APPENDIX L
404(b)(1) Analysis

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Draft

SECTION 404(b)(1) ANALYSIS

for the Dallas Floodway Project Environmental Impact Statement

April 2014

Table of Contents

List of Figures

List of Tables

Appendices

Acronyms and Abbreviations

ARCC	Aquatic Resources Compensation Calculator
AT&SF	Atchison, Topeka & Santa Fe
BMP	best management practice
BVP	Balanced Vision Plan
C	Construction Phase
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cfs	cubic feet per second
CWA	Clean Water Act
ECP	Erosion Control Plan
EIS	Environmental Impact Statement
ER	Engineering Regulation
EWLIDS	East and West Levee Interior Drainage Systems
FHWA	Federal Highway Administration
FRM	Flood Risk Management
HEP	Habitat Evaluation Procedure
IBI	index (or indices) of biotic integrity
IDP	Interior Drainage Plan
IDS	Interior Drainage System
IH	Interstate Highway
LEDPA	least environmentally damaging practicable alternative
M	Mitigation and Monitoring Measures
MS4	Separate Storm Sewer System
NEPA	National Environmental Policy Act
PAR	Planning Aid Report
PCBs	Polychlorinated biphenyls
PD	Planning and Design Phase
POST	Post-Construction and Operations Phase
PPCP	pharmaceuticals and personal care products
PRE	Pre-Construction Phase
SAR	stream assessment reach
SCM	Special Conservation Measure
SH	State Highway
SPF	Standard Project Flood
SWMP	Stormwater Management Plan
SWPPP	Stormwater Pollution Prevention Plan
TCEQ	Texas Commission on Environmental Quality
TDSHS	Texas Department of Health Services
TPWD	Texas Parks and Wildlife Department
TxDOT	Texas Department of Transportation
TXRAM	Texas Rapid Assessment Method
µg/L	micrograms per liter
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
WAA	wetland assessment area
WOUS	waters of the United States
WRDA	Water Resources Development Act

1.0 INTRODUCTION

This document addresses the requirements of Section 404(b)(1) of the Clean Water Act (CWA) by providing analysis of the potential environmental consequences to waters of the United States (WOUS) associated with the proposed Dallas Floodway Project developed by the City of Dallas and authorized by Section 5141 of the Water Resources Development Act (WRDA) of 2007 to incorporate the City of Dallas Balanced Vision Plan (BVP) Study and Interior Drainage System (IDS) improvements (City of Dallas 2006a, 2009a) within the Dallas Floodway Project. The proposed project includes flood risk management (FRM) elements, ecosystem restoration/habitat enhancement features, land and water-based recreation enhancement features, and interior drainage plan improvements in and adjacent to the Dallas Floodway in Dallas, Texas.

Because the action alternatives for the proposed Dallas Floodway Project would involve the discharge of dredge and fill material into WOUS, including wetlands, their analysis is required under the Section 404(b)(1) guidelines. This document provides the required analysis.

This analysis, prepared by the United States Army Corps of Engineers (USACE) Planning Branch in conjunction with the City of Dallas, is a discussion of the Dallas Floodway Project to address Section 404(b)(1) guidelines (refer to Section 1.2) as they pertain to the USACE Regulatory and Civil Works Programs. USACE, in cooperation with the City of Dallas, is preparing an Environmental Impact Statement (EIS) assessing the Dallas Floodway Project; this analysis relies on data and information presented in the EIS and incorporated here by reference.

This 404(b)(1) analysis has been developed to address both the USACE Civil Works Planning project and USACE Regulatory permit requirements due to the potential for the project to be evaluated strictly as a USACE Regulatory permit action and Rivers and Harbors Act Section 408 review. Distinctions and variations specific to each USACE program leads to differing definitions associated with common terminology. To address these distinctions, clarification of key terminology is required. The use of the term “ecosystem restoration,” or simply “restoration,” has different definitions depending on whether they are being utilized in the context of a USACE Civil Works Planning Project or an applicant trying to obtain a Section 404 permit under the USACE Regulatory Program.

In the context of Civil Works Planning, the only authority USACE has to implement an ecosystem project is through ecosystem restoration. This is because the Civil Works Planning mission is to restore previously degraded aquatic resources. Restoration in the Civil Works Planning context includes modifying degraded aquatic resources to a more natural state through functional gains to a single function or number of functions. In this context, restoration does not need to return the resources to a natural/historic condition. As an example, the Civil Works Planning requirement can achieve ecosystem restoration benefits just simply by improving a targeted function and not improving water quality or other functions to historic conditions.

At the same time, the USACE Regulatory Program defines restoration as the manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former degraded aquatic resource (33 Code of Federal Regulations [CFR] 332.2). The USACE Regulatory program also defines enhancement as the manipulation of the physical, chemical, or biological characteristics of an aquatic resource to heighten, intensify, or improve a specific aquatic resource function(s) (33 CFR 332.2). Enhancement involves targeting a specific function or functions and modifying WOUS to achieve higher functionality in those targeted categories that do not result in establishing a natural/historic condition. The distinction between restoration and enhancement is further acknowledged in the Regulatory Program Nationwide Permits, specifically Nationwide Permit 27 (Federal Register Vol. 77 No. 34).

Many actions that qualify as ecosystem restoration under USACE Civil Works Planning would be classified as enhancement for a Regulatory Program action. This is the case with the Trinity River ecosystem restoration action included as part of the Dallas Floodway Project. Therefore, this project feature has been defined as ecosystem restoration/habitat enhancement to reflect both programs. The Dallas Floodway Project Draft EIS and the Draft Feasibility Report as well as this 404(b)(1) analysis utilize the terms ecosystem restoration or restoration and should not be construed as representing the Regulatory Program definition.

1.1 Project Location

The Dallas Floodway Project is located within the Upper Trinity River watershed, along the Trinity River, near Dallas, Texas. The Upper Trinity River watershed is defined as the area extending from the source of the Trinity River to an area located near the Interstate Highway (IH) 20 Bridge, situated in the southern portion of the City of Dallas. The Upper Trinity River watershed covers approximately 6,275 square miles, and includes the majority of the Dallas-Fort Worth Metroplex.

1.2 Project Description

The Proposed Action consists of implementing proposed FRM elements, BVP Study Ecosystem and Recreation features, and Interior Drainage Plan (IDP) improvements within the Trinity River Corridor in Dallas, Texas. The projects authorized for analysis under Section 5141 of the WRDA of 2007 are those features included in the BVP Study and those recommended by the Phase I IDS Study (City of Dallas 2006a). In addition, while not included in the WRDA of 2007 authorization, the Phase II IDS Study recommendations (City of Dallas 2009a) are included as part of the Proposed Action. With approximately 495 acres of WOUS in the project area, implementation of the Proposed Action has the potential to result in the discharge of dredged and fill material into WOUS including wetlands. For regulatory purposes, the analysis in this report ensures compliance with costs, logistics, and technology; however, the analysis to determine the least environmentally damaging practicable alternative (LEDPA) is not driven by the net economic benefits.

The Proposed Action consists of the following four actions[1]:

1. *BVP Study FRM Elements* - The objective of the FRM elements is to provide cost effective riverine FRM benefits consistent with USACE national policy. The USACE has been analyzing Dallas Floodway Levees and working with the City of Dallas for several years to develop a plan for levee improvements that would provide the City of Dallas with FRM benefits. As detailed in the parallel USACE Feasibility Report, the USACE identified the 277,000 cubic feet per second (cfs) Levee Raise with the Atchison, Topeka & Santa Fe (AT&SF) Railroad Bridge modifications as being the plan with the most net economic benefits as a stand-alone alternative. In addition, the City of Dallas plans to flatten the riverside levee side slopes from 3:1 to 4:1 for maintenance purposes. Finally, the USACE has also identified non-structural actions as part of the FRM to include emergency response, public awareness/education, flood forecasting, and warning systems. Implementation of the proposed FRM elements would:

[1] Note that in the Dallas Floodway Project Draft EIS, Ecosystem Restoration and Habitat Enhancement is combined in a common action category with Recreation Enhancements. However, since the 404(b)(1) process considers impacts associated with ecosystem restoration differently from recreation enhancements, they are broken out as separate action groups in this analysis.

  - o reduce the risk to life and health, and improve the welfare of the residents in the Study Area;
  - o reduce the risk of property damage in the Study Area;
  - o reduce the risk of significant national and regional economic losses in the Study Area; and
  - o provide greater opportunities for increasing the public awareness of residual risk in the Study Area.

2. *IDP Improvements* – They consist of proposed improvements to the existing East and West Levee Interior Drainage Systems (EWLIDS). The objective of the IDP improvements is to reduce flood risk for areas served by the EWLIDS from the 100-year storm event. Implementation of the IDP would reduce flood risk for structures located within the levee-protected areas.
3. *BVP Study Ecosystem Restoration and Habitat Enhancement* – In identifying and implementing ecologically sound ways to use available water, the BVP Study Ecosystem Restoration/Habitat Enhancement features would improve ecosystem functions and diversity. The BVP Study Ecosystem Restoration/Habitat Enhancement features aim to restore and enhance aquatic and terrestrial habitats throughout the Dallas Floodway.
4. *BVP Study Recreation Enhancements* – Proposed BVP Study Recreation features would accommodate a variety of activities, including rest and relaxation in quiet nooks, large open areas for crowds, bird watching in secluded wetlands, or world-class rowing aligned with the downtown skyline. In developing the proposed mix of active, passive, urban and nature-based uses, the BVP Study Recreation features aim to increase recreational opportunities without reducing the level of riverine FRM. All of the proposed features are expected to result in an increase in public recreation use in the Floodway and adjacent areas.

The regulatory process that originates with this effort will continue throughout the life of the project. The Section 408 permit process is being initiated with conceptual designs and preliminary engineering design plans (e.g., 35% design plans, etc.) which is the best available information at this time. Due to the long project duration and for an effort of this scale and complexity, it was not prudent or warranted to develop 100% design plans for all the different project components at this time. The current review associated with the Section 408 process (construction approval letter) will allow for additional USACE review of the final construction design plans prior to initiation of construction and therefore confirms that the USACE will be able to ensure all impacts are adequately addressed. Those sections that required more detail during this stage of the process to allow compliance determinations with the 404(b)(1) requirements were currently developed.

Implementation of the Proposed Action would occur over an approximately 15-year period, subject to available funding, beginning in calendar year 2015. The regulatory permit process in this document is relying upon various levels of detail as discussed above. The outcome of this process will require detailed design and construction plan for all project features and detailed compensation, restoration, enhancement monitoring, and stormwater pollution prevention plans (SWPPPs) for construction activities prior to final authorization. This would allow for additional regulatory review to keep this project compliant with all required permits and actions.

The project would be implemented as seven discrete parts. In some instances, the implementation of one part is dependent on the completion of another, whereas others may by independent and could be implemented at any point in the schedule. Any deviation from the potential order of implementation of the seven parts identified here would be evaluated in the Section 408 and Section 404 review process to determine if the impacts to WOUS differ from those described in this analysis. The implementation parts are as follows:

- Part 1: FRM
  - This part includes all elements discussed under *BVP Study FRM Elements*, as discussed above. This part also includes excavation of the West Dallas Lake site borrow pit, as this provides the source material for the levee improvements.
  - This part must occur before any other major activity in the Floodway.
- Part 2: IDP
  - This part includes all interior drainage improvements on the protected side of the levees (i.e., not in the floodway). Pumping plant improvements addressed under other Section 408 processes—including Pavaho, Baker, and Able Pumping Plants—are not part of this action.
  - The initiation of this part does not require completion of any other part.
- Part 3: River Modification, Top Reach
  - For the purposes of this analysis, the "Top Reach" starts at the westernmost point of the Floodway and continues east to the Hampton/Inwood Bridge crossing. This part would be constructed as a two-phase effort:
    - Phase 3a: Start of project area to the Westmoreland Bridge crossing, and
    - Phase 3b: Westmoreland Bridge to the Hampton/Inwood Bridge crossing.
  - Part 3 would include the river modification within the top reach, as well as the relocation of any outfalls within the top reach area.
  - Part 3 would occur after Part 1.
- Part 4: River Modification, Middle Reach
  - For the purposes of this analysis, the "Middle Reach" starts at the Hampton/Inwood crossing of the Floodway and continues east to the Commerce Street Bridge. This part would be constructed as a two-phase effort:
    - Phase 4a: Hampton/Inwood Bridge to the Sylvan Bridge, and
    - Phase 4b: Sylvan Bridge to the Commerce Street Bridge.
  - Part 4 would include the river modification within the middle reach, as well as the relocation of any outfalls within the middle reach area.
  - Part 4 would occur after Part 3.
- Part 5: River Modification: Bottom Reach
  - For the purposes of this analysis, the "Bottom Reach" starts at the Commerce Street Bridge and continues east to the Corinth Street Bridge.
  - Part 5 would include the river modification within the bottom reach, the relocation of any outfalls within the bottom reach area, and the Corinth Wetlands.
  - Part 5 would occur after Part 4, although parts of the Corinth Wetlands may be started earlier.
- Part 6: Lakes
  - Part 6 would be divided into two subparts:
    - Part 6a would include the modification of the borrow pit into the West Dallas Lake. The modification may include grading, planting of the fringe wetland, and associated elements.
    - Part 6b would include the development of the Urban and Natural Lakes.

        - Under Alternative 2, Phase 6b would focus on modifying the borrow pits from the Trinity Parkway into the Urban and Natural Lakes.
        - Under Alternative 3, Phase 6b would include the total excavation of the Urban and Natural Lakes.
    - Part 6 would occur after Part 5. However, Part 6a could be initiated after Part 3, if it is advisable for improved construction schedule efficiency or to minimize resource impacts. Part 6b would still require Part 5 to be complete before being initiated.
- Part 7: Recreation Enhancements and Ecosystem Restoration/Habitat Enhancement
    - Part 7 includes recreational enhancements such as play fields, trails, and gathering spaces, as well as access roads, lighting, and structural support for recreation.
    - Part 7 would be divided into three subparts, consistent with the river modification phasing:
        - Part 7a: Top Reach. Part 7a could start any time after Part 3, but could not be completed before Part 6 is completed.
        - Part 7b: Middle Reach. Part 7b could start any time after Part 4, but could not be completed before Part 6 is completed.
        - Part 7c: Bottom Reach. Part 7c could start any time after Part 5, but could not be completed before Part 6 is completed.

The Proposed Action and alternatives are discussed in greater detail in the Dallas Floodway Project Draft EIS Section 2.2, and in figures in the Dallas Floodway Project Draft EIS Appendix D (Alternative 2), Appendix E (Alternative 3), and Appendix F (highlighting differences between Alternatives 2 and 3).

1.3 Project Authority

The Dallas Floodway Project Draft EIS was authorized by Section 5141 of the WRDA of 2007, which outlines authorization for the projects if the Secretary of the Army determines that the project is technically sound and environmentally feasible. The WRDA-authorized project is the BVP Study dated December 2003, revised March 2004 and the Phase I IDS Study, dated 2006. Furthermore, while not currently part of the WRDA of 2007, proposed IDS improvements identified for the West Levee IDS in the Phase II IDS Study, dated 2009, are included as part of the Proposed Action.

1.4 Section 404(b)(1) Guidelines

Projects that propose the discharge of dredge and fill material into WOUS must comply with the Section 404(b)(1) guidelines (40 CFR, Part 230) of the CWA. The Section 404(b)(1) guidelines require that positive findings of compliance must be made under 40 CFR 230.10(a-d), which requires that the alternatives analysis (including the proposed action) meet certain requirements. These requirements include compliance with other applicable statutes and establishing that the action will not cause or contribute to significant degradation of the aquatic ecosystem and that practicable and appropriate avoidance, minimization, and compensatory mitigation has and will occur.

2.0 ALTERNATIVES ANALYSIS

2.1 Introduction

Section 404(b)(1) guidelines at 40 CFR 230.10(a) require that the USACE can only permit the LEDPA. Section 40 CFR 230.10(a) states that "except as provided under Section 404(b)(2), no discharge of dredge or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences." The guidelines consider an alternative practicable "if it is available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes." Practicable alternatives under the guidelines assume that "alternatives that do not involve special aquatic sites are available, unless clearly demonstrated otherwise." The guidelines also assume that "all practicable alternatives to the proposed discharge which do not involve a discharge into a special aquatic site are presumed to have less adverse impact on the aquatic ecosystem, unless clearly demonstrated otherwise." The alternatives analysis required for Section 404(b)(1) guidelines can be conducted either as a separate analysis for Section 404 permitting or incorporated into the National Environmental Policy Act (NEPA) process. This analysis ensures the application of the guidelines for both USACE Regulatory and Civil Works Programs is in compliance relative to alternatives, impacts, and mitigation.

2.2 Basic and Overall Project Purpose

For the purpose of compliance with the 404(b)(1) guidelines, a definition of basic project purpose and overall project purpose is required. The function of these two purposes varies substantially. The definition of a basic project purpose aids in determining if an action is dependent on access to, or located within, special aquatic sites. The overall project purpose is utilized in determining the practicability of alternatives and identifying the LEDPA.

2.2.1 Basic Project Purpose

Defining the basic project purpose involves the determination of the basic essence of the proposal. The definition of the basic project purpose allows for the determination of whether an activity is water dependent or not. Because the Dallas Floodway Project involves multiple components to address differing but inter-related goals (e.g., FRM, habitat enhancement, and recreation), basic project purposes are developed for each component.

In an effort to afford additional protection to special aquatic sites, such as wetlands, as defined in subpart E of the Section 404(b)(1) guidelines, the guidelines establish two presumptions for activities which do not require access or proximity to or siting within the special aquatic site to fulfill their basic purpose (i.e., are not water dependent). USACE presumes that (1) practicable alternatives that do not involve special aquatic sites are available; and (2) such alternatives are less damaging to the aquatic ecosystem as described above in Section 2.1.

The basic purposes of flood protection and recreation (whether land-based or water-based) do not need to be within a special aquatic site for them to be fulfilled. Habitat enhancement, in this case the Trinity River and its associated wetlands, do require siting within special aquatic sites (e.g., wetlands) for the basic purpose to be fulfilled. Therefore, there is combination of non-water dependent and water-dependent actions proposed. USACE holds that if a proposed action has both water dependent and non-water dependent actions and associated purposes, the project is to be considered a non-water dependent activity (November 8, 1991 Twisted Oaks Joint Venture 404(q) Elevation). The Dallas Floodway Project is determined to be a "non-water dependent" project for the purposes of the Section 404(b)(1) guidelines and the presumptions apply. The rigorousness of the alternatives analysis for the Section 404(b)(1) guidelines has been adjusted to demonstrate whether these presumptions are overcome.

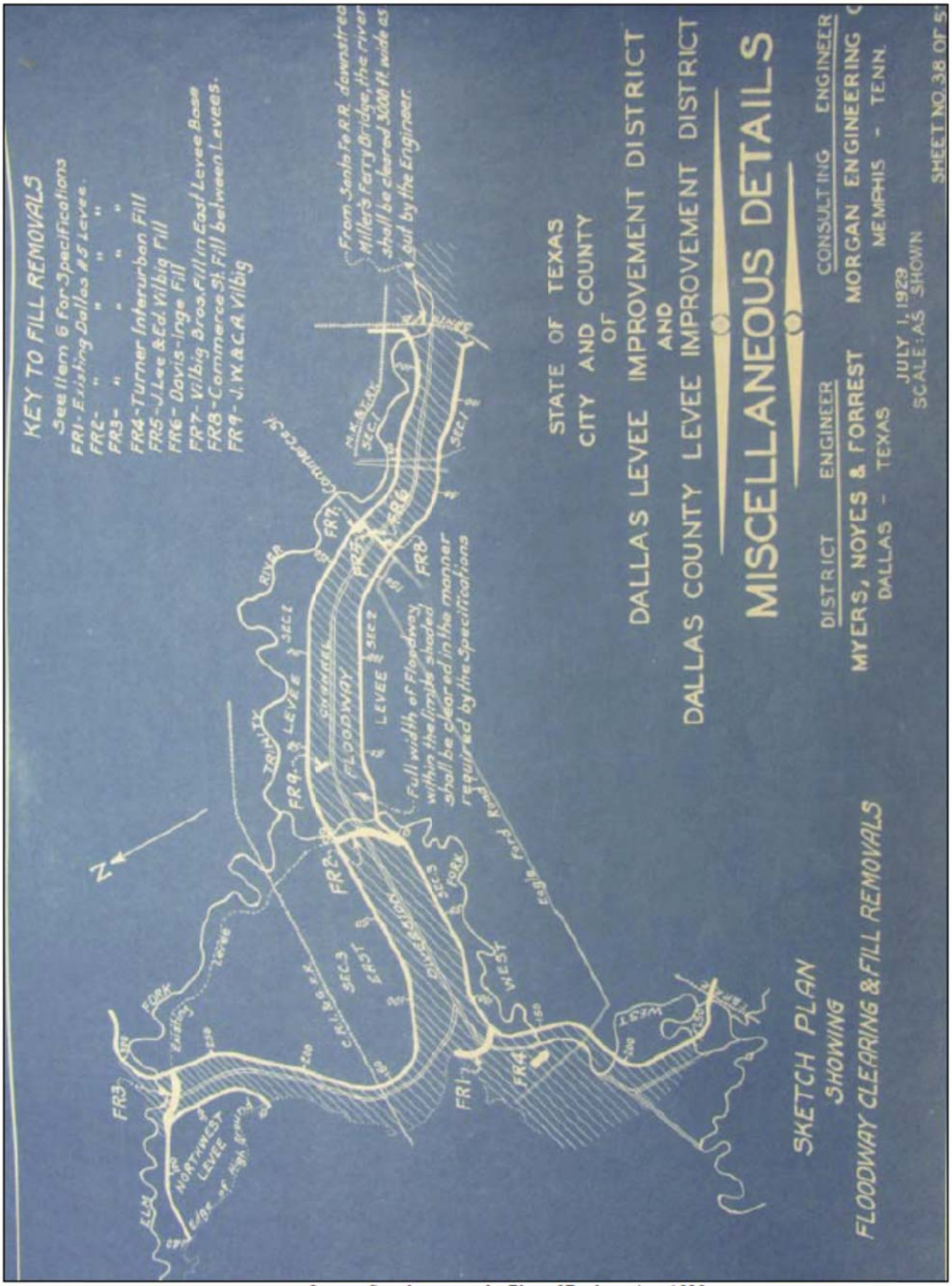
2.2.2 Overall Project Purpose

To define the overall project purpose, consideration of the need or needs of the applicant and proposal is required. The overall project purpose is used by the 404(b)(1) guidelines to determine the practicability of alternatives and is instrumental in determining the LEDPA because practicability factors must be considered in light of the overall project purpose.

There are three overall project purposes identified in the USACE Civil Works Program Dallas Floodway Project Draft EIS and supported by the City of Dallas: FRM, ecosystem restoration/habitat enhancement, and recreation. Flood events on the Trinity River have historically caused loss of lives and damage to property and structures. The Dallas Floodway currently is estimated to provide FRM benefits associated with the passage of a flood event with an approximate 1,500-year recurrence interval (estimated to be 245,000 cfs) without overtopping the East Levee. Thus, the Dallas Floodway is currently not able to contain the current Standard Project Flood (SPF) event (269,300 cfs), and such an event would overtop the levees. Current hydrologic and hydraulic models predict higher water surface profiles for the Dallas Floodway levees as compared to those modeled in 1958 due to a number of changes that have occurred since the completion of the 1958 design. Some of these changes include watershed development, land use changes, floodplain encroachments, updated design methods, and improved modeling technology. Recent local severe rainfall events have also demonstrated that improvements to both the levee system and the interior drainage system are needed to reduce the risk of flooding of interior levee developments.

In addition, urbanization, past channelization, and clearing of the Dallas Floodway has significantly degraded the natural terrestrial and aquatic habitat of the Dallas Floodway. The Trinity River now reflects little of its historic course, water quality, or habitat. The Trinity River in the vicinity of the City of Dallas, and specifically the Dallas Floodway, was originally modified to reduce the risk of flooding in the late 1920s (Figure 1). What was historically a meandering river was transformed into a straightened channel and moved approximately 3 miles to the southwest to “reclaim” developable land and provide flood risk management features. In addition, as shown in Figures 2 and 3, the wide floodplain benches and abundant riparian woodlands were filled to build commercial development. Figure 2 shows the river prior to its being relocated with the area at the bottom right-hand corner having extensive riparian woodlands adjacent to the river. Figure 3 demonstrates that while river remnants remain, very little riparian woodlands exist and what remains are hydrologically isolated from river flow. These river channel remnants now serve as sumps for interior drainage. Restoration of the river to pre-floodway conditions is not the objective of the Dallas Floodway Project, as such, a goal cannot be accommodated due to the urban development that has occurred in and around the pre-floodway river course. Instead, modification of the channel and associated wetlands is proposed to achieve some approximation of the habitat/channel connectivity that is more natural than the current condition. This would include increasing sinuosity of the river channel, adding floodplain benches, restoring riparian vegetation along those benches, and adding structure to the river channel.

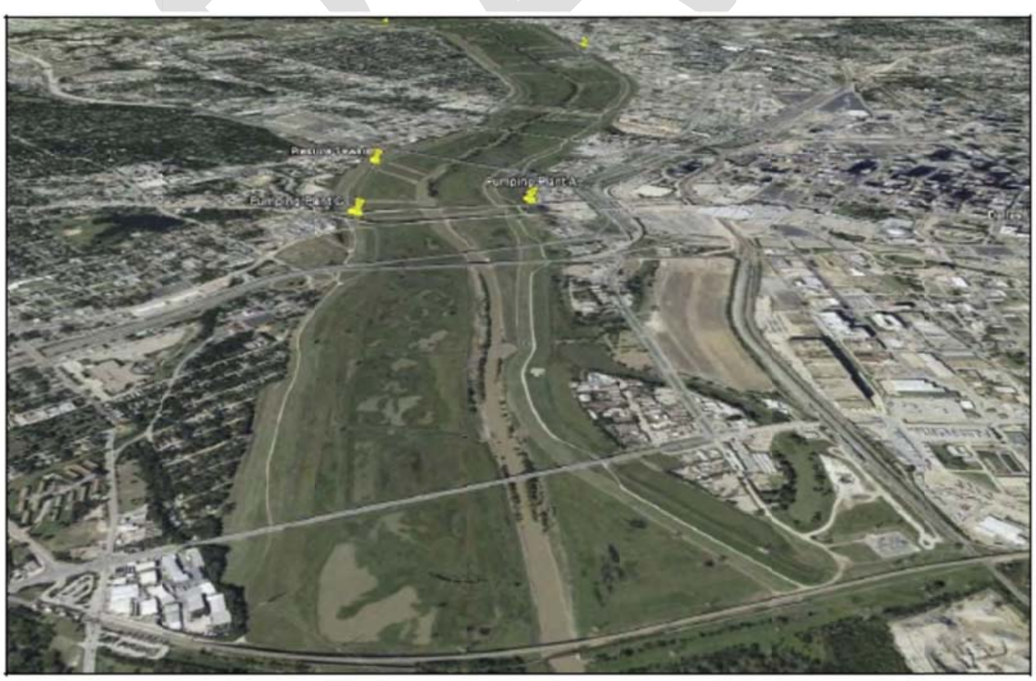
Making improvements to the existing river channel would allow connection to the upstream and downstream segments, which currently function more like the pre-floodway condition. Although fisheries can move upstream and downstream through the existing floodway, which is in part why the index of biotic integrity (IBI) scores (which strongly reflect the diversity of native fishes, as provided in an appendix to the United States Fish and Wildlife Service (USFWS) Planning Aid Report [PAR]) rated the Trinity River medium to high. However, there is not the diversity of structure and channel plan, profile, and dimensions that are present upstream and downstream of the floodway Study Area. Therefore, while it may be a conduit for travel, the river segment within the floodway is substantially degraded functioning riverine habitat.



Source: Supplement to the Plan of Reclamation, 1929

Figure 1. Dallas Floodway Original Design

Figure 2. The Dallas Floodway Under Construction in 1928



Source: Google Maps

Figure 3. Current Day Aerial of the Dallas Floodway

In addition to riparian woodlands, the historic river channel was associated with substantial oxbows that served as floodplain wetlands and provided habitat for migratory waterfowl and aquatic species. These wetlands were eliminated and converted to commercial development. However, the floodway contains several hundred acres of low to moderate quality depressional wetlands with limited connectivity to the Trinity River. These depressional wetlands contain limited vegetation diversity dominated by non-native vegetation that is frequently mowed as part of normal operations and maintenance of the floodway. A functional assessment for Regulatory Program needs (i.e., the Texas Rapid Assessment Method [TXRAM]) was applied to assess these features and generated TXRAM scores ranging from 53 to 61 for emergent wetlands in the Floodway (Halff Associates 2011). These scores reflect the poor hydrologic connectivity, limited buffers, and the topographic and vegetative simplicity and homogeneity of existing wetlands. These conditions limit the value of emergent wetlands to wildlife, as further indicated by the Habitat Evaluation Procedure (HEP) analysis in the USFWS PAR. Part of the proposed plan would be to reestablish wetlands similar in function to what previously existed adjacent to the Trinity River although extensive oxbow conditions would not be included. This would include shelving and emergent and forested wetlands adjacent to the Trinity River, improving conditions for migratory water fowl that migrate up and down the river system. If implemented as planned, the design of ecosystem restoration/enhancement features, including their spatial and hydrologic connectivity to other aquatic and wetland habitats, and their topographic and vegetative diversity, would improve wildlife habitat values, and would be verifiable through an increase in TXRAM scores. The project's monitoring program will include TXRAM evaluations of newly enhanced/restored wetlands, which is required to determine whether the postulated improvements in wetland functions are achieved.

The City of Dallas is "underserved" in terms of recreational opportunities, as the City of Dallas has a below average supply of recreation facilities and resources (Texas Parks and Wildlife Department [TPWD] 2005). This is also true of the Study Area specifically. Currently, there are approximately 23,000 acres of parkland available for public use within the Study Area. These areas include lakes, greenbelt/parkland, open space, picnic areas, sports fields, and jogging, hiking, and bike trails. There are approximately 1,500 recreational amenities located within a 30-mile radius of the Study Area (ESRI 2010; TPWD 2012). Appendix H of the Dallas Floodway Project Draft EIS discusses the current state of recreational resources within the Study Area; within the appendix, Section 1.3.5: Study Area Demographics details the lack of recreational opportunities to all Dallas residents, including minority and low income residents.

In 1999, the Outdoor Recreation Resources Review Commission (part of the National Park Service) published a comprehensive review of American recreation. This review found that recreation trends favor multiple-activity opportunities (e.g. land and water recreation) or developed and wilderness options. Access to recreation has decreased in recent times, while the demand for outdoor and recreational activity has increased. The 1999 review identified that urban regions with populations unable to invest financially in recreation are underserved. This underserved population includes the very poor; inner-city residents with little access to, or information about outdoor recreational opportunities; and people with disabilities (Cordell et al. 1999).

In 2002, the City of Dallas developed a master plan for recreation. This plan, titled *A Renaissance Plan for Dallas Parks and Recreation in the 21st Century* (the "Renaissance Plan") (City of Dallas 2002), provided a detailed inventory of recreational amenities within the City. In addition, the Renaissance Plan developed a long-range plan for future recreational amenities. The Renaissance Plan identified multiple inefficiencies in the Dallas Parks system. Specifically, the Renaissance Plan determined that the lack of programming and the deteriorating infrastructure of the parks resulted in the Dallas populace being underserved for recreational opportunities. As a result of the Renaissance Plan findings, the City of Dallas identified three areas of amenity improvement:

1. Focus on recovering the existing system and facilities
2. Expand and enhance the existing system
3. Look to the future and respond to new trends in recreational demands

The City of Dallas is a low-density city with 4.8 people per acre. In 2002, the City of Dallas had 20.73 acres of parkland per 1,000 residents, which at that time was above the national average. The City of Dallas was also above the national average for low-density cities for number of recreation centers. However, while the number of facilities was above average, the size and programming of these centers was less than the national average. The City of Dallas had fewer neighborhood parks than most low-density cities in the United States but an average number of sports fields. Dallas lacked adequate sports complexes and similar year-round facilities that also generate revenue (City of Dallas 2002).

In addition, as discussed previously and documented in the USFWS PAR HEP analysis and in the TXRAM scores of existing wetlands, urbanization, past channelization and clearing of the Dallas Floodway has significantly degraded the natural terrestrial, wetland, and aquatic habitat of the Dallas Floodway. The Trinity River now reflects little of its historic course, water quality, or habitat. The USFWS HEP analysis supports the conclusion that the project would bring about a net gain in habitat units, i.e. functionality, to wildlife; and the design of ecosystem restoration/habitat enhancement components is expected to increase connectivity, complexity, and diversity (and concomitant TXRAM scores) sufficiently to offset a net loss of wetland acreage.

The City of Dallas has expressed the desire for a “master plan” type of proposal that addresses an integration of referenced purposes. Two of the three proposed project elements, maintenance and repair of an existing FRM project and habitat enhancement, are location/site specific. The inter-relatedness of the existing habitat which is degraded due to the development and existing maintenance of the FRM system warrant a blending of these aspects in the definition of the overall project purpose. Combining these purposes into a single definition will not impact the range of alternatives to be considered. The City of Dallas also proposes land and water-based recreation to be intertwined with the ecosystem restoration/habitat enhancement and the FRM system maintenance aspects. It is reasonable to desire an integrated master plan framework. However, consideration is required to determine if such an inclusion results in an unreasonable narrowing of the definition of the overall project purpose. The City of Dallas’ recreation need is broader than being targeted in the floodway and land and water-based recreation can be accommodated at other locations. Exclusion of recreation from the overall purpose and defining it separately would require a broader range of alternatives for recreational opportunities. Even with the recreational component potentially being located elsewhere, there would still be substantial unmet recreational demands and the desire to locate recreational facilities in the project area would continue to exist. Additionally, the majority of impacts to WOUS will occur as a result of the proposed ecosystem restoration/habitat enhancement action, FRM, and IDP activities (a total of approximately 340 acres compared to less than 20 acres due to recreation). Therefore, a definition of an integrated overall project purpose that includes recreation is warranted.

For purposes of the Section 404(b)(1) guidelines analysis, the overall project purpose is: to provide FRM, habitat enhancement, and land and water-based recreational opportunities in a cohesive manner in the Dallas Floodway Project boundary.

2.3 Overview of Alternatives

The USACE and City of Dallas have developed two potential BVP Study action alternatives: one that assumes the Trinity Parkway is constructed within the Dallas Floodway (Dallas Floodway Project Draft EIS Alternative 2), and one that assumes the Trinity Parkway is not constructed within the Dallas Floodway (Dallas Floodway Project Draft EIS Alternative 3). Proposed by the Federal Highway Administration (FHWA) and the North Texas Tollway Authority/City of Dallas, the Trinity Parkway is a 9-mile long toll road that would extend from the State Highway (SH)-183/IH-35E juncture to US-175/Spur 310. Several route alternatives are currently being reviewed through the FHWA NEPA process (a separate and independent EIS); the Trinity Parkway EIS preferred alternative sites the parkway within the Dallas Floodway. For the purpose of regulatory analysis, the Trinity Parkway's preferred alternative has been incorporated into the analyses presented here relative to LEDPA determinations.

Potential future conditions in the absence of the Proposed Action (i.e., the No-Action Alternative) have been characterized under Alternative 1 in the Dallas Floodway Project Draft EIS for USACE Civil Works Program compliance. The No-Action Alternative (Alternative 1) discussion that follows addresses USACE Regulatory Program considerations under 33 CFR 325, Appendix B, and the Section 404(b)(1) guidelines.

2.3.1 Alternative 1: No-Action Alternative

The No-Action Alternative is an alternative that assumes the Proposed Action or any of the action alternatives are not implemented or an alternative is formulated that does not involve any discharges into WOUS.

2.3.2 Action Alternative Development and Description

2.3.2.1 Action Alternative Development

Due to the site-specific condition of the project purpose, off-site alternatives are not viable. Project components were evaluated to determine if they could be modified, sized, or implemented in various ways to avoid impacts to WOUS. Evaluations of each category are described below. Ultimately, balancing the need to address three aspects of the purpose while ensuring other logistical limiting factors were accommodated required trade-offs. Due to the intermediate level of design, it is not possible to complete the avoidance and minimization analysis for many project features. For example, road and trail alignments will be revised, design modifications to limit fills due to fill slope of recreational features, etc. will occur prior to commencement of work in WOUS. However, the overall project layout, general sequencing of construction, and other details have allowed for assessment of avoidance and minimization of impacts.

<u>FRM Components</u>

As detailed in the Feasibility Report and Dallas Floodway Project Draft EIS (e.g., Sections 1.3 and 2.2.1, respectively), the Dallas Floodway currently is estimated to provide FRM benefits associated with passage of a flood event with a 1,500-year recurrence interval without overtopping. This flood event is expressed as having a 0.067% AEP and has an estimated peak flow of 245,000 cfs. The current estimated peak flow for the SPF event is 269,300 cfs. The predicted future SPF peak flow is 277,000 cfs; thus, the Dallas Floodway is currently not able to contain the current or predicted future SPF event. Current hydrologic and hydraulic models predict higher water surface profiles for the Dallas Floodway levees as compared to those modeled in 1958 due to a number of changes that have occurred. Some of these changes include watershed development, land use changes, floodplain encroachments, updated design methodology, and improved modeling technology. Recent local severe rainfall events have also demonstrated that improvements are needed to reduce the risk of flooding of levee protected developments. The objective of the FRM elements is to provide cost effective river FRM benefits consistent with USACE national policy. The USACE has been analyzing Dallas Floodway Levees and working with the City of Dallas for several years to develop a plan for levee improvements that would provide the City of Dallas with additional FRM benefits. As detailed in the parallel USACE Feasibility Report (USACE 2013), the USACE identified the 277,000 cfs Levee Raise with the AT&SF Railroad Bridge modifications as being the plan with the most net economic benefits as a stand-alone alternative. For regulatory purposes, the analysis in this report ensures compliance with costs, logistics, and technology; however, the analysis to determine the LEDPA is not driven by the net economic benefits. In addition, as documented in Appendix A to the Feasibility Report, the City of Dallas plans to reduce the slope gradient of the riverside levee side slopes from 3:1 to 4:1 for several reasons, including (1) improve the efficiency and safety for levee mowing operations; (2) reduce the long term maintenance cost associated with repairing skin slides by reducing the frequency and severity of these slides that have occurred in the past; and (3) provide for easier and safer pedestrian access on the levee slopes when the floodway is used for recreation purposes.

Finally, the USACE has also identified non-structural actions as part of the FRM to include emergency response, public awareness/education, flood forecasting, and warning systems. Implementation of the proposed FRM elements would:

- reduce the risk to life and health, and improve the welfare of the residents in the Study Area;
- reduce the risk of property damage in the Study Area;
- reduce the risk of significant national and regional economic losses in the Study Area; and
- provide greater opportunities for increasing the public awareness of residual risk in the Study Area.

Deficiencies were identified with the existing levee system, many of which are location specific. Modification of the levees through flattening of slopes as well as raising their height results in increased levee footprints, which involves impacts to WOUS. Although as documented in Appendix A to the Feasibility Report, the existing slopes which are in many areas steeper than the proposed 4:1 could provide the level of protection required to achieve the project purpose, it would not achieve the City's additional goals cited above. Levee slope stability and required hydraulic conveyance through the project area as well as the site specificity of the levee deficiencies eliminate the ability to incorporate other modifications to the proposed action to further avoid impacts to WOUS.

Source materials for the FRM features will come from the same location as the proposed West Dallas Lake water recreation feature. This location selection for FRM source material is due to its appropriate soil consistency which is compatible with levee design requirements. Other locations in the project area were considered but found to contain unsuitable materials in adequate amounts. Consideration was also given to the use of off-site source materials that do not involve impacts to WOUS. However, the overarching integrated project purpose of FRM, habitat enhancement/restoration and recreation as described in Section 2.2.2 eliminates such options from being considered practicable. This is due to the West Dallas Lake assisting in accommodating the recreational need and purpose as well as providing FRM function in the upper reaches of the project corridor.

Additionally, the West Dallas Lake site may be impacted prior to the BVP actions due to soil borrow activities with the Trinity Parkway under one of the alternative scenarios. The Trinity Parkway EIS details the analysis required for the Section 404(b)(1) guidelines associated with that separate permit action. Based on the preliminary analysis in that EIS, obtaining borrow material from an off-site location is not likely to be practicable due to costs of the overall project. Therefore, soil material will likely be obtained from the West Dallas Lake area for either Trinity Parkway alternative resulting in the elimination of existing WOUS before excavation for FRM needs occurs. Therefore, excavating material as well as undertaking other construction related activities for FRM actions will not have any impacts to WOUS at the West Dallas Lake location. Consideration was also given to the effect the location and configuration the West Dallas Lake borrow area would have on the Trinity River alignment. Borrowing material from the proposed West Dallas Lake location does not dictate the relocation location of the Trinity River and its potential effects on WOUS. This is primarily driven by levee set back and hydro-geomorphic requirements.

<u>IDP Components</u>

As discussed in Section 2.2.3 of the Dallas Floodway Project Draft EIS, the IDP elements of the proposed action includes the demolition, reconstruction, and/or refurbishment of pumping plants that discharge stormwater runoff into the Dallas Floodway. The IDP improvement options and strategies were developed through an analysis of the interior drainage and compiled in Interior Levee Drainage Study East Levee – Phase I (City of Dallas 2006a) and West Levee – Phase II (City of Dallas 2009a). The design alternatives recommended in that study were based on those that would provide stormwater management for 100-year, 24-hour rain event with the least amount of disturbance to the human environment while also being the most cost effective.

The proposed IDP improvements are the same for both Alternative 2 and Alternative 3. Actions associated with improvements to IDP features have been evaluated to avoid and minimize impacts to WOUS. Currently, the combined total impact associated with the IDP elements are expect to be 0.06 acre of impact to jurisdictional WOUS resulting from construction of the Hampton Pumping Plant, and 0.27 acre of impact to jurisdictional wetlands resulting from drainage improvements at the Charlie Pumping Plant and the Hampton Pumping Plant (Tables 1 and 2).

<u>Ecosystem Restoration/Habitat Enhancement Components</u>

The Trinity River relocation is subject to existing limitations which have to be accommodated in channel design. These include physical and hydrological constraints which limit or eliminate the ability to avoid and minimize impacts to WOUS as well as influence the eventual location of the channel. It is also recognized that the post-project condition for ecosystem restoration/habitat enhancement for the Trinity River will yield higher functioning aquatic ecosystem conditions compared to the current condition based on inherent benefits. Ensuring compliance with the requirement of the 404(b)(1) guidelines that compensatory mitigation aspects not be included in this evaluation to preserve the sequencing requirement will be accomplished. The Trinity River plan, profile and dimensions will more closely approximate natural conditions compared to the current linear Trinity River condition. Maximizing sinuosity to restore the river to a pre-impact condition is not achievable because it would require levee removal as well as commercial, industrial, and residential relocations on an exorbitant scale. The existing levee system establishes lateral boundaries while upstream and downstream river alignments set tie-in limitations. Channel location in relation to the existing levee toe must be accommodated. A set back of 200 feet is required to avoid creating erosive conditions which can compromise levee integrity. Existing highway crossings and their associated piers create additional channel alignment limitations. Further constraining channel alignment is the need to adhere to hydro-geomorphological principles, ensuring that a stable channel results under varying flow conditions, as well as maintaining hydraulic neutrality in accordance with the Trinity River Record of Decision Criteria, while incorporating targeted habitat conditions and features. Extensive analysis, including independent review, associated with the channel design in relation to these specific constraints is detailed in (City of Dallas 2009b) which guided the ultimate channel plan, profile, dimension, and location. Further consideration was also given to ensure the river would not migrate into proposed water-based recreational lakes and their associated habitat enhancement features. This consideration involved balancing the various aspects of the project purpose.

Development of the relocated channel also requires construction activities adjacent to the proposed channel including, side slope grading and channel bench development. There would also be temporary construction impacts outside of the river channel associated with installing and restoring bypass channels and associated channel blocks to divert flow; temporary stockpiling; platform construction; and temporary access roads. These features also result in the modification and conversion of existing WOUS, including wetlands, within the floodway area. Avoidance and minimization are extremely limited due to the above referenced constraints while accommodating these needed construction related actions. The pre-construction condition would not be restored unless doing so would be consistent with the BVP Study.

Other ecosystem restoration/habitat enhancement features included in the proposed designs involve development of shallow open water areas, wetland shelving, hydrological control and management for target areas, and landscape plantings to increase both the species and structural diversity of wetland and river bank habitats. These habitat enhancement features contribute to the overall size of the proposed lakes and involve some impacts to WOUS.

Recreation Components

The City of Dallas originally strived to address the maximum need for water and land-based recreation for its citizens from adjacent neighborhoods as well as the greater Dallas area in the project corridor. This was based on substantial input from public involvement efforts by Dallas. Lakes were originally sized and configured in light of this goal as well as attempt to provide storage capacity for flood events. Initial designs by Dallas involved the construction of on-channel reservoirs. Those options were eliminated due to substantial impacts to wetlands and conversion of channel fisheries to flat water conditions, which lead to the development of off-channel options. Analysis associated with FRM efforts to increase flood capacity in the project reach, which was also originally a consideration in the location and design of the Urban and Natural Lakes, as well as satisfying the Trinity River Record of Decision criteria, resulted in the need to locate lakes in the lower reach of the project area. Siting lakes in the upper reaches results in greater increases in water surface profiles during various flow events, contrary to the need to minimize effects to the Record of Decision criteria. This limits the ability of locating the lakes further upstream to avoid impacts to WOUS. Locating further downstream would result in greater impacts due to higher concentrations of wetlands. The location of West Dallas Lake was previously discussed above and due to the Trinity Parkway borrow actions will result in little to no additional impacts to WOUS from activities undertaken to create a water-based recreational feature. No avoidance and minimization can occur.

Land-based recreational features such as the flex field complex, playgrounds, trails/paths, also result in impacts to WOUS while others such as pavilion, amphitheater, council rings, were able to be sited completely in upland areas. Thus, siting of recreational features is constrained by both elements that are part of the overall proposed action (i.e., the location of the lakes) and by other projects previously authorized within the floodway (i.e. the Pavaho Wetlands). These facilities were located through a “fill-in” concept to avoid the major features of the overall project. The land-based recreational feature with the greatest impact to wetlands is the play and flex field complex and associated parking areas totaling approximately 8 acres. This facility seeks to address the recreationally underserved residential population of Dallas. The proposed siting for the complex avoids major features of this project and others, and would include direct, pedestrian access to the recreational amenities from immediately adjacent communities. These communities include over 20% of the families currently housed in Dallas Housing Authority affordable housing facilities, four different schools, and a large residential community typified as lower income and with a high minority population. These communities would not have access to similar recreational facilities if they were located in other places in the floodway. The western end of the Study Area where there is little planned development and potentially lower impacts to wetlands would not be an acceptable site for the complex, as there is not an equivalent recreation need in the adjacent, non-residential communities adjacent to the east levee.

This consolidated facility requires all fields to be within reasonable proximity to each other to address tournament usage as well as overall operations and maintenance. This complex was located primarily to target underserved communities that have the greatest need and are expected to have the highest level of use. This requires a site on the west side of the river near Canada Drive. It was also sited in relation to the location of proposed lakes, habitat features such as the Pavaho wetlands, the Trinity River alignment, and other features which further limited options to avoid impacts. Access and maintenance roads will also result in the loss of approximately 4 acres of wetlands and other waters. The road alignment is also guided around proposed major water features and the new Trinity River alignment as well as being able to service “fill-in” recreational facilities. Refined adjustments can occur with this aspect.

Summary

Based on the above analysis, avoidance and minimization has been evaluated and considered with the various project purpose components. Most of the existing WOUS impacted by the project, are associated with ecosystem restoration/habitat enhancement activities. Existing constraints limit the ability to avoid many of these resources. Additional reductions would occur as detailed designs are developed for each phase or component of the project (e.g., adjustments to road and trail alignments, incorporation of more aggressive design parameters such as steeper side slopes for some fills, etc.). These will also be limited at times due to flooding conditions and the need to not create erosive conditions and address the Trinity River Record of Decision criteria.

2.3.2.2 Alternative 2: Proposed Action with the Trinity Parkway

Alternative 2 would implement the Proposed Action as described in Section 1.2 and Dallas Floodway Project Draft EIS Section 2.5.3. Under Alternative 2, the Trinity Parkway is assumed to be constructed within the Dallas Floodway. For a detailed presentation of the proposed Alternative 2 features, refer to the Dallas Floodway Project Draft EIS, Appendix D. The Trinity Parkway proposed action includes excavation of material for embankment and berm building. To maximize construction efficiency, and minimize impacts to WOUS, the City of Dallas, and the USACE would utilize the same sites used for borrow by the Trinity Parkway and convert those sites into the proposed Urban and Natural lakes. Thus, the impacts to WOUS from excavation associated with the BVP Study features would be decreased because the Trinity Parkway project borrow pits developed for use in the parkway berm would be expanded into the sites for the lakes, thereby resulting in “double-use” for the lake sites in the Dallas Floodway. The total estimated impacts to jurisdictional WOUS and wetlands under Alternative 2 are provided in Tables 1 and 2, respectively.

2.3.2.3 Alternative 3: Proposed Action without the Trinity Parkway

While the Trinity Parkway is currently a “reasonably foreseeable” project, there is a possibility that the Trinity Parkway project would not be constructed within the Dallas Floodway. Therefore, the USACE and City of Dallas have developed an alternative that would consider this potential outcome. Under Alternative 3, the Proposed Action would be implemented as described in Section 1.2, but the Trinity Parkway project would not be constructed within the Dallas Floodway. Thus, no efficiencies associated with “double-use” of the lake sites would be realized, and impacts resulting from excavation of material for FRM and lake features would be fully attributed to the Alternative 3 Proposed Action. For the reasons presented in Section 2.3.2.1, constraints on feature siting result in minimal modification of the size and location of proposed features between Alternative 2 and 3. Because Alternative 3 assumes that the Trinity Parkway is not in-place in the Dallas Floodway, certain minor BVP Study Ecosystem and Recreation features identified in Alternative 2 would be different under Alternative 3. For a detailed presentation of the proposed Alternative 3 features, refer to the Dallas Floodway Project Draft EIS, Appendix E. Under Alternative 3, there would be no change to the FRM elements or IDP improvements described under Alternative 2. The total estimated impacts to jurisdictional WOUS and wetlands under Alternative 3 are provided in Tables 3 and 4, respectively.

Table 1. Summary of Impacts to Jurisdictional WOUS under Alternative 2

Feature Category	*Trinity River (linear feet/acres)*	*Other Open Waters (acres)*	*Impact Description*
FRM Component			
Slope flattening	-	0.70	Filled along levee slopes to strengthen levees
FRM Subtotal	**-**	**0.70**	
IDP Component			
Hampton Pumping Plant	-	0.06	Filled to construct pump station and sump improvements
IDP Subtotal	**-**	**0.06**	
Ecosystem Component			
Meadow	-	0.85	Filled for open meadow areas
Planter boxes	-	0.02	Filled for landscape planter boxes
River relocation grading	38,232/134.2	16.33	Excavated to provide new river channel and banks
Urban Forest	-	4.56	Fill to construct urban forest
Wetland	-	0.02	Excavated and reengineered as part of larger wetlands
Wetland outfall	-	0.04	Filled to provide drainage outlet from wetlands
Ecosystem Subtotal	**38,232/134.2**	**21.82**	
Recreation Component			
Bench, curb, steps, wall	-	0.01	Filled to construct recreational amenities
Park road	-	0.05	Filled for road base
Primary pedestrian path	-	0.13	Filled to provide base for path
Secondary pedestrian path	-	0.04	Filled to provide base for path
Service drive	-	0.02	Filled to provide base for road
Recreation Subtotal	**-**	**0.25**	
Impact Total	**38,232/134.2**	**22.83**	
Waters Enhanced/Restored by the BVP Component			
River Relocation	39,967/209.7	2.99	
West Dallas Lake	-	122.87	
Urban Lake	-	84.19	
Natural Lake	-	49.45	
Drainage Sumps	-	3.09	
Other Open Waters	-	0.22	
Total	**39,967/209.7**	**262.81**	
Net Gain (Loss)	**1,735/75.5**	**239.98**	

Table 2. Summary of Impacts to Jurisdictional Wetlands under Alternative 2

Feature Category	*Area (acres)*	*Impact Description and Notes*
FRM Component		
Slope flattening	0.13	Filled along levee slopes to strengthen levees
Borrow pits	0.81	Excavated for material to strengthen levees
FRM Subtotal	**0.94**	
IDP Component		
Charlie Pumping Plant	0.16	Filled to construct pump station and sump improvements
Hampton Pumping Plant	0.11	Filled to construct pump station and sump improvements
IDP Subtotal	**0.27**	
Ecosystem Component		
Meadow	35.96	Filled and/or mowed and planted
Natural Lake	1.01	Excavated to construct lake
Oxbow Lake	2.01	Excavated to construct lake
Planter boxes	0.15	Filled for landscape planter boxes
River relocation grading	71.52	Excavated to provide new river channel and banks
Turf	0.14	Filled, mowed, planted, managed for recreation
Wetland	35.94	Excavated, reengineered as part of larger wetlands
Wetland outfall	0.22	Filled to provide drainage outlet from wetlands
Ecosystem Subtotal	**146.96**	
Recreation Component		
Bench, curb, steps, wall	0.30	Filled to construct recreational amenities
Equestrian trail	0.40	Filled to construct trail
Flex field	3.40	Filled to provide soccer/multi-use fields
Park road	4.01	Filled for road base
Play field	5.04	Filled, planted to provide multi-use recreational field
Playground	1.30	Filled to construct playground
Primary pedestrian path	1.66	Filled to provide base for path
Restricted access park road	0.03	Filled for road base
Restroom	0.02	Filled to construct restroom
Secondary pedestrian path	1.28	Filled to provide base for path
Service drive	0.26	Filled to provide base for road
Skate park	0.22	Filled to construct park
Urban Lake	0.15	Excavated, filled to construct lake
Whitewater Course	0.11	Excavated, filled to construct whitewater course
West Dallas Lake	0.03	Excavated to construct lake
Recreation Subtotal	**18.21**	
Impact Total	**166.37**	
Wetlands Enhanced/Restored by the BVP Component		
Stormwater Management Wetlands	46.12	Emergent wetlands along the Trinity Parkway, Flex Fields, and Pavaho Wetlands
Corinth Wetlands	83.78	Enhancement and expansion of existing emergent wetlands
Forested Ponds	9.76	Forested wetlands along the Urban Lake Promenade and the Natural Lake Headwaters
Marshlands	15.61	Fringe wetlands along West Dallas, Urban, and Natural Lakes
River Terraces	23.26	Forested wetlands along the Trinity River bank
Total	**178.53**	
Net Gain (Loss)	**12.16**	

Table 3. Summary of Impacts to Jurisdictional WOUS under Alternative 3

Feature Category	*Trinity River (linear feet/acres)*	*Other Open Waters (acres)*	*Impact Description*
FRM Component			
Slope flattening	-	1.11	Filled along levee slopes to strengthen levees
FRM Subtotal	**-**	**1.11**	
IDP Component			
Hampton Pumping Plant	-	0.06	Filled to construct pump station and sump improvements
IDP Subtotal	**-**	**0.06**	
Ecosystem Component			
Meadow	-	2.74	Filled for open meadow areas
Planter boxes	-	0.23	Filled for landscape planter boxes
Natural Lake		0.04	Excavated for Natural Lake
River relocation grading	38,232/134.2	18.42	Excavated to provide new river channel and banks
Urban Forest	-	4.57	Fill to construct urban forest
Wetland	-	0.19	Excavated and reengineered as part of larger wetlands
Ecosystem Subtotal	**38,232/134.2**	**26.19**	
Recreation Component			
Bench, curb, steps, wall	-	0.03	Filled to construct recreational amenities
Bike Path	-	0.03	Filled for path
Primary pedestrian path	-	0.16	Filled to provide base for path
Secondary pedestrian path	-	0.04	Filled to provide base for path
Service drive	-	0.21	Filled to provide base for road
Urban Lake	-	0.94	Excavated for Urban Lake
Recreation Subtotal	**-**	**1.41**	
Impact Total	**38,232/134.2**	**28.77**	
Waters Enhanced/Restored by the BVP Component			
River Relocation	39,967/209.7	2.99	
West Dallas Lake	-	122.42	
Urban Lake	-	83.82	
Natural Lake	-	50.71	
Drainage Sumps	-	3.84	
Other Open Waters	-	0.22	
Total	**39,967/209.7**	**264.00**	
Net Gain (Loss)	**1,735/75.5**	**235.23**	

Table 4. Summary of Impacts to Jurisdictional Wetlands under Alternative 3

Feature Category	*Area (acres)*	*Impact Description and Notes*
FRM Component		
Slope flattening	0.37	Filled along levee slopes to strengthen levees
Borrow pits	6.86	Excavated for material to strengthen levees
FRM Subtotal	**7.23**	
IDP Component		
Charlie Pumping Plant	0.16	Filled to construct pump station and sump improvements
Hampton Pumping Plant	0.11	Filled to construct pump station and sump improvements
IDP Subtotal	**0.27**	
Ecosystem Component		
Meadow	45.45	Filled and/or mowed and planted
Natural Lake	0.94	Excavated to construct lake
Oxbow Lake	5.91	Excavated to construct lake
Planter boxes	0.87	Filled for landscape planter boxes
River relocation grading	87.77	Excavated to provide new river channel and banks
Turf	0.14	Filled, mowed, planted, managed for recreation
Wetland	40.18	Excavated, reengineered as part of larger wetlands
Ecosystem Subtotal	**181.26**	
Recreation Component		
Bench, curb, steps, wall	0.21	Filled to construct recreational amenities
Bike Path	0.12	Filled to provide base for path
Boat Dock Car-top Boat Launch	0.02	Filled to construct boat dock and launch
Equestrian trail	0.57	Filled to construct trail
Flex field	4.81	Filled to provide soccer/multi-use fields
Park road	5.3	Filled for road base
Play field	4.39	Filled, planted to provide multi-use recreational field
Playground	1.23	Filled to construct playground
Primary pedestrian path	1.59	Filled to provide base for path
Restricted access park road	0.03	Filled for road base
Restroom	0.02	Filled to construct restroom
Secondary pedestrian path	1.33	Filled to provide base for path
Service drive	0.82	Filled to provide base for road
Skate park	0.32	Filled to construct park
Urban Lake	4.08	Excavated, filled to construct lake
Whitewater Course	0.14	Excavated, filled to construct whitewater course
West Dallas Lake	0.76	Excavated to construct lake
Recreation Subtotal	**25.74**	
Impact Total	**214.50**	
Wetlands Enhanced/Restored by the BVP Component		
Stormwater Management Wetlands	48.67	Emergent wetlands long the East Levee, Flex Fields, and Pavaho Wetlands
Corinth Wetlands	85.14	Enhancement and expansion of existing emergent wetlands
Forested Ponds	10.30	Forested wetlands along the Urban Lake Promenade and the Natural Lake Headwaters
Marshlands	15.14	Fringe wetlands along West Dallas, Urban, and Natural Lakes
River Terraces	23.21	Forested wetlands along the Trinity River bank
Total	**182.46**	
Net Gain (Loss)	**(32.04)**	

3.0 IMPACT ANALYSIS

Project impacts are evaluated with respect to the Guidelines, focusing on Subparts C-H and J. The purpose of the Guidelines is to restore and maintain the chemical, physical, and biological integrity of WOUS through the control of discharges of dredged or fill material. The discussion of each characteristic below begins with the definition and possible loss of environmental characteristics and values as provided in the corresponding section of the Guidelines.

3.1 SUBPART C: PHYSICAL AND CHEMICAL CHARACTERISTICS

3.1.1 Substrate (230.20)

The substrate of the aquatic ecosystem underlies the open waters of the United States and constitutes the surface of wetlands. It consists of organic and inorganic solid materials and includes water and other liquids or gases that fill the spaces between solid particles.

The discharge of dredged or fill material can change the physical, chemical, and biological characteristics of the substrate through a variety of mechanisms, including changes in substrate elevation and resulting changes in circulation, depth, currents, water fluctuations, and temperature; smothering immobile organisms or causing mobile animals to emigrate; changing substrate characteristics that affect recolonization; and the outright destruction of habitat.

3.1.1.1 Existing Conditions

Section 3.2 of the Dallas Floodway Project Draft EIS and the *Fluvial Geomorphic Assessment and Basis of River Realignment Design* (City of Dallas 2009b) provide information on the substrate of the Trinity River. In general, the sequence of sediments in the project area consists, from the surface down, of fill and overbank deposits, an upper clay and transitional unit, and a basal sand and gravel unit which overlies limestone and shale bedrock, some of which outcrops at the downstream end of the proposed Natural Lake (City of Dallas 2009b).

The existing Trinity River channel is relatively straight and narrow, with consistently steep banks and relatively uniform flow characteristics, in contrast to the variability of a more sinuous natural river system. The existing river channel has proven to be very stable and floodplain habitats are to a large degree isolated from the river channel. Sediment is primarily transported through the Study Area within the banks of the river channel except during floods of greater than bankfull, or about 13,000 cfs. Even during such events, however, there is relatively little deposition beyond the channel banks. Channel bank erosion and rebuilding via natural levee formation along the banks are continually occurring, with very little net migration of the channel across the floodplain.

In-channel substrate diversity consists of an undulating bed that results from the pulsed movement of sediments by high flows, and areas of exposed bedrock that control bed elevations (City of Dallas 2009b). Based on thorough sampling and mapping conducted in 2008, the channel bed within the Study Area is comprised of sandy gravel (23.3%), sand (15.9%), bedrock (13.3%), silt (13.0%), and clay hardpan (12.8%), with smaller amounts of other types, usually composites of the most common types. Detailed maps are provided in Figures 2.4-1a-f and 2.4-1j-k of the *Fluvial Geomorphic Assessment and Basis of River Realignment Design* (City of Dallas 2009b).

The substrates of emergent wetlands in the floodplain are found in depressional settings and consist primarily of deep, fine-textured Trinity Clay and Trinity/Urban land complex soils which formed in alluvium, and are frequently flooded, and poorly drained. These soils are hydric, exhibiting redoximorphic features and other indicators of prolonged saturation and anaerobic conditions during the growing season (Dallas Floodway Project Draft EIS Section 3.2; Halff Associates 2011).

In a study of the relationships between benthic macroinvertebrates and wastewater discharges into the Trinity River, benthic macroinvertebrates were collected in 1988 and again in 2005 from the substrate of the Trinity River just upstream of the project area in the West Fork, just downstream in the main stem, and at other more distant locations (Slye *et al*. 2011). In replicate samples of 6 x 6 inches (152 x 152 millimeters), 50-200 individual invertebrates were typically found, comprising 10-20 different taxa. At all sites, various species of Oligochaeta (earthworms, sludge worms) and Chironomidae (midge larvae) were the most dominant taxa. These organisms are the primary consumers of plant matter and detritus in the substrate. The study indicated an increasing diversity of invertebrates as well as water quality improvements in the river during the 1988-2005 intervals. While no sampling was conducted within the boundaries of the project Study Area, macroinvertebrate communities from all of the “metropolitan” sites up- and downstream of the project area were similar, suggesting that these results can be generalized to the area of the proposed river relocation. Not collected in the study, but of considerable interest are the native state-listed mussels that are known to exist in the river at the IH-35E crossing and are suspected to occur within the project Study Area (Dallas Floodway Project Draft EIS Section 3.5.2.1).

3.1.1.2 Alternative 1: No-Action Alternative

Under the No-Action Alternative, the topography of the area would largely go unchanged besides on-going levee maintenance, which may slightly alter levee heights. The dynamics of sediment movement within the river channel and across the floodplain wetlands would persist in the future as they currently exist. With No-Action, while the character of the substrate in any particular location can be expected to vary over time in response to episodic events, the substrate in the Study Area as a whole is expected to retain a similar range and relative abundance of sediment-substrate types and to continue along the recent trajectory of improving water quality and higher macroinvertebrate diversity.

3.1.1.3 Alternative 2: Proposed Action with the Trinity Parkway

The implementation of Alternative 2 would bring about changes in the spatial distribution of substrate types, substantially reshaping habitats within the Floodway. The impacts of the different Alternative 2 project features on jurisdictional WOUS and wetlands are summarized in Tables 1 and 2.

<u>Trinity River and Other WOUS</u>

The grading and excavation associated with the river relocation would impact 38,232 linear feet/134.2 acres of the existing Trinity River channel, eliminating a majority of the existing bank and bottom substrates of the river (refer to figures in Appendix A and Table 1). As described in Section 1.2 and shown in Table 5, the Trinity River relocation would occur in five sequential phases starting from the confluence of the Elm and West Forks in 2019 and ending at the Corinth Street Bridge in 2026. The proposed configuration of the river would result in increased channel sinuosity in the impacted area, thereby providing an additional 39,967 linear feet/209.7 acres of new channel.

The relocated river channel would be excavated within the same floodplain sediments as the existing channel; would have wider banks and a more sinuous configuration, and thus a greater surface area of bottom and bank substrate; and has been designed to “facilitate long-term development and maintenance of bed profile diversity through increased sinuosity of channel alignment.” Based on the modeling conducted for the *Fluvial Geomorphic Assessment and Basis of River Realignment Design* (City of Dallas 2009b), the proposed design is expected, over time, to successfully re-create and enhance the diversity of substrates in the river system relative to existing conditions. Sediment transport would remain predominantly within the channel, and the distribution of sediment characteristics would continue to reflect an undulating bed shaped by episodic flooding that gradually moves sediment down the river, with grain size sorting along hydraulic gradients, localized bank erosion and re-deposition, and outcrops of resistant bedrock and hardpan.

The USACE *Aquatic Resources Compensation Calculator* (ARCC) was used to perform a TXRAM functional analysis of impacts for each of the five stream assessment reaches (SARs) based on existing and predicted future TXRAM scores (refer to Appendix C for details of this analysis). The TXRAM functional analysis estimated that the design of the relocated river channel and other BVP ecosystem restoration/enhancement components (including planting of native woodland/riparian habitats) would result in an increase of TXRAM scores by 9.7 to 15.7 from existing scores (refer to Appendix C). Based on the TXRAM functional analysis, there would be no net loss of function for riverine habitat in the Trinity River under Alternative 2, with a predicted net functional gain of 6,938 linear feet.

Table 5. Summary of Impacts and TXRAM Functional Analysis for the Trinity River

SAR[1]	*Impact Year*	*Stream Segment*	*Impact to Existing (linear feet/acres)*	*Proposed Restoration (linear feet/acres)*	*Net Functional Gain/Loss (linear feet)*[2]
24-1	2019	Confluence of the Elm and West Forks to North Westmoreland Bridge	7,439/ 22.6	7,657/ 43.0	+1,263
24-2	2020	North Westmoreland Bridge to Hampton/Inwood Bridge	5,893/ 16.6	6,269/ 33.7	+1,260
24-3	2022	Hampton/Inwood Bridge to Sylvan Bridge	6,844/ 18.2	7,179/ 36.6	+1,049
24-4	2024	Sylvan Bridge to Commerce Street Bridge	7,268/ 23.7	7,558/ 38.2	+1,046
24-5	2026	Commerce Street Bridge to Corinth Street Bridge	10,788/ 53.1	11,305/ 58.2	+2,320
		Total	**38,232/ 134.2**	**39,967/ 209.7**	**+6,938**

Notes: [1] Refer to figures in Appendix A.
[2] The Net Functional Gain/Loss was calculated using the USACE *Aquatic Resource Compensation Calculator* and reflects the estimated increase in future TXRAM Scores that are based on future conditions outlined in the 35% design plans; refer to the Appendix C discussion of this analysis for details.

In addition to the Trinity River, Alternative 2 would impact the substrates of approximately 23 acres of other WOUS (i.e., primarily drainage sumps and the historic Trinity River channel) (refer to Table 1). These areas would be converted to either uplands (resulting in the complete loss of existing aquatic substrate) or other waters (resulting in modifications to the existing aquatic substrate). These impacts would be offset by the creation of approximately 263 acres of open waters (in addition to the Trinity River) for a net gain of approximately 240 acres of aquatic substrate (refer to Table 1) (*Note*: a TXRAM functional analysis equivalent to that of the Trinity River was not performed for the other WOUS because TXRAM only applies to streams and wetlands, but not other aquatic features).

<u>Jurisdictional Wetlands</u>

Alternative 2 would impact the substrates of approximately 166 acres of wetlands, with the single largest source of impacts (~72 acres) from grading and excavation to accomplish the river relocation (refer to figures in Appendix A and Table 2). Wetland restoration/enhancement represents another significant area of substrate modification (~36 acres of wetlands) (refer to Table 2 and additional discussion in Section 3.3.2.3 below). However, much of this area impacted by the river relocation and wetland restoration/enhancement would be overlapped by and incorporated into expanded areas of wetland habitat. Given habitat designs that maintain wetland hydrology in these areas and their siting in periodically flooded native soils, it is expected that the characteristics of hydric soils (e.g., redoximorphic features) similar to those documented in existing wetlands (Halff Associates 2011) would begin to develop in newly created wetland areas within 1 to 2 years following construction (Vepraskas et al. 1995). The river relocation design maintains the existing sediment carrying capacity of the river channel, such that newly constructed wetlands in the Floodway would be subject to approximately the same regime of overbank flooding and sedimentation that currently exists.

Other project features of the Ecosystem Component that would account for a significant area of substrate modification include the proposed meadows (~36 acres of wetlands) (refer to figures in Appendix A and Table 2). The proposed meadows would convert existing wetlands to upland conditions, resulting in the complete loss of wetland substrate.

Recreational elements of the BVP would impact approximately 18 acres of wetlands. The largest areas of impact are associated with fields (~8 acres), park roads (~4 acres), paths and trails (~3 acres), and playgrounds (~1.3 acre). As the proposed recreation features would convert wetlands to upland/developed conditions, these impacts would result in the complete loss of the wetland substrate. The design of these recreational features was constrained, by the Trinity Parkway, the optimization of the river relocation design, and the placement of enhanced/restored wetlands in desirable locations. Remaining areas suitable for recreational use could not lessen the impact on wetlands without being downsized or placed in locations that would diminish their use from that intended under the BVP. Final design of these recreational features would minimize potential negative effects, such as erosion by runoff or trampling from incidental recreational activity, beyond the footprints of the features to the extent practicable while retaining their intended use.

As shown in Table 2, the BVP Component under Alternative 2 would enhance or restore 178.53 acres of wetlands to offset the 166.37 acres impacted by the project, resulting in a net gain of 12.16 acres of wetland substrate. The USACE ARCC was used to perform a TXRAM functional analysis of impacts to wetlands based on existing and predicted future TXRAM scores (refer to Section 3.3.2.3 below and Appendix C for details of this analysis). The TXRAM functional analysis estimated that the design of the enhanced/restored wetlands and other BVP Ecosystem Components (including planting of native woodland/riparian habitats) would result in an overall increase of TXRAM scores (refer to Appendix C). Based on the TXRAM functional analysis, there would be a predicted net functional gain of 50.35 acres, indicating an increase in both area and quality of wetland substrate under Alternative 2.

<u>Summary</u>

Alternative 2 would result in an increase in the length/surface area of the Trinity River and the area of other WOUS and wetlands. In addition, these aquatic features would be designed to improve upon or maintain existing quality of substrates. This would result in an overall long-term improvement to aquatic substrate in the project area.

3.1.1.4 Alternative 3: Proposed Action without the Trinity Parkway

The impacts of the different Alternative 3 project features on WOUS are summarized in Tables 3 and 4. Substrate impacts would be substantially similar to those of Alternative 2 but would differ in the following respects.

- Under Alternative 3, an additional 48 acres of wetlands and 6 acres of other WOUS would be impacted. This increase in impacts would be primarily associated with the excavation of borrow areas that would already have been excavated to provide fill for the Trinity Parkway under Alternative 2. The excavated areas would subsequently be deepened to create lakes or be incorporated into the relocated river channel.
- Under Alternative 3, an additional 7 acres of wetlands and 1 acre of other WOUS would be impacted by recreational amenities that, in the absence of the Trinity Parkway, would be expanded and relocated to better serve the intended users. The activity associated with this proposed discharge to a special aquatic site (i.e., recreational features) may not be considered water dependent; however, a practicable alternative that meets this specific project need with less adverse impact is not available.

Trinity River and Other WOUS

The impacts to the aquatic substrate of the Trinity River associated with the river relocation under Alternative 3 would be same as described under Alternative 2 (Tables 3 and 1, respectively), resulting in an increase in aquatic substrate and a predicted net functional gain of 6,938 linear feet (Table 5). In addition to the Trinity River, impacts to the substrates of approximately 29 acres of other WOUS (i.e., primarily drainage sumps and the historic Trinity River channel) under Alternative 3 would be offset by the creation of 264 acres of open waters for a net gain in approximately 235 acres of aquatic substrate (refer to Table 3)

Jurisdictional Wetlands

As shown in Table 4, the BVP Component under Alternative 3 would enhance or restore 182.46 acres of wetlands to compensate the 214.50 acres impacted by the project, resulting in a net loss of 32.04 acres of wetland substrate. The USACE ARCC was used to perform a TXRAM functional analysis of impacts to wetlands based on existing and predicted future TXRAM scores (refer to Section 3.3.2.4 below and Appendix C for details of this analysis). Although there would be an overall net loss in area of wetland substrate (32.04 acres), the TXRAM functional analysis predicted there would be a net functional gain of 3.69 acres for wetlands.

Summary

Alternative 3 would result in an increase in the length/area of the Trinity River and the area of other WOUS. However, there would be a net decrease to the area of wetlands. As compared to Alternative 2, Alternative 3 would have a greater overall impact aquatic substrate with reduced benefit from compensation from enhancement/restoration under the BVP Ecosystem Component. Therefore, there would be greater detrimental impacts to substrate under Alternative 3 as compared to Alternative 2.

3.1.2 Suspended Particulate Materials/Turbidity (230.21)

Suspended particulates consist of fine-grained (silt and smaller) mineral and organic particles. They enter the water through natural processes and human activities including dredging and filling, and remain suspended for variable periods depending on agitation of the water mass and the physical and chemical properties of the sediments. The concentration of suspended sediments is indicated by turbidity. Under the Guidelines, consideration is given to the manner (timing, magnitude, and duration) in which dredge and fill activities may directly or indirectly increase sediment input to the aquatic ecosystem, and the resulting effects on properties including but not limited to light penetration, photosynthesis, and primary production; oxygen depletion and its overall effects on aquatic biota; on the physiology and behavior of fish and invertebrates; and on the aesthetic appearance of the water body.

3.1.2.1 Existing Conditions

The Trinity River has a relatively high suspended sediment concentration, estimated as 920 milligrams per liter during bankfull flows (13,000 cfs, exceeded approximately 2% of the time), resulting in a net transport of 28,000 tons/day (Dallas Floodway Project Draft EIS Section 3.3.2; City of Dallas 2009b). Suspended sediment concentrations in runoff to wetlands in the floodway presumably increase temporarily during periods of heavy rain and during rare episodes of overbank flooding, but no data are available.

3.1.2.2 Alternative 1: No-Action Alternative

Under the No-Action Alternative, concentrations of suspended sediments in the river and wetlands in the floodway would fluctuate within historic norms. Sediment would continue to be mobilized by high flows, but retained within the banks of the river channel except during rare and relatively brief episodes of overbank flooding. Wetlands in the floodway would continue to experience pulses of sediment in runoff during heavy rain and high flows.

3.1.2.3 Alternative 2: Proposed Action with the Trinity Parkway

Soils within the Study Area have low erosion factors and construction would not occur on steep slopes. Construction activities under Alternative 2 would include clearing, grading, and grubbing; demolition, earthwork; and landscaping around predominately previously disturbed areas. Whenever possible, cut soil would be used for fill on-site or at nearby projects to minimize impacts to soil. Disturbed areas would be seeded or re-sodded and then would be checked periodically to ensure that grass coverage is properly maintained and, when necessary, the site would be watered, fertilized, and reseeded or re-sodded as part of the overall BVP Study feature maintenance. These additional actions would help reduce erosion. Nevertheless, the implementation of Alternative 2 would expose large areas of unvegetated and potentially unstable soil to erosion by rainfall and river flow. The inputs of sediment from the reconstructed river channel and other BVP features would occur in pulses during high rainfall/runoff periods, and be elevated relative to baseline/No-Action conditions, with negative effects on downstream areas. For safety reasons, no construction would occur during rainfall or flood events that would have the potential for the Trinity River to rise above bankfull level.

The magnitude and duration of effects from construction would be minimized through compliance with the Texas Construction General Permit (TXR150000) and implementation of a project-specific SWPPP and associated best management practices (BMPs). The SWPPP and associated erosion control, runoff reduction, and sediment removal BMPs are intended to minimize off-site transport of sediment into WOUS. A preliminary SWPPP has been prepared for the FRM Component of the project (refer to Appendix D) and includes the following BMPs that would be implemented:

- Concrete Washout Pit – Concrete washout pits would be used to contain concrete and liquids when the chutes of concrete mixers and hoppers are rinsed out after delivery. The washout pits would be sized and located, as appropriate.
- Stabilized Construction Access – Stabilized construction access points would be located at entrance/exit locations to construction sites to reduce the tracking of mud and dirt onto public roads by construction vehicles.
- Stockpiled Material BMP – Stockpiled material would be protected by soil stabilization measures or erosion control blankets; surrounded by a temporary perimeter sediment barrier; and

located a minimum of 50 feet away from any concentrated flow of stormwater runoff, drainage course, or inlet.

- Sediment Pond and Sediment Pond Skimmer – Sediment ponds would be constructed in the borrow pits with an overflow weir or inlet if more than 5 acres is disturbed and not stabilized per Texas Commission on Environmental Quality (TCEQ) requirements. The sediment pond would be allowed to settle for 3 days after a rainfall event and then the sediment pond skimmer would be turned on until the pond is dry.
- Silt Fencing – Static Slicing Method - The silt fencing would be installed 25 feet from and parallel to the new toe of slope along the levee improvements and AT&SF Bridge removal.
- Rock Berm or Check Dam – Rock berms or check dams would be located every 200 feet and perpendicular to the silt fences.

SWPPPs and associated BMPs would be prepared for other project components (i.e., IDP, Ecosystem Restoration/Habitat Enhancement, and Recreation) with an equivalent level of detail. Standard erosion control BMPs would be utilized for most of these project components; however, these standard erosion control BMPs may be insufficient for the river modification but could be incorporated into the bypass channel design process.

Stormwater runoff from the City of Dallas would continue to be covered under the City of Dallas Stormwater Management Plan (SWMP), which is intended to ensure compliance with Section 402 of the CWA, Chapter 26 of the Texas Water Code, applicable USEPA and TCEQ regulations, and the requirements of the Phase I MS4 permit.

The BVP Study features would be designed and maintained to meet all applicable state water quality standards and additional water quality criteria, as needed, to meet the proposed uses of the features. Modification of the levee side slopes from 3:1 to 4:1 would have the benefit of reducing the frequency and severity of skin slides, thereby reducing inadvertent discharges of sediment to WOUS that affect sedimentation and water quality under existing conditions. The relocated river channel would have a more stable channel pattern with areas subject to erosion being armored or strengthened, using bioengineering approaches that incorporate native vegetation and other natural materials (City of Dallas 2009b). This would result in levels of bank erosion and suspended particulate concentrations that are approximate to, or would improve upon historic/baseline conditions. Plantings in the riparian zone would act as effective vegetative filters, reducing amounts of sediments that would otherwise flow directly into the river and downstream, resulting in reduced suspended particulate matter. The wetland features would play a role in improving overall long-term water quality by removing sediment from urban runoff, also resulting in reduced suspended particulate matter.

It is expected that the physical and biological measures implemented to stabilize soils and control sedimentation would become effective within the first year following construction, and that subsequently, suspended particulates and turbidity within the river and other water bodies, including the lakes and wetlands, would continue to fluctuate within historic norms, with long-term beneficial effects associated with a decrease in suspended sediment concentrations and turbidity.

3.1.2.4 Alternative 3: Proposed Action without the Trinity Parkway

Impacts to suspended sediment concentrations and turbidity would be substantially similar to those of Alternative 2 but would differ in the following respects.

- Under Alternative 3, an additional 48 acres of wetlands and 6 acres of other WOUS would be impacted. This increase in impacts would be primarily associated with the excavation of borrow areas that would already have been excavated to provide fill for the Trinity Parkway under Alternative 2. The excavated areas would subsequently be deepened to create lakes or be incorporated into the relocated river channel.
- Under Alternative 3, an additional 7 acres of wetlands and 1 acre of other WOUS would be impacted by recreational amenities that, in the absence of the parkway, would be expanded and relocated to better serve the intended users. As stated above in Section 3.1.1.4, the activity associated with this proposed discharge to a special aquatic site (i.e., recreational features) may not be considered water dependent; however, a practicable alternative that meets this specific project need with less adverse impact is not available.

Therefore, the detrimental impact of Alternative 3 with respect to suspended particulates/turbidity would have the potential to be initially greater than that of Alternative 2 due to the greater area of disturbance. However, the impact would still be temporary and ultimately controlled through the measures incorporated into the action.

3.1.3 Water (230.22)

Under the Guidelines, water clarity, nutrients and chemical content, physical and biological content, dissolved gas levels, pH, and temperature are all important aspects of surface water quality that contribute to its life-sustaining capabilities. The discharge of dredged or fill material can change the chemistry and physical characteristics of the receiving water through the introduction of chemical constituents in suspended or dissolved form. Changes in the clarity, color, odor, and taste of water and the addition of contaminants can reduce or eliminate the suitability of water bodies for populations of aquatic organisms and for human consumption, recreation, and aesthetics.

3.1.3.1 Existing Conditions

Existing water quality conditions are described in Section 3.4.2.3 of the Dallas Floodway Project Draft EIS. The Elm Fork and West Fork upstream of the confluence, as well as the Trinity River main stem through the project area and continuing downstream, are all classified as impaired under Sections 305(b) and 303(d) of the CWA and do not support the beneficial uses of recreation and fish consumption due to the presence of dioxin and polychlorinated biphenyls (PCBs) in edible tissue (fish).

In addition, pharmaceuticals and personal care products (PPCPs) have been detected in the Trinity River, as well as in fish tissues, as these chemicals make their way into surface waters through discharge of wastewater treatment plant effluent (Ramirez et al. 2009; USEPA 2013). Because conventional wastewater treatment technologies do not remove all pharmaceutical compounds completely and more effective advanced treatments are not commonly used, PPCPs are often detected in surface water and fish tissue. Effects from exposure can have adverse reproductive impacts to fish (i.e., abnormal reproductive development or feminization of males) (Wright-Walters and Volz. 2007; TCEQ 2010). While exposure to PPCPs has been found to have some adverse effects to aquatic life, the USEPA continues to report that consumption of low concentrations of pharmaceuticals found in drinking water does not represent human health risk (TCEQ 2010).

3.1.3.2 Alternative 1: No-Action Alternative

Under the No-Action Alternative, increased urbanization in the Upper Trinity River watershed and the potential for release of pollutants into stormwater runoff would increase. However, federal and state agencies (e.g., USEPA and TCEQ) would continue to address the effects of these pollutants on water quality and designated beneficial uses. Therefore, conditions affecting beneficial uses that are currently listed as not impaired (i.e., aquatic life use and public water supply use) or listed as "concern" (i.e., general use), are expected to remain the same or gradually improve over time. With the implementation of scheduled Total Maximum Daily Loads evaluations for bacteria and PCBs by the TCEQ, impairments to beneficial uses in the Trinity River (i.e., fish consumption use and contact recreation) would likely be reduced or eliminated over time. In addition, projects such as the City of Dallas Pavaho Wetlands could potentially help improve water quality of surface waters within the Study Area. However, PCBs and dioxins degrade slowly in the environment, and therefore the effects to the fish consumption beneficial use may be long-term.

3.1.3.3 Alternative 2: Proposed Action with the Trinity Parkway

Project construction would minimize potential impacts to surface water quality through compliance with the Texas Construction General Permit (TXR150000) and implementation of a project-specific SWPPP and associated BMPs. Stormwater runoff from the City of Dallas would continue to be covered under the City of Dallas SWMP, which is intended to ensure compliance with Section 402 of the CWA, Chapter 26 of the Texas Water Code, applicable USEPA and TCEQ regulations, and the requirements of the Phase I MS4 permit.

The use of BMPs such as silt fencing and sediment traps, the application of water sprays, and the prompt revegetation of disturbed areas would reduce potential impacts. Implementation of sediment and erosion controls during construction activities would maintain runoff water quality at levels comparable to existing conditions. A preliminary SWPPP has been prepared for the FRM components and is representative of the level of stormwater management planning that would be applied for all subsequent parts of the project. The preliminary FRM SWPPP is included in Appendix D; a similarly detailed SWPPP would be developed for other project components (i.e., IDP, Ecosystem, and Recreation), thereby complying with the USEPA's National Pollutant Discharge Elimination System (NPDES) permit for construction activities.

Furthermore, the BVP Study features would be designed and operated to meet all applicable state water quality standards and additional water quality criteria, as needed, to meet the proposed uses of the features.

<u>Lakes</u>

Water quality conditions in the lakes would vary over time as they mature and develop biological communities, seasonally as water temperature and light levels vary, and in response to episodic events such as floods that overtop the protective berms. Nitrogen and phosphorus in the lakes are significant considerations because the primary water source would have concentrations of both that are high enough to lead to the growth of undesirable algae, bacteria, and aquatic plants. Un-ionized ammonia is a nitrogen form that is also a water quality focus because of its potential toxicity to aquatic organisms. The un-ionized fraction of ammonia in water increases as pH and temperature increase. The growth of algal blooms tends to raise the pH, and algal blooms are more likely during warm weather. Therefore, the potential for toxic concentrations of un-ionized ammonia is higher during the summer months (City of Dallas 2009d).

Several internal and external sources would contribute solids that tend to accumulate in the lakes (e.g., algae, fish, and plant debris; trash; and sediment). These solids would reduce the water depth and volume of the lakes and can potentially release nutrients and other constituents back to the water column under certain conditions (City of Dallas 2009d).

Dissolved oxygen in the lakes is expected to remain below saturation levels between October and April, but as phytoplankton productivity increases, dissolved oxygen would rise above saturation and exhibit wider diurnal fluctuations. Low dissolved oxygen concentrations can kill fish in the lakes, and the absence of oxygen at the bottom of a lake can cause phosphorus that has accumulated in the sediments to be released to the water column. Subsequent algal blooms can negatively affect the public perception of a lake when they become dense enough to turn the water green. In addition, some species of blue-green algae produce odors and toxins that can affect animals, including humans, which come into contact with the toxins (City of Dallas 2009d).

Predicted chlorophyll *a* concentrations in both lakes show minimum values during the cooler months and maximum values during the phytoplankton-growing season, generally May through September. Daily maximum chlorophyll *a* values would exceed 30 micrograms per liter (µg/L) during part of the year, but the mean of the daily maximum concentrations is 13 µg/L. The seasonal mean chlorophyll *a* value would be approximately 11 µg/L. Chlorophyll *a* concentrations would increase as distance from the inflow structure increases because of the additional time for algal growth. Therefore, concentrations would be higher in Urban Lake than in Natural Lake. The daily maximum results for the Urban Lake would approach 60 µg/L on an annual basis, and the seasonal mean chlorophyll *a* concentration would be 28 µg/L (City of Dallas 2009d).

Water in both lakes would generally be clear outside of the phytoplankton-growing season, with visibility extending several feet below the surface. However, water clarity would decrease as chlorophyll *a* levels increase and the water would likely have a noticeable green tint in the summer months. Deep green coloration and floating algal mats are possible during extended periods of hot, calm weather during summer (City of Dallas 2009d).

Flood events on the Trinity River would spill into the lakes approximately every two years on average. Trinity River floodwaters have been observed to carry relatively high levels of bacteria and sediments. Water quality would continue to be influenced by floodwaters after the river levels recede until the effluent inflow flushes the lakes. The gravity drains in the lakes would provide a tool that can be used to minimize the duration of flood effects (City of Dallas 2009d). Following flood events, Natural Lake and Urban Lake may be opened as necessary to drain the lakes and minimize the deposition of sediment within the lakes (City of Dallas 2009c).

Bacterial levels would be low from the source water to the lakes because the Central Wastewater Treatment Plant effluent is chlorinated and de-chlorinated before it would be discharged to the lakes. However, wildlife would likely introduce bacteria to the lakes, creating the potential for exceedances of the primary contact criteria for coliforms and *E. coli*. The Trinity River flood events will also introduce bacteria into the lakes. It would be necessary to sample the lakes for coliform bacteria and *E. coli* as part of the routine water quality monitoring. Based on sampling results, it may be necessary to close the lakes to water contact activities temporarily while indirect methods are implemented to bring bacteria concentrations back into compliance (City of Dallas 2009d).

The Natural Lake, Urban Lake, and West Dallas Lake would be designed and operated to meet all applicable state water quality standards and additional water quality criteria, as needed, to meet the proposed uses of the lakes (City of Dallas 2009c). The Dallas Central Wastewater Treatment Plant effluent discharges to Natural Lake and Urban Lake would be treated and disinfected in compliance with state and federal regulations and would be suitable for primary contact recreation purposes. The planted riparian edges, floating wetlands, solar-powered aerators, and aeration water walls would be used to further improve and maintain the water quality within the lakes. The floating wetland plant communities selected for use would promote aquatic life and maximize nutrient absorption, especially nitrogen and phosphorus. The Urban Lake would be prone to algal blooms due to its more remote location from the incoming treated water source. Various natural or low-energy methods would be utilized in Urban Lake as mitigation against algal blooms and other impurities (e.g., aeration jets embedded in lakes, aeration water wells, and perched biofiltration wetlands). A special lake aeration feature would be installed along the eastern pylons of the IH-30 Bridge to enhance water flows and prevent stagnation. In addition to the above measures, floating wetlands, and aerators, water treated chemically within the park would be the method of last resort (City of Dallas 2009c).

Within West Dallas Lake, proposed rowing lanes would be defined by 20-foot-wide intermittent bands of floating wetlands that would also provide a nutrient-absorbing function. Other water quality improvement methods within the lake would consist of edge marshlands; "solar bees," which are floating and photovoltaic-powered aeration devices; and chemical applications. Chemical applications (e.g., copper sulfate) would be selected and implemented so as not to be a detriment to the health and vitality of edge marshlands and floating wetlands (City of Dallas 2009c).

Water quality modeling that has been performed to date indicates that, without management, there would likely be periods throughout the year when conditions in the lakes may exceed the water quality goals and would not support the desired uses. The Urban and Natural lakes would mature over time and these conditions cannot be accurately modeled at a conceptual level, and therefore may require future operational adjustments to address their effects. Conditions in the lakes would also be subject to external factors that cannot be easily controlled such as: water quality conditions in the Trinity River at flood stages, impacts of wildlife and park visitors, and changes to the treatment processes at the Dallas Water Utility's Central Wastewater Treatment Plant (City of Dallas 2009d).

To address the uncertainties in future water quality concerns, Adaptive Management (AM), which is an interactive strategy developed for the management and conservation of natural resources, would integrate design, management and monitoring to test assumptions, learn from observed responses to management actions, and modify management strategies accordingly. The AM concept involves an initial assessment of the system and its uncertainties; design of a management plan; design and implementation of a monitoring program to test its effectiveness and evaluate uncertainties; evaluation of observed outcomes versus expected results; and modification of the management plan. AM is especially well suited for Natural Lake and Urban Lake and would be applied to adapt to changes in water quality over time (City of Dallas 2009d).

River Modification

The relocated river channel would have a more stable channel pattern with areas subject to erosion being armored or strengthened, using bioengineering approaches that incorporate native vegetation and other natural materials (City of Dallas 2009b). This would result in minimal bank erosion and would not substantially contribute to suspended sediment concentrations. The proposed ecosystem restoration/habitat enhancement associated with the river modification (and other BVP Study features) would diminish the negative water quality impact of stormwater flows through reestablishment of native riparian vegetation along banks and river terraces. Plantings in the riparian zone would act as effective vegetative filters, reducing amounts of nutrients, sediment, and other contaminants that would otherwise flow directly into the river and downstream, resulting in the improved water quality over existing conditions and a long-term beneficial impact to water quality.

Wetlands

The wetland features that would occur on the river benches, in the floodplain, and along the lake margins would play a role in improving overall long-term water quality by removing nitrogen, phosphorus, sediment, and other pollutants from urban runoff.

Athletic Facilities and General Features

The turf and paved areas associated with the athletic facilities and general elements would be graded to drain into bioswales and wetlands that can receive and filter contaminants, and ultimately drain the stormwater. The proposed boating activities would not degrade water quality below existing conditions or affect designated uses. Invasive species (e.g. Johnson grass) and other noxious weed species would be controlled biologically and manually. If chemical control is required, herbicides approved for aquatic environments would be used. No artificial chemicals or fertilizers to accelerate plant growth or to control weeds would be permitted within the watershed of the Natural Lake (City of Dallas 2009c).

Interior Drainage Outfall Modifications

Stormwater runoff entering the Floodway from the interior drainage outfall modifications would continue to be covered under the City of Dallas SWMP (City of Dallas 2012).

3.1.3.4 Alternative 3: Proposed Action without the Trinity Parkway

Impacts to water quality would be substantially similar to those of Alternative 2 but would differ in the following respects.

- Under Alternative 3, an additional 48 acres of wetlands and 6 acres of other WOUS would be impacted. This increase in impacts would be primarily associated with the excavation of borrow areas that would already have been excavated to provide fill for the Trinity Parkway under Alternative 2. The excavated areas would subsequently be deepened to create lakes or be incorporated into the relocated river channel.
- Under Alternative 3, an additional 7 acres of wetlands and 1 acre of other WOUS would be impacted by recreational amenities that, in the absence of the parkway, would be expanded and relocated to better serve the intended users.

Therefore, the detrimental impact of Alternative 3 with respect to water quality would be initially greater than that of Alternative 2 due to the greater area of disturbance. However, the impact would still be temporary and ultimately controlled through the measures incorporated into the action.

3.1.4 Current Patterns and Water Circulation (230.23)

Current patterns and water circulation are the physical movements of water in the aquatic ecosystem. Currents and circulation respond to natural forces as modified by basin shape and cover, physical and chemical characteristics of water strata, and energy dissipating factors. The discharge of dredged or fill material can obstruct flow or change its direction and velocity, affecting erosion and deposition rates; the mixing of dissolved and suspended components of the water; water stratification; and the location, structure, and dynamics of aquatic communities.

3.1.4.1 Existing Conditions

Current patterns and circulation in the project area are discussed under Hydrology and Hydraulics in Section 3.3 of the Dallas Floodway Project Draft EIS. Whereas floodway hydrology is the focus of Appendix A (*Hydrology and Hydraulics*) of the Feasibility Report, the *Fluvial Geomorphic Assessment* *and Basis of River Realignment Design* (City of Dallas 2009b) is the primary source of information on currents and circulation as they relate to the aquatic ecosystem.

The relatively straight geometry of the existing river channel results in unidirectional circulation of varying depth and flow rates but without significant backwaters, meanders, or variety of channel form and dimensions. There are no significant tributaries entering the main stem of the river. The consistent, gradual grade of the Floodway and limited extent of bedrock result in relatively uniform flow through the project area. The relative homogeneity of the river channel is in contrast to the sinuosity, and presumably the variety of microhabitats, that it displayed prior to construction of the Floodway. Since construction of the Floodway, the channel has been remarkably stable, showing little net migration across the floodplain (City of Dallas 2009b).

3.1.4.2 Alternative 1: No-Action Alternative

Under the No-Action Alternative, some cumulative projects by others would be located in the Floodway and require some modifications to the Floodway, and therefore have the potential to affect (or alter) current patterns and water circulation through changes to the fluvial geomorphology of the Trinity River. However, these projects would result in minimal, if any, modifications to the bankfull channel, which has remained relatively stable for the past 70 years (refer to Section 3.3.2.6 of the Dallas Floodway Project Draft EIS). Current patterns and circulation would remain within their historic norms.

3.1.4.3 Alternative 2: Proposed Action with the Trinity Parkway

Construction of the relocated river channel would alter currents and circulation through the project area. Bypass channels would be constructed to maintain flows around construction sites, but the areas of the river left behind and subject to filling and excavation would experience an immediate loss of functions and values. However, the lengthening through increased sinuosity of the river channel would result in a decrease in the average current velocity, and with the greater diversity of substrates and microhabitats, the retention, uptake, and/or decomposition of nutrients and organic debris along the river would increase. The river channel relocation portion of the BVP Study would result in the most substantial change to the Trinity River channel in many decades. The existing channel appears to have remained relatively stable since the USACE reconstruction of the channel in the 1950s. The BVP Study features proposes physical changes to the channel and Floodway including restoration of channel meanders, creation of a mid-channel island, alterations to channel geometry, and construction of three lakes in the Floodway adjacent to the channel. These features would better approximate a natural condition than the straightened river channel that currently exists. The final design would incorporate Avoidance and Minimization measures identified in the *Fluvial Geomorphic Assessment and Basis of River Realignment Design* (City of Dallas 2009b) and listed in Section 3.6. Therefore, the river channel relocation would improve current flow patterns and water circulation within the Trinity River, as compared to existing conditions.

Treated effluent pumped from the Dallas Central Wastewater Treatment Plant would enter Natural Lake and Urban Lake and flow in an east to west direction, which is counter to the flow direction of the Trinity River. However, once this flow from the Urban Lake discharges into the Trinity River channel, flow patterns and circulation in the Trinity River would be as described above.

3.1.4.4 Alternative 3: Proposed Action without the Trinity Parkway

Impacts to current flow patterns and water circulation under Alternative 3 would be substantially similar to those of Alternative 2 because the design and construction of the relocated river channel and other BVP features would be essentially the same. The river channel relocation would improve current flow patterns and water circulation within the Trinity River, as compared to existing conditions.

3.1.5 Normal Water Fluctuations (230.24)

Normal water fluctuations in a natural aquatic system consist of daily, seasonal, and annual tidal and flood fluctuations in water level. Biological and physical components of such a system are either attuned to or characterized by these periodic water fluctuations. Discharges of dredged or fill material can alter the normal water-level fluctuations, resulting in prolonged periods of inundation, exaggerated extremes of high and low water, or a static, non-fluctuating water level. Such modifications can affect the physical characteristics of the system in numerous ways and can alter or destroy ecological communities, induce populations of nuisance organisms, modify habitat, reduce food supplies, restrict movement of aquatic fauna, destroy spawning areas, and change adjacent upstream and downstream areas.

3.1.5.1 Existing Conditions

Section 3.3 of the Dallas Floodway Project Draft EIS, along with Appendix A of the Feasibility Report and the *Fluvial Geomorphic Assessment and Basis of River Realignment Design* (City of Dallas 2009b) provide the basic information on the hydrograph of the Trinity River. Stage-discharge relationships in the Trinity River reflect the urbanization of the watershed, which results in rapid runoff response. River stage increases approximately 40 feet between flows of 200 cfs and 80,000 cfs. The average long-term daily flow of the river, however, is approximately 1,700 cfs as measured just downstream of Commerce Street. Flow is less than 13,000 cfs (i.e., the approximate bankfull channel capacity) approximately 97% of the time. Floods exceeding this threshold occur on an approximately annual basis and, depending on their actual magnitude, result in inundation of the floodway and the lakes and wetlands that border the river channel. Flow is less than 514 cfs, which is close to the "base flow" of 500 cfs used in the BVP, approximately 50% of the time. The incidence of flooding in the Trinity River is strongly controlled by the storage capacity and operating procedures of reservoirs in the watershed. Because of the reservoirs and the spread of precipitation in the watershed throughout the year, Trinity River flow is only moderately seasonal, being somewhat higher during the spring when the largest precipitation events tend to occur (City of Dallas 2009b).

3.1.5.2 Alternative 1: No-Action Alternative

Under the No-Action Alternative, there would be no major changes to the floodplain geometry and water fluctuations would continue to be primarily influenced by the hydrology of the Upper Trinity River watershed.

3.1.5.3 Alternative 2: Proposed Action with the Trinity Parkway

Section 4.3 of the Dallas Floodway Project Draft EIS, along with Appendix A to the Feasibility Study and the *Fluvial Geomorphic Assessment and Basis of River Realignment Design* (City of Dallas 2009b) contain the information about modifications in river morphology and the water fluctuations that would occur under Alternative 2.

The modification of the river channel from the existing straightened stream to a more natural meandering stream would require excavation of a new channel and eventual diversion of the water from the old channel into the new channel. During construction of the relocated river channel, flows upstream and downstream of construction areas would be maintained through bypass channels, and water levels would continue to fluctuate normally based on inflows from the watershed and upstream reservoir operations. BMPs implemented in conjunction with the proposed FRM, ecological restoration/enhancement, and IDP improvements would minimize the effects of these developments on runoff quantity and quality to the river. As construction proceeds, normal hydrology would be eliminated within the segments undergoing construction, impacting areas that would range in size from approximately 350 to 1,000 acres (refer to Dallas Floodway Project Draft EIS, Section 2.3.1). Conditions in these segments undergoing construction would be inhospitable to most of the organisms that inhabit the Trinity River. Sedentary organisms and some fish would not be expected to survive, although some of the fish and other vertebrates and mobile invertebrates may migrate to suitable habitat nearby. The successful implementation of an Aquatic Resource Recovery, Relocation, and Monitoring Plan (refer to Section 3.2.1.2 below) would reduce the immediate impact on mussel populations and facilitate their colonization of the relocated river channel.

When completed, the relocated river channel would have a more stable channel pattern with areas subject to erosion being armored or strengthened, using bioengineering approaches that incorporate native vegetation and other natural materials. The timing and quantity of stormwater runoff entering the floodway from the IDP portion of the project would not substantially change from existing conditions, with pumping being shut off prior to the peak hydrograph from the Upper Trinity Watershed reaching the Floodway. Overall, the project would result in no long-term changes to water fluctuations, which would continue to be primarily influenced by the hydrology of the Upper Trinity River watershed. The ecological communities that currently inhabit the river are expected to begin repopulating each newly connected segment of the river during the first year following the completion of construction as the relocation progresses.

3.1.5.4 Alternative 3: Proposed Action without the Trinity Parkway

Impacts to water fluctuations under Alternative 3 would be substantially similar to those of Alternative 2 because the design and construction of the relocated river channel and other BVP features would be essentially the same. Overall, Alternative 3 would result in no long-term changes to water fluctuations, which would continue to be primarily influenced by the hydrology of the Upper Trinity River watershed. The ecological communities that currently inhabit the river are expected to begin repopulating each newly connected segment of the river during the first year following the completion of construction as the relocation progresses. As such, there is not a substantial difference between Alternative 2 and Alternative 3 in terms of water fluctuations

3.1.6 Salinity Gradients (230.25)

Salinity gradients form where salt water from the ocean meets and mixes with fresh water from the land. This characteristic does not occur in the project area.

3.2 Subpart D: Biological Characteristics

3.2.1 Threatened and Endangered Species (230.30)

An endangered species is one that is in danger of extinction throughout all or a significant portion of its range, whereas a threatened species is one that is in danger of becoming endangered in the foreseeable future. Possible effects of the discharge of dredged or fill material include covering or otherwise directly killing individuals; the impairment or destruction of habitat and the resources (food, shelter, etc.) it provides; and facilitating incompatible activities.

3.2.1.1 Existing Conditions

Federal- and state-listed threatened and endangered species that potentially occur in Dallas County are discussed in Section 3.5.2 of the Dallas Floodway Project Draft EIS. There are 10 listed birds in Dallas County - 5 are federally listed, 3 are federally delisted but state-listed, and all 10 are state-listed. There is one federal bird candidate species. There are no federal or state-listed mammals in Dallas County. There are three state-threatened mollusks and three state-listed reptiles in Dallas County (TPWD 2013).

No federally listed species are likely residents in the project area; however, there is suitable habitat for special status species within the area. There is also potential for some special status bird species to transit the project area, using the grassland, forest, wetland, and river habitats for resting and feeding during migration. Three state threatened species of reptiles have the potential to occur in the project area. State-listed mussels are likely to occur in the Confluence and Mainstem Groups.

3.2.1.2 Alternative 1: No-Action Alternative

No impacts to threatened and endangered species would occur under the No-Action Alternative.

3.2.1.3 Alternative 2: Proposed Action with the Trinity Parkway

Per Section 4.5 of the Dallas Floodway Project Draft EIS, since no federally listed species occur, no impacts to federally listed species are anticipated; the USFWS has concurred with this finding

Existing mussel beds that may include state-listed threatened or endangered species are likely to be eliminated. Such impacts would be reduced through the implementation of Special Conservation Measures (SCMs). Specifically, an Aquatic Resource Recovery, Relocation, and Monitoring Plan would be developed and implemented in coordination with TPWD and the USFWS. Proposed elements of that plan would include but would not necessarily be limited to:

1) To conduct a survey to determine the location(s) of mussel beds and their association with environmental factors within the project area;
2) To determine which if any state-listed threatened and endangered species of mussels are present;
3) Based on the survey results, if mussels are present, to ensure that some habitat features (depth, substrate, flow conditions) that are conducive to the persistence of mussel beds are incorporated into the final design for the river relocation;
4) If mussel beds are present in areas subject to dredge and fill, to collect them prior to impact, and translocate them either to a suitable location in the river where they would be expected to survive, or to a temporary holding location pending the construction of suitable habitat in the river; and
5) To conduct monitoring, or support surveys and monitoring by others, to better understand the status and trends of mussel beds and their constituent species in the river ecosystem, as well as gaining valuable data regarding relocation strategies.

The increase in the overall length of the river, and in the heterogeneity of substrate, depth, and current flow conditions in the relocated river channel are expected to help maintain, and would likely enhance mussel habitat and mussel populations in the river.

3.2.1.4 Alternative 3: Proposed Action without the Trinity Parkway

Impacts to threatened and endangered species under Alternative 3 would be substantially similar to those of Alternative 2. Differences in the impacts to aquatic features (refer to Section 3.1.1.4) would impinge peripherally, if at all, on the river channel, and their designs, with BMPs minimizing any impact to the substrates and hydrology of the river. Impacts to existing mussel beds that may include state-listed threatened or endangered species would be reduced through the implementation of SCMs, as described for Alternative 2. As such, there is no substantial difference between Alternative 2 and Alternative 3 in terms of threatened and endangered species.

3.2.2 Fish, Crustaceans, Mollusks, and Other Aquatic Organisms in the Food Web (230.31)

As defined in 40 CFR 230.31, aquatic organisms in the food web include, but are not limited to, finfish, crustaceans, mollusks, insects, annelids, planktonic organisms, and the plants and animals they feed and depend on to thrive. Releases of contaminants through discharge of dredged or fill material can adversely affect adults, juveniles, larvae or eggs. Suspended particulates can bury eggs, preventing receipt of oxygenated water. They can also cause debilitation or death to less mobile organisms by smothering and/or direct exposure to chemical contaminants contained within the dredged materials.

3.2.2.1 Existing Conditions

As discussed in Section 3.1.1.1 and in Slye et al. 2011, the dominant taxa of benthic macroinvertebrates occurring in the substrates of the Trinity River are various species of earth worms, sludge worms and midge larvae, of which these organisms are the primary consumers of plant matter and detritus in the substrate and are therefore consumed by larger invertebrates and juvenile fish.

At least 16 species of mussels are known to occur in Lewisville Lake and the Elm Fork of the Trinity River and are likely to occur in suitable habitat (i.e., rivers with mixed mud, sand, and fine gravel in protected areas [see Table 3.5-5 of the Dallas Floodway Project Draft EIS]) in the Elm and West Forks, in the Confluence, and in the main stem of the Trinity River. The state-listed Texas pigtoe (*Fusconaia askewi*) mussel occurs within the Trinity River as documented in 2011-2012 (see Dallas Floodway Project Draft EIS Section 3.5) and the state-listed Louisiana pigtoe (*Pluerobema riddellii*) and Texas Heelsplitter (*Potamilus amphichaenus*) could potentially occur within the Study Area due to either habitat or historical presence.

Approximately 66 species of fish occur within the aquatic areas of the Dallas-Fort Worth Metroplex (see Dallas Floodway Project Draft EIS, Section 3.5). Fish surveys were conducted in 1987-1988 and again in 2004 in four reaches of the Trinity River; Reach 1 (between Sylvan Avenue and Corinth Street) and Reach 2 (upstream from Sylvan Avenue to the confluence) were within the project construction area, whereas Reaches 3 and 4 were upstream in the Elm Fork and West Fork, respectively. The surveys resulted in the collection of 34 species. Bullhead minnow (*Pimephales vigilax*) represented 32% of the total number of fish collected, followed by gizzard shad (*Dorosoma cepedianum*) (25%), red shiner (*Cyprinella lutrensis*) (9%), smallmouth buffalo (*Ictiobus bubalus*) (6%), bluegill (*Lepomis macrochirus*) (4%), and inland silverside (*Menidia beryllina*) (4%) (USFWS 2004). Data from the fish surveys were used to calculate an index of IBI according to both state-regional and Trinity Basin-specific metrics, as well as a fish community degradation index.

Results of the state regional IBI assessments demonstrated high aquatic life values for Reaches 2 and 3, intermediate values for Reaches 1 and 4, and high value for the overall Study Area. The basin-specific aquatic life use value for Reach 1 was intermediate to high, values for Reaches 2 and 4 were high, and the fish community in Reach 3, as well as for the overall Study Area, was scored high to exceptional. Comparing the more recent survey to earlier surveys, IBI scores remained either high or increased. Fish community degradation was determined to be moderate in Reach 1, but low in the other reaches, and low overall (USFWS 2004).

In addition to a fish community assessment within the Study Area, 25 of the fish collected were retained for chemical analyses. Results of the analyses showed detectable amounts of organochlorine contaminants, as well as PCBs and polychlorinated dibenzofurans and dibeno-p-dioxins at levels above the Texas Department of State Health Services (TDSHS) health assessment guidelines (USFWS 2004). Therefore, consumption of fish from the Trinity River is not advised as it may pose a threat to human health (TDSHS 2010a, 2010b).

3.2.2.2 Alternative 1: No-Action Alternative

The distribution of fish and other aquatic species under the No-Action Alternative would be similar to the distribution of aquatic species as described under existing conditions. Common fish and invertebrates would continue to utilize the aquatic riverine, emergent wetland, and open water habitats.

As described in Sections 3.1.2.2 and 3.1.3.2, sediment movement and concentration of suspended sediments in the river and wetlands would continue to fluctuate within historic norms with wetlands continuing to experience pulses of sediment runoff during heavy rain and extreme high flows. Changes to aquatic species occurrence and health would not be expected under the No-Action Alternative and therefore no increased risk to aquatic organisms in the food web.

3.2.2.3 Alternative 2: Proposed Action with the Trinity Parkway

Under the guidelines, the focus is on the manner in which discharge of dredged or fill material can affect the overall productivity and nutrient export capability of the ecosystem. More specifically, discharge of dredged or fill material can possibly redirect, delay, or stop the reproduction and feeding movements of some species of fish and crustaceans, thus preventing their aggregation in accustomed places such as spawning and nursery grounds and potentially leading to reduced populations. Further, reduction of lower trophic level producers (i.e., detrital species) can impact the flow of energy from primary consumers to higher trophic levels (40 CFR 230.31b).

As detailed in Section 4.5.3.2 of the Dallas Floodway Project Draft EIS, implementation of the BVP Study features under Alternative 2 would result in temporary negative impacts to aquatic species during construction within the main stem river. Fish, mussels, and other aquatic species are likely to experience mortality during the relocation of the Trinity River. However, as stated in Sections 3.1.1.3, 3.1.2.3, and 3.1.3.3, long-term beneficial impacts would result with the completion of river modification. These beneficial impacts include (1) general modification design that would facilitate long-term development and maintenance of bed profile through increased sinuosity of channel alignment; (2) enhancing the diversity of substrates in the river system; and (3) diminishing the negative water quality impact of stormwater flows through reestablishment of native riparian vegetation along banks and river terraces. Plantings in the riparian zone would act as effective vegetative filters, reducing amounts of nutrients, sediment, and other contaminants that would otherwise flow directly into the river and downstream, resulting in the improved water quality over existing conditions and a long-term beneficial impact to water quality. All of these beneficial impacts would likely improve detrital and macroinvertebrate production and availability for higher trophic consumers.

Mussel beds are known to occur in the Trinity River in the Horseshoe project area and in the Elm Fork and are likely to occur in other areas of the biological resources region of influence. As stated in 40 CFR 230.31, mollusks (i.e., mussels) are particularly sensitive to the discharge of material during periods of reproduction and growth and development due to their limited mobility. Reduced mollusk populations can result by way of delayed reproduction or reduced food availability from the discharge of dredged or fill material. In addition, suspension of contaminated sediments (i.e., organochlorines) during excavation can potentially contaminate mollusks or fish making them unsafe for human consumption. In order to reduce risk to existing state-listed mussel populations, an Aquatic Resource Recovery, Relocation, and Monitoring Plan would be developed and implemented to enumerate and characterize mussel beds and other sensitive aquatic resources, to ensure that these resources are preserved and/or restored, such that there would be no net loss (TPWD 2013). This plan would be required to be developed and submitted as part of the Section 408 application package before an authorization to initiate construction would be issued.

Following construction, there would be a net beneficial impact to shallow-water habitats under the implementation of the BVP Study Ecosystem features. Specifically, open water habitat would increase by 75.5 acres in the Trinity River and by 240 acres for other open waters with the creation of Urban Lake, West Dallas Lake, and Natural Lake (Table 1).

A fish consumption advisory is currently in effect for portions of the Trinity River due to elevated organochlorine levels. However, these contaminants have been determined to be legacy contaminants that have not been commercially distributed in the United States for over 15 years (USFWS 2004). As discussed in Section 3.1.3.1, the presence of PPCPs in surface waters due to effluent discharges from wastewater treatment plants continues to be researched (USGS 2002; Ramirez et al. 2009). Fish collected from Trinity River were found to contain traces of PPCPs in the tissues and livers (Ramirez et al. 2009; USEPA 2013). Effects from exposure can have adverse reproductive impacts to fish (i.e., abnormal reproductive development or feminization of males) (Wright-Walters and Volz 2007; TCEQ 2010). The source water for both the Natural Lake and Urban Lake would be treated effluent pumped from the Dallas Central Wastewater Treatment Plant, with approximately 60 MGD passing through the two lakes. The source of water for West Dallas Lake would be from groundwater, rainwater, and supplemented water from Trinity River. Given the potential of PPCPs likely to flow into the lakes via wastewater treatment plant effluent and via supplements from the Trinity River in the case of West Dallas Lake, fish stocked in these lakes and fish in the Trinity River would continue to be exposed to PPCPs. However, with implementation of conservation measures associated with long-term maintenance of water quality in the proposed lakes (see Section 3.1.3.3), a cleaner overall environment would result for fish and potential safer consumption of fish collected from these lakes in the future.

3.2.2.4 Alternative 3: Proposed Action without the Trinity Parkway

Impacts to fish, crustaceans, mollusks, and other aquatic organisms in the food web under Alternative 3 would be similar to those of Alternative 2. There would be the same increase in open water habitat of 75.5 acres in the Trinity River, but slightly less of an increase in open water habitat (235 acres) for other open waters with the creation of Urban Lake, West Dallas Lake, and Natural Lake (Table 3), as compared to Alternative 2.

There would also be an additional 48 acres of wetlands and 6 acres of other WOUS impacted due to the Ecosystem Component and an additional 7 acres of wetlands and 1 acre of other WOUS due to the Recreational Component under Alternative 3. Therefore, temporary impacts to aquatic organisms in the food web would be at a potentially greater risk of sediment disturbance and turbidity in association with dredged and fill material discharge. However, impacts would be temporary, incorporating conservation measures, and would still ultimately result in a long-term net benefit by way of increased shallow water habitats under Alternative 3.

3.2.3 Other Wildlife (230.32)

Wildlife associated with aquatic ecosystems includes resident and transient mammals, birds, reptiles, and amphibians. The discharge of dredged or fill material can cause changes in water levels, flow and circulation, salinity, chemical content, substrate characteristics and elevation, increased turbidity or contaminants, potentially resulting in the loss or change of breeding and nesting areas, escape cover, travel corridors, and preferred food sources; and in conditions that may favor the introduction of undesirable plant and animal species, disrupt the normal functions of the ecosystem, and lead to reductions in overall biological productivity.

3.2.3.1 Existing Conditions

Existing conditions for other wildlife are described in Section 3.5.2 of the Dallas Floodway Project Draft EIS. The habitats on which wildlife depend have been mapped and their values quantified in the Dallas Floodway Project Draft EIS as well as the USFWS PAR (USFWS 2014) (Feasibility Report Appendix G). The HEP analysis conducted by USFWS for the project used Habitat Suitability Index (HSI) models for several wildlife species in the grassland, urban, open water, aquatic riverine, emergent wetland, and bottomland hardwood habitats.

Habitats used in the HEP analysis that are associated with the aquatic ecosystem include aquatic riverine, emergent wetland, open water, and bottomland hardwoods (Figure 3.5-2 and Tables 3.5-1 and 3.5-2 of the Dallas Floodway Project Draft EIS) (*Note*: these categories are based on habitat types and may overlap with but do not necessarily correspond to areas of jurisdictional WOUS and wetlands; refer to Appendix A and Tables 1 and 2 for jurisdictional WOUS and wetlands). The wildlife species of these habitats range from aquatic and wetland habitat specialists whose survival is directly tied to the condition of those habitats; to species that are partially dependent on and make incidental use of aquatic and wetland resources; to species that primarily occur in uplands but will opportunistically use aquatic and wetland habitats and so benefit from the ecosystem processes that maintain and revitalize these habitats. Wildlife of the grassland and urban habitats, which are by far the most common habitats in the region of influence, especially in the main stem, are less dependent on or influenced by the aquatic ecosystem.

The USFWS PAR HSI values for water-dependent species that inhabit emergent wetlands and bottomland hardwoods, as represented by the wood duck and American coot, are very low, especially in the main stem. As modeled under the No-Project scenario, these values would change relatively little over the next 50 years.

3.2.3.2 Alternative 1: No-Action Alternative

The distribution, abundance, and diversity of other wildlife under the No-Action Alternative would remain largely as they are under existing conditions.

3.2.3.3 Alternative 2: Proposed Action with the Trinity Parkway

Under Alternative 2, during the construction of the levee raise, AT&SF Railroad Bridge modifications, and levee flattening, terrestrial wildlife would temporarily be impacted in the Mainstem and Confluence Group areas. Most of the species utilizing the mowed grasslands are common, opportunistic species. Most, if not all species would recolonize the area after construction. Minimal impacts to other aquatic species are expected, as most construction would avoid aquatic areas. Furthermore, identified BMPs and SCMs would minimize potential construction-related indirect impacts to aquatic areas.

Implementation of the IDP improvements would disturb or displace wildlife from the areas of construction and immediately surrounding areas. These activities could cause mortality to individuals of the smaller, less mobile and burrowing species, whereas mobile species would disperse to surrounding areas. Individuals dispersing away from the activity would likely experience increased risks of predation, reduced foraging or reproductive success, and energetic costs. The overall impact on wildlife populations would be relatively small, proportional to the relatively small areas of habitat affected. In areas temporarily impacted, wildlife species would recolonize available habitat area after construction. No long-term impacts to wildlife populations are likely. Due to the low quality of the habitat surrounding the majority of Study Area and the small area of impact, the impacts to wildlife, including migratory birds, would be minor.

The impacts to other wildlife under Alternative 2 from continued mowing of wetlands would be similar to the impacts from the current mowing regime. Common birds, amphibians, reptiles, and mammals adapted to human disturbance would continue to use the terrestrial habitat.

The implementation of the BVP Study Ecosystem and Recreation features would temporarily impact other wildlife in the main stem during construction. As with the IDP, these activities could cause mortality to individuals of the smaller, less mobile and burrowing species, whereas mobile species would disperse to surrounding areas. Individuals dispersing away from the activity would likely experience increased risks of predation, reduced foraging or reproductive success, and energetic costs. Most mammals and birds would be displaced but would likely colonize adjacent habitat. The impact to low-mobility and dispersed wildlife would be substantially greater than that observed in the IDP relative to the substantially larger area of disturbance. Once the BVP Study Ecosystem and Recreation features are established, open water, aquatic riverine, and emergent wetlands are expected to provide high quality habitat for mussels, amphibians, and other aquatic species, and foraging habitat for birds, reptiles, and mammals.

A TXRAM functional analysis was performed for impacts to the Trinity River and jurisdictional emergent wetlands (refer to Sections 3.1.1.3 and 3.3.2.3 and Appendix C). The TXRAM functional analysis estimated that the design of the relocated river channel and other BVP ecosystem restoration/enhancement components (including planting of native woodland/riparian habitats) would result in an increase of TXRAM scores for the relocated river and enhanced/restored wetlands (refer to Appendix C). Based on the TXRAM functional analysis, there would be no net loss of function for riverine habitat in the Trinity River, with a predicted net functional gain of 6,938 linear feet, and there would be a predicted net functional gain of 50.35 acres of wetlands, indicating an increase in area and quality of habitat for other wildlife under Alternative 2.

The USFWS PAR HEP analysis likewise supports improvements in habitat quality under Alternative 2. Jurisdictional emergent wetlands improve within the Study Area from an existing value of 60.54 habitat units to 119.81 habitat units under Alternative 2 (cumulative conditions at year 50).

3.2.3.4 Alternative 3: Proposed Action without the Trinity Parkway

As detailed in Section 4.5.4 of the Dallas Floodway Project Draft EIS, the impacts of Alternative 3 to terrestrial wildlife (compare Tables 4.5-6 and 4.5-7 with 4.5-11 and 4.5-12) would be similar to those of Alternative 2, except that Alternative 3 assumes that the Trinity Parkway would not be constructed before the BVP Study features. Accordingly, because partial excavation of lakes for the Trinity Parkway and the development of roads, paths, and trails would not occur prior to the BVP Study features, the excavation requirements of Alternative 3 would be substantially higher than those associated with Alternative 2, resulting in greater construction-related impacts to biological resources as compared to Alternative 2. Overall, there would be a greater loss of grassland habitat and greater increase in urban area with Alternative 3.

A TXRAM functional analysis was performed for impacts to the Trinity River and jurisdictional emergent wetlands (refer to Sections 3.1.1.4 and 3.3.2.4 and Appendix C). The TXRAM functional analysis estimated that the design of the relocated river channel and other BVP ecosystem restoration/enhancement components (including planting of native woodland/riparian habitats) would result in an increase of TXRAM scores for the relocated river and enhanced/restored wetlands (refer to Appendix C). Based on the TXRAM functional analysis, there would be no net loss of function for riverine habitat in the Trinity River, with a predicted net functional gain of 6,938 linear feet, and there would be a predicted net functional gain of 3.69 acres of wetlands, indicating an increase in area and quality of habitat for other wildlife under Alternative 3. As compared to Alternative 2, Alternative 3 would have less beneficial gain to habitats associated with jurisdictional WOUS and wetlands.

Conclusions of the USFWS PAR HEP analysis are essentially the same for Alternative 3 as Alternative 2, namely that there would be substantial gains in HSIs for water-dependent species (wood duck and American coot) in the bottomland hardwood and emergent wetland habitats. The increase in HSIs coupled with increased acreage results in a large increase in the overall habitat units of bottomland hardwoods.

Jurisdictional emergent wetlands improve within the Study Area from an existing value of 60.54 habitat units to 122.11 habitat units under Alternative 3 (cumulative conditions at year 50).

3.3 SUBPART E: SPECIAL AQUATIC SITES

Special aquatic sites are geographic areas, large or small, possessing special ecological characteristics of productivity, habitat, wildlife protection, or other important and easily disrupted ecological values. These areas are generally recognized as significantly influencing or positively contributing to the general overall environmental health or vitality of the entire ecosystem of a region (40 CFR 230.3(q-1)).

3.3.1 Sanctuaries and Refuges (230.40)

No areas considered sanctuaries or refuges would be impacted by the project alternatives as no sanctuaries or refuges are located in the Study Area.

3.3.2 Wetlands (230.41)

Wetlands consist of areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. The discharge of dredged or fill material in wetlands is likely to damage or destroy habitat and adversely affect the biological productivity of wetlands ecosystems by smothering, dewatering, permanently flooding, or altering substrate elevation or the periodicity of water movement, resulting in a variety of secondary effects on wetland biota and the functions and values that wetlands provide, including but not limited to habitat, flood protection, and water quality.

3.3.2.1 Existing Conditions

Existing jurisdictional wetlands are shown in Figure 3.4.2 and described in Sections 3.4.2.1 of the Dallas Floodway Project Draft EIS. Based on the approved jurisdictional determination (Halff Associates 2011), which is valid until March 24, 2016, there are approximately 309 acres of jurisdictional wetlands in the Dallas Floodway Project Study Area. Of these, 7 acres are categorized as forested wetlands (dominated by woody vegetation) and 302 acres are categorized as emergent wetlands (dominated by herbaceous plants) and comprise almost 150 discrete features that occur in low-lying, seasonally flooded areas between the tops of the river banks and the levees (Halff Associates 2011; Dallas Floodway Project Draft EIS, Figure 3.4-2).

Wetlands in the Floodway are primarily disconnected from the river and associated bottomland hardwoods, and are surrounded by grassland. They typically dry out during the summer (Halff Associates 2011) and are subject to frequent mowing along with the adjacent grasslands. The wetlands of the project area nonetheless provide seasonally valuable wildlife habitat for shore- and water birds, and contribute to floodwater storage and pollutant filtration in the river ecosystem.

A TXRAM assessment was used to evaluate the condition of existing wetlands and a TXRAM functional analysis has been used for impact assessment (refer to Appendix C) (*Note*: a TXRAM functional assessment has also been performed for the Trinity River, as discussed in Section 3.1.1 and Appendix C). A TXRAM field assessment of several of the emergent wetlands in the project area was conducted as part of the jurisdictional determination approved by the USACE on March 24, 2011 (Halff Associates 2011). For emergent wetlands that did not receive a TXRAM field assessment, TXRAM scores were inferred from other nearby, similar emergent wetlands, as described in *The Texas Rapid Assessment Method (TXRAM), Wetlands and Streams Modules* (USACE 2010a) (refer to Appendix C for details on the process used to infer scores).

3.3.2.2 Alternative 1: No-Action Alternative

Under the No-Action Alternative, wetlands are expected to remain largely in their present locations, and to continue to function as they do at present. Climate change is likely to result in wetlands becoming drier and probably shrinking on average, but with increasing year-to-year variation in size and quality.

3.3.2.3 Alternative 2: Proposed Action with the Trinity Parkway

Impacts to Wetlands

The impacts of the different Alternative 2 project features on jurisdictional wetlands are summarized in Table 2 and in the subsequent discussions. The TXRAM scores for impacted jurisdictional emergent wetlands within the Alternative 2 project area are provided in Table 6 along with impacted acreage from each project component. Figures in Appendix A show existing wetlands as they would be impacted by various Alternative 2 project components.

Table 6. Summary of Impacted Wetlands under Alternative 2

Wetland Number	*Total Area (acres)*	*TXRAM Score*	*Project Component (acres)*					*Total (acres)*
			FRM	*IDP*	*Ecosystem (other)*	*Ecosystem (river)*	*Recreation*	
1	2.09	58.01[1]	0.004		0.20		0.07	0.27
2	0.52	58.01[1]			0.52			0.52
4	11.83	58.91			6.16	5.58	0.08	11.82
5	0.2	55.91			0.20			0.20
6	7.03	53.94			6.47	0.55		7.02
9	4.17	59.5	0.02	0.11		0.42		0.55
10	0.2	58.01[1]			0.04	0.15		0.19
11	0.55	58.01[1]			0.10	0.45		0.55
12	0.76	58.01[1]				0.73	0.03	0.76
13	0.5	58.01[1]				0.50		0.50
14	1	58.25			0.00	0.01	0.98	0.99
15	1.07	57.78			0.39		0.68	1.07
16	0.6	58.26	0.01		0.02		0.01	0.04
19	1.66	57.87	0.12		0.07		0.02	0.21
20	3.73	60.97	0.68			2.15		2.83
22	1.42	57.44			1.08		0.33	1.41
25	2.74	53.16			0.00	1.09		1.09
26	1.29	55.63			0.02	0.01		0.03
27	3.98	57.52			2.78	0.43	0.66	3.87
29	7.9	57.76			1.42	0.80	5.45	7.67
31	11.64	53.95				2.73		2.73
32	6.49	55.27			2.70	1.12	0.14	3.96
33	5.19	58.09			0.00	4.51		4.51
36	20.85	60.38			11.31	0.47	6.36	18.14
44	25.03	58.33	0.08		1.84	13.35	0.06	15.33
46	3.28	57.49			0.05	1.47	0.20	1.72
48	2.61	55.46			0.36	1.26	0.71	2.33
52	2.42	57.93			0.20	0.90	0.12	1.22
53	4.24	58.07			0.11	4.13		4.24
54	7.95	58.96			0.86		1.72	2.58
56	0.95	56.26				0.95		0.95

Table 6. Summary of Impacted Wetlands under Alternative 2 (cont.)

Wetland Number	Total Area (acres)	TXRAM Score	Project Component (acres)					Total (acres)
			FRM	IDP	Ecosystem (other)	Ecosystem (river)	Recreation	
59	2.03	60.73			0.25	0.35	0.09	0.69
60	1.7	60.59				1.70		1.70
65	6.8	58.18		0.16		6.31		6.47
66	7.8	58.26				0.23		0.23
67	6.3	56.98			1.04	2.04		3.08
68	8.88	56.63			0.44	4.18	0.08	4.70
69	57.13	59.26			36.53	10.22	0.27	47.02
71	0.86	54.82			0.20	0.15		0.35
84	0.97	58.01[1]				0.97		0.97
85	0.43	56.23				1.10		1.10
86	0.16	60.59[1]				0.48		0.48
87	0.03	58.77[1]					0.14	0.14
89	0.03	57.76[1]			0.07			0.07
181	0.03	58.01[1]				0.03		0.03
188	0.03	58.01[1]	0.01					0.01
189	0.03	58.01[1]	0.02					0.02
Total	**239.2**		**0.94**	**0.27**	**75.44**	**71.52**	**18.21**	**166.37**

Note: [1] TXRAM scores are inferred from other sites as described in Appendix C.

Flood Risk Management

Levee slope grade reduction would impact 0.13 acre of wetlands and excavation from borrow pits needed to raise the levees would impact 0.81 acre of wetlands (Tables 2 and 6). Portions of some wetlands that exist along the bases of levees need to be filled and graded to maintain the structural integrity of the levees (e.g., Appendix A, Figures A-2, A-5, A-8, and A-11). There is no practicable alternative that would lessen this impact. The locations of borrow pits for the FRM have been based upon the presence of suitable material, meeting specific design criteria for levee strengthening, and they are co-located with the Parkway borrow pits (Appendix A, Figures A-6 and A-7). The impacted wetlands (0.81 acre) would be fragments of larger wetlands that would either (a) have already been eliminated by the Parkway borrow pits; or (b) would be eliminated by subsequent lake construction and river relocation. There are no alternative locations that would lessen this impact.

Interior Drainage Plan

Upgrades to the Hampton and Charlie pumping plants require the installation of new infrastructure across existing wetlands, impacting a total of 0.27 acre (Tables 2 and 6; Appendix A, Figures A-8 and A-14). These impacts are unavoidable given the need to upgrade these existing plants. The wetlands impacted by the Hampton plant upgrade would be converted to open waters (drainage sumps) (Appendix A, Figure A-8). At the Charlie plant, the impacted wetlands are part of a mosaic of wetlands and grassland existing between the West Levee and the river (Appendix A, Figure A-14). This entire area would be reconfigured to support the river relocation and other ecosystem and recreational design elements. The Charlie Plant's new outfall must discharge to the relocated river channel and thus requires construction through this area. Although the wetlands could be partially avoided, the proposed river relocation in this area limits the locational options for construction of the Charlie Plant's new outfall. There are no alternative locations that would lessen this impact.

Ecosystem Restoration/Enhancement

In order from largest to smallest, following are the impacts of the Ecosystem Restoration and Enhancement components of the BVP on wetlands.

River Relocation Grading. The proposed river relocation grading, including the channel, banks, and terraces, would impact 71.52 acres of wetlands (e.g., Appendix A, Figures A-5 through A-15). The new channel would become a jurisdictional WOUS and the river banks located outside the ordinary high water mark (i.e., non-jurisdictional) would increase compared to existing conditions. Although these river banks would become non-wetland, they would support valuable riparian habitat. River relocation is essential to the project purpose, being necessary to restore and enhance the functions and values of the river ecosystem, to allow other elements of the BVP to be successful, and to accommodate the Parkway. The design of the new river channel provides a more natural, meandering channel with greater habitat diversity than is currently found along the existing river channel, while leaving room for other ecosystem and recreation features within the Floodway. The present design achieves a reasonably successful compromise among competing objectives. The impact of the river relocation on existing wetlands could not be reduced without a substantial redesign, and such a redesign would not preserve the spatial integration of project features and diverse benefits that characterize Alternative 2. As such, there is not a practicable alternative that would lessen this impact.

Meadows. The proposed meadows would result in the impact of 35.96 acres of wetlands due to fill (Table 2). However, much of the adjoining wetlands would be eliminated by other Ecosystem or Recreation features (e.g., the athletic fields affecting wetland assessment area [WAA]-36 in Appendix A, Figures A-9 and A-10). As a result, the avoidance of these small fragments by itself would accomplish little, while the avoidance and minimization of impacts to larger areas of wetlands could not be accomplished without shrinking and redesigning major project features.

There would also be 22.69 acres of existing wetlands in the meadows area of the Floodway that would not be directly impacted by construction of the project. These areas would be managed by mowing once annually in the late winter, which would be an improvement from existing management practices that mows the areas frequently to maintain vegetation under 10 inches. In addition, this area would benefit from biological and manual control of invasive species. These remaining wetlands that are within the meadows would be crossed or bordered by new roads and paths, and other BVP elements, which could impact hydrology either positively or negatively, depending on how flow into and out of the wetlands are affected by the new features. Since the Guidelines only restrict dredge and fill in wetlands, they do not apply to the existing wetlands in the proposed meadow that would not be graded, filled, or excavated.

Wetlands. The constructed wetlands (including outfalls) would impact 36.16 acres of existing wetlands (Table 2). While there would be a temporal loss of acreage and function, with the completion of the project, the acreage and functions of jurisdictional wetlands would increase (refer to discussion of enhanced/restored wetlands below). A large component of the impact to wetlands is accounted for by the Corinth Wetlands, which would only temporarily impact existing wetland areas. There is not a practicable alternative that would preserve the existing wetlands without compromising the project's purpose and detracting from the integration of restored wetlands with other project features.

Lakes. Of the proposed lakes, Oxbow Lake would impact 2.01 acres of wetlands and Natural Lake would impact 1.01 acres wetlands (Table 2). Both lakes would be created largely from the Parkway borrow pits, which, along with the development of the Parkway and other ecosystem and recreation features, would eliminate existing wetlands in the vicinity with only a small portion of existing wetlands remaining within the proposed outline of the Oxbow Lake and Natural Lake at the time the lakes are to be constructed. However, it should be recognized that the excavation of the borrow pits would potentially dewater adjacent wetlands, as the borrow pit would excavate to a lower elevation than the adjacent wetlands. Hence, the additional loss of functions and values attributable to the Oxbow Lake and Natural Lake would be minimal.

Planters. Of 4.9 acres of raised planters to be installed (Dallas Floodway Project Draft EIS Table 2-4), only 0.15 acre would be located in wetlands. However, all of the adjoining wetlands would be eliminated by Urban Lake and Natural Lake, bordering meadows, public access, and other project features that are integrated with the Parkway alignment through this area (e.g., Appendix A, Figures A-11 through A-13). As a result, the avoidance of these small fragments by itself would accomplish little, while the avoidance and minimization of impacts to larger areas of wetlands could not be accomplished without shrinking and redesigning major project features such as Urban Lake.

Turf. Turf would impact 0.14 acres of wetlands in an area to be developed for the Confluence Boat Launch. Avoiding this impact would negatively impact the utility of the boat launch, and the wetlands would have very limited function in this context. Given the need to locate the boat launch in this area, avoidance is not a practicable alternative.

Recreation

In order from largest to smallest, following are the impacts of the Recreation components of the BVP on wetlands.

Recreational Fields and Playground. The Flex Fields, Play (Athletic) Fields, and Playground would require the filling of a combined total of 9.74 acres of emergent wetlands (Table 2; Appendix A, Figures A-5, A-6, and A-8 through A-10). The locations of the fields and playground are dictated by (1) the available land that would remain in the Floodway away from the Parkway, the lakes, and the relocated river channel; and (2) the desirability of making these recreational amenities accessible to the underserved residential population along the southern-western borders of the Floodway. The size of the fields is based on the recreational needs analysis (Section 2.2.2 above). Finally, the existing wetlands are scattered throughout the designed location for the fields, such that they could not be avoided without (a) significantly reducing the area available for recreation, and (b) leaving the wetlands in close proximity to heavy recreational use, which would diminish their values to wildlife. Given these considerations, there are no practicable alternatives that could reduce the impact on wetlands but still meet the project purpose regarding these fields.

Roads. The Park Road, Restricted Access Park Road, and Service Drive would directly impact a total of 4.30 acres of wetlands (Table 2; all figures in Appendix A). The roads are required to provide access for management and maintenance activities, and emergencies. The locations and geometries of the roads are dictated by the need to avoid yet provide reasonably close access to the locations of all major project elements throughout the Floodway; and by engineering, efficiency, and safety considerations. The road designs generally provide efficient (i.e., with the fewest twists and turns) routes between project features within the Floodway, with reasonable setbacks from project components where the presence and use of the road would detract from ecosystem or recreational values. The roads cannot feasibly be moved or redesigned to reduce the impact on wetlands without longer, more circuitous routes, which would be less compatible with other uses.

Pedestrian Paths. The Primary and Secondary Pedestrian Paths combined would require filling 2.94 acres of wetlands (Table 2; all figures in Appendix A). These linear features serve to (1) make the Floodway and project components accessible and enjoyable to non-motorized users; and (2) encourage non-motorized travel along maintained routes so that amenities can be provided for the users, and so that the incidental disturbance to habitats that would result from uncontrolled access is reduced. As with the roads, the paths are also designed to provide efficient routes between various points in the floodway. There is no practicable alternative to constructing the paths on fill because the natural ground surface is not suitable for use by cyclists, skaters, or wheelchairs. Accordingly, the project design was reviewed to determine if there might be alternative alignments for these paths that would reduce the impact by avoiding some of the existing wetlands. In general, wetland crossings appear to be unavoidable. Re-routing the pathways around wetlands that remain after the Parkway has been constructed and the major project features such as the river relocations and lakes, have been accommodated could not be achieved without extending the pathway into those project features. Therefore, there is not a less damaging practicable alternative to the current design of the Pedestrian Paths.

Bench/Curb/Steps/Wall. These features would impact 0.30 acre of wetlands around the edges of the lakes, constructed wetlands, and other project components where they are needed for safety and structural support (Table 2). As such, there are no practicable alternatives for these supporting features that would avoid wetlands.

Equestrian Trails. The Equestrian Trail would extend 8 miles by either 5 feet (one-way) or 10 feet (two-way) wide through the Floodway and connect to other regional trails. As designed, the trails would necessitate filling 0.40 acre of wetlands to provide a durable surface for the horses (Table 2). In most locations, as for the Pedestrian Paths, the location of the Equestrian Trail is constrained by the need for separation from other project features, and wetlands cannot be avoided where they are oriented perpendicular to the Floodway and must be crossed by the trail, or where the edge of a wetland provides the only available location for the trail. As such, there are no practicable alternatives for these supporting features that would avoid wetlands.

Skate Park. This feature (Appendix A, Figure A-13) is proposed underneath the IH-35 Bridge, between the proposed Urban Lake and Pedestrian Path, which would be along the edge of the Parkway. The Skate Park would eliminate 0.22 acre of wetland habitat (Table 2) which, at the time of construction, would be a small, probably degraded remnant of the wetlands that occurred in this area, most having been eliminated by the Parkway, Urban Lake, and Pedestrian Path. The Skate Park could not be relocated to avoid these wetlands except by having it replace an equivalent acreage of (an) other project feature(s), such as the wetlands, pathway, or raised planters that are part of the design for that area (Appendix A, Figure A-13). However, this is not considered a practicable alternative because the Skate Park needs to be accessible from Reunion Plaza.

<u>Enhanced or Restored Wetlands under the BVP Component</u>

The BVP Study would improve habitat quality by both enhancing 53.00 acres of existing wetlands and constructing 125.53 acres of new wetlands (i.e., restoration) for a total of 178.53 acres of wetlands within the Dallas Floodway (Table 7). The wetlands would include newly constructed stormwater management wetlands, marshland wetlands, forested river terraces, and forested ponds. These wetlands would be designed with the goal of improving overall water quality by removing nitrogen, phosphorus and other pollutants from urban runoff, and to increase both the amount and quality of plant and wildlife habitat in the Floodway. The City of Dallas also proposes to enhance existing emergent wetlands already occurring in the floodplain. The project would also compensate impacts to emergent wetlands by creating forested wetlands within the Floodway. As described in Appendix C, these forested wetlands would be planted with native bottomland hardwood species and would provide the function of similar forested wetlands that occurred historically along the Trinity River floodplain in the project area. The types of wetlands enhanced/restored are described below (refer to Appendix A for figures and Appendix C for details on these wetlands).

Table 7. Enhanced or Restored Wetlands under the Alternative 2 BVP Component

Wetland Type[1]	*Future TXRAM Scores (at Maturity)*[2]	*Wetland Area (acres)*		
		Enhanced	*Restored*	*Total*
Emergent Wetlands				
Flex Field Wetlands	78.21	1.07	19.02	20.09
Meadow Wetlands	71.29 to 79.46	5.08	17.46	22.54
Crow Lake Wetland	66.33	0.05	3.44	3.49
Corinth Wetlands	74.75 to 74.96	42.97	40.81	83.78
Marshlands-*West Dallas Lake*	65.41	0.43	6.64	7.07
Marshlands-*Urban Lake*	64.33	0.15	1.86	2.01
Marshlands-*Natural Lake*	67.66	0.89	5.64	6.53
Forested Wetlands				
Forested Ponds- *Urban Lake Promenade*	46.67	-	3.09	3.09
Forested Ponds- *Natural Lake Headwaters*	52.92	-	6.68	6.68
River Terraces	80.97 to 83.47	2.36	20.89	23.25
Total		**53.00**	**125.53**	**178.53**

Notes: [1] Refer to Appendix C for breakdown of acreage for individual enhanced/restored wetlands.
[2] Future TXRAM scores were estimated as described in Appendix C; at maturity represents the TXRAM score for 1 year after completion for emergent wetlands and 30 years after completion for forested wetlands.

Stormwater Management Wetlands

Flex Field Wetlands. The flex field wetlands would be constructed between the Athletic Fields and the Trinity River. These wetlands are intended to capture and treat stormwater runoff from the turf and paved areas associated with the Athletic Facilities and ultimately drain the treated stormwater to the Trinity River. These areas would also be inundated when flow in the Trinity River reaches 15,000 cfs (flow with an approximately 1.5 year return interval). The eight stormwater management wetlands would account for enhancement of 1.07 acres and restoration of 19.02 acres for a total of 20.09 acres of emergent wetlands (Table 7).

Meadow Wetlands. Three meadow wetlands would be constructed between the Parkway/East Levee and the Trinity River. These wetlands are intended to capture and treat stormwater runoff from the Parkway and paved areas associated BVP facilities and ultimately drain the treated stormwater to the Trinity River. A fourth meadow wetland would be located between the Pavaho Wetlands and the Trinity River and would receive water from the Pavaho Wetlands. Most of these areas would also be inundated when flow in the Trinity River reaches 15,000 cfs (flow with an approximately 1.5 year return interval). The four stormwater management wetlands would account for enhancement of 5.08 acres and restoration of 17.46 acres for a total of 22.54 acres of emergent wetlands (Table 7).

Crow Lake Wetland. The Crow Lake wetland would be constructed between the Parkway/East Levee and the Trinity River near Crow Lake. This wetland is intended to capture and treat stormwater runoff from the Parkway and paved areas associated BVP facilities and ultimately drain the treated stormwater to the Trinity River. The stormwater management wetland would account for enhancement of 0.05 acre and restoration of 3.44 acres for a total of 3.49 acres of emergent wetlands (Table 7).

Corinth Wetlands

These emergent wetlands already exist at the southeast edge of the project, just before the Trinity River flows into the Great Trinity Forest, but are of poor quality. Under the BVP Component, there would be two separate wetlands (one on the “island” between the Trinity River and Oxbow Lake and one between the Trinity River and West Levee) that would be enhanced/restored through grading and planting with native North Texas wetland species in appropriate numbers and diversity (as identified in City of Dallas 2009c). These areas would be inundated when flow in the Trinity River reaches 15,000 cfs (flow with an approximately 1.5 year return interval). The two wetlands would account for enhancement of 42.97 acres and restoration of 40.81 acres for a total of 83.78 acres of emergent wetlands (Table 7).

Forested Ponds

Forested ponds would be constructed alongside the edge of the Urban Lake Promenade and near the Natural Lake Headwaters. The forested ponds along the Urban Lake Promenade would function as biofiltration areas capable of absorbing lake nutrients. These constructed wetland ponds would be planted with native North Texas bottomland hardwood species and other water-tolerant herbaceous plants (as identified in City of Dallas 2009c) capable of high rates of biofiltration. Forested ponds along Urban Lake would be periodically filled with water pumped from the bottom third of Urban Lake. The water would be pumped from the lake under the Promenade, lifted up and over the adjacent water wall, allowing the water to be first be aerated by the water wall and then further filtered by the ponds before finally returning to Urban Lake. The wetland ponds would be 5 feet in depth and be equipped with overflow mechanisms to prevent overtopping. The seven forested ponds along Urban Lake would account for restoration of 3.09 acres of forested wetlands (Table 7).

Along the Natural Lake Headwaters, a forested pond would be designed to receive, retain and filter stormwater runoff from the bridge crossings proposed in other projects. The pond would have a retention area 4 feet deep, stretching like a plume from the headwaters to the Corinth Bridge. Filtered water would be released to the Natural Lake. This forested pond at the Natural Lake Headwaters would account for restoration of 6.68 acres of forested wetlands.

Marshlands

The marshlands include the wetlands constructed along the shoreline of Urban Lake, Natural Lake, and West Dallas Lake. The marshlands would be planted with herbaceous hydrophilic species native to North Texas (as identified in City of Dallas 2009c) with appropriate species planted at appropriate levels along the slopes. Invasive species would be treated immediately through either biological or manual control. If chemical control is required to meet invasive species occurrence monitoring goals , only herbicides approved for use in aquatic environments would be used. Urban Lake would account for enhancement of 0.15 acre and restoration of 1.86 acres for a total of 2.01 acres of emergent wetlands. Natural Lake would account for enhancement of 0.89 acre and restoration of 5.64 acres for a total of 6.53 acres of emergent wetlands. West Dallas Lake would account for enhancement of 0.43 acre and restoration of 6.64 acres for a total of 7.07 acres of emergent wetlands. The fringing wetlands would be of high value due to their ecotonal location between grassland and open water.

River Terraces

River terraces would be constructed along the banks of the realigned Trinity River and are intended to provide the functions and values of forested wetlands. This would be achieved by designing the river terraces to be graded to an elevation that would be completely inundated by river flows for at least

10consecutive days during the growing season (i.e., from February 22 to December 11) for greater than 50% of the years (e.g., greater than 25 years out of 50 years). These areas would also be designed to include appropriate soil requirements to meet the proposed wetland conditions and planted with wetland plants considered typical for natural forested wetlands within the vicinity of the Study Area. The 15 river terraces would account for enhancement of 2.36 acres and restoration of 20.89 acres for a total of 23.25 acres of forested wetlands.

TXRAM Functional Analysis

As shown in Tables 2 and 7, the BVP Component under Alternative 2 would enhance or restore 178.53 acres of emergent or forested wetlands to offset the 166.37 acres of emergent wetlands impacted by the project, resulting in a predicted net gain in wetland area of 12.16 acres. The USACE ARCC was used to perform a TXRAM functional analysis of impacts to wetlands based on existing and predicted future TXRAM scores (refer to Appendix C for details of this analysis) (*Note*: a TXRAM functional analysis has also been performed for the Trinity River, as discussed in Section 3.1.1 and Appendix C). The TXRAM functional analysis estimated that the design of the enhanced/restored wetlands and other BVP Ecosystem Components (including planting of native woodland/riparian habitats) would result in an overall increase in TXRAM scores (refer to Appendix C). Based on the TXRAM functional analysis, there would be a predicted net functional gain of 50.35 acres, indicating an overall increase in both area and quality of wetlands under Alternative 2.

3.3.2.4 Alternative 3: Proposed Action without the Trinity Parkway

Impacts to Wetlands

The impacts of the different Alternative 3 project features on jurisdictional wetlands are summarized in Table 4 and would be similar to those described in detail under Alternative 2 (refer to Section 3.3.2.3 above). The TXRAM scores for impacted jurisdictional emergent wetlands within the Alternative 3 project area are provided in Table 8 along with impacted acreages from each project component. Figures in Appendix B show existing wetlands as they would be impacted by various Alternative 3 project components.

Table 8. Summary of Impacted Wetlands under Alternative 3

Wetland Number	*Total Area (acres)*	*TXRAM Score*	*Project Component (acres)*					*Total (acres)*
			FRM	*IDP*	*Ecosystem (other)*	*Ecosystem (river)*	*Recreation*	
1	2.09	58.01[1]			0.20		0.06	0.26
2	0.52	58.01[1]			0.52			0.52
4	11.83	58.91			6.17	5.59	0.07	11.83
5	0.2	55.91			0.20			0.20
6	7.03	53.94			6.47	0.55		7.02
9	4.17	59.5	0.02	0.11		0.41		0.54
10	0.2	58.01[1]			0.04	0.15		0.19
11	0.55	58.01[1]			0.10	0.45		0.55
12	0.76	58.01[1]				0.73	0.03	0.76
13	0.5	58.01[1]				0.50		0.50
14	1	58.25				0.01	0.99	1.00
15	1.07	57.78			0.32		0.75	1.07
16	0.6	58.26	0.58		0.02			0.60

Table 8. Summary of Impacted Wetlands under Alternative 3 (cont.)

Wetland Number	*Total Area (acres)*	*TXRAM Score*	*Project Component (acres)*					*Total (acres)*
17	10.63	56.97	0.04					0.04
18	25.68	60.56	1.45					1.45
19	1.66	57.87	1.57		0.07		0.01	1.65
20	3.73	60.97	1.44			2.29		3.73
21	3.44	58.46	0.08					0.08
22	1.42	57.44			1.06		0.36	1.42
25	2.74	53.16	1.60			1.12	0.01	2.73
26	1.29	55.63	0.10		0.02	0.56	0.620	1.30
27	3.98	57.52			2.87	0.38	0.73	3.98
29	7.9	57.76			1.58	0.82	5.59	7.99
31	11.64	53.95				2.81		2.81
32	6.49	55.27			4.94	1.25	0.30	6.49
33	5.19	58.09			0.14	5.04		5.18
36	20.85	60.38			11.80	0.48	5.87	18.15
42	1.02	53.74			0.02			0.02
44	25.03	58.33	0.08		2.45	12.64	0.21	15.38
46	3.28	57.49			0.22	1.56	1.49	3.27
48	2.61	55.46			0.62	1.26	0.73	2.61
50	0.44	59.6					0.15	0.15
52	2.42	57.93			0.14	1.26	1.02	2.42
53	4.24	58.07			0.12	4.12		4.24
54	7.95	58.96			2.00	0.25	5.70	7.95
56	0.95	56.26				0.95		0.95
59	2.03	60.73			1.43	0.45	0.15	2.03
60	1.7	60.59				1.70		1.70
65	6.8	58.18		0.16	0.01	6.63		6.80
66	7.8	58.26	0.24		3.46	4.10	0.40	8.20
67	6.3	56.98			0.90	5.40		6.30
68	8.88	56.63			0.80	8.07	0.03	8.90
69	57.13	59.26			44.32	12.68	0.13	57.13
71	0.86	54.82			0.41	0.26	0.20	0.87
84	0.97	58.01[1]				0.97		0.97
85	0.43	56.23				1.82		1.82
86	0.16	60.59[1]				0.48		0.48
87	0.03	58.77[1]					0.14	0.14
89	0.03	57.76[1]			0.07			0.07
181	0.03	58.01[1]				0.03		0.03
188	0.03	58.01[1]	0.01					0.01
189	0.03	58.01[1]	0.02					0.02
Total	**278.31**		**7.23**	**0.27**	**93.49**	**87.77**	**25.74**	**214.50**

Note: [1] TXRAM scores are inferred from other sites as described in Appendix C.

There would be direct impacts to 214.50 acres of wetlands under Alternative 3, which would be greater than the impacts to 166.37 acres of wetlands under Alternative 2. This increase in net loss would be primarily associated with the excavation of borrow areas that would already have been excavated to provide fill for the Trinity Parkway under Alternative 2. The excavated areas would subsequently be deepened to create lakes or be incorporated into the relocated river channel.

There would also be 24.08 acres of existing wetlands in the meadows area of the Floodway that would not be directly impacted by construction of the project. These areas would be managed as described under Alternative 2 (refer to Section 3.3.2.3 above).

<u>Enhanced or Restored Wetlands under the BVP Component</u>

The BVP Study would improve habitat quality by both enhancing 59.02 acres of existing wetlands and constructing 12.34acres of new wetlands (i.e., restoration) for a total of 182.46 acres of wetlands within the Dallas Floodway (Table 9). The wetlands would include newly constructed stormwater management wetlands, marshland wetlands, forested wetlands, and forested ponds and would be similar to those described in detail under Alternative 2 (refer to Section 3.3.2.3 above). Refer to Appendix A for figures and Appendix C for details on these enhanced/restored wetlands.

Table 9. Enhanced or Restored Wetlands under the Alternative 3 BVP Component

Wetland Type[1]	*Future TXRAM Scores (at Maturity)*[2]	*Wetland Area (acres)*		
		Enhanced	*Restored*	*Total*
Emergent Wetlands				
Flex Field Wetlands	78.21	1.20	18.80	20.00
Meadow Wetlands	71.29 to 79.46	5.77	22.90	28.67
Corinth Wetlands	74.75 to 74.96	47.57	37.57	85.14
Marshlands-*West Dallas Lake*	65.41	0.48	6.44	7.02
Marshlands-*Urban Lake*	64.33	0.12	1.73	1.85
Marshlands-*Natural Lake*	67.66	0.80	5.47	6.27
Forested Wetlands				
Forested Ponds- *Urban Lake Promenade*	46.67	-	3.68	3.68
Forested Ponds- *Natural Lake Headwaters*	52.92	-	6.62	6.62
River Terraces	80.97 to 83.47	3.08	20.13	23.21
Total		**59.02**	**123.44**	**182.46**

Notes: [1] Refer to Appendix C for breakdown of acreage for individual enhanced/restored wetlands.
[2] Future TXRAM scores were estimated as described in Appendix C; at maturity represents the TXRAM score for 1 year after completion for emergent wetlands and 30 years after completion for forested wetlands.

<u>TXRAM Functional Analysis</u>

As shown in Tables 4 and 9, the BVP Component under Alternative 2 would enhance or restore 182.46 acres of emergent or forested wetlands to offset the 214.50 acres of emergent wetlands impacted by the project, resulting in a net loss in wetland area of 32.09 acres. The USACE ARCC was used to perform a TXRAM functional analysis of impacts to wetlands based on existing and predicted future TXRAM scores (refer to Appendix C for details of this analysis) (*Note*: a TXRAM functional analysis has also been performed for the Trinity River, as discussed in Section 3.1.1 and Appendix C). The TXRAM functional analysis estimated that the design of the enhanced/restored wetlands and other BVP Ecosystem Components (including planting of native woodland/riparian habitats) would result in an overall increase in TXRAM scores (refer to Appendix C). Based on the TXRAM functional analysis, there would be a predicted net functional gain of 3.09 acres. Although there would be an overall loss in wetland area by 32.09 acres, the TXRAM functional analysis indicates an increase in the quality and function of wetlands under Alternative 3. Impacts under Alternative 3 with respect to wetland function would be greater than under Alternative 2.

3.3.3 Mudflats (230.42)

No areas considered to be mudflats would be affected by the Dallas Floodway Project alternatives.

3.3.4 Vegetated Shallows (230.43)

No areas considered to be vegetated shallows would be affected by the Dallas Floodway Project alternatives.

3.3.5 Coral Reefs (230.44)

There are no coral reefs located in the Study Area.

3.3.6 Riffle and Pool Complexes (230.45)

The Dallas Floodway Project Draft EIS discusses the effects that the Proposed Action could have on fish and other aquatic species, and on stream morphology. No riffle and pool complexes have been identified in the Study Area and none would be created by the proposed river relocation under Alternatives 2 or 3.

3.4 SUBPART F: HUMAN USE CHARACTERISTICS

3.4.1 Municipal and Private Water Supplies

The Proposed Action and all of the alternatives would utilize existing municipal water supplies. An important component of the BVP Study is the conservation of water by using treated effluent - rather than fresh potable water - in its design of the water features and amenities associated with the BVP Study. The design specifications would include the re-use of treated wastewater in the Natural Lake Headwater wetlands, the Urban and Natural Lakes system, and recreational field irrigation, as well as other water-recycling practices. The only potable water that would be consumed would be that used in restrooms and drinking water fountains. Although the BVP Study features would require consumption of potable water, the sustainability practices initiated by the BVP Study would conserve water and not adversely impact the existing water supply.

There are no known public water utilities that draw water directly from the Trinity River in the project area or downstream from the project area in Dallas, Ellis, Kaufman, Henderson, and Navarro counties (FHWA 2014). There are public water utilities that draw water directly from the Trinity River further downstream (e.g., the City of Houston draws water from Lake Livingston) but these are substantially downstream and would not be adversely affected by the project.

3.4.2 Recreational and Commercial Fisheries

3.4.2.1 Existing Conditions

Existing conditions for recreational fisheries are described in Section 3.7.2 of the Dallas Floodway Project Draft EIS. There are no commercial fisheries in the Study Area.

3.4.2.2 Alternative 1: No-Action Alternative

Under the No-Action Alternative, fishing activities would continue to be limited in the Study Area. Fishing in the Study Area portion of the Trinity River is catch-and-release only due to unsafe levels of dioxins and PCBs (TDSHS 2010a). According to the Texas Parks and Wildlife *River Fishing in Dallas Ft. Worth: Trinity River System Public Access Points*, the only recreational fishing access point within the Study Area is located at Crow Lake Park (TPWD 2007). An increase of population and associated demand on recreational fishing would likely overcrowd the only recreational fishing lake in the project area and require additional access points to accommodate a long-term increase in use.

3.4.2.3 Alternative 2: Proposed Action with the Trinity Parkway

Section 4.7.3 of the Dallas Floodway Project Draft EIS discusses potential effects of Alternative 2 on recreational fishing and other forms of recreation. Proposed construction activities would result in temporary disruptions to recreational fisheries. However, recreational fishing opportunities would increase under Alternative 2 with fishing available in West Dallas Lake and Natural Lake. This would result in beneficial impacts to recreational fishing during operation.

3.4.2.4 Alternative 3: Proposed Action without the Trinity Parkway

Under Alternative 3, effects to recreational fishing would be similar to those under Alternative 2. However, Alternative 3 would result in a small net increase in recreation acreage as compared to Alternative 2, and thus the beneficial impact would be greater.

3.4.3 Water-Related Recreation (230.52)

3.4.3.1 Existing Conditions

Existing conditions for water-related recreation are described in Section 3.7.2 of the Dallas Floodway Project Draft EIS.

3.4.3.2 Alternative 1: No-Action Alternative

As discussed in Section 4.7.2 of the Dallas Floodway Project Draft EIS there would likely be an increase in water related recreation facilities under the No-Action Alternative. However, the increased population and associated demand on all recreational amenities would likely result in a greater recreation shortfall than currently exists.

3.4.3.3 Alternative 2: Proposed Action with the Trinity Parkway

Under Alternative 2, there would be a significant increase in the number and types of water related recreation opportunities available to the people in the City of Dallas. The implementation of the BVP Study would result in the new lakes and associated amenities would provide new and enhanced recreation and interpretive opportunities and provide scenic, picnicking, and wildlife viewing opportunities. New vehicular and pedestrian entry points would provide overall improvements to existing access to water related recreation facilities and opportunities within the Floodway. New boat launches and docks would increase the amount of Trinity River access to a greater variety of watercraft.

3.4.3.4 Alternative 3: Proposed Action without the Trinity Parkway

Under Alternative 3, water related recreation would be the same as under Alternative 2.

3.4.4 Aesthetics

3.4.4.1 Existing Conditions

Existing conditions for aesthetics in the project area are described in Section 3.8.2 of the Dallas Floodway Project Draft EIS.

3.4.4.2 Alternative 1: No-Action Alternative

The identified cumulative projects by others would be typical of a major metropolitan area and would be consistent with the overall existing visual environment of the Study Area. The identified trails, parks, and recreation amenities, while subjective to individual viewer group perceptions, can generally be described as consistent with the overall visual environment and would not result in a dramatic change to the visual environment or change to visual sensitivity.

3.4.4.3 Alternative 2: Proposed Action with the Trinity Parkway

Construction would negatively impact visual resources within the Floodway, but these impacts would be temporary. Visual quality ratings would improve with the implementation of each of the BVP Study features and remain the same with implementation of proposed IDP improvements. Night lighting features would be designed and operated to minimize impacts to nighttime views. Overall, Alternative 2 would result in beneficial impacts to the visual environment.

3.4.4.4 Alternative 3: Proposed Action without the Trinity Parkway

Under Alternative 3, effects to aesthetics would be the same as under Alternative 2.

3.5 Subpart G: Evaluation And Testing Of Dredge And Fill Materials

Dredge and fill materials would be used to implement the Dallas Floodway Project. Dredge and fill materials would be obtained from areas within the Floodway. The evaluation and testing of dredged and fill material for discharge to WOUS would be conducted utilizing the *Evaluation of Dredged Material for Discharge in Waters of the US-Testing Manual (Inland Testing Manual)* (USEPA and USACE 1998). The Inland Testing Manual assists in assessment for the potential of contaminant-related impacts associated with dredged material disposal into open water.

The material testing would follow the tiered approach identified in the manual. Tier I would utilize all the existing information including previous testing to identify areas with potential for environmental impacts. Tier I would also include additional testing, as necessary. Tier II would explore sediment and water chemistry and attempt to identify the potential effects of any contamination identified in the dredged materials removed from the channel. Tier III is concerned with well-defined toxicity and bioaccumulation testing procedures and Tier IV allows for case specific laboratory and field testing for unusual circumstances.

3.5.1.1 Existing Conditions

There would be two borrow sites for fill material for the Dallas Floodway Project. Both borrow pits would be located along the south side of the Floodway, to the east and west of the Westmoreland Bridge, respectively. Material from the borrow pits was analyzed in several locations during the Phase II Environmental Site Assessment investigation (*Note*: this assessment focused on borrow sites and areas in vicinity of several bridges but did not collect samples for much of the Floodway that would be excavated for the proposed river relocation). Constituents of concern include arsenic and lead (USACE 2008). Of the five samples taken within the two borrow pits, lead concentrations averaged 23.9 parts per million and arsenic concentrations averaged 7.2 parts per million. The Phase II Environmental Site Assessment report concluded that the lead and arsenic concentrations present in soils are due to airborne deposition (USACE 2008).

3.5.1.2 Alternative 1: No-Action Alternative

No dredge and fill material would be discharged to WOUS due to the project under the No-Action Alternative. Other projects in the Floodway that would involve the discharge of dredge and fill materials to WOUS would be subject to the USACE regulatory permitting authority.

3.5.1.3 Alternative 2: Proposed Action with the Trinity Parkway

Under Alternative 2, proposed construction activities would require the dredge and fill of materials. As discussed above, the tiered approach identified in the Inland Testing Manual would be followed. A Tier I evaluation would be prepared and it is anticipated that extensive additional testing of the dredged material and borrow material would be required, particularly in areas of the Floodway that would be excavated for the proposed river relocation. Any material containing contaminants of concern would be identified in the Tier I evaluation and discharge to or use of this material as fill in WOUS would be avoided. If discharge or use of this contaminated material as fill cannot be avoided, then a Tier II evaluation would be required to ensure all material used meets state 401 water quality certification requirements.

3.5.1.4 Alternative 3: Proposed Action without the Trinity Parkway

The tiered approach identified in the Inland Testing Manual would be followed under Alternative 3 and impacts would be similar to those under Alternative 2. However, excavation of borrow areas for the FRM elements of the project under Alternative 3 would be greater because under Alternative 2, these areas would already have been excavated to provide fill for the Trinity Parkway. As identified in the Trinity Parkway EIS (FHWA 2014), portions of the borrow pits that would be excavated under Alternative 3 contain materials contaminated with arsenic and lead. However, discharge to or use as fill of this contaminated material in WOUS would be avoided. If discharge or use of this contaminated material as fill cannot be avoided, then a Tier II evaluation would be required to ensure all material used meets state 401 water quality certification requirements.

3.6 Subpart H: Actions To Minimize Adverse Effects

Brief reference is provided below to the applicable guidelines of Subpart H and some – but not all - of the measures identified in the Dallas Floodway Project Draft EIS. Measures to minimize adverse effects have been introduced as part of proposed action development; with additional measures listed under Section 3.6.2 below. Additional refinement may occur in the course of Section 408 review.

3.6.1 Applicable Guidelines

- **§230.70, Actions concerning the location of the discharge.**

  Excavated material for use for FRM must meet strict geotechnical guidelines. The site for excavation of fill to support FRM improvements is the only site within the floodway identified with suitable material. For other uses of fill, the project is designed to use fill material exclusively sourced within the Floodway. Excavated material would be used as fill primarily in uplands or areas being converted to wetlands (e.g., the filling of the existing river channel with materials excavated to construct the relocated channel) and would be derived from and hence compatible with the native substrate. Features requiring the fill of wetlands are sited to minimize environmental impact while also providing maximum construction efficiency and maximum benefit to the target population. For example, flex fields are sited on wetlands that would be initially impacted by the river modification, and are also immediately adjacent to recreationally underserved neighborhoods and schools.

  All disturbed soils shall be immediately stabilized following the completion of work and be replanted with native species. Before approval of the final design, the contractor shall obtain City of Dallas approval of a soil layering plan, seed mixes, planting/seeding, and monitoring methods proposed for use in revegetation. Noxious and invasive vegetation would be controlled by hand weeding or herbicide application.

- **§230.71, Actions concerning the material to be discharged.**

  The effects of a discharge on the aquatic ecosystem can be minimized by treatment of, or limitations on the material itself. As described in Subpart G, the tiered approach identified in the Inland Testing Manual would be followed. Any material containing contaminants of concern would be identified in a Tier I evaluation and discharge to or use of this material as fill in WOUS would be avoided. If discharge or use of this contaminated material as fill cannot be avoided, then a Tier II evaluation would be required to ensure all material used meets state 401 water quality certification requirements. If the material does not meet 401 water quality requirements, a landfill or treatment facility that meets the relevant state and federal regulatory standards for waste treatment and disposal would be used. No fill would be sold for use outside of the Floodway.

- **§230.72, Actions controlling the material after discharge.**

The design and construction of proposed retaining walls, embankment fills, cut slopes, and levees would have temporary and permanent erosion and/or scour control measures to minimize erosion potential and levee/channel slope instability. For each construction proposal, an Erosion Control Plan (ECP) shall be prepared by the construction contractor. The ECP would include site-specific BMPs to minimize erosion, sediment generation, and fugitive dust generation during construction. The City of Dallas would finalize each ECP upon final design approval of the proposed improvements, and all erosion control measures would be field adjusted for site conditions. The ECP and associated SWPPP would be part of the Section 408 package submitted by the City of Dallas to the USACE for review. The proposed design for the SWPPP for the FRM is included in Appendix D. Subsequent project elements to be completed by the City of Dallas would require SWPPP planning at the same or greater level of detail as those included in Appendix D.

Before completing river-channel construction, the river banks would be stabilized to ensure slope integrity. Meander bends would be protected with bank treatments designed to prevent lateral migration and channel instability. In addition, where feasible, channel bank slopes shall be flattened to 4:1 on the insides of the meander bends and remain at 3:1 on the outsides of the meander bends.

- **§230.74, Actions related to technology.**

Part (d) refers to "Designing access roads and channel spanning structures using culverts, open channels, and diversions that will pass both low and high water flows, accommodate fluctuating water levels, and maintain circulation and faunal movement." Project design measures including development of a Soils Management Plan, SWPPP, and ECP would include minimization of discharges of fill to waters of the U.S. in the course of construction.

Final river terrace designs would be evaluated for stability and sustainability using geotechnical, hydraulic, and sediment transport analyses. Terrace vegetation would be established in a manner that does not compromise terrace function or stability. Geomorphic terrace elevations would be designed in relation to water surface elevations at effective flow frequencies, with stable slopes given local hydraulic, geotechnical, and vegetation conditions, and would provide adequate terrace drainage.

- **§230.75, Actions affecting plant and animal populations.**

Consistent with Part (d), the Proposed Action would use planning and construction practices to institute ecosystem restoration/habitat enhancement to produce a new or modified environmental state of higher ecological value by displacement of some or all of the existing environmental characteristics.

Ecosystem restoration/habitat enhancement techniques would be used to minimize adverse impacts and to compensate for impacted habitat, such that no additional compensatory mitigation would be required for impacts to jurisdictional WOUS and wetlands. While these concepts underpin virtually all of the ecosystem restoration/habitat enhancement design components, additional specific measures to minimize and/or provide compensation for impacts to plant and animal populations are identified in the Draft Dallas Floodway EIS, Chapter 7.

- **§230.76, Actions affecting human use.**

  The Proposed Action would effectively increase human use potential and balance recreational with flood control and ecological values.

  The proposed construction activities would result in temporary disruptions to access and human use within the Floodway. However, these impacts would be temporary and only effect a small portion of existing recreation areas at a time as construction would occur in stages. Proper advanced notification of potential disruption to access would be provided to the public.

  Under Alternative 2 or Alternative 3, there would be a significant increase in the number and types of recreation opportunities available to the people in the City of Dallas within the Floodway. Notably, the new lakes and associated amenities would provide new and enhanced recreation and interpretive opportunities and provide scenic, picnicking, and wildlife viewing opportunities. New vehicular and pedestrian entry points would provide overall improvements to existing access to recreation facilities and opportunities within the Floodway. New boat launches and docks would increase access to the Trinity River by users of a greater variety of watercraft. Furthermore, proposed IDP improvements would reduce the flood risk to some existing and proposed recreation areas.

- **§230.77, Other actions.**

  Part (d) identifies that "When a significant ecological change in the aquatic environment is proposed by the discharge of dredged or fill material, the permitting authority should consider the ecosystem that will be lost as well as the environmental benefits of the new system." As identified through the TXRAM functional analysis (refer to Appendix C), there would be net functional gain for the Trinity River and jurisdictional wetlands under the Proposed Action. In addition, the USFWS PAR HEP analysis likewise supports improvements in habitat quality under the proposed action (refer to Section 4.5 of the Dallas Floodway Project Draft EIS and Section 3.2.3 above).

3.6.2 Avoidance, and Minimization and Compensatory Mitigation (230.10(d))

The guidelines require that impacts to WOUS be avoided, minimized, and that remaining impacts be compensated. Many of the measures provided in Section 7.2 of the Dallas Floodway Project Draft EIS are relevant and include the following; note that the numbers assigned in the Dallas Floodway Project Draft EIS are maintained here to ease in comparison of documents. These SCMs apply to multiple environmental resources as shown in Table 7-1 of the Dallas Floodway Project Draft EIS. Measures that do not directly address the properties of WOUS, but deal with related functions and values such as wildlife habitat, are not included.

Planning and Design Phase (PD)

PD-1 This Section 404(b)(1) analysis evaluated 35% complete design plans. Further design should refine the current plans, and not significantly alter size, alignment, or the magnitude of potential impacts. If there are sizeable changes between the 35% design and future designs, additional analysis is likely to be required for permitting. This analysis may include the potential for additional public and agency review and comment.

PD-2 As project elements are designed and submitted for construction, the project sponsor shall ensure that the proposed project feature would be a single and complete project that is within the impacts discussed within the EIS and incorporates any ecosystem enhancement requirements incurred. For example, the project sponsor may not propose to begin construction on a project feature that would impact wetlands without also including equal or greater wetland restoration/enhancement as part of the same proposal. A project sponsor may not defer restoration that may balance impacts to a later project element.

PD-6 The design and construction of proposed retaining walls, embankment fills, cut slopes, and levees would have appropriate temporary and permanent erosion and/or scour control measures to minimize erosion potential and levee/channel slope instability.

PD-7 For each construction proposal, an ECP shall be prepared by the construction contractor. The ECP would include site-specific BMPs to minimize erosion, sediment generation, and fugitive dust generation during construction. The City of Dallas would finalize each ECP upon final design approval of the proposed improvements, and submit the plan for USACE Regulatory review as part of the comprehensive Section 408 package review.

PD-9 The final design of the river modification (including channel relocation, terraces, and riverbank treatments) shall satisfy all applicable standards for channel modifications within a designated Floodway. These may include, but are not limited to, requirements of the USACE, the City of Dallas, the TCEQ, and the Texas Department of Transportation (TxDOT). Final river terrace designs would be evaluated for stability and sustainability using geotechnical, hydraulic, and sediment transport analyses. Terrace vegetation would be established in a manner that does not compromise terrace function or stability.

PD-10 Any refinements to existing designs would maintain the geomorphic terrace elevations designed in relation to water surface elevations at effective flow frequencies, with stable slopes given local hydraulic, geotechnical, and vegetation conditions, and would provide adequate terrace drainage.

PD-11 Bank treatments shall be designed based on local hydraulic conditions, maximum shear stresses during high flows, local geotechnical conditions, proximity to other park features, and existing or proposed vegetation. Typical treatments shall be designed for river reaches with similar conditions and would extend the length of a given reach. Transitions between different bank treatments shall be designed to withstand hydraulic discontinuities and changes in shear stress. All bank treatments would be appropriately “keyed in” at the channel invert elevation and the top of bank elevation to prevent unraveling of the treatment. Materials and construction methods for all bank treatments shall be specified to ensure sustainability over the necessary design life for each treatment. Only native North Texas riparian species would be planted in riparian areas.

PD-12 To ensure that the enhanced/restored wetland would properly function, the design/construction plans and post project monitoring would include the following measures:

a. *Hydrology*: The wetland would be designed to achieve the minimum requirement to meet the hydrology criteria as defined in the 1987 Wetland Delineation Manual and the Great Plains Regional Supplement (USACE 2010b). This would be achieved through either (1) locating the wetland at an elevation where it would receive sufficient inundation/saturation from the Trinity River or (2) designing the wetland as a depressional basin that would receive stormwater runoff from surrounding areas, overbank flows from the Trinity River and drainage sumps, or water from other artificial sources (e.g., pumped from the created lakes or Trinity River).

b. *Vegetation*: The design would utilize a mixture of agency recommended native plants, as well as other native plants that are more common early successional species and easy to establish vegetative cover, to help ensure plant survival.

c. *Soils*: The project design would include identification of soils that would be collected from wetland impact locations and then spread on the enhanced/restored areas. By using soils from the impact sites, there would be the added benefit of an incredible seed source as well as organic material. The soils to be used for enhancement/restoration would be tested for nutrient, organics, and percolation and if they do not meet the minimum standards, additional organics/soil amendments/ripping would be added/completed until the standard is met.

PD-13 The final design of Floodway features would conform to all USACE regulations and guidelines for construction in the Floodway.

PD-14 The river channel relocation design shall have a geomorphically stable channel pattern and geometry that does not encroach within 200 feet of the toe of the levee. The channel pattern shall be offset from all sensitive floodplain park features by a distance sufficient to allow channel adjustments to occur without impacting park features over the life of the project. Where offset from park features is not possible, channel geometry shall be strengthened, using bioengineering approaches that incorporate native vegetation and other natural materials.

PD-18 The project sponsor shall initiate consultation with the TPWD early in the design process to discuss potential impacts to aquatic resources and specifically to state-listed mussels. If appropriate, the project sponsor would prepare a recovery plan for any impact to state-listed species found within the Study Area anticipated by a project feature.

PD-20 Buoy and lane marking structures, such as floating wetlands in the lakes shall be designed to incorporate measures to hold the plant communities together during flood events. The anchorage cables shall have sufficient slack to allow the floating features to rise to a 10-year flood elevation and to remain affixed to the structure during larger flood events, keeping them in place underwater.

PD-21 The final design of the riparian zones shall meet USACE and City of Dallas requirements for Floodway vegetation.

PD-24 The construction contractor shall prepare a Contingency Action Plan for managing hazardous materials on the construction site that reflects the guidance of Army Regulation 200-1 and ER 1165- 2-132 before implementing the Preferred Alternative. The City of Dallas would finalize the Contingency Action Plan upon final design approval of the proposed improvements, and all hazardous material control measures would be field adjusted for site conditions.

PD-25 The project shall be required to limit the establishment and harmful effects of non-native/invasive species within the areas of ecosystem restoration/habitat enhancement. To that end, an Invasive Species Management Plan shall be prepared, submitted for review and approval to the USACE and the TPWD, and implemented. This plan shall conform to the requirements of the USACE Regulatory division, and shall include at minimum the following components:

a. A list of the non-native/invasive plant and animal species that may occur, along with practical methods for their detection and removal.

b. Monitoring protocols and provisions to ensure that non-native invasive plant and animal species are detected early and eradicated if possible, but in any case controlled to ensure that they do not become dominant to the exclusion of native species.

c. To ensure that the non-native/invasive species metric of TXRAM scores for the enhanced/restored wetlands is higher than the baseline condition, action shall be taken as necessary to ensure that the average total relative percent cover of non-native/invasive plant species in wetland communities remains below 10% (USACE 2010a).

Pre-Construction Phase (PRE)

PRE-1 In defining the construction extents for each element, the construction contractor would minimize the amount of disturbed ground area at any given time, and minimize ground-disturbing activities in WOUS.

PRE-2 The perimeter of all areas to be disturbed during construction activities shall be clearly demarcated using flagging or temporary construction fencing, and no disturbance outside the demarcated perimeter would be authorized. All access routes into and out of the proposed disturbance area shall be flagged, and no construction travel outside those boundaries shall be authorized. When available, areas already disturbed by past activities or those that would be used later in the construction period would be used for staging, parking, and equipment storage.

PRE-3 Erosion control measures and appropriate BMPs, as required and developed through the SWPPP and engineering designs and ECP (see PD-7), would be implemented before, during, and after construction activities in accordance with the Texas Construction General Permit (TXR150000). Refer to the preliminary SWPPP prepared in support of the FRM in Appendix D for the requisite level of detail and protection to be applied to all project phases.

Construction Phase (C)

C-1 Before completing river-channel construction, the riverbanks shall be stabilized to ensure slope integrity. Meander bends shall be protected with bank treatments designed to prevent lateral migration and channel instability. In addition, where feasible, channel bank slopes shall be flattened to 4:1 on the insides of the meander bends and remain at 3:1 on the outsides of the meander bends.

C-2 After grading of the enhanced/restored wetlands is complete and before planting, the permittee would complete an “as built” survey to verify the target elevations identified in the designs were established and then install and monitor groundwater piezometers (for minimum of 1 year of normal rainfall conditions) to identify and document that sufficient wetland hydrology is present, as required. No plants would be installed until soils and hydrology criteria are met.

C-3 Best management practices shall be implemented at staging areas to prevent the discharge of petroleum, oils, lubricants and other pollutants to WOUS.

C-5 To minimize potential impacts of exposure to or release of hazardous and regulated materials into WOUS, all fuels, waste oils, and solvents shall be collected and stored in tanks or drums within a secondary containment system that consists of an impervious floor and bermed sidewalls capable of containing the volume of the largest container, plus 10%, stored therein.

C-6 Prior to entry into the construction site, all equipment shall be cleaned to prevent the import of non-native plant species. Also before entering the construction site, all equipment would be inspected to ensure that hydraulic fittings are tight, hydraulic hoses are in good condition, and to verify that there are no leaks of petroleum, oils, or lubricants.

C-12 The construction contractor shall closely monitor weather reports throughout the Upper Trinity River watershed. If significant rain events are predicted within the watershed, the contractor would remove all equipment from the Floodway to the protected sides of the levees to the greatest extent practicable. Construction shall not occur during rain events, and construction personnel shall have frequent communication with the City of Dallas Flood Control Division to assess the safety of operating within the Floodway.

Post-Construction and Operations Phase (POST)

POST-1 All disturbed soils shall be immediately stabilized following the completion of work and be replanted with native species. Before approval of the final design, the contractor shall obtain City of Dallas approval of a soil layering plan, seed mixes, planting/seeding, and monitoring methods proposed for use in revegetation. Noxious and invasive vegetation would be controlled by hand weeding or herbicide application.

POST-2 During operations, spill response materials (e.g., absorbents, drain covers, mops, brooms, shovels, drum repair materials and tools, warning signs and tapes, and personal protective equipment) shall be readily available for use in WOUS and storage areas and during transport in the event of an unplanned release.

Mitigation and Monitoring Measures (M)

Mitigation and monitoring to be implemented as part of the Preferred Alternative would include:

M-1 Erosion and sedimentation controls identified in the ECP (refer to PD-7) would be monitored and maintained during construction and for 12 months thereafter to ensure site stabilization.

M-3 The USACE and City of Dallas shall develop and implement a Wetland and Waters Enhancement/Restoration and Monitoring Plan. This plan would specify that unavoidable permanent impacts to sensitive habitats (i.e., aquatic riverine and emergent wetlands) would be compensated through enhancement/restoration of similar habitats. Overall performance standards for the project shall be established through this plan. Specifically, ecosystem restoration/habitat enhancement shall be required to adequately offset losses and alterations of existing aquatic and wetland habitats. Preliminary criteria for a monitoring plan are presented in the EIS Appendix M.

TXRAM scores for enhanced/restored wetlands and the Trinity River are predicted increase over time, compared to existing conditions (refer to Appendix C). To determine whether this occurs, as the project is implemented, net changes in aquatic and wetland acreage and functions would be quantified and tracked over time through the application of the TXRAM Wetlands and Streams Modules (USACE 2010a; see measure M-5 below). The USACE ARCC would be used to estimate whether net compensation requirements identified in this analysis are being met in order to provide adequate compensation. These results would be incorporated into an Annual Monitoring Report using the USACE Fort Worth District's recommended form (see measure M-5 below).

If adequate compensation is not being provided, modifications to the project design shall be required either to reduce future impacts to existing resources, or to increase the gain in either acreage or TXRAM scores associated with enhanced/restored habitats. The successful implementation of the Wetland and Waters Enhancement/Restoration and Monitoring Plan would ensure that no net loss of aquatic resources functions and values and no cumulative loss of sensitive aquatic habitat result from implementation of the Preferred Alternative.

M-4 The City of Dallas would coordinate with the TPWD and TCEQ to implement the Aquatic Resource Recovery, Relocation, and Monitoring Plan or similar plan. Performance standards for the monitoring and management of ecosystem features are included in the Draft Dallas Floodway Project EIS Appendix M. Detailed planning for state-list mussel species would be completed as project elements move forward with Section 408 review. Mussel planning cannot be completed at this time as there is insufficient information of the life history and habitat requirements of these state-listed species.

M-6 As new/enhanced aquatic and wetland habitats are developed under the project design, wetland and stream assessment reach (WAAs and SARs, respectively) shall be established and evaluated using TXRAM methods (USACE 2010a) to provide objective metrics on whether the project is meeting the over-arching goal of adequately compensating for its impacts with net gains in aquatic resource acreage and/or functions. As identified in Appendix C of this analysis, individual WAAs and SARs shall be established during the first year following construction, and shall be reevaluated every two years subsequently, until the score is within two points of the previous evaluation and the site appears to be on a stable trajectory. Each WAA and SAR would be evaluated in this manner for a minimum of five years (first year plus two subsequent evaluations). The data shall be used in conjunction with the Annual Monitoring Report (measure M-3) to identify which metrics indicate functional deficiencies, and how they can be improved. Such an analysis would provide data for adaptive management and for future habitat restoration planning projects (USFWS 2010).

M-7 The USACE and City of Dallas shall implement the Revegetation and Landscaping Plan for the BVP Study Ecosystem and Recreation features (see Appendix M of the Dallas Floodway Project Draft EIS). In particular, the Revegetation and Landscaping Plan identifies the use of regionally native plants and landscaping practices and technologies that conserve water and prevent pollution and sets out recommendations for maintenance schedules. The project proponent would not be permitted to use non-native plant species, even if they are currently part of the BVP Study planting palette. Non-native species shall not be included in the implemented planting palettes of aquatic, wetland, and riverbank and terrace habitats.

3.7 Subpart I: Planning To Shorten Permit Processing Time

Not applicable.

3.8 Subpart J: Compensatory Mitigation For Losses Of Aquatic Resources

Compensatory mitigation means the restoration (re-establishment or rehabilitation), establishment (creation), enhancement and/or in certain circumstances preservation of aquatic resources for the purposes of offsetting unavoidable adverse impacts which remain after all appropriate and practicable avoidance and minimization measures have been achieved (Guidelines, part 230.92). For the Proposed Action under either Alternative 2 or 3, the net gains of acreage and/or functions of aquatic resources would be sufficient to offset temporal and permanent losses, such that no further compensatory mitigation would be required.

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