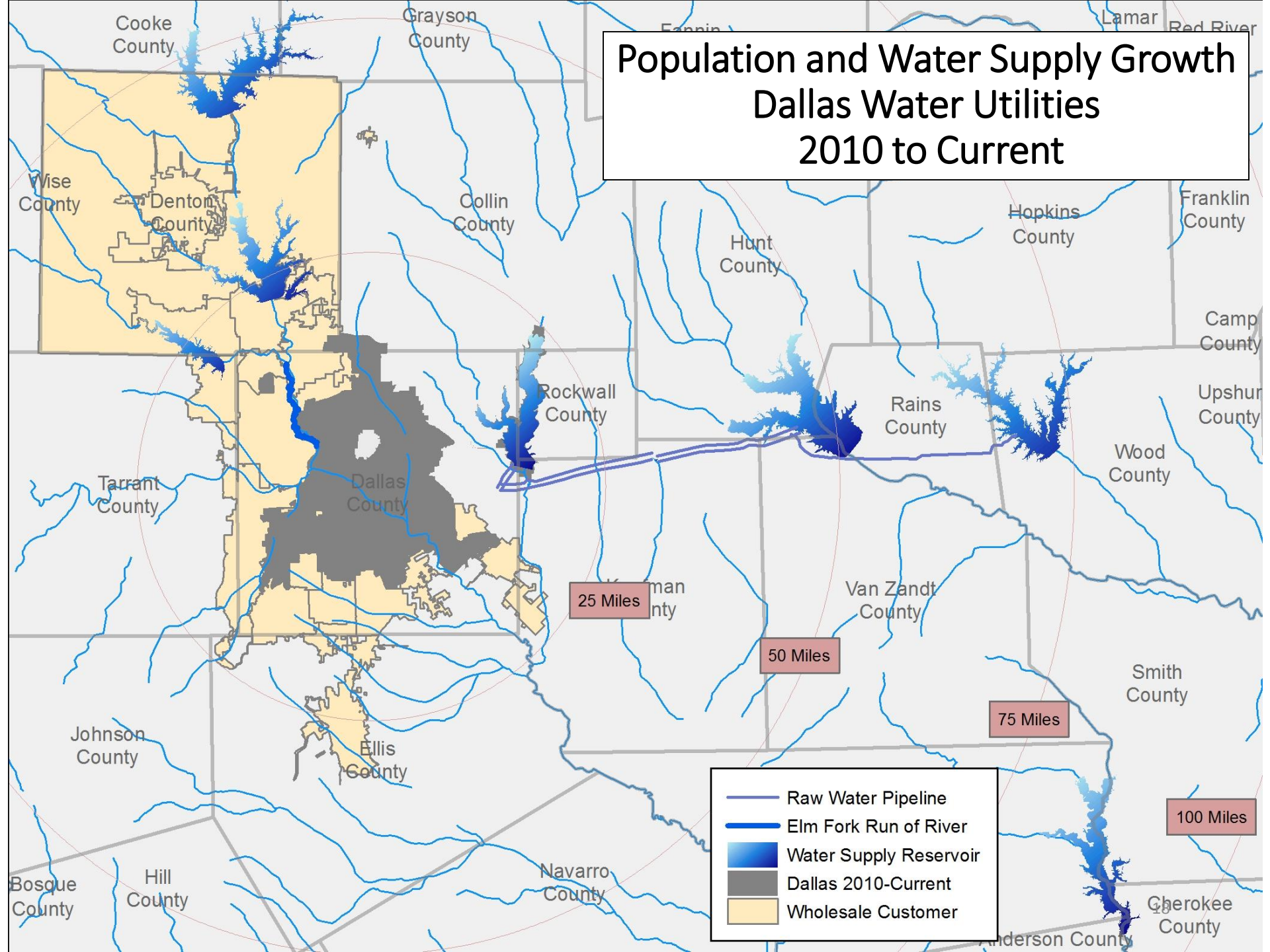
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Dallas 2010-Current
Wholesale Customer
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Hill County
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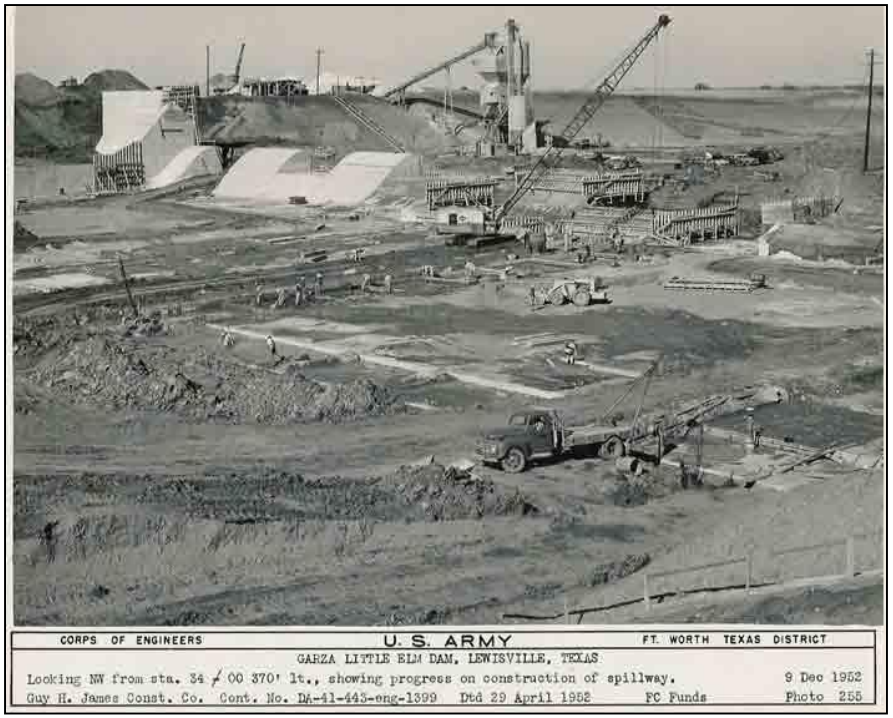
Cherokee County
Anderson County

Services Provided by Dallas Water Utilities

Water Production and Delivery	Wastewater Collection and Treatment
Provide high quality potable water that meets all State and Federal regulatory requirements	Provide wastewater collection, transport, treatment and discharge to meet Federal and State regulatory requirements
Provide drinking water and fire protection to over 2.4 million in the City of Dallas, 23 customer cities and DFW Airport	Provide wastewater service for over 2.1 million customers in the City of Dallas and 11 wholesale customer cities
24/7 operations and maintenance of: 7 reservoirs, (6 connected) 3 water treatment plants with a combined capacity of 900 MGD 23 pump stations 9 elevated and 12 ground storage tanks	24/7 operations and maintenance of: Two wastewater treatment plants with a combined capacity of 260 MGD 15 wastewater lift stations
Maintain approximately 4,925 miles of water mains in the distribution system	Maintain approximately 4,017 miles of wastewater mains in the sanitary sewer system
Value of water assets $3.2 Billion	Value of wastewater assets $2.0 Billion

Long Range Water Supply Planning

- Dallas' 1959 Long Range Water Supply Plan was updated in 1975, 1989, 2000 and 2005
  - *The 1959 study recommended that Dallas supply water to surrounding cities*
- The passage of Senate Bill 1 of the 75th Legislative Session in 1997 changed water supply planning throughout the State
  - *Regional water planning groups established*
  - *Regional and State water plans required every five years*
  - *Local plans to be provided to the Regional Water Planning Group for consideration in the Regional Water Plan*



Historic Implementation of Long Range Water Supply Plan

Water Management Strategy	LRWSP	I	U	S	N	O
Iron Bridge Reservoir (Lake Tawakoni)	1959	X				
Forney Reservoir (Lake Ray Hubbard)	1959	X				
Aubrey Reservoir (Lake Ray Roberts)	1959 &1975	X				
Enlarge Lake Lavon	1959					X
Roanoke Reservoir	1959				X	
Lake Cooper Pipeline	1975					X
Lake Palestine	1975	X				
Lake Fork	1968 State Water Plan	X				

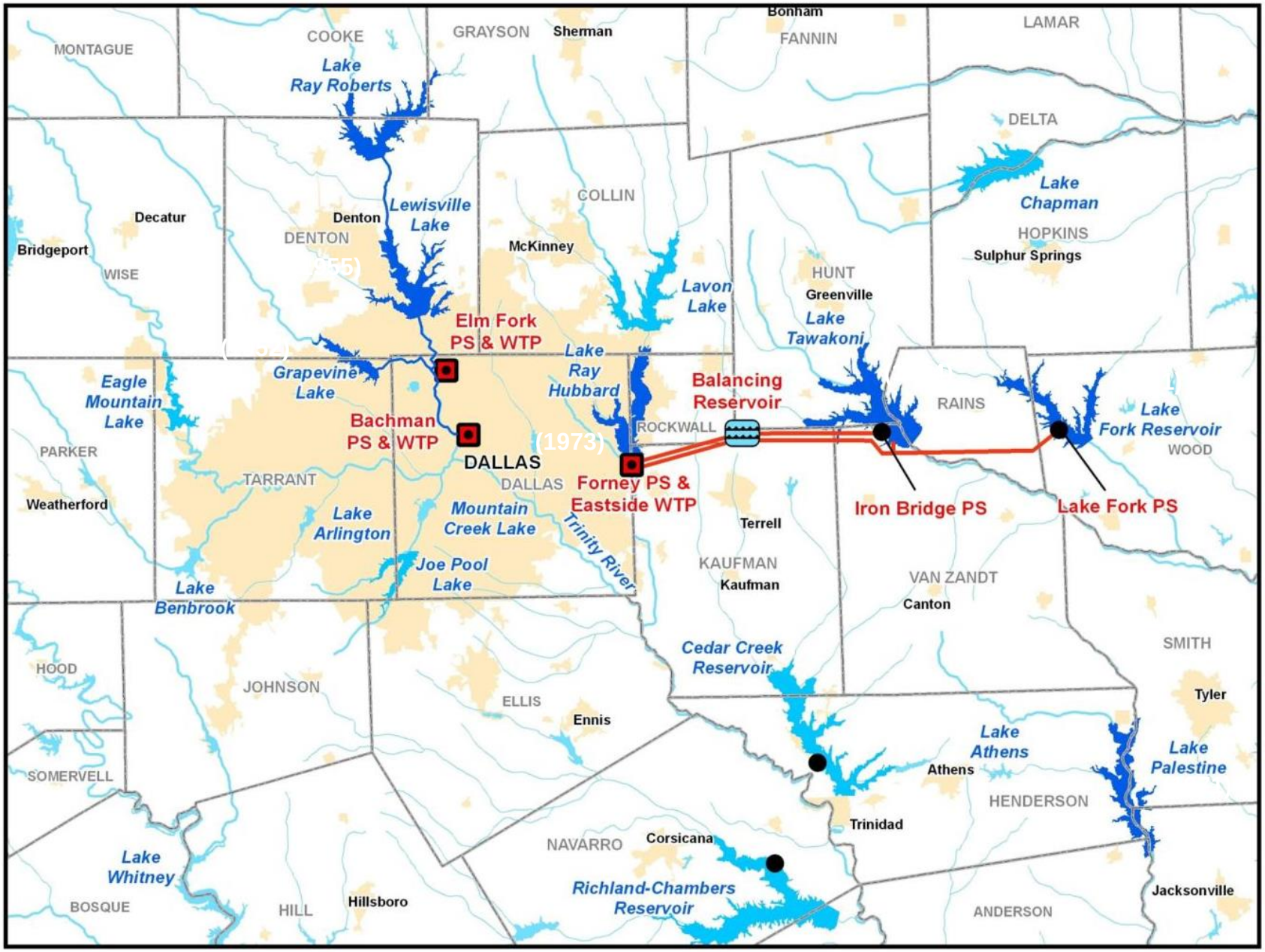
I- Implemented
U- Underway
S – Study/Evaluation
N- No Longer Available
O- Implemented by Others

Historic Implementation of Long Range Water Supply Plan (Continued)

Water Management Strategy	LRWSP	I	U	S	N	O
Sulphur Bluff Reservoir (Marvin Nichols)	1975/2000			X		
Tennessee Colony Reservoir	1975					
Lake Mineola	1975					
Connect Lake Fork	1989	X				
Connect Lake Palestine	1989		X	X		
Reuse	1989/2000/2005	X	X	X		
Conservation	2000/2005	X	X	X		
Wright Patman	2005			X		
Lake Fastrill	2005				X	

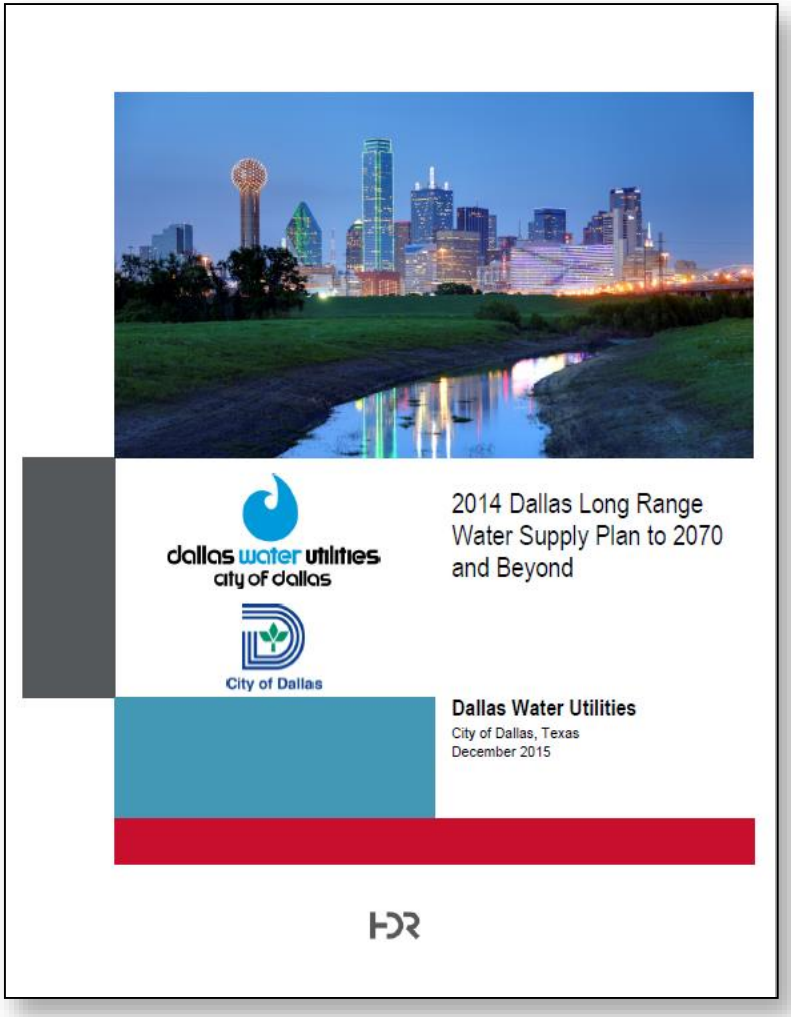
I- Implemented
U- Underway
S – Study/Evaluation
N- No Longer Available
O- Implemented by Others

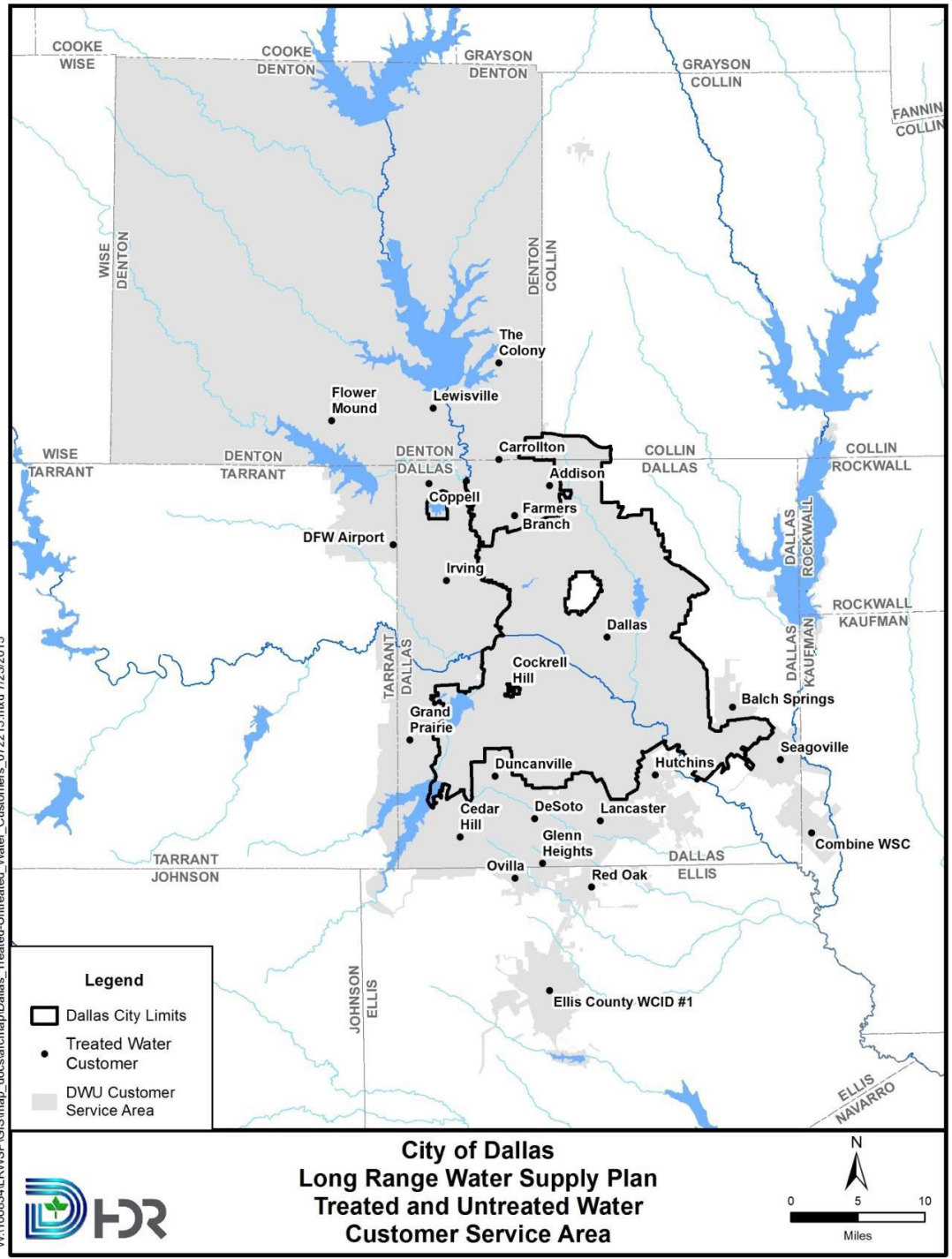
Dallas' Regional System Current Water Supply



2014 Long Range Water Supply Plan

- Adopted by Council on October 8, 2014
- System average day water demands reduced by 23% or on average approximately 151 MGD
- Connected firm yield reduced over time due to sedimentation and increased evaporation from higher temperatures
- Projected supply and demand deficit beginning in 2027
  - 15 MGD deficit in 2030
  - 258 MGD deficit by 2070
- Recommends strategies to address deficit





Dallas Water Utilities Service Area

Current

Population served: 2.4 million

- 1.2 million in Dallas
- 1.2 million in 27 wholesale customer cities

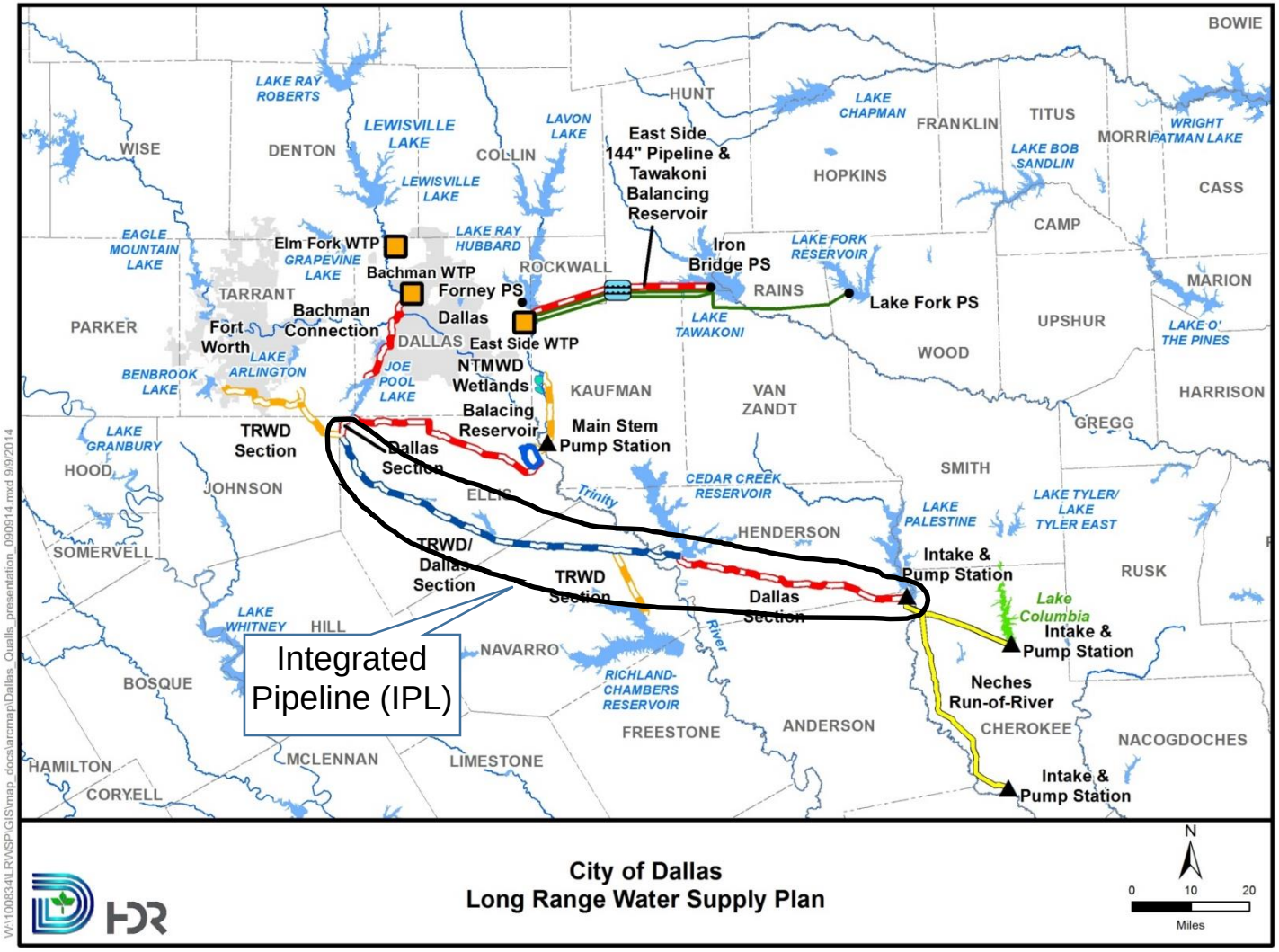
2070 Projected

Population Served: 5.3 million

- 1.9 Million in Dallas
- 3.4 million in 27 wholesale customer cities

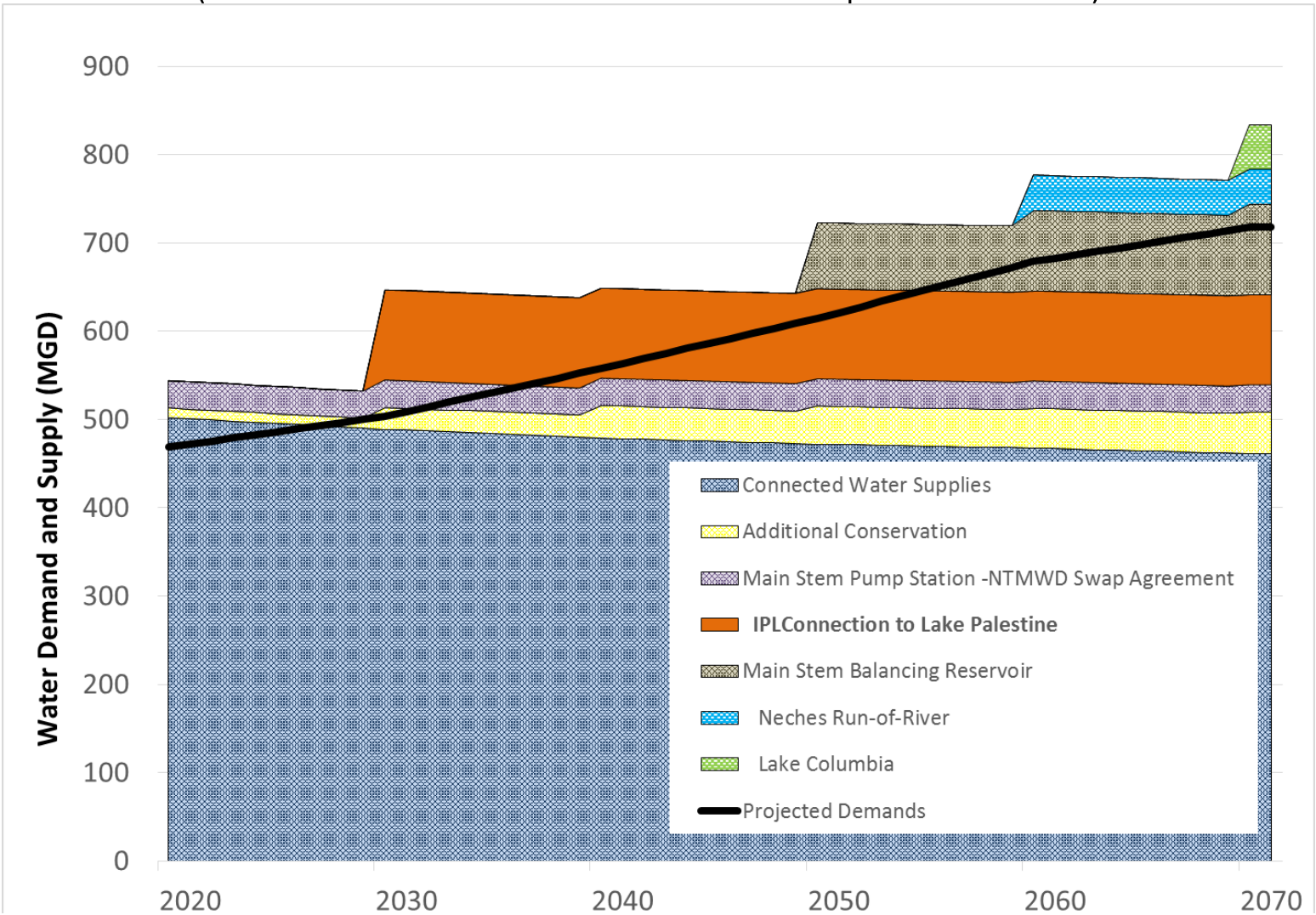
Source: 2014 Long Range Water Supply Plan

2014 Long Range Water Supply Plan Recommended Strategies 2020 - 2070



Recommended Water Management Strategy Implementation Timeline

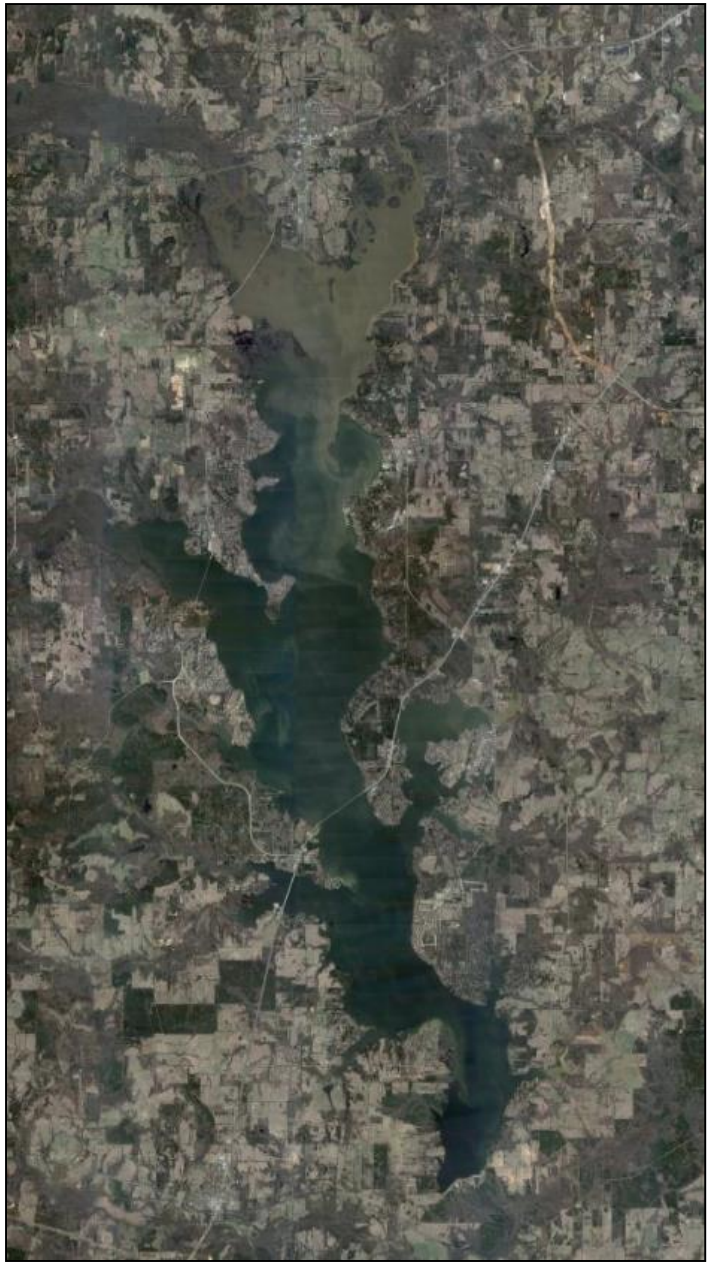
(Forecast of Demand vs. Planned Implementation)



Integrated Pipeline (IPL)Project

Lake Palestine

- Lake Palestine was constructed by the Upper Neches River Municipal Water Authority and was completed in 1971
- In 1972, Dallas acquired rights to use 53.73% of the firm yield of Lake Palestine
- In the1975 LRWSP Dallas began the planning for the connection of Lake Palestine
- In 2007 entered into Interlocal Cooperation Contract (ICC) with Tarrant Regional Water District (TRWD) to study joint transmission facilities

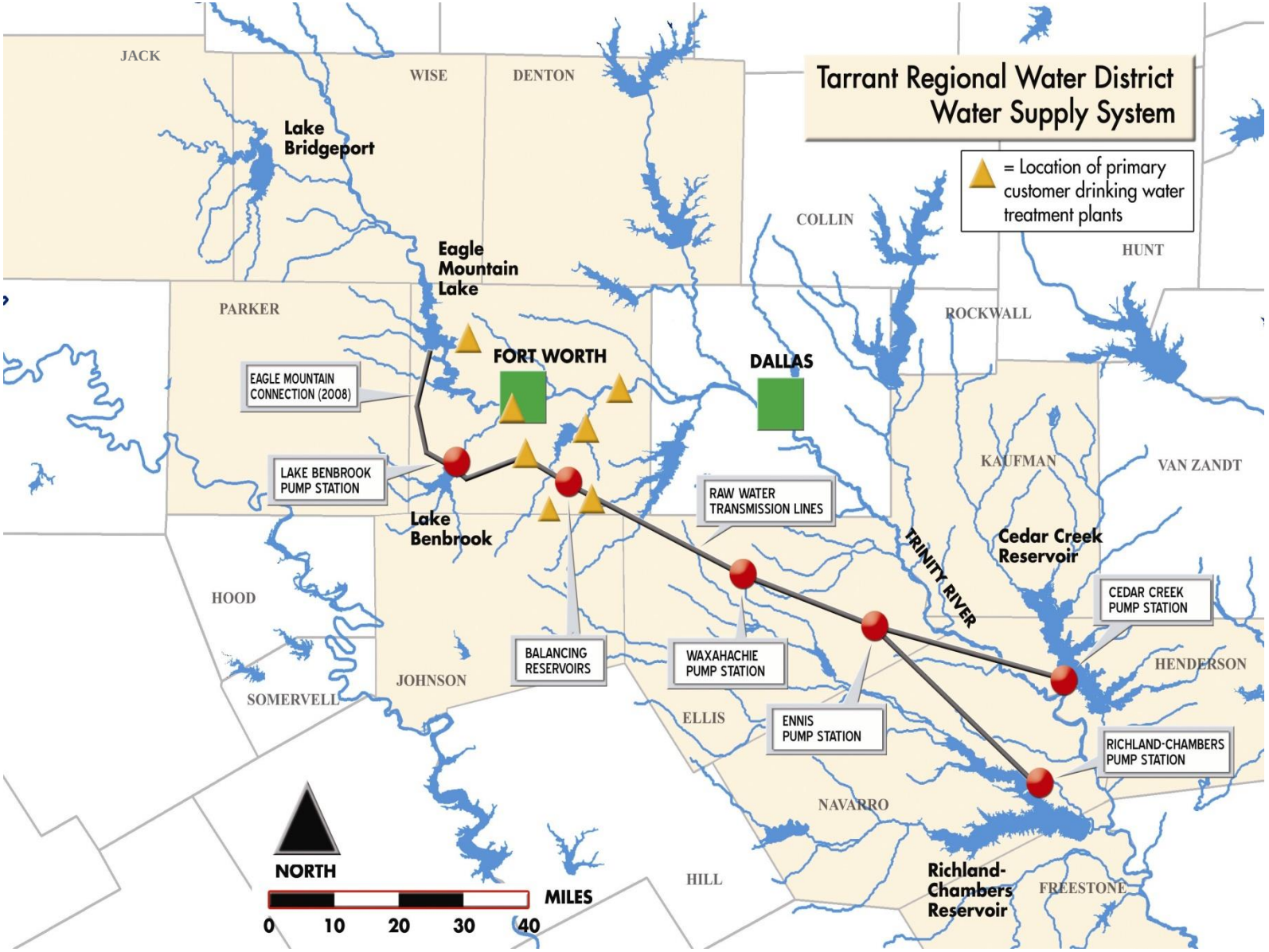


Tarrant Regional Water District

- Created in 1924
- Responsibilities: Raw water supply and flood control
- Service area spans all or part of 11 North Texas counties
  - Jack
  - Wise
  - Johnson
  - Ellis
  - Henderson
  - Navarro
  - Parker
  - Tarrant
  - Denton
  - Kaufman
  - Freestone

- Contracts with 65 cities including the cities of Fort Worth, Arlington, Mansfield and the Trinity River Authority
- Current service area population is 1.6 million
- Service area population projected to increase to 2.66 million by 2050
- Current supply of 447,000 acre-feet per year
  - Lake Bridgeport
  - Cedar Creek
  - Lake Benbrook
  - Lake Arlington
  - Eagle Mountain Lake
  - Richland-Chambers
  - Lake Worth

Tunnel under US 67 in Midlothian



Source: Tarrant Regional Water District

TRWD provides water directly or indirectly into all or a portion of each of the 11 highlighted Counties

Interlocal Cooperation Contract: Key Principals

- To promote and to take advantage of regional water supply
  - Dallas City Council authorized an Interlocal Cooperation Contract (ICC) on March 28, 2007 with TRWD that:
    - Allows Dallas to share the cost of water transmission from distant sources
    - Provides the framework for increasing the reliability of water supplies for Dallas
    - Provides the ability for Dallas to obtain interim and emergency water supplies
    - Evaluated the feasibility of partnering with TRWD in moving Lake Palestine water
  - First Amendment added cooperative efforts for Oklahoma Water Development in October 22, 2008
  - Second Amendment added the Fair Opportunity Purchasing and Contracting guidelines (MWBE guidelines) including creation of the Business Coordination Team, November 10, 2010

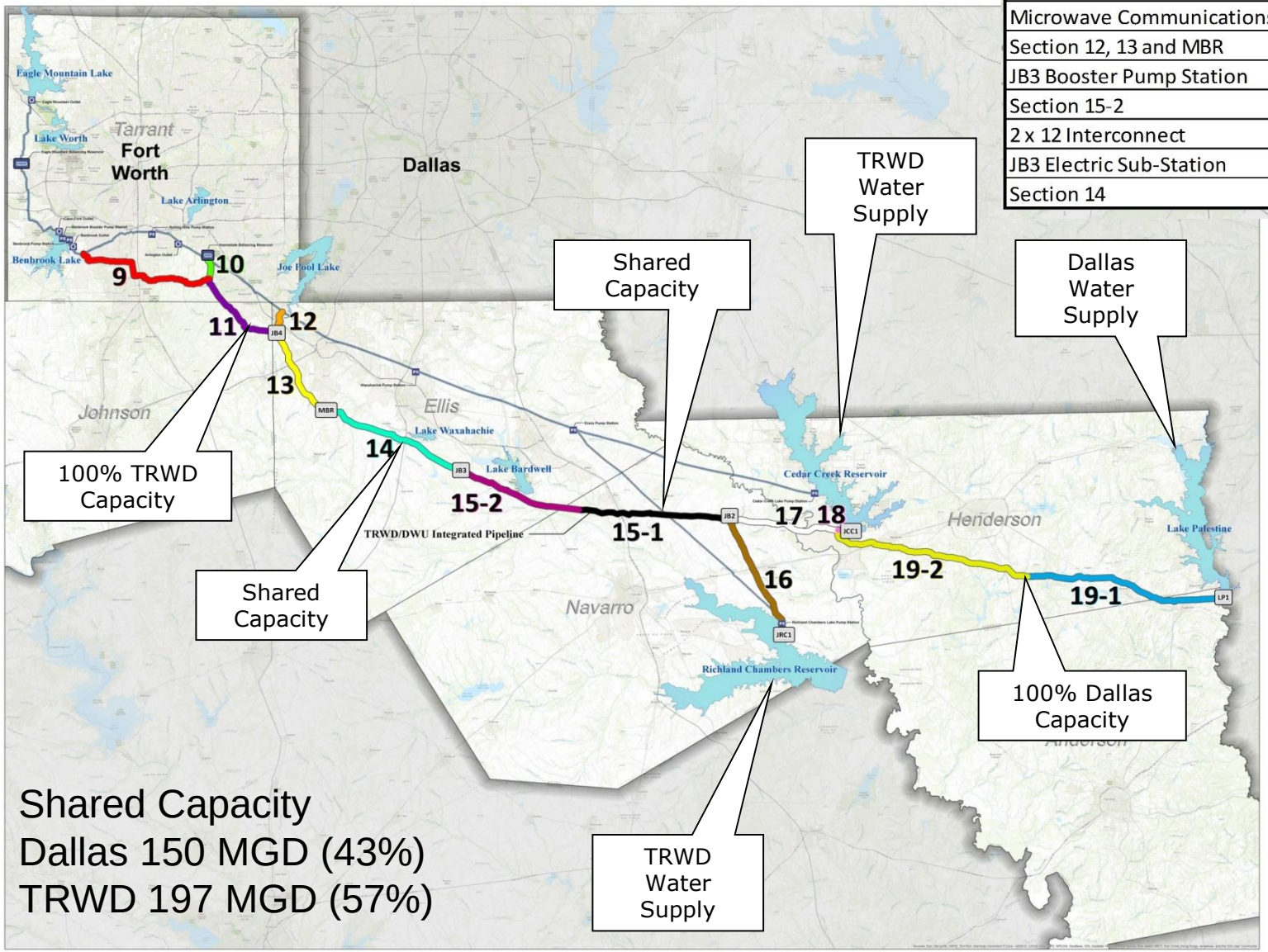
Integrated Pipeline (IPL) Project

- Dallas has contractual water rights in Lake Palestine
- Tarrant Regional Water District (TRWD) has water rights in Cedar Creek Reservoir and Richland Creek Reservoir
- IPL will interconnect Dallas and TRWD supplies
  - Dallas needs additional water supply in the 2030 time period
  - Connecting Lake Palestine extends supplies over 20 years

Pipe for Segment 15-2 in Ellis County

IPL Pipeline Route and Capacity Shares

Major Construction Projects	Award/Start Date
Section 15-1	May 2014
JB3 Reservoir	July 2014
JB3 Pumps Motors Drives	October 2014
Microwave Communications	October 2014
Section 12, 13 and MBR	November 2014
JB3 Booster Pump Station	March 2015
Section 15-2	April 2015
2 x 12 Interconnect	August 2015
JB3 Electric Sub-Station	October 2015
Section 14	December 2015

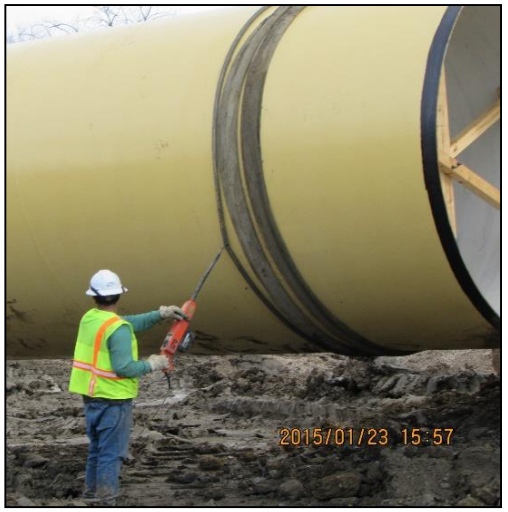


Shared Capacity
Dallas 150 MGD (43%)
TRWD 197 MGD (57%)

IPL Project Benefits

- Allows Dallas to share the cost of water transmission from distant sources
  - Dallas Estimated Share – $832M
  - Estimated Cost Savings for Dallas
    - Capital cost - $196M
    - Revenue requirement for coverage of O&M versus debt payment – average of approximately $20M per year or 33% over the life of the bonds
- Sets the stage and tone for future regional partnerships
- Good Faith Effort - M/WBE Participation Goal
  - Attachment to ICC through Second Amendment
  - 25% overall goal

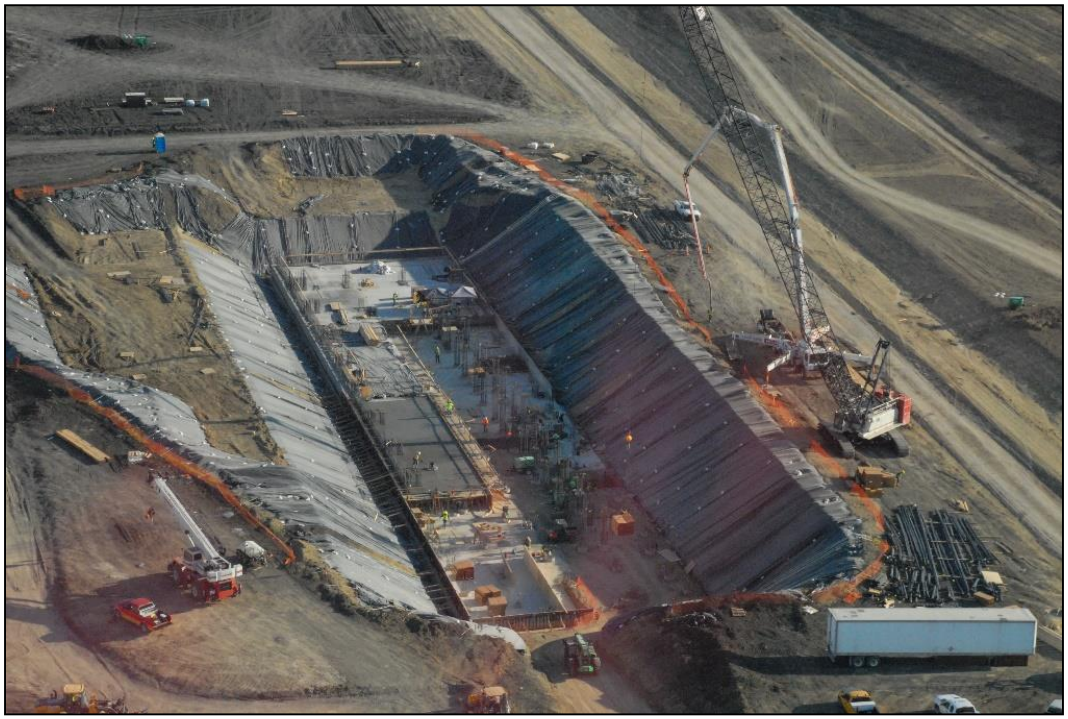
Hydraulic pressure testing of pipe at factory



Coating testing before installation

Agreements with TRWD related to the Development of the IPL Project:

- Water Transmission Facilities Financing Agreement
- Water Transmission Facilities Delivery Contract



JB3 Pump Station Foundation

Financing Agreement: Key Principles

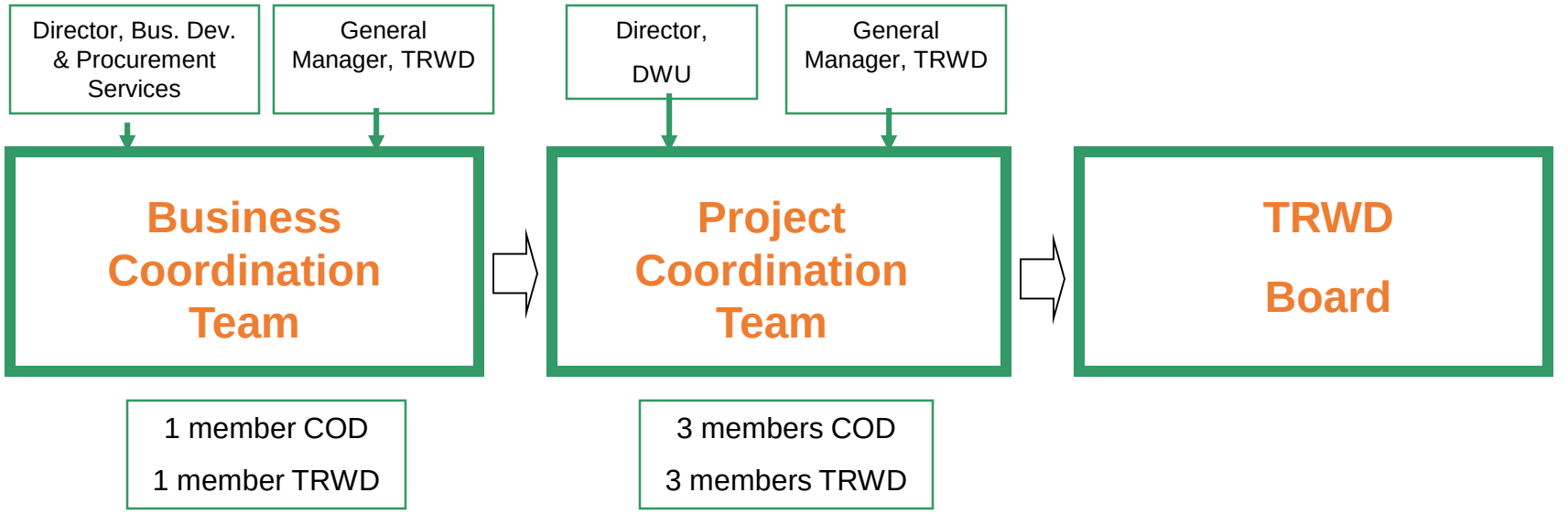
- Dallas' Reserved Capacity Rights in IPL – 150 MGD
- Development, ownership, operation – TRWD
- Financing - TRWD
- Allocation of Costs – Maximize benefits, equitably distribute costs
- Project Governance – Project Coordination Group – 3 members from Dallas
- Water Rights Ownership – Retained
- Council Adoption November 10, 2010

Richland Chambers Interconnect Facility

Financial Overview

- Current Project Budget - $2.4 Billion
  - TRWD share of project costs is $1.4B
  - Dallas' share of project costs is $1.0B
- TRWD issues all bonds for the project including Dallas' portion
- Current TRWD Revenue Bond Issues have totaled $1.3B:
  - Dallas' share of project costs from 2009 through 2016 totals $507.9M
  - TRWD share of projects costs from 2009 through 2016 totals $817.9M
- Dallas' approves the structure and amount of the sale for Dallas' share of project costs
  - City Manager authorized to approve bond resolution
  - Bonds secured by Dallas' revenues
  - Dallas is responsible for Palestine Segment and Intake construction schedule

Project Implementation Organizational Structure



Contract Process Approval Path

Delivery Contract: Key Principles

- O&M Costs equitably distributed based on Dallas' "Reserved Capacity Rights" of 150 MGD
- Annual budget reviewed by City
- Two way settle up clause
- Dallas to identify delivery point and to specify volume and timing of delivery
- Project Governance - Same as Financing Agreement
- Delivery contract includes
  - Cost Allocation Manual (CAM) – methodology of equitable distribution of O&M costs
  - Operational Guidelines
- Council Adoption June 22, 2011

180-foot Communications Tower at Joint Booster Pump Station 3

IPL Progress

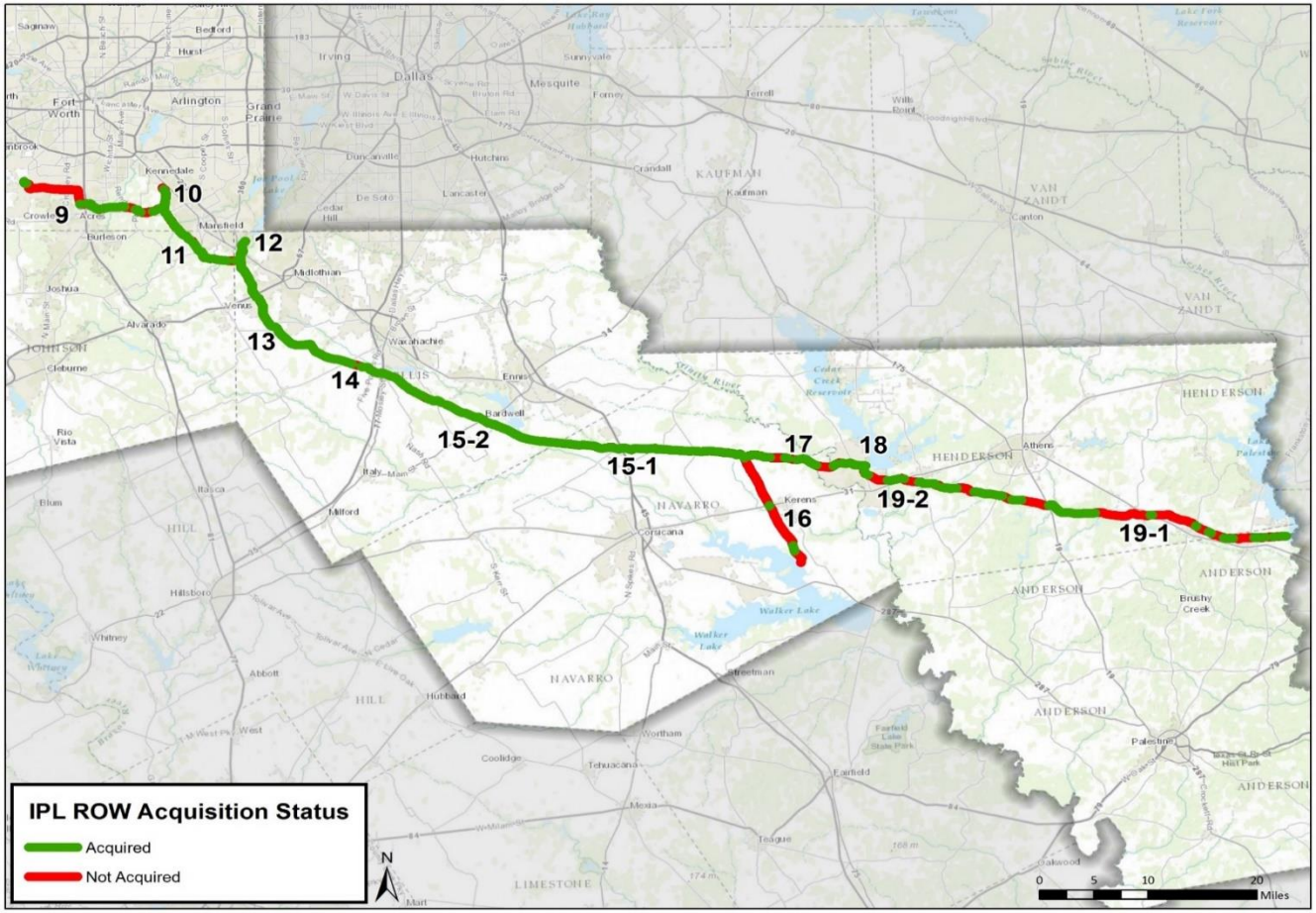
JB3 Pump Station Suction Reservoir

Tunnel under US 67 in Midlothian

Installation of Pipe for Segment 15-2 in Ellis County

Richland Chambers Interconnect Facility

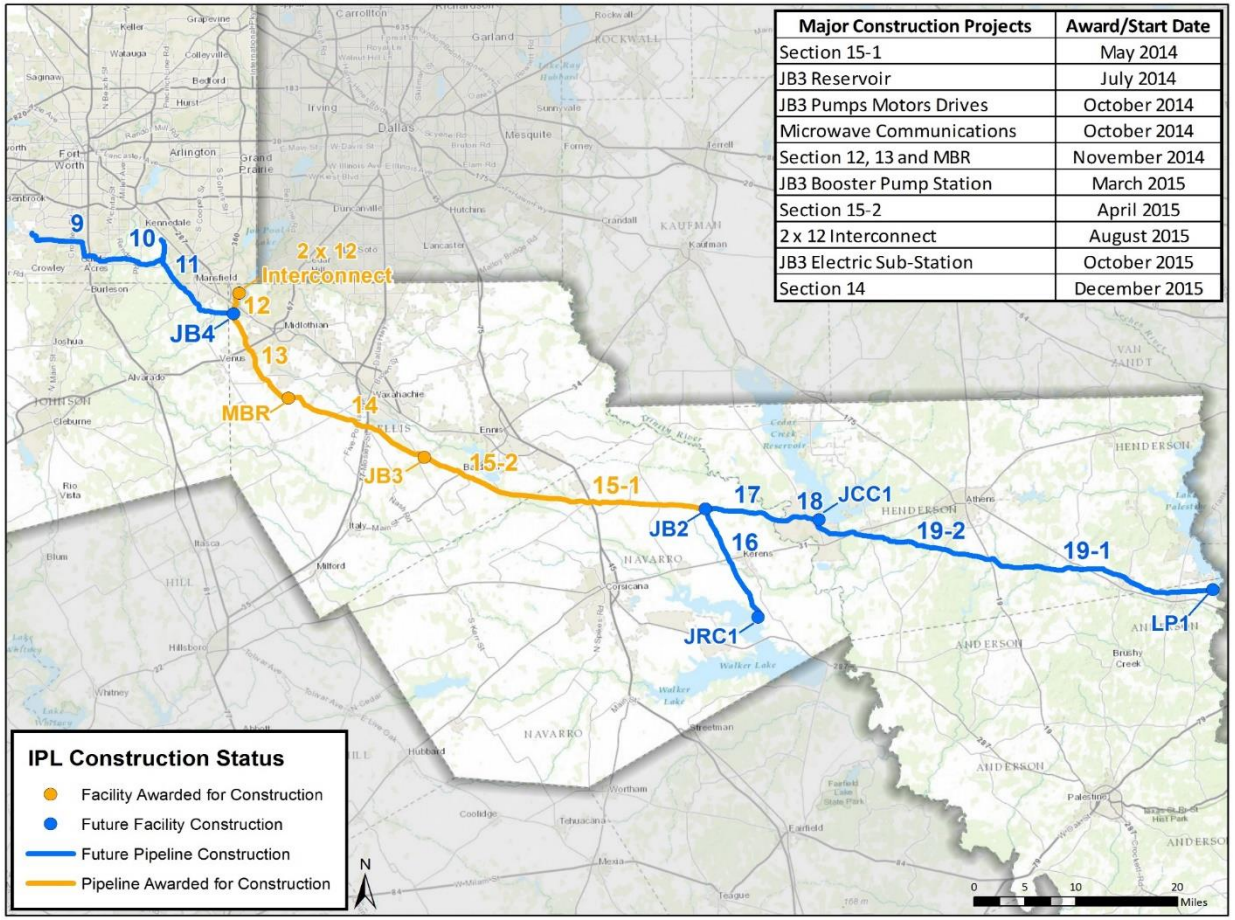
Right-of-Way Acquired



Land Acquisition Status

Pipeline Sections	9	10	11	12	13	14	15.1	15.2	16	17	19.1	19.2	Facilities	Total
Total Parcels	53	29	45	5	29	54	57	30	26	33	78	68	11	518
Acquired as of Jan 6, 2016	22	17	29	5	28	52	57	30	4	22	17	33	11	327
Acquired by Eminent Domain	1	1	1	1	7	7	11	9	0	3	0	1	1	43

Construction Underway



Major Construction Projects	Award/Start Date
Section 15-1	May 2014
JB3 Reservoir	July 2014
JB3 Pumps Motors Drives	October 2014
Microwave Communications	October 2014
Section 12, 13 and MBR	November 2014
JB3 Booster Pump Station	March 2015
Section 15-2	April 2015
2 x 12 Interconnect	August 2015
JB3 Electric Sub-Station	October 2015
Section 14	December 2015

Design and Construction Percent Complete by Section and Facility as of January 6, 2016

Section/Facility	9	10	11	12/13 MBR	14	15-1	15-2	16	17/18	19-1	19-2	JB2	JB3	JB3R	JB4	LP1	JCC1	JRC1
Design %	90%	100%	100%	100%	100%	100%	100%	65%	90%	45%	45%	60%	100%	100%	30%	30%	90%	60%
Construction %				54%	0%	97%	40%						16%	100%				

Summary

Summary

- 2060 DWU System population is approximately 9.7% higher in 2014 LRWSP than 2005 LRWSP
- 2060 DWU System water demand is approximately 20% lower in 2014 LRWSP than 2005 LRWSP
- The 2060 DWU System average gallons per capita per day for the Dallas service area decreased from 188 gpcd in the 2005 LRWSP to 137 gpcd in the 2014 LRWSP
- Strategies to meet 2070 DWU System consist of:
  - 12% Additional conservation
  - 36% Indirect reuse
  - 25% New surface water
  - 27% Connection to existing water supplies

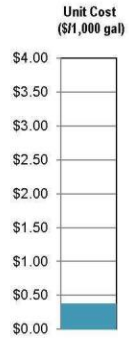
Future Projects

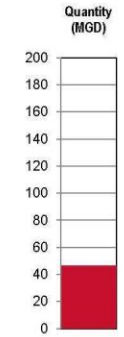
- Main Stem Pump Station
  - Developing amendment to NTMWD Swap agreement for cost sharing
- IPL Palestine Connection Palestine Segment (Segment 19)
  - TRWD - Land Acquisition
  - TRWD - Permit application development
- IPL Bachman Connection
  - Develop scope of work for routing study for land acquisition
- Main Stem Balancing
  - Developing scope of work for preliminary engineering, geotechnical evaluation and land acquisition
- Neches Run-of-River
  - Developing Agreement with Upper Neches River Municipal Water Authority (UNRMWA)
  - Assist UNRMWA with water rights permitting
- Lake Columbia (2070)
  - Developing agreement with Angelina Neches River Authority

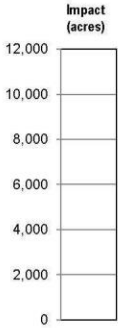
Appendix

2014 LRWSP Recommended Water Management Strategies Summaries

RECOMMENDED AND ALTERNATIVE WATER MANAGEMENT STRATEGIES







Project Name: **Additional Water Conservation**

Status: **Recommended (2020)**

Description of Strategy:

Water conservation is defined as "those practices, techniques, and technologies that will reduce the consumption of water, reduce the loss or waste of water, improve the efficiency in the use of water, or increase the recycling and reuse of water so that a water supply is made available for future or alternative uses" (Texas Water Code §11.002 (a) (8) (B)). Conserving existing water supplies through demand reduction can be one of the most cost-effective strategies available to municipal water suppliers to increase available supply. Conservation goals applicable over the 50-year planning timeframe of the 2014 LRWSP and ideas on how these goals could potentially be met through strategies are identified in Dallas' Strategic Plan and Water Conservation Plan. Additional water conservation is the conservation that is anticipated to be achieved above the water savings associated with the plumbing fixtures act.

Water Availability:

The annual volume of water saved under the additional conservation savings strategy is estimated to be 10.9 MGD in 2020 (12,219 acft/year) and 46.4 MGD in 2070 (52,014 acft/year). This represents a potential additional reduction in water use by the City of Dallas of 4.4% in 2020 and 12.9% in 2070 as compared to the TWDB's baseline projections.

Permitting and Environmental Issues:

Permitting and environmental issues are minimal for additional water conservation.

Costs:

Unit Cost, Quantity of Water, and Land Impacted			
Unit Cost of Water:	$0.38	$/1,000 gal	Treated Water Delivered
Quantity of Water:	46.4	MGD	Reliability = Firm

Phasing and Implementation:

Dallas continues to actively improve its water conservation efforts with the recent adoption of an update to its water conservation plan and the planned update of their strategic water conservation plan. These documents guide and document how Dallas plans, achieves, and monitors savings from conservation. The biggest risk to achieving the supply savings associated with additional conservation is the ability to continue to modify consumer behavior. Achieving additional conservation savings becomes more challenging as these savings are realized. Generally, easier programs are implemented first with more advanced programs that are more costly or require a greater level of consumer behavior modification implemented next. To overcome these risks, Dallas should continue to invest resources in the update to its strategic water conservation plan and continue to identify and implement best management practices that are likely to succeed as technology improves and consumer behaviors change.

Additional Conservation Implementation Steps:

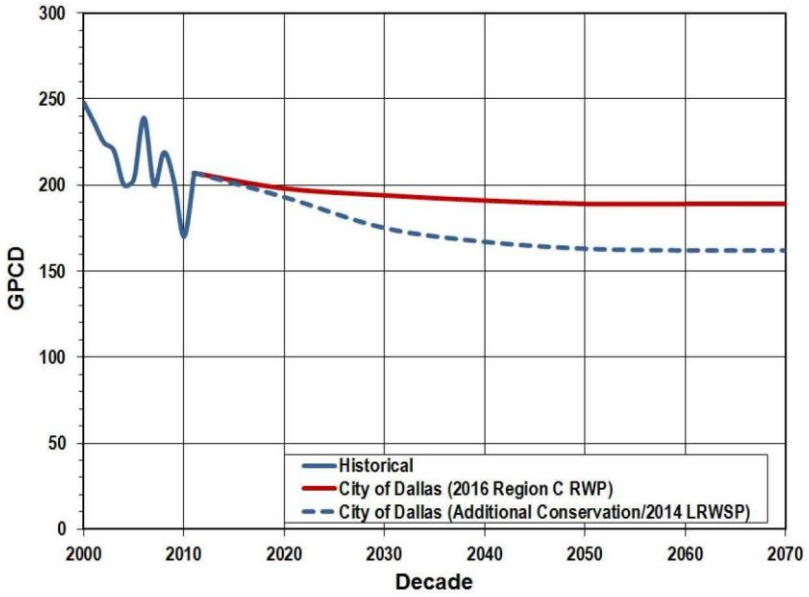
- Update Water Conservation Five-Year Strategic Plan to identify, fund and implement appropriate best management practices to achieve the planned savings.
- Continue to monitor and document savings achieved from conservation efforts.

Estimated Reduction Dallas Water Demands with Additional Conservation Strategy

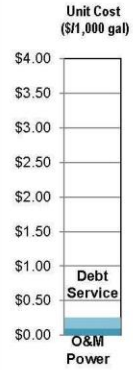
Component	2020	2030	2040	2050	2060	2070
Dallas Population Projections	1,242,135	1,347,717	1,531,681	1,707,057	1,841,064	1,905,498
TWDB Projected gpcd **(2011 TWDB baseline = 207 gpcd)**	198	194	191	189	189	189
TWDB Projected Water Demand (MGD)	245.6	260.8	291.6	322.5	347.2	359.3
Recommended gpcd with Additional Conservation (2014 LRWSP)	189	175	167	164	164	164
Projected Water Demand w/ Additional Conservation – (MGD)	234.7	236.2	255.3	280.3	302.3	312.9
Additional Conservation Savings (MGD)	10.9	24.6	36.3	42.2	44.9	46.4
Percentage Decrease in Water Demand with Additional Conservation	4.4%	9.5%	12.4%	13.1%	12.9%	12.9%

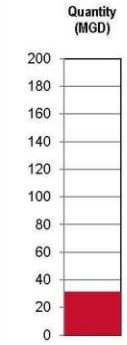
Note: The TWDB established a per capita use of 207 gpcd for Dallas for the year 2011 which serves as the baseline value for determining the estimated reductions presented in this table. Values in the table are rounded to the nearest 0.1 MGD.

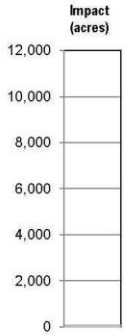
Comparison of Per Capita Water Use Goals for the City of Dallas



RECOMMENDED AND ALTERNATIVE WATER MANAGEMENT STRATEGIES







Project Name: **Main Stem Pump Station**

Status: **Recommended (2020)**

Cost Summary (Dallas Portion)	
Total Project Cost	**$26.1 M**
Annual Debt Service	$1.8 M
Annual O&M and Power	$1.1 M
Total Annual Cost	**$2.9 M**

Description of Strategy:

In December 2008, Dallas and the North Texas Municipal Water District (NTMWD) entered into an agreement (swap agreement) for the exchange of return flows. The swap agreement allows Dallas to use NTMWD return flows discharged into Lake Ray Hubbard in exchange for NTMWD utilizing a portion of Dallas' return flows from the main-stem of the Trinity River. Under the swap agreement Dallas and NTMWD will cooperate in the construction of a pump station (Main Stem Pump Station) and transmission pipeline to deliver up to 90 MGD of return flows (from Dallas and other entities) from a location on the main stem of the Trinity River to an agreed "point of delivery" near the NTMWD wetlands located near the East Fork of the Trinity River and Hwy 175 near Seagoville. Upon completion of the Main Stem Pump Station and pipeline, Dallas will have the right to utilize all of NTMWD water discharged into Lake Ray Hubbard. The project to be constructed under the swap agreement includes the construction of a Main Stem Pump Station (90 MGD) and a 72-inch diameter, 14.2 mile pipeline to transport water to the NTMWD wetlands

Water Availability:

Under the swap agreement, Dallas will exchange return flows from its Central and Southside WWTPs for an equal amount of return flows from NTMWD as discharged into Lake Ray Hubbard. By 2040 the volume of NTMWD return flows discharged into Lake Ray Hubbard is estimated to total 31.1 MGD (34,863 acft/yr).

Permitting and Environmental Issues:

Dallas has a water right permit that allows for the diversion of Dallas' return flows from the Trinity River. Therefore the only significant permit required for the construction of the Main Stem Pump Station project would be a Section 404 permit from the USACE for impacts to a waterway associated with the construction of the diversion facilities and pipeline. Additionally, if it were necessary to construct a new channel dam on the Trinity River, then this structure would require a new state water rights permit and need to be considered in the Section 404 permitting process.

Environmental concerns associated with the main stem pump station project including impacts to habitat, threatened and endangered species, wetlands, and freshwater inflows are all anticipated to be low.

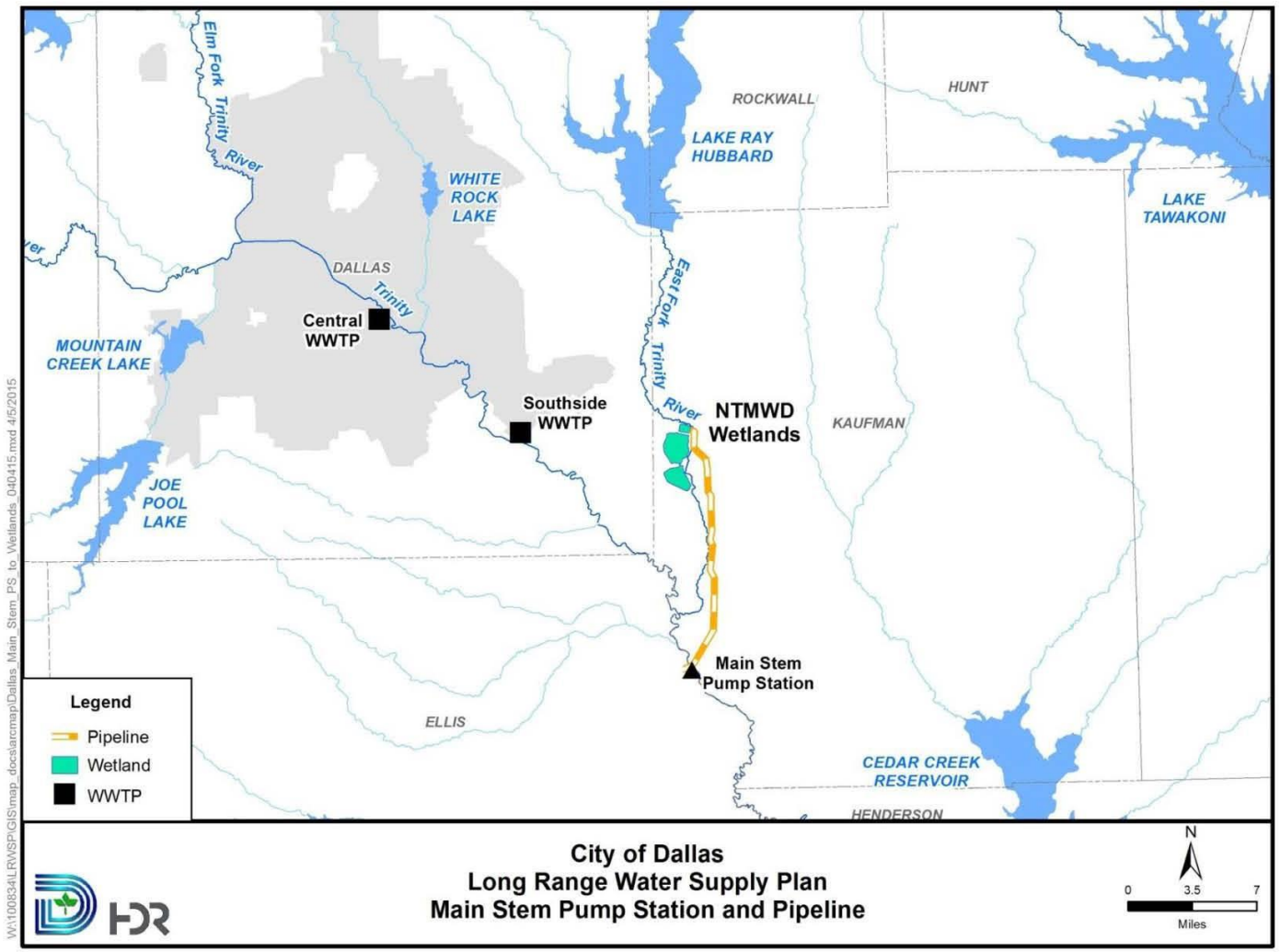
Costs:

Unit Cost, Quantity of Water, and Land Impacted			
Unit Cost of Water: O&M Unit Cost:	$0.25 $0.10	$/1,000 gal	Raw water in Lake Ray Hubbard
Quantity of Water:	31.1	MGD	Reliability = Firm
Land Acquired (excluding Mitigation):	91	acres	

Phasing and Implementation:

The following implementation steps are recommended for the Main Stem Pump Station.

- Continue to coordinate with NTMWD on the implementation of this strategy.
- Because the project timeline has shifted due to the immediate need of NTMWD, Dallas and NTMWD are planning to amend the terms of the swap agreement to reflect the new concept and timeline.


Elm Fork Trinity River
WHITE ROCK LAKE
ROCKWALL
HUNT
LAKE RAY HUBBARD
LAKE TAWAKONI
DALLAS
Trinity
Central WWTP
East Fork Trinity River
MOUNTAIN CREEK LAKE
Southside WWTP
NTMWD Wetlands
KAUFMAN
JOE POOL LAKE
Main Stem Pump Station
ELLIS
CEDAR CREEK RESERVOIR
HENDERSON
Legend
Pipeline
Wetland
WWTP
W:\100834\LRWSP\GIS\map_docs\arcmap\Dallas_Main_Stem_PS_to_Wetlands_040415.mxd 4/5/2015
City of Dallas
Long Range Water Supply Plan
Main Stem Pump Station and Pipeline
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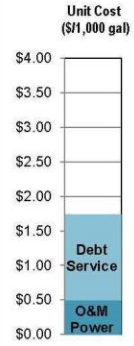
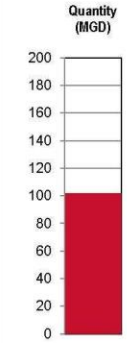
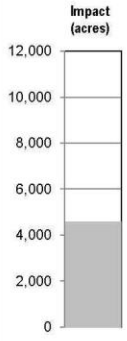
3.5
7
Miles

RECOMMENDED AND ALTERNATIVE WATER MANAGEMENT STRATEGIES







Project Name: **Main Stem Balancing Reservoir**

Status: **Recommended (2050)**

Cost Summary	
Total Project Cost	**$674.5 M**
Annual Debt Service	$46.4 M
Annual O&M and Power	$18.5 M
Total Annual Cost	**$64.9 M**

Description of Strategy:

The Main Stem Balancing Reservoir project is a proposed off channel reservoir that could store approximately 300,000 acft of Dallas' (and potentially other entities') return flows as well as stormwater runoff originating in the upstream Trinity River watershed. Additionally, because the diversion point for this strategy is located downstream of the confluence with the East Fork of the Trinity River, the Main Stem Balancing Reservoir could also be used to transfer water from Dallas' eastern system to Dallas' western system by storing water released from either Lake Ray Hubbard or from Dallas' eastern raw water transmission pipelines where they cross the East Fork. Water supplies would be delivered to the Joe Pool area through a 36.5 mile, 84-inch transmission system.

Water Availability:

The Main Stem Balancing Reservoir was preliminarily designed to achieve a desired firm yield of 102 MGD (114,000 acft/yr) by 2070. The water availability analysis indicated that by 2070, 109 MGD of return flows would be available for diversion after considering the swap agreement with NTMWD and an amended instream flow requirement.

Permitting and Environmental Issues:

This project would require a surface water permit for the channel dam (if needed) on the Trinity River from TCEQ. While Dallas has rights to divert its Trinity River discharges, a new water right permit would be required to divert stormwater. In addition to the surface water permit, a Section 404 permit from the USACE for impacts to a waterway from construction activities would be needed for the construction of the diversion facilities and pipeline.

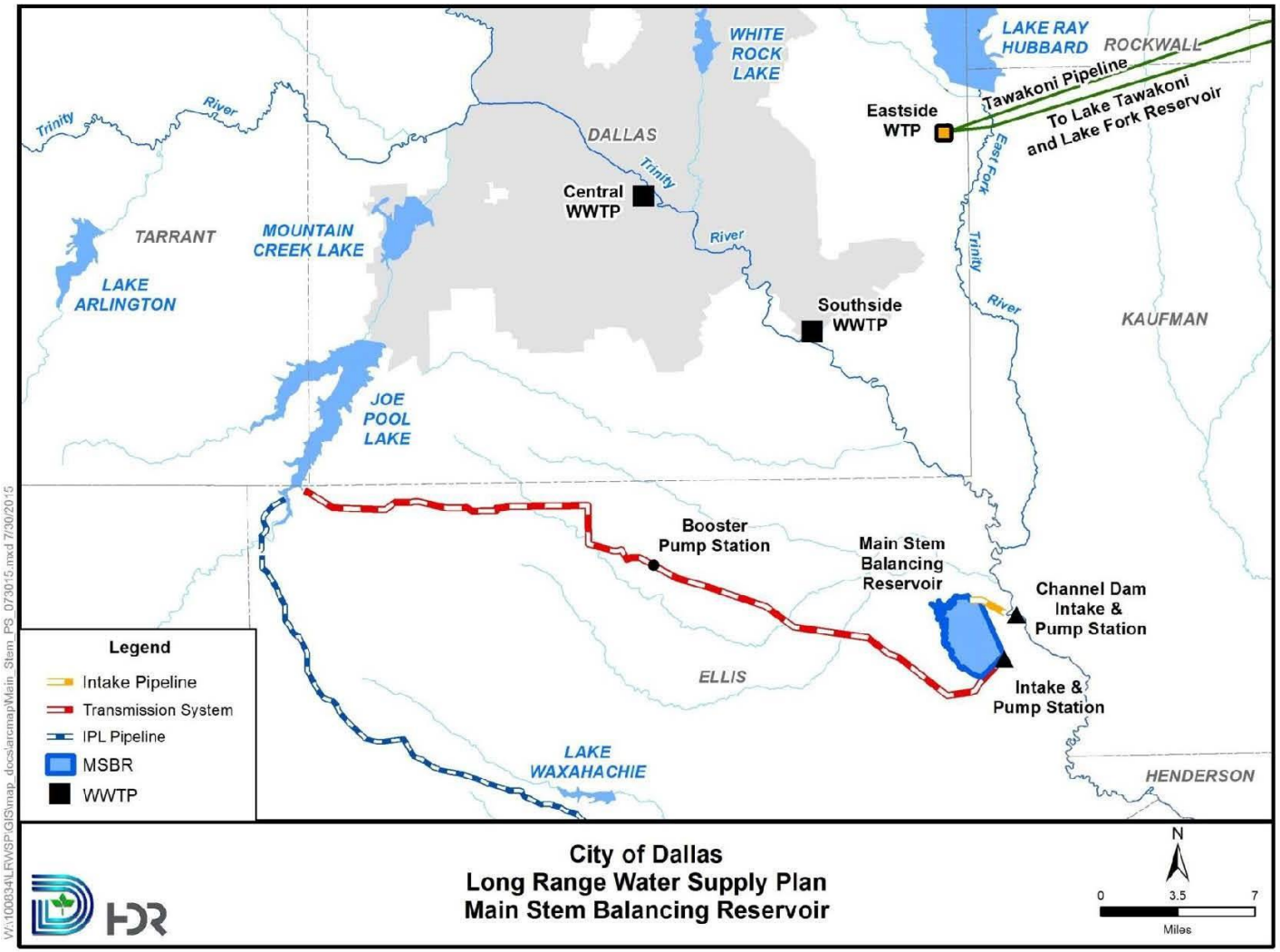
Environmental concerns associated with the main stem pump station project including impacts to habitat, threatened and endangered species, wetlands, and freshwater inflows are all anticipated to be low.

Costs:

Unit Cost, Quantity of Water, and Land Impacted			
Unit Cost of Water: O&M Unit Cost:	$1.74 $0.50	$/1,000 gal	Raw Water Delivered to Bachman Turnout / Joe Pool Area
Quantity of Water:	102	MGD	Reliability = Firm
Land Acquired (excluding Mitigation):	4,584	acres	

Phasing and Implementation:

It is recommended that Dallas initiate a feasibility study that includes: securing the water rights permit for the storage reservoir, performing a reservoir site foundation evaluation, initiating a land acquisition and maintenance program (prior to construction), preparing a water quality evaluation, performing a siting study of the main-stem pump station considering flooding issues; and determining the need for a new Trinity River water control structure or improvements to an existing structure.


WHITE ROCK LAKE
LAKE RAY HUBBARD
ROCKWALL
Tawakoni Pipeline
To Lake Tawakoni and Lake Fork Reservoir
Eastside WTP
DALLAS
Central WWTP
Trinity River
East Fork
TARRANT
MOUNTAIN CREEK LAKE
LAKE ARLINGTON
Southside WWTP
KAUFMAN
JOE POOL LAKE
Booster Pump Station
Main Stem Balancing Reservoir
Channel Dam Intake & Pump Station
Intake & Pump Station
ELLIS
LAKE WAXAHACHIE
HENDERSON
Legend
Intake Pipeline
Transmission System
IPL Pipeline
MSBR
WWTP
V:\100834\LRWSP\GIS\map_docs\arcmap\Main_Stem_PS_073015.mxd 7/30/2015
City of Dallas
Long Range Water Supply Plan
Main Stem Balancing Reservoir
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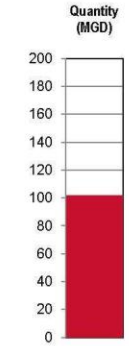
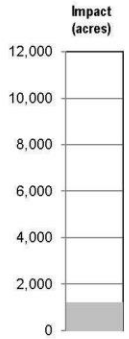
RECOMMENDED AND ALTERNATIVE WATER MANAGEMENT STRATEGIES





Project Name: **Integrated Pipeline (IPL) – Part 1 Connection to Lake Palestine**

Status: **Recommended (2027)**

Cost Summary	
Total Project Cost	**$939 M**
Annual Debt Service	$64.6 M
Annual O&M and Power	$21.3 M
Total Annual Cost	**$85.9 M**

Description of Strategy:

Dallas and the TRWD are partnering on the planning and development of an integrated raw water transmission system to meet future water needs. The purpose of the transmission system, also known as the Integrated Pipeline (IPL), is to bring water from Lake Palestine, Richland-Chambers Reservoir, and Cedar Creek Reservoir to Dallas and TRWD. The 134-mile long raw water transmission pipeline ranges in diameter from 84-inch to 108-inch and will convey water at a planned peak capacity of 347 MGD. Dallas' portion of the capacity of the shared pipeline is currently planned to be 150 MGD. For the purposes of the 2014 Dallas LRWSP, the IPL strategy has been broken out into two separate, but related projects. The first project for the IPL is delivering water to the Joe Pool area, shared infrastructure with TRWD. The second part of the strategy is delivering water the IPL near the Joe Pool area to the Bachman WTP, likely Dallas only infrastructure.

Water Availability:

Dallas has contracted for 102 MGD of Lake Palestine supply which will be conveyed through the IPL. Assuming an average delivery of the Palestine water results in the IPL will have an unutilized capacity of approximately 48 MGD (or about 53,800 acft/yr) which could be utilized by Dallas to deliver additional water from other strategies located within the Neches River Basin.

Permitting and Environmental Issues:

The Lake Palestine Pipeline project would pose several permitting challenges along with the typical challenges associated with a new project. A Section 404 permit from the USACE for impacts to a waterway from construction activities would be needed for the construction of the diversion facilities and pipeline.

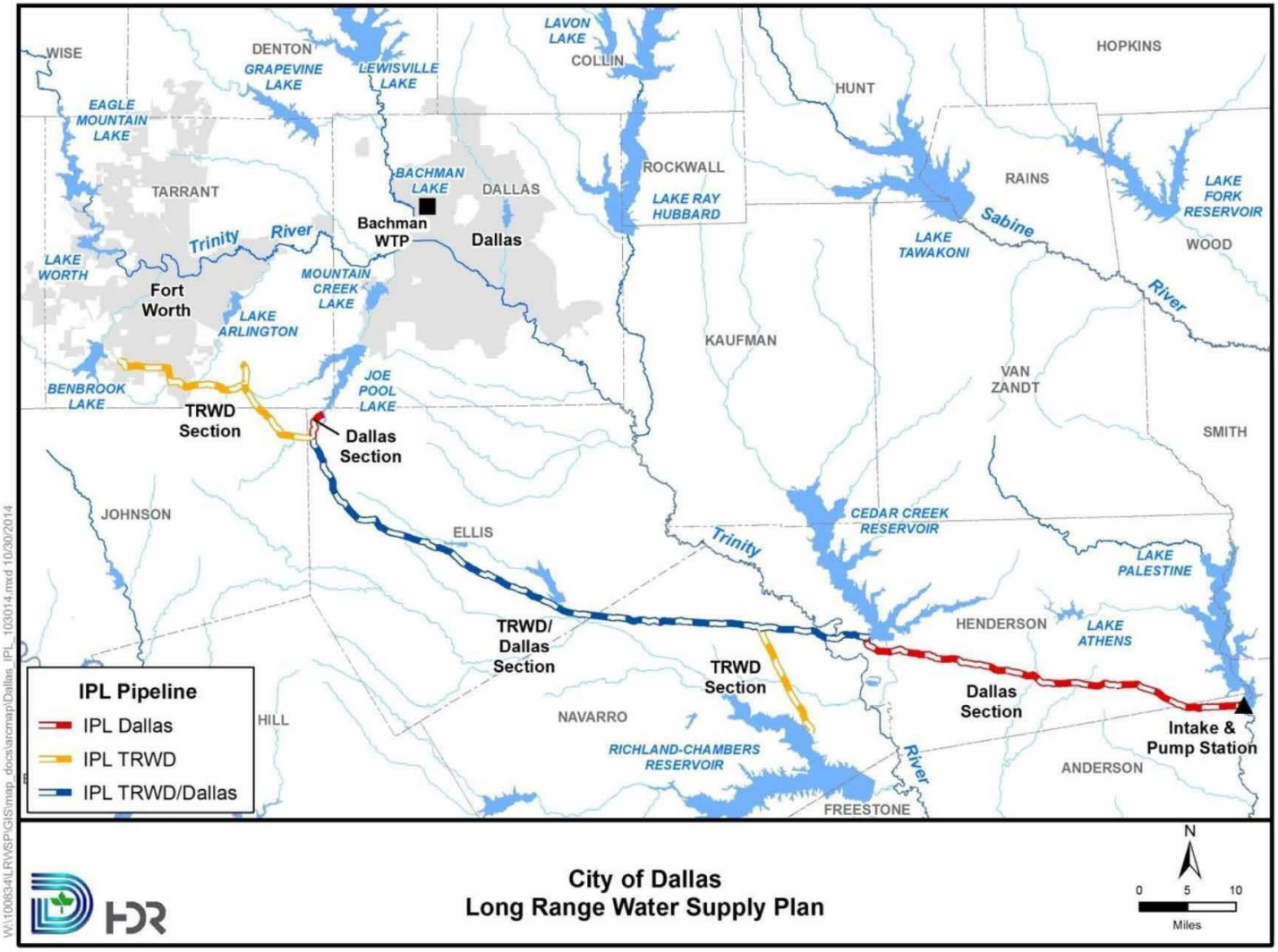
Costs:

Unit Cost, Quantity of Water, and Land Impacted			
Unit Cost of Water: O&M Unit Cost:	$2.31 $0.57	$/1,000 gal	Raw water to the Bachman Turnout
Quantity of Water:	102	MGD	Reliability = Firm
Land Acquired (excluding Mitigation):	1,656	acres	

Phasing and Implementation:

Dallas has invested significant capital in the development of this project, and many of the hurdles remaining are centered on land acquisition and construction activities. The following steps are recommendation for implementation of the IPL.

- Re-evaluate the planned 150 MGD capacity of the two Dallas-only segments of the IPL considering the combined supply from the three recommended strategies could supply as much as 194 MGD (Lake Palestine (102 MGD), Neches Run-of-the-River (42 MGD) and Lake Columbia (50 MGD)). Once the delivery capacity is finalized, proceed with the final design of the two Dallas-only pipeline segments of the IPL.
- Determine what metric will initiate the construction of the Dallas segments of the IPL.


WISE
DENTON
GRAPEVINE LAKE
LEWISVILLE LAKE
LAVON LAKE
COLLIN
HOPKINS
HUNT
EAGLE MOUNTAIN LAKE
TARRANT
BACHMAN LAKE
DALLAS
ROCKWALL
LAKE RAY HUBBARD
RAINS
LAKE FORK RESERVOIR
Trinity River
Bachman WTP
Dallas
Sabine River
LAKE TAWAKONI
WOOD
LAKE WORTH
Fort Worth
MOUNTAIN CREEK LAKE
LAKE ARLINGTON
KAUFMAN
VAN ZANDT
BENBROOK LAKE
JOE POOL LAKE
TRWD Section
Dallas Section
SMITH
JOHNSON
ELLIS
CEDAR CREEK RESERVOIR
Trinity
LAKE PALESTINE
HENDERSON
LAKE ATHENS
TRWD/ Dallas Section
TRWD Section
Dallas Section
Intake & Pump Station
HILL
NAVARRO
RICHLAND-CHAMBERS RESERVOIR
ANDERSON
FREESTONE
IPL Pipeline
IPL Dallas
IPL TRWD
IPL TRWD/Dallas
City of Dallas
Long Range Water Supply Plan
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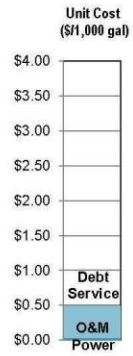
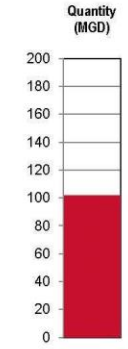
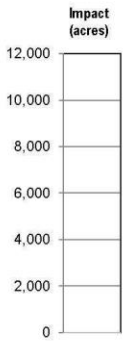
RECOMMENDED AND ALTERNATIVE WATER MANAGEMENT STRATEGIES







Project Name: **Integrated Pipeline (IPL) – Part 2 Connection to Bachman WTP**

Status: **Recommended (2027)**

Cost Summary	
Total Project Cost	**$244.3 M**
Annual Debt Service	$16.8 M
Annual O&M and Power	$1.4 M
Total Annual Cost	**$18.2 M**

Description of Strategy:

Several alternative delivery options were evaluated to deliver the IPL water from the Joe Pool Lake area to the Bachman WTP. Of the various options evaluated, the option, which consists of a pipeline to connect the IPL to the Bachman WTP, was chosen as the preferred alternative in the 2014 Dallas LRWSP. The selected route delivers water from the IPL to the Bachman WTP in a closed conduit utilizing gravity and residual head from the IPL with a shallow tunnel to get through a highpoint along the route. This route parallels State Highway 360 along the west side of Joe Pool, then east on Camp Wisdom Road, heads north meandering east of Mountain Creek Lake to ultimately deliver water to the Bachman WTP. At the Bachman WTP the water is discharged above Frasier dam for diversion into Bachman through Fishing Hole Lake. The water relies on the residual head from the IPL and does not require any additional booster pumping stations for this alternative. From the work of the LRWSP it was determined that a west side WTP expansion could be delayed until about 2050, therefore there are no WTP improvement costs included in this estimate. The alternative plan, which provides Dallas some potential cost savings at the expense of potential conflict with other entities, is to discharge the water into Joe Pool and using the streams and reservoirs to transmit the water to the Trinity River, where a channel dam would be placed to back water up to Frasier dam where it could be lifted into the Bachman WTP intake system.

Water Availability:

Dallas has contracted for 102 MGD of Lake Palestine supply which will be conveyed through the IPL. The IPL will have an unutilized capacity of approximately 48 MGD (or about 53,800 acft/yr) which could be utilized by Dallas to deliver additional water from other strategies located within the Neches River Basin. The IPL part 2 is sized to deliver the full 150 MGD capacity, for the purposes of the LRWSP.

Permitting and Environmental Issues:

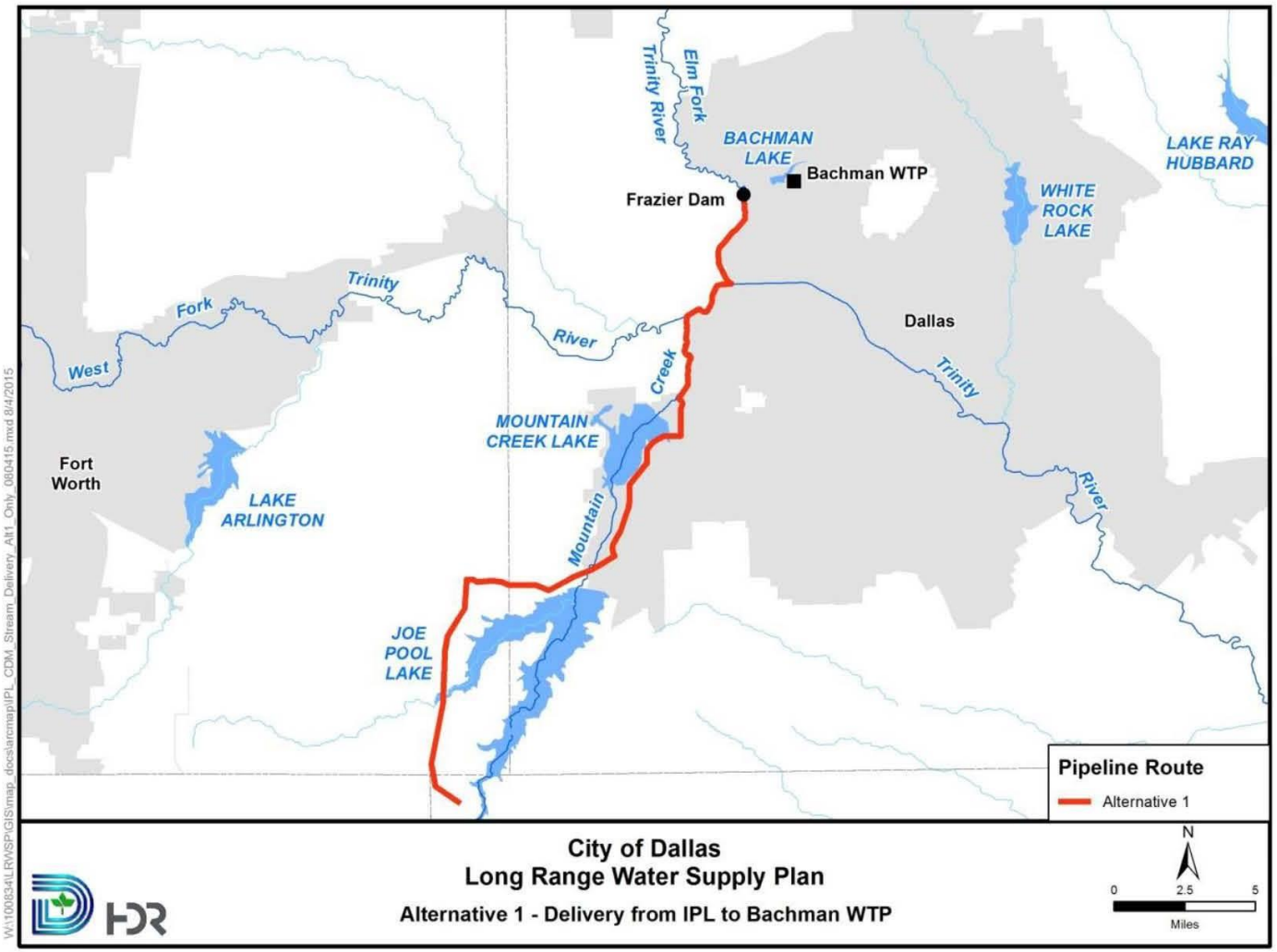
The Bachman WTP connection could pose permitting challenges along with the typical challenges associated with a new project. A Section 404 permit from the USACE for impacts to a waterway from construction activities would be needed for the construction of the pipeline. A Section 408 permit, required to cross the levee system, would also be required.

Costs:

Unit Cost, Quantity of Water, and Land Impacted			
Unit Cost of Water: O&M Unit Cost:	$0.49 $0.04	$/1,000 gal	Raw Water Delivered to Bachman WTP
Quantity of Water:	102	MGD	Reliability = Firm
Land Acquired (excluding Mitigation):	552	acres	

Phasing and Implementation:

Dallas should consider a study to evaluate the potential willingness for cooperation with other entities to allow the alternative deliver option using the bed and banks of the stream system. Coordination with the USACE will also be required for any construction activities in the Trinity Levee System.


Trinity River
Elm Fork
BACHMAN LAKE
Bachman WTP
Frazier Dam
LAKE RAY HUBBARD
WHITE ROCK LAKE
Dallas
Trinity
River
Creek
Mountain
MOUNTAIN CREEK LAKE
Trinity
Fork
West
River
Fort Worth
LAKE ARLINGTON
JOE POOL LAKE
Pipeline Route
Alternative 1
City of Dallas
Long Range Water Supply Plan
Alternative 1 - Delivery from IPL to Bachman WTP
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5
Miles
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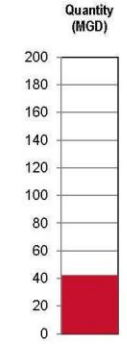
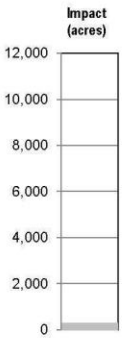
RECOMMENDED AND ALTERNATIVE WATER MANAGEMENT STRATEGIES





Project Name: **Upper Neches Project**

Status: **Recommended (2050)**

Cost Summary	
Total Project Cost	**$226.8 M**
Annual Debt Service	$15.6 M
Annual O&M and Power	$13.4 M
Total Annual Cost	**$29.0 M**

Description of Strategy:

In 2013 Dallas and the UNRMWA initiated the Upper Neches River Water Supply Project Feasibility Study to evaluate options to replace the Fastrill Reservoir project that was rendered not feasible. The preferred Upper Neches Project would include run-of-river diversions from the Neches River operated conjunctively with Lake Palestine. This additional water supply would be used to supplement existing water supplies available to Dallas from Lake Palestine and potentially other UNRMWA customers.

The selected Upper Neches Project strategy includes a new river intake and pump station for a run-of-river diversion from the Neches River near the SH 21 crossing. Water would be delivered through a 42-mile, 72-inch diameter pipeline to Dallas' pump station at Lake Palestine for delivery to Dallas through the IPL. Facilities include a small diversion dam on the Neches River, a river intake and pump station, and a transmission pipeline and booster pump station with delivery to the IPL pump station site near Lake Palestine.

Water Availability:

The Upper Neches Project includes a run-of-river diversion from Neches River backed up by storage in Lake Palestine when streamflows are not available due to drought conditions, senior water rights calls, and/or TCEQ environmental flow restrictions. Water availability at this diversion point was computed based on a maximum diversion rate of 141 cfs (91 MGD). The firm yield for this strategy is 42.2 MGD (47,250 acft/yr), assuming conjunctive system operations with Lake Palestine.

Permitting and Environmental Issues:

Similar to other new water projects in Texas, a surface water permit for the channel dam and river diversion from the Neches River would be required from TCEQ and would need to include an inter-basin transfer authorization. In addition to the surface water permit, a Section 404 permit from the USACE for impacts to a waterway from construction activities would be needed for the construction of the diversion facilities and pipeline. Environmental concerns associated with the conjunctive use project including impacts to habitat, threatened and endangered species, wetlands, and freshwater inflows are all anticipated to be low.

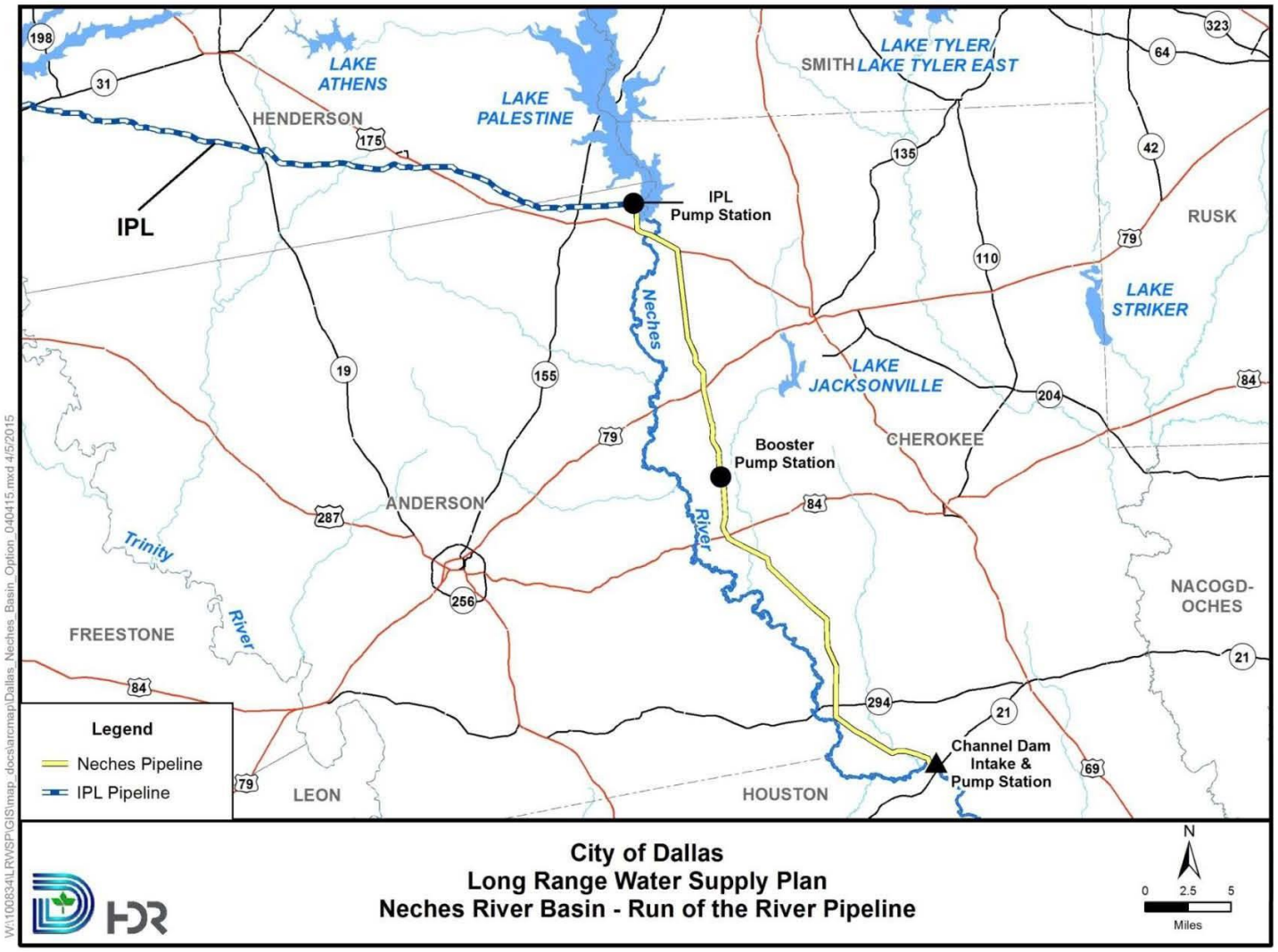
Costs:

Unit Cost, Quantity of Water, and Land Impacted			
Unit Cost of Water: O&M Unit Cost:	$1.88 $0.87	$/1,000 gal	Raw Water Delivered through the IPL to Bachman Turnout
Quantity of Water:	42.2	MGD	Reliability = Firm
Land Acquired (excluding Mitigation):	299	acres	

Phasing and Implementation:

The following steps are recommended for implementation of the Upper Neches Project.

- Continue to partner with the UNRMWA on additional studies and permitting of a new strategy in the Neches River Basin. The final project permitted and pursued by UNRMWA could have a different configuration than the one chosen by Dallas as part of the 2014 LRWSP, but would still serve as a recommended strategy for Dallas.
- Develop an agreement with UNRMWA to establish what, if any, local yield of the project may be required to remain in the Neches River Basin.


LAKE ATHENS
LAKE PALESTINE
LAKE TYLER/ LAKE TYLER EAST
SMITH
HENDERSON
IPL
IPL Pump Station
RUSK
LAKE STRIKER
Neches
LAKE JACKSONVILLE
CHEROKEE
Booster Pump Station
ANDERSON
Trinity River
Neches River
NACOGD-OCHES
FREESTONE
Channel Dam Intake & Pump Station
LEON
HOUSTON
198
31
175
135
64
323
42
79
110
19
155
84
204
287
256
294
21
69
Legend
Neches Pipeline
IPL Pipeline
City of Dallas
Long Range Water Supply Plan
Neches River Basin - Run of the River Pipeline
N
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Miles
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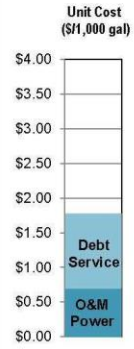
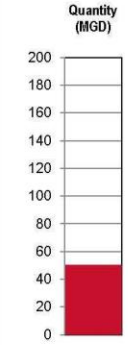
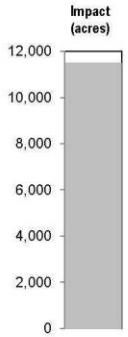
RECOMMENDED AND ALTERNATIVE WATER MANAGEMENT STRATEGIES







Project Name: **Lake Columbia**

Status: **Recommended (2070)**

Cost Summary	
Total Project Cost	**$288.6 M**
Annual Debt Service	$19.9 M
Annual O&M and Power	$12.7 M
Total Annual Cost	**$32.6 M**

Description of Strategy:

Lake Columbia is a proposed reservoir project of the ANRA and located on Mud Creek in Cherokee County. The reservoir would be connected to Dallas' western system via a 20 mile, 42-inch diameter pipeline from Lake Columbia to the proposed IPL pump station at Lake Palestine. Water would then be delivered to the Lake Joe Pool area via the IPL. For purposes of this study, the assumption was made that Dallas will be responsible for 70 percent of the dam, reservoir land acquisition, and relocations, and the local entities involved in the project will be responsible for the remaining 30 percent of these costs.

Water Availability:

ANRA estimates that after considering local needs, approximately 50 MGD of supply would be available to Dallas. Dallas' capacity in the IPL is 150 MGD and, after considering Dallas' Lake Palestine supply of 102 MGD, the IPL will initially have available excess capacity of about 48 MGD. Considering the potential for Dallas to manage pumping rates from both Lakes Palestine and Columbia, it is reasonable for Dallas to potentially contract for up to 50 MGD of supply from Lake Columbia.

Permitting and Environmental Issues:

ANRA has been granted a water right permit for Lake Columbia by the TCEQ to impound 195,500 acft and to divert 76.3 MGD (85,507 acft/yr). However, the Lake Columbia project is subject to completion of the EIS and issuance of the §404 permit from the USACE, as well as completion of a Source Water Assessment. In addition, TCEQ Permit No. 4228 will have to be amended to allow for interbasin transfers of supplies to the Trinity River Basin.

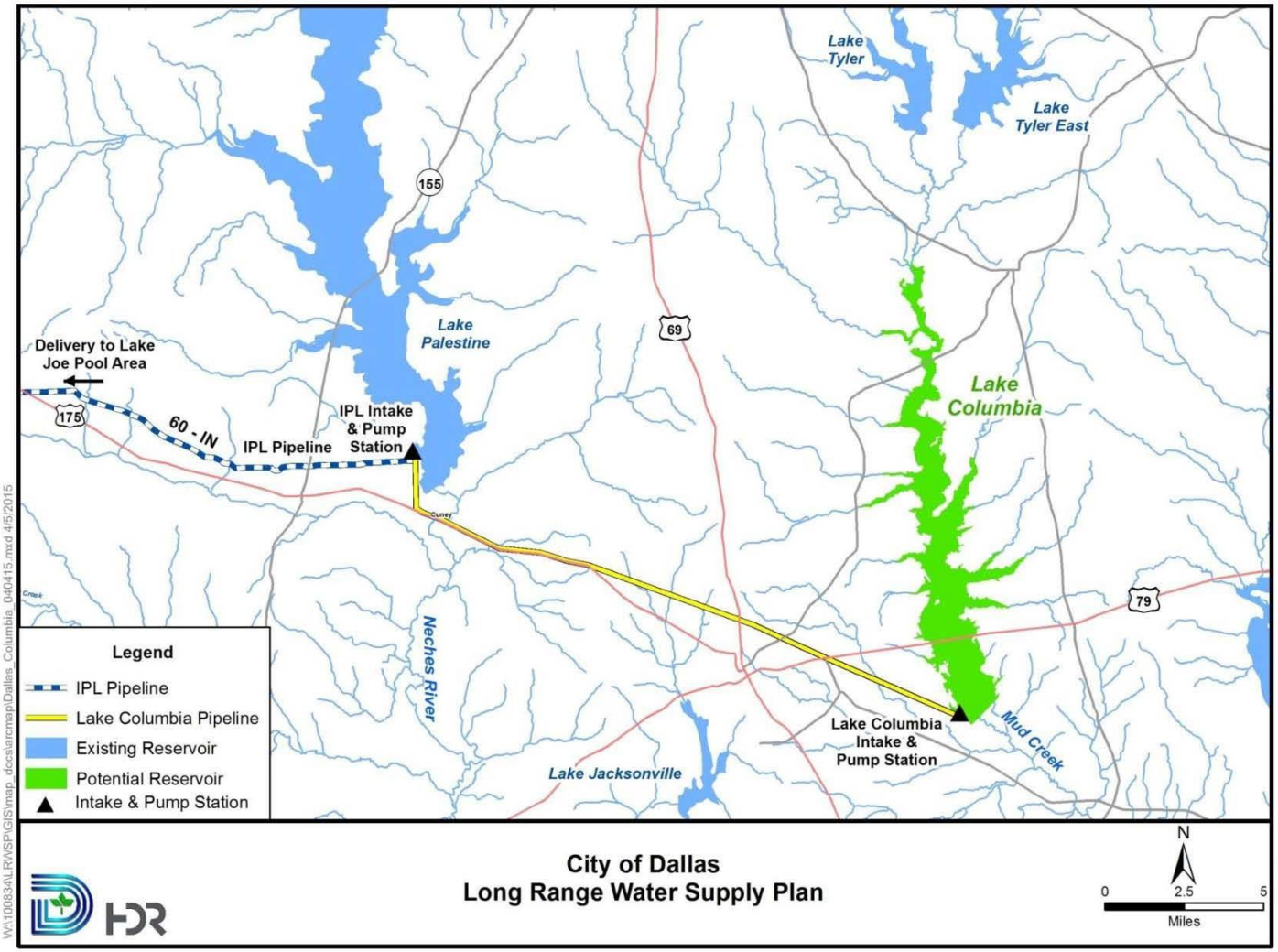
Implementation of the Lake Columbia project will comply with TCEQ Permit No. 4228 which does not currently require instream flow releases and the project could have a significant impact on daily flows on Mud Creek. The large footprint of Lake Columbia would impact approximately 5,751 acres of wetlands and 5,579 acres of bottomland hardwoods and includes a unique habitat area consisting of an herbaceous seepage bog that will require mitigation before for the 404 permit is granted.

Costs:

Unit Cost, Quantity of Water, and Land Impacted			
Unit Cost of Water: O&M Unit Cost:	$1.78 $0.70	$/1,000 gal	Raw Water Delivered through the IPL to Bachman Turnout
Quantity of Water:	50	MGD	Reliability = Firm; potentially subject to use by local entities
Land Acquired (excluding Mitigation):	8,538	acres	Additional acreage required for mitigation (approx.. 11,000 acres)

Phasing and Implementation:

For implementation, Dallas should continue to partner with the ANRA on the permitting of Lake Columbia including the 404 permitting process and the amendment of ANRA's existing water right to include an interbasin transfer which would authorize Dallas' use of this water in the Trinity River Basin.


Lake Tyler
Lake Tyler East
155
Lake Palestine
69
Lake Columbia
Delivery to Lake Joe Pool Area
175
60 - IN
IPL Pipeline
IPL Intake & Pump Station
79
Neches River
Lake Columbia Intake & Pump Station
Mud Creek
Lake Jacksonville
Legend
IPL Pipeline
Lake Columbia Pipeline
Existing Reservoir
Potential Reservoir
Intake & Pump Station
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City of Dallas
Long Range Water Supply Plan
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