History of the Dallas Floodway

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This paper traces some of the fascinating history of the early creation of the Dallas Floodway and its pivotal role in flood damage reduction for the Metroplex. Flooding has been an integral part of disasters in North Texas since the early 1800's.

In the Beginning - In 1839, John Neely Bryan first visited the place that would one day become Dallas. He had come to the three forks area of the Trinity to survey a spot for a possible trading post serving Indians and settlers. The site was the easiest place to cross the Trinity, and also near where the Preston Trail was planned. This highway would link North Texas to South Texas. After surveying, Bryan returned to Arkansas to settle his affairs. While he was gone, a treaty was signed, removing all Indians from North Texas. He returned in November of 1841, to find the Indians, and half of his customers, gone. So, he shifted his trading post idea to that of a permanent community. About 22 miles to the northwest, there was a community called Bird's Fort. He invited those who had settled there to come and settle in his proposed town. John Beeman arrived in April of 1842 and planted the first corn. Other families soon followed. Members of the Peters Colony settled nearby, and Peter's Colony agents bragged on the new town, now called Dallas, attracting even more settlers. For a while, Bryan was everything to the community: postmaster, storeowner, and his home was the courthouse. In 1843, Bryan married Margaret Beeman. The town was quickly growing. In 1843, the first doctor arrived, and in 1845, the first lawyer arrived. In 1845, the first election was held on the issue of Texas' annexation to the United States. Thirty-two citizens were able to vote, 29 voted for annexation and 3 were opposed. Dallas was now a part of the state of Texas. The Trinity River was not as destructive and unpleasant as it seemed during major floods of the 1800's and particularly, 1908. This body of water runs for 715 miles, it falls about 1280 feet and is the longest self-contained river in Texas. It has 4 forks in the Dallas / Fort Worth vicinity, namely the East, West, Elm and Clear. The river was a great resource to sustain life and settlement along its banks during the colonial years. Several Indian tribes settled along the river, and it is said that the Trinity River got its name from the Spanish settler Alonzso de Leon on May 19, 1690 for the day of Feast of the Most Holy Trinity. John Neely Bryan mentioned above, built his cabin near the river when he settled in the Dallas region, and since then the river has proven to be the most central and primary source of water for the City of Dallas and its surrounding areas. In the latter part of the past century, several new resources like Lake Lewisville, Grapevine Lake, Benbrook Lake, Lake Arlington, Lavon Lake, Joe Pool Lake, and Lake Ray Hubbard were developed to augment the water supply.

Flooding - Severe flooding has occurred in the past:

Trinity River Flood Heights
Source: Engineering News-Record; November 21, 1929

Year	Gage Height at Commerce Street
1822	"Big Flood" of Indian Legend
1841	(Dallas settled.)
1844	50.7 feet
1866	49.2 feet
1871	47.4 feet
1890	45.4 feet
1908	52.6 feet

Early Bridges – The first "significant" bridge over the Trinity River is believed to have been a toll bridge across the old channel of the river, at a point between the present triple underpass at the foot of Elm, Main and Commerce Streets and their intersection with Industrial Boulevard. The bridge was a private enterprise

connecting a road running through the river bottoms out toward Eagle Ford, and thence southwestward to the county line. The only free public facility for crossing the river was nearby on Dallas county Right-of-Way over a low-water ford. As traffic grew the toll company eventually sold the bridge to the County. Subsequently, bridges were built at two other locations. One, known as the "long wooden" bridge was located near present Cadiz Street. The second, on Zang Boulevard turnpike, was located just west of the present Houston Street Viaduct. The design of these early bridges was such that moderate flooding, either submerged the bridges or their approaches. The 1908 flood magnified traffic disruption, which occurred all too frequently with floods.

Flood of 1908 - In 1908 the Trinity River returned and Dallas clearly understood the meaning of a "river runs through it". In May 1908, the Trinity River upper basin experienced a 10-inch to over 15-inch rainfall during a three-day period that resulted in a flood gage reading in Dallas of 52.6 feet. "The flood killed eleven people, and 4,000 others fled their homes to seek higher ground. Much of the downtown area and all of West Dallas was flooded, and damage was estimated at more than five million dollars." Although other reports placed the flood damage at $2.5 million, the magnitude of the Trinity River flood is considered the largest ever recorded at Dallas. The Trinity River was about two miles wide between West Dallas and downtown Dallas. The entire City was completely dark for three days with no telephone, telegraph, or rail service. Oak Cliff could only be reached by boat.

The modern history of Dallas can be traced to several outstanding events, but one single event that stands out was the flood of 1908. "This "calamitous" event spurred Dallas' leaders into action to free the city from the future ravages of the river." As the growth of Dallas accelerated in the early 20th century, most of the settlement had been confined to the east bank of the Trinity River. When further development occurred larger portions of the town's population were "across the river" and the Trinity became more of a divisive rather than cohesive factor. It was Leslie Allison Stemmons' pursuit to find a solution to the flooding problems along the Trinity River for Dallas. His long lasting memory was the destructive flood of 1908.

Kessler Plan - G.B. (George Bannerman) Dealey of the *Dallas Morning News* liked the planning efforts that he witnessed in St. Louis on his visit to the World's Fair in 1904. As a result he persuaded George E. Kessler, a landscape architect that had spearheaded much of the planning work in St. Louis, to come to Dallas in 1910 to lay out ground for the State Fair of Texas. Later, he was contracted to draw up a plan for the City of Dallas in 1911, which also included a levee system to control the Trinity floodwaters. Initially, City Council did not accept some portions of the Kessler Plan. William B. Parsons, a hydraulic engineer, was subsequently retained to make an independent investigation that corroborated the Kessler Plan. World War I also contributed to lack of progress on moving ahead with the Kessler Plan. Mr. Kessler returned to Dallas in 1918 under the sponsorship of *The Dallas Morning News* to revise and improve his Trinity plan in 1919. His recommendations included changing the width of the Proposed Dallas Floodway levees near downtown Dallas from 1,200 feet wide to about 2,000 feet wide, and raising the levee height from 25 feet to 30 feet. It should be pointed out that there was pressure to keep the distance between the levees as close as reasonably possible such that future bridges to connect Oak Cliff / West Dallas to downtown Dallas could be feasibly constructed. "The Trinity River project is the biggest problem you have in Dallas," Kessler pointed out. Kessler's general list of improvements for Dallas included; levees, belt railroad, Union Station, freight terminals, Civic Center, grade crossings, street openings, parks, parkways, boulevards, and playgrounds. The plan included a recommendation that two parkways be created, a series of Boulevards established and some five additional municipal parks acquired. In general compliance with these proposals the Turtle Creek Parkway was acquired, together with White Rock and the Kidd Springs park and recreation area. The revised Kessler Plan of 1919 was subsequently reviewed by the Chicago firm of Alford and Burdick, hydraulic engineers, who reported the project was feasible.

The Original Levee Districts -- The Dallas County Levee Improvement District No. 5 was created in 1919. This levee district consisted of a 4,500-acre footprint located adjacent and upstream of the confluence of the Elm Fork and West Fork of the Trinity River. The Trinity Farm Securities Company owed about 90 percent of the land. By the mid-1920's, levees were constructed upstream of the Elm Fork and West Fork confluence to place protected land in cultivation. These levees were sufficiently high to protect against all but the largest of floods. In April 1926, the Dallas County Commissioners Court dissolved the Dallas County Levee Improvement District No. 10. In July 1926, the City and County of Dallas Levee Improvement District was created. This district became known as the Levee District and its' footprint extended from the confluence of the Elm Fork and West Fork of the Trinity River downstream to the Santa Fe Railroad (now known as the ATSF Bridge that defines the downstream end of the existing Dallas Floodway). The Levee District two largest holdings belonged to Leslie Stemmons and the Trinity Farm Securities Company. The geographical boundaries of the Levee District and the Dallas County Levee Improvement District No. 5 were mostly defined by the flood delineation limits of the 1908 flood. A Joint Plan of Reclamation for the Dallas County Levee Improvement District No. 5 and the Levee District was filed in November 1926 that provided for 7217 acres of reclamation for the Levee District and 3,336 acres of reclamation for the Dallas County Levee Improvement District No. 5. Thus, the Joint Plan of Reclamation included 10,553 acres to be reclaimed along the Trinity River that also acknowledged a reduction in footprint for the Dallas County Levee Improvement District No. 5 from its' original size of 4,500 acres.

Ulrickson Committee - In 1925, the City of Dallas appointed the Ulrickson Committee (named after the Chairman, Charles Ulrickson) to devise a more detailed extension of the Kessler Plan with respect to flood control. The committee issued its final report in 1927 recommending a flood control plan to protect approximately 10,500 acres from flooding along the Trinity River that would also include storm sewers and general utility, sewers and water works, traffic ways, and beautification. The levees would be about 13 miles long on each side of the river, 30 feet high, 9 feet higher than the 1908 flood, 156 feet wide at the base, and 6 feet wide at the crown, while having the capacity to carry two and one-half times the volume of the Trinity River flood of 1908. In addition, the Trinity River corridor from the Santa Fe Railroad to Millers Crossing (located two miles downstream where SH-310 is presently located) would be cleared of all obstructions such as trees, brush, and structures. Interior drainage would entail seven gravity flow sluiceways, four pumping plants, and five pressure sewer lines. This plan was proposed to be implemented by means of a $23.9 million bond issue. By December 1927, the report was approved and bonds were authorized by election.

Project Financing - The property owners within the Levee District sold bonds against their properties for $6.0 million in April 1928 to relocate the river and build the levees. The Dallas County Levee Improvement District #5 also sold bonds to contribute $500,000 for this joint effort. In addition, the City of Dallas and Dallas County also sold bonds for a little more than $3 million each to participate in the immediate phase of the Trinity project, while the railroads (Rock Island, and the Texas & Pacific) and utility companies dedicated about a million dollars to the Trinity project. Dallas County provided funds (less than $2 million) to construct four viaducts across the Dallas Floodway (in addition to the existing Houston Street Bridge, known then as the Oak Cliff Viaduct that was built in 1912), and one viaduct (Irving Road Viaduct) across the Elm Fork. Besides the five major viaducts, four minor crossings were also constructed along various parts of the river. Each of the four new viaducts across the Dallas Floodway were constructed with a 150-foot center span to accommodate the river channel and enough clearance for the bridge decks to be above the levees, which was about nine feet higher than the 1908 flood. The Levee District appointed a three-person Board of Supervisors, led by Leslie Stemmons, to manage the construction effort that commenced during 1928. In summary, a little more than $13 million was the immediate cost for implementing the Trinity project. More than $10 million more would be needed for infrastructure and economic development improvements behind the levees that was part of the overall $23.9 million bond issue. The Morgan

Engineering Company from Memphis, Tennessee was the consulting engineer along with additional engineering performed by Myers, Noyes & Forrest Inc.

The Construction Contractor and its Management -- The Trinity Farm Construction Company was awarded the construction contract as a private letting. This brought on much criticism due to the company's large real estate holdings in the project and lack of fair competition for a contract price. Competitive bidding was foregone because of the past experience of this construction contractor, but also for the following reason. The bonds for the levee districts could not be sold unless there was a guarantee that the project could be built for the monies that were available. The Trinity Farm Construction Company contractually agreed to complete the project within the available money regardless of any unforeseen conditions that might arise. The company secured a Surety Bond in the amount of $4.3 million with the American Surety Company of New York. The Trinity Farm Construction Company was a consortium of T.H. Harbin of Waxahachie, E.P. Harwell of Tulsa, Oklahoma and C.H. Clark of Wichita Falls. D. Kervin was the Chief Engineer. The City of Dallas played a major part in the construction, monitoring and management of the project. The City Manager kept the budget controls under strict supervision. Various players in the City including the Levee District, Park Board, School Board and the City Planning Commission donated their time and effort to the construction and success of the project.

Original Dallas Floodway Construction -- In June of 1928, ground breaking for the project took place. G.B. Dealey was the honored speaker at the groundbreaking ceremony for the project. The actual construction started on July 24, 1928. This was the second largest project in the country during its time. It was second only to the Ohio Levee Project in Dayton. The total cost of the project was estimated at $14,000,000. The project resulted in the protection of 20 districts, reclaimed 7,317 acres of land on the west and 3,333 acres on the east. It created an industrial land sector on the east side in addition to several other civic improvements. It included the relocation of utilities, streetcars, telegraph poles, oil and gas lines, water lines and sewer lines. The cost for relocation of utilities and other items was $1,500,000. "An average of 1,000 men at a time were employed on the project. Up to 15 huge dragline machines worked 24 hours a day. They moved 22 million cubic yards of dirt to relocate the river one-half mile west into the middle of the flood plain and to build up the levees." The work was completed in about 700 working days. This was accomplished by employing a base of 400 workers in the field with more added at later stages of construction.

The Dallas County funds were used to construct four viaducts across the Dallas Floodway and one viaduct (Irving Road Viaduct) across the Elm Fork in the approximate location of today's Shady Grove Road crossing. The four viaducts constructed across the Dallas Floodway were the Corinth Street Viaduct, Cadiz Street Viaduct (now the eastbound portion of I-35 Bridge; the original deck was replaced), Commerce Street Viaduct, and the Lamar-McKinney Viaduct (now known as Continental Street Bridge), all built by Dallas County by the early 1930's and coincident with the levee construction. Each of these four viaducts were constructed with a 150-foot center span to accommodate the river channel and enough clearance for the bridge decks to be above the levees, which was about nine feet higher than the 1908 flood. In addition, a street railway bridge (known as the Interurban Railway Bridge) was constructed along the same alignment that is presently occupied by the Jefferson Street Bridge that is located just downstream of the Houston Street Bridge.

The levees were designed to have 2,000 to 3,000 feet distance between the inside footings. Each levee was about 156 feet thick on average at the base, 6-foot crown, and 30 feet high. The side slopes were to slope at three to one (3:1). The channel work along the river eliminated the various twist and turns. The confluence of the river forks was moved three and one half (3 ½) miles west to the present confluence. Four pump stations were constructed; Plant A (known later as the Able Pump Station) included two pumps at 20,000

gpm capacity each and was located at the East Levee just downstream of the Houston Street Viaduct, Plant B (known later as the Baker Pump Station) included four pumps at 52,000 gpm capacity each and was located at the East Levee just upstream of today's Sylvan Avenue, Plant C (known later as the Charlie Pump Station) included two pumps at 60,000 gpm capacity each and was located at the West Levee at the Jefferson Street Viaduct, and Plant D (known later as the Delta Pump Station) included two pumps at 60,000 gpm capacity each and was located at the West Levee just upstream of the Hampton Bridge. As a side note, the terms "A", "B", "C", and "D" for the pumping plants later became "Able", "Baker", "Charlie", and "Delta", respectively, during the U.S. Army Corps of Engineers reconstruction of the Dallas Floodway levees during the 1950's. Along with each of these four pump stations, gravity sluiceways were constructed, plus one more at Eagle Ford located along the West Fork. Also, three pressure sewers; the Mill Creek Pressure Sewer (later known as the Belleview Pressure Sewer with 2,636,700 gpm capacity) located between today's IH-35 Bridge and Corinth Bridge at the East Levee, the Dallas Branch Pressure Sewer (256,731 gpm capacity) located just downstream of Continental Bridge at the East Levee, and the Coombs Creek Pressure Sewer (3,146,298 gpm capacity) located upstream of the Houston Street Bridge at the West Levee were constructed to carry interior drainage through the levees to the river. In all, 26 miles of levee was placed, about 15 miles of new river channel excavated, with an overall project cost for local interests that also included interior drainage, bridges, and utilities was about $20 million.

The levees were designed to confine a flood of about two and one half times that which occurred in 1908. The design flood (capacity of the floodway) was estimated in the late 1920's to be 500,000 cubic feet per second (cfs). The existing lakes such as Lake Worth, Eagle Mountain Lake, Lake Dallas, Mountain Creek Lake and Bridgeport Lake were all considered as a factor of safety, given their potential ability to store some floodwaters to lessen the flooding peak discharges downstream. This factor was not part of the computations that generated the design flood protection of 500,000 cfs for the levee system.

Challenges with Project Construction --- The City of Dallas was slow to meet its construction schedule for the Dallas Branch Pressure Sewer and the Mill Creek Pressure Sewer. As a result, 4,000 linear feet of the East Levee experienced about a one-year delay in construction. The levee construction could have been completed by December 1930, if the pressure sewers had been constructed on schedule. During project construction, some changes were found to be appropriate while keeping with the overall cost budget for the project. Myers, Noyes and Forrest prepared an Amended Joint Plan of Reclamation for the two levee districts that was approved by the Board of Supervisors and by the State Reclamation Engineer in December 1931. The levee side slopes on the riverside were changed from three-on-one side slopes to two and one-half-on-one side slopes. Later in the 1950's the channel side slopes were changed to 3:1. In addition, two turning basins were to be part of project construction to facilitate future navigation. One was to be located immediately downstream of the Commerce Street Viaduct, while the second was to be located upstream of the Lamar-McKinney Viaduct (now known as Continental Street Bridge). About 3 million yards of dredged earth were to be removed for these two turning basins and placed in the Hydraulic Fill Area located east of the East Levee between Turtle Creek Boulevard and Young Street. However, the two turning basins for navigation were not constructed. To save costs, the river channel excavation moved over towards the East Levee to avoid limestone and shale excavation in the Dallas Floodway from about the Cadiz Street Bridge vicinity (now IH-35) to the downstream end of the Dallas Floodway. Also due to costs, not all of the interior drainage works were constructed as planned by the Ulrickson Committee. Four pump stations were completed as planned. However, five of the seven gravity sluiceways were constructed as originally planned, and three pressure sewer systems were constructed instead of five that were originally planned. Portions of the East Levee and West Levee ran into porous material (sands and gravels) below grade that required cut-off trenches. To save costs, these trenches were filled with clay soils "in the wet", which means that the trenches were not dewatered first. In addition, the levees lacked compaction and there was no moisture control during placement. It was part of the original plan to clear trees and shrubs downstream of

the Santa Fe Railroad Bridge (now called the ATSF Railroad Trestle Bridge) to Millers Crossing (now occupied by the SH-310 Bridge) that was located about two miles downstream to maintain flood conveyance. However, this work was never done.

In February 1932, the Levee District's Board of Supervisors resigned their positions in consideration that, ". . . the district's work is as nearly complete as it is possible to perform; the unfinished portion of the work consisting only of a small gap in the east levee, together with the district's portion of the hydraulic fill storm sewer, neither of which the district can complete until such time as the city of Dallas completes its part of the drainage program as voted by the citizenship of Dallas on December 15, 1927 . . ." The small gap in the East Levee was in reference to the late completion of the Dallas Branch Pressure Sewer later in 1932.

Industrial Properties Corporation - Back in 1928, the Industrial Properties Corporation was organized to pull together real estate interests in a coordinated fashion for a 1,500-acre area adjacent to the river corridor and downtown Dallas. Leslie Stemmons was President until his death in 1939. John Stemmons immediately took leadership and by 1945, his efforts succeeded with the State legislature in creating the Dallas County Flood Control District, revamping the financial status of the Levee District, gaining agreement by the U.S. Army Corps of Engineers in rehabilitating the overall levee system (including pressure storm sewers and larger pumping plants), and gaining the position of President of Industrial Properties Corporation.

Forrest and Cotton - T. Carr Forrest was an engineer that served the Levee District and the Industrial Properties Corporation starting in 1928, which also included engineering support for the levees and flood control works. Once the Corps was authorized by Congress in 1945 (later amended by Congress in 1950) to reconstruct the Dallas Floodway levees and flood control works, Carr Forrest worked in association with the Corps on the overall design and construction phase. During this period of time, Carr Forrest was also responsible for the operation and maintenance of the overall flood control works. Congress commissioned a new U.S. Army Corps of Engineers District in Fort Worth in 1950. James Cotton, a civilian engineer with the Corps, came to the Fort Worth District to manage all of the levee rehabilitation including enlarging the levee structures, providing additional pumping plants on both sides of the levee, enlarging sumps for storage of local drainage, and constructing two major pressure sewers (Turtle Creek and Lake Cliff). By 1953, Carr Forrest persuaded James Cotton to leave the Corps and join him to create a new engineering firm called Forrest and Cotton. During the summer of 1946, Carr Forrest introduced engineer Lee Halford to John Stemmons, and started involving Mr. Halford on flood control improvements such as water mains, storm sewers, sanitary sewers, and repair work on the pump plants. Mr. Halford was strongly involved with the Corps' design and construction efforts for the overall flood control works. Mr. Halford later became President of the Industrial Properties Corporation in 1975.

Operation/Maintenance Following Original Construction --- Due to the stock market crash of 1929 combined with the depression years in the 1930's, The City and the Levee District did not have sufficient funds to operate and maintain the levee system. "So even though we had the levee system, said John Stemmons (son of Leslie Stemmons), we still had a big problem with flooding from local drainage. For many years whenever a hard rain started, my brother Storey and I got out the rain gear and headed for the Levee District. We'd go to the largest of the pumping plants and get the pumps started. I would tend the pumps and Storey would pull trash from the grates with a heavy, long handled metal rake which weighed well over fifty pounds. And we would keep it going until our crew could get there to take over." "Dad died in 1939, and he just wore himself out trying to figure out how to put the thing back in shape. He never got to see all of his dream come true. But he never quit trying, never gave up. He fought like a tiger. And I guess some of that fight rubbed off on Story and me." The April 1942 flood produced a 111,000 cubic feet per second peak discharge, which is the largest peak flow at Dallas along the Trinity River since the 1908 flood

to present. Although the levees held for the 1942 flood, John Stemmons realized that the levees were in poor shape and getting worse.

The Dallas County Flood Control District -- John Stemmons' efforts led to the State legislature (House Bill No. 736, Acts of the 49th Legislature, Chapter 355) establishing the Dallas County Flood Control District, while refinancing the existing debt of the two default levee districts; the City and County of Dallas Levee Improvement District and the Dallas County Levee Improvement District No. 5. As part of the State's provisions, $25,000 in annual State taxes collected within the boundaries of the district (assumes the boundaries of the two default levee districts) goes to the annual operation and maintenance of the flood control levees and interior drainage components located within the newly formed Dallas County Flood Control District. The State had incentive to create the Dallas County Flood Control District to protect its State resources; such as the highways, bridges, courthouse, State buildings and facilities that would be damaged with failure of the levees and flood control works. The State acknowledged this in the act language and further acknowledged that another flood like April 1942 could break the levees. The provisions also included a "sunset provision" of twenty years for the Dallas County Flood Control District, which was subsequently extended three years due to lack of significant funds made available to the district during the beginning of this 20-year period. Thus, the Dallas County Flood Control District was established to operate for 23 years until it would expire on December 30, 1968. The Dallas County Flood Control District immediately entered into an agreement with the City and County of Dallas Levee Improvement District and the Dallas County Levee Improvement District No. 5 on May 7, 1946 under which terms the two levee districts granted all rights and powers as conveyed to the District by the Legislature to operate and maintain the Dallas Floodway flood control works within their respective boundaries.

U.S. Army Corps of Engineers (Corps) and Sponsorship – As the Dallas County Flood Control District was being established, the Corps was pursued by Congress (originally authorized in 1945 by Public Law 14, 79th Congress, first session and then amended in 1950 by Public Law 516, 81st Congress, second session) to participate in reconstruction of the Dallas Floodway levees and flood control works. The Corps' Galveston District produced a study report in November 1948 to "outline the requirements for the protection of areas in these cities (Dallas and Ft. Worth) subject to floods from the Trinity River or its tributaries and consider(s) the need and justification for improvements to the interim drainage system for areas presently protected by levees in these cities. The report presents a plan of local improvement for projects which are justified at this time." The 1948 report documented the poor condition of the levees, such as the numerous levee slides, severe levee cracking, and levee subgrade issues regarding potential seepage. The report further stated that the levee height would generally contain 300,000 cubic feet per second with no freeboard. Also in November 1948, the Corps and the project sponsor, the Dallas County Flood Control District (represented by the Board of Directors Chairman John Stemmons), entered into an agreement for the Dallas County Flood Control District to participate in the project for the Dallas Floodway. During development of the 1948 report, consideration was given to an East Levee Extension that would extend 40,000 feet from the ATSF Bridge (the downstream end of the Dallas Floodway) to and around Rochester Park. However, the levee extension was dropped from the Corps' project probably due to economic considerations. Although, the Dallas County Flood Control District established to the Corps that the local interests within the old Dallas County Levee Improvement District No. 5 were not satisfied with the proposed project in terms of the approach with interior drainage. The Corps was advised by the Dallas County Flood Control District that the reconstruction project needed to adhere as close as possible to the latest version of the Joint Plan of Reclamation that was the basis to the original Dallas Floodway project completed in 1932. By State law, any such deviations must be approved by the two original levee districts. Thus, the Dallas County Flood Control District advised the Corps to follow the original plan for fear that project delays could be forced. The Dallas County Flood Control District also expressed their desire for levee trench cut-offs, given that they only have fee title to a 200-foot strip of land extending to the river from the riverside levee toe along both levees in the

Dallas Floodway. Thus, their concern was that they could not control future gravel pit mining near the levees within the floodway and that such activity could impose seepage concerns under the levees, if no cut-off trench is in place. The Corps established that the concern did not justify the need for levee cut-offs and that the original trench work done in 1932 was satisfactory. After the 1949 flood that caused major flood damages in Fort Worth, Congress commissioned a new Corps' District in Fort Worth in 1950 to carry out the levee flood control projects in Dallas, Fort Worth, and the reservoir projects such as Lake Lewisville, Grapevine Lake, and Benbrook Lake.

Corps' Reconstruction of the Dallas Floodway -- Beginning in August 1952 and extending over a period of three years, a series of six definite project reports were produced by the Fort Worth District of the Corps that represented detailed plans and specifications for components of the Dallas Floodway reconstruction. The Corps' project for the Dallas Floodway started construction in January 1953 and was completed in May 1960 at a Federal cost of $8.3 million. The Dallas County Flood Control District's contribution to this project was $1.5 million, of which, $300,000 was cash to buy-up to a Turtle Creek Pressure Sewer (from the City of Dallas) in lieu of a new pump station. It was determined by the Corps that the standard approach of a pump/sump system would have been $300,000 less cost to construct and thus, the City's preference for a pressure sewer system resulted in this cash contribution to the Corps. Included in the project construction was pump station improvements as follows; a new Able Pump Station (three pumps at 46,667 gpm capacity each) built next to original pump station, a new Pavaho Pump Station (two pumps at 60,000 gpm capacity each), and a new Hampton Pump Station (four pumps at 50,000 gpm capacity each). In addition, the Turtle Creek Pressure Sewer (1,727,880 gpm capacity) and the Lake Cliff Pressure Sewer (396,317 gpm capacity) were also constructed as part of the flood control project. In addition, the river channel was further excavated to have a 50-foot bottom width, one-on-one side slopes, and a deeper bottom elevation that was 8 feet lower. Also, the stretch of the channel from the Belleview Pressure Sewer outlet to the Cadiz Street Bridge (now IH-35) was moved to the west by 100 feet to address potential levee toe erosion due to proximity of the river channel. The overall channel excavation extended from the Forest Avenue Bridge (no longer exists) that was located about 3,000 feet downstream of the Dallas Floodway to the Hampton Bridge. The channel was designed to carry 13,000 cubic feet per second at bank full. The interior drainage outfalls were also cleaned out. The Dallas Floodway was designed to carry 226,000 cubic feet per second (identified as the Standard Project Flood) with four feet of levee freeboard. The 22.6 miles of levees were designed to keep the landside levee toe unchanged, while extending the levee crown to 16 feet and its side slopes to three on one. Thus, the Dallas Floodway was reduced in width by about 30 feet. The levee construction consisted of stripping the old levee off. The new levees were constructed by placing suitable material at 8-inch layers to be rolled with at least 6 passes of a tamper type roller.

Operation and Maintenance after the Corps' Reconstruction -- The Dallas County Flood Control District carried on with its operation and maintenance responsibilities until its "sunset provisions" expired the State agency on December 30, 1968. The City of Dallas and the City of Irving jointly entered into an agreement with the Dallas County Flood Control District on September 6, 1968 that established both cities responsibilities to carry on with the operation and maintenance responsibilities held by the Dallas County Flood Control District. Thus as the Dallas County Flood Control District expired in December 1968, the Cities of Irving and Dallas carried on with the same responsibilities for floodway and flood control works operation and maintenance for their respective city boundaries along the Elm Fork, West Fork, and mainstem of the Trinity River. The Corps continues its oversight and inspections and coordinates with both cities.

Additional Interior Drainage Capacity – In 1963, the City of Dallas upgraded two pumps (40,000 gpm capacity each) at the Delta Pump Station, and two pumps (40,000 gpm capacity each) at the Charlie Pump Station. In 1967, the City upgraded two pumps (40,000 gpm capacity each) at the small Able Pump Station, while adding one pump (2,500 gpm capacity) for the small Hampton Pump Station in 1969. The City added

a new Hampton Pump Station (next to the small Hampton Pump Station) in 1975 that included five pumps (80,000 gpm capacity each) plus one pump (6,000 gpm capacity). Also in 1975, the City added a new Baker Pump Station (next to the small Baker Pump Station) that included five pumps (80,000 gpm capacity each) plus one pump (6,000 gpm capacity). In 1979, the City added one pump (6,000 gpm capacity) to each of the following pump stations; the large Able Pump Station, the Charlie Pump Station, the Pavaho Pump Station, and the Delta Pump Station. These small pumps were added to handle the frequent small drawdowns in the sumps to limit the use of the large pumps to save operation and maintenance costs. Also by 1979, the Woodall Rodgers Pressure Sewer (753,586 gpm capacity) was constructed by the City, while the upper portion of this pressure sewer system was part of a Texas Department of Transportation project for the Woodall Rodgers Freeway. In the 1980's, six 10-feet by 10-feet box culverts were added to the new Baker Pump Station to augment gravity flow capacity. Due to reconstruction of Central Expressway in the early 1990's, an interior drainage underground storage facility (Cole Park Detention Vault, 71 million gallons capacity) was constructed under Cole Park to provide relief to Turtle Creek drainage.

Park Land Creation – The Department of City Planning and also the Parks and Recreation of Dallas submitted to the City Council a report entitled, "Parks and Open Spaces" in April, 1959. This report listed 16 recommendations for improvements to the Park system. This report traced the creation of the first parkland, and subsequent growth of the park system through bequests from individuals, estates and foundations. One of the main recommendations in the report as stated by Mr. Lynn Landrum about the idea of donating the interlevee area as parkland, "This offer was made in 1929 by the levee improvement district to the Dallas Park Board. It was proposed to turn over to that body the entire interlevee area, 3,300 acres in a tract approximately half a mile wide by ten miles long. If this should be acceptable, it was suggested to make it a city-county park, the only stipulation being that it be suitably developed for park purposes." This offer occurred as early as 1929 with the original idea of an interlevee park going all the way back to the earlier Kessler Plan. In 1965, the City of Irving challenged this idea and tried to annex the interlevee lands, extending downstream from the present corporate limits of Irving, right through the heart of Dallas to the point of the river's crossing by the Commerce Street Viaduct. This annexation attempt failed. Mr. Landrum's vision was summed up when he wrote shortly before he passed away, "It is not generally known to the people of Dallas that they have been offered in the very heart of Dallas a great central park of more than five square miles, accessible to South Dallas, Oak Cliff, West Dallas, Downtown Dallas and North Dallas. And there is not a cent to pay for title."

During the early 1970's James M. Collins, who was a U.S. Representative (1968-1983) for Dallas that heavily supported the Trinity River developments, suggested to John Stemmons that the 4,000 acres of floodway between the levees could be a great park. Congressman Collins was able to make available $2,235,187 of Federal funds (HUD) to help the City secure the properties between the levees, while the Industrial Properties Corporation donated about 933 such acres to the City. The City contributed $1,117,593 for completing the acquisitions by January 1974 as a stipulated timeframe that was part of the agreement mandated by Industrial Properties Corporation as part of their land donation.

Diminished Flood Conveyance Capacity for the Dallas Floodway -- Since 1960, two things have occurred that have reduced the Dallas Floodway's levee system to 300-year protection from its original ability to contain the Standard Project Flood (800-year event) with four feet of levee freeboard. Due to significant urbanization within the Dallas / Fort Worth metroplex during the past four decades, the quantity of flood waters produced by the Trinity River watershed upstream of Dallas has significantly increased. The Standard Project Flood discharge is now estimated at about 270,000 cubic feet per second as compared with 226,000 cubic feet per second in 1960. The second happening that has significantly reduced the Dallas Floodway's ability to contain the design flood is the growth of the Great Trinity Forest downstream of the Dallas Floodway. The trees significantly reduces the flood conveyance in the southern Trinity River

corridor, which in turn, reduces flood conveyance within the Dallas Floodway that is located just upstream. The Corps' analysis in the 1950's did not anticipate the land use changes downstream of the Dallas Floodway that have resulted in agricultural and pasture lands going out of production, while a new forest has taken hold. In subsequent years, the Corps expressed concern to the City of Dallas about controlling the growth of the trees downstream, but the City of Dallas was not able to manage this issue, in part, because the City did not own these properties. Both of these factors have about the same weighting with respect to reducing the effectiveness of the Dallas Floodway.

The Dallas Floodway Extension (DFE) Project -- The DFE Project is a Corps' flood control project targeted for the southern Trinity River corridor just downstream of the existing Dallas Floodway. Due to the Trinity floods in May 1989 (peak stage of 43.3) , May 1990 (peak stage of 47.1; about a 50-year event), and December 1991 (peak stage of 44.4), the City of Dallas gained the initiative to pursue this flood control project with the Corps. Once the DFE Project is constructed, it will do two things that will affect the Dallas Floodway. First, a Lamar Levee is part of the DFE Project that would extend from the downstream end of the East Levee of the Dallas Floodway and carry downstream to the Rochester Park Levee. As a result, the East Levee cut-off wall that is in the vicinity of the DART Bridge at the downstream end of the Dallas Floodway would no longer be utilized. This cut-off wall consists of a concrete wall and a stop log system for closing the gap for the Union Pacific Railroad and a second gap for a railroad spur. A shelter that contains the stop logs is also located next to the concrete wall. The wall also contains a notch spillway for allowing any first overtopping to occur there to preserve the levees. The second effect that the DFE Project has on the Dallas Floodway is reducing flood elevations. The DFE Project contains a component called the Chain of Wetlands that represents a secondary route for Trinity floodwaters to move through the Great Trinity Forest along the west overbank of the Trinity River from Cedar Creek to Loop 12 downstream. Thus, conveyance through the Great Trinity Forest will be improved and this will further increase conveyance within the Dallas Floodway. The DFE Project will result in the Dallas Floodway levees being able to contain the Standard Project Flood, but with no levee freeboard. The DFE Project was authorized for construction by Section 301 of the River and Harbor Act of 1965 (79 Stat. 1091) and modified by section 351 of the Water Resources Development Act of 1996 (110 Stat. 3724) and by Section 356 of the Water Resources Development Act of 1999 (Public Law 106-53). The DFE Project is expected to start construction in the Spring of 2004 and be completed by 2009.

The Upper Trinity River Feasibility Study (UTRFS) -- This Corps' study of the Dallas / Fort Worth Metroplex for the upper Trinity River basin was authorized by Congress in April 1988 (House Document No. 276, 89th Congress). The feasibility study has been ongoing since 1990 and is developing several projects for several City sponsors for eventual construction within the Metroplex. One of the projects is the Dallas Floodway project. The Corps is currently in the midst of an environmental impact statement for the Dallas Floodway that is expected to have a draft report by 2005. From a flood control perspective, two initiatives may be part of the overall Dallas Floodway project. One initiative is a levee raising the levees for the Dallas Floodway that would result in a levee freeboard of about two feet. The second initiative may be the modification of the ATSF Trestle Bridge that would remove the timber piers and the earthen embankment on the west overbank. In its place, a new pedestrian bridge would be constructed that would preserve the center span that dates back to 1926. These improvements to the ATSF Trestle Bridge would remove the flood risk of debris collecting on the timber piles and thereby creating a higher flood elevation.

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