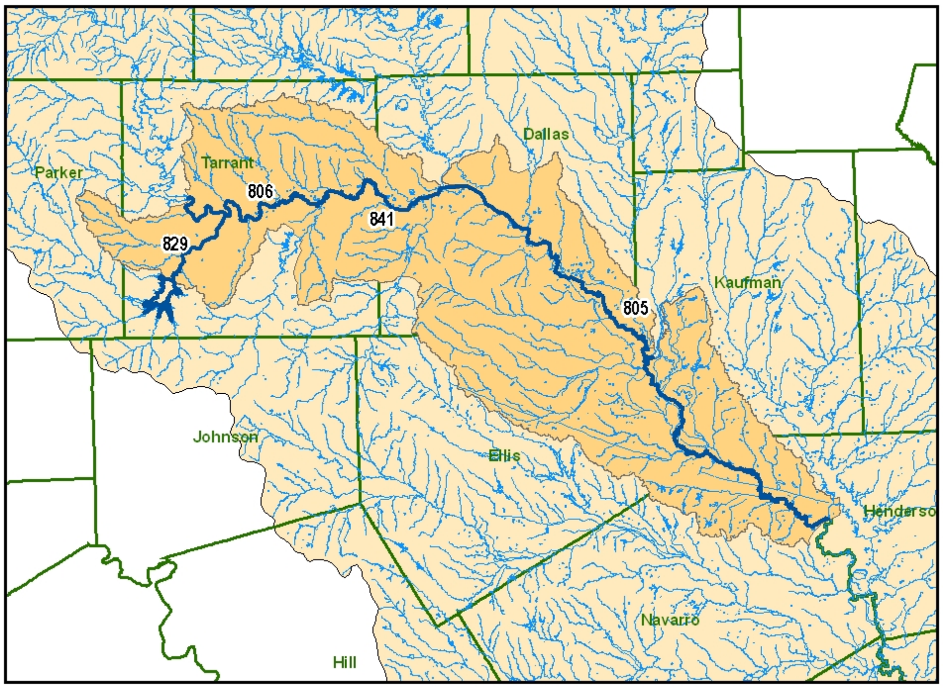
Total Maximum Daily Loads for PCBs in Trinity River Segments 0829, 0806, 0841, and 0805
Work Order No. 582-7-80164-01

MONITORING PLAN

Revision1



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August, 2007

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ACRONYMS AND ABBREVIATIONS

ADV	fish consumption advisory
AFP4	Air Force Plant 4
AL	aquatic life order
BAF	bioaccumulation factor
cfs	Cubic feet per second
DDE	Dichlorodiphenyldichloroethylene
HAC	health assessment comparison
IH	interstate highway
MCL	maximum contaminant level
mg/kg/day	milligrams per kilograms per day
MGD	million gallons per day
MS4	Municipal Separate Storm Sewer System
NASD	Dallas Naval Air Station
NASFW	Forth Worth Naval Air Station
ng/g	nanogram per gram
ng/L	nanogram per liter
NWIRP	Naval Weapons Industrial Reserve Plant
ºF	degrees Fahrenheit
PCB	Polychlorinated biphenyl
RCRA	Resource Conservation Recovery Act
SH	state highway
TAC	Texas Administrative Code
TCEQ	Texas Commission on Environmental Quality
TDSHS	Texas Department of State Health Services
TMDL	total maximum daily load
TPDES	Texas Pollutant Discharge Elimination System
TPWD	Texas Parks and Wildlife Department
TRA	Trinity River Authority
TRACS	Texas Regulatory Activities and Compliance System
TRWD	Tarrant Regional Water District
TSCA	Toxic Substances Control Act
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Policy Act
USGS	U.S. Geological Survey
WWTP	wastewater treatment plant

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<u>Monitoring Plan</u>

1. INTRODUCTION

Polychlorinated biphenyls (PCB) are widespread and persistent synthetic organic contaminants that can affect human health at low concentrations. As a result of PCBs found in fish tissue, an Aquatic Life Order (AL) and a Fish Consumption Advisory (ADV) were issued by the Texas Department of State Health Services (TDSHS). Aquatic Life Order 2 was issued in January 1990, banning fish possession due to high chlordane concentrations. AL-2 applied to the Trinity River from the Seventh Street bridge on the Clear Fork in downtown Fort Worth to Interstate Highway (IH) 20 in Dallas. Aquatic Life Order 14, issued in September 2002, extended the existing fish possession ban downstream to State Highway (SH) 34 near Rosser, in Kaufman County, Texas. AL-14 applied to all fish species because of PCB and DDE contamination, in addition to chlordane. Fish Consumption Advisory 25 was issued in September 2002 for all gar species from SH 34 to the Cedar Creek reservoir discharge canal due to elevated levels of chlordane, DDE, and PCBs. Only PCBs are addressed in this Total Maximum Daily Load (TMDL) project. Chlordane in fish tissue was addressed in two previous legacy pollutant TMDL documents and Implementation Plans covering the Fort Worth and Dallas area.

1.1 PCB Background and Properties

PCBs are a group of 209 chlorinated organic compounds composed of two connected phenyl rings with 1 to 10 chlorines attached at 10 possible positions (2,3,4,5,6,2',3',4', 5',6') around the rings. The 209 individual compounds are known as PCB congeners. The individual congeners have different physical and chemical properties. PCBs were first produced on an industrial scale in 1929 by the Swan Chemical Company. This company was later purchased by Monsanto Industrial Chemicals and became the main U.S. producer of PCBs for nearly its entire domestic production life (De Voogt and Brinkman 1989). In the early years of PCB production, its main use was as a dielectric fluid in transformers. Like many industrial products, the post-WWII era significantly diversified the application of these chemicals and increased their levels of production. The main applications were dielectric fluids, heat transfer fluids in heat exchangers, and as heat-resistant hydraulic fluids. Many other smaller miscellaneous applications for PCBs were also developed, including plasticizers, carbonless copy paper, lubricants, inks, laminating agents, impregnating agents, paints, adhesives, waxes, additives in cements and plasters, casting agents, de-dusting agents, sealing liquids, fire retardants, immersion oils, and pesticides (De Voogt and Brinkman 1989).

In 1971, Monsanto voluntarily limited its production of PCBs because of the growing public and scientific concerns of their effects (De Voogt and Brinkman 1989), and in 1976 the Toxic Substances Control Act (TSCA) was passed, calling for a ban on all production, distribution, and new use of PCBs (USEPA 2003). Monsanto's compliance with the TSCA resulted in a complete cessation of PCB production in mid-1977; PCBs have not been produced in the United States since that time (De Voogt and Brinkman 1989). Long-life PCB applications such as transformers were still allowed under strict regulations for operations and disposal, but those uses will eventually be phased out as the old technologies are replaced.

PCBs were produced as mixtures of PCB congeners sold in the U.S. under the trade name Aroclor. Various Aroclor mixtures, varying in the amount of chlorine, were manufactured (*e.g.*, Aroclor 1242, 1248, 1254, 1260). The last two numbers of each Aroclor mixture indicate the approximate percentage of chlorine by mass in the product.

Although the physical properties of PCBs vary a great deal among the 209 congeners, all PCBs are poorly soluble in water, and most PCBs in aquatic systems will be associated with sediment. PCBs are also highly resistant to degradation, and their residence times in the aquatic environment are typically calculated to be on the order of decades.

1.2 Impaired Segments

The Texas Commission on Environmental Quality (TCEQ) placed four segments of the Trinity River on the 2002 Clean Water Act §303(d) List of impaired water bodies due to "PCBs in fish tissue" as a result of the TDSHS closures and advisory. The term "project area" is used throughout this report and refers to impaired portions of the four segments identified in AL-14 and ADV-25. The project area spans 150 river miles in Tarrant, Dallas, Kaufman, Ellis, Henderson, and Navarro Counties. The segments included in this TMDL Study are listed below and shown in Figure 1:

Clear Fork Trinity River Below Lake Benbrook (0829). Segment 0829 is a 14-mile freshwater stream extending from immediately downstream of the Benbrook Dam to the confluence with Upper West Fork Trinity River (Segment 0806) in Fort Worth. Only the lower 1 mile of this segment (below the 7th Street bridge) is on the §303(d) List for PCBs.

Upper West Fork Trinity River below Lake Worth (Segment 0806). Segment 0806 is a 33-mile freshwater stream that begins immediately below the Lake Worth dam in Tarrant County and extends to a point immediately upstream of the confluence of Village Creek in Tarrant County. The lower 22 miles of the segment (below the confluence with Segment 0829) are on the §303(d) List for PCBs.

Lower West Fork Trinity River (Segment 0841). Segment 0841 is a 27-mile freshwater stream that extends from immediately upstream of the confluence of Village Creek in Tarrant County to immediately upstream of the confluence of the Elm Fork Trinity River in Dallas County. The entire segment is on the §303(d) List for PCBs.

Upper Trinity River (Segment 0805). Segment 0805 is a 100-mile freshwater stream that extends from immediately upstream of the confluence of the Elm Fork Trinity River in Dallas County to a point immediately upstream of the confluence of the Cedar Creek Reservoir discharge canal in Henderson/Navarro Counties. All portions of the 100-mile segment are included in the §303(d) list for PCBs.

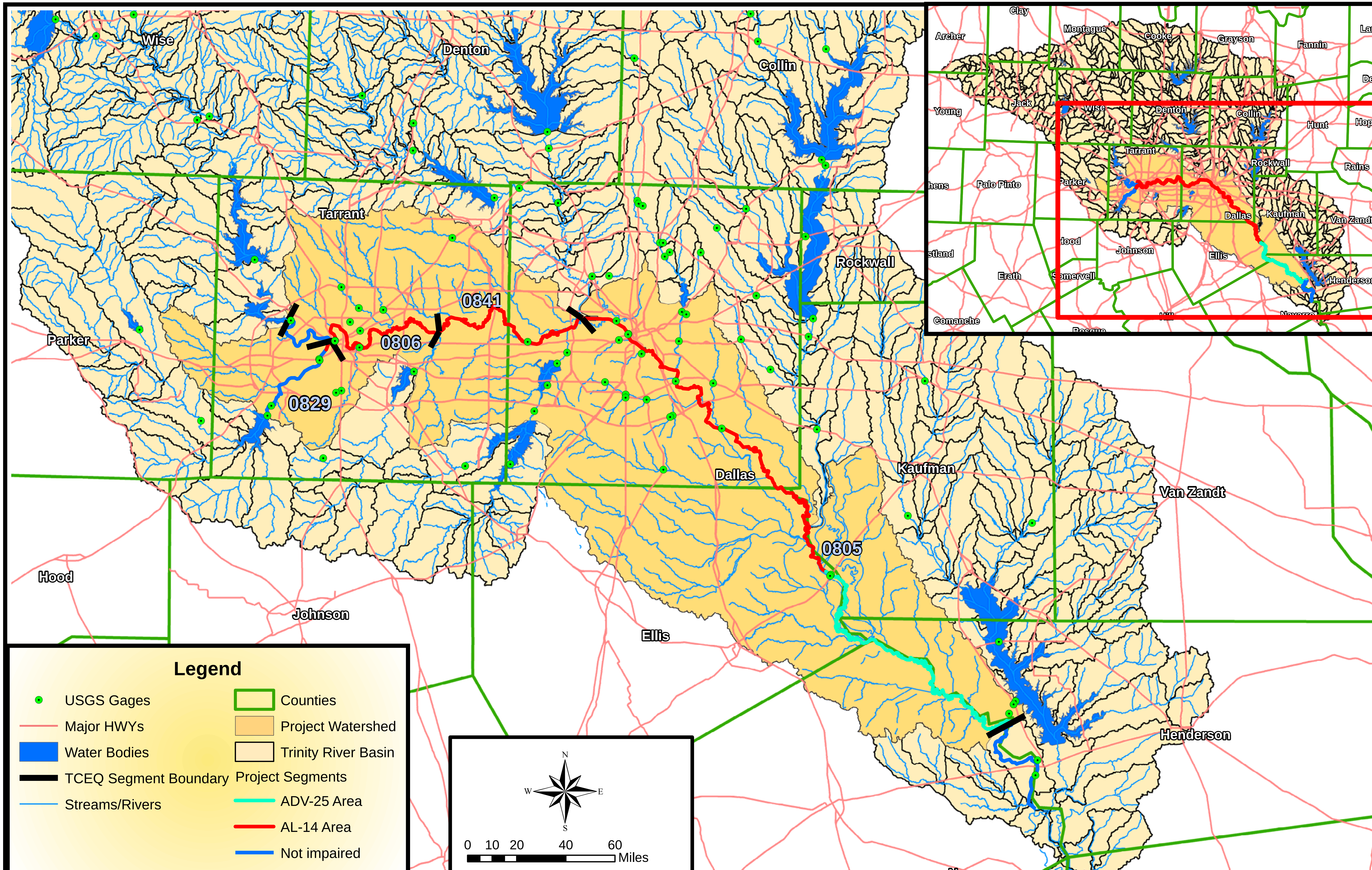


Figure 1. Location Map

1.3 PCB Water Quality Standards and Screening Values

Several national and state criteria and screening levels for PCBs in water and fish tissue exist. The state/federal maximum contaminant level (MCL) for drinking water is 500 nanograms per liter (ng/L), while the human health water quality criteria recommended by the U.S. Environmental Protection Agency (USEPA) is 0.17 ng/L (USEPA 1999).

Texas Surface Water Quality Standards (Texas Administrative code [TAC] §307.1-307.10) include human health water quality criteria for PCBs of 1.3 ng/L and 0.885 ng/L in freshwater and saltwater, respectively. These concentrations are lower than the MCL for drinking water, because the highest exposure potential of PCBs in waters is through consumption of contaminated fish (Webster, *et al*. 1998). The lower concentration is intended to lessen exposure and accumulation in fish tissue. Additionally, fresh and saltwater criteria differ because the TCEQ assumes that consumption rates are higher for saltwater species.

The TDSHS based its health assessment of total PCBs on a screening level of 47 ng PCB per gram fish tissue. This screening value was derived from a USEPA chronic oral reference dose for Aroclor 1254 of 0.00002 milligrams per kilograms per day (mg/kg/day)[1]. Table 1 summarizes the screening values determined by the TDSHS to be protective of human health. Those values have been used as endpoint targets in previous TMDLs in Texas. It is noted, however, that the human health water quality criteria for PCBs, described in the previous paragraph) was developed by the TCEQ based on different risk assumptions from those used by the TDSHS. This TMDL project may or may not use a tissue-based target to determine allowable loads. However, it is noted that decisions on the lifting or modification of consumption advisories (and thus, listing on the 303(d) list) are under the jurisdiction of TDSHS.

Table 1 Screening values for total PCBs in Fish Tissue (ng/g)

Effect	TDSHS Health Assessment Comparison Value
Non-cancer	47
Cancer	272

[1] This is the lower of the carcinogen and noncarcinogen comparison values. The comparison value using the USEPA slope factor of 2 $(mg/kg/day)^{-1}$ to account for the carcinogen effects of PCBs was 272 ng/g. Assumptions: body weight 70 kg, consumption rate 30 g/day, exposure period 30 years (for carcinogens), and excess lifetime cancer risk of $1x10^{-4}$.

2. HISTORICAL DATA REVIEW AND WATERSHED CHARACTERIZATION

2.1 Hydrology

The Trinity River Basin lies primarily in the eastern half of Texas and has an overall length of 360 miles. It is located generally along a northwest-southeast axis from Archer County, south of Wichita Falls and northwest of Fort Worth, to Chambers County, at Trinity Bay, east of Houston. The total area drained by the Trinity River and its tributaries is approximately 17,965 square miles (http://www.trinityra.org).

Generally, stream flows in the Trinity River Basin follow the rainfall pattern of the area. In the north-central portion of Texas where the Trinity River arises, the annual average rainfall ranges from 27 inches in the west to about 33 inches in the east.

Flow summaries were compiled using data from the United States Geological Survey (USGS) gages obtained from http://waterdata.usgs.gov/tx/nwis/. The seven USGS gage stations in the main stem and forks of the Trinity (Figure 1) have daily flow records for the last 25 years (January 1982-October 2006). Data collected in 2007 were not used in the analysis as they are provisional and subject to revision. An inventory of existing data is presented in Table 2.

Table 2 Inventory of Daily Flow Data in the Project Segments (flows in cfs)

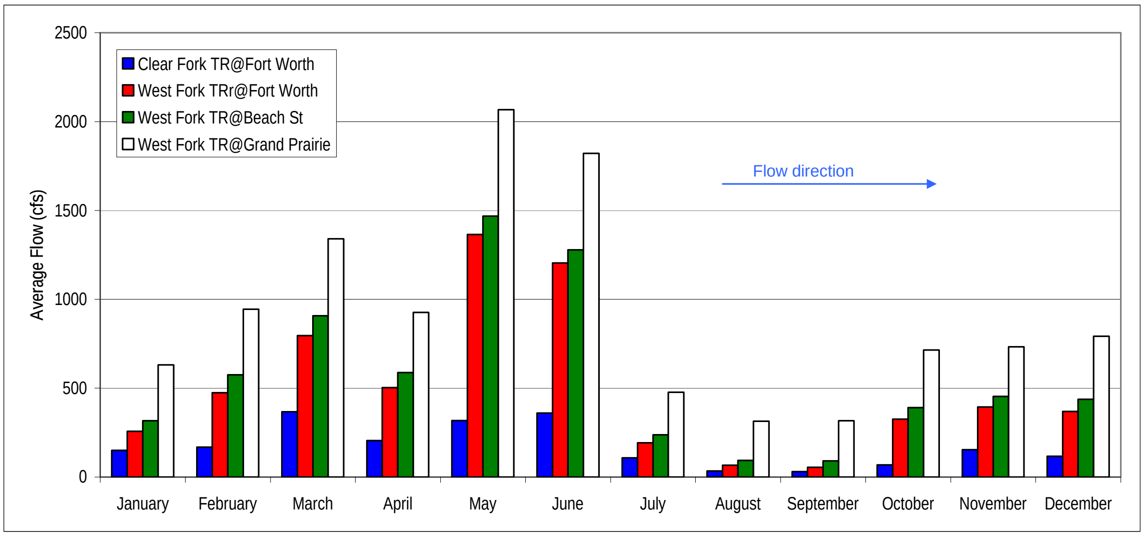
USGS Gage	Daily Observations	Minimum	Maximum	Average
08047500 - Clear Fork Trinity River near IH 30 in Fort Worth	9862	0	11,000	173
08048000 - West Fork Trinity River at Nutt Dam in Fort Worth	9861	0	31,900	500
08048543 - West Fork Trinity River at Beach St.	9859	0	35,200	569
08049500 – Lower West Fork Trinity River at Belt Line Rd. in Grand Prairie*	9862	46	48,900	923
08057000 – Upper Trinity River at Dallas (Commerce St.)	9857	207	72,100	2,397
08057410 - Upper Trinity River at South Loop 12 below Dallas	8763	297	79,200	2,846
08062500 - Upper Trinity River at SH 34 near Rosser, TX	9859	418	107,000	4,020

* station was re-located on April 5, 2003

The trends in precipitation and vegetation, taken in conjunction with land slopes and other factors, cause runoff in the upper basin to be rapid, but low in total volume. Runoff becomes progressively slower, but higher in total volume as one proceeds downstream (TRA 2001). As a result, stream flows in the upper basin are more erratic and quite often zero, as indicated by the minimum values in Table 2. Most of the smaller streams in the basin cease to flow within a few days or weeks without rain, depending on the season and drainage area.

Several of the Trinity River's tributaries, and the river itself below Dallas, have a base or dry weather flow of effluent discharged from wastewater treatment plants. A limited number of smaller streams have a consistent base flow maintained by springs.

Although the Trinity River Basin has moderate rainfall and runoff on average, it is notoriously erratic with floods at times and drought at other times. Even a normal year has much of the rain and streamflow in the late spring, followed by very hot dry weather from mid-June through August (Ulery, *et. al.* 1993). This trend is apparent in the monthly average flows presented in Figure 2. Monthly average flows ranged between 30 and 7,150 cfs, and, in general, increased from upstream to downstream.



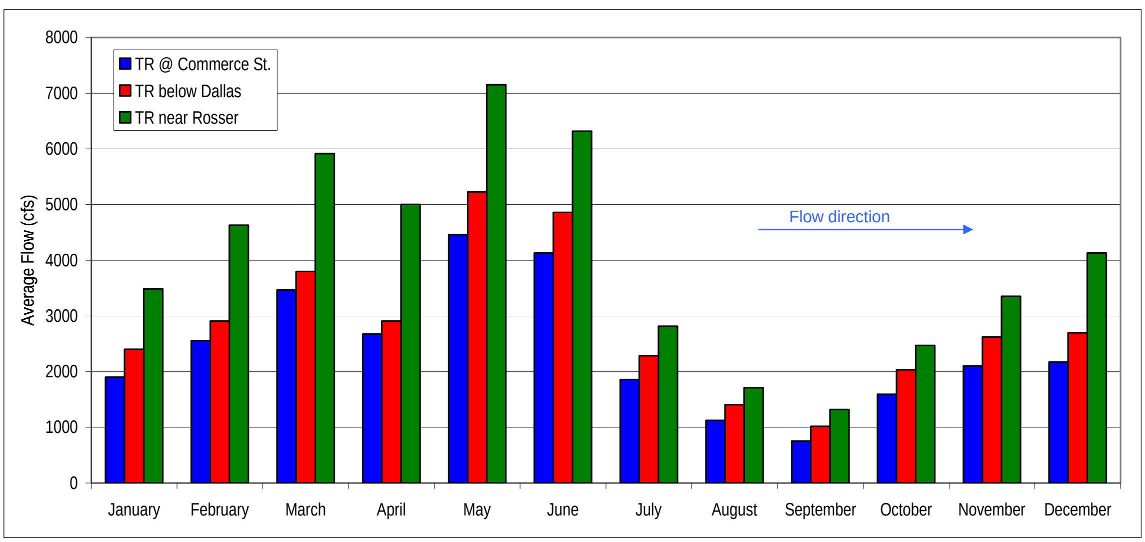


Figure 2 Twenty five-Year Monthly Average Flows

2.2 Climate

The project area has a subtropical sub-humid climate characterized by hot summers and dry winters (TRA 2001). Typical conditions are represented by those of the

Dallas/Forth Worth International Airport which gets about 33 inches of rain per year, much of which is delivered in the spring and autumn (Table 3). Dallas has an average daily minimum temperature of 54.6 degrees Fahrenheit (ºF) and an average daily maximum temperature of 76.3ºF. The average number of days with a minimum temperature of 32ºF or less is 39 days a year. Snowfall in the Dallas area averages 2.7 inches a year. Winds average 12.7 miles per hour, primarily from the south/southeast.

Table 3 Summary of Climate Data for the Dallas/Fort Worth Area

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual
Avg High Temperature (ºF)	54.1	58.9	67.8	76.3	82.9	91.9	96.5	96.2	87.8	78.5	66.8	57.5	76.3
Avg Low Temperature (ºF)	32.7	36.9	45.6	54.7	62.6	70	74.1	73.6	66.9	55.8	45.4	36.3	54.6
Avg Rain (inches)	1.83	2.18	2.77	3.5	4.88	2.98	2.31	2.21	3.39	3.52	2.29	1.84	33.7
Avg Wind (mi/hr)	12.7	12.7	16.1	15	13.8	12.7	10.4	10.4	11.5	11.5	12.7	12.7	12.7
Thunderstorm Days	1	2	4	6	8	6	5	5	4	3	2	1	46
Highest Temperature (ºF)	93	96	100	100	107	113	110	112	111	106	89	90	113
Lowest Temperature (ºF)	-2	-8	10	29	34	48	56	55	40	24	19	-1	-8
Avg Days above 90	-	-	-	1	5	21	28	27	15	3	-	-	100
Avg Days below 32	14	8	3	-	-	-	-	-	-	-	3	10	39
Avg Snowfall (inches)	1.2	1	0.2	-	-	-	-	-	-	-	0.1	0.2	2.7

Source: http://web2.airmail.net/danb1/climate.htm. Data obtained from the National Weather Service, DFW Airport Station.

2.3 Land Use

The land uses for the overall project area is illustrated, on a percent basis, in Figure 3. Figure 4 depicts the land use/land cover distribution in the project area. Both figures are derived from the 1992 National Land Cover Dataset of the U.S. Geological Survey (USGS 1999b). Overall, pasture/hay has the highest contribution (35% of the area), 28 percent of the watershed corresponds to developed land (residential commercial, utility, and transportation), and 14 percent of the project area is forest. However, these land use assignments are based on satellite imagery from the late 1980s to early 1990s, and it is expected the developed land has expanded since that time.

Land use was also quantified for 39 individual sub-watersheds that comprise the project area. The sub-watersheds were developed from a digital elevation model at 30-meter resolution, the National Elevation Dataset (USGS 1999a). Most of the sub-watersheds correspond to a single major tributary each, either a creek or fork of the Trinity River, and range in size from 3.4 to 232 square miles. Table 4 summarizes the size and percentage of the watershed area of selected sub-watersheds in various land use categories. The watersheds downstream of Dallas, contributing to the lower half of segment 0805, are more rural in character than other parts of the project area.

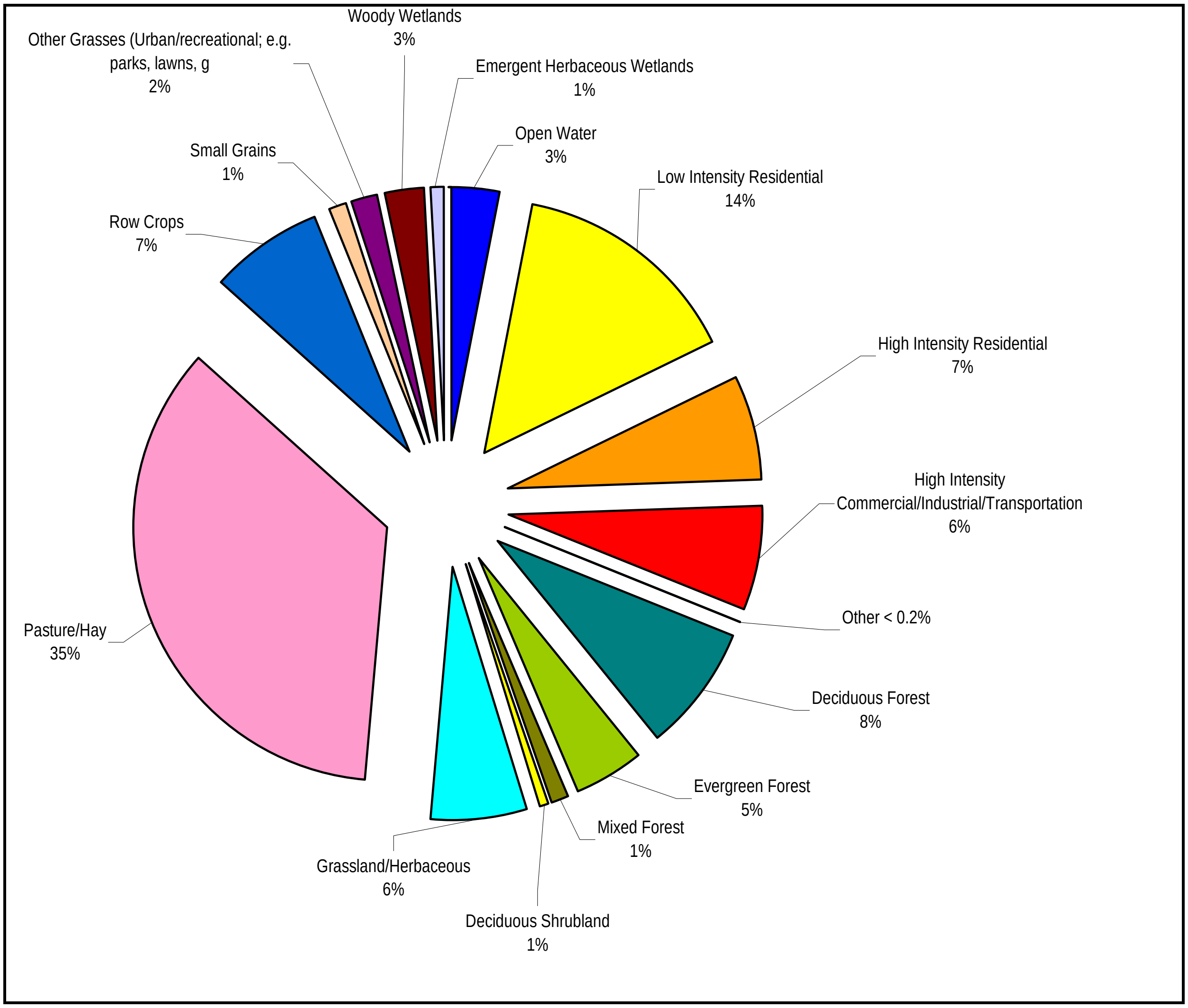


Figure 3 Land use distribution in the project area

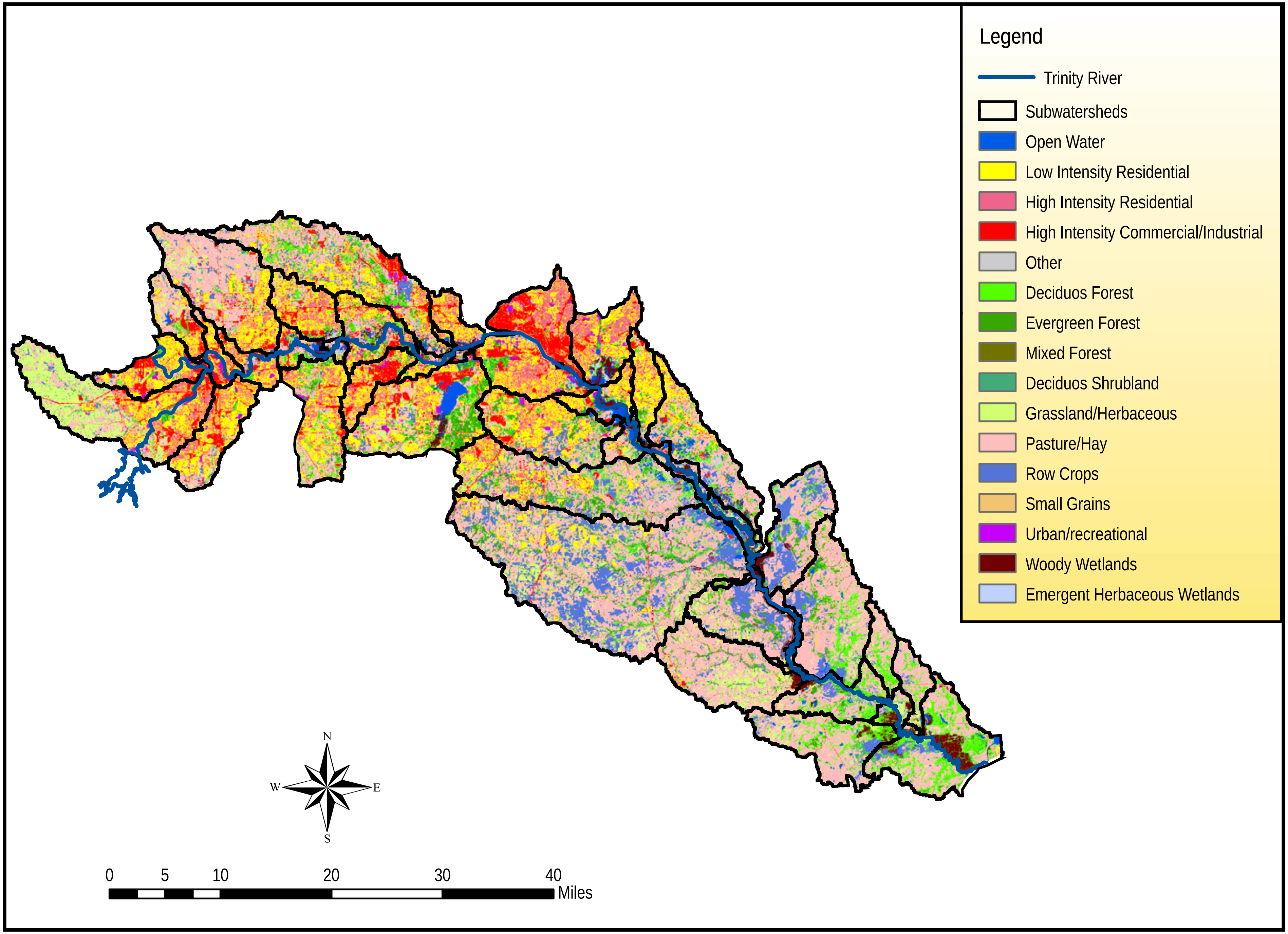


Figure 4. Land Use Distribution in Project Sub-Watersheds

Table 4 Land Use Summary in Project Sub-Watersheds

Sub-Watershed	Open Water	Low Intensity Residential	High Intensity Residential	High Intensity Commercial / Industrial/ Transportation	Deciduous Forest	Evergreen Forest	Mixed Forest	Deciduous Shrubland	Grassland/ Herbaceous	Pasture/ Hay	Row Crops	Small Grains	Other Grasses	Woody Wetlands	Emergent Herbaceous Wetlands	Other	Total Area (mi^2)
West Fork above Clear Fork & below Lake Worth	1%	43%	12%	19%	3%	2%	0%	0%	4%	8%	1%	0%	7%	0%	0%	< 0.2%	28
Clear Fork below Lake Benbrook	1%	17%	11%	9%	2%	2%	1%	2%	31%	21%	1%	1%	2%	0%	0%	< 0.2%	94
Marine Creek	2%	19%	5%	14%	3%	2%	1%	0%	10%	38%	2%	1%	1%	0%	0%	< 0.2%	22
Sycamore Creek	0%	42%	21%	13%	1%	1%	0%	0%	3%	13%	3%	0%	3%	0%	0%	< 0.2%	37
Big Fossil Creek	1%	17%	6%	7%	2%	2%	1%	0%	7%	49%	4%	3%	1%	0%	0%	< 0.2%	77
Village Creek below Lake Arlington	1%	31%	16%	7%	7%	5%	2%	0%	5%	23%	1%	0%	3%	0%	0%	< 0.2%	48
Sulphur Branch	1%	36%	23%	11%	3%	3%	1%	0%	1%	13%	1%	0%	2%	2%	2%	< 0.2%	28
Trinity River between Sulphur Branch and Johnson Creek	6%	23%	8%	12%	7%	5%	2%	1%	2%	19%	0%	0%	4%	8%	4%	< 0.2%	30
Johnson Creek	0%	35%	21%	28%	1%	2%	0%	0%	2%	5%	0%	0%	5%	0%	0%	< 0.2%	21
Bear Creek	1%	19%	4%	10%	8%	6%	2%	0%	4%	36%	6%	1%	2%	1%	0%	< 0.2%	93
Mountain Creek below Joe Pool Lake	7%	22%	7%	10%	6%	13%	1%	1%	7%	19%	2%	1%	3%	2%	0%	< 0.2%	81
Trinity River between Elm Fork and White Rock Creek	3%	29%	25%	27%	2%	2%	0%	0%	1%	4%	0%	0%	4%	2%	1%	< 0.2%	76
White Rock Creek below White Rock Lake	5%	34%	32%	7%	3%	2%	0%	0%	1%	3%	0%	0%	4%	7%	2%	< 0.2%	35
Five Mile Creek	1%	30%	11%	8%	5%	8%	2%	0%	4%	21%	6%	1%	3%	0%	0%	< 0.2%	58
Prairie Creek	3%	49%	13%	7%	4%	4%	1%	0%	2%	11%	0%	1%	4%	1%	0%	< 0.2%	20
Ten Mile Creek	2%	14%	5%	4%	8%	6%	2%	0%	4%	38%	11%	3%	1%	0%	1%	< 0.2%	103
Parsons Slough	9%	14%	2%	3%	10%	3%	2%	0%	3%	42%	2%	2%	2%	2%	2%	< 0.2%	52
Red Oak Creek	1%	4%	0%	1%	6%	5%	1%	0%	7%	49%	22%	1%	0%	1%	0%	< 0.2%	232
Smith Creek	2%	0%	0%	0%	3%	8%	2%	0%	7%	52%	21%	0%	0%	4%	0%	< 0.2%	43
Walker/Village Creek	1%	1%	0%	1%	3%	5%	1%	0%	15%	65%	3%	3%	0%	2%	0%	< 0.2%	65
Bois D'Arc/ Cottonwood Creek	1%	0%	0%	0%	11%	7%	1%	2%	5%	62%	9%	1%	0%	0%	0%	< 0.2%	73
Entire Project Area	3%	14%	7%	6%	8%	5%	1%	1%	6%	35%	7%	1%	2%	3%	1%	0%	1,673

2.4 Survey of Sources, Dams, and Monitoring Stations

This section presents a summary of major storm water outfalls, wastewater discharge points, dams, potential source areas, existing TCEQ monitoring stations, and TDSHS fish sampling locations along segments 0829, 0806, 0841, and 0805. This section was primarily contributed by John Mummert from TCEQ Region 4 to be used in planning activities for the project. To facilitate the text description, a schematic of all features mentioned was prepared and is included as Figure 5.

Segment 0829

Only the lower 1 mile of this segment (below 7th Street) is on the 303(d) list. This length coincides roughly with that impacted by storm water discharges from the Purcy Street drain, a major City of Fort Worth storm water outfall that drains much of the downtown and hospital district area of the city. The outfall is located approximately midway through this 1-mile stretch.

There are a series of low-water dams located in Trinity Park, just upstream from the impaired portion of the segment. Although these dams may retain some sediment, they are more likely to be flushed (and completely under water) during high-flow events. There is a larger dam, designed to retain water for a supplemental City water supply intake, which is more likely to have retained sediment over time. That structure is located less than 0.25 mile upstream (south) from IH-30. This may be a logical location to collect sediment on the upstream side of the impaired area. This dam is also a barrier to upstream fish movement under most conditions. There are additional low-water dams upstream between the water supply dam and Benbrook Lake; however, these dams are similar in size to those in Trinity Park and are flooded during storm events. One of those smaller dams is located just upstream from Rogers Street, and below a number of storm water outlets from the Union Pacific Railroad Centennial Yard. This site is located adjacent to Segment 0829, starting approximately 3 miles above the impaired portion of the segment. This is a large railroad yard with a history of spills of various materials. Although there are no known PCB issues, the location of the yard and the history of spills at the site make it a possible source area. Prior to 1989, the railroad yard held a permit to discharge to the city storm sewer system from a storm water/wastewater treatment facility. The ultimate outfall point to Segment 0829 was located immediately downstream from the city water supply dam.

Segment 0806

This segment is impaired below the confluence with Segment 0829. The upstream portion between Lake Worth and the 0829 confluence is not impaired. There does not appear to be any dams in the upstream reach. Farmers Branch carries runoff from a portion of the Fort Worth Naval Air Station (NASFW, formerly Carswell Air Force Base), located at the southeast corner of Lake Worth at the upstream end of Segment 0806, approximately 8 miles upstream from the confluence of Segments 0806 and 0829. Extensive sampling has been performed at this site in conjunction with Superfund activities at the base and the adjacent Air Force Plant 4 (AFP4). PCB sources were found at AFP4, with historical releases to Lake Worth, but there are no known PCB issues at NASFW. Lake Worth fish tissue PCBs have been addressed in a previous

TMDL and Implementation Plan. An unnamed tributary drains the Cities of Sansom Park and River Oaks on the opposite side of the river in this same upstream area.

Storm water inflow to the impaired portion of Segment 0806 is carried by small outfalls that discharge to the segment, and by the major stream tributaries to the segment. There are three dams along the lower portion of Segment 0806 large enough to retain sediment and act as a barrier to fish.

Nutt Dam is located approximately 0.2 mile downstream from North Main Street in downtown Fort Worth. This is less than 1 mile below the confluence of Segments 0829 and 0806, and just below the site of the former TXU North Main power plant, located adjacent to the north bank of the river on the west side of North Main Street. The power plant was constructed in the early 1950s, and was closed several years ago. The plant was demolished and the property sold to Tarrant County College. Sampling conducted as part of that sale found no known or probable PCB sources at the site.

Marine Creek enters Segment 0806 approximately 2.2 miles downstream from the 0829 confluence, at Samuels Avenue. Marine Creek carries runoff from an old industrial area of north Fort Worth (including former refineries, chemical manufacturing plants, cement plants, stockyards, railroad yard, *etc*.).

Tarrant Regional Water District (TRWD) built and maintains a dam at 4th Street in Fort Worth, approximately 2.6 miles below the Marine Creek confluence. This dam is relatively new compared to Nutt Dam and the water intake dams. The 4th Street dam maintains a large pool for recreational activities (water skiing, rowing clubs, etc.). Sycamore Creek enters Segment 0806 approximately 2 miles below 4th Street. Sycamore Creek carries storm water runoff from older areas of south Fort Worth.

TRWD built and maintains a dam at Beach Street, less than 0.5 mile downstream from the Sycamore Creek confluence. This is the newest of the dams in this area (less than 10 years old). This dam also maintains a large pool for recreational activities.

The City of Fort Worth operated the Riverside Wastewater Treatment Plant (WWTP), located north of the river on the east side of Beach Street and the south side of 1st street, from 1924 until 1979. Gateway Park now occupies much of that site. The effluent outfall from the WWTP to the river was located at the bend in the river to the east of Beach Street. A separate storm water outfall for the plant was located in this same general area, and that outfall is being used for a portion of the storm water drainage from Gateway Park. The City recently discovered PCBs in the soil at some locations in the park associated with the former WWTP. The WWTP may have been a source of PCBs to the river through the effluent outfall and/or via storm water runoff from the site. The City is addressing this site through the TCEQ Voluntary Cleanup Program, and an assessment of the river will be part of that work. Additionally, the U.S. Army Corps of Engineers (USACE) is planning an ecological assessment in this same area in conjunction with plans for an oxbow lake and flood control as part of the Trinity River Vision Project. The TRWD is also involved with this latter project. TCEQ TMDL activities in this area should be coordinated with City, USACE, and TRWD activities to avoid duplication of effort and maximize use of resources.

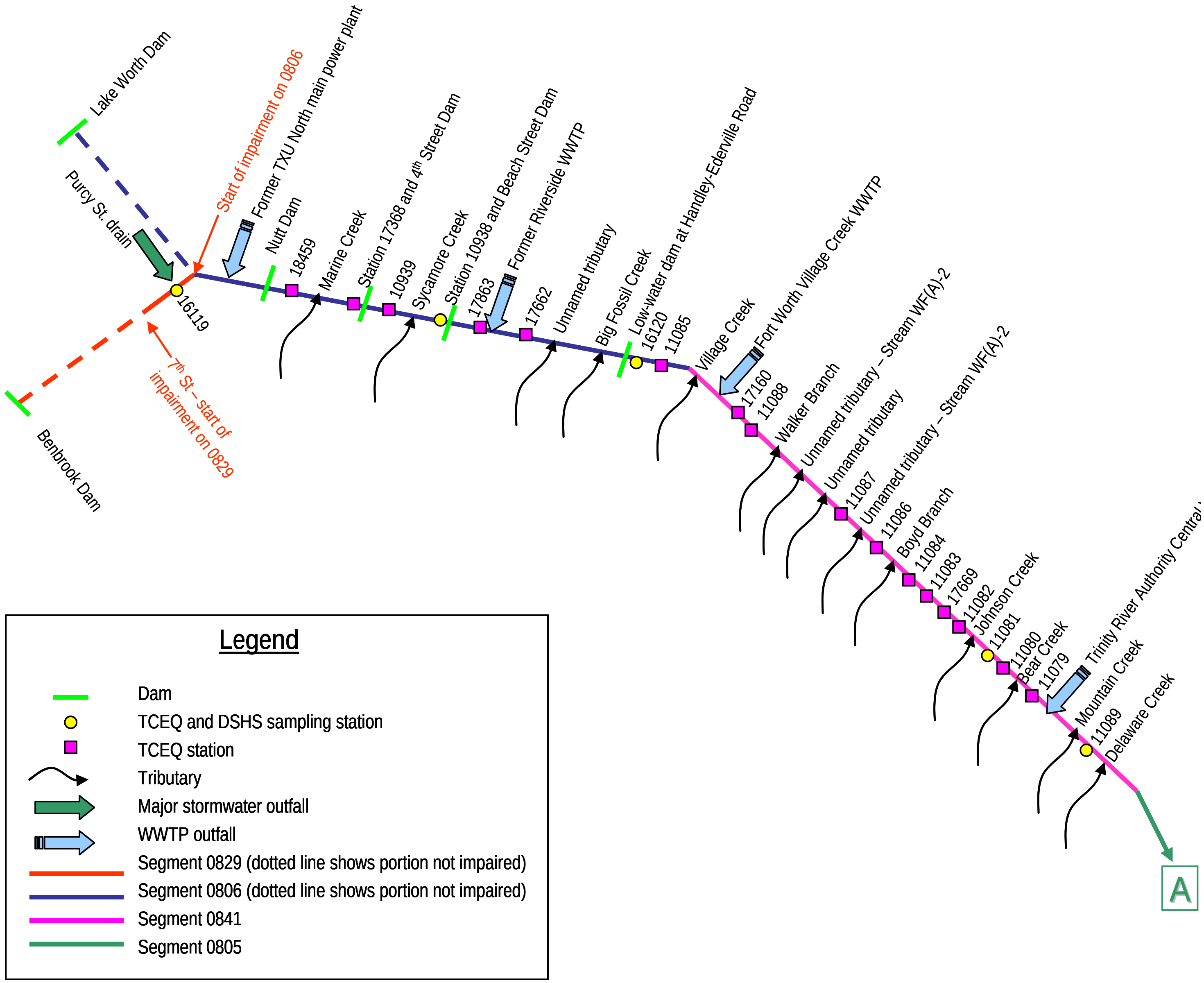


Figure 5 Schematic of the Project Segments

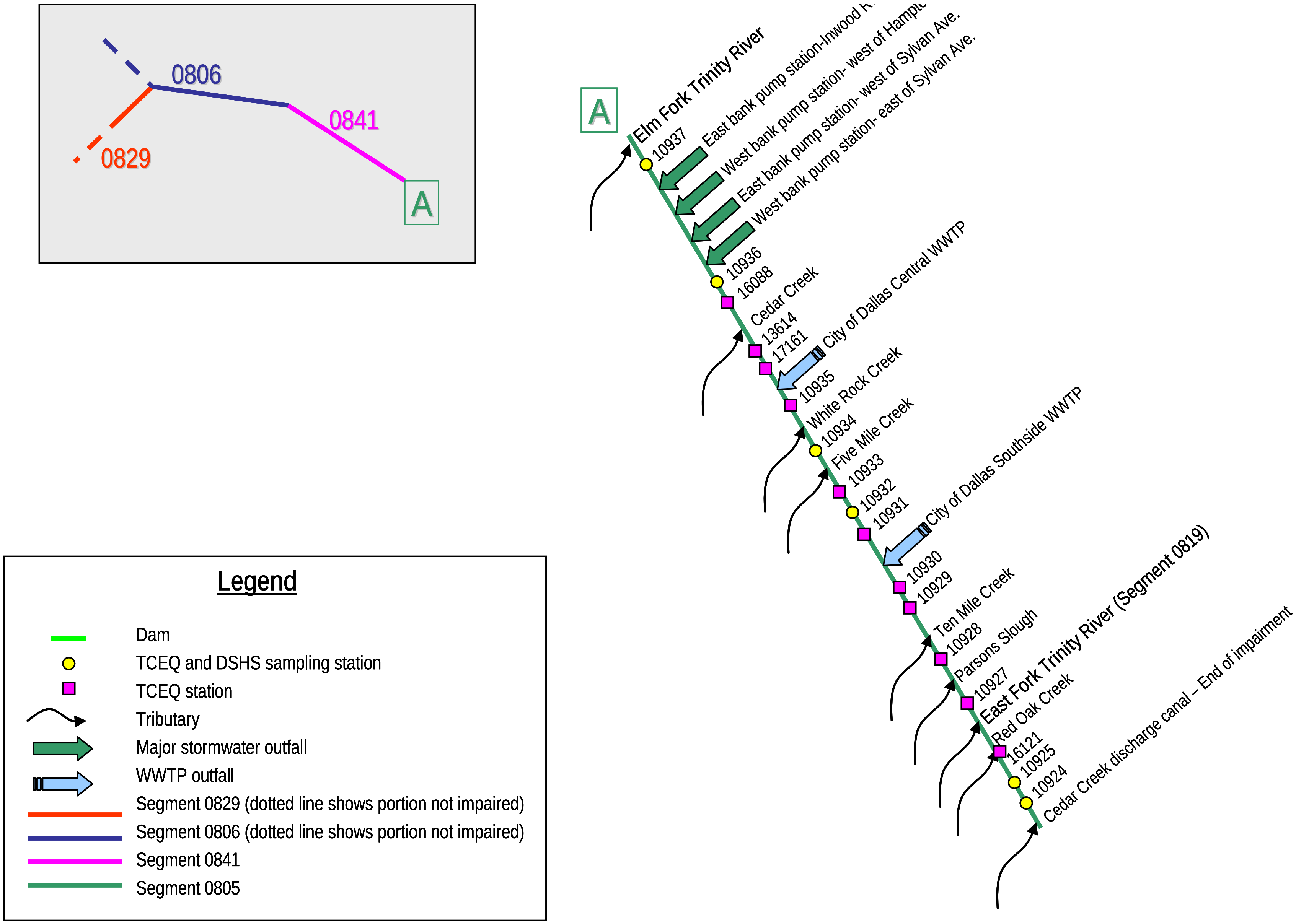


Figure 5 Schematic of the Project Segments – Cont'd

An unnamed tributary enters Segment 0806 approximately 3 miles downstream from Beach Street. This tributary drains an old industrial area of north Fort Worth (including former refineries and chemical manufacturing plants). A visible accumulation of oil sheen is often present on this creek near NE 28th Street and Sylvania Avenue after a rain event.

Big Fossil Creek enters Segment 0806 approximately 6.5 miles downstream from Beach Street. Big Fossil and its major tributary, Little Fossil Creek, drain a large watershed in north-central Tarrant County.

A small low-water dam is located at Handley-Ederville Road, approximately 0.5 mile downstream from the Big Fossil Creek confluence. This dam is considerably smaller than the upstream TRWD dams, and similar to those in Trinity Park in Segment 0829. In addition, recent and on-going levee construction activities may have disturbed this site and made it less useful for any sampling activities.

Segment 0806 ends approximately 7.5 miles below Handley-Ederville Road, at a point immediately upstream from the confluence with Village Creek.

Segment 0841

Storm water inflow to this segment is carried by small outfalls and by the major stream tributaries. There are no known dams along this segment large enough to retain sediment or act as a barrier to fish.

Village Creek enters Segment 0841 at the upper end of the segment, approximately 7.5 miles downstream from Handley-Ederville Road. Village Creek and its major tributary, Rush Creek, drain primarily residential and commercial areas of a large portion of the City of Arlington.

The City of Fort Worth Village Creek WWTP (permitted flow 166 million gallons per day [MGD]) discharges treated effluent to this segment approximately 1 mile below the Village Creek confluence.

Walker Branch enters Segment 0841 approximately 3.2 miles below the Village Creek confluence. Walker Branch drains portions of the Cities of Fort Worth, Hurst, Euless, and Bedford; including the main Bell Helicopter Textron plant at 600 Hurst Boulevard. Storm water runoff from this facility drains via an unnamed tributary to Walker Branch approximately 3.2 miles above the confluence of Walker Branch and Segment 0841. Bell Helicopter is not known to have had PCB issues, but the site is noted here because this is a major manufacturing plant in the watershed and PCBs were likely present at one time. The facility does not appear to be a priority for the PCB TMDL study at this time.

Three unnamed tributaries enter Segment 0841 at approximately 1.2 miles, 1.4 miles, and 5.6 miles below the Walker Branch confluence. The first and third, designated Stream WF(A)-2 and WF(A)-1, respectively, in the City of Arlington Municipal Separate Storm Sewer System (MS4) system, enter from the south and drain primarily residential areas of the City of Arlington. The middle tributary (no designation) drains from the north and includes some salvage yards and the City of Arlington landfill. Boyd Branch enters the segment from the north approximately 7.6 miles below Walker Branch and less than 0.5 mile upstream from SH-360, and appears to drain primarily commercial and residential areas.

Johnson Creek enters Segment 0841 approximately 5.8 miles downstream from SH-360. Johnson Creek drains a large watershed in Arlington and Grand Prairie, including a north Grand Prairie warehouse/industrial district; the Six Flags park and stadium areas of Arlington; and older commercial, residential, and industrial areas of east Arlington.

Bear Creek enters Segment 0841 approximately 5.2 miles downstream from the Johnson Creek confluence. Bear Creek and its tributaries drain an extensive watershed in northeast Tarrant County, including much of the Dallas-Forth Worth Airport. The airport is located approximately 10 miles upstream from the confluence of Bear Creek with Segment 0841. Although the airport has experienced a number of fuel and other spills over the years, PCBs do not appear to be an issue at this site.

The Trinity River Authority (TRA) Central WWTP (permitted flow 135 MGD, expanding to 200 MGD) discharges treated effluent to this segment approximately 1.5 miles below the Bear Creek confluence.

Mountain Creek enters Segment 0841 approximately 2.4 miles downstream from the Bear Creek confluence, below the northeast corner of the TRA Central WWTP. Mountain Creek and a tributary (Copart Branch of Mountain Creek) drain an industrial area of Grand Prairie as well as portions of the former Dallas Naval Air Station (NASD) below Mountain Creek Lake. NASD is closed; however, extensive sampling has been performed in conjunction with Resource Conservation Recovery Act (RCRA) activities at the former base and the adjacent Naval Weapons Industrial Reserve Plant (NWIRP). PCB sources were found at both facilities, with historical releases to Mountain Creek Lake. NASD and NWIRP are currently undergoing remediation activities that include PCBs. Mountain Creek Lake fish tissue PCBs were addressed in a previous TMDL and Implementation Plan.

Delaware Creek enters Segment 0841 approximately 1.8 miles below the Mountain Creek confluence. Delaware Creek drains a variety of land uses in the City of Irving. The segment ends just above the confluence with the Elm Fork Trinity River, less than 1 mile below the Delaware Creek confluence.

Segment 0805

The Elm Fork Trinity River (Segment 0822) enters the Trinity River at the upper end of Segment 0805. Segment 0822 drains a large watershed below Lake Lewisville. Much of the dry weather flow in Segment 0822 is withdrawn for public water supply use prior to reaching Segment 0805.

The City of Dallas storm water system is large and complex, with more than 1100 outfalls in the entire system (see maps at www.wheredoesitgo.com/watershed_map.html). Many of these outfalls are routed to a series of sumps adjacent to the Trinity River levee, from which the collected storm water is pumped or gravity-fed into the river. Parsons and TCEQ staff met with City of Dallas staff on 11 July 2007 to discuss the city storm water system, visit several pump stations, and assess potential sampling points in the downtown reach of Segment 0805 between the Elm Fork Trinity confluence and the downstream Cedar Creek confluence. Storm water discharges to this area of the river are controlled, with releases made through several pump stations along the east and west bank of the river, and some additional gravity-feed points. Pump stations along the east bank collect drainage from the downtown area and from industrial areas to the west of downtown (including a portion of Love Field). The west bank stations drain more residential areas.

Cedar Creek enters Segment 0805 approximately 7.8 miles downstream from the Elm Fork Trinity confluence, and drains a south-central Dallas watershed.

The City of Dallas Central WWTP (permitted flow 150 MGD, expanding to 200 MGD), located off Sargent Road, discharges treated effluent to Segment 0805 approximately 2 miles below the Cedar Creek confluence.

White Rock Creek, which enters Segment 0805 approximately 4.6 miles below the Cedar Creek confluence, drains the Lower White Rock Creek watershed. The TXU Parkdale power plant is located in this watershed. The plant was constructed in the 1950s and removed from operation several years ago. The existence of any current PCB issues is unknown, although TXU staff may have information on this matter. TCEQ Region 4 Waste staff report there have been some historical PCB spills at the plant. The plant is located on the east side of Dallas, adjacent to White Rock Creek, approximately 5 miles upstream from the confluence of White Rock Creek with Segment 0805.

Five Mile Creek enters Segment 0805 approximately 5.8 miles below the White Rock Creek confluence, just north of IH-20. Five Mile Creek drains a watershed in south-central Dallas County.

The City of Dallas Southside WWTP (permitted flow 110 MGD), located on Log Cabin Road in southeast Dallas County, discharges to Segment 0805 approximately 5.5 miles downstream from IH-20.

Urban influences on Segment 0805 begin to decline below the Southside discharge point. Road crossings and access to the river becomes increasingly limited.

Ten Mile Creek enters Segment 0805 approximately 9 miles below the Dallas Southside WWTP. Ten Mile Creek drains a large watershed in south Dallas County. The upper end of the watershed is urban; the lower is rural. The TRA Ten Mile Creek WWTP discharges to this tributary.

Parsons Slough enters Segment 0805 approximately 9 miles below the Ten Mile Creek confluence. Parsons Slough drains a rural watershed in southeastern Dallas and southwestern Kaufman County. There are no point source discharges to Parson Slough, and flow is generally low except in wet weather.

The East Fork Trinity River (Segment 0819) enters Segment 0805 approximately 3 miles below the Parsons Slough confluence. Segment 0819 drains a watershed below Lake Ray Hubbard in eastern Dallas and western Kaufman County. The upper end of the watershed is urban and carries effluent flow from the Garland and Seagoville WWTPs. The lower end of the watershed is very rural with limited access to the segment.

Red Oak Creek enters Segment 0805 in Ellis County, approximately 3 miles below the East Fork Trinity confluence. Red Oak Creek drains a large watershed in northeast Ellis County. The TRA Red Oak Creek WWTP discharges to this tributary.

Below Red Oak Creek there are only two road crossings on Segment 0805 (SH-34 and Farm-to-Market [FM] Road-85) before the segment ends at the Cedar Creek discharge canal.

2.5 Historical PCB Data for Fish Tissue Samples

Available fish tissue PCB data for the project segments were compiled and summarized below. Data were collected by the TDSHS, USGS, Texas Parks and Wildlife Department (TPWD), TRA, and TCEQ between 1984 and 2006. A total of 141 tissue samples were compiled, 127 of which corresponded to individual edible portions of fish. The remaining samples were composite edible portions, individual whole fish, and composite whole fish samples. Most of the samples collected were bottom dwellers such as blue catfish, channel catfish, common carp, gizzard shad, and smallmouth buffalo. Length, weight, and species data were available for most samples, but percent lipid, age, and sex data were not.

A total of 15 locations in the project area had tissue PCB Aroclor data (Figure 6). There were no PCB congener data available. A summary of the compiled Aroclor data is provided in Table 5. It is noted that data were grouped into four sectors according to location and levels of PCBs to facilitate data analysis (see Figure 6). In addition, Table 5 includes a summary of fish data collected in Clear Fork at SH-183 (outside the project area) for comparison with data in sector A. A brief description of the data follows.

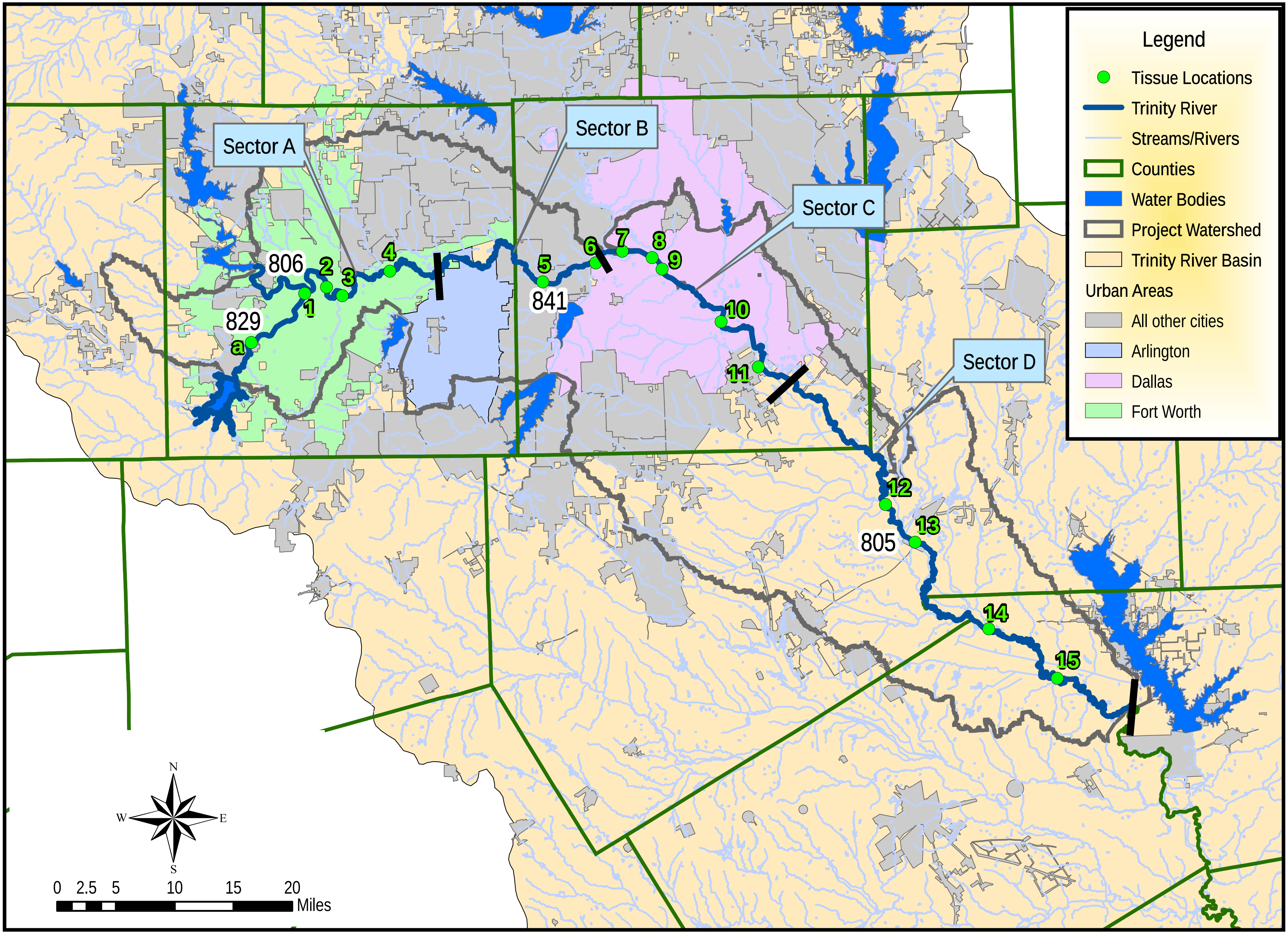


Figure 6. Locations with Historical PCB Data for Fish Tissue

Table 5 Total PCBs in Fish Tissue from the Project Segments

Site #	Site	TCEQ Station ID	Segment	Year	Source[a]	Sample Type[b]	% Exceeding HAC Value[c]	Detects/ Samples	Range (ng/g)	Median (ng/g)	Mean (ng/g)	Sector	# of Samples	Median	Mean
a	Clear Fort at SH-183	NA	0829	1998	DSHS	fsf	0%	0/3	<40	<40	<40	Upstream of project area			
				2000	DSHS	fsf	0%	0/5	<40	<40	<40				
1	Clear Fork at Purcey Street	16119	0829	1988	DSHS	fsf	100%	2/2	360-590	475	475	A	48	158	444
				1990	DSHS	fsf	75%	2/3	<40-62	50	44				
				1996	TPED	fsf	100%	4/4	57-3500	280	1029				
2	West Fork upstream of 4th Street Dam	17368	0806	2006	CoFW	fsf	46%	10/13	<10-360	40	114				
3	West Fork at Beach Street	10938	0806	1989-1990	TCEQ	**w**	67%	2/3	<40-2400	1810	1410				
				1998	DSHS	fsf	100%	10/10	69-2700	220	500				
				2000	DSHS	fsf	100%	5/5	150-3270	290	911				
4	West Fork at Handley	16120	0806	1990	DSHS	fsf	60%	3/5	<40-224	166	125				
				1996	TPWD	fsf	67%	2/3	<50-97	90	71				
5	Lower West Fork at Belt Line Road	11081	0841	1987	DSHS	fsf	50%	1/2	<40-390	205	205	B	20	<40	74
				1990	DSHS	fsf	33%	2/3	<40-85	45	50				
				1998	DSHS	fsf	20%	2/10	<40-300	<40	55				
6	Lower West Fork at Loop 12 - WEST	11089	0841	2000	DSHS	fsf	40%	2/5	<40-182	<40	74				
7	Upper Trinity at Mockingbird	10937	0805	1988	DSHS	fsf	10%	1/10	<40-760	<40	94	C	44	135	304
				2000	DSHS	fsf	20%	1/5	<40-154	<40	47				
8	Upper Trinity at Sylvan Ave	NA	0805	1990	DSHS	fsf	75%	3/4	<40-478	180	215				
9	Upper Trinity at Commerce	10936	0805	1988	DSHS	fsf	100%	4/4	220-840	245	498				
				1996	TPWD	fsf	100%	3/3	140-1400	160	567				
10	Upper Trinity at Loop 12 - SOUTH	10934	0805	1987	DSHS	fsf	100%	1/1	155						
				1993	USGS	**w**	100%	1/1	640						
				1996	TPWD	fsf	100%	3/3	280-450	420	383				
11	Upper Trinity at	10932	0805	1990	DSHS	fsf	100%	3/3	83-350	348	260				

Site #	Site	TCEQ Station ID	Segment	Year	Source[a]	Sample Type[b]	% Exceeding HAC Value[c]	Detects/ Samples	Range (ng/g)	Median (ng/g)	Mean (ng/g)	Sector	# of Samples	Median	Mean
	Dowdy Ferry Road			2000	DSHS	fsf	80%	8/10	<40-1900	110	492				
12	Upper Trinity River at Red Oak confluence	16121	0805	1996	TPWD	fsf	67%	2/3	<50-340	100	155	D	29	<40	131
13	Upper Trinity River at SH 34	10925	0805	1984	TCEQ	**w**	100%	1/1	130						
				1990	DSHS	fsf	40%	2/5	<40-917	<40	251				
				1993	USGS	**w**	100%	1/1	580						
14	Upper Trinity River at FM 85	10924	0805	1987-1988	DSHS	fsf	75%	3/4	<40-170	58	77				
				1989-1990	TCEQ	**w**/fsf	33%	1/3	<40-164	<40	68				
				1994	TCEQ	**w**	0%	0/3	<40	<40	<40				
15	Upper Trinity River at Henderson CR 2138	NA	0805	2001	DSHS	fsf	22%	2/9	<40-544	<40	87				

Total PCBs is the sum of the Aroclors analyzed
NA = not available
[a] DSHS = Texas Department of State Health Services
CoFW = City of Fort Worth
TPWD = Texas Parks and Wildlife Department
USGS = United States Geologic Survey
TCEQ = Texas Commission on Environmental Quality
[b] fsf = fillet skin off
W = whole fish
[c] HAC = health assessment comparison value = 47 ng/g total PCBs.

Spatial Trends

Figure 7 shows the distribution of total PCB concentrations for the various stations. Note that non-detects were assumed equal to one half of the detection limit for statistics calculations. As can be seen, fish from Sector A had the highest PCB levels for the entire project area.

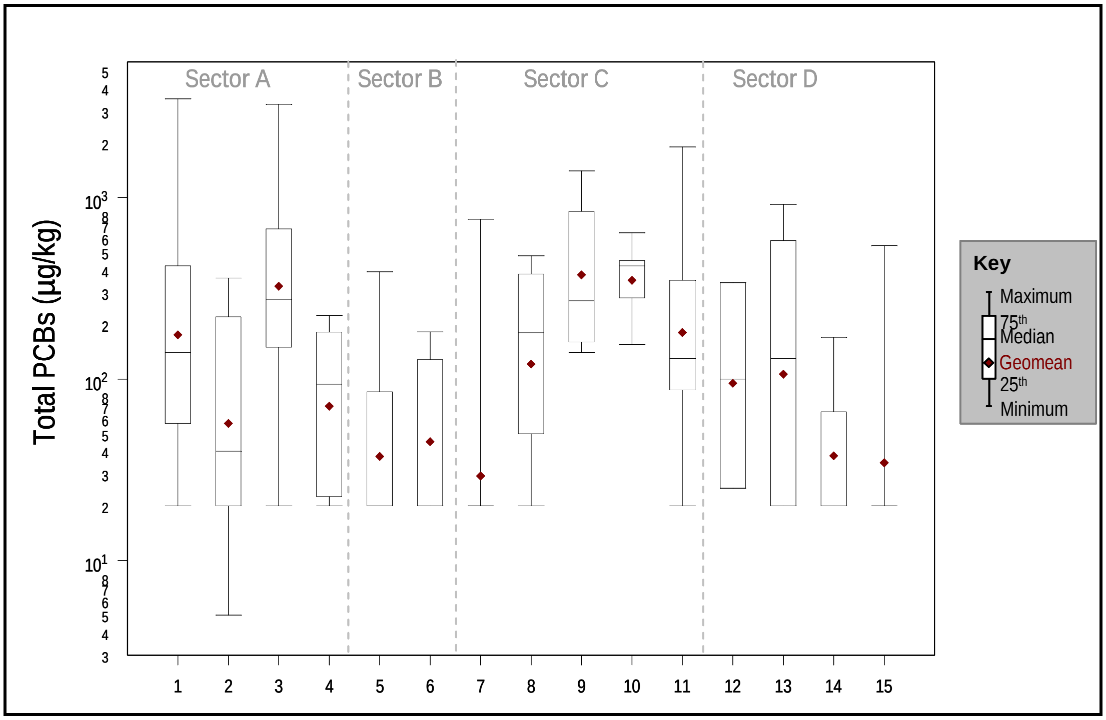


Figure 7 Box Plots of Total PCB Concentrations

Sector A

Sector A encompasses the impaired portions of Segments 829 and 806. This sector is within the City of Fort Worth. PCB levels in fish tissue samples from Sector A collected between 1988 and 2006 ranged from <10 to 3,500 ng/g, with latter value for a smallmouth buffalo collected at the Purcey Street drain in 1996. A total of 48 samples yielded median and average values of 158 and 444 ng/g, respectively. Site 3 (West Fork at Beach Street) exhibited the highest total PCB levels within Sector A and the highest average concentration for the entire dataset (766 ng/g). It is noted that fish samples collected near the Benbrook Dam (Site a in Table 5 and Figure 6) exhibited PCB levels below quantitation limits, which contrast with the high concentrations observed in Sector A.

Sector B

Sector B corresponds to the portion of the West Fork Trinity River between Village Creek and the Elm Fork Trinity River. This sector presented the lowest PCB levels in tissue in the project area. Fish tissue concentrations from 1987 to 2000 in Sector B ranged from <40 to 390 ng/g, with overall median and averages of <40 and 74 ng/g, respectively.

Sector C

Sector C, a densely-populated area, is within the City of Dallas and encompasses the West Fork Trinity River between the Elm Fork Trinity River and a point located 1 mile downstream of Dowdy Ferry Road, just outside the Dallas City limits. As can be seen in Table 5 and Figure 7, PCB concentrations are significantly higher than those observed in Sector B, a less urbanized area. Fish tissue concentrations from 1987 to 2000 in Sector C ranged from <40 to 1,900 ng/g, with the latter value from an alligator gar collected at Dowdy Ferry Road in 2000. The 44 samples available for this sector yielded an average of 304 ng/g and a median value of 135 ng/g.

Sector D

Sector D is the lower stretch of Segment 805 from 1 mile below Dowdy Ferry Road to the confluence with the Cedar Creek Reservoir discharge canal. Average PCB concentrations declined in the more rural Sector D. Total PCB concentrations in fish collected from this sector ranged from <50 to 917 ng/g, with the latter value from a smallmouth buffalo collected in 1990. The 29 samples collected in Sector D had an average of 131 ng/g and a median value of <40 ng/g.

The tissue dataset was plotted as a function of distance from the confluence of Segments 829 and 806 (distances increase in the downstream direction) in an attempt to determine spatial trends. However, as can be seen in Figure 8, the data are too scattered and there is no trend with distance. It is apparent from Figure 8 that levels of PCB in tissue are correlated with the degree of dense urbanization, as the highest concentrations were observed in Sectors A and C, the two most highly developed areas. However, areas such as Arlington and Grand Prairie between Dallas and Fort Worth that are now highly developed, but were developed relatively recently (mostly since 1970), do not appear to exhibit high PCB concentrations. This observation may be due to the fact that PCBs were banned in the 1970s.

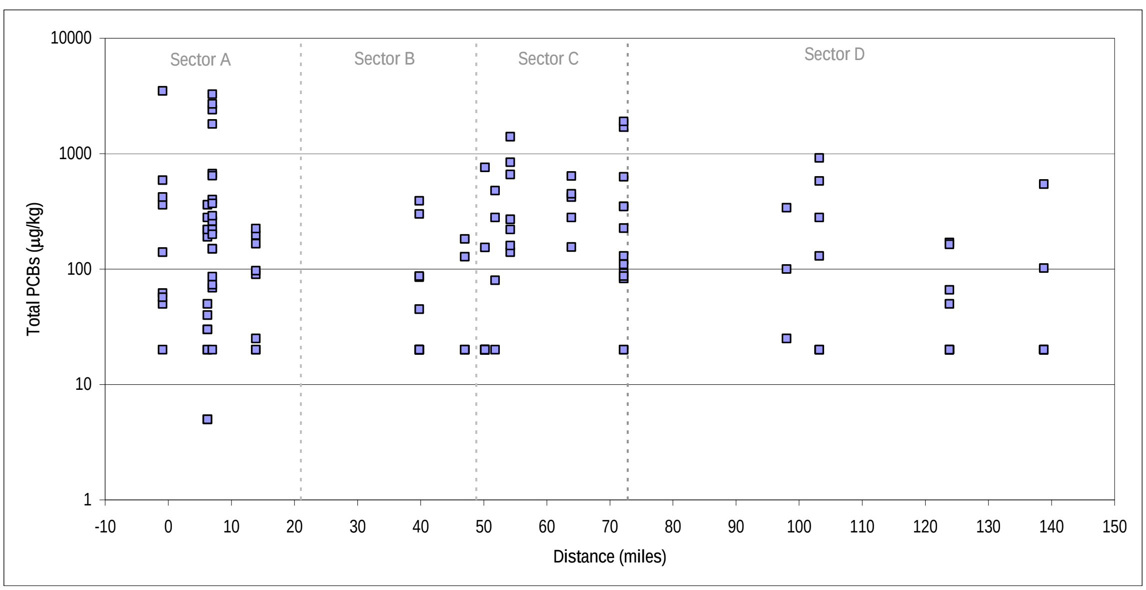


Figure 8 Total PCBs in Fish Tissue vs. Distance

Temporal Trends

The analysis of temporal trends is limited by the fact that samples were collected at different dates for the various stations and also by the fact that the dataset is fairly small to yield statistically significant results. Plots of tissue data by year by sector are shown in Figure 9. No obvious trend can be inferred from Figure 9. Concentrations do not seem to be changing over time. This lack of trend was confirmed by the very low r^2 and high *p*-values obtained from linear regressions of the average total PCB concentrations by year.

2.6 Historical PCB Data for Sediment Samples

PCB results from a total of 94 samples collected between 1974 and 2001 in the study area were compiled. Four of those correspond to stormwater outfall sediment samples (mud as reported in TRACS). Thirty-two of the ninety stream sediment samples had detectable levels of PCB in sediment. PCB levels in sediment samples varied between non-detectable and 2,900 ng/g, the latter for a sample collected at Beltline Road in Grand Prairie (Segment 0841) in 1978. The overall average PCB concentration in sediment was 72 ng/g, with a median value below the detection limit. Concentrations in sediment from storm water outfalls collected in 1988 ranged from 170 to 340 ng/g for Pump Station A in Dallas, with an average concentration of 253 ng/g. Figure 10 summarizes the sediment data by segment. Non-detects were assumed as half the detection limit for calculation purposes. It can be seen that Segment 0841 exhibited the highest average PCB concentration in sediments, but this was heavily influenced by the single sample noted above. Segment 0841 (corresponding to Sector B) presented the lowest concentrations in fish tissue.

2.7 Historical PCB Data for Water Samples

A limited dataset of PCB measurements in water concentrations from four locations was available. Fifteen of 20 samples (15 out of 20) had concentrations below the detection limits. Table 6 presents an inventory of PCB concentrations measured in water.

Table 6 Total PCB Levels in Water Samples

Segment	Statistic	Value
805	# samples	17
	# samples above MDL	4
	Range (ng/L)[a]	0.87-12.79
	Average (ng/L)[a]	7.03
	MDL for non-detects	0.03-5
841	# samples	3
	# samples above MDL	1
	Range (ng/L)[a]	7.48
	MDL for non-detects	0.183-1

[a] Only detected concentrations are included

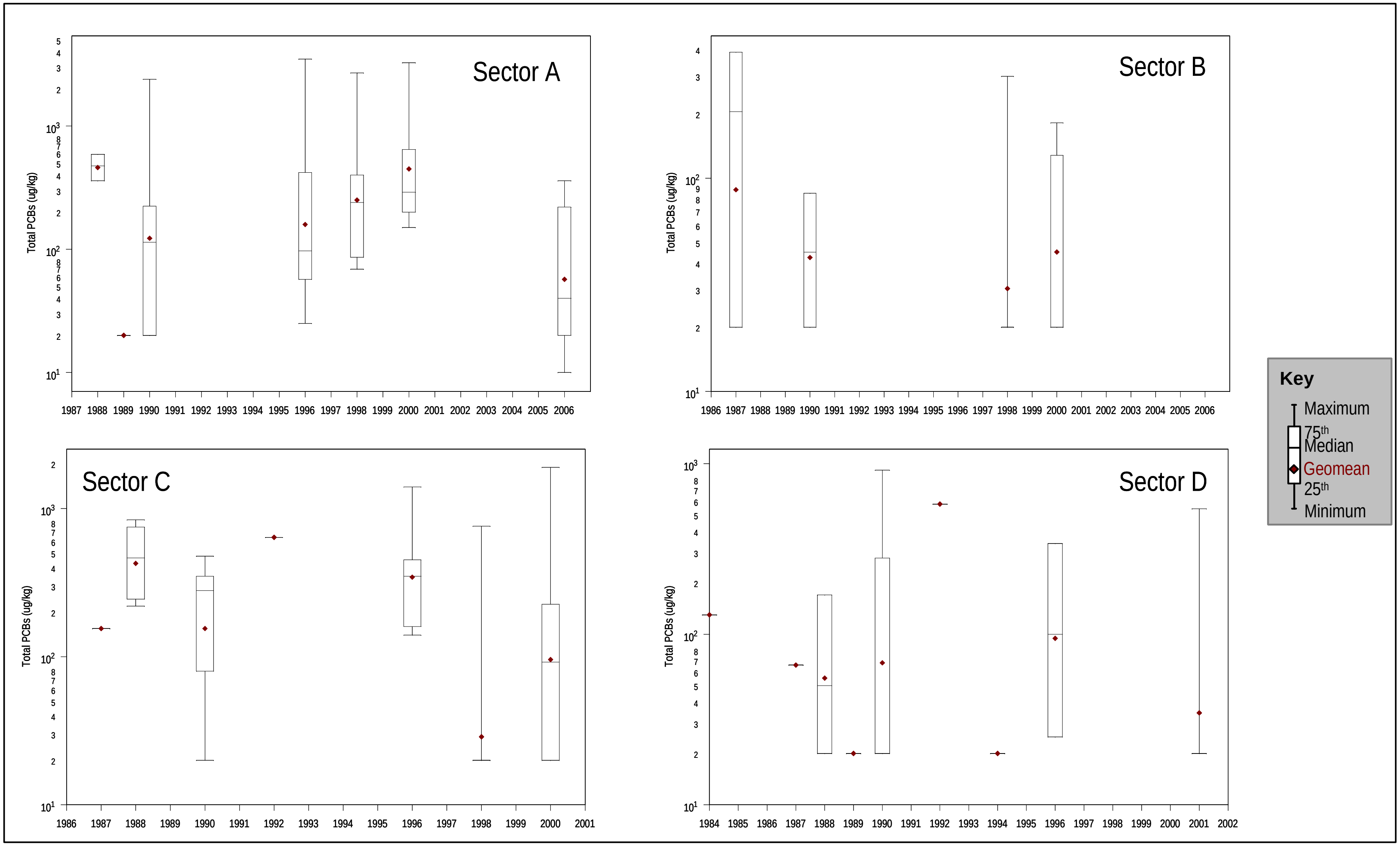


Figure 9 Total PCB Data in Fish by Year

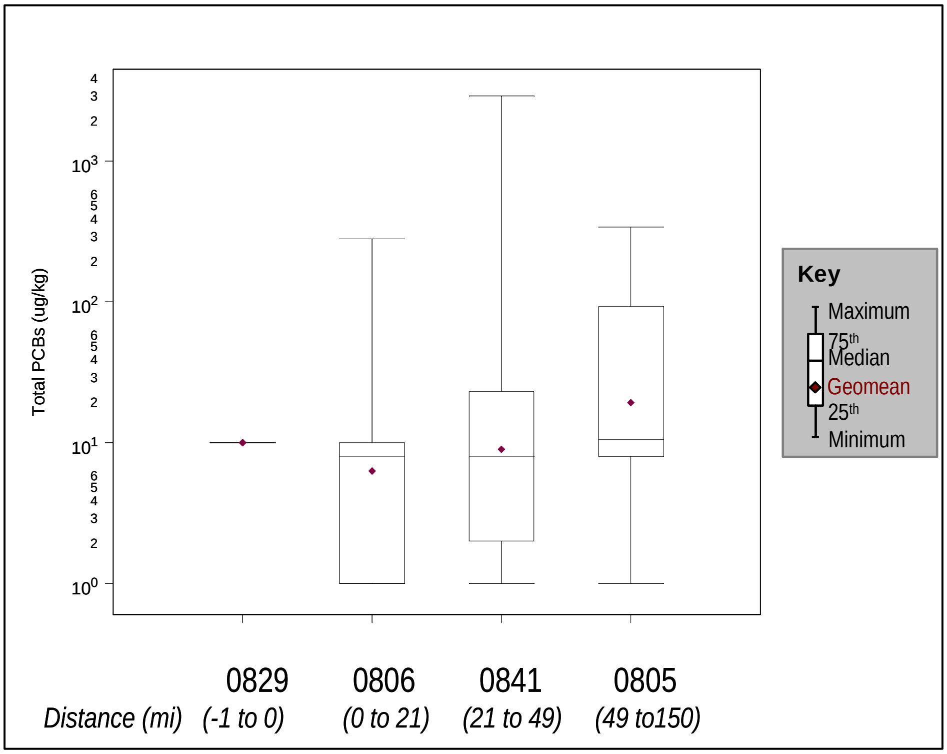


Figure 10 Total PCBs in Sediment Samples

2.8 Source Data

Potential continuing sources of PCBs to the Trinity River include point source effluents, storm water runoff, wet/dry deposition, and re-suspension of buried sediments. Flows in Trinity River Segments 0841 and 0805 are effluent-dominated, with four major domestic sewerage systems (Fort Worth Village Creek, Trinity River Authority Central, Dallas Central, and Dallas Southside), each discharging more than 100 MGD (see Table 7). A few smaller municipal sewage treatment plants and industrial WWTPs also discharge to the project area segments. Figure 11 shows the locations of permitted wastewater discharges to the segments comprising the project area. Finally, a number of MS4s are also located within the project area (not shown in Figure 11).

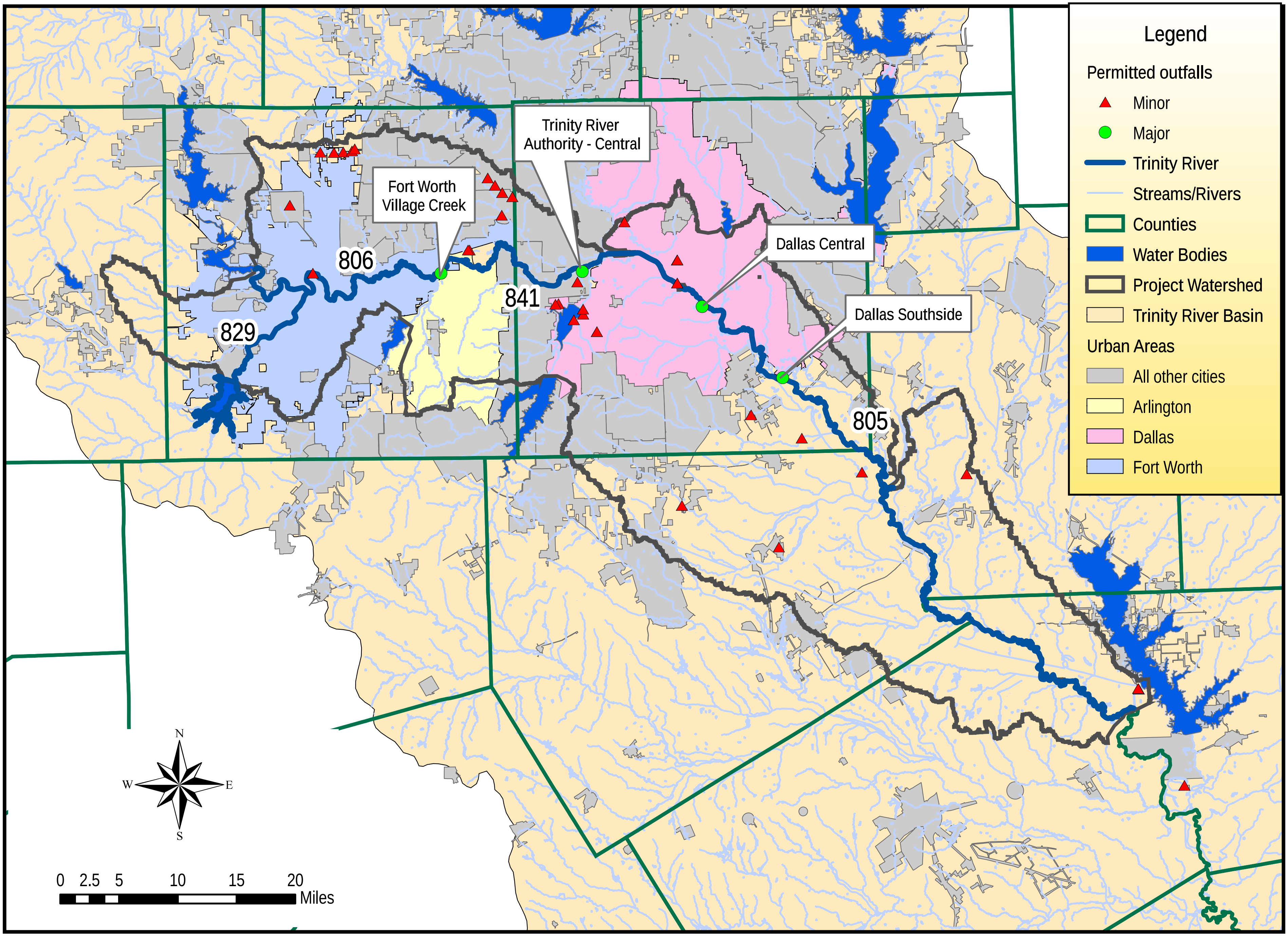


Figure 11. TPDES Permittees in the Project Area

Table 7 TPDES Permitted Discharges to Segments 0829, 0806, 0841, and 0805

TCEQ Permit #	USEPA NPDES #	Permittee	Facility Name	Facility Type	Permit Category	Effluent Type	Receiving Water	TCEQ Segment	County	Permitted Annual Average Flow, in MGD	Average Reported Monthly Average Flow, in MGD (year of data)
WQ0004400-000	TXS000703	North Texas Tollway Authority	North Texas Tollway Authority MS4	NA	MS4	Stormwater	Various ditches and tributaries to segment 0805	805	Dallas	NA	NA
WQ0004401-000	TXS000704	North Texas Tollway Authority	North Texas Tollway Authority MS4	NA	MS4	Stormwater	Various ditches and tributaries to segment 0805	805	Dallas	NA	NA
WQ0004641-000	TXS001601	City of Mesquite	Mesquite MS4	NA	MS4	Stormwater	Various ditches and tributaries to segment 0805	805	Dallas	NA	NA
WQ0004396-000	TXS000701	City of Dallas	Dallas MS4	NA	MS4	Stormwater	Various ditches and tributaries to segment 0805	805	Dallas	NA	NA
WQ0004350-000	TXS000901	City of Ft. Worth and Tarrant Regional Water District	Fort Worth MS4	NA	MS4	Stormwater	Various ditches and tributaries to segments 0806, 0829, & 0841	841, 806, 0829	Tarrant	NA	NA

TCEQ Permit #	USEPA NPDES #	Permittee	Facility Name	Facility Type	Permit Category	Effluent Type	Receiving Water	TCEQ Segment	County	Permitted Annual Average Flow, in MGD	Average Reported Monthly Average Flow, in MGD (year of data)
WQ0004691-000	TXS001301	City of Irving Dallas CFCD 1 D	City of Irving	NA	MS4	Stormwater	Various ditches and tributaries to segment 0841	841	Dallas	NA	NA
WQ0004635-000	TXS000301	City of Arlington	City of Arlington	NA	MS4	Stormwater	Various ditches and tributaries to segment 0841	841	Tarrant	NA	NA
WQ0010060-001	TX0047830	City of Dallas	Central WWTP	Major	Public Domestic	Treated Wastewater	Upper Trinity River	805	Dallas	150	137 (2003-2007)
WQ0010060-006	TX0047848	City of Dallas	Southside WWTP	Major	Public Domestic	Treated Wastewater	Upper Trinity River	805	Dallas	110	68 (2006-2007)
WQ0010984-001	TX0022811	Trinity River Authority	Ten Mile Creek Plant	Major	Public Domestic	Treated Wastewater	Ten Mile Creek	805	Dallas	24	14 (1998-2007)
WQ0013415-001	TX0104345	Trinity River Authority	Red Oak Creek Regional WWTP	Major	Public Domestic	Treated Wastewater	Red Oak Creek	805	Ellis	3.5(interim) 6.0(final)	3.575 (2007)
WQ0014795-001	TX0026603	City of Palmer	City of Palmer WWTF	Minor	Public Domestic	Treated Wastewater	Upper Trinity River	805	Ellis	0.226	0.196 (2002-2005)
WQ0014471-001	TX0126128	Scurry-Rosser ISD	Scurry-Rosser WWTP	Minor	Public Domestic	Treated Wastewater	Cottonwood Creek	805	Kaufman	0.04	No data reported
WQ0014628-001	TX0032212	D Bar B Water & Wastewater Supply Corp.	D Bar B Mobile Home Ranch	Minor	Private Domestic	Treated Wastewater	Upper Trinity River	805	Dallas	0.024	No data reported

TCEQ Permit #	USEPA NPDES #	Permittee	Facility Name	Facility Type	Permit Category	Effluent Type	Receiving Water	TCEQ Segment	County	Permitted Annual Average Flow, in MGD	Average Reported Monthly Average Flow, in MGD (year of data)
WQ0014699-001	TX0128686	Dallas County Park Cities MUD	Dallas County Park Cities MUD WWTP	Minor	Private Domestic	Treated Wastewater	Old Channel Elm Fork Trinity River	805	Dallas	0.72	0.122 (2007)
WQ0002519-000	TX0088099	Hanson Aggregates West, Inc.	Hanson Aggregates West, Inc.	Minor	Industrial	Groundwater	Old Tenmile Creek; Red Oak Creek	805	Ellis	0.3	0 (2004-2007)
WQ0004161-000	TX0119784	Equitable Nissei Dallas	JP Morgan Chase Tower 2200 Ross	Minor	Industrial	Groundwater	Upper Trinity River	805	Dallas	0.155	0.166 (2003-2007)
WQ0004663-000	TX0126080	Buckley Oil Co.	Buckley Oil Co. WWTP	Minor	Industrial	Stormwater	Able Sump, Upper Trinity River	805	Dallas	Intermittent and flow variable	0.022 (2007)
WQ0004687-000	TX0126268	Chemcentral Southwest, L.P.	Chemcentral Southwest	Minor	Industrial	Stormwater	Fivemile Creek	805	Dallas	Intermittent and flow variable	No data reported
WQ0004765-000	TX0127779	IPC Dallas I, LP	San Jacinto Tower Office	Minor	Industrial	Groundwater	Upper Trinity River	805	Dallas	0.0291	No data reported
WQ0010303-001	TX0022802	Trinity River Authority of Texas	Central Regional WWTP	Major	Public Domestic	Treated Wastewater	Lower West Fork Trinity River	841	Dallas	162 (current) 189(proposed)	115 (2001-2007)
WQ0010494-013	TX0047295	City of Fort Worth	Village Creek WWTP	Major	Public Domestic	Treated Wastewater	Lower West Fork Trinity River	841	Tarrant	166	111 (2006-2007)
WQ0011032-001	TX0023591	Andrews, Chester Alan	Alta Vista Mobile Home Park	Minor	Private Domestic	Treated Wastewater	Big Bear Creek	841	Tarrant	0.008	0.005 (2002-2007)

TCEQ Permit #	USEPA NPDES #	Permittee	Facility Name	Facility Type	Permit Category	Effluent Type	Receiving Water	TCEQ Segment	County	Permitted Annual Average Flow, in MGD	Average Reported Monthly Average Flow, in MGD (year of data)
WQ0012807-001	TX0093963	Golden Triangle Estates Homeowners	Golden Triangle Estates WWTP	Minor	Private Domestic	Treated Wastewater	Big Bear Creek	841	Tarrant	0.09	0.009 (2007)
WQ0012982-001	TX0096270	Regency Conversions Inc	Regency Conversions	Minor	Private Domestic	Treated Wastewater	Unnamed Trib of Big Bear Creek	841	Tarrant	.005	0.003 (2006-2007)
WQ0013036-001	TX0119156	Pine Tree MHP Landowners Association	Pine Tree MHP	Minor	Private Domestic	Treated Wastewater	Unnamed Trib of Big Bear Creek	841	Tarrant	.042	0.029 (2001-2007)
WQ0013831-001	TX0090336	Pine Tree Estates No. 2 Landowners	Pine Tree Estates II WWTP	Minor	Private Domestic	Treated Wastewater	Unnamed Trib of Big Bear Creek	841	Tarrant	.042	0.018 (2004-2007)
WQ0001250-000 (outfall 003)	TX0001007	Extex LaPorte LP	Mountain Creek Steam Electric Station	Major	Industrial	Stormwater	Unnamed Trib of Mountain Creek	841	Dallas	Intermittent and flow variable	0.022 (2004-2007)
WQ0003446-000	TX0108065	Hanson Pipe & Precast, Inc.	Hanson Pipe & Precast	Minor	Industrial	Treated Wastewater	Lower West Fork Trinity River	841	Dallas	Intermittent and flow variable	1.06 (2007)
WQ0003993-000	TX0116530	Citgo Products Pipeline Company	Arlington Pump Station	Minor	Industrial	Stormwater, groundwater	unnamed trib to Lower West Fork Trinity River	841	Tarrant	Intermittent and flow variable	0.006 (2007)
WQ0001441-000	TX0025101	Dallas-Fort Worth International Airport	Dallas-Fort Worth International Airport	Minor	Industrial	Stormwater	Big Bear Creek	841	Tarrant	Intermittent and flow variable	No data

TCEQ Permit #	USEPA NPDES #	Permittee	Facility Name	Facility Type	Permit Category	Effluent Type	Receiving Water	TCEQ Segment	County	Permitted Annual Average Flow, in MGD	Average Reported Monthly Average Flow, in MGD (year of data)
WQ0002831-000	TX0100315	Reagent Chemical & Research, Inc	Reagent Chemical & Research, Inc	Minor	Industrial	Treated Wastewater	Unnamed tributary to segment 0806 above Clear Fork	806	Tarrant	Intermittent and flow variable	<0.00001 (2002-2006)
WQ0003730-000	TX0120120	Chevron USA, Inc.	Chevron USA, Inc.	Minor	Industrial	Treated Wastewater	ditch to segment 0806 below Clear Fork	806	Tarrant	Intermittent and flow variable	0.0025 (2006-2007)

Though PCB concentrations in these effluents are expected to be low, the sheer magnitude of the discharge may result in a significant PCB load. A limited set of PCB data in wastewater sludge solids from these sewage treatment plants was obtained from facility self-reported data (Table 8). While a significant portion of the reported PCB levels were below analytical reporting limits, very high values (up to 6,800 ng/g) were also measured at some facilities. Because suspended solids are also present to some degree in all effluents, this implies that some PCBs will be present in effluents.

Table 8 Self-Reported PCB Levels in Sludge from TPDES Dischargers

NPDES Permit	Permittee Name	Sample Count	Time Period		Concentration Range (ng/g)	
TX0022802	Trinity River Authority (TRA) Central Plant	5	07/31/01	07/31/06	< 8.3	8.3
TX0022811	TRA - Ten Mile Creek	2	12/31/05	12/31/06	< 8.3	< 8.3
TX0047295	City of Fort Worth	2	07/31/93	07/31/02	0	< 1,000
TX0047830	City of Dallas - Central	9	12/31/98	07/31/06	< 80	6,800
TX0047848	City of Dallas - Southside	3	12/31/98	07/31/00	< 640	720
TX0104345	TRA - Red Oak	5	07/31/01	07/31/06	0	< 8.3

Storm water runoff may also provide significant PCB loads. While PCBs have not been produced in the U.S. since 1977, they may continue to be deposited to land surfaces by atmospheric deposition, old and leaking electrical transformers, land application of sewage sludge, and improper waste disposal practices. These new sources, as well as soil eroded from historically contaminated sites, may contribute PCB loading to the Trinity River and its tributaries in storm water.

The USGS sampled particle-associated PCBs from storm water runoff at four locations in the project area as part of a city-wide study of lakes and streams in Fort Worth (Van Metre, *et al*. 2003). A summary of the reported data is presented in Table 9. Total PCB concentrations varied from <45 to 764 ng/g at downtown Fort Worth. It is important to point out that the authors of the study found a strong correlation between land use and PCB concentrations in suspended solids isolated from storm water.

2.9 Data Gaps

A review of existing data revealed that very little to no in-stream water PCB data are available for the project segments. In addition, the latest dataset of sediment was collected in 2001 and, thus, no recent data to assess the level of impairment are available. Finally, data to quantify major sources of PCB to the Trinity River are needed to estimate pollutant loads.

Table 9 Total PCB Concentrations in Suspended Sediments of Storm Water Samples (Van Metre *et. al*, 2003)

Site	Date	Aroclor 1242		Aroclor 1254		Aroclor 1260		Total PCB	
Site 1, Unnamed Tributary of Clear Fork in Oakmont Park, Benbrook[a]	10/15/2000	<	30	<	30	<	30	<	90
	3/8/2001	<	25	<	25	<	25	<	75
	8/17/2001	<	15	<	15	<	15	<	45
Site 5, Purcey Drain discharge to Clear Fork (Downtown Fort Worth)	10/15/2000	<	95	E	72	E	48	E	120
	5/4/2001	<	190	E	72	E	70	E	142
	5/4/2001	<	180	E	86	E	82	E	168
	8/16/2001	E	82	=	310	=	350	E	742
	8/16/2001	=	64	=	470	=	230	=	764
Sycamore Creek near E. Rosedale Street	5/4/2001[b]	E	29	E	32	E	34	E	95
		<	410	<	410	<	410	<	1,230
		<	95	E	23	E	26	E	49
		<	590	<	590	E	94	E	94
	8/16/2001[b]	<	2,000	<	2,000	<	2,000	<	6,000
		<	460	<	460	<	460	<	1,380
		<	330	<	330	<	330	<	990
	8/3/2001[b]	E	8.6	E	18	E	30	E	57
		E	6.8	E	14	E	25	E	46
		E	8.9	E	12	E	23	E	44
		<	140	<	140	E	38	E	38
		<	410	<	410	<	410	<	1,230
Big Fossil Creek at SH-26	5/4/2001	<	30	<	30	<	30	<	90
	8/11/2001	<	65	E	43	E	57	E	100
	9/18-9/19/01	<	35	<	35	<	35	<	105
	10/11/2001	<	50	<	50	<	50	<	150

[a] Tributary discharges to Clear Fork approximately 4 kilometers downstream of Benbrook Dam
[b] Results presented correspond to discrete samples
E, estimated
=, detection above reported limit
<, non detection at indicated value
nd, not detected

3. MONITORING PLAN

3.1 PCB Conceptual Model and TMDL Approach

It is expected that much of the PCBs present in the Trinity River causing elevated levels in fish originated from historical legacy sources, and that these legacy PCB levels will slowly decline. However, continuing sources to the Trinity River may also be significant in causing elevated PCB levels, and should be quantified. Potential continuing sources of PCBs to the Trinity River include point source effluents, storm water runoff, atmospheric deposition, and resuspension of buried sediments. Flows in Trinity River Segments 0841 and 0805 are effluent-dominated, with four major domestic sewerage systems (Fort Worth Village Creek, Trinity River Authority Central, Dallas Central, and Dallas Southside) each discharging approximately 100 MGD on average. Storm water runoff may also contribute significant PCB loads. While PCBs have not been produced in the U.S. since 1977, they may continue to be deposited to land surfaces by atmospheric deposition, old and leaking electrical transformers, land application of sewage sludge, and improper waste disposal practices. These new sources, as well as soil eroded from historically contaminated sites, may contribute PCB loading via storm water to the Trinity River and its tributaries. Contaminated sediments can also act as a continuing source of PCBs to the water column. While a river is not inherently a long-term depositional environment, and PCBs will ultimately be trapped in sediments of downstream reservoirs, a number of low-head dams along the Trinity River in Fort Worth and Dallas provide low-velocity pools that serve as temporary depositional areas for suspended sediments. The primary mechanisms for PCB removal from the Trinity River include volatilization to the atmosphere, decay, burial in deep sediments, and flushing downstream. Flushing downstream is considered likely to be the major removal mechanism. Decay rates for most PCBs are very slow, as are sediment burial rates in the river. Some of the deposited sediments are likely flushed downstream with each high-flow event, and dissolved PCBs in the water column are slowly but continuously flushed downstream. It is not known whether the continuing PCB loads exceed the rate of PCB flushing downstream.

The TMDL development approach will likely rely on a simple multiple-box, mass balance analytical model, most likely implemented in a spreadsheet for simplicity and transparency. The term model is used in the general sense here, as what is proposed is more of an analytical framework than a computer model. The system will be divided into multiple boxes, with different boxes for water and sediment for each reach of the river. The model will likely be implemented at steady state. Here, use of the term "steady-state" does not imply that PCB levels in the Trinity River are not changing, but rather that they are changing slowly relative to the time steps at which dynamic models are typically designed for, and thus a non-dynamic model is considered sufficient. The major PCB sources and removal mechanisms will be treated as first-order processes.

To implement the model, quantification must be made of the existing levels of PCBs in each segment or reach, the rate of PCB exchange between each reach (which will be primarily proportional to flows), and the external loading of PCBs to each reach. The multiple removal mechanisms, most of which are difficult to measure, can then by estimated by difference. Internal loading from the sediments to the water column is also difficult to measure, and will be pooled with settling (removal from the water column to the sediments), volatilization, and degradation as a net internal removal/loading rate. Based on this, it will be possible to predict the reduction in PCB concentrations to be expected from a reduction in external loading from one or more sources, or from removal of contaminated sediment "hot spots."

Since the model will be steady-state, instream flows, effluent loadings, and storm water loadings will be averaged over time.

3.2 Modeling Approach Data Requirements

The primary data required for this and any stream or river TMDL is flow data. As noted in Section 2.1, the USGS operates a number of continuous flow gages along the West Fork, East Fork, Elm Fork, Clear Fork, and Upper Trinity River. It is recognized that much of the dry weather flow in the Elm Fork (Segment 0822) is withdrawn for public water supply use prior to reaching Segment 0805 and, thus, upstream gage readings will have to be adjusted to reflect the flow reaching 0805. In addition, the USGS operates flow gages on a few of the other major tributaries (Prairie Creek, Mountain Creek, White Rock Creek), and other major tributaries (Bear Creek, Big Fossil Creek, Sycamore Creek, Ten Mile Creek) have been gaged historically. For ungaged tributaries, flows will be projected either 1) from nearby gaged tributaries of similar land use, using the relative watershed area ratios, or 2) by distributing the flow differences between gages in the Trinity River among point source inflows (if any) and tributaries. It would not be economical to attempt to measure flows as part of this project, as prediction of an average flow would require many measurements over two or more years.

A second type of data required for the proposed TMDL approach is in-stream PCB concentration measurements. These data are used to quantify the existing in-stream loads of PCBs in each segment, as well as the exchanges of PCBs between segments. For these purposes, the plan is to sample in-stream PCB concentrations in Segments 0806 and 0841 at sites near the upstream and downstream ends of each segment, as well as a site near the middle of each segment. Because Segment 0805 is 100 miles long, it is considered advisable to split it into two or more reaches, and include five in-stream stations. Because the impaired portion of Segment 0829 is only 1 mile long, only one in-stream station is required.

PCB levels in ambient water samples are seldom high enough to allow quantitation without pre-concentration. Thus, water samples for PCBs will be collected using high-volume samplers, which concentrate PCBs from several hundred liters of water over several hours. The particulate phase is trapped by a glass fiber filter, while the dissolved PCBs are trapped on an XAD-2 resin cartridge. Parsons and the University of Houston have extensive experience using these samplers for low-level dioxin and PCB measurements in the Houston Ship Channel system.

Along with PCB measurements in water, it is advisable to also measure suspended solids concentration. PCBs in water tend to occur more on suspended solids than as dissolved compounds. Thus, suspended solids levels may assist in data interpretation. For the duration of each sampling event, water will be collected every thirty minutes and combined into one large Erlenmeyer flask. At the end of the sampling period, a single, time-composite sample will be poured into a bottle to be sent to the lab for TSS analysis.

To quantify the in-stream load, in addition to PCB measurements the volume of each reach and segment must also be known. Approximate volumes may be estimated from aerial photographs, combined with a limited number of depth measurements at cross-river transects near the sampling sites if the data are not available from other sources (e.g. USGS). To quantify the exchanges between reaches or segments, in addition to PCB concentration measurements, flows between segments must also be known. These will be estimated from USGS flow measurement data.

A third type of data recommended for the proposed TMDL approach is PCB concentration measurements in bed sediments. While in-stream PCB measurements in water represent only a snapshot of a particular time, and water concentrations of PCBs can be quite dynamic, sediments serve as long-term reservoirs of PCBs in streams and PCB levels in sediments are considered much less dynamic than those in water. By deriving a sediment-water PCB distribution coefficient from the paired sediment-water measurement PCB measurements, sediment PCB levels may better predict long-term in-stream loads than the PCBs measurements in water. Along with sediment samples for PCB analysis, sediment organic carbon should also be measured, as this has been found to strongly influence the PCB capacity of the sediment.

Because they are less expensive than water samples to collect and analyze, sediment PCB measurements will also be used to identify "hot spots" of high concentration, which may be linked to nearby upstream tributaries or point sources. For these purposes, composite sediment PCB samples will be collected at each of the sites where water PCB concentrations are measured, as well as downstream of major tributaries or point source outfalls. Each composite sample will consist of a homogenized mixture of at least three surface (0-5 cm) sediment grab samples from each site, typically collected from a transect across the stream.

PCB measurements in sediments of tributaries will also be used to estimate loading of PCBs from tributaries. The instream PCB concentrations will be estimated from the sediment concentration using the distribution coefficient approach described above.

The fourth type of data required for the proposed TMDL approach is PCB loads from wastewater discharges. With the large number of wastewater outfalls discharging to the impaired segments, it would be expensive to sample them all. Moreover, almost all of the discharges are small. The recommended approach involves measuring PCB concentrations using high-volume samplers in effluents of only the four largest facilities (City of Fort Worth Village Creek, Trinity River Authority Central, City of Dallas Central, and City of Dallas Southside), and using the average of the concentrations measured as an estimate of point source PCB concentrations. This average concentration would then be multiplied by the average or permitted flow from each facility to estimate the existing PCB load from each facility. It could be argued that while this approach may be sufficient for large domestic WWTPs with similar high-level treatment, it is not a good predictor of concentrations at smaller domestic facilities or the few industrial facilities. It is expected, however, that loads from the smaller facilities will be relatively negligible. Also, the instream sediment "hot spot" sampling should be helpful in identifying any major PCB sources, and additional effluent sampling could be performed to address any "hot spots" near outfalls.

The fifth type of data required for the proposed TMDL approach is PCB loading from storm water. Storm water is expected to be a major external source of PCBs to the system. Storm water sampling is also expensive, given the preparation and waiting required for proper conditions, in addition to the high expense of water sampling for PCBs. It is proposed that a limited stormwater PCB sampling effort using the high-volume technique be targeted at five sites, each to be sampled in one event. Due to the typically unpredictable nature of rainfall in this area, and the fact that water samplers must be operated manually over several hours, small neighborhood-scale streams would not be sampled, but only major tributaries with watersheds larger than 20 square miles. This will help ensure that when runoff occurs, the flow and runoff influence at these sites will persist for sufficient time for sampling deployment and collection. The sites will include those draining urban core sites (Purcey Street outfall in Fort Worth, Dallas storm water sump discharges A & H), suburban areas (Big Fossil Creek), and more rural areas (Parsons Slough).

A sixth type of data recommended for the proposed TMDL approach is PCB concentrations in fish tissue. The ultimate goal of the TMDL is reduction of fish tissue concentrations to levels that are safe to eat, *i.e.*, do not exceed TDSHS criteria. To develop a TMDL, a water concentration target must be set at which it is believed fish tissue levels will be acceptable. This linkage between fish tissue and water levels is known as a bioaccumulation factor (BAF). The TCEQ uses a default statewide bioaccumulation factor for PCBs in deriving Texas' surface water quality standards. The applicability of the default statewide BAF to this system is not known. It is known that BAFs tend to vary between fish species, and that BAFs for individual PCB congeners also vary. Additional fish tissue measurements, paired with the water and sediment samples, would assist in quantifying a more appropriate site-specific BAF. Additionally, a site-specific biota-sediment accumulation factor could be used to develop a sediment cleanup target for the TMDL to be used during the implementation phase. Fish sampling and PCB tissue analysis is not proposed for this project. Given that the TSDHS plans to collect 13 additional fish samples in the spring and summer of 2008, it would seem a partial duplication of effort. The plan is to collect water and sediment PCB samples at nine of the stations to be sampled by the TSDHS. It is hoped they will be able to provide their data for the TMDL project on a time frame that will be useful to this TMDL project.

3.3 PCB Analytical Quantification

PCBs may be quantified as individual congeners, as Aroclor equivalents, or as homologue groups (*i.e.*, monochlorobiphenyls, dichlorobiphenyls, *etc*.). Historically, the most used method has been through Aroclor analysis (USEPA Method 8082). However, this procedure may yield significant error in determining both total PCB and their total toxicity, because it assumes that the distribution of PCB congeners in environmental samples and parent Aroclor compounds is similar (USEPA 2000).

In the Aroclor analysis method, a low-resolution chromatographic separation is used that does not separate most of the individual congeners, but attempts to characterize the peaks by statistically matching the low-resolution chromatogram back to the characteristic pattern of the originally produced Aroclors. This method assumes that distribution of PCB congeners in environmental samples and parent Aroclor compounds is similar (USEPA 2000). Total PCB is calculated as the sum of the Aroclors. There are several problems with analysis of PCBs as Aroclors. First, weathering in the environment alters the relative abundance of congeners, such that they no longer represent a mixture of the original Aroclors. Therefore, the algorithms used for quantitation apply poorly in environmental samples and provide inaccurate results. Second, because the chromatographic method has limited resolution, and the detector is not very specific, there are a wide range of compounds, both non-PCB contaminants and natural organic matter, that may co-elute from the chromatography column and be incorrectly included in the PCB peak(s). This is especially true in "dirty" environmental matrices such as sediments and tissue. A third problem with the Aroclor method is its poor sensitivity; levels below method detection limits are very common even in contaminated sediments, water, and tissue with the Aroclor method. In samples collected in Lake Worth and analyzed by both the Aroclor method and congener-specific methods, the Aroclor results (when detected) ranged from five to more than 100 times higher than those based on congener analysis (Besse *et al*. 2005).

While Aroclor analysis is far less expensive that congener analysis, the project team will not be using Aroclor analysis except in certain cases where the absolute quantitation of PCB concentrations is not important and it is sufficient to know relative concentrations (for example, if it is desirable to trace or pinpoint the location of a pollutant source). Water and sediment samples will be analyzed for the full set of 209 congeners using EPA Method 1668A.

3.4 Summary of Proposed Monitoring Plan

The proposed monitoring plan consists of collecting 33 bottom sediment samples and 12 high-volume water samples to confirm the severity and spatial extent of the current impairment. Water and sediment data will be paired with fish tissue data to be collected by the TDSHS in Spring/Summer 2008 to estimate bioaccumulation relationships. It is noted, however, that if the project requires a much shorter schedule, it will be necessary to collect tissue data as part of this project. In addition, the monitoring plan includes collection of samples at the four major dischargers and at five stormwater locations to aid in calculating pollutant loads. Table 10 lists the locations proposed for sampling in fiscal year 2008.

Additional parameters to be measured concurrently with PCB sample collection include:

- For sediment: total organic carbon and grain size distribution.
- For water: total suspended solids.

Table 10 Proposed Sampling Locations and Frequencies

Station ID	Station description	River Mile	Site Type	Sediment	Ambient Water	Storm Water	Effluent	Tissue by TDSHS
18456	Clear Fork Trinity River @ Rosedale St.	-2	Tributary loading	1				
17126	Purcey Street drain outfall to Clear Fork Trinity River		stormwater load			1		
16119	Clear Fork Trinity River at Purcey St	0.4	Main stem 0829	1	1			1
18460	West Fork Trinity River @ University Dr.	-1.5	Tributary loading	1				
18459	West Fork Trinity River @ North Side Drive	2.7	Main stem 0806	1	1			
17370	Marine Creek @ NE 23rd St.		Tributary loading	1				
17368	West Fork Trinity River above Fourth Street dam	5.7	Main stem 0806	1				
17131	Sycamore Creek @ I-30		Tributary loading	1				
10938	West Fork @ Beach St.	7.9	Main stem 0806	1	1			1
10814	Big Fossil Creek @ Hwy 121		Tributary loading	1		1		
16120	West Fork Trinity River @ Handley-Ederville Rd.	14.7	Main stem 0806	1	1			1
11085	West Fork Trinity River @ Precinct Line Rd.	19.5	Main stem 0806	1				
17189	Village Creek @ I-30		Tributary loading	1				
	Ft. Worth Village Creek WWTP		Effluent loading				1	
11087	West Fork Trinity River @ FM 157 (Collins St)	28.3	Main stem 0841	1	1			
11084	West Fork Trinity River @ SH 360	33.7	Main stem 0841	1				
17664	Johnson Creek @ Carrier Parkway		Tributary loading	1				
11081	West Fork Trinity @ Belt Line Rd	40.7	Main stem 0841	1	1			
10864	Bear Creek @ Hunter-Ferrell Rd		Tributary loading	1				
	TRA Central WWTP		Effluent loading				1	
10815	Mountain Creek @ Singleton Blvd.		Tributary loading	1				
11089	West Fork Trinity River @ West Loop 12	47.9	Main stem 0841	1	1			1
18310	Elm Fork Trinity River @ East Irving Blvd.		Tributary loading	1				

Station ID	Station description	River Mile	Site Type	Sediment	Ambient Water	Storm Water	Effluent	Tissue by TDSHS
10937	Upper Trinity River @ Westmoreland Rd	51.3	Main stem 0805	1	1			1
	Dallas stormwater sump A		stormwater load			1		
	Dallas stormwater sump H		stormwater load			1		
10936	Upper Trinity River @ Commerce St.	55.1	Main stem 0805	1	1			1
	City of Dallas Central WWTP		Effluent loading				1	
10935	Upper Trinity River @ I-45	59.9	Main stem 0805	1				
18458	White Rock Creek @ South 2nd Ave		Tributary loading	1				
10934	Upper Trinity River @ South Loop 12	64.8	Main stem 0805	1	1			1
18575	Five Mile Creek @ Stuart-Simpson Rd		Tributary loading	1				
10932	Upper Trinity River @ Dowdy Ferry Road	73.1	Main stem 0805	1	1			1
	City of Dallas Southside WWTP		Effluent loading				1	
	Ten Mile Creek below Parkinson Rd		Tributary loading	1				
10928	Upper Trinity River below Ten Mile Creek @ Crabtree Rd (Tenmile Rd)	84.9	Main stem 0805	1				
10839	Parsons Slough at Davis Rd		stormwater load			1		
10990	East Fork Trinity River @ FM 3039		Tributary loading	1				
17506	Red Oak Creek @ FM 660		Tributary loading	1				
10925	Upper Trinity River @ SH 34	104	Main stem 0805	1	1			1
10924	Upper Trinity River @ FM 85	125	Main stem 0805	1				1

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