DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, NEW ORLEANS DISTRICT
7400 LEAKE AVENUE
NEW ORLEANS, LA 70118-3651

DRAFT FINDING OF NO SIGNIFICANT IMPACT

AMITE RIVER AND TRIBUTARIES, LOUISIANA
COMITE RIVER BASIN
COMITE RIVER DIVERSION
INUNDATION EFFECTS
EAST BATON ROUGE PARISH, LOUISIANA

SEA# 601

The U.S. Army Corps of Engineers, Mississippi Valley Division, New Orleans District (CEMVN) has conducted an environmental analysis in accordance with the National Environmental Policy Act (NEPA) of 1969, as amended. The Supplemental Environmental Assessment (SEA) 601 dated May 2025, for the Comite River Diversion Project in East Baton Rouge Parish, Louisiana. The overall purpose of the Comite Diversion is to reduce the risk of flood damage in residential areas along the Comite River and tributary streams in East Baton Rouge Parish, Louisiana, and neighboring Livingston Parish. The proposed action is needed to mitigate potential effects not identified or considered in previous evaluations and to evaluate additional real estate acquisition to allow increased water flows across private properties in the vicinity of the project.

The **Draft** SEA, incorporated herein by reference, evaluated the acquisition of flowage easement adjacent to the previously authorized project boundaries. Updated hydraulic modeling identified new areas that could be inundated during operation of the diversion channel. Once the project becomes operational, it is possible that additional property could see inundation. The Draft SEA also addressed minor project modifications that have occurred throughout construction of the project. Those modifications necessitate the completion of additional mitigation to offset impacts.

The proposed action as detailed in Section 2.1 of Draft SEA #601 could result in unavoidable indirect impacts to approximately 1,234 acres of forested bottomland hardwoods (BLH) from inundation and direct impacts of approximately 44 acres. Further, approximately 51 acres that were previously included in the construction right-of-way for the Comite Diversion would be avoided. The associated net loss of Average Annual Habitat Units (AAHUs) that would result from the proposed action condition would be 66.14 AAHUs. Personnel from the U.S. Fish and Wildlife Service (USFWS) determined the above potential impacts using the Wetland Value Assessment (WVA) model, which calculated the project's induced impacts to habitat. Mitigation for unavoidable adverse impacts to BLH habitat would be accomplished through acquisition of credits at an appropriate compensatory mitigation bank concurrent with construction as described in Section 5 of Draft SEA #601.

A "no action" plan was evaluated but no other alternative was identified. The "no action" plan is not a legally compliant alternative because the acquisition of flowage easements is necessary for properties that will be inundated by a project already under construction and environmental impacts would be unmitigated.

The potential effects were evaluated, as appropriate. A summary assessment of the potential effects of the recommended plan are listed in Table 1.

Table 1: Summary of Potential Effects of the Recommended Plan

	Insignificant effects	Insignificant effects as a result of mitigation*	Resource unaffected by action
Aesthetics	☒	☐	☐
Air quality	☒	☐	☐
Aquatic resources	☒	☐	☐
Invasive species	☒	☐	☐
Fish and wildlife habitat	☐	☒	☐
Threatened/Endangered species/critical habitat	☒	☐	☐
Historic properties	☐	☐	☒
Other cultural resources	☒	☐	☐
Floodplains	☒	☐	☐
Hazardous, toxic & radioactive waste	☐	☐	☒
Hydrology	☒	☐	☐
Land use	☒	☐	☐
Navigation	☐	☐	☒
Noise levels	☒	☐	☐
Public infrastructure	☒	☐	☐
Socio-economics	☒	☐	☐
Soils	☒	☐	☐
Tribal trust resources	☒	☐	☐
Water quality	☒	☐	☐
Recreation Resources	☒	☐	☐
Wetlands and other Terrestrial Resources	☐	☒	☐

All practicable and appropriate means to avoid or minimize adverse environmental effects were analyzed and incorporated into the recommended plan. Best management practices (BMPs) will be implemented, if appropriate, to minimize impacts.

Pursuant to section 7 of the Endangered Species Act (ESA) of 1973, coordination with the USFWS indicates the presence of four listed and proposed threatened and endangered species, (Pallid sturgeon, Tricolored bat, Alligator Snapping turtle, and Monarch butterfly) that are known to occur or believed to occur within the vicinity of the project area. CEMVN has initiated coordination with the USFWS for a determination that the project, is “Not Likely to Adversely Affect” federally listed and proposed threatened and endangered species, or their critical habitat. Once coordination is complete, this would fulfill the requirements under Section 7(a)(2) of the ESA. All coordination will be completed prior to finalization of this document.

In a letter dated 14 March 2025, CEMVN initiated consultation with the State Historic Preservation Officer (SHPO)/Tribal Historic Preservation Officer (THPO) regarding the effects of the undertaking on historic properties. The consultation letter offers a conclusion of "No Adverse Effects to Historic Properties." The SHPO responded their agreement on April 1, 2025. No Tribes responded within the 30 day review period. CEMVN remains obligated to require the National Historic Preservation Act (NHPA) Standard Conditions related to changes in the Scope of Work, Inadvertent Discoveries, and encountering Unmarked Human Burials.

Pursuant to the Clean Water Act (CWA) of 1972, as amended, a CWA Section 404(b)(1) public notice **will be** distributed to the public and comments will be solicited concurrent with the public review of this Draft SEA. A Section 404(b)(1) short form evaluation has been drafted and notification of the proposed action has been provided to the Louisiana Department of Environmental Quality relative to the Section 401 State Water Quality Certificate. The recommended plan has been found to be compliant with section 404(b)(1) Guidelines (40 CFR 230). A modification request for the Water Quality Certification pursuant to Section 401 of the CWA will be obtained from the Louisiana Department of Environmental Quality prior to construction. All conditions of the water quality certification will be implemented in order to minimize adverse impacts to water quality.

The following environmental design commitments are an integral part of the proposed action:

a) The proposed action would result in unavoidable adverse impacts to approximately 1,278 acres. Most of this impact is through an increased frequency of inundation. The associated net loss that would result from the proposed action condition would be 66.14 AAHUs. The amount of mitigation credits that would be required to fully compensate for unavoidable impacts to BLH will be determined upon selection of an appropriate compensatory mitigation bank concurrent with construction.

b) If the proposed action is changed significantly or is not implemented within 1 year, USACE would reinitiate ESA Section 7 consultation with the USFWS.

c) <u>Changes in Scope of Work</u>**:** Any change to the approved scope of work, including, but not limited to, deviation from the Government furnished Rights of-Entry and/or from the drawings or specifications (e.g., proposed alternate borrow areas, disposal areas, staging areas, alternate access routes, etc.), will require re-evaluation for compliance under Section 106 of the NHPA, NEPA, and other applicable Laws and Executive Orders. If the contractor fails or refuses to comply with these conditions, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to any such stop orders shall be made the subject of a claim for extension of time or for excess cost of damages by the contractor.

d) <u>Discovery of Previously Unknown Archaeological Remains and Artifacts:</u> If during the course of work, archaeological artifacts (prehistoric or historic), unmarked graves, burials, human remains, or items of cultural patrimony are discovered, all work must stop immediately within a 100 meter (328 ft) radius buffer zone around the point of discovery; unless there is reason to believe that the area of the discovery may extend beyond in which case the buffer zone will be expanded appropriately, and take all reasonable measures to avoid or minimize harm to the finds. The contractor shall inform their contacts at CEMVN, who will in turn contact

CEMVN Historic Preservation (HP) staff. The contractor will not proceed with work until CEMVN HP completes consultation with the SHPO, and others, as appropriate.

e) Louisiana Unmarked Human Burial Sites Preservation Act: A historic cemetery with unmarked boundaries is present on the bluff above and adjacent to Bayou Baton Rouge. Design plans are drawn to avoid impacts to this cemetery. However, if coffin remains, human bone or unmarked grave(s) are encountered, then all work must stop immediately within a 100 meter (328 ft) radius buffer zone around the point of discovery, unless there is reason to believe that the area of the discovery may extend beyond that 100 meter buffer, in which case the buffer zone will be expanded appropriately, and compliance with the Louisiana Unmarked Human Burial Sites Preservation Act (R.S. 8:671 et seq.) is required. The USACE contractor shall notify the law enforcement agency of the jurisdiction where the remains are located within 24 hours of the discovery. The USACE contractor shall also notify USACE and the Louisiana Division of Archeology (LDOA) within 72 hours of the discovery. Discoveries of unmarked graves, burials, human remains, or items of cultural patrimony on Federal or Tribal lands shall be subject to the Native American Graves Protection and Repatriation Act (25 U.S.C. §3001-3013, 18 U.S.C. § 1170) and the Archaeological Resources Protection Act of 1979(16 U.S.C. §470aa – 470mm).

All applicable environmental laws **will be** considered and coordination with appropriate agencies and officials **will be** completed. All substantive issues will be addressed in the Final FONSI.

All applicable laws, executive orders, regulations, and local government plans were considered in evaluation of alternatives. Based on SEA #601, the reviews by other Federal, State and local agencies, Tribes, input of the public, and CEMVN, it is my determination that the proposed action would not cause significant adverse effects on the quality of the human environment; therefore, preparation of an Environmental Impact Statement is not required.

Date

CULLEN A. JONES, P.E., PMP
Colonel, U.S. Army
District Commander

DRAFT SUPPLEMENTAL ENVIRONMENTAL ASSESSMENT

AMITE RIVER AND TRIBUTARIES, LOUISIANA, COMITE RIVER BASIN, COMITE DIVERSION INUNDATION EFFECTS, EAST BATON ROUGE PARISH, LOUISIANA

SEA # 601

MAY 2025

U.S. Army Corps of Engineers
Mississippi Valley Division
Regional Planning and Environment Division South
New Orleans District

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1 INTRODUCTION

The U.S. Army Corps of Engineers (USACE), Mississippi Valley Division (MVD), Regional Planning and Environment Division South (RPEDS), has prepared this Draft Supplemental Environmental Assessment (SEA) to evaluate potential impacts of the Comite River Diversion Project, which were not identified in previous National Environmental Policy Act of 1969 (NEPA) documents. This SEA has been prepared in accordance with the NEPA and 33 Code of Federal Regulations (CFR) Part 230, as reflected in the USACE Engineering Regulation (ER) 200-2-2. This SEA provides sufficient information on the potential adverse and beneficial environmental effects of the proposed action to allow the District Commander of the USACE New Orleans District (CEMVN), to make an informed decision on the appropriateness of an Environmental Impact Statement (EIS) or a Finding of No Significant Impact (FONSI).

The Comite Project (Figure 1) is located in East Baton Rouge Parish, Louisiana in the southern portion of the Comite River Basin. The purpose of the Comite Diversion is to reduce the risk of flood damage in residential areas along the Comite River and tributary streams in East Baton Rouge Parish, Louisiana, and neighboring Livingston Parish. The general intent of this SEA is to address the proposed acquisition of flowage easements adjacent to the previously authorized project boundaries, to reconcile mitigation requirements for the authorized Federal project, which is currently under construction, and to provide mitigation plans for any impacts to significant resources that have not previously been mitigated. Minor project modifications have been required during the construction process that require mitigation. Further, some impacts that were originally expected were avoided and no longer require mitigation. Those areas are indicated in Figure 2.

1.1 Authority

The overall Comite River Diversion Project detailed in Figure 1 is authorized as part of the Amite River and Tributaries Study. Specifically, the project is authorized by Section 101(11) of the WRDA of 1992 (Public Law 102-580), as amended and reauthorized by Section 301(b)(5) of the WRDA of 1996 (Public Law 104-303), and as amended by Section 371 of the WRDA of 1999, Public Law 106-53, with technical corrections to Section 371 contained in Section 6 of Public Law 106-109.

1.1.1 Purpose and Need for the Proposed Action

The overall purpose of the Comite Diversion is to reduce the risk of flood damage in residential areas along the Comite River and tributary streams in East Baton Rouge Parish, Louisiana, and neighboring Livingston Parish. The proposed action is needed to mitigate potential effects not identified or considered in previous evaluations and to evaluate additional real estate acquisition to allow increased water flows across private properties in the vicinity of the project. Without appropriate mitigation of impacts, the project would not comply with the Clean Water Act (CWA), Section 404(b)(1) and Section 906 of WRDA 1986, as amended. See Appendix C to Engineer Regulation 1105-2-100.

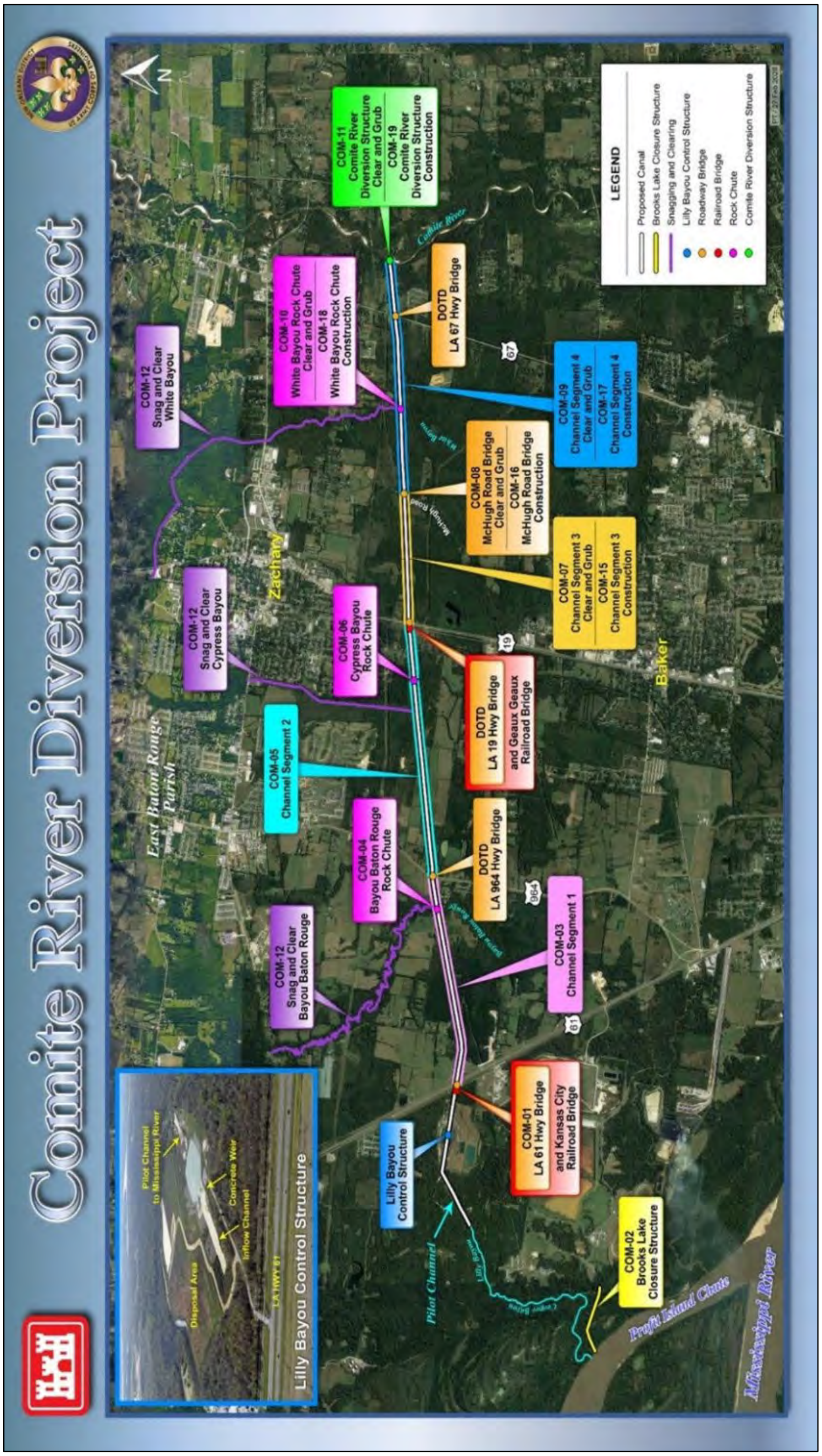

Figure 1: Project Area

1.1.2 Data Gaps and Uncertainties

The ability of hydraulic models to present potential effects with a greater degree of certainty has increased over the years. The new models project anticipated inundation not captured by previous models. Because natural systems are complex and consist of an intricate web of variables that influence the existence and condition of other variables within the system, all projects contain certain inherent uncertainties. Models used for this study rely on mathematical representations of current and future conditions to quantify and predict the future environmental conditions. No model can account for all relevant variables in an evolving ecosystem. Additionally, there is inherent risk in reducing complex natural systems to mathematic expressions driven by simplified interactions of key variables. As such, model results represent a 'best guess' regarding how the proposed project would actually perform based on what we presently know about existing and future conditions.

1.1.3 Prior NEPA Documents

1. Comite: Amite River and Tributaries Study, Feasibility Report on Comite River Basin, 1991, Environmental Impact Statement and Record of Decision.
2. Comite: Amite River and Tributaries, Louisiana, Comite River Basin; Revision of Comite Diversion Authorized Plan, EA #222, 1995
3. Comite: Amite River and Tributaries, Louisiana, Comite River Basin; Revision of Comite Diversion Authorized Plan, EA #222a, 2002
4. Comite: Amite River and Tributaries, Louisiana Comite River Basin: Comite River Diversion Supplemental Mitigation Options, East Baton Rouge Parish, Louisiana, EA #426, 2012
5. CEMVN prepared EA #576 to evaluate alternatives to compensate for unavoidable impacts to significant resources associated with the construction of the West Shore Lake Pontchartrain (WSLP), Comite River Diversion, and East Baton Rouge Flood Risk Management (EBR) projects; also known collectively as the Bipartisan Budget Act of 2018 (BBA) Construction Projects. This EA evaluated the process of converting all remaining mitigation obligations for purchase from local mitigation banks. EA #576 superseded the recommended alternative found in EA #426.

The foregoing documents are incorporated by reference herein.

1.1.4 Public Concerns

Flooding of residential and commercial property within the Amite and Comite River Basins is of great concern to residents. The Comite Diversion Structure was designed to reduce risk relative to those concerns. The loss of wetland, riverine, and wooded habitat as a result of construction and operation of the project is also a public concern.

2 ALTERNATIVES INCLUDING THE PROPOSED ACTION

2.1 Proposed Action

The proposed action consists of: A) increased water levels or flows during operation and the acquisition of flowage easements adjacent to the previously authorized project boundaries; B) updating mitigation requirements and the mitigation plan based on changes to the project that have occurred during construction; and C) use of an existing road and construction of a new road to be used for access to the construction area for the Brooks Lake guide levee and use of an existing cleared area on W. Irene Road for staging construction equipment and supplies.

A. Increased water levels and flows and acquisition of flowage easements: Updated hydraulic modeling identified new areas that could be inundated during operation of the diversion channel. Once the project becomes operational, an additional 1,234 acres of adjacent property could be inundated. The Louisiana Department of Transportation and Development (local sponsor) would acquire or otherwise secure a real estate interest in those properties to allow increased water levels and flows over private property. This increase in flooding would be expected to result in loss of some bottomland hardwood habitat value, which requires compensatory mitigation. The new modeling was utilized to prepare wetland value assessments (WVAs) to calculate the changes to hydrology within these areas. The majority of these areas are already adapted to frequent flooding due to their proximity to the Mississippi River. The modeling indicates a reduction in BLH habitat equivilent to 62.47 average annual habitat units (AAHUs) is likely to occur over the 50-year project life. Those AAHUs are included in the updated mitigation plan.

B. Update to the mitigation plan: In addition to the habitat loss discussed above, this SEA also discloses, on an after-the-fact basis, minor project modifications that have occurred throughout construction of the project that require changes to the required mitigation amounts and updating of the mitigation plan. On balance, those modifications necessitate additional compensatory mitigation to offset impacts. The additional compensatory mitigation requirements would be satisfied through purchase of mitigation bank credits. The modifications are found at 10 locations along the authorized project as depicted in Figure 2. Details of the changes are as follows:

   1. Minor Project Modifications: Minor project modifications have occurred throughout construction of the project. Those minor modifications are found at 10 locations along the project right-of-way and are depicted in Figure 2. The area depicted as I1 was an inadvertent construction error in 2004 during the construction of the Lilly Bayou Control Structure. The impact of that error requires mitigation. Impacts depicted as I2, I3, and I4a and I4b are essentially mapping errors resulting from changes in mapping formats over the past 30 years since the original project was designed in the late 1980s. The areas depicted as I6, I7, I8, and I9 were the result of changing concrete drop structures to stepped riprap for design and environmental benefits. However, the change resulted in a slightly larger footprint.

   2. Avoidance: Approximately 51 acres that were evaluated in the original project NEPA documents and included in the subsequent mitigation procured for the project, would be avoided and no impacts incurred. Those areas are also indicated on Figure 2. The avoidance of those areas generates a mitigation surplus of 16.06 Average Annual Habitat Units (AAHUs), which would be deducted from the mitigation required for the additional impacts addressed in this SEA.

3. Remove Maintenance Dredging: Maintenance dredging within the Comite River was incorporated into the project design and evaluated in the original project NEPA documents. However, recent sedimentation modeling has indicated that maintenance dredging would not be required. Maintenance dredging impacts would be avoided. No project related modifications relative to dredging within the Comite River will be evaluated in this SEA.

4. Riprap: Due to unexpected geological conditions, the Comite River diversion channel required more shoreline and bed stabilization (riprap) than anticipated. Most of the channel is now rock lined. There would also be additional riprap placed along the Comite River to prevent erosion of the diversion structure.

C. Minor project modifications are needed which include:

1. Impact I-10 would result from adding additional shoreline stabilization (approximately 260-feet) along the Comite River. The additional stabilization affecting approximately 3.7 acres would reduce the potential for bank erosion, which could result in adverse impacts to the nearby diversion structure.

2. Access to the Brooks Lake Control Structure – access to the construction area for the Brooks Lake guide levee would be through the use of an existing road (approximately 1,400-feet) and construction of a new road (approximately 1,750-feet) within the previously authorized project boundaries. The new road would be approximately 16-feet in width. An existing mowed field (1.6 acres) adjacent to W. Irene Road would be used as a staging area for equipment and supplies (Figure 3).

2.2 No Action Alternative (Future Without Project (FWOP))

NEPA requires that in analyzing alternatives to a proposed action, a federal agency must consider an alternative of No Action. The No Action alternative evaluates the impacts associated with not implementing the proposed action and represents the FWOP condition against which alternatives considered in detail are compared.

The future without project (FWOP) conditions evaluated in this document are the expected conditions with the currently authorized project in place, as described in EA #222. However, the hydraulic modeling that was used to project anticipated inundation considered the without project conditions to be the conditions that existed prior to construction of the project. This was done to calculate potential inundation from the construction and operation of the authorized project. The FWOP provides a baseline essential for impact assessment for proposed plan comparison. The No Action Alternative is not a legally compliant alternative as acquisition of flowage easements is necessary for properties that would be inundated by a project already under construction and environmental impacts would be unmitigated.

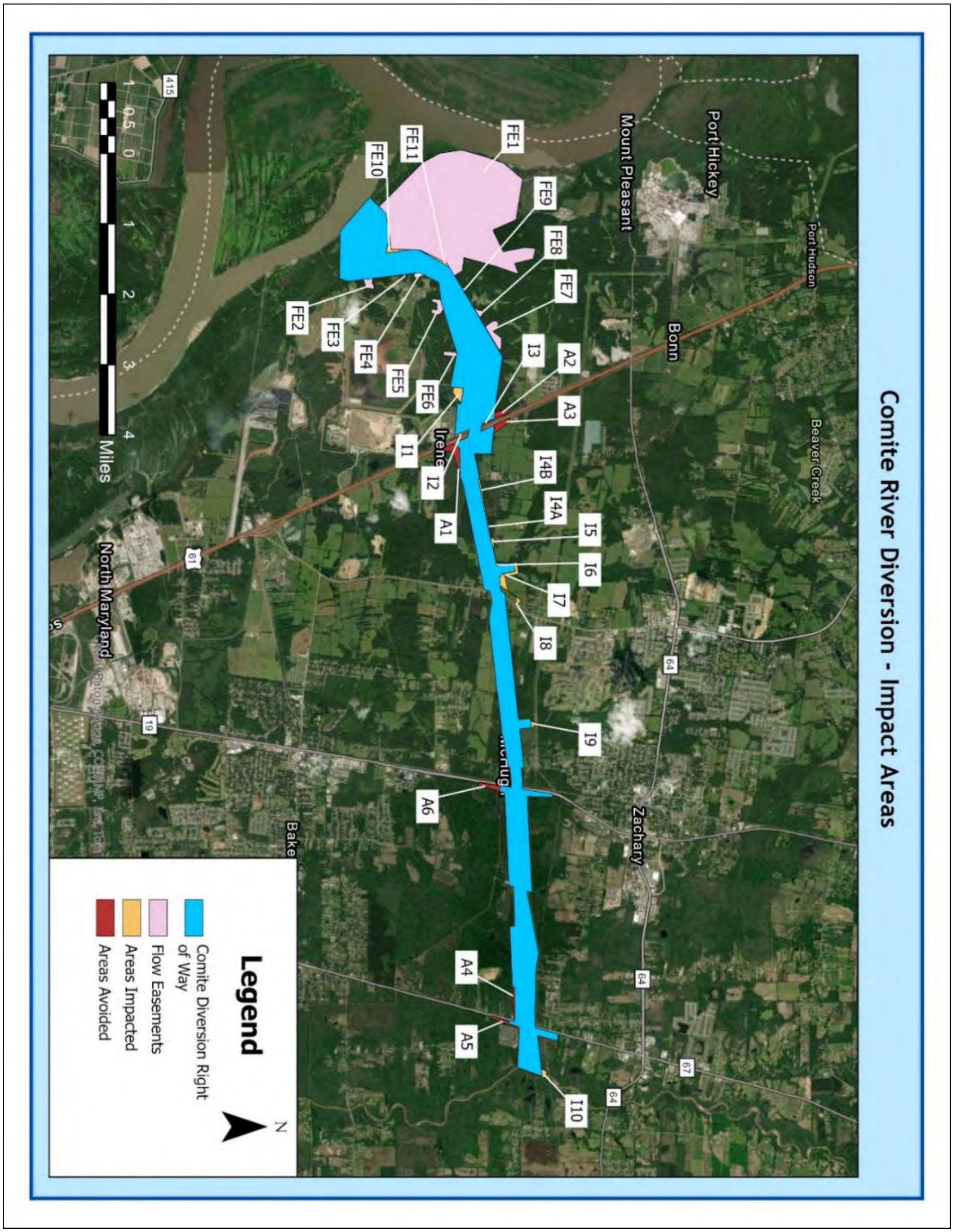

Figure 2: Project Specific Elements Evaluated in this Assessment

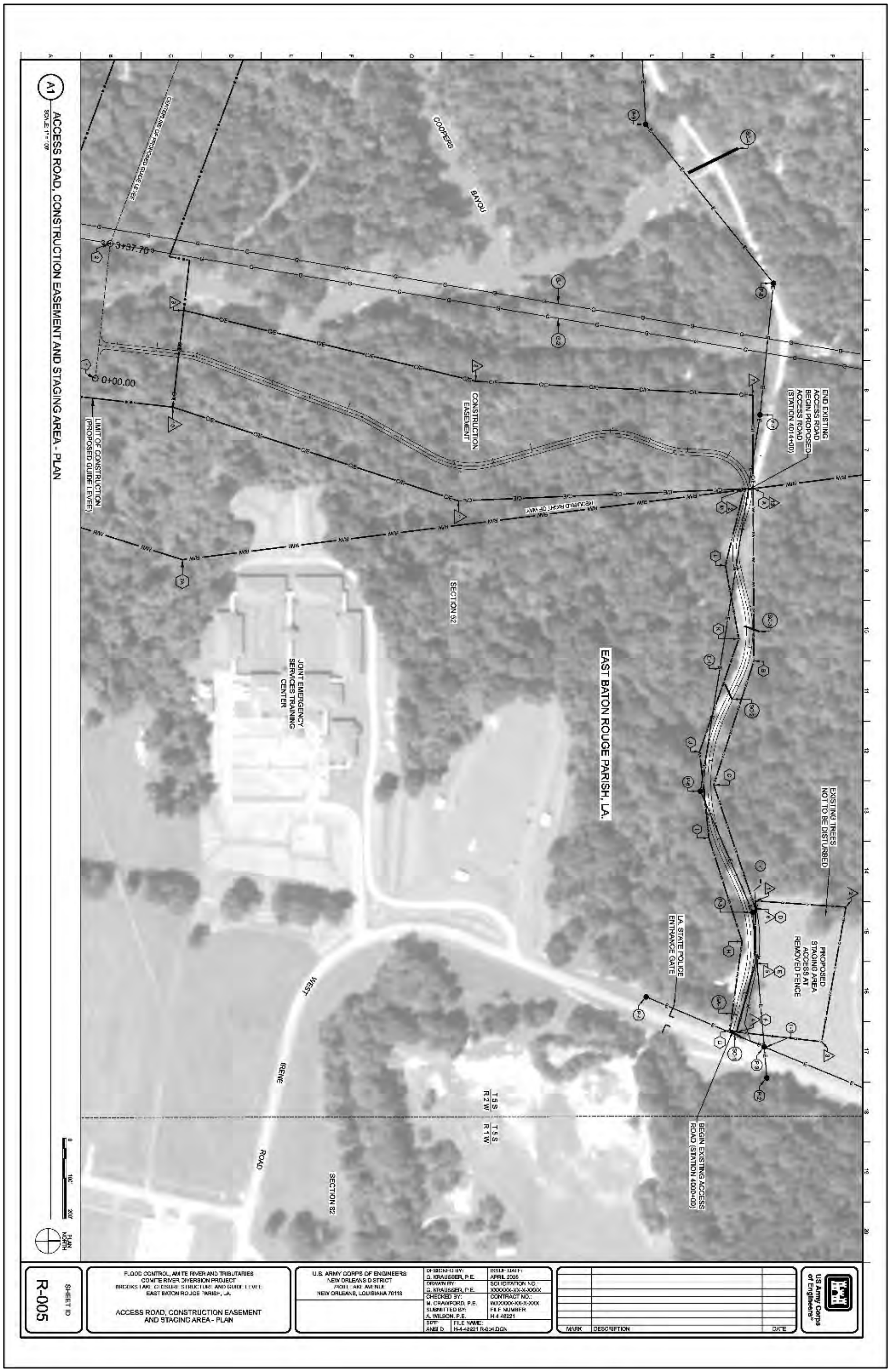

Figure 3: Proposed Road and Staging Area

3 AFFECTED ENVIRONMENT

3.1 Description of the Project Area

The Comite project is located in East Baton Rouge Parish, Louisiana, as indicated in Figure 4. The parish is composed of about 455 square miles of land and 15 square miles of water, and it is a mixture of developed and undeveloped land. Forested areas, wetlands, and other native habitats have been converted for agricultural use, urban/residential expansion, and industrial development, most rapidly over the past 30 years. The state capital of Baton Rouge, located in the western portion of the parish on the Mississippi River, is the second-largest city in Louisiana. It is the main residential center of the parish, and various industries and businesses are located within or nearby. Residences, farms, and smaller businesses are mostly located in the northern and eastern portions of the parish.

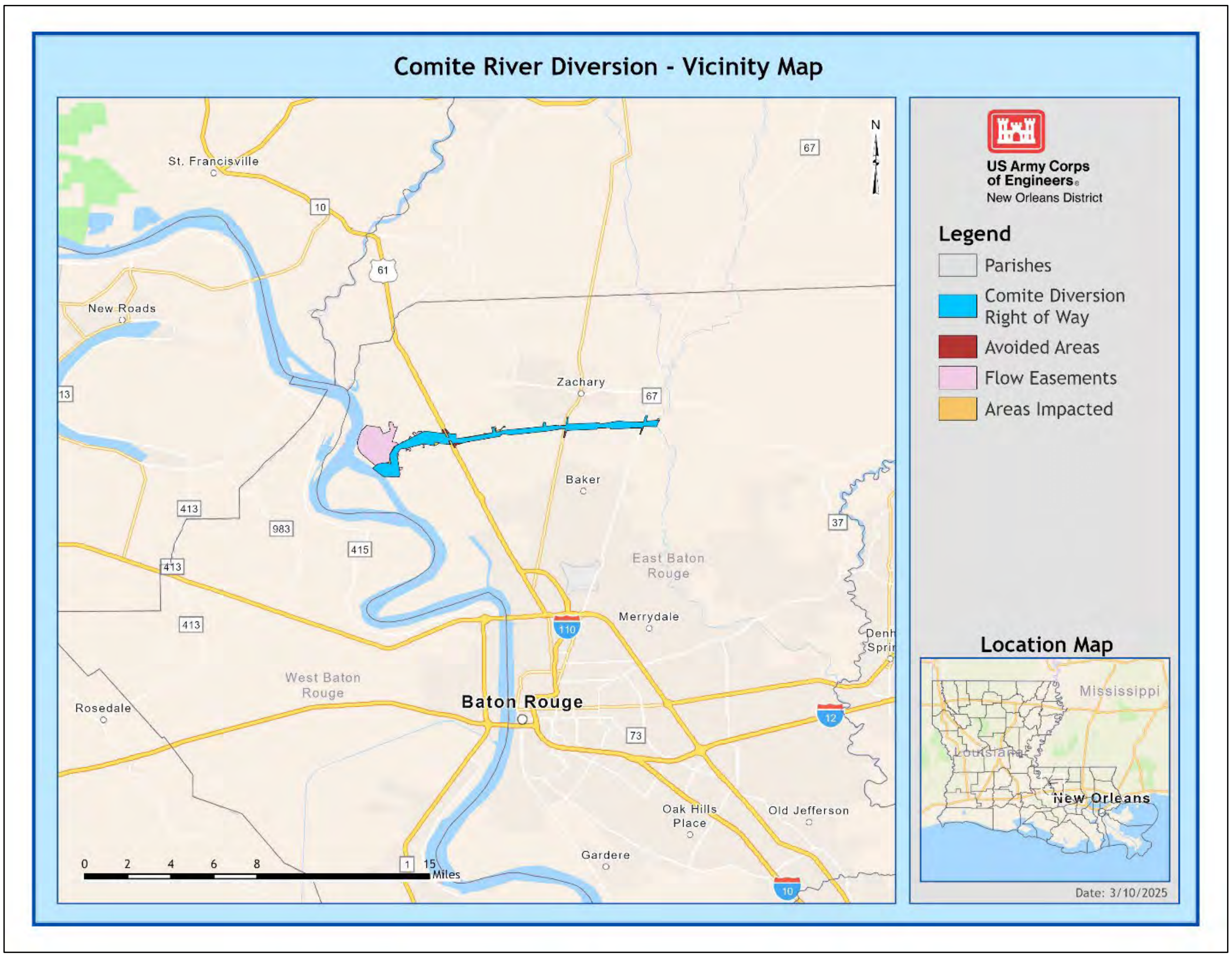

Figure 4: Project Vicinity Map

3.1.1 Description of the Watershed

A watershed is an area of land drained by a particular set of streams and rivers. There are 12 major watersheds within Louisiana (Figure 5). The Comite project lies mostly within the 4,700 square-mile Lake Pontchartrain Basin watershed, which encompasses 16 parishes within the southeastern portion of the state. A small portion of the project on its western end and Profit Island lie within the Mississippi River Basin. The Lake Pontchartrain Basin consists of a number of rivers that drain to Lake

Pontchartrain, Lake Maurepas, Lake Borgne, and Breton Sound. These water bodies form a shallow brackish receiving basin for fresh water from the Amite, Tickfaw, Blind, Tangipahoa, Tchefuncte, and Pearl Rivers, as well as Bayous Lacombe and Bonfouca. Fresh water is also introduced through regional drainage canals, while salt water enters the watershed from the Gulf of America via Mississippi Sound, and Chef and Rigolets Passes (Penland et al, 2002). The Mississippi Basin in the vicinity of the Comite Project is very narrow, consisting entirely of the lands and waters between the river levees or higher elevation land near the river. Lilly Bayou, which will be used to convey the floodwaters diverted from the Comite River to the Mississippi River, is one of the lowermost streams flowing into the Mississippi River. Just south of Lilly Bayou, White Bayou and Cypress Bayou are intercepted by the Baker Canal which carries part of their flows, along with the flow from Bayou Baton Rouge, into the Mississippi River.

Figure 5: Louisiana River Basins (LDEQ, 2007)

In Figure 5, the Lake Pontchartrain Basin Watershed is shown in yellow. The location of the Comite Diversion project is represented by a red star.

Urbanization is evident throughout the Lake Pontchartrain Basin watershed and has led to drastic changes in land use patterns and major impacts on important natural resources. In the western region of the basin, East Baton Rouge Parish has grown rapidly during the past 30 years. Extending eastward, rolling woodlands, bottomland hardwood forest, wetlands, and small farms have been converted to a suburban setting of houses, shopping centers and small businesses. Petrochemical plants, bulk cargo facilities, grain elevators, and refineries have turned the banks of the Mississippi River into an industrial corridor from Baton Rouge to New Orleans. Flanking the plants are subdivisions and commercial developments covering areas that were once utilized for agriculture (Penland et al, 2002).

3.1.2 Geology

The first stage in formation of the Lake Pontchartrain Basin began when sea level rise ended 3,000-4,000 years ago at the end of the Holocene Transgression. This was followed by the development of the Pine Island barrier shoreline trend, which resulted in the formation of Lake Maurepas and Lake Pontchartrain. The next stage in the formation of the Basin began when the St. Bernard delta complex of the Mississippi River Deltaic Plain built out of the alluvial valley onto the continental shelf about 3,000-4,000 years ago. The St. Bernard delta complex buried the Pine Island barrier island trend under a sequence of deltaic sediments. About 2,000 years ago, the Mississippi River abandoned the St. Bernard delta complex and diverted out of the Basin to a new location of the Lafourche delta complex. This stage in the development of the Basin saw the natural transgression of the St. Bernard delta complex, as coastal land loss began to occur, and the Chandeleur Islands started to form approximately 2,000 years ago. The Mississippi River moved back into the Basin about 1,000 years ago by diverting from the Lafourche delta complex to the Modern delta complex in the southern region of the Basin (Penland et al, 2002).

Soils within East Baton Rouge Parish predominately consist of loess-like soils with high silt content that were likely deposited by wind action. Areas along the Mississippi River consist of soils that developed from sands, silts, and clays deposited by the river (USDA, 1968).

3.1.3 Relevant Resources

The EIS associated with the Amite River and Tributaries Study, Feasibility Report on Comite River Basin and SEA #222 considered all relevant resources. This section updates the relevant resources that could be impacted by the proposed project modifications considered above. The important resources described are those recognized by laws, executive orders, regulations, and other standards of National, state, or regional agencies and organizations; technical or scientific agencies, groups, or individuals; and the general public. Table 1 provides summary information of the institutional, technical, and public importance of these resources.

A wide selection of resources were initially considered and determined not to be altered by the proposed project. They included: Socioeconomic Resources, Navigation, Water Bottoms and Essential Fish Habitat. Socioeconomic Resources were considered in the 1990 EIS and subsequent EA #222 and with no changes identified in association with the proposed action. The objectives of Executive Order 11988 (Floodplain Management) were considered; however, CEMVN has determined that floodplain impacts, if any, from the proposed action would be positive (i.e., improving the adjacent flood plain and associated habitats, and thus, maintaining their natural and beneficial values). Additionally, there is no practicable alternative for project construction outside the 100-year floodplain. Prime or unique farmlands, as defined by the Farmland Protection Policy Act, were identified and impacted in the original EIS; however, the areas under consideration in this document are forested bottomland hardwoods primarily in frequently flooded areas. Further, most of the effects are temporal inundation.

The following relevant resources are discussed in this report: wetlands and other terrestrial resources, aquatic resources/fisheries, wildlife, threatened and endangered species, water and sediment quality, air quality, cultural resources, recreational resources, and visual resources (aesthetics) shown in Table 1.

Table 1: Relevant Resources and Their Institutional, Technical, and Public Importance

Resource	Institutionally Important	Technically Important	Publicly Important
Wetlands & Other Terrestrial Resources	Clean Water Act of 1977, as amended; Executive Order 11990 of 1977, Protection of Wetlands; Coastal Zone Management Act of 1972, as amended; and the Estuary Protection Act of 1968., EO 11988, and Fish and Wildlife Coordination Act.	They provide necessary habitat for various species of plants, fish, and wildlife; they serve as ground water recharge areas; they provide storage areas for storm and flood waters; they serve as natural water filtration areas; they provide protection from wave action, erosion, and storm damage; and they provide various consumptive and non-consumptive recreational opportunities.	The high value the public places on the functions and values that wetlands provide. Environmental organizations and the public support the preservation of marshes.
Aquatic Resources/ Fisheries	Fish and Wildlife Coordination Act of 1958, as amended; Clean Water Act of 1977, as amended; Coastal Zone Management Act of 1972, as amended; and the Estuary Protection Act of 1968.	They are a critical element of many valuable freshwater and marine habitats; they are an indicator of the health of the various freshwater and marine habitats; and many species are important commercial resources.	The high priority that the public places on their esthetic, recreational, and commercial value.
Wildlife	Fish and Wildlife Coordination Act of 1958, as amended and the Migratory Bird Treaty Act of 1918	They are a critical element of many valuable aquatic and terrestrial habitats; they are an indicator of the health of various aquatic and terrestrial habitats; and many species are important commercial resources.	The high priority that the public places on their esthetic, recreational, and commercial value.
Threatened and Endangered Species	The Endangered Species Act of 1973, as amended; the Marine Mammal Protection Act of 1972; and the Bald Eagle Protection Act of 1940.	USACE, USFWS, NMFS, NRCS, EPA, LDWF, and DENR cooperate to protect these species. The status of such species provides an indication of the overall health of an ecosystem.	The public supports the preservation of rare or declining species and their habitats.
Cultural Resources	National Historic Preservation Act of 1966, as amended; the Native American Graves Protection and Repatriation Act of 1990; and the Archeological Resources Protection Act of 1979	State and Federal agencies document and protect sites. Their association or linkage to past events, to historically important persons, and to design and construction values; and for their ability to yield important information about prehistory and history.	Preservation groups and private individuals support protection and enhancement of historical resources.
Recreation Resources	Federal Water Project Recreation Act of 1965 as amended and Land and Water Conservation Fund Act of 1965 as amended	Provide high economic value of the local, state, and national economies.	Public makes high demands on recreational areas. There is a high value that the public places on fishing, hunting, and boating, as measured by the large number of fishing and hunting licenses sold in Louisiana; and the large per-capita number of recreational boat registrations in Louisiana.
Aesthetics	USACE ER 1105-2-100, and National Environmental Policy Act of 1969, the Coastal Barrier Resources Act of 1990, Louisiana's National and Scenic Rivers Act of 1988, and the National and Local Scenic Byway Program.	Visual accessibility to unique combinations of geological, botanical, and cultural features that may be an asset to a study area. State and Federal agencies recognize the value of beaches and shore dunes.	Environmental organizations and the public support the preservation of natural pleasing vistas.
Air Quality	Clean Air Act of 1963, Louisiana Environmental Quality Act of 1983.	State and Federal agencies recognize the status of ambient air quality in relation to the NAAQS.	Virtually all citizens express a desire for clean air.
Water Quality	Clean Water Act of 1977, Fish and Wildlife Coordination Act, Coastal Zone Mgt Act of 1972, and Louisiana State & Local Coastal Resources Act of 1978.	USACE, USFWS, NMFS, NRCS, EPA, and State DNR and wildlife/fishery offices recognize value of fisheries and good water quality and the national and state standards established to assess water quality.	Environmental organizations and the public support the preservation of water quality and fishery resources and the desire for clean drinking water.

3.1.4 Wetlands and Other Terrestrial Resources

3.1.4.1 Existing Conditions

The project area is primarily composed of wet bottomland hardwood (BLH) forest and swamp habitat. Intact tracts of BLH forest habitat are throughout the work area. These habitats are characterized by a mix of deciduous and evergreen vegetation often grouped into particular species associations based upon the hydrology and topography of the area. BLH forests provide all basic ecosystem services of a typical wetland (Smith et al. 1995). Hydrologically, these forested areas act to store ground water, maintain surface water, and aid in flood and storm protection by acting as natural "sponges." Biogeochemically, these forested areas provide numerous valued services such as carbon sequestration, nutrient detention, and natural nonpoint source pollution mitigation.

Most of the habitat within the action area is wet BLH habitat. However, the non-wet BLH present within this area more or less serve the same habitat function with similar value, so they were not separated from the wet BLH. Dominant species observed within the area include green ash (*Fraxinus pennsylvanica*), black willow (*Salix nigra*), red maple (*Acer rubrum*), American sycamore (*Platanus occidentalis*), boxelder (*Acer negundo*), swamp tupelo (*Nyssa biflora*), bald cypress (*Taxodium distichum*), sugarberry (*Celtis laevigata*), Chinese tallow (*Triadica sebifera*), common buttonbush (*Cephalanthus occidentalis*), water locust (*Gleditsia aquatica*), lizard's tail (*Saururus cernuus*), little duckweed (*Lemna obscura*), and water hyacinth (*Elchhornia crassipes*). These habitats are frequently flooded and typically are intermixed with aquatic habitat, which is discussed in the following section.

Evaluations of the effects to terrestrial habitats were conducted using the Wetland Value Assessment (WVA) methodology. Implementation of the WVA requires that habitat quality and quantity (acreage) are measured for baseline conditions and predicted for future without-project and future with-project conditions. Each WVA model utilizes an assemblage of variables considered important to the suitability of that habitat type to support a diversity of fish and wildlife species.

The WVA provides a quantitative estimate of project-related impacts to fish and wildlife resources; however, the WVA is based on separate models for wet bottomland hardwood (BLH), chenier/coastal ridge, fresh/intermediate marsh, brackish marsh, and saline marsh. Although, the WVA may not include every environmental or behavioral variable that could limit populations below their habitat potential, it is widely acknowledged to provide a cost-effective means of assessing restoration measures in wetland communities. WVAs were prepared for the areas impacted and are discussed in Section 4.

3.1.5 Aquatic Resources/Fisheries

3.1.5.1 Existing Conditions

The proposed action encompasses two distinct watersheds. Their aquatic resources differ somewhat since the Mississippi River is a highly turbid alluvial river and the Comite River is a generally clear river running though the Pleistocene Terrace. Lilly Bayou, Cooper Bayou, Bayou Baton Rouge, and Cypress Bayou are part of the Mississippi River Watershed. White Bayou was traditionally a tributary the Comite River; however, local drainage improvements have already diverted much of White Bayou drainage to the Mississippi River Watershed. For the purposes of this assessment, the Comite River system was evaluated as part of the Mississippi River Basin. This is because of several reasons: the similarity of species compositions between the two watersheds; the authorized Comite Diversion Project is part of existing conditions that authorized diversion of water from the Comite River to the Mississippi River; and the water entering the authorized project boundaries would drain to the Mississippi River. The Comite River will continue to flow towards Lake Pontchartrain during normal conditions. Under these normal flow conditions, only the riprap placed along the Comite River would have contact with the water flowing past the Diversion Project.

The Mississippi River plays an important role in the distribution of fishes across the state because it provides suitable habitat for many species. The Mississippi River supports one of the most diverse fisheries in the world with at least 183 species of freshwater fish in the Mississippi River Delta. There are three species of mussels, and 13 species of crawfish found within the Mississippi Basin in Louisiana. Data suggests that fish in the lower Mississippi River have non-random depth distributions that vary seasonally and according to species. Species richness was highest in shallow water, with about 50 percent of the species no longer collected in water deeper than 8 meters and about 75 percent no longer collected in water deeper than 12 meters. Several factors could be involved in influencing this pattern, including low illumination, increased water pressure, and habitat organization (Miranda and Killgore 2013). Shovelnose sturgeon, Pallid sturgeon, Flathead catfish, blue catfish, Channel catfish, Freshwater drum, Paddlefish, Goldeye, Gizzard shad, Threadfin shad, Channel shiner, Silverband shiner, Silver chub, Speckled chub, River carpsucker, Stonecat, and Sauger are among the most common fish species in the river.

The State Management Plan for Aquatic Invasive Species in Louisiana (2005) identifies several established finfish and mollusks within the state (Tulane and Xavier 2005). The management plan focuses not on all invasive species in Louisiana, but on those inhabiting aquatic environments and those spread via aquatic pathways. Established finfish include Rio Grande cichlid (*Cichlasoma cyanoguttatum*), common carp (*Cyprinus carpio*), grass carp (*Ctenopharyngodon idella*), silver carp (*Hypophthalmichthys molitrix*), and bighead carp (*Hypophthalmichthys nobilis*). The network of interconnected waterways within the state makes it easy for fish to relocate, constantly changing their ranges. Two mollusks are known as invasive in Louisiana, the zebra mussel (*Dreissena polymorpha*) and the Asian clam (*Corbicula fluminea*). These species are predominantly freshwater mollusks, and, in general, are confined to river drainages. Zebra mussels and Asian clams are established in the three largest rivers in Louisiana (Mississippi, Red, and Atchafalaya) and therefore, are considered extensively established. (Tulane and Xavier 2005). The area is a highly turbid, dynamic riverine environment on the largest river in North America. Portions of the area being evaluated are currently inundated during Mississippi River high water events. Those areas would continue to be inundated with no reduction in inundation. The proposed action would result in an increased frequency of inundation for portions of the evaluation area.

An amendment to the Magnuson-Stevens Act in 1996 strengthened the ability of the National Marine Fisheries Service (NMFS) and associated councils to protect and conserve the habitat of certain marine, estuarine, and anadromous finfish, mollusks, and crustaceans. These specific habitats have been deemed Essential Fish Habitat (EFH). EFH can be broadly defined as “those waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity.” All species managed under this authority are marine species preferring salt water for most of their life cycle. The Mississippi River and other waterways considered in this evaluation are fresh water with no suitable habitat for marine species managed by NMFS.

3.1.6 Wildlife

3.1.6.1 Existing Conditions

The area contains a variety of birds, mammals, and other wildlife. Both migratory and resident birds occur in or near the project area. Common birds include ibis (*Plegadis spp.; Eudocimus albus*), egrets (*Ardea alba; Egretta thula*), cormorants (*Phalacrocorax spp*.), herons (*Ardea herodias; Egretta spp.*; (*Nycticorax spp*.), hawks (*Accipiter spp.; Buteo spp*.), kestrels (*Falco sparverius*), vultures (*Coragyps atratus; Cathartes aura*), and several species of swallows, flycatchers, wrens, warblers, and sparrows. Wintering migratory waterfowl using the surrounding areas include gadwalls (*Anas strepera*), pintails (*Anas acuta*), mallards (*Anas platyrhynchos*), blue-winged teal (*Anas discors*), green-winged teal (*Anas crecca*), shovelers (*Anas clypeata*), coot (*Fulica americana*), redheads (*Aythya americana*), lesser scaup (*Aythya affinis*), mergansers (*Mergus spp*.; *Lophodytes cucullatus*), wigeons (*Anas* *americana*), canvasbacks (*Aythya valisineria*), and some black ducks (Anas rubripes). Grebes (*Podilymbus podiceps; Podiceps spp*.) and loons (*Gavia immer*) are nongame migratory waterfowl wintering in the area, and the common snipe (*Gallinago gallinago*) is the only game species of shorebird wintering in the area.

Mammals using the habitat include numerous furbearers such as nutria, muskrat, swamp rabbit, mink (*Mustela vison*), river otter (*Lontra canadensis*), raccoons, and white-tailed deer. Portions of the area provides habitat for salamanders, toads, frogs, turtles, and several species of venomous and nonvenomous snakes. The American alligator (*Alligator mississippiensis*) is abundant and is caught commercially for its hide and meat.

Numerous terrestrial invertebrates are found throughout the project area. The most notable are insects, which often serve as vectors, transmitting disease organisms to higher animals including man. Mosquitoes are the most important of the vectors in the area, although other groups such as deer flies, horseflies, and biting midges are also considered vectors. The area provides suitable breeding habitat for such species as the salt-marsh mosquitoes (*Aedes sollicitans and Culex salinarius*) and other species of mosquitoes, which carry the West Nile virus, which has recently caused illness and death of both animals and humans in Louisiana.

3.1.7 Threatened, Endangered, and Protected Species

3.1.7.1 Existing Conditions

Sections 3.2.4.1.1 through 3.2.4.1.4 describe the listed and proposed threatened and endangered species that may be present within the proposed project area.

3.1.7.2 Pallid Sturgeon (listed)

The pallid sturgeon (*Scaphirhynchus albus*) is an endangered, bottom-oriented, fish that inhabits large river systems from Montana to Louisiana. Within this range, pallid sturgeons tend to select main channel habitats in the Mississippi River and main channel areas with islands or sand bars in the upper Missouri River. In Louisiana it occurs in the Atchafalaya and Mississippi Rivers, and below Lock and Dam Number 3 on the Red River. The pallid sturgeon is adapted to large, free flowing, turbid rivers with a diverse assemblage of physical characteristics that are in a constant state of change.

3.1.7.3 Tricolored Bat (proposed)

The Tricolored bat (*Perimyotis subflavus*) is a proposed endangered species that is facing extinction due primarily to the rangewide impacts of white-nose syndrome, a deadly disease affecting cave-dwelling bats across the continent. The species is wide ranging across eastern and central United States and are often found in caves and abandoned mines. In the southern United States, including Louisiana, where caves are sparse, tricolored bats are often found roosting in roast-associated culverts where they exhibit shorter torpor bouts and forage during warm nights. During the spring, summer, and fall tricolored bats are found in forested habitats where they roost in trees, primarily among leaves of live or recently dead deciduous hardwood trees, but they may also be found in Spanish Moss, pine trees, and occasionally human structures. Tricolored Bats may occur within the project vicinity.

3.1.7.4 Alligator Snapping Turtle (proposed)

The Alligator Snapping turtle (*Macrochelys temminckii*) is a proposed threatened species that is commonly found in Louisiana. They often live in swamps with rivers close by but are mainly found in large rivers, canals, lakes, and oxbows. Given the proximity of the proposed action to the Mississippi River, Comite River, and Cooper Bayou, Alligator Snapping Turtles could be within or traverse the proposed project area.

3.1.7.5 Monarch Butterfly (proposed)

The Monarch Butterfly (*Danaus plexippus*) is a proposed threatened species that is found in Louisiana. Monarch butterflies prefer areas that are rich and abundant in high-nectar forbs, as adult monarchs feed on the nectar of many flowers during breeding and migration. However, they only lay eggs on milkweed plants as that is the only food the caterpillars can eat. For overwintering monarchs, habitat with a specific microclimate is needed for protection from the elements, as well as moderate temperatures to avoid freezing. For the eastern North American population, most monarchs overwinter in oyamel fir tree roosts located in mountainous regions of central Mexico, at an elevation of about 8,000 to nearly 12,000 feet. The habitat of the proposed project area is not the preferred habitat for the Monarch Butterfly. No significant abundance of milkweed has been identified within the proposed project area. Most of the area impacted has a significant overstory with limited opportunities for growth of flowering plants. However, portions of the proposed action area likely contain flowering plants during portions of the year. Therefore, USACE cannot rule out presence of feeding Monarch Butterfly within the project area. Also, it is likely that the Monarch Buttery transit the area at various times of the year.

No designated critical habitat was identified inside the project area.

3.1.8 Water and Sediment Quality

3.1.8.1 Existing Conditions

The Comite River has been categorized as an effluent-limited stream, which, by definition is any stream segment in which the best practicable treatment levels for point source discharges are required to maintain the stream's standards. As part of its surface water quality monitoring program, the Louisiana Department of Environmental Quality (LDEQ) routinely monitors 25 parameters on a monthly or bimonthly basis using a fixed station, long-term network (Monitored Assessments) (LDEQ 2024). Based upon those data and the use of less-continuous information (Evaluated Assessments), such as fish tissue contaminants data, complaint investigations, and spill reports, the LDEQ has assessed water quality fitness for the following uses: primary contact recreation (swimming), secondary contact recreation (boating, fishing), fish and wildlife propagation, drinking water supply and shellfish propagation (LDEQ 2024). Based upon existing data and more subjective information, water quality is determined to either fully, partially, or not support those uses. A designation of “threatened” is used for waters that fully support their designated uses but that may not fully support certain uses in the future because of anticipated sources or adverse trends in pollution.

The designations for the Comite River and Mississippi River are mentioned in the LDEQ “2024 Louisiana Water Quality Inventory: Integrated Report,” in Table 3-2. The smaller bayous and streams within the project area are not specifically mentioned in the Louisiana Water Quality Inventory but are expected to be similar to the specified river segments above.

Table 2: LDEQ Integrated Report Summary

2024 Integrated Report of Water Quality in Louisiana
March 28, 2024

Subsegment Number	Subsegment Description	Water Body Type	Size	Designated Water Body Uses: PCR	SCR	FWP	DWS	ONR	OYS	AGR	LAL	Impaired Use for Suspected Cause	Suspected Causes of Impairment	IR Category for Suspected Causes	TMDL Priority	Suspected Sources of Impairment
LA040102_00	Comite River-From Wilson-Clinton Highway to White Bayou (Scenic)	R	38	N	F	N		N				FWP	TURBIDITY	IRC 5RC	L	SILVICULTURE ACTIVITIES; SITE CLEARANCE (LAND DEVELOPMENT OR REDEVELOPMENT)
LA070201_00	Mississippi River-From Old River Control Structure to Monte Sano Bayou	R	84.4	F	F	F	N					DWS	1,2-DICHLOROETHANE	IRC 5	L	SOURCE UNKNOWN

Water Body Types: R = Rivers

Designated Use Descriptions:
PCR = Primary Contact Recreation (swimming)
SCR = Secondary Contact Recreation (boating)
FWP = Fish and Wildlife Propagation (fishing)
DWS = Drinking Water Supply
ONR = Outstanding Natural Resource
OYS = Oyster Propagation
AGR = Agriculture
LAL = Limited Aquatic Life and Wildlife

Use Support Codes for Designated Uses: F = Fully supporting designated use
N = Not supporting designated use
I = Insufficient data to make reliable determination

IR Category for Suspected Causes: IRC 5 = 303(d) List
IRC 5-Alt = 303(d) List but LDEQ will implement alternative corrective strategies
IRC 5RC = 303(d) List but criteria revisions (Revise Criteria (RC)) are planned
IRC 4a = TMDL completed
IRC 4b = Other corrective actions in place
IRC 3 = Insufficient data for subsegment to make a reliable determination
IRC 2 = Insufficient data for designated use to make a reliable determination
IRC 1 = No impairment, fully supporting all uses

Source: https://deq.louisiana.gov/page/2024-Water-Quality-Integrated-Report

3.1.9 Air Quality

3.1.9.1 Existing Conditions

The U.S. Environmental Protection Agency (USEPA) Office of Air Quality Planning and Standards has set National Ambient Air Quality Standards (NAAQS) for six principal pollutants, called "criteria" pollutants. They are carbon monoxide, nitrogen dioxide, ozone, lead, particulates of 10 microns or less in size (PM-10 and PM-2.5), and sulfur dioxide. Ozone is the only parameter not directly emitted into the air but forms in the atmosphere when three atoms of oxygen (O_3) are combined by a chemical reaction between oxides of nitrogen (NOx) and volatile organic compounds (VOC) in the presence of sunlight. Motor vehicle exhaust and industrial emissions, gasoline vapors, and chemical solvents are some of the major sources of NOx and VOC, also known as ozone precursors. Strong sunlight and hot weather can cause ground-level ozone to form in harmful concentrations in the air. The Clean Air Act General Conformity Rule (58 FR 63214, November 30, 1993, Final Rule, Determining Conformity of General Federal Actions to State or Federal Implementation Plans) dictates that a conformity review be performed when a federal action generates air pollutants in a region that has been designated a non-attainment or maintenance area for one or more NAAQS. A conformity assessment would require quantifying the direct and indirect emissions of criteria pollutants caused by the Federal action to determine whether the proposed action conforms to Clean Air Act requirements and any State Implementation Plan (SIP). The primary and secondary standards are presented in Table 3.

Table 3: Primary and Secondary NAAQS for the Seven Contaminants Established by USEPA

National Ambient Air Quality Standards [3][4]				
	Primary Standard		Secondary Standard	
Criteria Pollutant	**Concentration Limit**	**Averaging Time**	**Concentration Limit**	**Averaging Time**
Carbon monoxide	9 ppmv (10 mg/m^3)	8-hour (1)	None	
	35 ppmv (40 mg/m^3)	1-hour (1)		
Sulfur dioxide	0.03 ppmv (80 $\mu g/m^3$)	Annual (arithmetic mean)	0.5 ppmv (1300 $\mu g/m^3$)	3-hour (1)
	0.14 ppmv (365 $\mu g/m^3$	24-hour (1)		
Nitrogen dioxide	0.053 ppmv (100 $\mu g/m^3$)	Annual (arithmetic mean)	Same as primary	
Ozone	0.075 ppmv (150 $\mu g/m^3$)	8-hour (2)	Same as primary	
	0.12 ppmv (235 $\mu g/m^3$)	1-hour (3)	Same as primary	
Lead	0.15 $\mu g/m^3$	Rolling 3-month average	Same as primary	
	1.5 $\mu g/m^3$	Quarterly average	Same as primary	
Particulate Matter (PM_{10})	150 $\mu g/m^3$	24-hour (4)	Same as primary	
Particulate Matter ($PM_{2.5}$)	15 $\mu g/m^3$	Annual (5) (arithmetic mean)	Same as primary	
	35 $\mu g/m^3$	24-hour (6)	Same as primary	

(1) Not to be exceeded more than once per year.
(2) The 3-year average of the fourth-highest daily maximum 8-hour average at each monitor within the area over each year must not exceed 0.075 ppmv.
(3a) The expected number of days per calendar year with maximum hourly averages above 0.12 ppm must be equal to or less than 1.
(3b) As of June 15, 2007, the U.S. EPA revoked the 1-hour ozone standard in all areas except for certain parts of 10 states.
(4) Not to be exceeded more than once per year on average over 3 years.
(5) The 3-year average of the weighted annual mean $PM_{2.5}$ concentrations from single or multiple community-oriented monitors must not exceed 15 $\mu g/m^3$.
(6) The 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within the area must not exceed 35.5 $\mu g/m^3$.

Effective December 15, 2016, East Baton Rouge Parish was designated by the USEPA as a nonattainment, or maintenance area, for ozone under the 8-hour standard. This classification is the result of area-wide air quality modeling studies, and the information is readily available from LDEQ, Office of Environmental Assessment and Environmental Services.

The general conformity rule was designed to ensure that Federal actions do not impede local efforts to control air pollution. It is called a conformity rule because Federal agencies are required to demonstrate that their actions “conform with” (i.e., do not undermine) the approved SIP for their geographic area. The purpose of conformity is to (1) ensure Federal activities do not interfere with the air quality budgets in the SIPs, (2) ensure actions do not cause or contribute to new violations, and (3) ensure attainment and maintenance of the NAAQS.

Federal activities proposed in East Baton Rouge Parish may be subject to the State’s general conformity regulations as promulgated under LAC 33:III.14.A, Determining Conformity of General Federal Actions to State or Federal Implementation Plans. A general conformity applicability determination is made by estimating the total amount of direct and indirect VOC and NOx emissions caused by the construction of the work. Prescribed de minimis levels of 100 tons per year per pollutant are applicable in East Baton Rouge Parish. Projects that would result in discharges below the de minimis level are exempt from further consultation and development of mitigation plans for reducing emissions.

3.1.10 Cultural Resources

3.1.10.1 Existing Conditions

The geographic region of the Comite River Diversion is rich with locations of cultural resources. Within the “Florida Parishes” of which East Baton Rouge Parish is a part, prehistoric sites as early as 12,000 B.P. and as recent as 300 B.P. have been documented (Markell et al. 1997). The earliest known contact between Europeans and the aboriginal populations in Louisiana was during the 1539 – 1543 expedition of Hernando de Soto. The early historic Native Americans practiced agricultural, gathering of wild resources, and hunting and fishing. Villages existed and included mounds that still exist today. The linguistic group closest to the modern Comite Diversion corridor were the Tunican, who resided near Angola, Louisiana and are a numerous active Tribe still today.

Although unpopulated by Europeans, the Comite project corridor lay in territory claimed by France until 1763, when the French relinquished their title to Britain. In 1783 at the conclusion of the American Revolution, the British in turn surrendered the territory to Spain, and permanent settlement of the area began (Markell et al. 1997). During the Antebellum Era, the project area was populated primarily by British or Scots Irish settlers. The economy depended heavily on agriculture and eventually dairying. Among the settlers was James Penny, and his property (16EBR117) has recently received a Phase III excavation (Heller et al. 2024). After disruptions of the Civil War, the area returned to agriculture and a lumbering industry began which in turn brought railroads. In more recent times, agriculture has continued alongside other means of lifestyle typical of diverse lifeways present in settlements and life today.

Many years of development and planning have been involved with the Comite River Diversion, and during this time numerous cultural resource surveys have included the Rights-of-Way for the Comite Diversion. Numerous cultural resources have been recorded, a relatively few of them being considered eligible for the National Register of Historic Places (NRHP). Per the National Historic Preservation Act (NHPA), these historic properties have been avoided or mitigated through actions undertaken pursuant to earlier NEPA documents and NHPA coordination.

The Areas of Potential Effect (APE) defined by the actions narrated within this EA are from two primary type of actions: Flowage Easements and Impact Areas. Flowage Easements are real estate instruments that compensate landowners for allowing water to flow over their properties. In this case, easements would be necessary for some adjacent low terrain properties that naturally hold water and would do so at times when the Comite River Diversion is being used. These areas have low potential either to contain intact cultural resources that have not previously been recorded or to damage intact unknown cultural resources via the ponding or flowing of water. Impact Areas may see more obvious destructive potential via use of large, mechanized equipment or excavation. These areas have received Phase I cultural resources survey to document any cultural resources that may exist. No Historic Properties exist within the area of potential effects for the actions proposed by this EA. Site 16EBR220 is a historic cemetery located adjacent to proposed actions, but USACE determined that it would not be affected. This determination was coordinated with LA SHPO and federally recognized Tribes

3.1.11 Recreational Resources

3.1.11.1 Existing Conditions

This resource is institutionally important because of the Federal Water Project Recreation Act of 1965, as amended and the Land and Water Conservation Fund Act of 1965, as amended. Recreational resources are technically important because of the high economic value recreational activities contribute to local, state, and National economies. Recreation resources are publicly important because of the high value that the public places on fishing, hunting, and boating, as measured by the large number of fishing and hunting licenses sold in Louisiana and the large per-capita number of recreational boat registrations in Louisiana.

Tables 4 through 6 show the number of fishing licenses, hunting licenses, and boat registrations, respectively, in the vicinity of the study area. The fishing and hunting license and boat registration data are provided by the Louisiana Department of Wildlife and Fisheries (https://www.wlf.louisiana.gov/page/recreational-fishing-licenses-and-permits).

Table 4: Fishing Licenses Sold in the Vicinity of the Project Area – Fiscal Year 2019

Parish	Resident Freshwater	Resident Saltwater	Non-resident Freshwater	Non-resident Saltwater
East Baton Rouge	17,316	11,269	122	91
State / Parish Average	5,059	3,100	26	19

Table 5: Hunting Licenses Sold in the Vicinity of the Project Area – Fiscal Year 2019

Parish	Resident	Non-resident	Resident Duck Only	Non-resident Duck Only
East Baton Rouge	4,923	13	1,933	3
State / Parish Average	2,043	3	683	2

Table 6: Active Boat Registrations in the Vicinity of the Project Area – Fiscal Year 2019

Parish	Boat Registrations
East Baton Rouge	14,533
State / Parish Average	4,790

Of the many heavily pursued recreational activities within the larger parish area, the most significant are hunting and fishing. Recreational fishing is by far the most popular and heavily pursued activity in the vicinity of the proposed Comite River Diversion study area. Most of the fishing that occurs in the study area is by boat. Hunting for small game is a prevalent activity. A wide range of species and habitat types are available, however most of this occurs on privately held land. Big game hunting for whitetail deer is relegated to the more productive habitat such as bottomland hardwood areas away from residences or businesses. The areas used for hunting and fishing between Airline Highway and the Mississippi River are heavily used as river levels allow. With the current Comite Diversion Project, areas are intermittently affected by water levels that enter the diversion from the Comite River and empty into the Mississippi River. There are active hunting camps in the area and hunters and fisherman use this area as a launching point to access Profit Island which is popular island in the Mississippi River used for hunting and fishing. The island is currently leased by a 12-member hunting club. During times of high Mississippi River events and use of the Comite Diversion Channel, access to these camps can be temporarily inaccessible.

3.1.12 Visual Resources (Aesthetics)

3.1.12.1 Existing Conditions

This resource is institutionally important because of the laws and policies that affect visual resources, most notably the 1969 NEPA. Visual resources are publicly and technically important because of the high value placed on the preservation of unique natural and cultural landscapes.

The current Comite River Diversion project runs from the Comite River and empties into the Mississippi River through a series of channels, chutes, and control structures. The Comite River is the only state designated scenic river in the region. The Louisiana Department of Wildlife and Fisheries (LDWF) Scenic Rivers Program preserves, protects, develops, reclaims, and enhances the wilderness qualities, scenic beauties, and ecological regimes of designated free-flowing Louisiana rivers, streams, bayous, and segments thereof. While the Comite River is protected under this designation, it falls under an exemption from certain provisions (R.S 56:1855(P(1)) to allow project features to be built for channelization, clearing and snagging, channel realignment, reservoir construction, or dredging operations for drainage purposes in the Comite River. Most of the portions surrounding the diversion project are a combination of forests and open fields with little development. Most of the public visual access is obtained from the public roadways that cross the diversion at multiple locations. One of these crossings is the Great River Road National Scenic Byway, Hwy 61, which provides the primary source of visual access on the west side of the project area and adjoining lands. The land between Hwy 61 and the Mississippi River consists of bottomland hardwood and swamp where much of the inundation occurs. These areas have the greatest chance of intermittent inundation by seasonal river levels and are located on privately leased or owned lands. Public visual access to these areas is obtained from watercraft only.

4 ENVIRONMENTAL CONSEQUENCES

This section describes the environmental consequences of the No Action Alternative (Future Without-Project Conditions; FWOP) and the Proposed Action Alternative (Future Conditions with the Proposed Action; FWP). Indirect and direct impacts are discussed for each scenario and resource section below. Cumulative effects are discussed in Section 4.10. A summary of the finding is found in Table 7.

Table 7: Relevant Resources in and Near the Project Area

Relevant Resource	Impacted	Not Impacted
Wetlands & Other Terrestrial Resources	X	
Aquatic	X	
Wildlife	X	
Threatened and Endangered Species	X	
Water Quality	X	
Air Quality	X	
Cultural[1]		X
Recreational		X
Visual		X
HTRW[2]		X
Noise	X	

[1]Although not impacted, cultural resources are addressed to comply with the National Historic Preservation Act.

[2]Hazardous, Toxic, and Radioactive Waste. Although the area has been determined to have a low probability of containing HTRW, it is assessed in this document to comply with USACE policy.

4.1 Wetland and Other Terrestrial Resources

Future Conditions with No Action

Without implementation of the proposed action, wetlands and other terrestrial resources in the project vicinity would continue to be impacted by existing natural and anthropogenic factors. The anthropogenic factors include the currently authorized Comite Diversion Project, which is currently being constructed. However, without implementation of the proposed action, adequate mitigation and real estate interest would not be addressed, which would not be in compliance with NEPA, the CWA, the FWCA and the USACE Implementation Guidance for Section 2036(a) of the WRDA 2007, Mitigation for Fish and Wildlife and Wetlands Losses, and Appendix C to Engineer Regulation 1105-2-100. Further, most of the flowage easement areas are currently flooded during high Mississippi River Events, which would continue.

Future Conditions with the Proposed Action

Minor project modifications during construction resulted in additional impacts not considered in the original project NEPA assessments. There would be approximately 27.5 acres of additional impact (19.73 AAHUs) to BLH. Another 10 acres of impacts occurred in overgrown fields; however, most of the overstory in this area is Chinese Tallow (an invasive species). Another 4 acres of impacts were to pine plantation providing limited habitat value. Finally, there is approximately 2.5 acres of impacts that occurred within a mowed lawn and field with little habitat value.

Conversely, minor project modifications resulted in avoidance of approximately 51.3 acres of which 25.9 acres were BLH. Pine plantation composed 16.6 acres and 8.8 acres is a mowed field. WVA conducted on the 25.9 acres of BLH generated 16.06 AAHUs. Those 16.06 AAHUs would be used to offset mitigation requirements of the above additional impacts. Of the 51.3 acres, approximately 9.3 acres are likely wetlands based off USGS hydric soils maps. Section 5 contains additional details on mitigation.

Use of the existing road for access will not require any alteration to that road and impacts from the movements of equipment and vehicles along the road would be confined to the existing cleared right-of-way. Construction of the new road would require clearing of trees and surface grading for the road. Use of the existing mowed field for a staging area for construction activities will not require modification of the existing field. Conditions at the field would be expected to return to pre-project conditions after conclusion of the construction activities.

New hydraulic modeling indicated that an additional 1,234 acres of BLH could be inundated once the Diversion Project becomes operational. Therefore, flowage easements would be secured for those properties by the local sponsor. The new modeling was utilized in preparation of the WVAs to calculate the changes to hydrology within these areas. The majority of these areas are already adapted to frequently flooding due to their proximity to the Mississippi River. No significant changes are expected, but the increased frequency of flooding would have some effects to the areas, which is indicated by the WVAs. The modeling indicates a reduction of 62.47 AAHUs is likely to occur over the 50-year project life. Of the 1,234 acres, approximately 932 acres are likely wetlands based off USGS hydric soils maps. Mitigation for these effects is discussed in Section 5.

4.2 Aquatic Resources/Fisheries

Future Conditions with No Action

Without implementation of the proposed action, effects identified in the previous NEPA document would remain the existing conditions. However, these effects would not be adequately mitigated and would not be in compliance with NEPA, the CWA, the FWCA, and the USACE Implementation Guidance for Section 2036(a) of the WRDA 2007, Mitigation for Fish and Wildlife and Wetlands Losses, and Appendix C to Engineer Regulation 1105-2-100.

Future Conditions with the Proposed Action

This evaluation is only considering potential effects from the proposed action. Overall potential project effects were addressed in previous NEPA documents. Direct and indirect impacts to aquatic/fisheries resources would primarily be confined to the Lilly and Cooper Bayou areas. Direct effects to the small streams where the rock chutes were placed would occur, but those effects are expected to be minor in nature as the rock chutes serve has a hard surface habitat that would be utilized by aquatic species in those areas. Similarly, the installation of shoreline stabilization along 260 feet of the Comite River will have minor effects in the construction vicinity. The Lilly and Cooper Bayou areas would see increased sedimentation primarily after the initial operation of the diversion channel. The increased erosion would persist until Lilly Bayou stabilizes to the new flow volumes from the channel. That increase in sedimentation would cause accumulations (typically less than 1-foot) along the channel. Those effects were identified in previous NEPA documents, but the new modeling suggests minor sedimentation could occur in areas (ponds) and in the adjacent wetlands. Once the system reaches equilibrium from the resulting diversion channel flow increases, no long-term adverse effects were identified to aquatic resources.

4.3 Wildlife

Future Conditions with No Action

Without implementation of the proposed action, the permanent effects resulting from construction of the project as identified in the previous NEPA document would remain the existing conditions. However, some of these effects would not be adequately mitigated and the project would not be in compliance with the CWA, and WRDA 1986, Section 906, as amended, Mitigation for Fish and Wildlife and Wetlands Losses, and Appendix C to Engineer Regulation 1105-2-100.

Future Conditions with the Proposed Action

No known colonial nesting water/wading bird rookeries are known to exist within the project area. If any such nests are discovered during construction the appropriate no work zones would be observed. Minimal and temporary adverse direct and indirect impacts to wildlife would be anticipated. Construction activities are expected to displace terrestrial wildlife in the area; however, this would be a temporary disturbance, with wildlife likely to return following the completion of activities. An overall reduction in habitat value and subsequently reduction in utilization of the habitat by wildlife would occur for the areas converted from BLH to maintained right-of-way near the rock chutes. Migratory waterfowl and other avian species would be temporarily displaced from the project area. It is anticipated that wildlife populations would move to existing adjacent habitat areas during construction activities. Some species of waterfowl and other aquatic wildlife would likely utilize the easement areas more due to the increase in frequency of inundation. No significant changes to wildlife habitat are anticipated as the area is already frequently flooded by the Mississippi River. Use of the field for a staging area may disrupt any use made of the field by wildlife but that effect would be temporary during the construction period and would be expected to return to pre-project conditions after construction is complete. For construction of the new road, wildlife would likely avoid the construction area due to noise during road construction (tree clearing and surface grading) and after while the road is in heavy use during the Brooks Lake closure structure construction. Once construction is complete, conversion of existing forested area to maintained road would cause wildlife to use adjacent areas with minimal overall displacement.

4.4 Threatened and Endangered Species

Future Conditions with No Action

Under the no action alternative, no changes to existing conditions would occur. Effects to listed species would be similar to those that currently exist along with permanent impacts resulting from construction of the project as outlined in EA 222.

Future Conditions with the Proposed Action

Although threatened or endangered species may occur within the general project vicinity, their presence within the project area is unlikely. The proposed project area does not contain critical habitat for federally listed species, and the open areas surrounding the project area would allow them to easily avoid the project activities. The Comite Diversion Project was coordinated with U.S. Fish and Wildlife Service (USFWS) numerous times within the past 30 years. Since those previous consultations, several additional species have been listed under the Endangered Species Act. USACE has previously coordinated construction of individual project features before construction was to proceed to ensure recently listed species were adequately considered and all practicable measures were implemented to reduce effects to those listed species. USACE finds the following relative to listed species:

Pallid Sturgeon (Not Likely to Adversely Affect (NLAA))

- o The pallid sturgeon (*Scaphirhynchus albus)* would not be present within most of the proposed project area as the project area is located above ordinary high water. Sturgeon could utilize the flowage easement areas where additional inundation would occur during high water periods. This would mimic the current situation that occurs during high water along the Mississippi River. Therefore, the proposed action would be Not Likely to Adversely Affect (NLAA) either directly or indirectly Pallid sturgeon.

USACE finds the following with respect to species proposed to be listed:

Tricolored Bat (NLAA)

- o The Tricolored bat (Perimyotis subflavus) may occur within the project vicinity, though impacts, if any, are expected to be minor. Effects could result from removal of trees during construction, habitat changes from project induced effects, and construction noise. Due to the location of the proposed action and the presence of a forested area, CEMVN cannot discount that an individual Tricolored bat could be forced to relocate or avoid the proposed project area during construction. Construction noise would be short-term in nature and mimic nearby highway and development. Tree removal and/or habitat modification is likely; however, no direct or long-term effects to the species were identified as there is a significant amount of similar adjacent habitat. Therefore, the proposed action is NLAA the Tricolored bat.

Alligator Snapping Turtle (NLAA)

- o The Alligator Snapping turtle (Macrochelys temminckii) could traverse or potentially be found within the proposed project area, especially along the Comite River in the area where shoreline stabilization will be installed. Therefore, construction activities could pose a hazard to individual turtles if they traverse the area during construction. After construction, the presence of the diversion channel is unlikely to affect the species. No significant adverse effects to their habitat or water quality have been identified. Still, it is possible (though unlikely) that a turtle could be within the project area and affected. Given the circumstances, CEMVN finds the proposed action is NLAA the Alligator Snapping turtle.

Monarch Butterfly (No Effect)

- o The Monarch Butterfly (Danaus plexippus) prefers a mid-successional plant community, rich and abundant in high-nectar forbs. No impacts were identified as the bottomland hardwood habitat encompassing most of the proposed project area is not the preferred habitat for the Monarch Butterfly. No milkweed or other preferred habitat was identified within or near the proposed project site. The proposed action would not impede movement or migrations through the project site. Further, no applications of pesticides are associated with construction of the proposed action. In consideration of these factors, USACE finds "no effect" to the monarch butterfly.

These effect determinations are currently being coordinated with the USFWS and will be finalized in accordance with Section 7 of the Endangered Species Act prior to completion of the NEPA process.

4.5 Water and Sediment Quality

Future Conditions with No Action

Under the no action alternative, the potential permanent and temporary effects of construction identified in the 1990 EIS, EA# 222, and EA# 222a would remain unchanged. The exception is that recent modeling indicates a reduction in the estimated sediment load in the Comite River. That reduction eliminates the need for routine maintenance dredging. That modeling is discussed in Section 4.5.2.

Future Conditions with the Proposed Action

The 1990 EIS recognized that construction of control structures on low areas adjacent to the Amite/Comite River channels to create artificial reservoirs for fisheries management would restrict the movement of fish in or out of the riverine system and could have water quality or temperature related problems. USACE recognized that the proposed concrete drop structures proposed at the three-stream crossing would likely have similar adverse impacts to water quality and temperature. Therefore, they were replaced with rock chutes consisting of stepped riprap that provides water quality and habitat benefits. No significant adverse effects to water quality were identified in the original environmental evaluations, and no subsequent effects were identified in this assessment. Throughout the course of construction, there would be some disturbances to ambient water quality; however, direct and indirect impacts would be short-lived and highly localized. Best Management Practices have and would continue to be utilized through completion of construction.

Increases in inundation frequency of the real estate easement areas would result in more frequent flushing of natural ponds and disconnected water bodies within those areas. The increase in frequency should result in improvements to those areas. Immediately following the initial operation of the structure, modeling indicates that the flow through the Lilly Bayou Control Structure would result in erosion along the flow route to the Mississippi River. Once the sediment reaches the Mississippi River, it would become part of the sediment load of the river. Minor sedimentation was modeled in some of the areas adjacent to the channel alignment. No significant effects are anticipated from this sedimentation, which would stabilize once a new equilibrium is reached in the system. Sedimentation modeling is presented in the attached March 28, 2024, report titled, “Comite River Diversion Sedimentation Analysis” (Appendix A).

The modeling analysis found that under most scenario assumptions, the Comite River would be net erosional over the future 30-year study period, including with diversion operations. The analysis concludes that, utilizing the most likely (determined from a sensitivity analysis, simple geomorphic validation testing, and professional judgement) sediment model parameterization, diversion operations would induce negligible additional sediment aggradation relative to the future without diversion operations. The model calculates that diversion operations would cause approximately 2500 cubic yards (in 30 years) of sediment to become deposited within 1 mile downstream of the planned diversion inlet location. A ‘conservative’ scenario was simulated that assumed plausible, more conservative sediment parameterization (that is likely to cause a greater rate of sediment aggradation) and calculated that 88,000 cubic yards of sediment would be deposited within the model domain relative to the future without diversion operations. A ‘most conservative’ scenario was simulated that assumed physically possible, yet unlikely, very conservative sediment parameterization (that is likely to cause extreme rates of sediment aggradation) and calculated that approximately 130,000 cubic yards of sediment would be deposited within the model domain relative to the future without diversion operations. All the calculated deposition during the most conservative scenario would occur within the reach downstream of the planned diversion inlet location.

An analysis of modeled flow hydraulics within Lilly and Cooper Bayous concluded that the introduction of flow and sediment from diversion operations would not likely lead to sediment aggradation with the bayou channels. The most likely outcome is that the bayou channel would straighten and enlarge due to bed and bank erosion. The bayou channels would likely maintain their current course because the channels are surrounded by large terraces that would restrict lateral channel migration.

An analysis of sediment transport capacity within the diversion channel indicates that the mean channel geometry should adequately convey introduced loads of flow and sediment. Certain channel design elements are expected to induce localized sediment aggradation; these elements include the drop structure immediately downstream of the inlet built to dissipate flow energy, near tributary inflows, near channel bends, and approaching the Lilly Bayou control structure. The amount of localized aggradation occurring from a large flow event would be on the order of 1000 cubic yards per 1 day flow event at each problem location. Likely, this amount of sediment would not impact diversion performance; however, it may require maintenance (e.g., dredging) at the decadal time scale to ensure diversion conveyance remained unaffected through the project lifespan. The energy-dissipation pool downstream of the diversion inlet control structure may experience higher rates of sedimentation locally, which may need additional sediment management. That sediment management is theoretical at this time and would be addressed by the local sponsor as part of routine operation and management of the federal project.

The conversion of the concrete drop structures to rock chutes (riprap) slightly increased the project footprint but resulted in correction of a potential design issue that could have resulted in a degradation of water quality within the diversion channel and its receiving waters. The drop structures would have held water during dry periods resulting in degraded water quality in the basin. That water would be flushed into larger ecosystem during the next flow.

Minimal effects to water quality, primarily consisting of increased turbidity, would be anticipated due to installation of shoreline stabilization along 260 feet of the Comite River. These effects would be localized to the construction area and would be temporary, occurring during the construction period. All appropriate best management practices would be utilized during construction as appropriate to comply with CWA Section 402.

A Section 404(b)(1) Evaluation for the 1991 FEIS, which included impacts caused by the subject design, was signed on 20 September 1990. However, the action would result in additional fill material being discharged into waters of the U.S., therefore, in accordance with Section 404 of the CWA, a revised 404(b)(1) evaluation will be prepared for incorporation into the final SEA. A Section 404 Public Notice will be circulated for public comment concurrent with the public review of this Draft SEA. Further, a water quality certificate (WQC 901004-17/AI 101235) was issued on October 18, 2002, which has been modified a couple times primarily to allow for changes in mitigation. The certification remains valid, and a modification request will be coordinated with LDEQ.

4.6 Air Quality

Future Conditions with No Action

Without implementation of the proposed action, the status of non-attainment of air quality for East Baton Rouge Parish would not change from current conditions.

Future Conditions with the Proposed Action

With implementation of the proposed action, flowage easements and mitigation bank credits would be acquired. No project-related construction activities are expected to occur at the flowage easement areas or at mitigation banks, and no direct or indirect adverse impacts to air quality are expected from the acquisition of the easements or the credits.

Construction of the new access road to be used for construction of the Brooks Lake control structure and the addition of 260 ft of shoreline stabilization along the Comite River would cause emissions due to construction equipment and activities. Based on previous evaluations of projects of this nature, on-site construction activities at the those areas are expected to produce less than the *de minimis* levels of 100 tons per year of volatile organic compound emissions and nitrous oxides emissions, respectively. Thus, the ambient air quality in East Baton Rouge Parish would not noticeably change from current conditions, and the status of attainment for the parish would not be altered.

4.7 Cultural Resources

Future Conditions with No Action

With implementation of the No Action alternative, the Comite River Diversion would still be constructed and would still operate in accordance with descriptions contained in previous NEPA documents. There has been extensive and full Phase I survey coverage of the Comite River Diversion Corridor, and where/if necessary, there has been Phase II and Phase III Investigation in compliance with the National Historic Preservation Act (NHPA). Cultural resources would not be affected by the proposed action and would remain the same as the existing conditions described in Section 3.

Future Conditions with the Proposed Action

With the implementation of the proposed action due to updated modeling and changes during construction, no additional effects to cultural resources are expected. Site 16EBR220 is a historic cemetery located adjacent to but not within the area of potential effect. USACE determined that it would not be affected. Due to its proximity, a letter of coordination concluding for No Adverse Effects to Historic Properties dated March 14, 2025, was sent to SHPO and Federal-recognized Tribes. A response of agreement was received from SHPO dated April 1, 2025. No other responses were received within 30 days.

4.8 Recreational Resources

Future Conditions with No Action

With implementation of the No Action alternative, recreational resources would remain the same as the existing conditions described in Section 3. Recreational resources both consumptive and nonconsumptive may continue as water levels allow.

Future Conditions with the Proposed Action

The updated modeling shows new areas that would be affected by increased water levels and flows during the operation of the Comite River diversion channel. The additional areas are adjacent to flowage easements previously authorized. While vehicular access to the hunting camps near the shore of the Mississippi River may be inaccessible due to the additional inundations, the camps themselves are not expected to be affected. During seasonal high river events access to the camps is limited to boat access only as would also be the case due to the opening of the diversion. As mitigation plans are implemented, habitat value and recreational opportunities would likely increase in those areas.

4.9 Visual Resources (Aesthetics)

Future Conditions with No Action

With implementation of the No Action alternative, aesthetic resources would remain the same as the existing conditions described in Section 3. Under the no action alternative and the continuation of the current plan, visual resources could improve as the authorized mitigation plan is implemented. Many of the lands affected in the current plan are remote and with limited access or are on privately owned lands. As mitigation plans are implemented, habitat value and the intrinsic visual quality would most likely increase.

Future Conditions with the Proposed Action

With the implementation of the action, aesthetic resources would be minimally affected. The additional areas subject to increased water levels and flows are adjacent to flowage easements previously authorized and many of affected lands are not visible from public thoroughfares. Areas visible from public thoroughfares that could potentially experience the increased water levels are limited to areas near LA Hwy 964 and LA Hwy 61, though visual impacts would be temporary. As mitigation plans are implemented, habitat value and the intrinsic visual quality would most likely increase as native tree and shrub species regenerate and blend into the existing landscape.

4.10 Cumulative Impacts Analysis

East Baton Rouge Parish and surrounding parishes, especially Livingston and Ascension, have undergone a considerable increase in population and development in recent years. Many of the people employed in the Baton Rouge metropolitan area reside in and near the communities and municipalities beyond the urbanized central area of Baton Rouge. The Comite project is designed mainly to provide flood risk reduction to residents and businesses in and around Denham Springs, Louisiana, which is located in Livingston Parish immediately east of East Baton Rouge Parish. To accommodate the increase in population, major highway improvement projects, especially on Interstate Highways 10 and 12 have been occurring for many years. Residential subdivisions in outlying communities, especially those along the Interstate 10 and 12 corridors are being developed at a rapid pace. Increases in development require additional infrastructure and utilities to support their increase in residents. Some of those features have needed to be relocated for the Comite River Diversion Project. Those relocations involve local and regional power, gas and petroleum lines. Aside from the Comite project and the interstate highway improvements, there are no other known large Federal projects in the immediate area. Industrial development along the Mississippi River is expected to continue. Several new industries have been proposed along the Mississippi River and are sometimes required to acquire federal permits. The entire Baton Rouge metropolitan area is undergoing considerable growth in residential, commercial, and industrial development; the Comite project would provide increased flood risk reduction to support this development. While the proposed action is part of the larger Comite Diversion Project, the proposed action would not individually increase cumulative impacts. However, it is integral to the overall project success, policy compliance and environmental compliance. If the proposed action is not completed, adverse effects could result in cumulative impacts as project related impacts would not be appropriately mitigated.

5 MITIGATION

It is the policy of the Corps Civil Works program to demonstrate that impacts to all significant ecological resources, both terrestrial and aquatic, have been avoided and minimized to the extent practicable, and that any remaining unavoidable impacts have been compensated to the extent possible. Mitigation planning would be accomplished in a watershed context. In accordance with the USACE Implementation Guidance for Section 2036(a) of the WRDA 2007, Mitigation for Fish and Wildlife and Wetlands Losses, and Appendix C to Engineer Regulation (ER) 1105-2-100, compensatory mitigation was formulated to occur within the same watershed as the impacts and to replace the functions and services of each habitat type with functions and services of the same habitat type. Appendix C to ER 1105-2-100 (C-4)(g) directs the following steps be considered in mitigation planning:

5.1 Inventory and Categorize Ecological Resources:

There would be approximately 27.5 acres of additional direct impacts (19.73 AAHUs) to BLH. Another 10 acres of impacts occurred in overgrown fields; however, most of the overstory in this area is Chinese Tallow (an invasive species). Another 4 acres of impacts were to pine plantation providing limited habitat value. Finally, there is approximately 2.5 acres of impacts that occurred within a mowed lawn and field with little habitat value.

New hydraulic modeling indicated that an additional 1,234 acres of BLH could be indirectly impacted once the Diversion Project becomes operational. Therefore, flowage easements would be secured for that property by the local sponsor. The new modeling was utilized in preparation of the WVAs to calculate the changes to hydrology within these areas. The majority of these areas are already adapted to frequently flooding due to their proximity to the Mississippi River. No significant changes are expected, but the increased frequency of flooding would have some effects to the areas, which is indicated by the WVAs. The modeling indicates a reduction in BLH habitat equivilent to 62.47 AAHUs is likely to occur over the 50-year project life.

5.2 Determine Significant Net Losses.

Minor project modifications during construction have resulted in direct impacts to an additional 44.1 acres (19.73 AAHUs), and previously unidentified inundation from operation of the structure could potentially affect another 1,234 acres (62.47 AAHUs). Minor project modifications resulted in avoidance of 25.9 acres of BLH. WVA(s) conducted on the 25.9 acres of BLH generated 16.06 AAHUs. Those 16.06 AAHUs would be used to offset mitigation requirements of the above additional impacts as they were part of the original designed project and have already been mitigated as part of the on-site mitigation and mitigation credits previously implemented (704.6 AAHUs). Therefore, CEMVN proposes to reduce the mitigation requirement identified for the additional impacts (19.73 AAHU) and inundation (62.47 AAHUs) by the avoided impacts (16.06 AAHUs). This would result in a need for an additional **66.14 AAHUs** in BLH compensatory mitigation.

In review of the additional impacted areas, CEMVN noted impacts to a mowed lawn/field (2.5 acres) and a pine plantation (4.1 acres). The original project included an 8.8 acres field and a 16.6-acre pine plantation that are now being avoided. Since these areas were considered in the original mitigation plan and are now being avoided, CEMVN proposes to allow avoidance of these areas to mitigate any minor habitat effects resulting from the newly identified 2.5-acre field and 4.1-acre pine plantation. None of these areas were considered in development of the AAHUs mentioned previously.

5.3 Define Mitigation Planning Objectives

It is the policy of the Corps Civil Works program to demonstrate that impacts to all significant ecological resources, both terrestrial and aquatic, have been avoided and minimized to the extent practicable, and that any remaining unavoidable impacts have been compensated to the extent possible. The mitigation plan would replace the lost functions and services of the impacted habitats through restoration or enhancement activities designed to create/increase/improve the habitat functions and services at specific mitigation sites or through purchase of credits at mitigation banks. Since onsite mitigation was deemed impracticable due to time constraints and restrictions on acquisition of suitable mitigation properties, the objective is to evaluate the loss of functions and values and secure mitigation credits to offset those losses. Use of approved habitat evaluation models (WVAs) have been utilized to establish the unit of measurement in habitat units.

5.4 Determine Unit of Measurement

As briefed in Section 3.2.1.1, evaluations of the effects to terrestrial habitats were conducted using the WVA methodology. Implementation of the WVA requires that habitat quality and quantity (acreage) are measured for baseline conditions and predicted for future without-project and future with-project conditions. Each WVA model utilizes an assemblage of variables considered important to the suitability of that habitat type to support a diversity of fish and wildlife species. The output of the WVA is in AAHU(s) which was used to measure mitigation plan increments in order to calculate specific ecological resource losses, and to define mitigation planning objectives.

5.5 Identify and Assess Potential Mitigation Strategies

The appropriate application of mitigation is to formulate an alternative that first avoids adverse impacts, then minimizes adverse impacts, and lastly, compensates for unavoidable impacts. The proposed project was effectively designed to avoid and minimize adverse impacts, which was initially addressed in the 1990 EIS. The most recent adjustment to the mitigation plan was evaluated in EA 576, which confirmed the need for 704.6 AAHUs for compensatory mitigation. That EA reviewed the existing mitigation plan formulated in the original Feasibility Study and refined in two SEA(s). Those plan(s) were quite old and infeasible due to changes in existing conditions or land ownership. Act 734 of the 2010 Regular Legislative Session prohibited the state from cost-sharing for expropriation of mitigation land for the Comite Project which made acquisition of large mitigation properties unfeasible. Because mitigation is required to occur before or concurrent with construction (WRDA 1986, Section 906), it was assumed that no portion of the existing mitigation plan(s) could be implemented. EA 576 identified a new alternative to fulfill the mitigation requirements and in accordance with the USACE Implementation Guidance for Section 2036(a) of the WRDA 2007, Mitigation for Fish and Wildlife and Wetlands Losses, and Appendix C to Engineer Regulation 1105-2-100 was to use the USACE generated 33.15 AAHUs from onsite mitigation (Carmena Tract) and purchased the remaining mitigation credits (671.45 AAHU) from approved mitigation bank(s).

5.6 Define, Estimate and Display Costs of Mitigation Plan Increments.

Compensatory mitigation was formulated to occur within the same watershed as the impacts and to replace the functions and services of each habitat type with functions and services of the same habitat type. CEMVN investigated the use of mitigation banks within appropriate, applicable service area, the eastern portion of the project is located in Hydrologic Unit Code (HUC) 08070202 (Amite) and the western portion is located in 08070201 (Bayou Sara-Thompson). Since the project impacts cross watershed boundaries and are difficult to distinguish given that the proposed action essentially combines the watersheds across the project area, available mitigation opportunities within both impacted service areas would be used to compensate for unavoidable wetlands impacts. Since other mitigation alternatives are not practicable as justified above, an incremental cost analysis would be performed for mitigation banks with available credits once mitigation funding is available. The amount of credits that would be required to fully compensate for unavoidable wetlands impacts would be determined by applying a WVA value to each available mitigation bank. The cost per credit would be multiplied by the credits required at each mitigation bank to demonstrate that the most cost-effective mitigation measure(s) is selected.

CEMVN proposes to mitigate for approximately 66.14 AAHUs of unavoidable adverse impacts to forested BLH habitat at one or more mitigation banks with available BLH mitigation credits. Mitigation banks are established with Primary and Secondary Service areas. There are currently 35 mitigation banks with available BLH credits and a Primary Service Area for Hydrologic Unit Code (HUC) 08070202 (Amite) and/or HUC 08070201 (Bayou Sara-Thompson). Two additional banks with available BLH credits have those HUCs as a Secondary Service Area. The number of available banks is subject to change as credits are purchased or released frequently. Therefore, a detailed analysis of credits available at specific banks is impractical at this time since the credits available at the selected bank now may not be available when funding is available in the future. Conversely, a lower cost alternative (bank) may become available after completion of this assessment. At the time of this assessment there are sufficient credits available to achieve the required mitigation goal.

5.7 Recommended Compensatory Mitigation Plan

Approximately 66.14 AAHUs would be purchased from one or more mitigation banks with a primary or secondary service area for HUC 08070202 and/or HUC 08070201.

No additional restoration activities are proposed, so no additional property acquisition is required for compensatory mitigation.

A habitat assessment of the eligible mitigation banks at the time of solicitation utilizing the Corps certified habitat assessment model (WVA) would be completed for each of the 35 mitigation banks with credits available when mitigation funding becomes available. Those WVA values would be used to compare the cost per credit for each eligible bank that submits a bid to determine the most cost-effective mitigation option. The purchase of mitigation credits would comply with any applicable Federal procurement laws and regulations such as the Federal Acquisition Regulation (FAR) codified at 48 CFR.

Appendix C to ER 1105-2-100 states, “The purchase of credits from a mitigation bank or in-lieu fee program for a water resources project relieves the Corps and the non-Federal sponsor from the responsibility of monitoring the mitigation measure and demonstrating that the mitigation measure is successful, as long as the Secretary or designee determines that monitoring is being conducted by the owner or operator of the mitigation bank or in-lieu fee program.”

6 COORDINATION AND PUBLIC INVOLVEMENT

Preparation of this EA and FONSI was coordinated with the public, appropriate Congressional, Federal, Tribal, state, and local interests, as well as environmental groups and other interested parties. The following agencies, as well as other interested parties, received copies of the draft EA and draft FONSI:

U.S. Department of the Interior, Fish and Wildlife Service
U.S. Environmental Protection Agency, Region VI
U.S. Department of Commerce, National Marine Fisheries Service
U.S. Natural Resources Conservation Service, State Conservationist
U.S. Coast Guard Sector New Orleans
U.S. Coast Guard Marine Safety Unit Baton Rouge
Maritime Navigation Safety Association
The Associated Branch (Bar) Pilots
Crescent River Port Pilots Association
New Orleans Baton Rouge Steamship Pilot Association
Associated Federal Pilots
Big River Coalition
Lower Mississippi River Committee (LOMRC)
Coastal Protection and Restoration Authority Board of Louisiana
Advisory Council on Historic Preservation
Governor's Executive Assistant for Coastal Activities
Louisiana Department of Wildlife and Fisheries
Louisiana Department of Energy and Natural Resources, Coastal Management Division
Louisiana Department of Energy and Natural Resources, Coastal Restoration Division
Louisiana Department of Environmental Quality
Louisiana State Historic Preservation Officer
Plaquemines Parish Government
Alabama-Coushatta Tribe of Texas
Caddo Nation of Oklahoma
Chitimacha Tribe of Louisiana
Choctaw Nation of Oklahoma
Coushatta Tribe of Louisiana
Mississippi Band of Choctaw Indians
Jena Band of Choctaw Indians
Seminole Tribe of Florida
Seminole Nation of Oklahoma
Tunica-Biloxi Tribe of Louisiana
Alabama-Coushatta Tribe of Texas
Alabama Quassarte Tribal Town
Chitimacha Tribe of Louisiana
Choctaw Nation of Oklahoma
Coushatta Tribe of Louisiana
Mississippi Band of Choctaw Indians
Muscogee (Creek) Nation
Jena Band of Choctaw Indians
Seminole Nation of Oklahoma
Tunica-Biloxi Tribe of Louisiana

7 COMPLIANCE WITH ENVIRONMENTAL LAWS AND REGULATIONS

There are many Federal and state laws pertaining to the enhancement, management, and protection of the environment. Federal projects must comply with environmental laws, regulations, policies, rules, and guidance. Compliance with laws would be accomplished upon 30-day public and agency review of this EA# 601 and associated FONSI.

7.1 Clean Air Act of 1972

The Clean Air Act (CAA) sets goals and standards for the quality and purity of air. It requires the USEPA to set National Ambient Air Quality Standards (NAAQS) for pollutants considered harmful to public health and the environment. The Project Area is in East Baton Rouge Parish, which is currently in maintenance status of NAAQS. The proposed actions are expected to produce emissions below the *de minimus* threshold amounts and no general conformity determination is required.

7.2 Clean Water Act of 1972 – Section 401 and Section 404

The Clean Water Act (CWA) sets and maintains goals and standards for water quality and purity. Section 401 requires a Water Quality Certification from LDEQ that a proposed project does not violate established effluent limitations and water quality standards. State Water Quality Certification (WQC 120529-02/AI 182232/CER 20120001) was originally issued on September 20, 1990, and modified on June 15, 2012, for the proposed Comite River Diversion. A modification request is being coordinated with LDEQ concurrent with this SEA.

As required by Section 404(b)(1) of the CWA, an evaluation to assess the short- and long-term impacts associated with the discharge of dredged and fill materials into waters of the United States resulting from this project was previously completed with the last modification signed July 18, 2012. The 404(b)(1) would be updated to account for the proposed actions being evaluated in this document. It would be signed before the conclusion of the NEPA process and would be attached to the Final SEA.

7.3 Coastal Zone Management Act of 1972

The Coastal Zone Management Act (CZMA) requires that, "each federal agency conducting or supporting activities directly affecting the coastal zone shall conduct or support those activities in a manner which is, to the maximum extent practicable, consistent with approved state management programs." The proposed action is located outside the Louisiana Coastal Zone.

7.4 Endangered Species Act of 1973

The Endangered Species Act (ESA) is designed to protect and recover threatened and endangered (T&E) species of fish, wildlife, and plants. There are four listed and proposed T&E species, the Pallid sturgeon, Tricolored bat, Alligator Snapping turtle, and Monarch butterfly that are known to occur or believed to occur within the vicinity of the project area. No plants were identified as being threatened or endangered in the project area. CEMVN has initiated coordination with the USFWS for a determination that the project, as proposed, is “not likely to adversely affect” federally listed or proposed threatened or endangered species, or their critical habitat, under the jurisdiction of USFWS. Once coordination is complete, this would fulfill the requirements under Section 7(a)(2) of the Endangered Species Act. All coordination would be completed prior to finalization of this NEPA document. Past coordination with USFWS on Comite Diversion project features currently under construction resulted in USFWS concurring with USACE that the proposed action is “not likely to adversely affect” ESA listed species.

7.5 Fish and Wildlife Coordination Act of 1934

The FWCA provides authority for the USFWS involvement in evaluating impacts to fish and wildlife from proposed water resource development projects. It requires that fish and wildlife resources receive equal consideration to other project features. It requires Federal agencies that construct, license, or permit water resource development projects to first consult with the USFWS, NMFS, and state resource agencies regarding the impacts on fish and wildlife resources and measures to mitigate these impacts. Section 2(b) requires the USFWS to produce a Coordination Act Report (FWCAR) that details existing fish and wildlife resources in a project area, potential impacts due to a proposed project and recommendations for a project. The USFWS reviewed the proposed changes to the project described in EA 601 and provided a project specific recommendation on March 12, 2025. The Final FWCAR would be included as an Appendix to this document when received from USFWS.

The USFWS Recommendations and CEMVN's responses to the USFWS recommendations are as follows:

1. The Corps shall fully compensate for any unavoidable losses to forested habitat caused by project implementation. That compensatory mitigation shall be "in-kind" and within, or as close as possible to, the same watershed as the project impacts.

   Response 1 - Concur. One of the main intentions of the SEA is to correct mitigation deficiencies that currently exists. In accordance with the USACE Implementation Guidance for Section 2036(a) of the WRDA 2007, Mitigation for Fish and Wildlife and Wetlands Losses, and Appendix C to Engineer Regulation 1105-2-100, compensatory mitigation would be formulated to occur within the same watershed as the impacts and to replace the functions and services of each habitat type with functions and services of the same habitat type to the maximum extent practicable.

2. Forest clearing shall be minimized to the maximum extent practicable.

   Response 2 - Concur. The Corps would only clear the areas required for project construction or access.

3. Forest clearing associated with project features should be conducted during the fall or winter, when practicable, to minimize impacts to nesting migratory birds.

   Response 3 - Concur. If nesting migratory birds are identified within the project area, consideration would be given to timing construction to minimize effects to those species if practicable.

4. The Service recommends that the USACE contact the Service and the LDWF for additional ESA section 7 consultation if: 1) the scope or location of the proposed project is changed significantly, 2) new information reveals that the action may affect listed species or designated critical habitat, 3) the action is modified in a manner that causes effects to listed species or designated critical habitat, or 4) a new species is listed or critical habitat designated.

   Response 4: Concur. USACE is currently coordinating with USFWS on ESA listed and proposed species. Once the current consultation is concluded, USACE would reinitiate consultation if any of the four conditions above apply.

7.6 Hazardous, Toxic, and Radioactive Waste (HTRW)

ER 1165-2-132 provides that in the Planning, Engineering, and Design (PED) Phase that, for proposed projects in which the potential for HTRW problems has not been considered, an HTRW initial assessment, as appropriate for a reconnaissance study, should be conducted as a first priority. If the initial assessment indicates the potential for HTRW, testing, as warranted and analysis similar to a feasibility study should be conducted prior to proceeding with the project design. The non-Federal sponsor (NFS) for the project would be responsible for planning and accomplishing any HTRW response measures and would not receive credit for the costs incurred.

An ASTM E 1527-21 Phase 1 Environmental Site Assessment, HTRW 25-03 dated March 11, 2025, was completed for the project area, and a copy is being maintained on file at CEMVN. The probability of encountering HTRW for the proposed action is low based on the initial site assessment. If a recognized environmental condition (REC) is identified in relation to the project area, the CEMVN would take the necessary measures to avoid the REC so that the probability of encountering or disturbing HTRW would continue to be low.

7.7 Magnuson-Stevens Fisheries Conservation and Management Act

The Magnuson-Stevens Fishery Conservation and Management Act, as amended, Public Law 104-208, addresses the authorized responsibilities for the protection of Essential Fish Habitat (EFH) by NMFS in association with regional fishery management councils. The proposed action is located outside EFH.

7.8 Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA) (16 U.S.C. 703, et seq.) is the primary legislation in the United States established to conserve migratory birds. The MBTA prohibits taking, killing, or possessing of migratory birds unless permitted by regulations promulgated by the Secretary of the Interior. The USFWS and the Department of Justice are the federal agencies responsible for administering and enforcing the statute. Similar to the ESA consultation, USACE is currently consulting with the local USFWS Ecological Services Field Office on the proposed action, pursuant to the MBTA and FWCA. This coordination would be completed before finalization of this draft EA.

7.9 National Historic Preservation Act of 1966

Section 106 of the National Historic Preservation Act of 1966, as amended, requires Federal agencies to take into account the effects of their undertakings on historic properties and afford the Advisory Council on Historic Preservation a reasonable opportunity to comment on such undertakings. The procedures in 36 CFR Part 800 define how Federal agencies meet these statutory responsibilities. The Section 106 process seeks to accommodate historic preservation concerns with the needs of Federal undertakings through consultation among the agency official and other parties with an interest in the effects of the undertaking on historic properties, including the State Historic Preservation Officer ("SHPO") or Tribal Historic Preservation Officer (THPO) and any Tribe that attaches religious or cultural significance to historic properties that may be affected by an undertaking. The goal of consultation is to identify historic properties potentially affected by the undertaking, assess its effects and seek ways to avoid, minimize or mitigate any adverse effects on historic properties. Historic cemetery 16EBR220 is located adjacent to but outside of the area of potential effect and would not be adversely affected by the proposed actions. Consultation for this SEA pursuant to Section 106 was initiated by, and a finding of no adverse effect to historic properties sent to SHPO on March 14, 2025, for review and concurrence that the actions of this Supplemental EA are determined as having no additional potential to cause effect to any potential cultural resources. SHPO agreed with USACE determination with a letter dated April 1, 2025.

7.10 Tribal Consultation

NEPA, Section 106 of the National Historic Preservation Act, EO 13175 (Consultation and Coordination with Indian Tribal Governments), the American Indian Religious Freedom Act, and related statutes and policies have a consultation component. In accordance with CEMVN's responsibilities under NEPA, Section 106, and EO 13175, CEMVN has offered the following federally recognized Indian Tribes the opportunity to review and comment on the potential of the proposed action to significantly affect protected tribal resources, tribal rights, or Indian lands: Alabama-Coushatta Tribe of Texas, Alabama Quassarte, Chitimacha Tribe of Louisiana, Choctaw Nation of Oklahoma, Coushatta Tribe of Louisiana, Jena Band of Choctaw Indians, Mississippi Band of Choctaw Indians, Seminole Nation of Oklahoma, and Tunica-Biloxi Tribe of Louisiana. On March 14, 2025, letters were mailed to the tribal leaders requesting input regarding the proposed action. No responses were received within the 30-day review period.

8 CONCLUSION

This office has assessed the potential environmental impacts of the proposed action and found it to have no potential for significant impacts upon the human environment. To the maximum extent practicable, all efforts to avoid and minimize potential effects were incorporated into the project design. Still, minor impacts to biological resources could occur. Potential effects to bottomland hardwood habitat would be mitigated through appropriate use of compensatory mitigation and incorporation of mitigation recommendations from other agencies, if any are provided. Mitigation for effects to BLH habitat would likely be through purchase of appropriate credits at a mitigation bank as outlined within this document.

9 PREPARED BY

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APPENDIX A

Comite River Diversion Sedimentation Analysis

Comite River Diversion Sedimentation Analysis

MVN Engineering Division
28 March 2024 (Final Draft)

Executive Summary

We present a sedimentation analysis supporting the USACE MVN Comite River diversion design and construction project. The objective of the analysis was to quantitatively assess how future diversion operations will affect regional sedimentation within the Comite River channel and floodplains; ancillary analyses qualitatively assess the plausible diversion impact on Lilly and Cooper Bayous downstream of the diversion conveyance channel outfall and maintenance dredging required to maintain the design conveyance of the diversion.

This analysis utilized a one-dimension HEC-RAS sediment model to simulate a 30-year hydrograph to calculate Comite River sedimentation dynamics with and without diversion operations. The modeling analysis found that under most scenario assumptions, the Comite River will be net erosional over the future 30-year study period, including with diversion operations. The analysis concludes that, utilizing the most likely (determined from a sensitivity analysis, simple geomorphic validation testing, and professional judgement) sediment model parameterization, diversion operations will induce negligible additional sediment aggradation relative to the future without diversion operations. The model calculates that diversion operations will cause approximately 2500 cubic yards (in 30 years) of sediment to become deposited within 1 mile downstream of the planned diversion inlet location. A 'conservative' scenario was simulated that assumed plausible, more conservative sediment parameterization (that is likely to cause a greater rate of sediment aggradation) and calculated that 88,000 cubic yards of sediment would be deposited within the model domain relative to the future without diversion operations. A 'most conservative' scenario was simulated that assumed physically possible, yet unlikely, very conservative sediment parameterization (that is likely to cause extreme rates of sediment aggradation) and calculated that approximately 130,000 cubic yards of sediment would be deposited within the model domain relative to the future without diversion operations. All the calculated deposition during the most conservative scenario would occur within the reach downstream of the planned diversion inlet location.

An analysis of modeled flow hydraulics within Lilly and Cooper Bayous concluded that the introduction of flow and sediment from diversion operations will not likely lead to sediment aggradation with the bayou channels. The most likely outcome is that the bayou channel will straighten and enlarge due to bed and bank erosion. The bayou channels will likely maintain their current course because the channels are surrounded by large terraces that will restrict lateral channel migration.

An analysis of sediment transport capacity within the diversion channel indicates that the mean channel geometry should adequately convey introduced loads of flow and sediment. Certain channel design elements are expected to induce localized sediment aggradation; these elements include the drop structure immediately downstream of the inlet built to dissipate flow energy, near tributary inflows, near channel bends, and approaching the Lilly Bayou control structure. The amount of localized aggradation occurring from a large flow event would be on the order of 1000 cubic yards per 1 day flow event at each problem location. Likely, this amount of sediment would not impact diversion performance; however, it may require maintenance (e.g., dredging) at the decadal time scale to ensure diversion conveyance remained unaffected through the project lifespan. The energy-dissipation pool downstream of the diversion inlet control structure may experience higher rates of sedimentation locally, which may need additional sediment management.

Preface

Please note that this report is meant as a companion to the larger collection of research conducted on the behalf of the U.S. Army Corps of Engineers (USACE) New Orleans District (MVN) to support the Comite Diversion design and construction project. A detailed description of the project design and environment are not in the scope of this report as that information is well described elsewhere.

As per convention in the sediment engineering community, sediment grain size is measured in metric units. The conversion factor to Imperial units is 1 millimeter = 0.03937 inches.

Contents

1. Introduction

The Comite River diversion (CRD) sedimentation study relies on computational sediment transport modeling. While riverine sediment transport modeling is often assumed to be an extension of riverine hydraulic modeling, there are important differences in modeling assumptions and interpretation. Riverine hydraulics are well described by the Navier Stokes equations, which permits accurate and precise simulation of incompressible, viscous fluid such as water. While sediment transport is government by fundamental Newtonian physics, the driving forces include both hydraulic (e.g., boundary shear stress) and geotechnical (e.g., granular slope stability) and sediment transport flux is limited by both global (i.e., upstream watershed) and local (i.e., the proximal channel bed and banks) supply. The flux of each sediment grain-size is dependent on its absolute size and density as well as its relative size within the entire distribution of sediment in contact with flow. These complexities hinder practical deterministic simulation of sediment transport. Instead, sediment transport modeling is most effective by providing a qualitative (or probabilistic) understanding of the sources, sinks, and pathways of the regional sediment regime. Generation of general sediment budgets are possible. While these products do not provide a single value of sediment flux or predicted bed change, they are useful to identify natural channel and engineering failure modes and bound those within a band of uncertainty and a factory of safety.

1.1 Problem Overview

The objective of this sedimentation study is to identify and, to the extent possible, quantify how operation of the Comite River diversion will alter the regional geomorphology and sediment transport regime. Significant changes to the channels up and downstream may impact diversion performance or other sources of utility such as ecosystem health or recreation.

The 1995 CRD Design Report (USACE 1995) identified three possible sedimentation problems induced by diversion operations: [1] the effect on the Comite River channel downstream of the diversion inlet, [2] the effect on the Lilly and Cooper Bayous downstream of the diversion outlet, and [3] the effect on the sediment transport capacity of diversion channel. The primary focus of this report to is to investigate the first problem. The diversion of river flow out of a natural channel will potentially induce sedimentation within the natural channel downstream of the diversion site. Typically, diversions remove a greater percentage of flow than mobilized sediment since mobilized sediment is preferentially located relatively low in flow column, often with an opposing transverse directional tendency than the upper flow column. Diversions typically preferentially remove water from the upper column due to design practicality. Further, sediment flux is typically exponentially related to metrics of flow such as velocity, boundary shear stress, or stream power and, therefore, a reduction in flow will necessitate a non-linear greater reduction in sediment transport capacity. These factors work in tandem to, in theory, induce sedimentation downstream of the diversion inlet due to a decrease in reach-scale sediment transport capacity.

The theory behind the impact of the balance of water and sediment load on channel stability is well established in geomorphic thought (Leopold et al., 1964; Kellerhals et al., 1976). Lane's balance (Lane 1954; Figure 1) has become ubiquitous as an illustrative tool because of its simplicity. Water load and slope sit together on one side of the scale, representing transport capacity (i.e., work available to move sediment), while sediment load and particle size sit on the other side, representing sediment supply (i.e., that work required to maintain a stable channel). In this illustration, it is plain to see that removing water load at greater rate relative to the sediment load may cause a balanced, stable channel to tip leftward, presumably leading to aggradation.

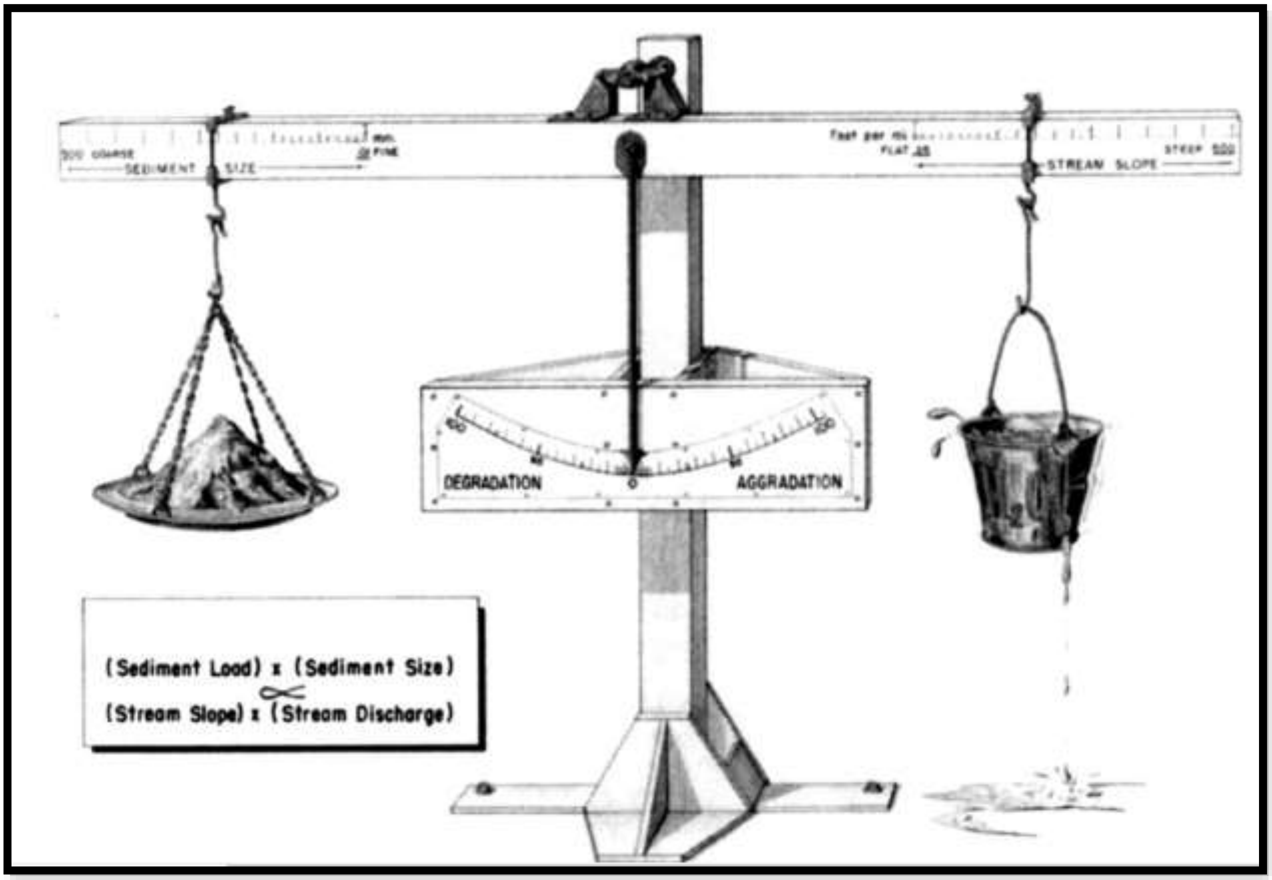


Figure 1: Schematic of the Lane's balance for a stable river channel.

The 1995 CRD Design Report used a HEC-6 (see www.mbh2o.com/support/ for details) numerical model to estimate the impact of sedimentation on diversion performance and the affected environment. Their analyses found that the effects would be 'minor' and occur in the 3 to 4 miles immediately downstream of the diversion inlet. Where significant sedimentation did occur, they recommended dredging and estimated that the dredging requirements would be on the order of 275,000 cubic yards per 10 years. These results are largely confirmed by a 2011 Arcadis sediment study of CRD which predicted that diversion operation would likely have 'minor impacts' on sedimentation trends and bed level changes within the Comite River channel. That study did find that erosional nature of the current upper channel (within the study area) may continue after project construction, but the erosion would abate in time (next few decades timescale) and trend towards equilibrium, while the lower channel would likely continue to experience increased deposition.

The most significant impact of diversion operation on Lilly and Cooper Bayou (Problem 2 above) will likely be generated from the introduction of floodwater, which would temporarily increase the bayous' channel discharge by 2-3 orders of magnitude during diversion operation. The outflow of the diversion channel pours all floodwater and sediment into Lilly and Cooper Bayou which convey the water and sediment to the Mississippi River. A following section of this report investigates potential sedimentation/scour impacts. The 1995 CRD Design Report suggests that Lilly and Cooper Bayou may evolve to accommodate the new flow and sediment regime after a period of significant scour (10-20 ft) and channel widening (10s to 100s ft). This analysis finds that those results are likely without armoring. Our analysis does not identify significant sedimentation concerns (i.e., aggradation/shoaling) likely to affect the diversion function, such as by obstructing flow.

The CRD 1995 Design report documents assessment of the impacts of diversion operation on the diversion conveyance channel over time (Problem 3 above). That report states the diversion conveyance channel was "*somewhat large*" to maintain optimal sediment transport capacity through the channel and that some deposition was expected (requiring dredging 500,000 cubic yards of sediment from the upstream most 8000 ft of the channel every 25 years). A following section of this report explores maximum probable aggradation rates within the conveyance channel as well as areas with the highest potential for sedimentation problems. This analysis does not indicate that the main conveyance channel will experience significant shoaling; likely areas of sedimentation include localized zones near bends or channel expansion.

1.2 Affected Environment

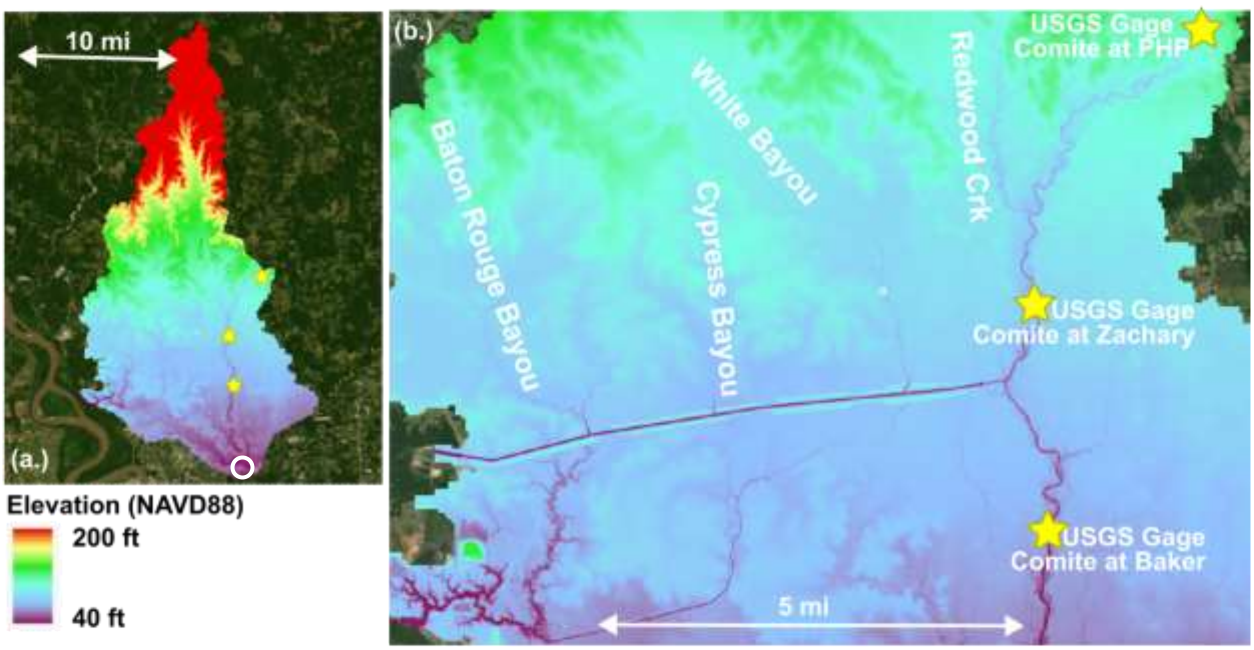


Figure 2: Map (a.) shows a digital elevation model of the Comite River watershed above the model outlet as simulated in this study. Map (b) is a zoomed view of the immediate area around the planned diversion including the diversion structure added to the topography (i.e., future with project terrain). The major tributaries and USGS gages within the immediate area are shown for reference. The gage at Comite near Comite, LA at the model outlet is shown as the large open circle in (a.).

The Comite River watershed at the scale of our project area (Figure 2) is 284 mi^2. The climate is characterized as Temperate with no dry season and hot summers. Convective rainfall drives precipitation during the summer supplemented with occasional tropical storms. Frontal storms drive precipitation during winter. Annual mean precipitation is 61 inches. While rainfall volumes are nearly equal year-round, spring rainfall often falls with more intensity than late summer rainfall or winter, driving higher runoff volumes and river discharges.

The Comite River is a perennial alluvial river with a baseflow on the order of 100 cfs and a bankfull discharge on the order of 10,000 cfs (based on current modeling) which has an averaged calculated recurrence of 2 years (USACE, 1995). Typical high flow/flood events last from 1 to 7 days.

Previous USACE analyses (e.g., USACE, 1990; USACE, 1995) have identified the following flow recurrence intervals for the Comite River based on historical records (Table 1); the table displays the projected diversion conveyance at those recurrence intervals. The diversion channel will (as designed) begin to receive river water inputs when the Comite River discharge exceeds 500 cfs. The diversion channel is designed to divert proximately 50 % of the Comite River discharges during high flow events.

Table 1: Recurrence discharges computed for the Comite River at the diversion reach location (USACE 1995).

Recurrence (yrs)	**River discharge (cfs)**	**Diversion conveyance (cfs)**	**% diverted**
1	6850	4450	65
5	16 200	9300	57
10	22 100	12 700	57
100	45 800	23 900	52
200	50 300	24 900	49

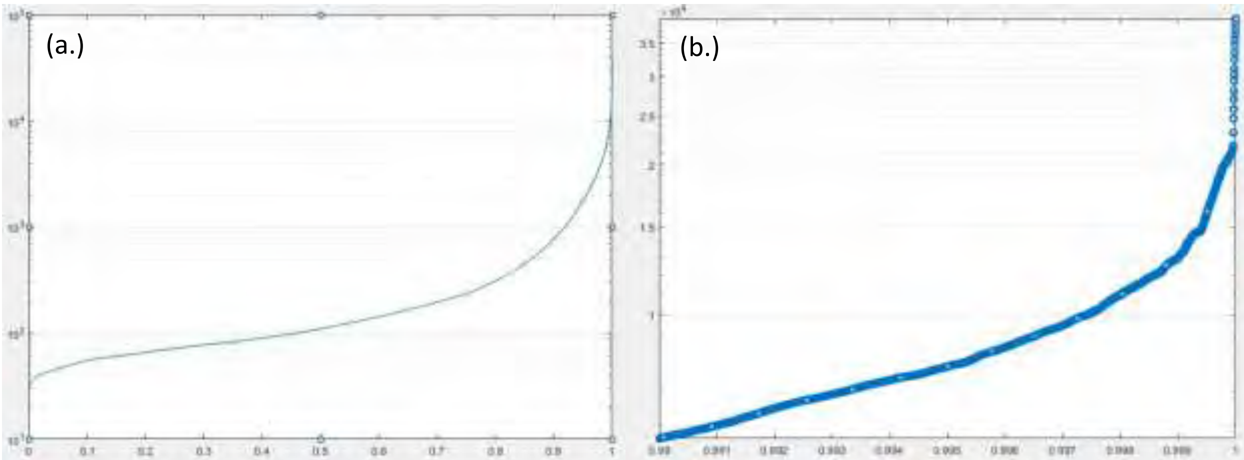


Figure 3: Total cumulative flow recurrence measured at the USGS gage at Comite River near Comite, LA between 1995-2023, (a.) shows the full distribution and (b.) is zoomed in for the recurrences with the 'fraction of time not exceeded' > 0.99. In the plots, the X-axis represents fraction of the total time when the river discharge does not exceed a defined discharge. The Y-axis shows a range of river discharge values in logarithmic space.

Table 2: Representative discharge values for quantile bins of the flow recurrence distributions shown in Figure 3. The left columns show mean discharge values computed for the full distribution binned at 0.1 fraction intervals; the right columns show mean discharge values computed for distribution between the 0.990 and 0.999 fraction of the time not exceeded at 0.001 fraction intervals.

Quantile	Mean Q (cfs)		Quantile	Mean Q (cfs)
0.05	46.2		0.9905	5810
0.15	60.3		0.9915	6240
0.25	71.7		0.9925	6720
0.35	83		0.9935	7160
0.45	98.3		0.9945	7590
0.55	124		0.9955	8210
0.65	167		0.9965	9050
0.75	235		0.9975	10100
0.85	451		0.9985	11850
0.95	1765		0.9995	16100

The planned diversion structure will be 12 miles long with an initial invert of 60.8 ft NAVD88 at the inlet control structure relative to the bed elevation of the natural Comite River of 57.5 ft NAVD88. The diversion channel will be trapezoidal and approximately 130 ft wide at the bed with 1V:3H to 1V:4H sloped banks and a bankfull depth on the order of 40 ft. The bed and banks will be riprapped to prevent bed erosion. The longitudinal slope of the conveyance channel will be approximately 0.0002.

Figure 4 is a geologic map of the CRD project area (from Snead et al., 2019). The Comite River drains the Prairie group of fluvial terraces into the Pleistocene coastal plain. The area is relatively flat with the greatest relief generated from faulting along the Baton Rouge fault zone which is oriented east-west, north of Lake Pontchartrain, extending west through the Baton Rouge metropolitan area to the

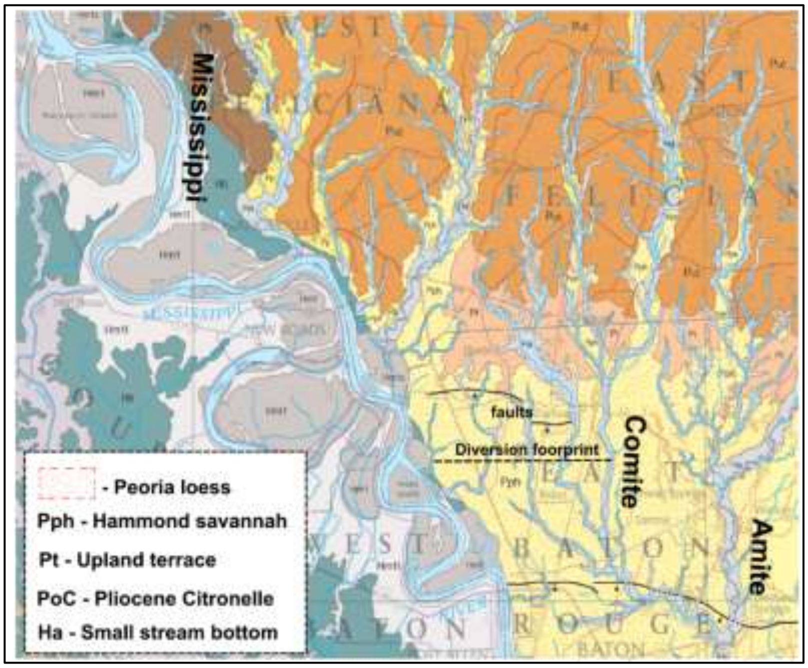


Figure 4: Annotated geologic map of the project area from Snead et al. (2019).

Mississippi River floodplain. The Comite River runs through the fault zone, which produces a steeper channel slope than coastal rivers located on the western side of the Mississippi River floodplain. The soils are relatively well-drained and are composed of a wide range of sediment grain sizes. Terrace surfaces are mostly loess mantled. Loess is fine windblown silt from the post-glacial Mississippi River valley. Loess weathers into steep vertical slopes or scarps and is prone to rilling. The regional drainage network cuts into the remnant Pliocene coastal plain which contains relict deposits of gravels and coarse sands. These coarse sands were deposited in the Pliocene when the Mississippi River valley was wetter and braided channels were more common regionally.

The Comite River geomorphology has been significantly impacted by human activity. Sand and gravel mining, which peaked in the 1970s and is still present today, has led to channel shortening (i.e., loss of sinuosity) and bed incision due to mining pit capture (Harris, 2020). Further, there is evidence that land-use change has significantly increased the amount of run-off conveyed by the Comite River drainage network over the last 60 years (Wu and Xu, 2007).

There is little observational sediment data available for the study site. The USGS collected bulk bed sediment grain-size samples in 2023 (n=28) to support this study (Figure 5) and in 2017 (n= 10) to support a precursor to this study. On behalf of the USACE New Orleans District, Arcadis drafted a CRD design report (Arcadis, 2019). This report contained grain-size data for bulk sediment samples within the study site (*n*=30) as well as sediment parameterization for calibration and validation sediment model simulations. However, there was no precise location information available for the 2017 USGS or Arcadis sediment datasets which prevented direct use in our analyses. Sediment grain-size distribution varied widely over short distances and, therefore, sample locations with coarser precision are not directly applicable.

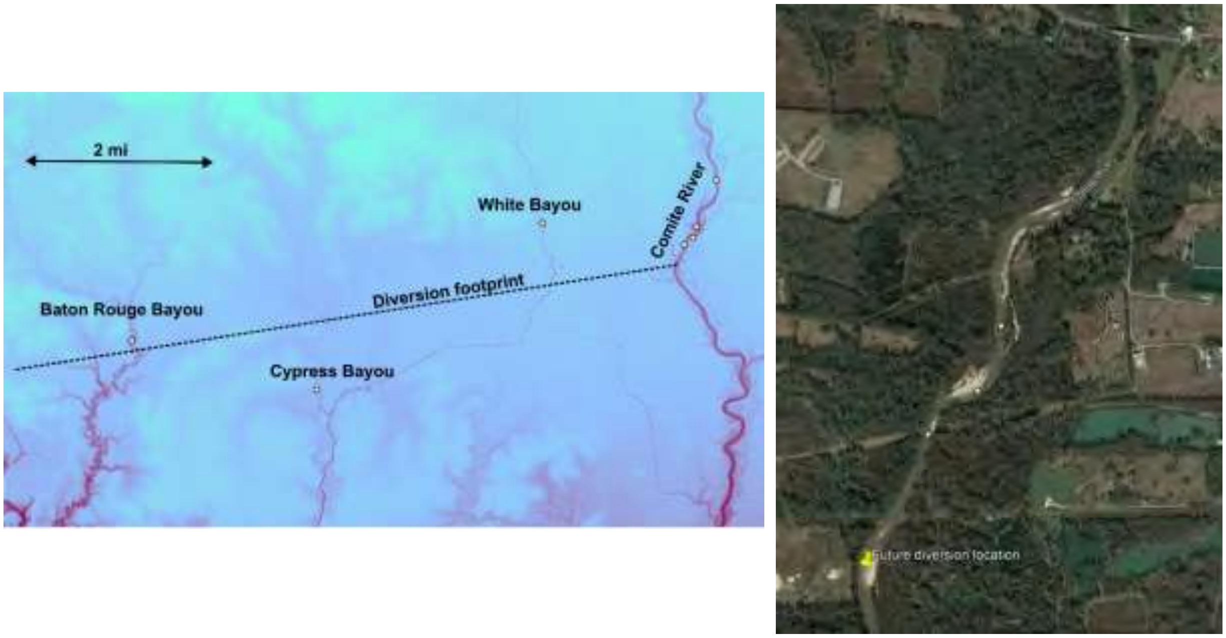


Figure 5: Maps of the USGS bulk bed sediment sampling locations in July 2023 as used in this study. The map on the left shows the locations (relatively small white circles) relative to the drainage network affected by the diversion; the map on the right shows the locations within the Comite River relative to large sand bars and the Highway 64 bridge.

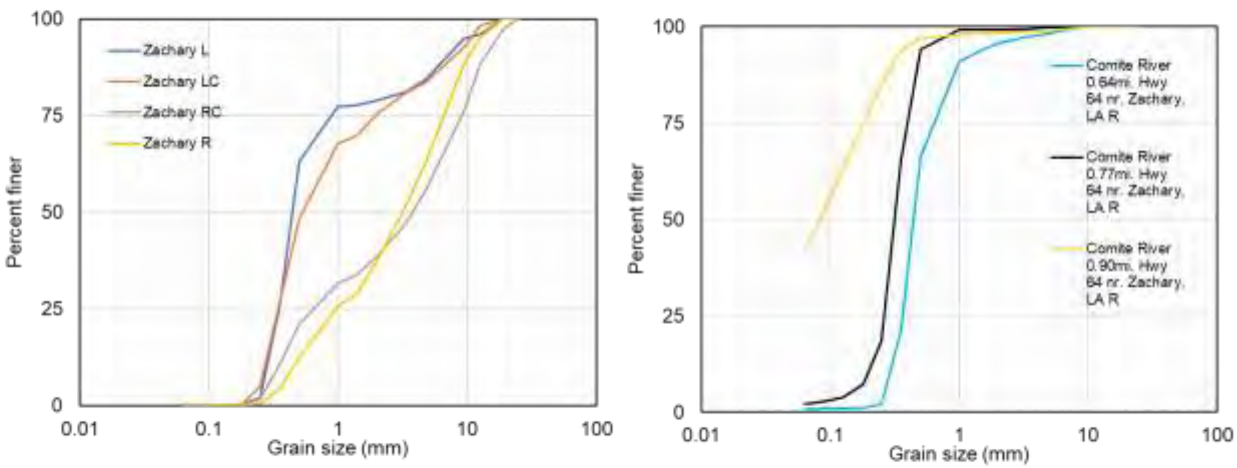


Figure 6: Grain-size distributions of bulk bed samples collected at the Highway 64 bridge (left plot) and at three locations along the right descending bank within the sand bar upstream of the diversion inlet. In the left plot legend, L,R,C are abbreviations for left descending, central, and right descending, respectively. In the right plot legend, the distances given are the distance between the sample location and the Highway 64 bridge.

Figure 5 shows the locations of bed sediment measured to support this study in 2023. For each location shown, samples were collected at four locations spanning the width of the channel. Samples were collected at the Highway 64 bridge located approximated 1.2 miles upstream of the planned diversion inlet. The USGS was contracted to measure discharge and sediment flux at this location to support this study; however, prolonged low-water prevented data collection prior to drafting this report. Samples were also collected at an upstream, central, and downstream location along a large sand bar ~0.4 miles upstream of the planned diversion inlet. It was assumed that these locations provide the majority of bed material passing through or by the diversion at the flow/flood event basis. Additionally, bulk bed sediment samples were collected in each of the three major bayous that will be intercepted by the planned diversion conveyance channel. Figure 6 shows the grain size distributions measured along the transect at the Highway 64 bridge and along the right descending bank for the three locations measuring the bar sediment gradations. These measurements confirm the findings of the 2017 USGS and Arcadis measurements that a wide range of sands and gravels are present in the channel bed material, within each sample and, especially, laterally sorted within a single cross section. The bars contain fine to medium sand and the thalweg often contains coarse sand to fine gravels. Based on these measurements we can assume bed sediment will typically range between 0.1 and 10 mm. Finer sediment is present in the flow column but may only deposit in preferential locations, like the recirculation zone forming downstream of large sand bars (e.g., the measurement collected 0.9 mi downstream of the Hwy 64 bridge). Sediment samples collected within the bayous that are intercepted by the planned diversion indicate that the bayou beds are primarily composed of sands. However, because the bayous typically have relatively low discharges, it is unlikely that the bed material is mobilized until large flood events occur.

2. Methods

This study assesses sedimentation utilizing a one-dimensional (1-D) HEC-RAS (Version 6.4.1) quasi-unsteady sediment transport model (www.hec.usace.army.mil/software/hec-ras/). This type of model is state of the practice for USACE sedimentation studies and is in wide use by resource management agencies, the engineering industry, and academia.

Use of the 1-D HEC-RAS quasi-unsteady sediment transport model (referred to as the 1D RAS model herein) in this study was supported from analyses utilizing observational datasets and ancillary analytical and computational modeling exercises.

2.1 Model development overview

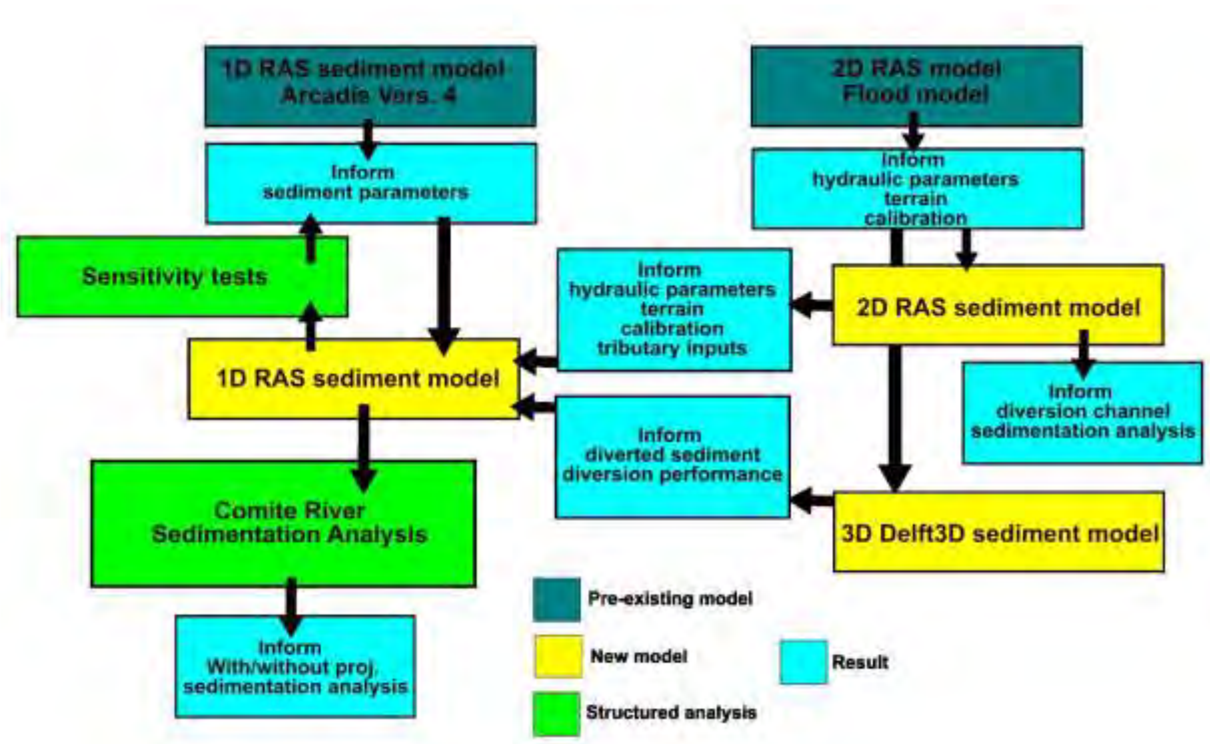
The CRD sedimentation study leveraged antecedent modeling work supporting previous CRD analysis dating back to the 1990 feasibility study (USACE 1990) and the 1995 design memorandum (USACE 1995).

While this model relied on the 1D RAS model to assess the impact of the CRD on regional sedimentation, additional models were used to inform development of that model. An existing calibrated and validated two-dimensional (2-D) unsteady HEC-RAS hydraulic model developed to support the 2022 CRD impact analysis (USACE 2022) (referred to as the 2-D RAS hydraulic model herein) was modified to calculate 2-D sediment transport within the CRD study area. Modifications included increasing the resolution of the computational mesh around channels, realigning cells to better approximate the channel alignment, and reducing the model domain area to Comite watershed (as the 2-D hydraulic model included the Amite River watershed upstream of the U.S. Geological Survey (USGS) gage at Denham Springs). The 2-D HEC-RAS sediment transport model was recalibrated and validated in a similar manner as the original 2-D RAS hydraulic model to ensure that the modifications did not reduce performance. Calibration and validation tests indicated that the ability of the 2-D RAS sediment model to hind-cast river hydraulics was similar to the 2-D RAS hydraulic model and that the realism of the in-channel velocity fields was significantly improved (e.g., less spatially anomalous velocity peaks and troughs). The 2-D RAS sediment model was too computationally intensive to be utilized to assess sedimentation at greater than year timescales (i.e., single flood events on the order of days took multiple days (wall clock time) on modeling desktop computers to run), so a 1-D modeling approach was utilized instead of a 2-D approach. As described in later sections, the 2-D sediment model would be used to [1] inform the relative flow and sediment contribution of tributary inputs, [2] inform the effect of the diversion operations on 2-D fields of sediment transport capacity within the Comite River channel bed around the diversion inlet, and [3] identify zones within the CRD diversion channel with relatively poor sediment transport capacity.

In addition to the 2-D Ras sediment model, a high resolution three-dimensional (3-D) Delft3D sediment model was developed for the Comite River channel and diversion channel immediately proximal to the diversion channel inlet. The objective of this model was to help support estimation of the amount of Comite River sediment that would be steered into the diversion channel. An additional objective was to investigate the impact of the possible formation of a flow recirculation zone within the initial channel bend composing the diversion inlet on diversion efficiency. The flow recirculation zone was identified by a contemporaneous CFD modeling study performed by ERDC.

An existing 1-D HEC-RAS sediment model developed to support a 2011 CRD hydraulic modeling and design study (Arcadis 2011) was used to inform development of the 1-D RAS sediment model used in this analysis. The existing model utilized an earlier version (Version 4) of HEC-RAS that did not have the ability to resolve sediment outflows and therefore required a schematized workflow that the current version does not require. Because of that deficiency and uncertainties related to model metadata, the existing model was used to benchmark assumptions and performance of a new model and not used to directly assess CRD sedimentation. Figure 7 summarizes the conceptual design of the modeling framework.

Figure 7: Conceptual design of the study methodology. This study leverages two pre-existing numerical models, the Arcadis 1D RAS sediment model and the 2D RAS (flood) model. The primary output of this study is calculated sedimentation due to diversion operations informed by the 1D RAS sediment model. Two additional models, the 2D sediment model and the 3D Delft3D sediment model, are used tools add additional insight to the sedimentation analysis. The structured analyses are the focus of this methodology section.



2.2 Development of the 1-D RAS sediment model.

The 1-D RAS sediment model was developed in HEC-RAS Version 6.4.1. The model geometry consisted of 164 cross sections oriented laterally to a polyline representing the central path of the Comite River channel between the USGS river gages located at the Comite River at Port Hudson-Pride Road (PHPR) near Milldale, LA (USGS 07377600), at the upstream model boundary, and at the Comite River near Comite, LA (USGS 07378000), at the downstream model boundary (locations shown in Figure 2). This model reach was approximately 20.6 miles in length. The averaged cross section spacing is 640 ft and the average channel width within this reach is typically between 200 and 300 feet. The horizontal shape of the cross-section alignments were designed to capture the mean direction of the flow paths of the [1] right and [2] left floodplains and the [3] channel. The mean flow path direction was determined by superimposing velocity vectors during a large steady-state flooding discharge (20,000 cfs) computed using the 2-D RAS sediment model.

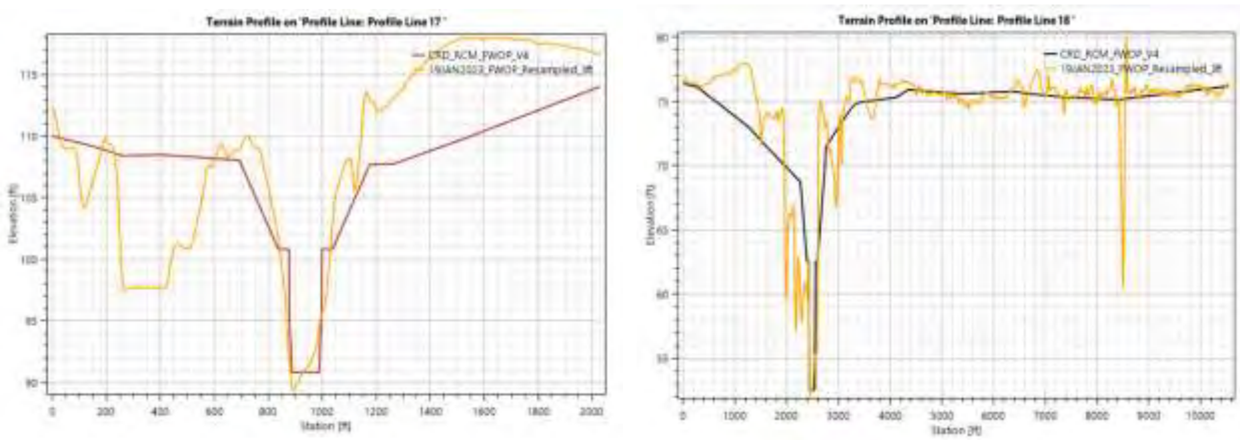


Figure 8: Example computation cross sections developed for the 1-D RAS sediment model. The yellow line shows the original cross section terrain derived from the digital elevation model; the red line shows the simplified cross section geometry used in the model with the smoothed floodplain elevation and synthetic compound channel. Note the prominence of ridges and secondary channels in the original terrain, many of which were an artifact of extrapolating single-beam sonar cross section surveys into continuous surfaces.

The cross-sections represent the simplified terrain geometry within their footprint (Figure 8). The final cross-section elevations were defined at 25 to 40 points distributed throughout the length of each cross section at elevation breakpoints. Elevation values were interpolated from a 1000 ft x 1000 ft cell low resolution digital elevation model (DEM) smoothed from a high-resolution (3 ft x 3 ft cell) DEM developed to parameterize the 2-D RAS hydraulic model. The low-resolution DEM was used to represent the floodplain topo-bathymetry. A synthetic compound channel (i.e., a relatively narrow low-flow channel located below a perched, relatively wide high-flow channel) was "burned in" the terrain using the RAS Mapper terrain editor tool. The compound channel geometry was designed to generate the same general 'water level vs. flow discharge' and 'mean channel velocities vs. discharge' relationships as that simulated using the high-resolution DEM but without some significant modeling problems that the high-resolution DEM produced when used to parameterize the model cross section elevations. The most significant problem associated with the high-resolution DEM was that, because it contained 2-D channel geometry derived from 1-D cross section topo-bathymetric surveys, it contained large longitudinally oriented ridge-like artifacts from the extrapolation process that divided the channel into multiple sub-channels. These sub-channels complicated delineation of the channel bed area and the floodplain area, which is required for sediment transport modeling (i.e., in the process of defining the 'mobile bed limits'). Figure 9 shows that the simplified channel was able to convey the same approximate discharge (within the banks/mobile-bed limits) as that those derived from the observed DEM, but without the unrealistic fluctuations from one cross-section to immediately neighboring cross-sections common to the observed DEM model.

The thalweg (minimum bed) elevations of the low-flow channel were set to maintain the spatially-averaged longitudinal channel slope as identified in the high-resolution DEM. Slopes were binned into

10 reaches based on breakpoints after smoothing and ranged from 7.5 x 10^{-4} near the upstream boundary (where the channel was relatively confined by relict terraces) to 3.2 x 10^{-4} at the downstream

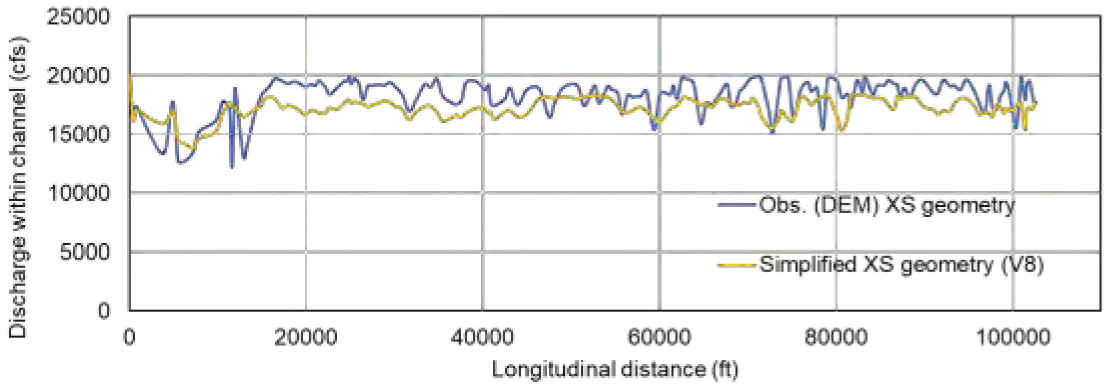


Figure 9: Longitudinal profile of calculated channelized discharge for the 1D RAS model parameterized with observed bathymetry (interpolated from the 2D flood model terrain/DEM) and with simplified bathymetry composed of smoothed floodplain topography and compound trapezoidal channels based on averaged observed hydraulic geometry. For this test, 20,000 cfs was routed through the model employing both 'observed' and 'simplified' bathymetry.

boundary (where the channel entered a broad coastal plain).

The initial model inflow at the upstream boundary was parameterized using discharge data derived from the USGS gage station at PHPR. Model outflows were parameterized using flow stage data derived from the USGS gage station at Comite, LA. Five additional significant ungaged tributary inflows were identified and added to the model as lateral inflow series to the model flow data files (Table 3). The mean relative contribution of the tributaries to the total discharge measured at the downstream boundary was estimated by adding a spatially uniform steady-state precipitation to the 2-D RAS sediment model that resolved the tributary drainage basins. Figure 10 shows the six resolved inflow locations, the diversion location, and their position relative to the cross-section footprints with stationing. The diversion inflow was river discharge dependent; the diversion-Comite River discharge relationship was based on 2D model results validated by physical modeling that supported the 1995 design report.

Table 3: Station and relative mean flow contribution of tributary inputs included in the 1-D RAS sediment model.

Inflow	Station (ft from downstream boundary)	Estimated mean contribution to total outflow
Upstream boundary	102,688	50 %
Redwood Creek	71,525	20 %
Beaver Creek	62,958	2 %
White Bayou	19,138	19 %
Cypress Bayou	4862	4 %
Blackwater Bayou	2139	5 %
Diversion (outflow)	56,917	$Q_{DIV} = 4.6 \times 10^{-11} \times Q^3 - 1.5 \times 10^{-6} \times Q^2 + 1.5 \times 10^{-2} \times Q - 5.4$

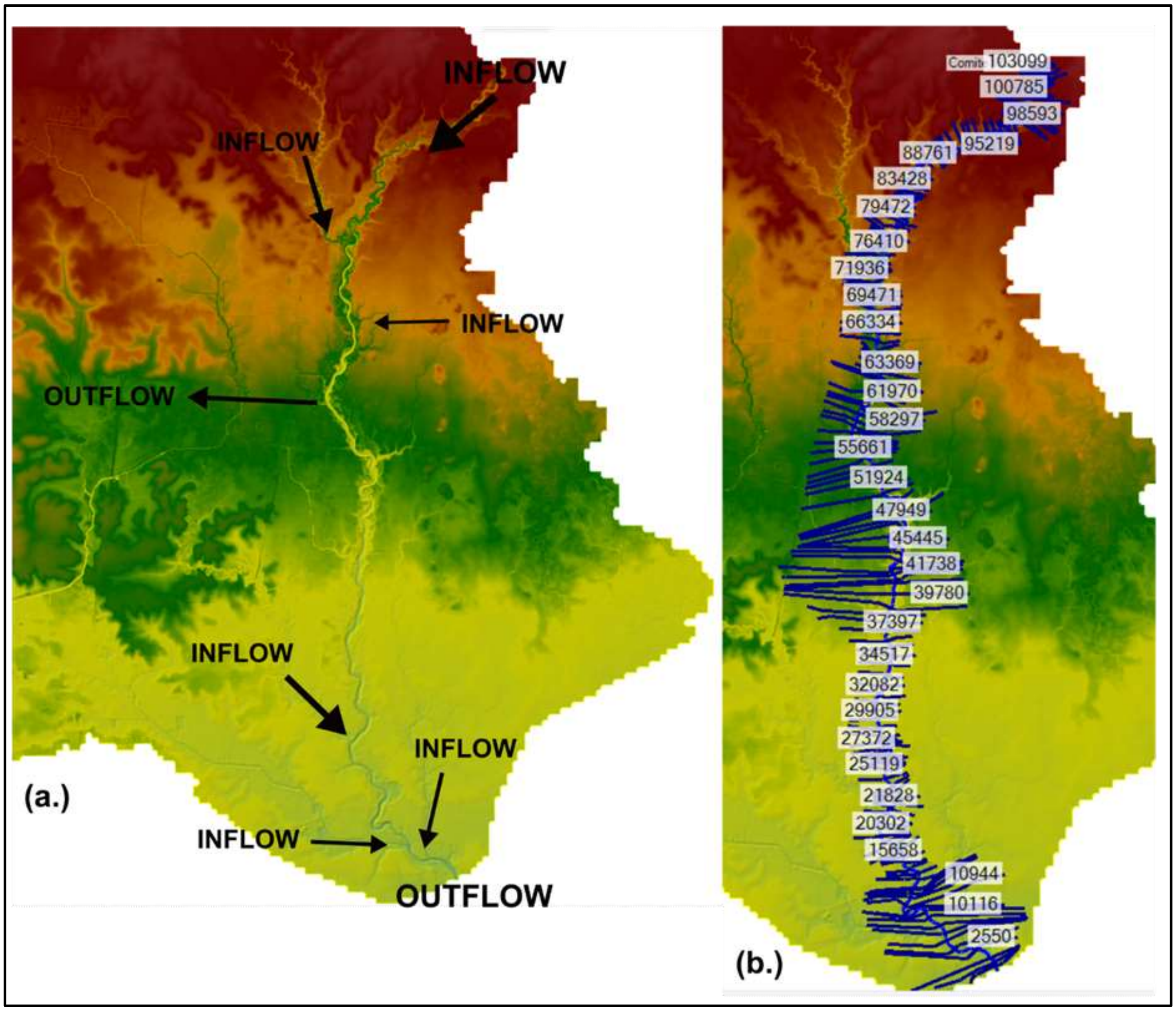


Figure 10: Maps of the approximate locations of (a.) the significant inflows and outflows within the model domain and the (b.) computational cross sections with some stationing values shown for reference. The outflow in the middle of the domain (around station 55661) is the planned diversion which is present in the 'future with project' scenarios only.

Hydraulic calibration

The ability of the 1-D RAS sediment model to simulate realistic hydrodynamics was assessed by comparing the longitudinal profiles of the modeled surface water elevation and cross section-averaged velocity to that predicted by the 2-D RAS sediment model. The 2-D RAS sediment model was calibrated and validated against observed surface water elevations (at three internal USGS gages) during multiple flow events (See Appendix A for summary results of the 2-D RAS sediment model hydraulic calibration). Calibration of the 1-D RAS sediment model consisted of systematic modification of the hydraulic roughness values (channel and floodplain) and the width and depth of the synthetic compound channel dimensions (i.e., the dimensions used to simplify the channel discussed previously) to optimize model performance during a low (500 cfs), moderate (5000 cfs), and high (20,000 cfs) steady discharge. The final hydraulic roughness values were identified as Manning's n = 0.035 for the channel and Manning's n = 0.3 for the floodplain. The final channel dimensions are summarized in Table 4. Calibration results are illustrated in Figure 11 to Figure 16. The calibration transect stretched 60,000 ft between the USGS gage at Zachary above the planned diversion inlet to the USGS gage near Comite, LA at the downstream outflow of the model domain.

Table 4: Final channel geometry of synthetic channels developed for the 1-D RAS sediment model.

Channel	Location (Stationing ft)	Depth (ft)	Bed width/Max width (ft)	Side-slopes (H:V)
Low flow	0-102688	10	100/120	2
High flow A	46822-102688	Variable	200/500	20
High flow B	35210-46822	Variable	400/600	20
High flow C	19010-35210	Variable	200/500	20
High flow D	0-19010	Variable	100/500	20

As an additional calibration test, the cross-section averaged velocities simulated using the 1D RAS sediment model were compared to those simulated using the previously calibrated and validated Arcadis 1D HEC-RAS model. The results of these tests showed a similar ability to predict hydrodynamics over the model extents. Results from these tests are shown in the Appendix B.

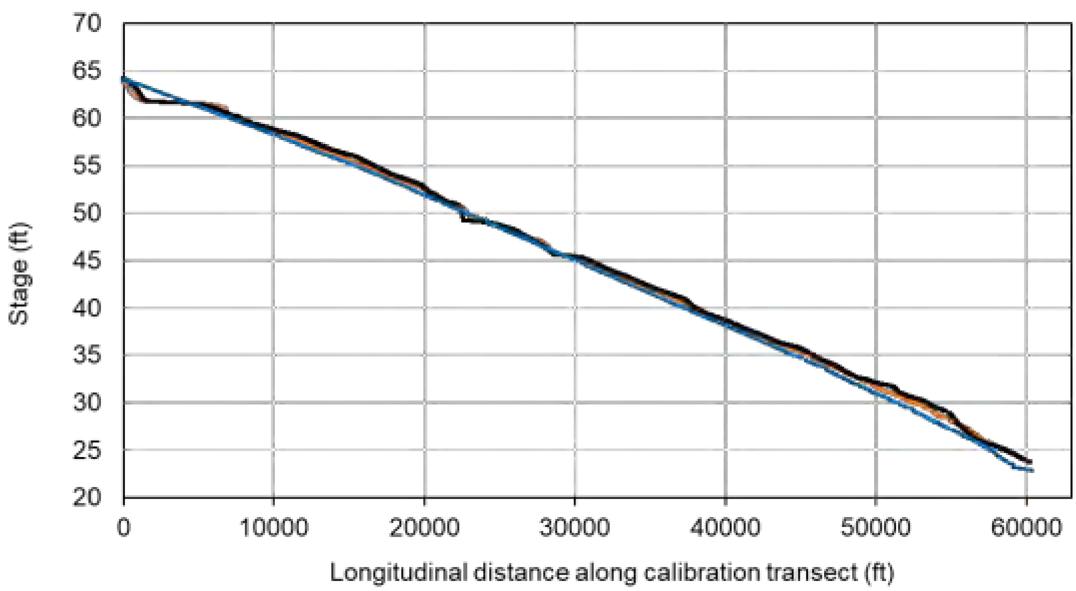


Figure 11: Plot of surface water elevation longitudinal transect at a steady 500 cfs discharge for the 2D RAS sediment model (red), 1D RAS sediment model (Hi-Res DEM) (black), and 1D RAS sediment model (Low-Res DEM) (blue).

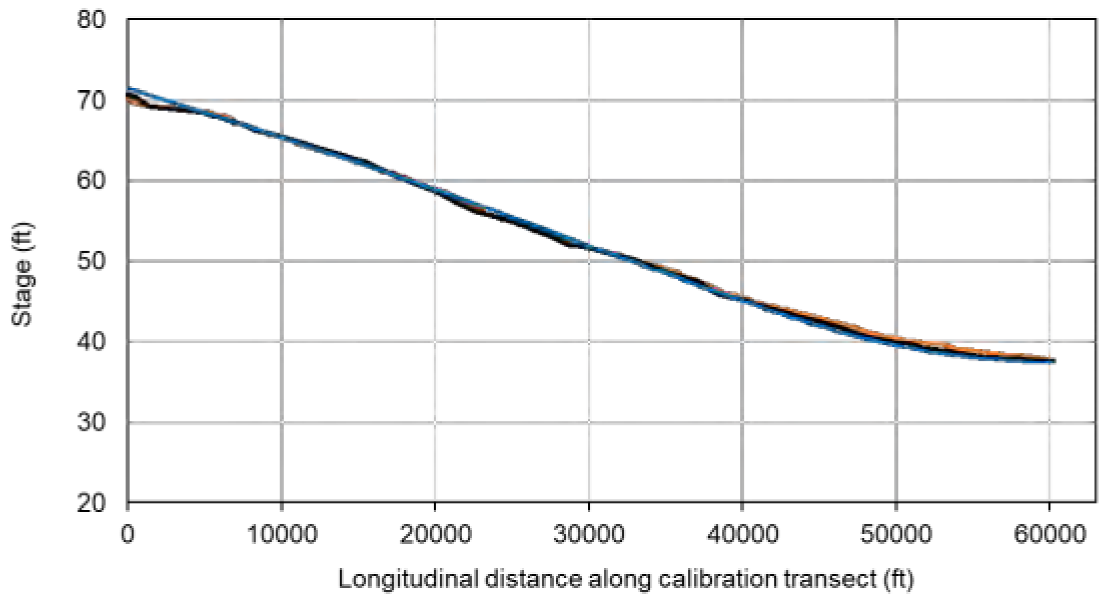


Figure 12: Plot of surface water elevation longitudinal transect at a steady 5000 cfs discharge for the 2D RAS sediment model (red), 1D RAS sediment model (Hi-Res DEM) (black), and 1D RAS sediment model (Low-Res DEM) (blue).

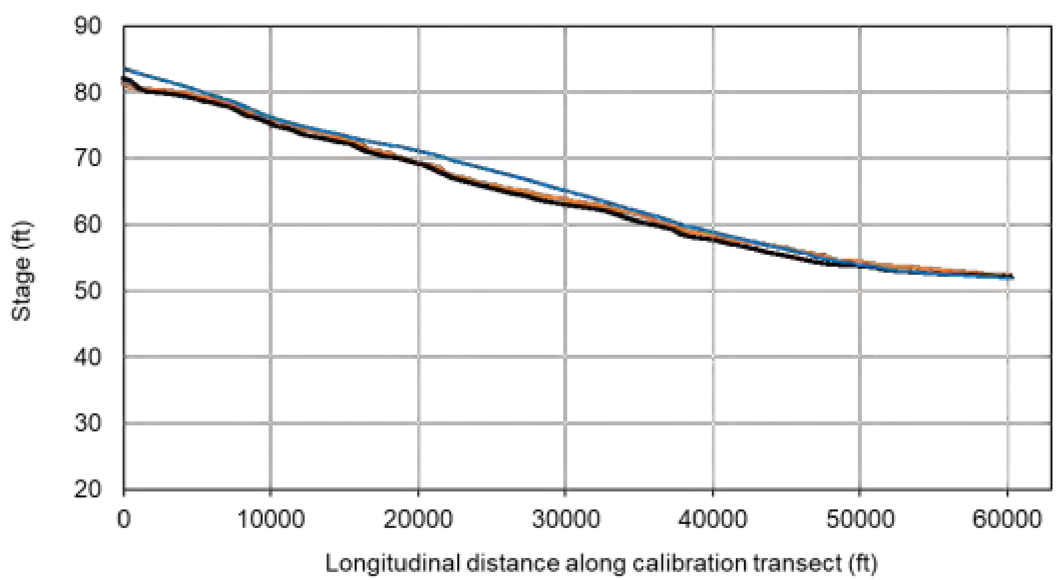


Figure 13: Plot of surface water elevation longitudinal transect at a steady 20,000 cfs discharge for the 2D RAS sediment model (red), 1D RAS sediment model (Hi-Res DEM) (black), and 1D RAS sediment model (Low-Res DEM) (blue).

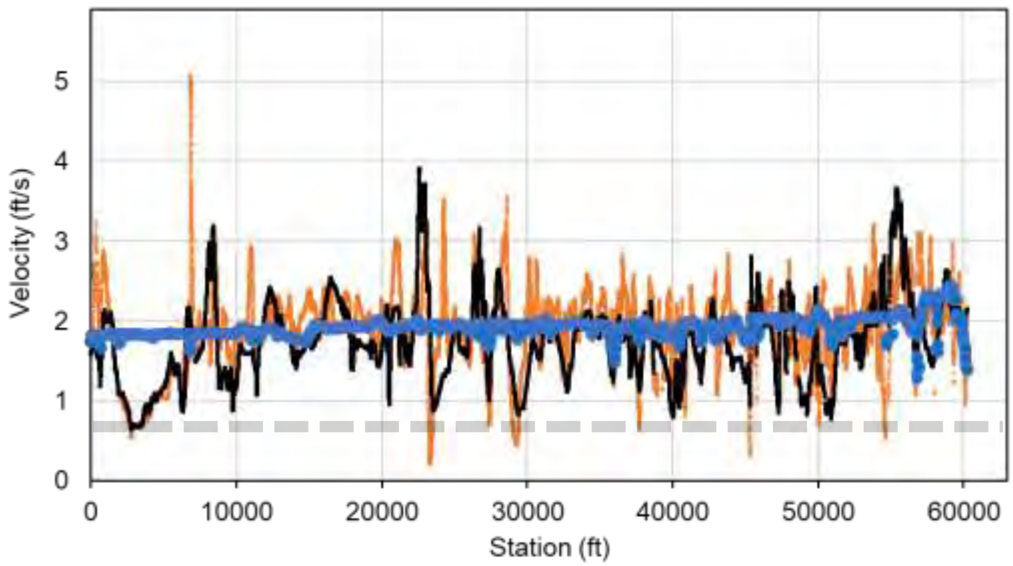
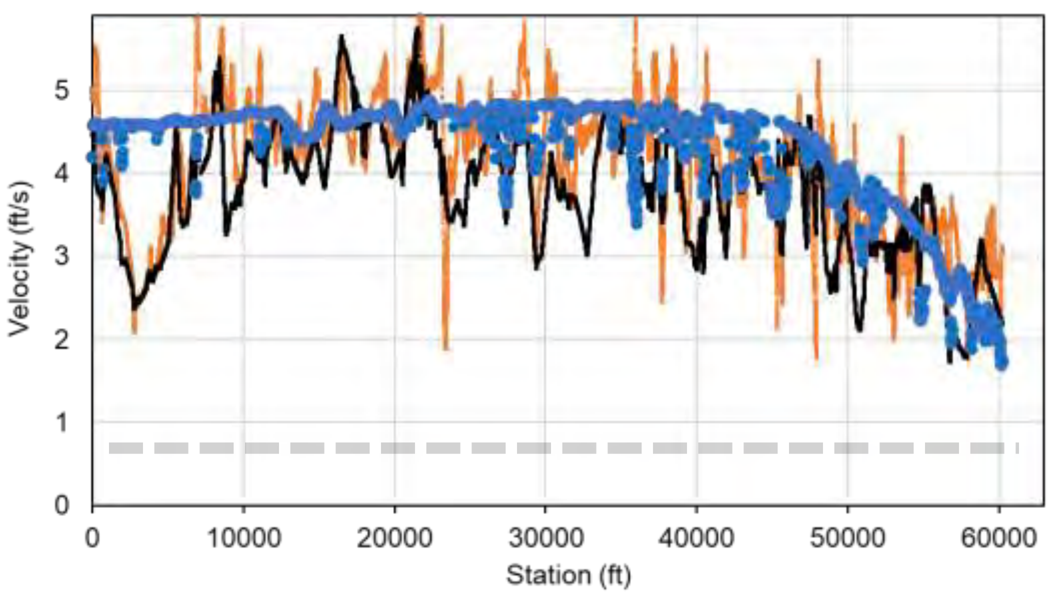


Figure 14: Plot of channel-averaged velocity longitudinal transect at a steady 500 cfs discharge for the 2D RAS sediment model (red), 1D RAS sediment model (Hi-Res DEM) (black), and 1D RAS sediment model (Low-Res DEM) (blue).The average values for these transects are 2D = 1.9 ft/s, 1D Hi-Res = 1.8 ft/s, 1D Low-Res = 2.0 ft/s. Flow direction is from left to right in this plot. The thick dashed line shows the approximate reach-averaged threshold velocity to mobilize the median bed grain size (0.004 – 0.008



mm) for reference.

Figure 15: Plot of channel-averaged velocity longitudinal transect at a steady 5000 cfs discharge for the 2D RAS sediment model (red), 1D RAS sediment model (Hi-Res DEM) (black), and 1D RAS sediment model (Low-Res DEM) (blue). The average values for these transects are 2D = 4.2 ft/s, 1D Hi-Res = 3.9 ft/s, 1D Low-Res = 4.4 ft/s. Flow direction is from left to right in this plot. The thick dashed line shows the approximate reach-averaged threshold velocity to mobilize the median bed grain size (0.004 – 0.008 mm) for reference.

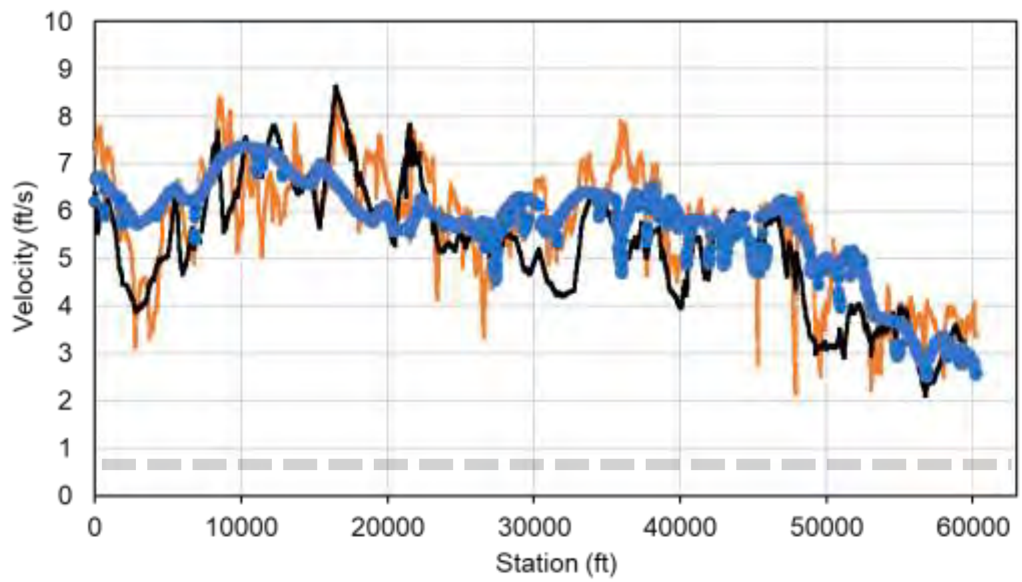


Figure 16: Plot of channel-averaged velocity longitudinal transect at a steady 20,000 cfs discharge for the 2D RAS sediment model (red), 1D RAS sediment model (Hi-Res DEM) (black), and 1D RAS sediment model (Low-Res DEM) (blue). The average values for these transects are 2D = 5.7 ft/s, 1D Hi-Res = 5.3 ft/s, 1D Low-Res = 5.7 ft/s. Flow direction is from left to right in this plot. The thick dashed line shows the approximate reach-averaged threshold velocity to mobilize the median bed grain size (0.004 – 0.008 mm) for reference.

Setup of the sediment transport parameters of the 1D RAS sediment model

The 1-D RAS sediment model uses the quasi-unsteady flow analysis method. This method simulates flow and sediment flux through a continuous unsteady hydrograph by dividing the hydrograph into a series of relatively short intervals of steady flow. This method is more stable than using a true unsteady flow method; the primary draw-back is that a volume of flow cannot be accelerated or decelerated through the model domain to simulate spatially variable flow storage. In relatively small model domains, such as that used in this study, this limitation is typically acceptable. This study utilizes 24-hour steady flow increments which is the order of time at which the Comite River discharge experiences significant change. The computational timestep for both hydraulic and sediment calculations is discharge dependent and varied between 0.5 and 3 hours; the geomorphic time step (i.e., bed change calculation) was the hydraulic time step divided by 10.

Sediment inflows were estimated using a single flow discharge-sediment flux rating curve at all open boundaries. The rating curve used measured values of flux and grain-size distribution (GSD) of mobile sediment to characterize sediment flux at low discharge and utilized the Yang sediment transport function (Yang, 1972) to predict sediment flux at a high discharge. The GSD of the sediment flux at high discharge was assumed equal to the average of that measured at the channel bed (i.e., “equal mobility"(Parker and Klingman, 1982)). 'In between' flux values were calculated with the Yang function and GSD was linearly interpolated between the distributions of the end members. The Yang sediment transport formulae was selected because it had performed well in the Arcadis model and previous studies (e.g., Hossian and Rahman, 1998; Karamisheva et al., 2006; Nakato, 1990) suggest it typically performs well in large sandy channels and compound channels under a wide range of flow conditions. The single sediment transport measurement at low discharge provided the only available observed values during model development due to prolonged drought conditions in the study area.

The channel bed GSD in each cross section was initially approximated as a single spatially-uniform distribution. The distribution was derived from the averaged distribution of sixteen bulk bed sediment samples collected around the planned diversion inlet along the Comite River channel; the sampling locations were designed to measure the GSD of the channel reach immediately (< 1.5 mi) upstream of the diversion and included four stations equally spaced along four lateral transects (Figure 5). The model was then run for a 10-year simulation period with a realistic time series of flow values, allowing the GSD in each cross-section to adapt to the local hydraulic environment. The resultant distribution of bed gradations was used to parameterize the model in following simulations. The total allowable bed sediment erosion was initially set at 8 ft (i.e., sediment bed thickness was set to 8 ft); in the absence of new measurements, the value from the existing Arcadis model was used.

The sediment transport parameters of the model were initially set to default, or 'best practice' values as specified in the user guide, if denoted. Parameter values were then modified to reflect those used in the existing Arcadis 1-D sediment model if [A] different than the initial values and if [B] the modification was aligned with sediment transport theory (e.g., a sediment transport function was suitable for the Comite River channel based on GSD and flow regime). The performance of the sediment parameterization was then tested through a series of calibration simulations and sensitivities were tested in a series of sensitivity simulations, which are described in the following sections.

2.3 Sediment transport calibration through sensitivity testing

The performance of the 1-D RAS sediment model was calibrated through systematic sensitivity testing. The use of observed values to guide parameterization in sediment models is often difficult because of the paucity of available sediment measurements. Sediment data are laborious and expensive to obtain. The sensitivity tests were used to identify the relative influence of model parameters and the likely degree of error generated by the uncertainty in parametrization.

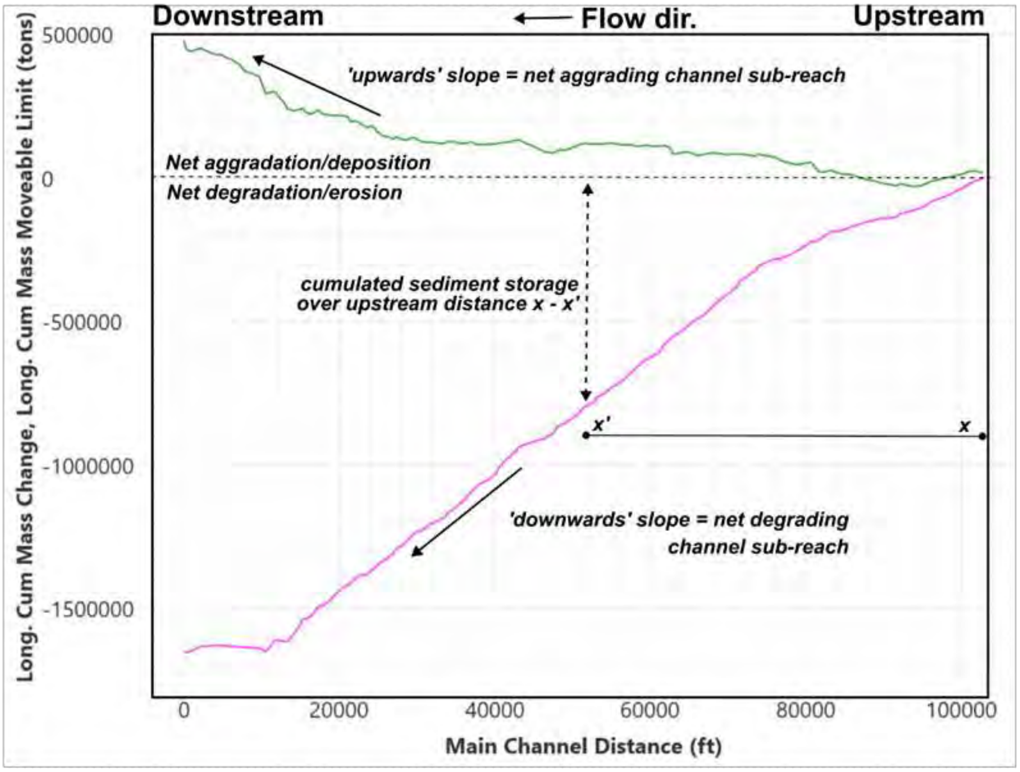


Figure 17: Example plot of model output showing net sediment storage (Base scenario without project shown). The green line is total net sediment storage (floodplains and channel) and the pink line is channel storage only. This plot is annotated to aid interpretation.

The sensitivity tests were designed to systematically modify one parameter from a 'base case' scenario and identify how that change affected the sediment storage within the model domain during a 30-year simulation. Sediment storage was used as the primary comparison metric because it carries information about sediment inflow, outflow, and sediment exchange within the bed and floodplain. Figure 17 is an example plot of sediment storage as typically illustrated in this report. The plot shows cumulative sediment storage, systematically summed with distance downstream. This figure, the green line shows the total net sediment storage in the model (channel and floodplains) and the pink line shows the total net sediment storage in the channel only. The figure shows data from the base scenario without project; the total net sediment storage in the model is positive (net aggradation) while the channel storage is negative (net degradation). The y-axis title in this type of plot was automatically assigned by the HEC-RAS plotter and should be interpreted to mean "Net cumulated sediment storage along longitudinal channel transect".

Sensitivity test scenario design

The sediment parameters used in the base case scenario were determined from a preliminary series of tests during model development designed to ensure simulation of realistic geomorphic behavior. These parameters are shown in Table 5.

As described in the setup of the sediment parameters section, the initial inflow sediment rating curve was based on that validated in the Arcadis sediment model; the gradation was assumed to linearly-increase from an observed grain-size distribution collected by the USGS at a low discharge (~100 cfs) to the observed spatially-averaged bed grain-size distribution (equal mobility hypothesis) (Parker and Klingman, 1982). The initial bed sediment gradation was assumed to be the average value of the bed material samples collected by the USGS (in 2023) after a 10-year 'hot start' simulation was used to evolve and equilibrate the bed grain-size distribution at each model cross-section to typical local hydrodynamics.

The simulation utilized a synthetic 30-year quasi-unsteady hydrograph. The synthetic hydrograph was created using the Monte Carlo method to draw daily discharges from the total cumulative discharge recurrence probability distribution illustrated in Figure 3 (calculated from the USGS gage at the model outlet). The total discharge drawn from the probability distribution was then broken into its mean constituent (tributary) inflows as calculated for Table 3. To account for the effects of spatial variability of rainfall, a random fluctuation was applied to each tributary inflow. The fluctuation value was recalculated daily and based on the calculated mean contribution of each tributary and the standard deviation of the observed time series at the model outlet.

The procedure defined above created a time series of flows with the same statistical recurrence probability as that observed but with no time dependence (autocorrelation). Since in actuality, a high or low daily flow is more likely to follow a daily flow of similar magnitude than a randomly assigned magnitude, a simple method to insert a degree of autocorrelation was applied. Statistical analyses using HEC-SSP indicated that high flow events typically lasted 2-10 days within the study area. To simulate this phenomenon, an algorithm was applied to the time series that sorted 10-day discharge sequences into 5-days of monotonically rising discharges and 5-days of monotonically falling discharges. This method would generate more realistic pulses of flow and sediment entering the model domain than if daily discharges were fully random.

Sensitivity test workflow

Model performance sensitivity to sediment transport parameterization was tested in six suites of comparative tests. Plots of absolute sediment inflows and outflow are given for each simulation so model performance can be compared against simulations in other suites. The suites test the following groups of parameters: [1] sediment feed, [2] bed gradation, [3] internal sediment transport, [4] miscellaneous (numerical methods, etc.), [5] diversion efficiency, and [6] bridge effects.

Table 5: Sediment parameterization for the base scenario. These parameters were assigned based on professional judgement, past experience, and HEC-RAS User Guide recommendations.

Parameter type	Parameter	Value
Internal sediment transport		
	Transport Function	Yang
	Sorting Method	Thomas
	Fall Velocity Method	Van Rijn
	Hiding Function	Ashida and Michiue
	Active Layer Thickness	2 X d90
1D Bed Change		
	Initial bed thickness	8 ft
	Channel Deposition/Erosion	Veneer/Veneer
	Overbank Deposition/Erosion	Veneer/None
Sediment Computation Options		
	Bed exchange iterations per timestep	10
	Min. bed change required for updating bathy/hydraulics	0.02 ft
	Transport energy slope method	downwind
	Sediment computation multiple X hydraulic timestep	1
	Number of US/DS cross sections used to calculate hydraulics for sediment transport	2/2
	Computational increment	Variable (3 to 0.25 hrs depending on Q)

Test 1: Sediment feed into the model domain

The first suite of sensitivity tests investigated how modifying the magnitude or the gradation (i.e., grain-size distribution) of the sediment flux entering the model domain affected sediment storage. Figure 18 shows the cumulative sediment inflows and the outflow through the downstream outlet in the model over the 30-year simulation period for selected sensitivity simulations; the difference between the inflows and outflow is the total cumulative sediment storage over the simulation period. Table 6 provides a description of each sensitivity scenario as well as the difference between the sediment storage calculated for that scenario and the base scenario. For reference, the base scenario cumulative sediment inflow was 1.23×10^6 tons, the sediment outflow from the downstream open boundary was 7.54×10^5 tons, and the total storage within the channel bed and floodplain was 4.78×10^5 tons. In the vast majority of scenarios simulated in the sensitivity tests, outflow was smaller than total inflows indicating net sediment storage within the model domain. However, when only the channel bed (i.e., the cross-section width between the user-defined moveable bed limits) was considered, the channels were degradational (suggesting the floodplains retained more than enough sediment to compensate for the erosion of channel bed material) (Figure 19).

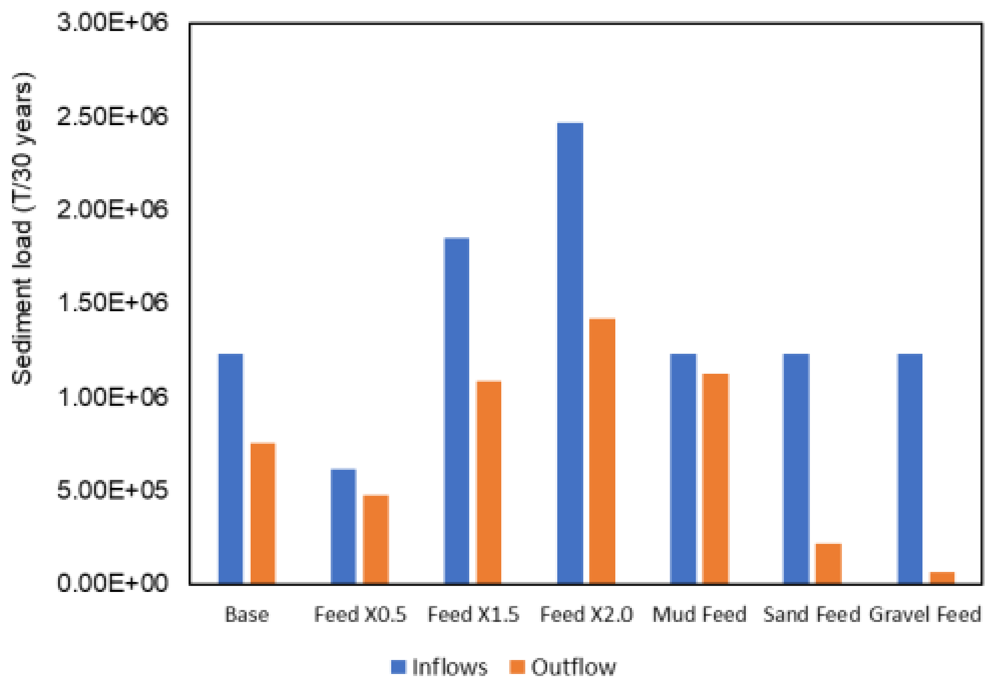


Figure 18: Bar chart of sediment inflows (including tributary inputs) and outflow at the model downstream boundary for the scenarios included in this test. The difference between the bars for each test is the sediment storage within the study area.

Scenario ID	Description	Change in total net storage as fraction relative to base scenario (% change).	Change in net bed sediment erosion mass relative base (% change)
Feed X0.5	Sediment inflows increased by factor of 0.5 (half of base) per unit inflow of water	0.29 (-71%)	0.65 (-36%)
Feed X1.5	Sediment inflows increased by factor of 1.5 per unit inflow of water	1.6 (+60%)	0.98 (-3%)
Feed X2.0	Sediment inflows increased by factor of 2.0 (double of base) per unit inflow of water	2.19 (+119%)	0.98 (-2%)
Mud Feed	All inflows mud (equal parts all clay and silt fractions)	0.23 (-77%)	1.11 (+11%)
Sand Feed	All inflows sand (coarser sand fractions added with increasing discharge)	2.13 (+113%)	1.03 (+3%)
Gravel Feed	All inflows gravel (coarser gravel fractions added with increasing discharge)	2.45 (+145%)	0.36 (-64%)

Table 6: Parameter information and calculated change in sediment storage from the Base scenario for each scenario in test. Note that a positive change in total net storage indicates that the identified parameterization INCREASED storage in the model domain; a positive change in net bed erosion indicates that the identified parameterization DECREASED storage in the channel bed.

The simulations that tested the impact of changing the magnitude of the sediment feed indicated that feed had a slightly non-linear impact on storage. Decreasing the feed (inflow sediment per unit inflow water) by half (-50%) decreased storage by -71%. Increasing the feed by a factor of 1.5 and 2.0 increased sediment storage by 1.6 and 2.19, respectively.

The simulations that tested the impact of changing the gradation of the sediment feed indicated that mud (clay and silts), sand, and gravel were stored significantly differently in the channel bed once introduced into the model domain. Relative to the Base scenario, the uniform mud feed scenario significantly decreased sediment storage within the model domain while the uniform sands and gravels feed increased sediment storage. In all scenarios, the bed was net degradational, with the uniform sand feed only slightly more degradation than the Base scenario. Over the 30-year simulation, the introduced gravel feed proved much less mobile than the sands and muds. Gravels moved on the order of a few miles over the simulation period and showed signs of net accumulation within the study area channel bed (though not enough to compensate for the net erosion of finer material in the initial bed material).

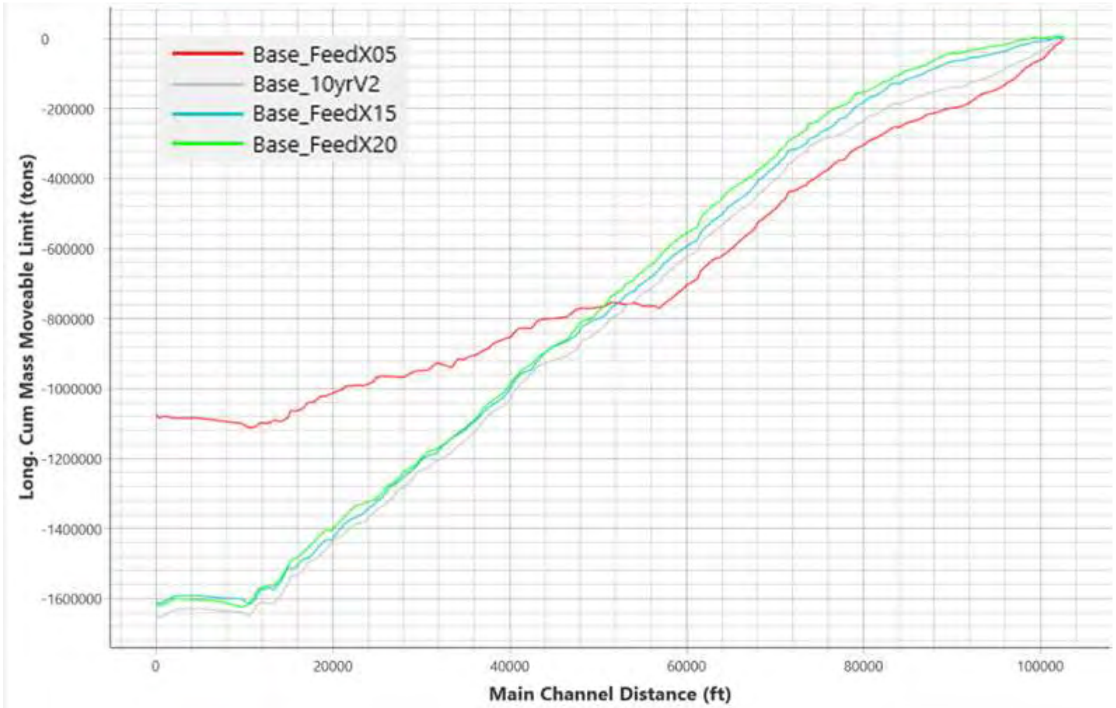


Figure 20: Net sediment storage within the channel bed at the conclusion of each simulation testing the sensitivity to sediment feed magnitude. Note that the simulation labeled 'Base_10yrV2' is the base scenario.

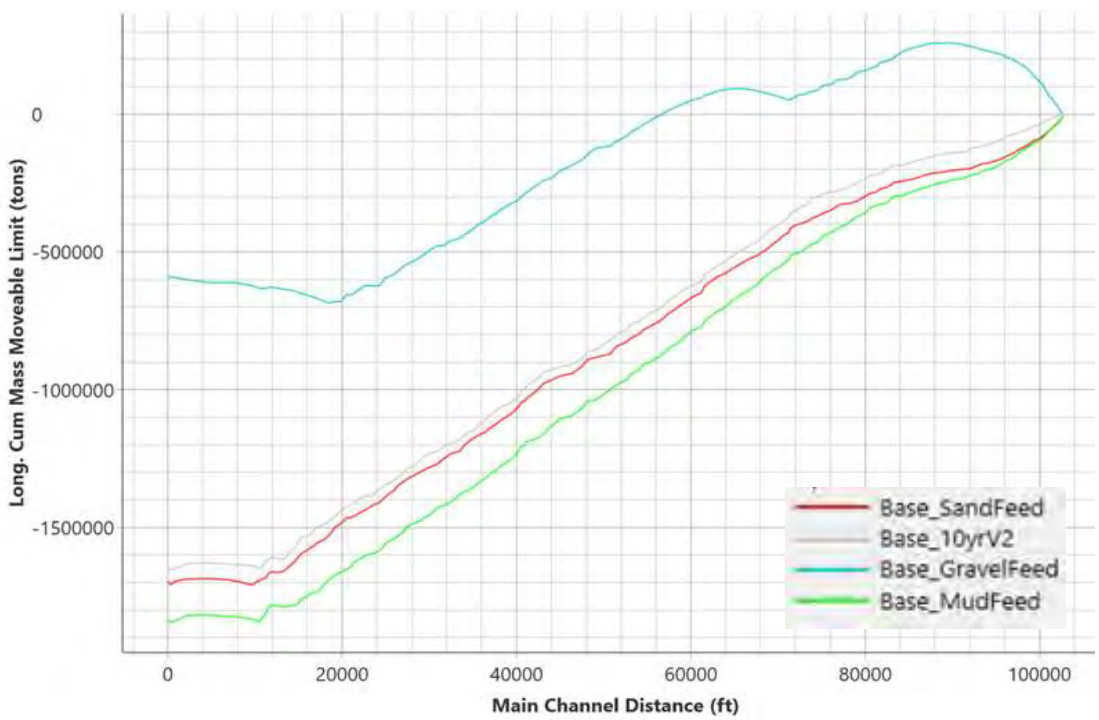


Figure 19: Net sediment storage within the channel bed at the conclusion of each simulation testing the sensitivity to sediment feed grain-size gradation. Note that the simulation labeled 'Base_10yrV2' is the base scenario.

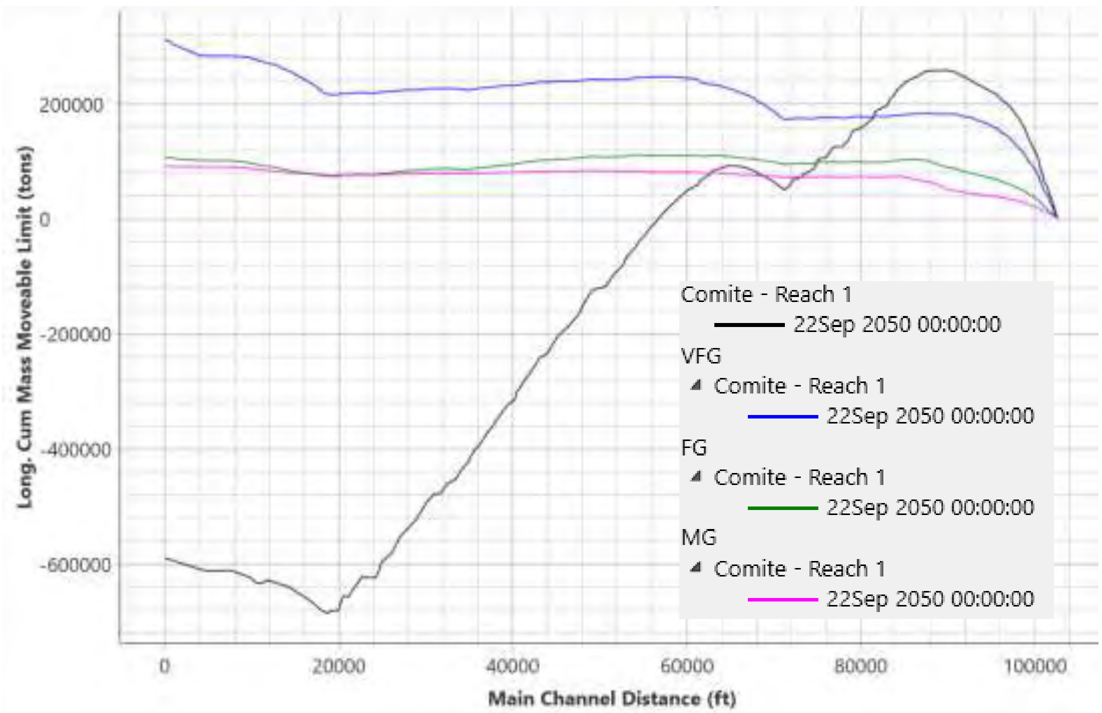


Figure 21: Net sediment storage within the channel bed for the 'gravel feed' scenario. This plot shows that while the channel, as a whole (black line), experienced net erosion, the sediment storage values by individual grain size indicated that the sediment storage for gravels increased. The black line is total storage, the blue line is storage of very-fine gravel (VFG), the green line is storage of fine gravel (FG), and the pink line is storage of medium gravel (MG).

Test 2: Initial bed gradation

The second suite of sensitivity tests investigated how modifying the initial bed gradation influenced the final magnitude of sediment storage. In these scenarios, there was no bed pre-conditioning (i.e., no "hotstart" – except for the 'Base' scenario as discussed previously). The feed was the same in all scenarios, which was set to equal the base scenario. Figure 22 shows the longitudinal gradation of the bed material in each scenario at the start of the simulation in terms of the median grain-size fraction (D_{50}). The Base scenario (Base_10yrV2) shows signs of downstream fining with a D_{50} typically ranging from 6 to 2 mm and a spatially median value of 3.8 mm. Figure 23 shows the longitudinal gradation of the bed material in each scenario at the conclusion of the simulation. Through the simulation, the introduced feed generates slightly more variability in the bed gradation for the uniform GSD scenarios. For the Base scenario, the GSD becomes more spatially variable and coarsens slightly on average (D_{50} = 4.5 mm).

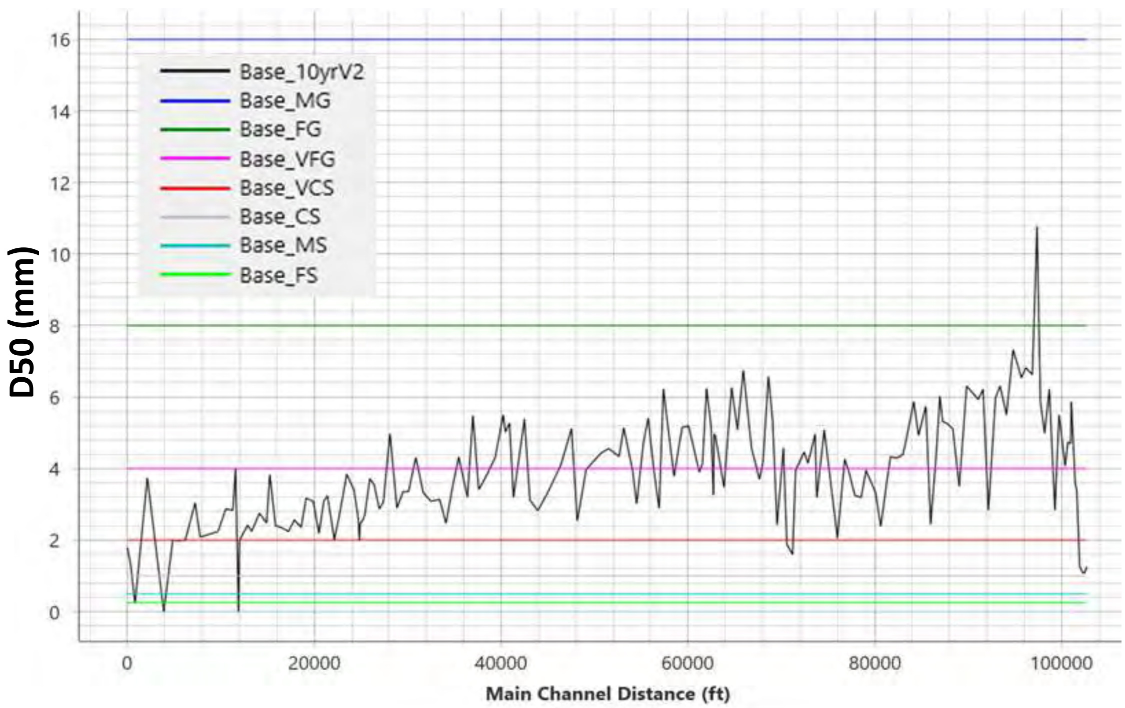


Figure 22: D_{50} for the initial channel bed for the scenarios testing the impact of bed gradation on sediment storage.

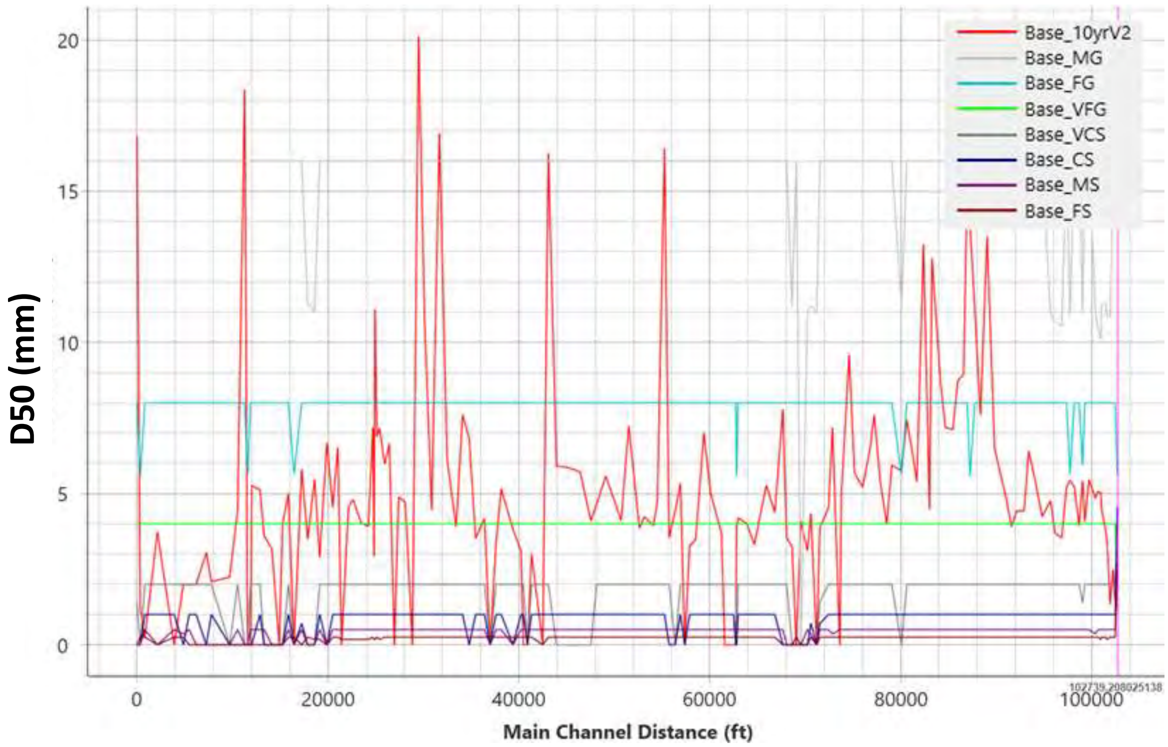


Figure 23: Calculated D50 for the channel bed at the conclusion of a 30-year simulation for the scenarios testing the impact of bed gradation on sediment storage.

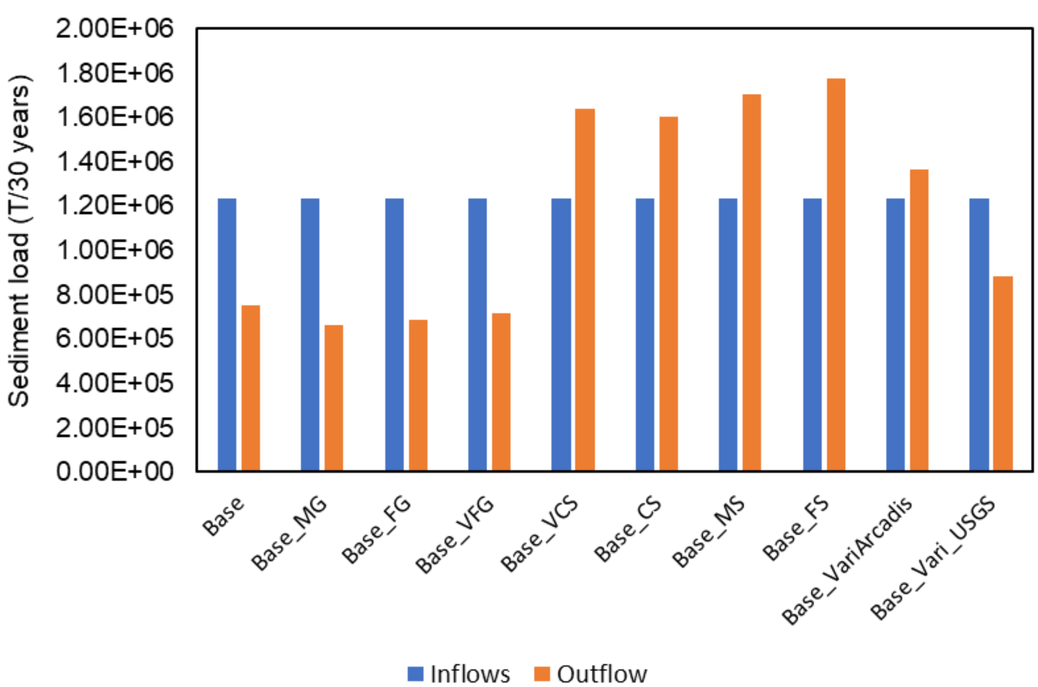


Figure 24: Bar chart of sediment inflows (including tributary inputs) and outflow at the model downstream boundary for the scenarios included in this test. The difference between the bars for each test is the sediment storage within the study area.

Table 7: Parameter information and calculated change in sediment storage from the Base scenario for each scenario in test. Note that a positive change in total net storage indicates that the identified parameterization INCREASED storage in the model domain; a positive change in net bed erosion indicates that the identified parameterization DECREASED storage in the channel bed.

Scenario ID	Description	Change in total net storage as fraction relative to base scenario (% change).	Change in net bed sediment erosion mass relative base (% change)
MG	Uniform initial bed gradation = medium gravel (MG) = 8 mm	1.19 (+19%)	0.19 (-81%)
FG	Uniform initial bed gradation = fine gravel (FG) = 4 mm	1.14 (+14%)	0.06 (-94%)
VFG	Uniform initial bed gradation = very-fine gravel (VFG) = 2 mm	1.07 (+7%)	0.01 (-98.8%)
VCS	Uniform initial bed gradation = very-coarse sand (VCS) = 1.0 mm	-0.85 (-185%)	2.09 (+109%)
CS	Uniform initial bed gradation = coarse sand (CS) = 0.5 mm	-0.78 (-175%)	2.1 (+110%)
MS	Uniform initial bed gradation = medium sand (MS) = 0.25 mm	-0.99 (-199%)	1.96 (+96%)
FS	Uniform initial bed gradation = fine sand (FS) = 0.125 mm	-1.13 (-213%)	1.95 (+95%)
Var_Arcadis	Spatially variable (X-secs may be different) GSD as defined in Arcadis model	-0.27 (-127%)	1.81 (+81%)
Var_USGS	Spatially variable GSD (X-secs may be different) as per 2017 USGS survey	0.74 (-26%)	1.0 (+0%)

There is a significant change in behavior calculated between the sand and gravel bed scenarios. Unlike the majority of other scenarios tested, the sand bed scenarios are net erosional (including the floodplains) (Figure 25). Similar to the other scenarios, the downstream third of the domain is depositional; however, the erosion occurring in the upper two-thirds is greater in magnitude. All scenarios examined by these tests were calculated to have degradational channels over the 30-year study interval (Figure 26).

The significant difference in behavior between mobile sand and gravel may be a result of, in part, the Yang sediment transport function utilized to calculate sediment flux rates within the model domain. The Yang formulae is composed of separate equations for grain-size fraction above and below the 0.6 mm grain-size threshold.

An interesting result to note is that the magnitude of the erosion during the sand bed scenarios was not linearly related to grain size. Finer sands experienced more exchange between the channel bed and floodplain than coarser sands, which tended to induce more floodplain (and, therefore, overall) storage through the simulation period. While finer sand in the upstream reach channel was eroded preferentially by grain size (until limited by the total sediment thickness available for erosion), all sand, independent of grain-size experienced similar rates of deposition in the lower downstream reach of the floodplain. The combination of these factors hindered the ability to identify generalized sediment storage behavior by sand grain-size fraction.

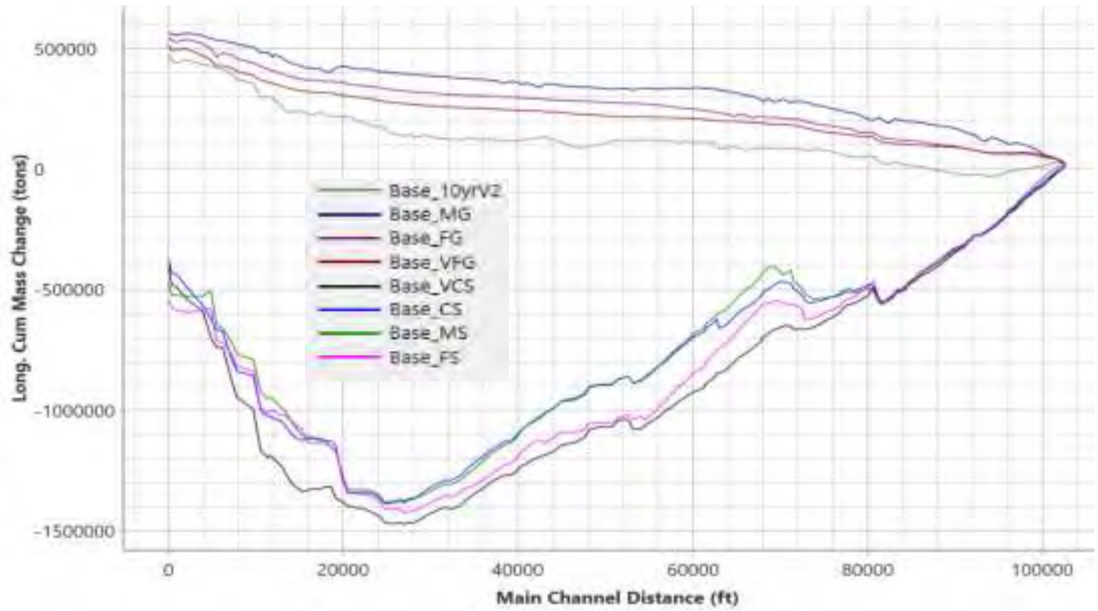


Figure 26: Net total sediment storage at the conclusion of each simulation testing the sensitivity to initial bed sediment gradation. Note that the simulation labeled 'Base_10yrV2' is the base scenario.

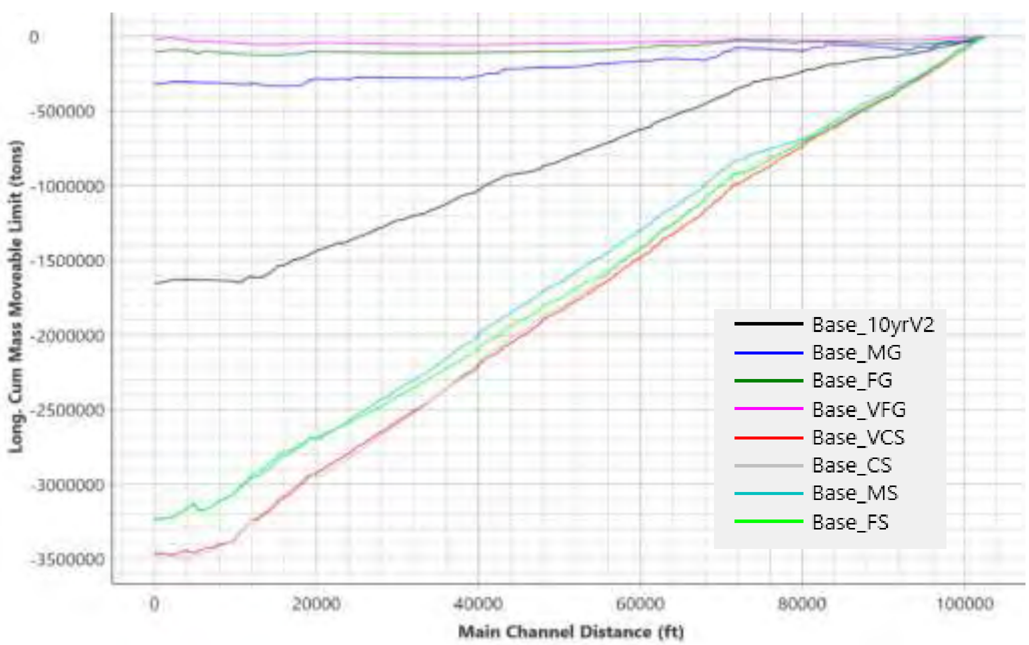


Figure 25: Net sediment storage within the channel bed at the conclusion of each simulation testing the sensitivity to initial bed sediment gradation. Note that the simulation labeled 'Base_10yrV2' is the base scenario.

The scenarios testing bed sediment gradations based on Arcadis and USGS (2017) measurements and assumptions predicted less sediment storage over the duration of the simulation than the Base scenario. This was primarily an artifact of the overall finer initial bed gradations (Figure 28). Note that steep, sudden spikes in cross section invert are artifacts of 1-D model numerical methods. While the model was not modified to prevent their calculation in the sensitivity tests, effort was awarded to prevent their calculation in the final production simulations.

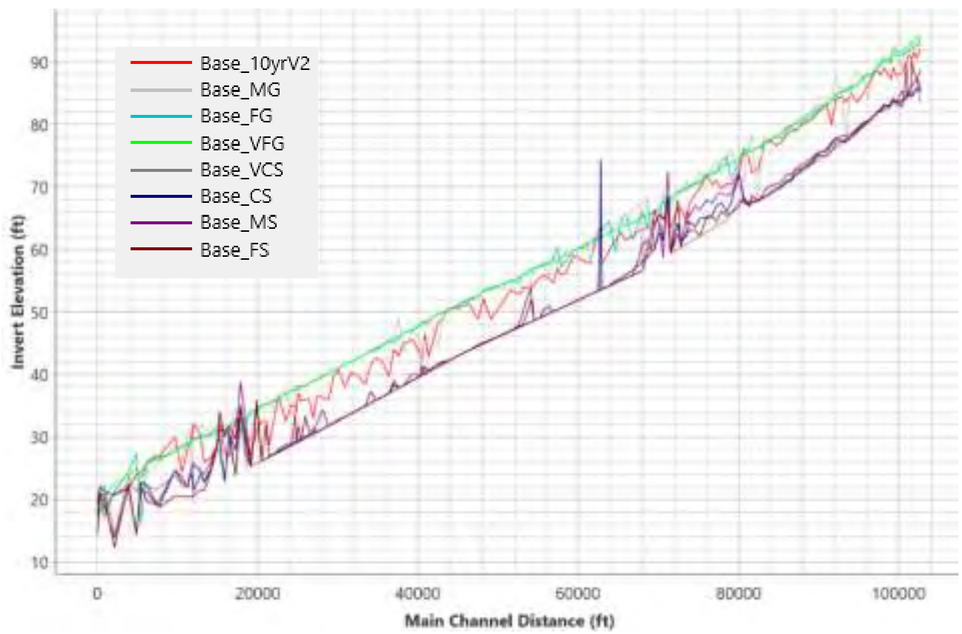


Figure 27:Longitudinal profile of the final thalweg bed (referred to as "invert") elevation for the scenarios testing the sensitivity of initial bed gradation at the conclusion of a 30-year simulation duration. Note that the profile of the coarser gravel bedded simulations did not significantly change from the initial profile at the start of the simulation.

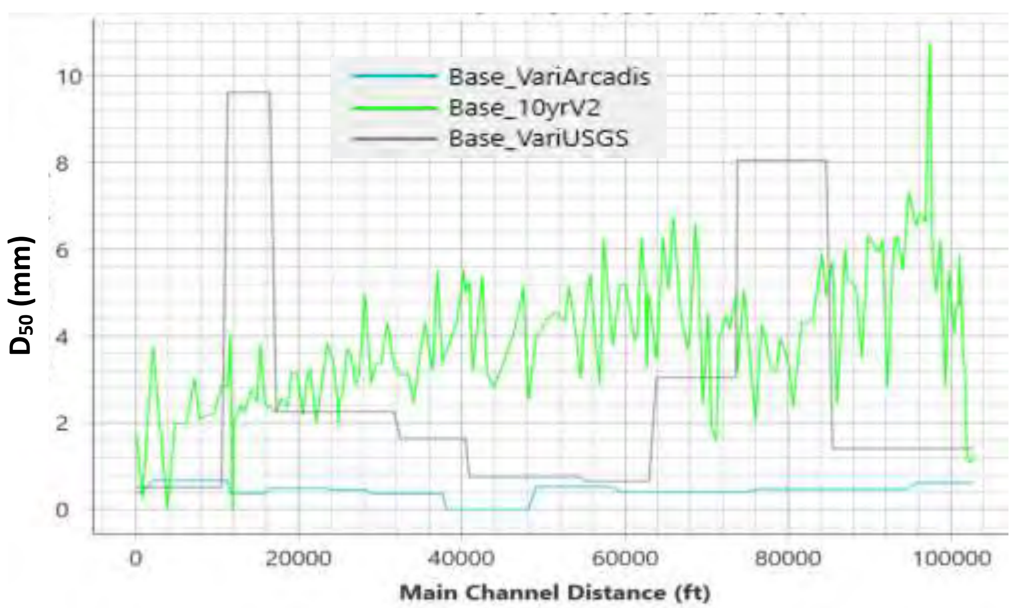


Figure 28: D_{50} for the initial channel bed for the scenarios testing the impact of bed gradation with spatially variable gradations on sediment storage.

Test 3: Intra-model sediment transport simulation

The third suite of sensitivity tests investigated the influence of sediment transport and mixing functions on sediment storage (Figure 29; Table 8). The sediment sorting and fall velocity calculation methods were not systematically investigated in this analysis. The Thomas sorting method was used because it was assumed that the wide range of grain sizes would permit some degree of vertical armoring of bed material. The Van Rijn fall velocity method was used because the project team had the most experience with that method and previous analyses indicated that simulated regional sedimentation was not sensitive to this parameter.

Sensitivity tests included simulations utilizing the Yang (Base scenario), Engelund-Hansen, Laursen, and Toffaletti transport functions. These functions are considered appropriate for large sandy or sand and gravel bedded channels based on their calibration and validation histories. These functions performed similarly, predicting total flux out of the model within 20 % of each other. The Engelund-Hansen function predicted half (-50%) of the sediment storage as the Base scenario, while the Toffaletti and Laursen functions predicted -30 % and -8 % of the Base scenario respectively. Figure 30 shows sediment capacity ratings curves calculated for the functions at a model cross section immediately upstream of the planned diversion location. A power-law curve fit to the Yang data shows that the Yang function predicted sediment flux per unit flow discharge generally in the middle of that predicted by other functions and was very similar to the Laursen power-law curve.

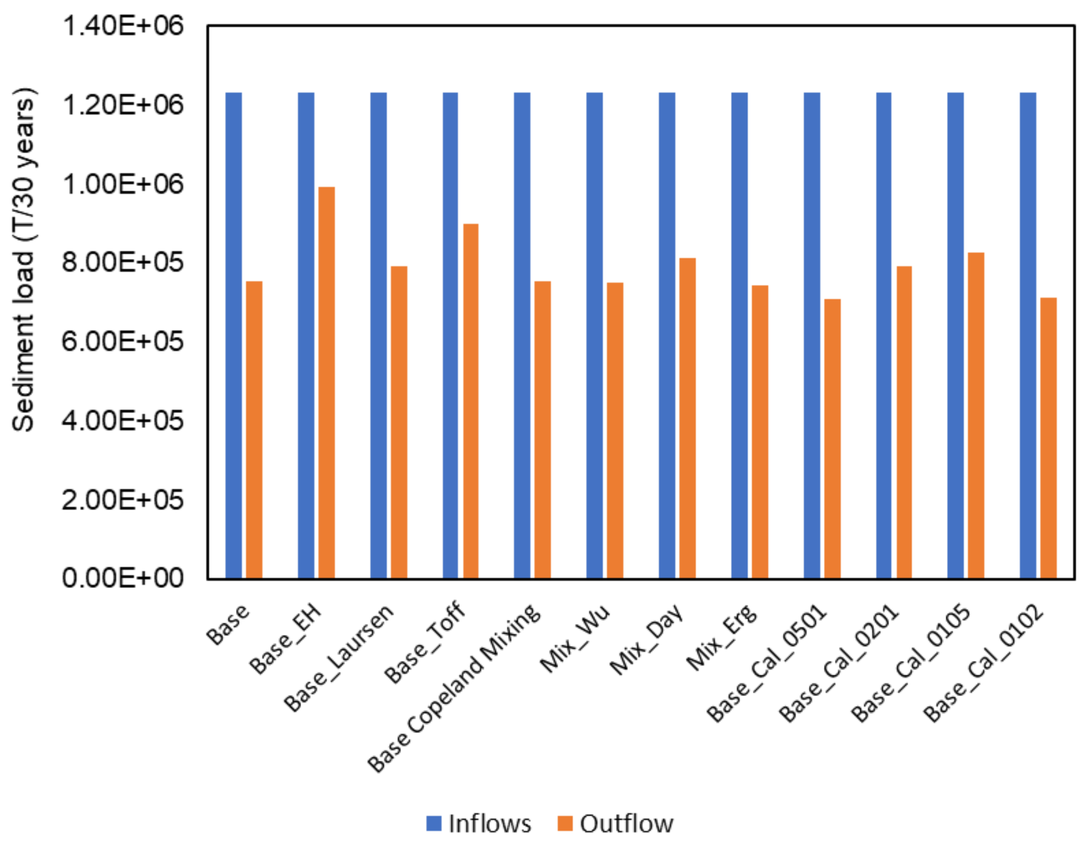


Figure 29: Bar chart of sediment inflows (including tributary inputs) and outflow at the model downstream boundary for the scenarios included in this test. The difference between the bars for each test is the sediment storage within the study area.

Table 8: Parameter information and calculated change in sediment storage from the Base scenario for each scenario in test. Note that a positive change in total net storage indicates that the identified parameterization INCREASED storage in the model domain; a positive change in net bed erosion indicates that the identified parameterization DECREASED storage in the channel bed.

Scenario ID	Description	Change in total net storage as fraction relative to base scenario (% change).	Change in net bed sediment erosion mass relative base (% change)
Base	Base model that utilizes the Yang transport formulae and Ashida and Michiue hiding function	-	-
EH	Base model modified to use the Engelund-Hansen transport function	0.5 (-50%)	2.1 (+110%)
Laursen	Base model modified to use the Laursen (Copeland) transport function	0.92 (-8%)	1.78 (+78%)
Toff	Base model modified to use the Toffaletti transport function	0.70 (-30%)	0.21 (-79%)
Copeland Mixing	Base model modified with Copeland [bed mixing] method turned on.	No change	No change
Mix_Wu	Base model modified to use Wu hiding function	1.01 (+1%)	0.44 (-56%)
Mix_Day	Base model modified to use Day hiding function	0.88 (-12%)	0.24 (-76%)
Mix_Erg	Base model modified to use Egiazaroff hiding function	1.02 (+2%)	0.98 (-2%)
Cal_0501	Base model with scaling factors applied: Transport function X 0.5 , Critical mobility threshold X 1.0	1.1 (+10%)	0.69 (-31%)
Cal_0201	Base model with scaling factors applied: Transport function X 2.0 , Critical mobility threshold X 1.0	0.92 (-8%)	1.35 (+35%)
Cal_01_05	Base model with scaling factors applied: Transport function X 1.0 , Critical mobility threshold X 0.5	0.85 (-15%)	1.01 (+1%)
Cal_01_02	Base model with scaling factors applied: Transport function X 1.0 , Critical mobility threshold X 2.0	1.09 (+9%)	0.58 (-42%)

Tests confirmed that the sediment hiding functions did not have a significant impact on sediment storage (fluctuating sediment storage by 14 %).

The final simulations of these tests investigated how generalized modification of transport formulae affected sediment storage. Generalizing the Base scenario sediment transport formula (i.e., the Yang function) as in the form:

$$Q_s = \alpha(\omega - \beta\omega_c)^\gamma$$

where Qs is the sediment flux, ω is a metric of tractive force (such as velocity or bed stress), ω_c is the critical threshold of the tractive force to initialize grain motion, and α, β, and γ are calibration coefficients. In the Base scenario, the α and β coefficients are both set to 1. We conducted additional sensitivity scenarios that systematically changed the α and β coefficients to 0.5 and 2.0, which would calculate sediment storage after halving or doubling the calculated transport (α) or the critical threshold for grain motion (β). The results of these scenarios are helpful in providing context to assess the effect of the other transport functions. For example, analysis of the sensitivity test results show that application of the Laursen function reduced sediment storage, relative to that calculated in the Base scenario, at the same magnitude as increasing the sediment flux predicted by the Base scenario by a factor of 2.

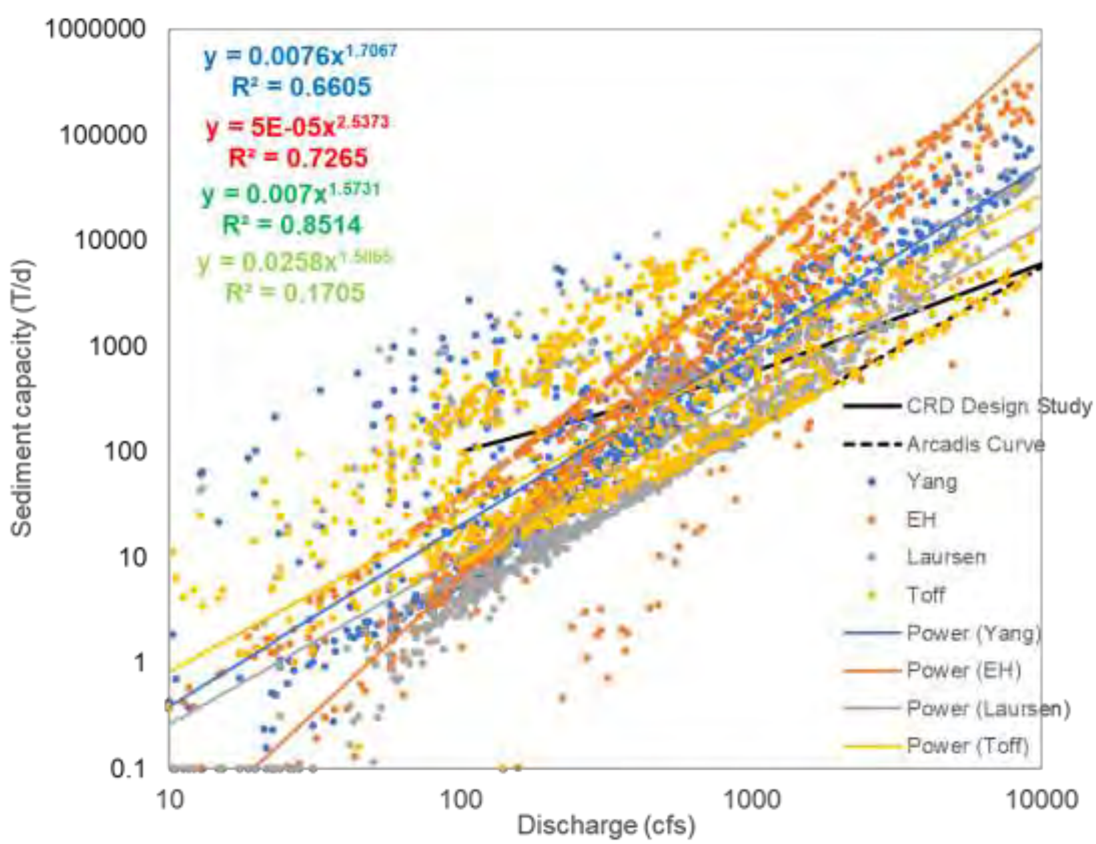


Figure 30: Sediment capacity-flow discharge relationships (in log-log space) for the four sediment transport function tested in this study. Relationships were defined at the model cross section immediately upstream of the planned diversion inlet location. The colored lines show the fitted trend line calculated for the scatter datasets. The black lines show the sediment rating curves used in the 1995 USACE Design Study and the Arcadis study respectively, The Arcadis line is partially hidden by the Toffaletti scatter dataset.

Test 4: miscellaneous parameters.

The objective of these simulations was to test the sensitivity of miscellaneous parameters that did not fall in the previous test categories. The first series of simulations varied the initial depth of bed sediment thickness. The Base scenario assumed an initial thickness of 8 ft (i.e., the value assumed in the Arcadis sediment model); over the 30-year simulation this initial thickness did not significantly limit the depth of erosion. Changing the initial thickness to smaller values (i.e., 5 and 2 ft) did act as a limiter of erosion depth (Figure 31) but did not significantly change the sediment storage value at the conclusion of the simulation (Figure 32;Table 9).

The next series of tests investigated the effect of hydrograph resolution. The Base scenario broke the hydrograph into 24 hr time steps. Here a time step refers to the length of time for a hydrograph ordinate, not a computational time step. The tests modified the time steps to 12 hrs or 48 hrs, which effectively halved or doubled the total simulation time respectively. No non-linear impacts were observed within the sediment dynamics as these modifications either halved or doubled the total sediment storage at the conclusion of the simulations.

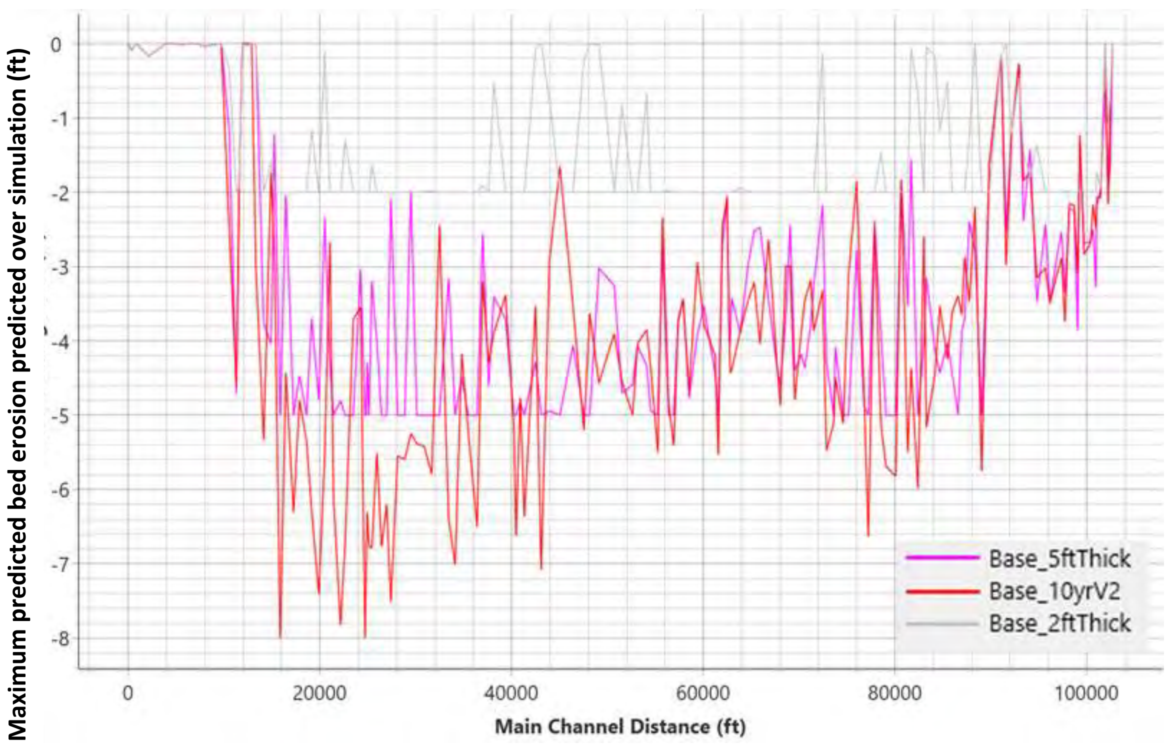


Figure 31: Maximum bed sediment erosion over the course of a 30-year simulation. The results for three simulations are shown, for initial sediment thickness of 8 (Base_10yrV2), 5 (Base_5ftThick), and 2 (Base_2ftThick), respectively.

The next three sensitivity tests investigated individual (unrelated) modifications to the model parameterizations. The test referred to as 'bed iterations X2' doubled the number of times the sediment mixing and hiding functions were applied per computational timestep. The test referred to as 'local energy slope calc' modified the method used to calculate the transport energy slope (from downwind to local). The results of both of these tests indicated that the impact of the tested parameters was minimal on sediment storage. The test referred to as 'No Overbank' removed the ability to either erode or deposit sediment from areas of a cross section outside of the mobile bed limits. By preventing channel-floodplain sediment exchange, total sediment storage decreased -144 % and became net negative. For reference, approximately one flow per year significantly inundated the floodplain of a cross section.

The next test simulated the impact of an alternative sediment sorting method. In this test, the 'Thomas (Ex5)' method was swapped for the 'Copeland (Ex7)' method which was designed for sand bedded channels that do not develop significant armoring layers of relatively coarser sediment. The Copeland method typically computed more erosion than the Thomas method; in this test it decreased overall storage by 16% but decreased bed erosion by 26%, relative to the base scenario.

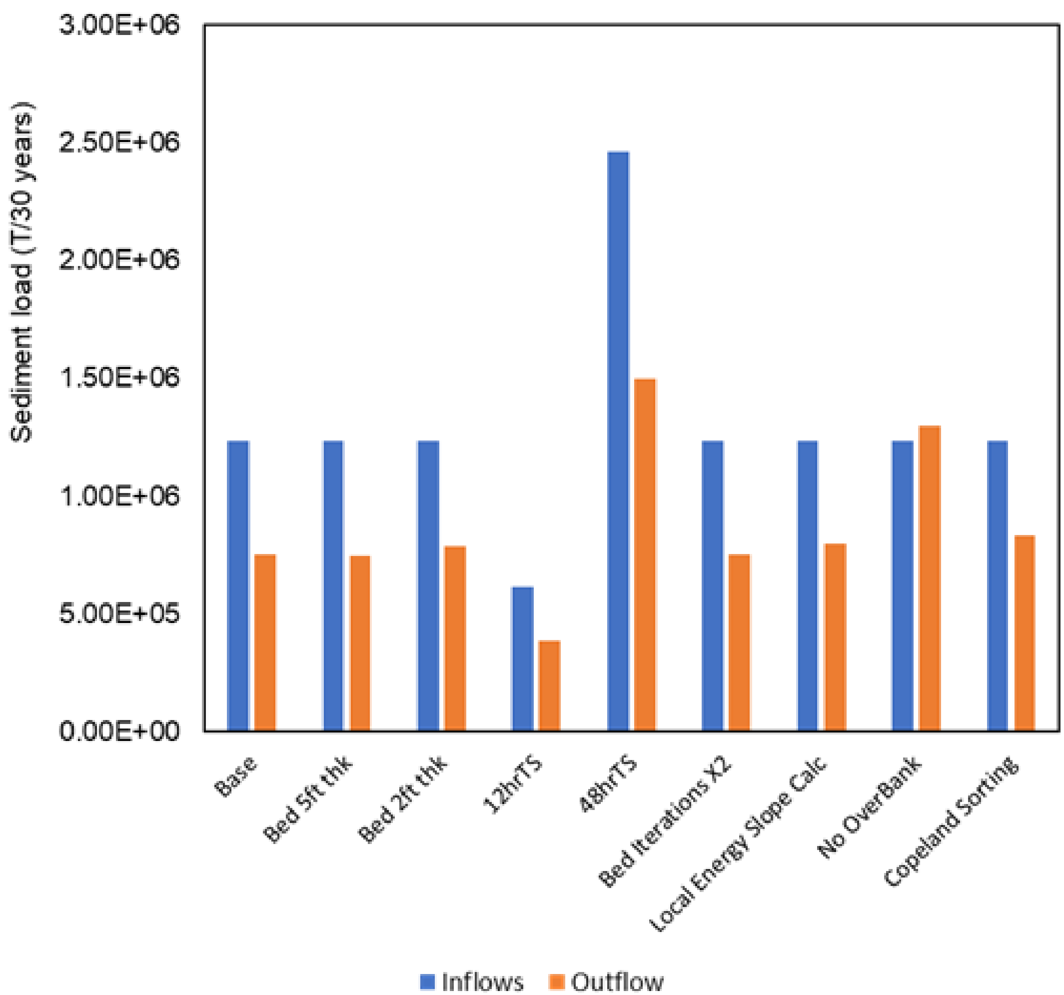


Figure 32: Bar chart of sediment inflows (including tributary inputs) and outflow at the model downstream boundary for the scenarios included in this test. The difference between the bars for each test is the sediment storage within the study area.

The final set of tests in this category investigated the effect of the hotstart method to pre-process the bed sediment gradations for the initial conditions. The Base scenario uses the bed gradations calculated at the conclusion of a 10-year hydrograph (i.e., the first decade of the 30-year time series used in the previous simulations). A problem with this method is that the spatial distribution of bed gradations had adapted to an evolved bed bathymetry not necessarily indicative of that at the start of the model run.

The current version of HEC-RAS allows the user to hotstart a simulation after evolving the bed gradation over an extended period of time without evolving the bed bathymetry. However, this new method can only consider changes in gradation in response to a single steady discharge, which, in most cases, should theoretically be reflective of the channel forming discharge. For these tests we set the channel forming discharge to 500 and 1000 cfs over a 10-year period. We also included tests that calculated the effect of the hydraulics at those discharges on sediment transport averaged over three cross-sections (to 'smooth' out the spatial gradients in bed gradations). The hotstart generated with a 10-year 500 cfs discharge produced a relatively fine initial bed gradation that led to a ~19 % decrease in sediment storage over the 30-year simulation. The hotstart generated with a 10-year 1000 cfs discharge produced a coarser initial bed gradation that led to a +30 % increase in sediment storage over the 30-year simulation. Smoothing the hydraulics over 3 cross sections did not make a significant difference in predicted sediment storage. Direct comparison between hotstart methods is difficult because each method would impact the magnitude of the initial sediment inflows at time zero differently.

While the hotstart method in the Base scenario generated realistic bed gradations (locally the bed GSDs diverged but the spatially averaged GSD only marginally coarsened from 3.8 to 4.6 mm over the 10-year hotstart period), on average, local variability in gradations were steep (typically oscillating +/- 1mm over the distance on 1 to 2 cross section). This variability in gradations led to a 'saw-tooth' effect in the final bathymetry where the cross-section invert undulated up and down on the order of 5 ft (Figure 34). These processes are likely not realistic; however, they may be an unavoidable consequence of simulating riverbed evolution with a wide range of sediment grain-size fractions in one dimension. Real (prototype) river channels are able to sort sediment horizontally within the channel; for example, sorting sand into intermittent large bars and gravels into the thalweg channel. A HEC-RAS 1-D river

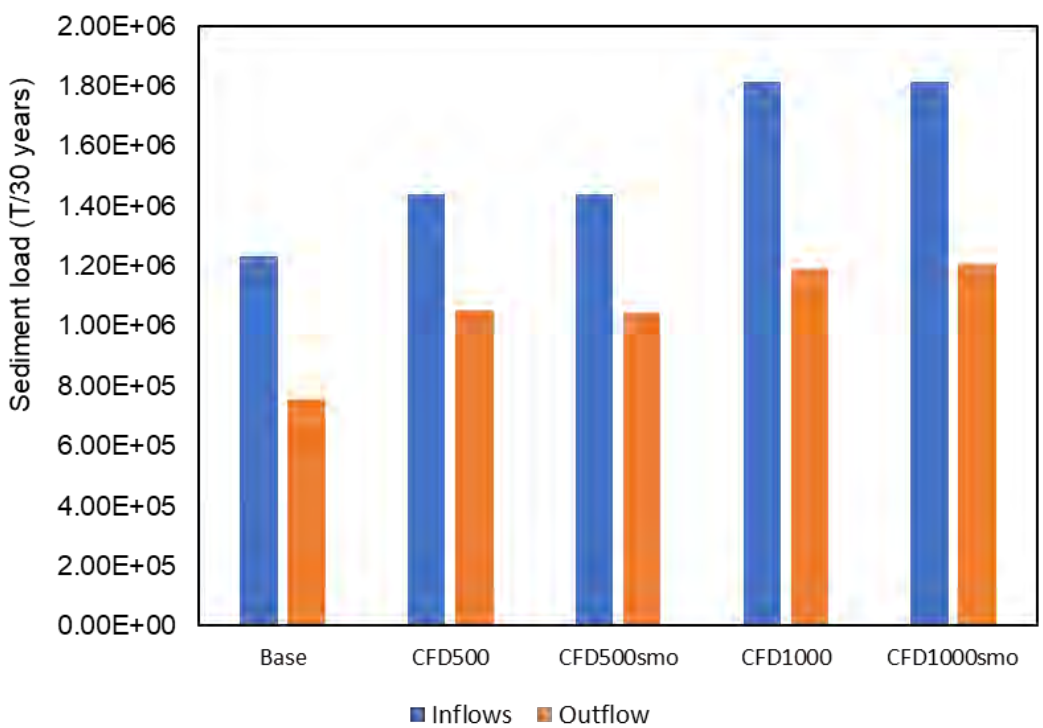


Figure 33: Bar chart of sediment inflows (including tributary inputs) and outflow at the model downstream boundary for the scenarios included in this test. The difference between the bars for each test is the sediment storage within the study area.

model must assume one single distribution per cross-section, forcing sorting processes to occur in the longitudinal direction. Smoothing gradation gradients between cross sections reduced the invert undulations.

Scenario ID	Description	Change in total net storage as fraction relative to base scenario (% change).	Change in net bed sediment erosion mass relative base (% change)
Bed 5ft Thk	Initial bed sediment thickness set to 5ft.	1.01 (+1.1%)	0.95 (-5%)
Bed 2ft Thk	Initial bed sediment thickness set to 2ft.	0.93 (-7%)	0.54 (46%)
12hrTS	Computational increment set to 12 hrs (reduced by half)	0.48 (-52%)	0.67 (-33%)
48hrTS	Computational increment set to 48 hrs (doubled)	2.02 (+102%)	1.34 (+34%)
Bed Iterations X2	Doubled bed change iterations per timestep	1.01 (+1.03%)	0.61 (-39%)
Local ES Calc	Modified transport energy slope from downwind to local	0.91 (-9.4%)	1.03 (+3%)
No Overbank	No overbank deposition allowed	-0.14 (-114%)	0.04 (-96%)
Copeland Sorting	Sediment sorting method set to Copeland method	0.84 (-25.8%)	0.74 (-25.8%)
CFD500	Bed gradation hotstart using 1000 days of steady 500 cfs flow	0.81 (-19%)	1.21 (+21%)
CFD500smo	CFD500 + smoothed calculations over 3 XS	0.83 (-17%)	1.26 (+26%)
CFD1000	Bed gradation hotstart using 1000 days of steady 1000 cfs flow	1.31 (+30.7%)	1.16 (+16%)
CFD1000smo	CFD1000 + smoothed calculations over 3 XS	1.28 (+28%)	1.14 (+14%)

Table 9: Parameter information and calculated change in sediment storage from the Base scenario for each scenario in test. Note that a positive change in total net storage indicates that the identified parameterization INCREASED storage in the model domain; a positive change in net bed erosion indicates that the identified parameterization DECREASED storage in the channel bed.

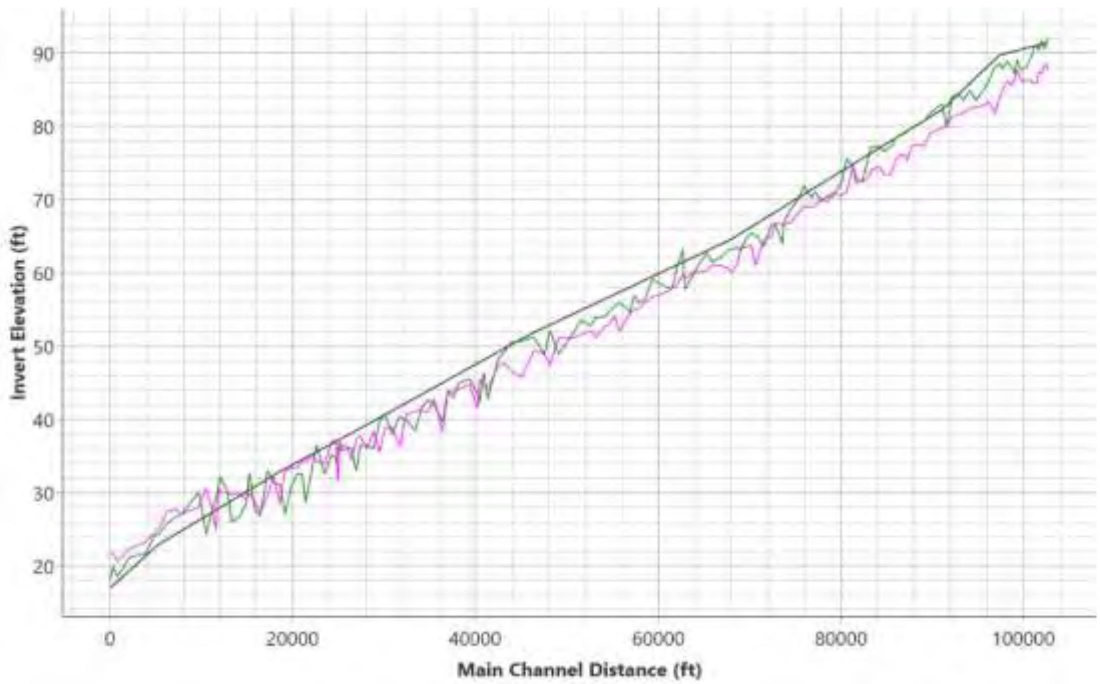


Figure 34: Longitudinal profile of the final thalweg bed (referred to as "invert") elevation for the base scenario using a bed gradation hotstart file computed after a 10-year time varying hydrograph (dark red line) and a scenario that used a 10-year bed gradation warm-up period of a uniform 'channel-forming discharge' assumed to be 500 cfs (blue line). The initial invert prior to the hotstart simulation is shown for reference.

Test 5: Sediment capture by diversion.

An uncertainty related to assessing the impact of the Comite River diversion on channel sedimentation is the amount of sediment that will be extracted into the diversion channel. Theoretically, the greater the amount of sediment diverted per unit flow diverted, the less sediment that will be deposited downstream in response to diversion operations. Diverting more sediment decreases the likelihood that the sediment load will be above sediment transport capacity downstream of the diversion and decreases the supply of mobile sediment available for deposition within the downstream reach.

Figure 35 illustrates how diversion operation removes flow discharge and decreases sediment transport capacity (here shown by the decrease in flow velocity).

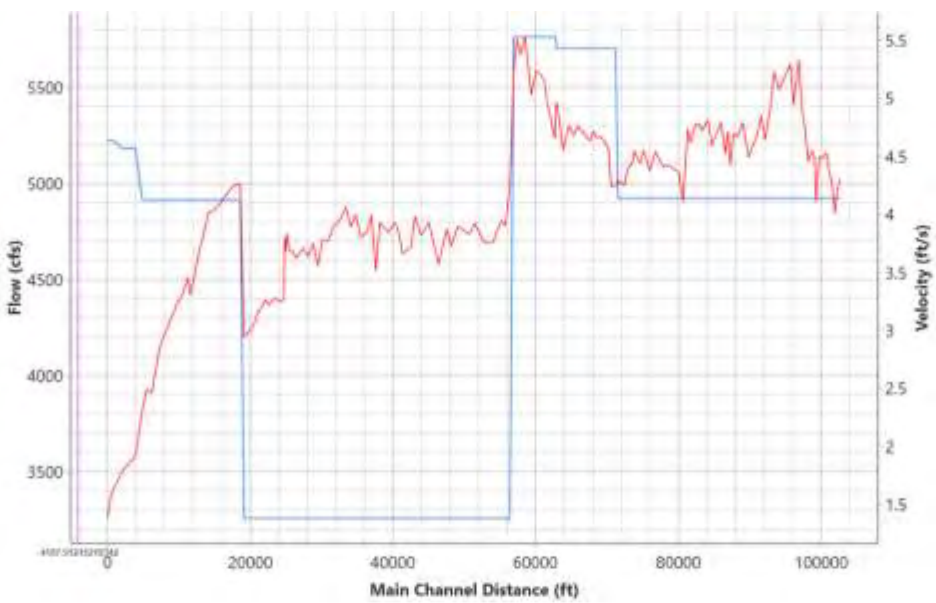


Figure 35: Instantaneous flow (blue) and mean reach velocity (red) calculated along the longitudinal channel for an arbitrary array of inflows. Locations along the x-axis where discharge increases represents a location of a tributary inflow; the location where the discharge decreases represents the diversion location.

These sensitivity scenarios test different assumptions about the percentage of mobilized sediment within the Comite River flow column that is diverted. For these scenarios, the possible amount of sediment diversion is set by grain-size fraction and can range from a sediment-water ratio (SWR) of zero (diverted flow has a sediment concentration of zero) to a SWR of 1 (sediment is diverted so that the sediment concentration within the diversion flow is equal to the sediment concentration within the Comite River immediately upstream of the diversion inlet).

The 'Linear GSD-Q' scenario assumes that the percentage of a grain-size fraction steered into the diversion increases in an approximate linear manner with decreasing grain size and increasing discharge. The 'Manual Rouse 1 [&] 2' scenarios estimate the fraction of a grain-size that is diverted by calculating the sediment concentration present in the flow column above the invert of the diversion inlet control structure. The position of sediment within the flow column is calculated using two different assumptions of the Rouse equation and is dependent on the ratio of grain settling velocity and near-bed shear velocity. The 'D3D informed' scenario uses a high-resolution 3-D Delft3D model to directly compute the amount of sediment steered into the diversion channel. The scenarios labeled SWR1, SWR05, and SWR0 explicitly set the amount of sediment diverted to maintain SWR values of 1, 0.5, and 0. The SWR0 and

SWR1 scenarios bracket the practical range of impacts that the diversion operations may have on sediment storage, ranging on decreasing storage by -17 % to decreasing storage by -53 %. The D3D Informed scenario uses the most sophisticated method to predict diversion sediment dynamics and predicts storage behavior similar to the SWR1 and the Manual Rouse 1 scenarios.

Based on the results of this suite of sensitivity tests, no assumption about diversion sediment capture efficiency tipped the channel bed from being net erosional to becoming net aggradational. In all scenarios, diversion operations reduce net sediment aggradation (storage) relative to the Base scenario. This is because, while the loss of transport capacity below the diversion does induce some localized sediment deposition, the diversion steers sediment out of the system that would otherwise become deposited within the lower model domain. Figure 38 shows that the SWR0 scenario, which assumes no sediment is lost to the diversion, has the highest cumulative sediment flux throughout the channel.

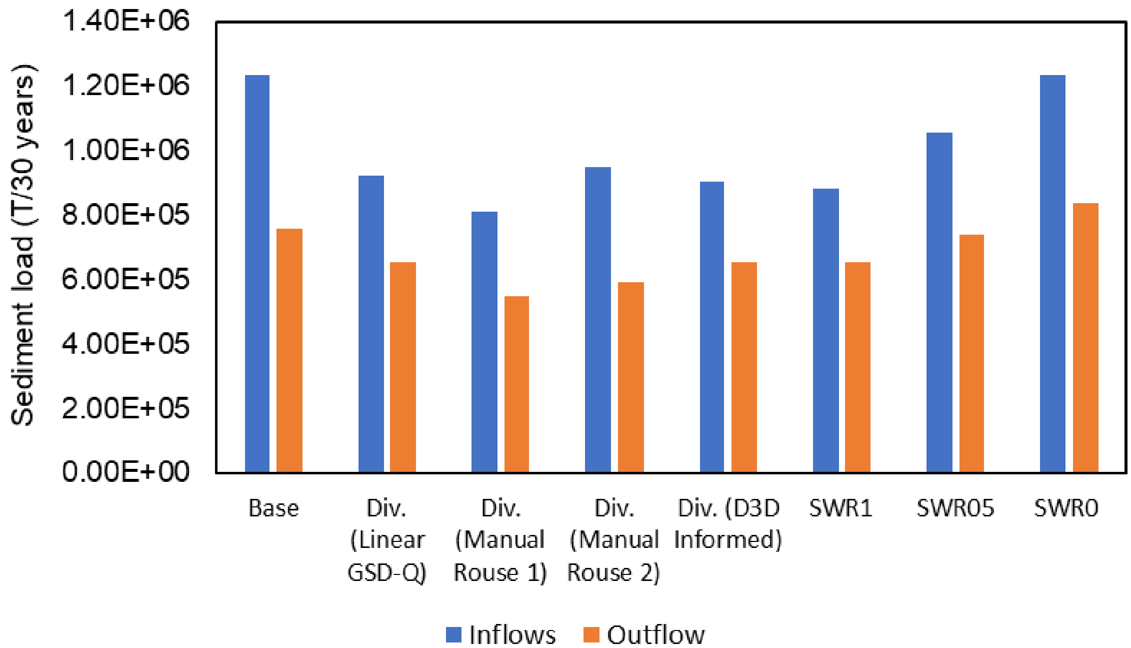


Figure 36: Bar chart of sediment inflows (including tributary inputs) and outflow at the model downstream boundary for the scenarios included in this test. The difference between the bars for each test is the sediment storage within the study area.

Table 10: Parameter information and calculated change in sediment storage from the Base scenario for each scenario in test. Note that a positive change in total net storage indicates that the identified parameterization INCREASED storage in the model domain; a positive change in net bed erosion indicates that the identified parameterization DECREASED storage in the channel bed.

Scenario ID	Description	Change in total net storage as fraction relative to base scenario (% change).	Change in net bed sediment erosion mass relative base (% change)
Div. (Linear GSD-Q)	With diversion operation – diverted sediment GSD linearly increases with Q	0.56 (-44%)	0.63 (-37%)
Div. (Manual Rouse 1)	With diversion operation – diverted sediment GSD calculated with Rouse balance	0.55 (-45%)	0.62 (-38%)
Div. (Manual Rouse 2)	With diversion operation – diverted sediment GSD calculated with Rouse balance/alt. assumption	0.75 (-25%)	N.A.
Div. (D3D Informed)	With diversion operation – diverted sediment GSD calculated using 3D model	0.52 (-48%)	0.64 (-36%)
SWR1	With diversion operation – assume SWR = 1	0.47 (-53%)	0.66 (-34%)
SWR05	With diversion operation – assume SWR = 0.5	0.66 (-34%)	0.64 (-36%)
SWR0	With diversion operation – assume SWR = 0	0.83 (-17%)	0.63 (-37%)

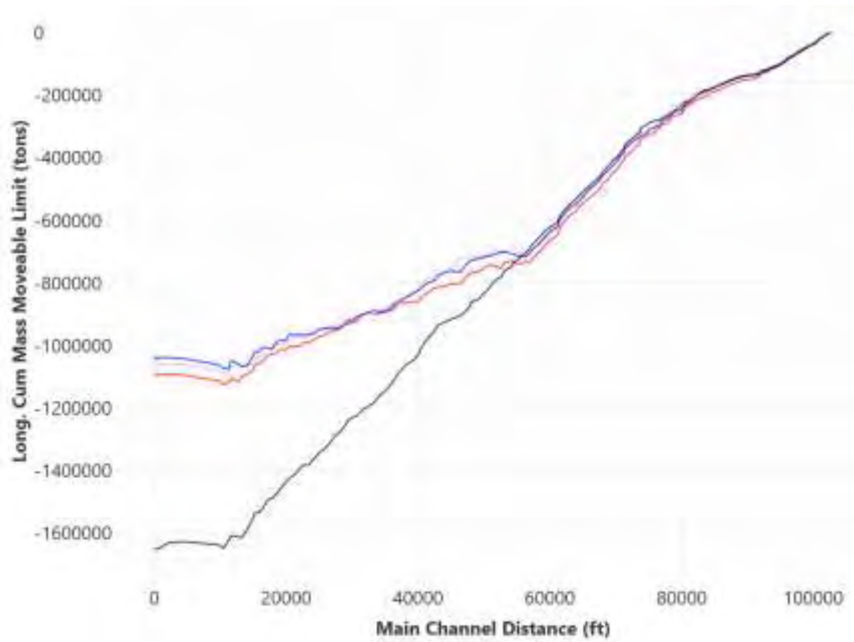


Figure 38: Net sediment storage within the channel bed for scenarios testing the effect of diversion efficiency, in terms of the fraction of river sediment steered into the diversion conveyance channel. The base scenario without diversion operations (black line) is shown for reference. The scenarios with a sediment-to-water ratio (SWR) of zero (blue line) and a SWR of 1 (red line) effectively bracket the range of plausible influence that diversion efficiency may impart. The scenario with a diversion SWR set to 0.5 is also shown (gray line).

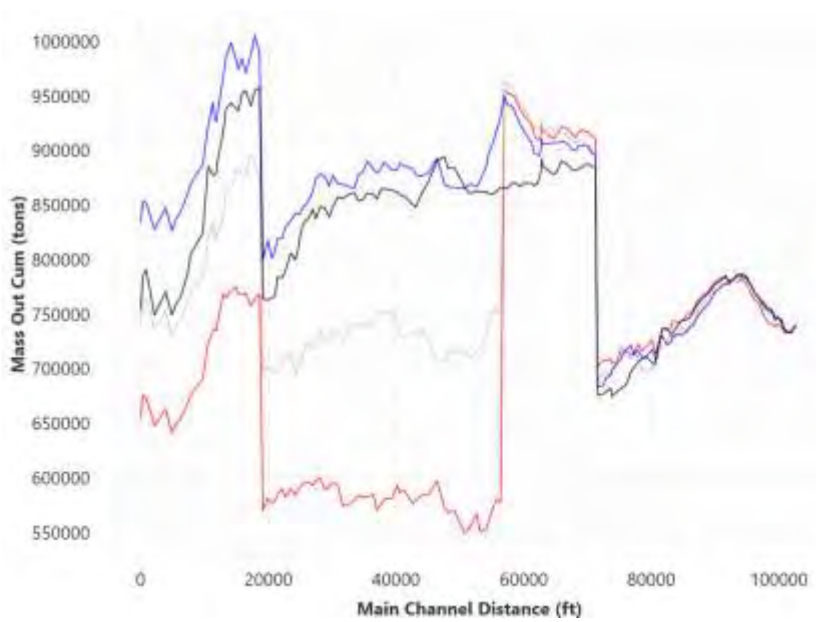


Figure 37:Total sediment flux through the longitudinal channel transect summed over the 30-year study period. The figure shows how diversion operation modifies total sediment flux along the channel based on how much sediment load is removed at the diversion location. Scenarios and line color match the previous figure: base (black), blue (SWR=0), gray (SWR=0.5), red (SWR=1.0).

Test 6: Impact of simulating bridges

HEC-RAS has the ability to simulate the effect of bridge structures on 1-D river hydraulics and sediment transport. While bridges have been shown to have a considerable impact on local hydraulics and geomorphology, the long term, regional impacts are more difficult to determine. The effect of bridges on rivers is heavily influenced by the alignment of flow approaching and leaving the bridge reach relative to the bridge alignment; the balance of these alignments often significantly changes over time and is inherently a 2-D effect. Our Base scenario explicitly does not include bridge effects due to the uncertainties in the accuracy/precision of the model's ability to simulate them at the 30-year time scale. Instead, the likely impact of bridges on sedimentation due to diversion operations will be qualitatively considered in the discussion section of this report based on existing theory. However, we did perform a simulation incorporating four bridges in our study area to investigate how the model would respond. The bridge parameterizations were based on that defined in the Arcadis sediment model.

The results of the bridge analysis are shown in Figure 39. The bridge locations relative to the channel elevation profiles are shown in (a) while the cumulative total longitudinal storage and cumulative longitudinal bed (mass) change are shown in (b). The bridges do typically promote local bed aggradation around the immediate bridge locations, generating a net increase in total sediment storage of 13 % and a reduction in bed erosion by 2.3 % within the model domain.

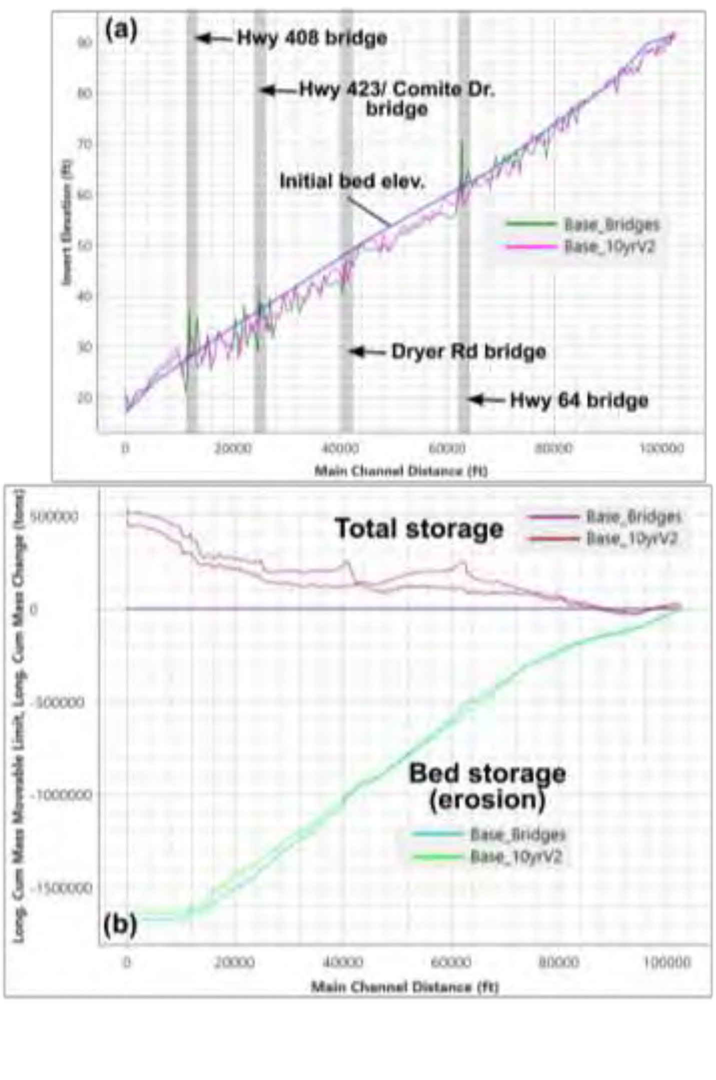


Figure 39: Plots of change in (a) bed invert elevation and (b) total and bed sediment storage with and without the impact of bridges simulated. Base_10yrV2 is the 'Base scenario' that does not include bridge effects. The vertical gray lines show the approximate location of bridges in Plot A. Cumulative sediment (mass) change is change in mass per cross section summed in the downstream direction (right to left in plot b).

Results of the sensitivity tests:

- The effect of sediment feed magnitude on sediment storage is straightforward, larger rates of feed encourage larger channel storage. The relationship is slightly exponential. Sandy and gravel feeds encourage much more storage than mud feeds.
- The initial gradation of the channel bed may have a significant impact on sediment storage. Sandy bed material is much more easily evacuated from the model domain than gravels.
- The Yang transport function simulated sediment flux rates similar to other functions, including the Laursen equation. The Yang function tended to predict more overall sediment storage and less bed erosion than that typical of other transport functions.
- Sediment thicknesses significantly less than 8 ft deep will fully erode in certain zones and limit morphological change.
- In most scenarios, the model domain is net aggradation because of floodplain storage; if floodplain storage is not allowed or if only the channel bed material is considered, most scenarios are net erosional – including scenarios simulating diversion operations.
- Diversion operations reduce [1] total net sediment storage within the model domain and [2] channel bed erosion relative to the base scenario without diversion operations in tested scenarios. Diversion efficiency, in terms of the fraction of river sediment diverted, has a small influence on sediment storage.
- Incorporating the effect of bridges on sediment storage has a small impact on the net amount of sediment storage within the channel bed (decreasing net bed erosion by 2.3 %). Bridge effects may be more influential if sedimentation is analyzed at a more local scale.

Table 11: Summary table of sensitivity tests.

Parameter	Change in bed storage relative to Base scenario	Confidence
Sediment feed: + magnitude	Slight increase	Moderate
Sediment feed: + coarseness	Increase	High
Bed sediment: more gravel	Slight increase	High
Bed sediment: more sand	Decrease	High
Bed sediment: decreased thickness	No change	Low
Floodplain deposition not allowed	Decrease	Moderate
More sediment diverted	Decrease	Moderate
Bridge effects resolved	Slight increase	High

2.4 Sediment transport validation.

The performance of the 1-D RAS sediment model with the Base scenario sediment parameterization was validated against two types of observational datasets. The first type of datasets were specific gage records; the second type of dataset was comparative bed level output from a model validated with observational bathymetric survey data.

Specific gage measurements are derived at stream gages within the area of interest where both river discharge and stage data are available. Identifying how stage changes for a specific discharge through time can indicate how the bed elevation may be eroding or aggrading. For example, if the mean stage for a 5000 cfs discharge decreases by two feet over a 10-year period, a logical interpretation of those records suggests that the mean bed elevation for the channel wetted by the 5000 cfs discharge was lowered by two feet due to erosion. It should be noted that while specific gage analyses are commonly used to assess long term channel evolution (e.g., Biedenharn et al., 2017; Pinter and Heine, 2005), it is an interpretative, qualitative analysis. Other processes besides bed evolution can influence the stage-discharge relationship such as a change in hydraulic roughness due to altered vegetation or land-use.

Figure 40 and Figure 41 show specific gage analysis plots for USGS river gage locations upstream of our study site (Comite at Olive Branch) and at the downstream boundary (Comite near Comite, LA). While the values of record oscillate over time, there is a clear 'lowering' stages for a specific discharge, indicating possible degradation over this time period. The rate of lowering was calculated to be on the order of 1.5 ft per 20 years. The upstream gage appears to exhibit a slightly stronger [linear] lowering

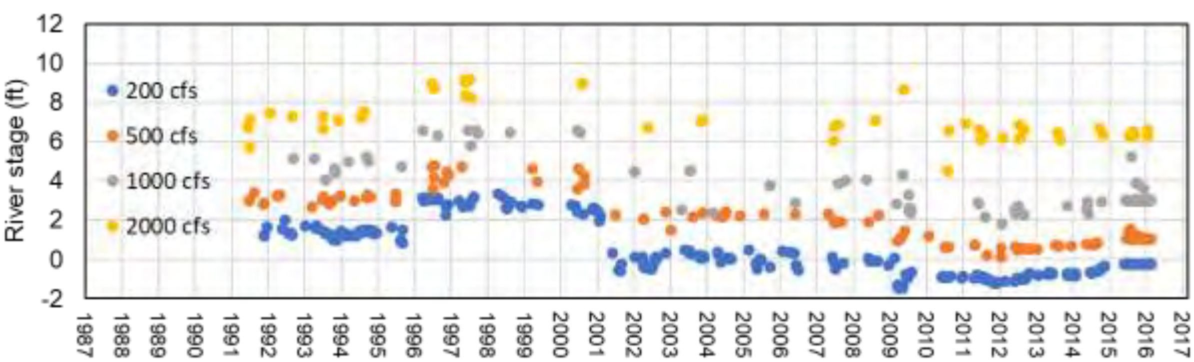


Figure 40: Specific gage analysis for the USGS gage at Comite River near Comite, LA (a downstream site)

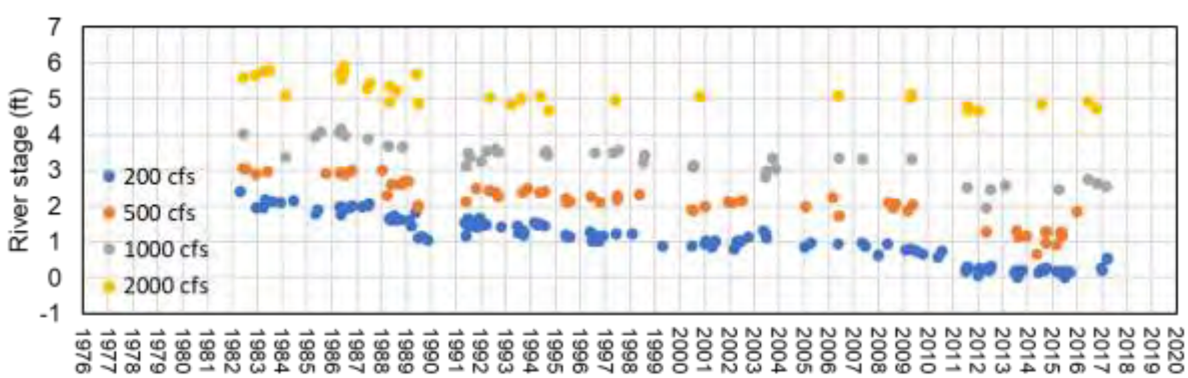


Figure 41:Specific gage analysis for the USGS gage at Comite River at Olive Branch (an upstream site)

trend (r^2 = 0.9) than the downstream gage (r^2=0.7).

Figure 42 shows the simulated bed elevation change at the end of a 20-year interval using historical flow records derived from the Arcadis 1-D HEC-RAS calibration simulations (red circles); a 10-cross section moving average filter is also applied for reference (red line). The green line represents the approximate 1.5 ft degradation predicted by the specific gage analysis, which aligns well with the model results.

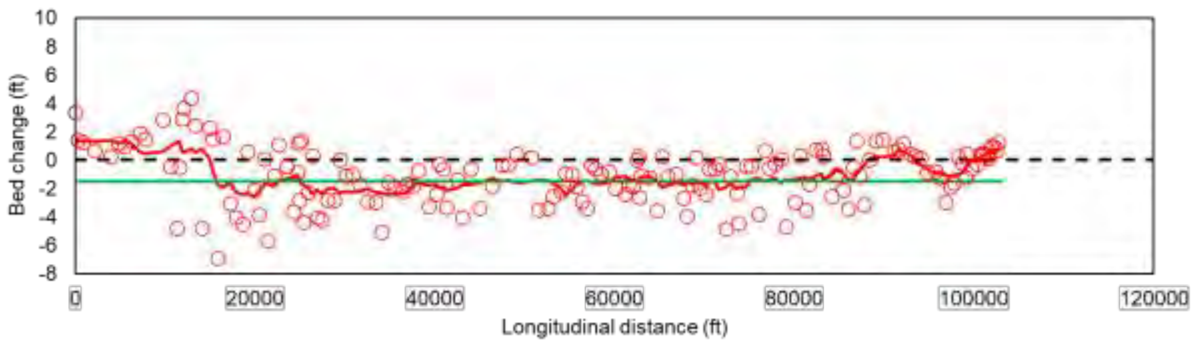


Figure 42: Modeled bed change (red circles; red line shows filtered trend) relative to the mean bed change predicted by the specific gage analysis (green line). The dashed black line shows the zero-bed change line.

For additional validation the 1-D RAS sediment model results, as simulated above for the specific gage analysis, are compared to the same metrics of bed change as simulated in the Arcadis 1-D HEC-RAS model (Figure 43). The Arcadis model was reported to have been validated against an observed time series of bathymetric surveys (not available for this analysis). The general magnitudes of bed change and spatial patterns of aggradation and degradation match well. The largest discontinuity lies around 90,000 to 100,000 ft on the x-axis. This is well above our primary area of interest and lies near the upstream margins of the 1D RAS sediment model and is likely influenced by boundary effects.

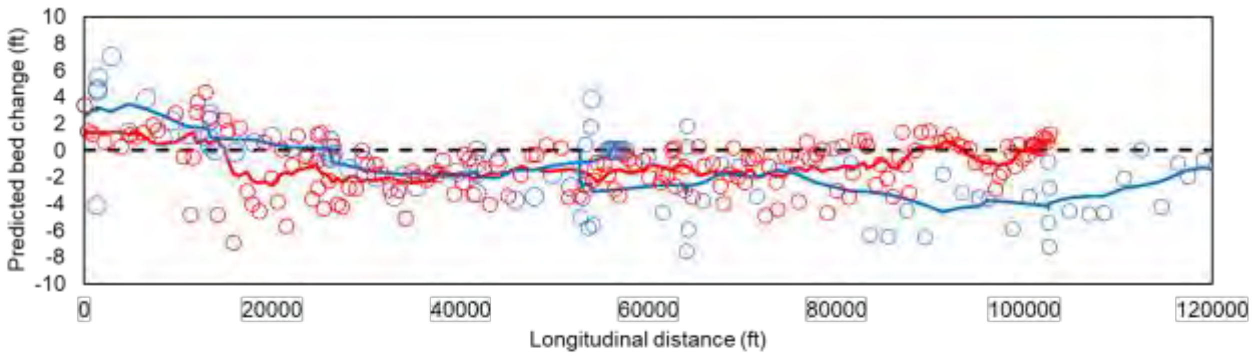


Figure 43: Modeled bed change (red circles; red line shows filtered trend) relative to that modeled with the Arcadis HEC-RAS sediment model (blue circles; blue line shows filtered trend. The dashed black line shows the zero-bed change line.

2.5 Final 1D RAS sediment model parameterization

This section describes the methods used to parameterize the final sediment models used to assess the impact of diversion operations on Comite River sedimentation.

The validation tests discussed in the last section suggest that the Base scenario sediment parameterization can replicate past sedimentation and likely simulates realistic sediment transport behavior within our area of interest. Based on the results of our sensitivity analysis, the current parameterization simulates sedimentation logically, based on inputs (e.g., sediment feed magnitude and gradation, bed gradation) and within the typical range of values generated by alternative parameters (i.e., it does not generate outlier values).

We acknowledge, that as there are no additional robust time series of geomorphic data to validate our model, the skill of our sediment model contains significant uncertainty. This uncertainty is common in sediment transport analysis as geomorphic data are laborious to obtain and are often limited by the lack of value attributed to environmental monitoring by funders or uncooperative weather. In this study, we attempt to manage uncertainty by assessing the impacts of diversion operations using a three-tiered scenario framework with increasing conservatism. Referring back to the Lane balance (Figure 1), we hypothesize that the most likely failure mode due to diversion operations is sediment aggradation. Therefore, we design incremental conservatism into three scenarios by tuning parameters that have been shown to increase aggradation (sediment storage) in our model domain during the sensitivity analysis.

The first scenario is the Base scenario and represents the parameterization using our best professional judgement (Table 12). The second scenario is the conservative parameterization and represents a scenario parameterized using plausible assumptions that generate more sediment storage than the Base scenario parameterization. The third scenario is the most conservative parameterization and represents a scenario parameterized using assumptions that generate more sediment storage than the conservative scenario parameterization. The most conservative scenario uses parameters that are unlikely given the regional environment but are constrained to physically possible values. We include a final fourth scenario to test a counter hypothesis that increased sediment transport rates, i.e., the high sediment transport rate (HSTR) scenario, may promote a different failure mode due to diversion operations than the other scenarios. While this hypothesis is not necessarily supported by theory, the complexity associated with sediment transport justifies broad inquiry.

Table 12: Sediment transport parametrization for the three-tiered (+1) scenario framework used to assess the impact of diversion operations on sedimentation. Increasing conservatism bounds increasing levels of assumed uncertainty.

Parameter	Base	Conservative	Most conservative	HSTR
Feed magnitude	Base	Base X 1.5	Base X 2.0	Base X 2.0
Feed gradation	Base	Base (mud removed[A])	Base (mud removed)	Base
Initial gradation	Base	MS-MG[B]	MS-MG	Base
Qs Function	Yang CC[C]=1,1	Yang CC=0.5,1	Yang CC=0.5,1	Yang CC=2,0.5
Mixing Function	Ashida and Michiue	Wu	Wu	Ashida and Michiue
Bed sed thickness	8 ft	10 ft	10 ft	10 ft
1D Bed change	Overbank Depos. =veneer	Overbank Depos. =veneer	Overbank Depos.= none	Overbank Depos.=veneer
Diversion efficiency	Calc 3D Model[D]	Calc 3D Model	SWR = 0	Calc 3D Model

[A]clay and silts are removed from feed gradation ; [B]Initial bed gradation is uniform distribution of sediment fractions between medium sands and medium gravels; [C]Sediment transport calibration coefficient (flux multiplier, critical tractive force multiplier), [D]Determined from 3D modeling analysis.

3. Results

This section summarizes the impact of operating the Comite River diversion on regional sedimentation. The first sub-section reports the results of our analysis on sedimentation within the natural Comite River, which consists of the bulk of our study. The second sub-section summarizes the results of the sedimentation study of Lilly Bayou (i.e., the planned outfall channel of the diversion). The Lilly Bayou sedimentation study was sub-contracted to ERDC Coastal and Hydraulics Laboratory due to time constraints. The final sub-section includes analysis of possible sedimentation problems within the Comite River diversion conveyance channel.

3.1 Sedimentation dynamics within the Comite River due to diversion operations

Our analysis calculated that diversion operations is likely to significantly impact Comite River channel sediment dynamics at the 30-year time scale. Figure 44 summarizes the relative differences in the simulated bed change for the base, conservative, and most conservative simulations, including the without diversion operations (Future without Project [FWOP]) and with diversion operations (Future with Project [FWP] scenarios. For the range of different assumptions simulated in these scenarios, the total bed sediment storage for the model domain, over the 30-year study duration, spanned over 3 million tons (1.8 million yd^3).

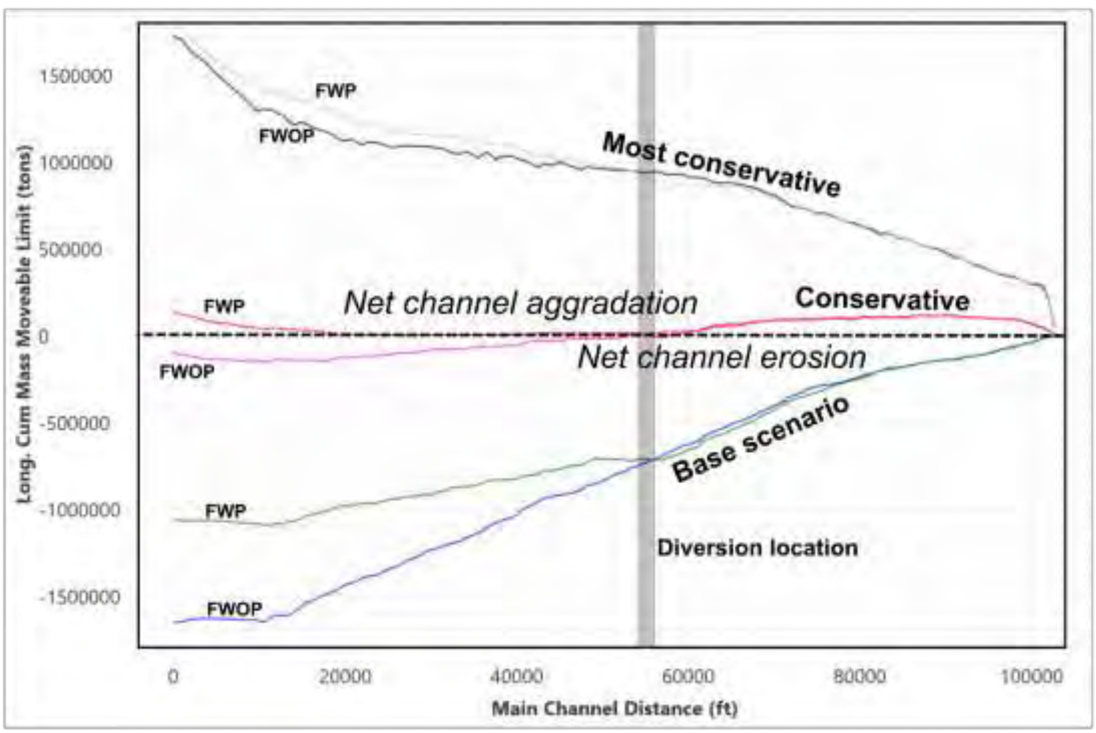


Figure 44:Calculated net sediment storage within the channel for the three-tiered scenarios, with (FWP) and without diversion (FWOP) operations over a 30-year study period.

The base scenario(s), which were designed to utilize the most realistic sediment parameterizations, predicted that diversion operations would generate approximately 600,000 tons of channel sediment storage relative to the FWOP scenario. However, under the base scenario assumptions, the channel was net erosional and the added sediment storage reduced the magnitude of total erosion as opposed to inducing bed sediment aggradation.

The conservative scenario(s) predicted the least amount of net bed sediment change; predicting that diversion operations would cause a net erosional channel (FWOP predicted -98,569 tons sediment storage) to generate a net storage of +144,241 tons at the conclusion of the 30-year simulation (an increase in 242,820 tons relative to the FWOP scenario).

The most conservative scenario(s) predicted significant bed sediment storage without and with diversion operations, 1,732,908 and 1,786,052 tons, respectively. The most conservative sediment parameterizations predicted that diversion operations would have a relatively small impact on total net sediment storage (+53,144 tons).

The 'high sediment transport rate (HSTR)' scenario(s) predicted high rates of sediment flux relative to the Base scenario (Figure 45); also, the impact of diversion operations was the largest of the final four scenarios analyzed (increasing sediment storage by 783,897 tons). In the HSTR scenarios, the high magnitude sediment flux promoted relatively uniform sedimentation patterns, where diversion operations led to increased bed erosion upstream of the planned diversion inlet location and decreased sediment erosion downstream of that location.

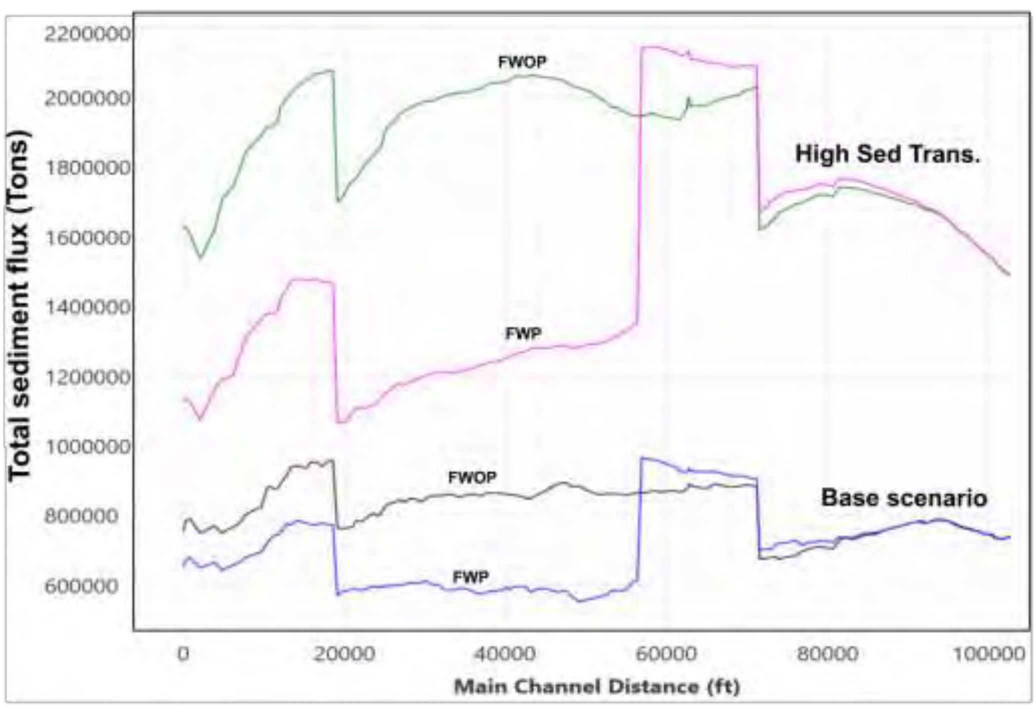


Figure 45: Longitudinal profiles of total sediment flux through each model cross section for the HSTR and base scenarios, FWP and FWOP.

A more detailed summary of the results of the base, conservative, and most conservative scenarios are included in the following subsections.

3.1.1 Base scenario results

Results of the base scenarios, without and with project, are summarized in Table 13. Methods used to calculate table values from model output are defined in Appendix E.

*Table 13: Summary sediment storage results for the Base scenarios. *Upstream and downstream reach extents in terms of river miles downstream (negative) or upstream (positive) from the diversion inlet location.*

Reach	Position* (approx. mi)		Length	Change in bed mass (Tons/30 yrs)		Diff. bed vol./elev. (FWP – FWOP)		Estimated Excess sediment
	DS	US	ft	FWOP	FWP	Yd^3	Yd^3/yr	$Yd^3/30$ yr
1	-11	-7	19,891	-210,656	-72,721	86,468	2,882	0
2	-7	-5	10,978	-214,814	-84,629	81,610	2,720	0
3	-5	-3	10,458	-240,659	-92,895	92,629	3,088	0
4	-3	-2	5,084	-76,345	-56,525	12,425	414	0
5	-2	-1	5,102	-110,040	-35,528	46,710	1,557	0
6	-1	0	5,404	-104,938	4,033	68,311	2,277	2,528
7	0	+1	5,072	-118,649	-114,417	2,653	88	0
8	+1	+2	10,448	-231,604	-234,214	-1,636	-55	0
9	+2	+5	10,837	-156,529	-176,810	-12,713	-424	0
10	+5	+9	19,414	-185,586	-191,607	-3,774	-126	0
Total	-10.7	+8.6	102,688	-1,649,821	-1,055,312	372,682	12,423	2,528

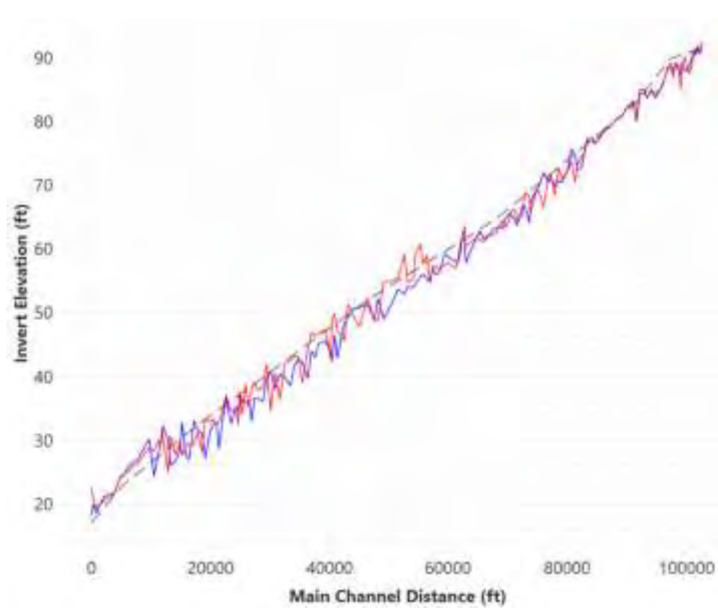


Figure 46: The longitudinal profile of the channel thalweg bed (invert) elevations (ft NAVD88) for the base scenarios. The dashed line shows the initial bed elevation, the blue line shows the FWOP final bed elevation, and the red line shows the FWOP (i.e., with diversion operations) final bed elevation.

The base scenarios include the optimal sediment parameterization based on our analyses and professional judgment.

Our analysis of the base scenario calculates that diversion operations will generate a negligible amount of sediment storage over the 30-year study period duration. Approximately 2,528 yd^3 of excess sediment are calculated to deposit within the 1-mi reach downstream of the planned diversion inlet location.

3.1.2 Conservative scenario results

Results of the conservative sediment parameterization scenarios, without and with project, are summarized in Table 14. Methods used to calculate table values from model output are defined in Appendix E.

*Table 14: Summary sediment storage results for the Conservative scenarios. *Upstream and downstream reach extents in terms of river miles downstream (negative) or upstream (positive) from the diversion inlet location.*

Reach	Position* (approx. mi)		Length	Change in bed mass (Tons/30 yrs)		Diff. bed vol./elev. (FWP – FWOP)		Estimated Excess sediment
	DS	US	ft	FWOP	FWP	Yd^3	Yd^3/yr	Yd^3/30 yr
1	-11	-7	19,891	27,789	136,610	68,217	2,274	68,217
2	-7	-5	10,978	-46,355	4,962	32,169	1,072	3,110
3	-5	-3	10,458	-44,557	-6,276	23,998	800	0
4	-3	-2	5,084	-15,774	-5,265	6,588	220	0
5	-2	-1	5,102	-1,911	196	1,321	44	123
6	-1	0	5,404	-39,199	26,785	41,363	1,379	16,791
7	0	+1	5,072	-23,947	-51,008	-16,964	-565	0
8	+1	+2	10,448	-48,978	-52,613	-2,279	-76	0
9	+2	+5	10,837	-15,384	-16,295	-571	-19	0
10	+5	+9	19,414	109,747	107,156	-1,624	-54	0
Total	-10.7	+8.6	102,688	-98,569	144,251	152,217	5,074	88,240

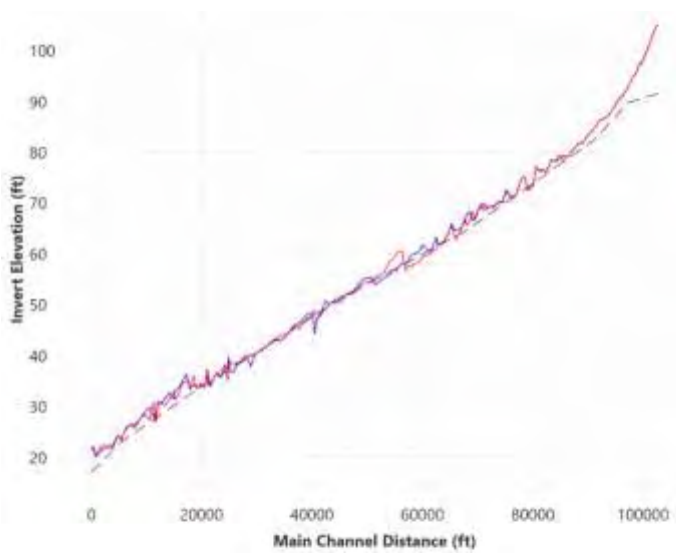


Figure 47: The longitudinal profile of the channel thalweg bed (invert) elevations (ft NAVD88) for the conservative scenarios. The dashed line shows the initial bed elevation, the blue line shows the FWOP final bed elevation, and the red line shows the FWOP (i.e., with diversion operations) final bed elevation.

The conservative scenarios include plausible sediment parameterization intended to generate relatively high rates of sediment aggradation.

Our analysis of the conservation scenario calculates that diversion operations will generate approximately 88,240 yd^3 of excess sediment. Approximately 20 % of that is in the 2 miles downstream of the planned diversion inlet location.

The other 80 % of the excess sediment is located in the two downstream most sub-reaches. These sub-reaches are prone to deposition due to low slope and wide floodplains. Simulated local dynamics may also be influenced by model boundary effects (true for upstream most sub-reaches too).

3.1.3 Most conservative scenario results

Results of the most conservative sediment parameterization scenarios, without and with project, are summarized in Table 15. Methods used to calculate table values from model output are defined in Appendix E.

*Table 15: Summary sediment storage results for the most-conservative scenarios. *Upstream and downstream reach extents in terms of river miles downstream (negative) or upstream (positive) from the diversion inlet location.*

Reach	Position* (approx. mi)		Length	Change in bed mass (Tons/30 yrs)		Diff. bed vol./elev. (FWP – FWOP)		Estimated Excess sediment
	DS	US	ft	FWOP	FWP	Yd^3	Yd^3/yr	$Yd^3/30$ yr
1	-11	-7	19,891	611,359	533,724	-48,667	-1,622	0
2	-7	-5	10,978	40,902	100,382	37,286	1,243	37,286
3	-5	-3	10,458	83,168	98,126	9,377	313	9,377
4	-3	-2	5,084	24,341	32,989	5,421	181	5,421
5	-2	-1	5,102	19,104	56,238	23,278	776	23,278
6	-1	0	5,404	15,840	105,413	56,151	1,872	56,151
7	0	+1	5,072	35,820	-7,318	-27,042	-901	0
8	+1	+2	10,448	163,153	132,793	-19,032	-634	0
9	+2	+5	10,837	152,829	152,569	-163	-5	0
10	+5	+9	19,414	586,392	581,138	-3,294	-110	0
Total	-10.7	+8.6	102,688	1,732,908	1,786,052	33,315	1,110	131,513

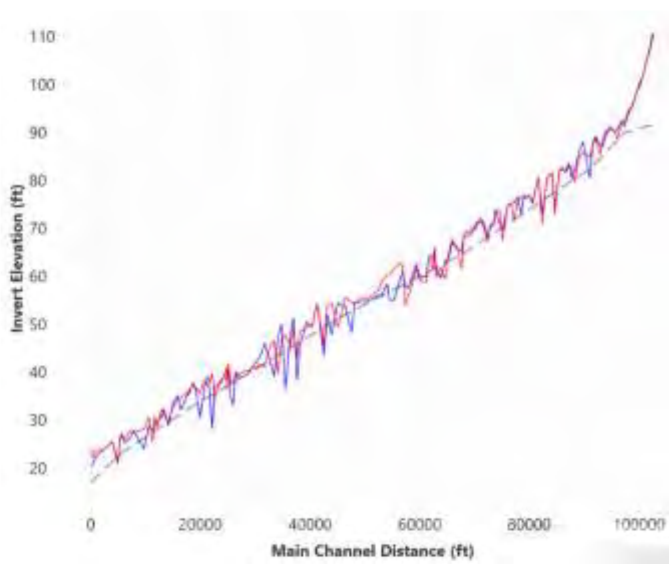


Figure 48: The longitudinal profile of the channel thalweg bed (invert) elevations (ft NAVD88) for the most conservative scenarios. The dashed line shows the initial bed elevation, the blue line shows the FWOP final bed elevation, and the red line shows the FWOP (i.e., with diversion operations) final bed elevation.

The most-conservative scenarios include physically possible, but unlikely sediment parameterization intended to generate very high rates of sediment aggradation.

Our analysis of the most conservative scenario calculates that diversion operations will generate approximately 131,513 yd^3 of excess sediment. That excess sediment is fairly evenly distributed throughout the channel downstream of planned diversion inlet location.

3.1.4 High sediment transport scenario results

Results of the high sediment transport sediment parameterization scenarios, without and with project, are summarized in Table 16. Methods used to calculate table values from model output are defined in Appendix E.

*Table 16: Summary sediment storage results for the high sediment transport scenarios. *Upstream and downstream reach extents in terms of river miles downstream (negative) or upstream (positive) from the diversion inlet location.*

Reach	Position* (approx. mi)		Length	Change in bed mass (Tons/30 yrs)		Diff. bed vol./elev. (FWP – FWOP)		Estimated Excess sediment
	DS	US	ft	FWOP	FWP	Yd^3	Yd^3/yr	$Yd^3/30$ yr
1	-11	-7	19,891	-431,329	-181,014	156,916	5,231	0
2	-7	-5	10,978	-234,714	-76,454	99,209	3,307	0
3	-5	-3	10,458	-267,986	-103,196	103,302	3,443	0
4	-3	-2	5,084	-117,718	-44,559	45,861	1,529	0
5	-2	-1	5,102	-133,804	-40,943	58,212	1,940	0
6	-1	0	5,404	-164,705	-35,748	80,840	2,695	0
7	0	+1	5,072	-156,449	-131,778	15,465	516	0
8	+1	+2	10,448	-225,868	-273,126	-29,625	-987	0
9	+2	+5	10,837	-133,328	-168,221	-21,874	-729	0
10	+5	+9	19,414	-376,152	-403,115	-16,903	-563	0
Total	-10.7	+8.6	102,688	-2,242,052	-1,458,155	491,404	16,380	0

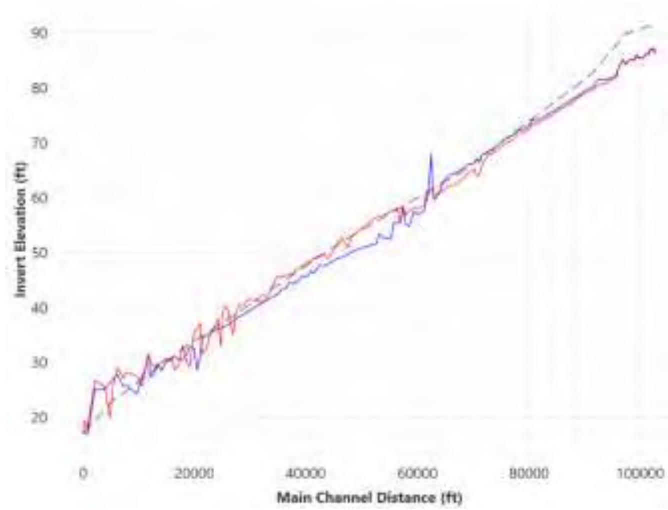


Figure 49: The longitudinal profile of the channel thalweg bed (invert) elevations (ft NAVD88) for the high sediment scenarios. The dashed line shows the initial bed elevation, the blue line shows the FWOP final bed elevation, and the red line shows the FWOP (i.e., with diversion operations) final bed elevation.

The high sediment transport scenarios include sediment parameterization designed to increase sediment supply and capacity to test a competing hypothesis to that associated with the increasingly conservative scenarios.

Increasing sediment transport did accentuate the calculated impact of the FWP relative to the FWOP sediment storage. However, in both scenarios, the channel bed was highly erosional, and no excess sediment was predicted within the model domain.

3.2 Summary of the Lilly Bayou sedimentation assessment

The Coastal Hydraulics Laboratory at ERDC performed a scour analysis of the Lilly and Cooper Bayou channels utilizing a preexisting 2-D AdH hydraulics model. Calculated values of bed stress (Figure 50) suggest that the sediment transport capacity of the bayou channels will generally be sufficient to transport sediment inflows from the Lilly Bayou control structure. It is assumed that the water inflow will be transporting sediment well below its capacity as the diversion inflow control structure restricts sediment intake from the lower flow column of the Comite River, including much of the coarsest sediment load. No significant channel aggradation is expected within the main bayou channels.

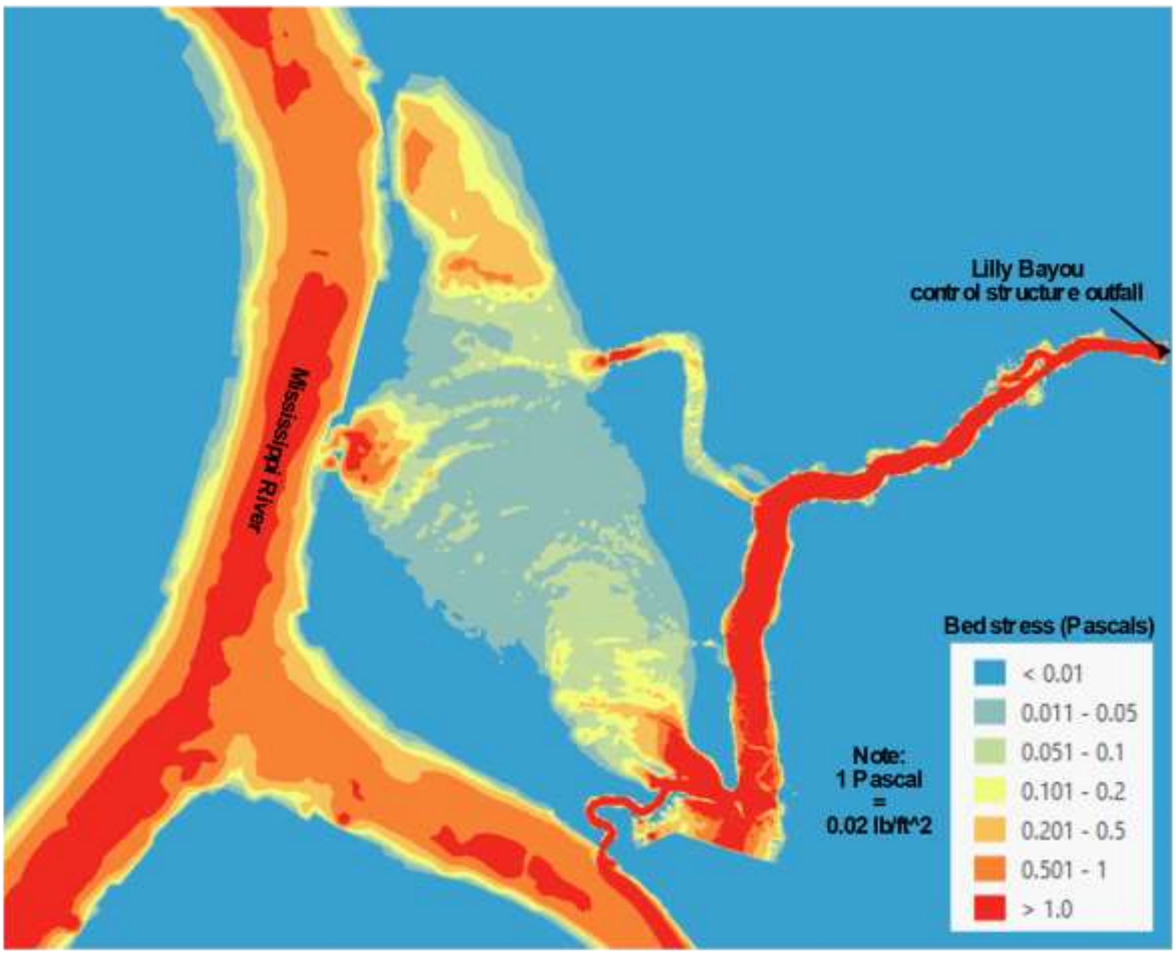


Figure 50: Map of computed bed stress for the 500-year diversion discharge through Lilly and Cooper Bayou. This map utilizes output from a calibrated/validated 2-D AdH hydraulics model developed by ERDC (McAlpin et al., unpublished).

Investigation of the bed material within Lilly and Cooper bayou shows that the bed consists of sands and silts (Figure 51;Table 17). While some sands, less than 0.5 mm and finer, are found within the bed material, the vast majority consists of finer material. Based on the regional geology, this fine material may be loess sediment and easily erodible. Based on these findings and assumptions, it is expected that the bayou channels will experience significant erosion during large diversion inflows.

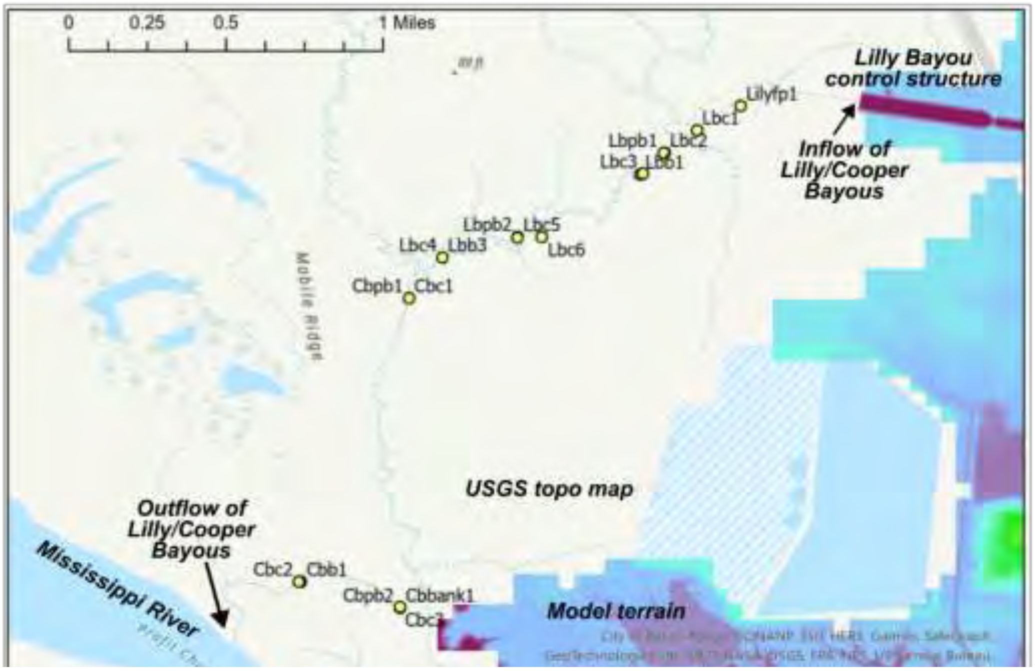


Figure 51: Map of bulk bed sediment sampling locations supporting the Lilly Bayou sedimentation assessment.

Table 17: Grain-size information for bulk bed sediment samples with locations shown in Figure 51.

Sample ID	D_{50} (mm)	%fines	% < 0.1 mm	% < 1.0 mm
CBB1	0.016	98.5	99	100
CBC1	0.024	85.2	99	100
CBC2	0.285	32.8	35	100
CBC3	0.213	35.6	39	99
CBPB1	0.021	97.4	99	100
CBPB2	0.016	83.4	91	100
LBB1	0.079	46.2	54	100
LBB2	0.021	93.3	99	100
LBC1	0.021	97.3	100	100
LBC2	0.317	7.47	8	100
LBC3	0.449	9.61	10	99
LBC4	0.015	95	98	100
LBC5	0.045	58.8	68	99
LBC6	0.364	23.3	27	100
LBFP1	0.041	60.1	64	100
LBFP2	0.020	99.5	100	100
LBFP3	0.013	97.1	98	100
LBFP4	0.011	98.4	100	100
LBPB1	0.024	79.6	84	100
LBPB2	0.019	91.9	98	100

Analysis of ERDC's hydraulic analysis (McAlpin et al., unpublished) of the junction between Cooper Bayou and the Mississippi River indicates that, during high Mississippi River stages, the Cooper Bayou base-level is sufficiently high enough to reduce flow velocities at the downstream reach of the channel. Under these conditions, this area would be prone to sediment deposition. However, it is likely that much of any deposited material would become remobilized as Mississippi River stage recedes over time.

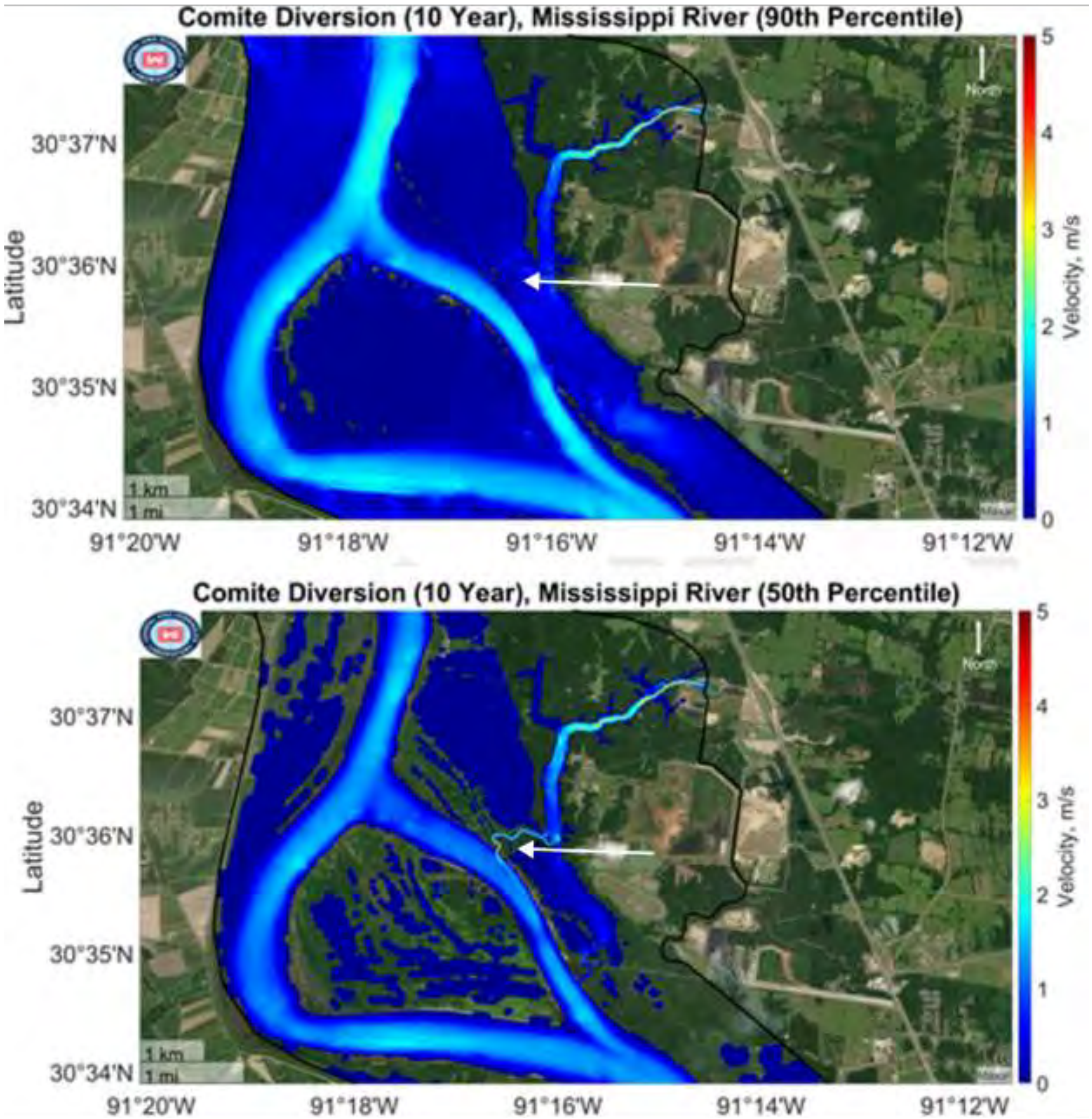


Figure 52: Modeled flow velocities and inundation extent predicted for a 10-year recurrence discharge through Lilly and Cooper Bayou and a high (90 percentile) and a moderate (50 percentile) Mississippi River stage. The white arrow points to a downstream reach of Cooper Bayou that may experience sediment aggradation during high Mississippi River stages.

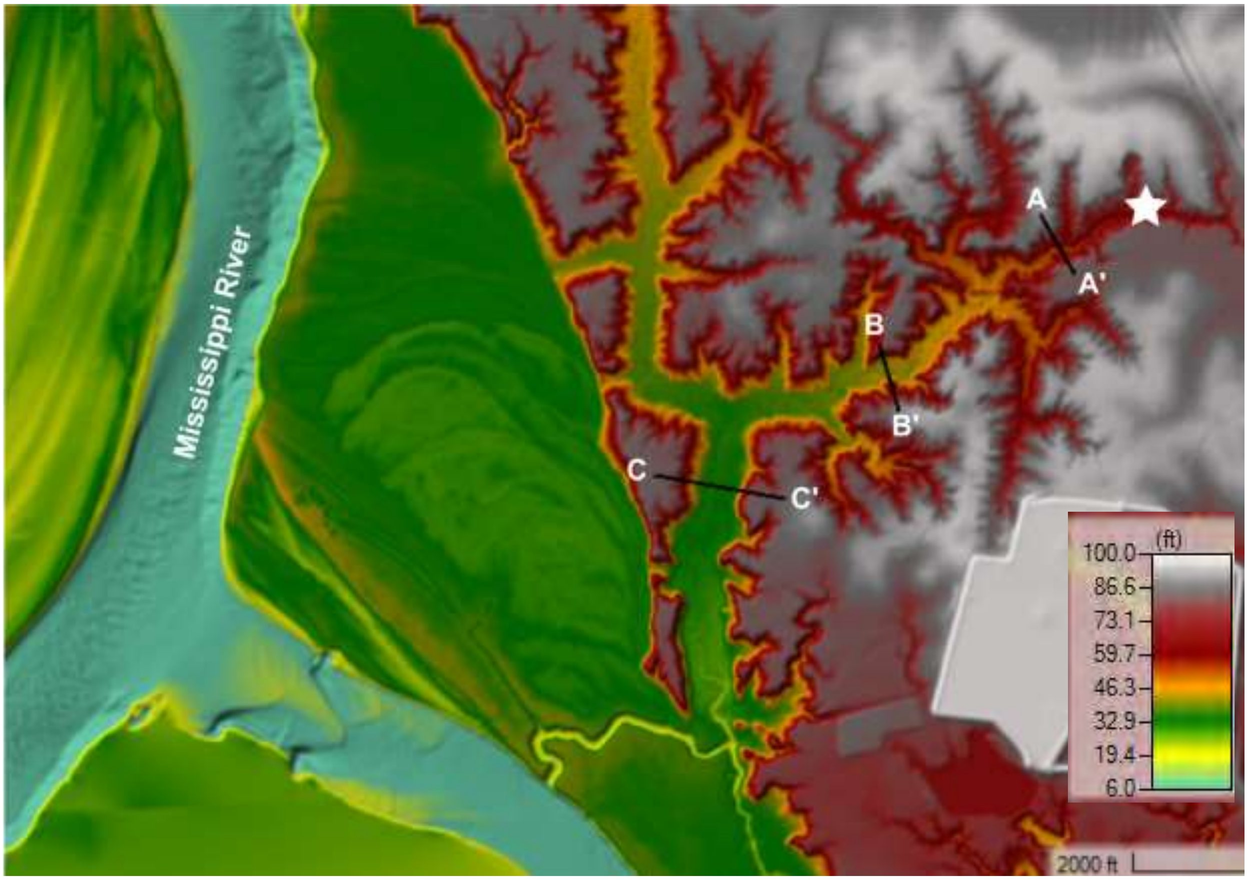


Figure 53: Digital elevation model of Lilly and Cooper Bayou. The star shows the location of the Lilly Bayou control structure outflow. Also shown are the cross sections shown in Figure 55.

Analysis of the topo-bathymetry within and surrounding the Lilly and Cooper bayou show a mature concave longitudinal profile and a well-developed floodplain with terraces. The terrace complex will help constrain the flow of the diversion water to the present-day drainage network. The current channel will likely decrease in sinuosity after successive inputs of diversion flow.

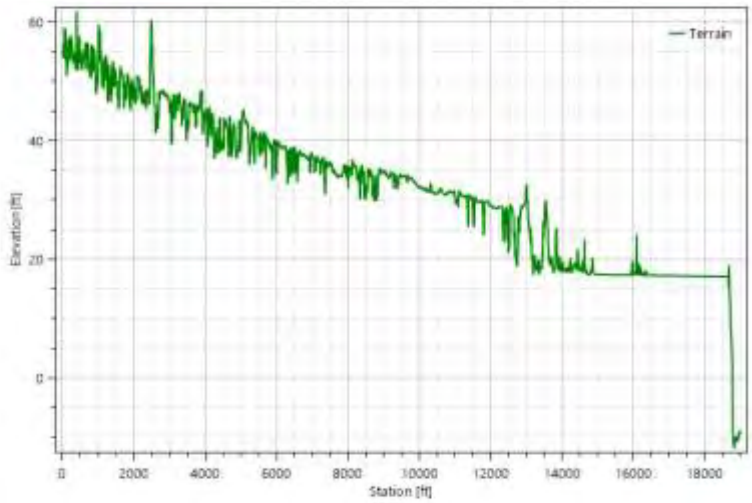


Figure 54: Longitudinal bed elevation for Lilly/Cooper Bayou, from the location the star in Figure 53 to the junction with the Mississippi River. Flow is left to right.

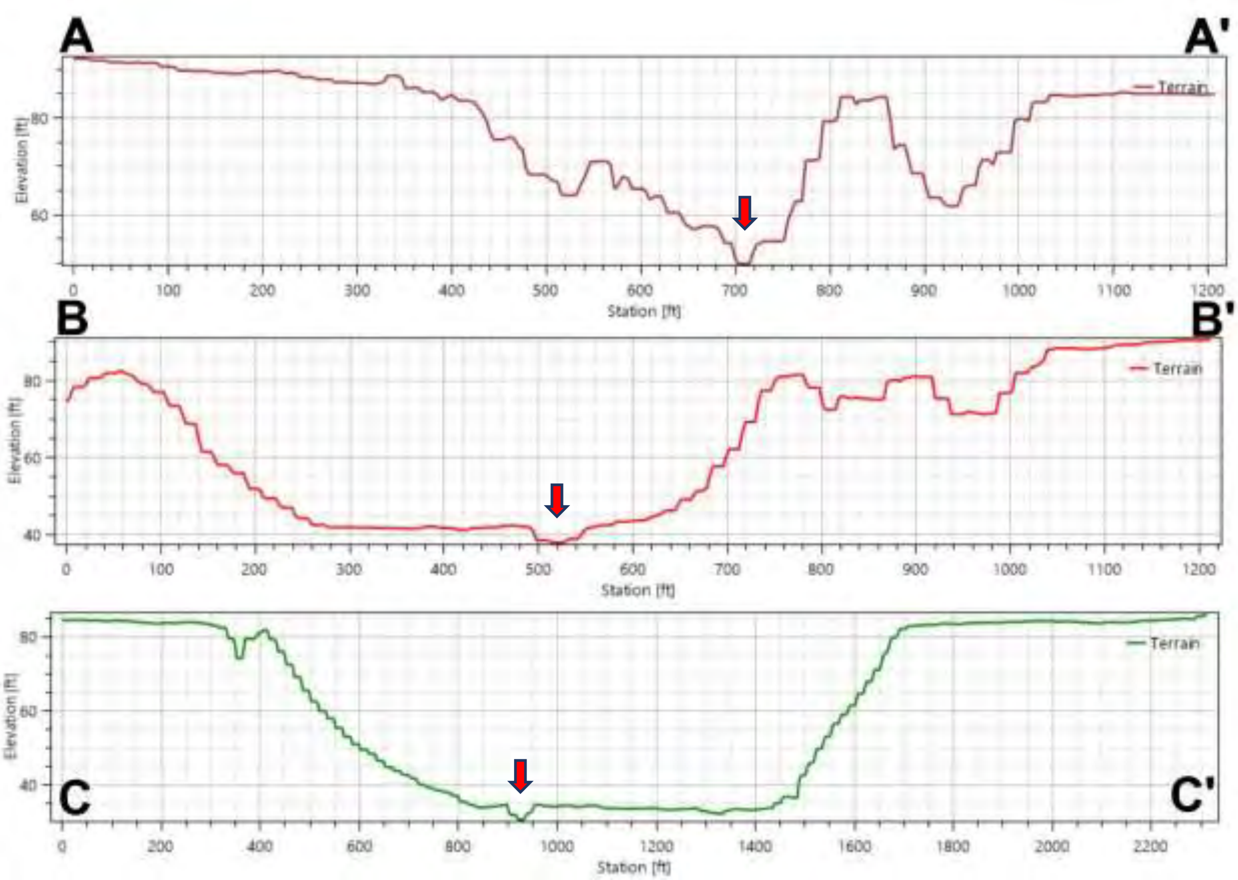


Figure 55:Terrain cross-sections showing present day channel dimensions (identified by the red arrow) and the surrounding floodplains/terraces shown in Figure 53.

3.3 Analysis of possible sedimentation in the Comite Diversion conveyance channel

In this analysis we used the 2D RAS sediment model to investigate zones of potential sediment aggradation in the Comite River diversion. To simplify the analysis (mitigate extensive run times to explicitly simulate sediment transport over a mobile bed with many grainsizes), we utilize the 'capacity only' method available in HEC-RAS 6+. This method calculates sediment flux in terms of total-load capacity which assumes sediment supply equals sediment transport capacity (the flow transports the maximum load possible) everywhere. Spatial variability in the abundance of bed sediment is not considered in this calculation. This method is useful to calculate the maximum rate of sediment aggradation at a given discharge (i.e., positive values of 'equilibrium bed change rate', a metric calculated in HEC-RAS) in alluvial rivers. This method is less useful to determine scour, which is generated from sediment supply deficits.

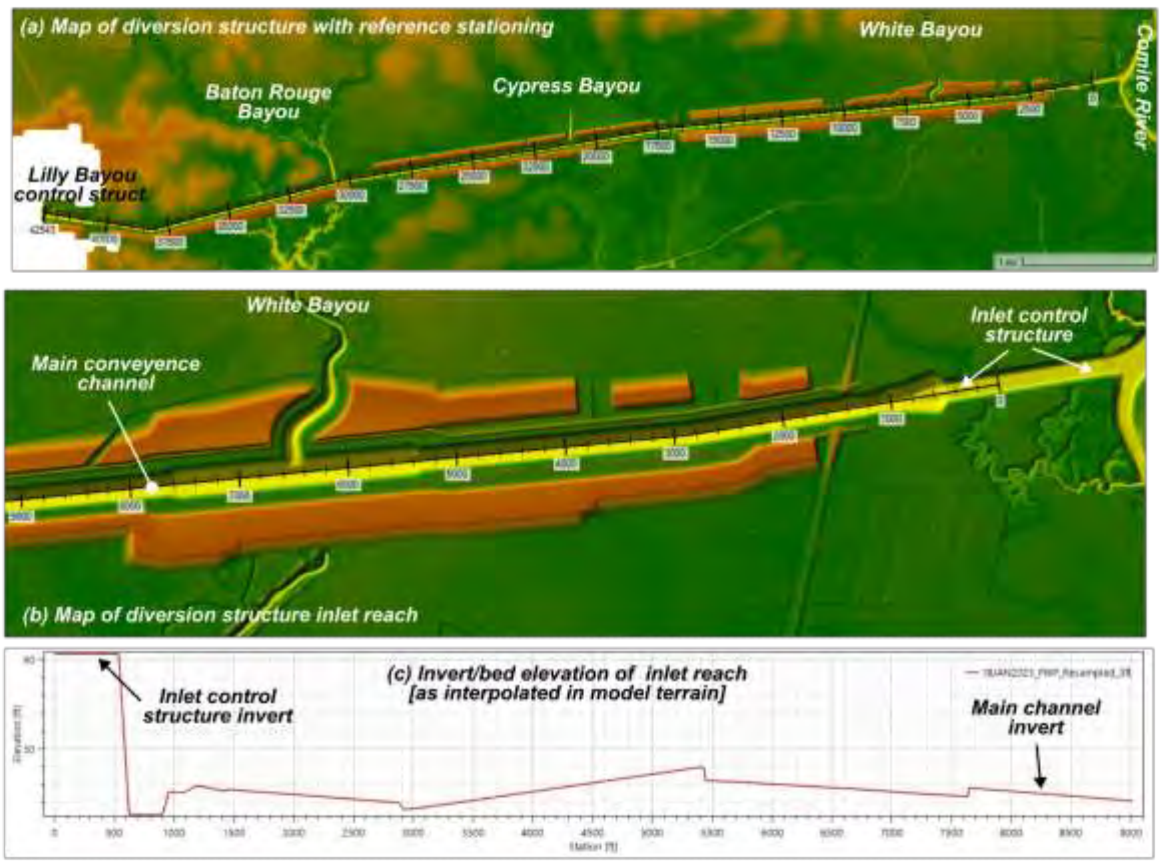


Figure 56: Map of the diversion channel as parameterized within the model (a). Map (b) shows a zoomed view of the upstream margin of the diversion channel, with the bed elevation shown in (c).

The following plots (Figure 57 to Figure 60) show the calculated equilibrium bed change rate (EBCR) along a central longitudinal transect along the diversion channel (as shown with stationing in Figure 56) at different discharges. Note the values have been converted to ft/day in these plots; in the maps, EBCR is given in units in/day. Positive spikes show channel areas that may be prone to sediment aggradation. Negative spikes can be disregarded because the diversion channel bed will be armored with much coarser material than that assumed in this analysis.

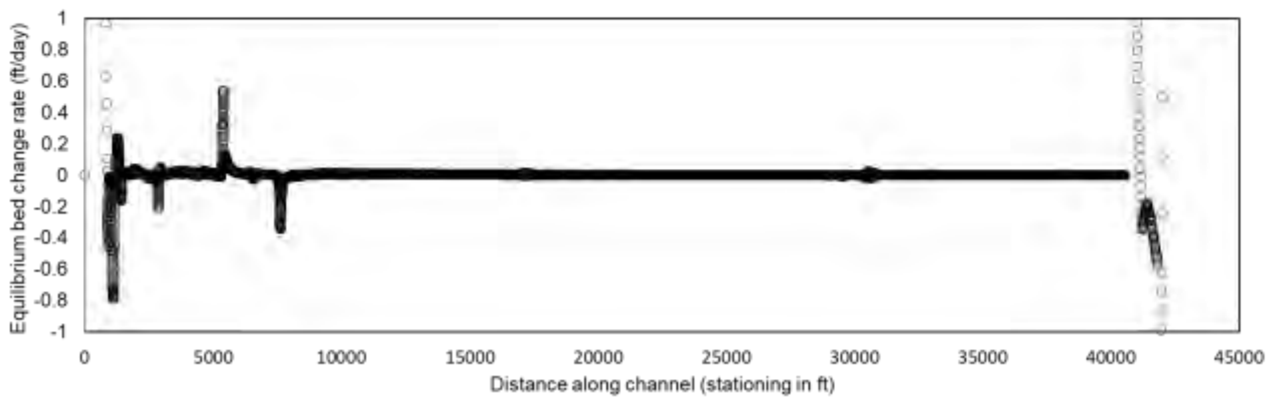


Figure 57: Modeled total equilibrium bed change rate for 3000 cfs diversion discharge. Stationing increases from upstream to downstream in this plot.

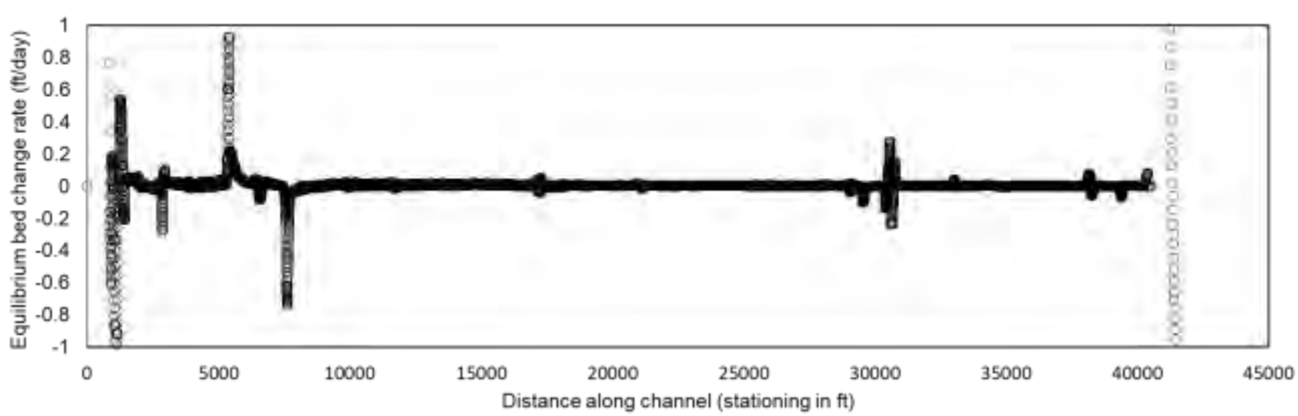


Figure 58: Modeled total equilibrium bed change rate for 5000 cfs diversion discharge. Stationing increases from upstream to downstream in this plot.

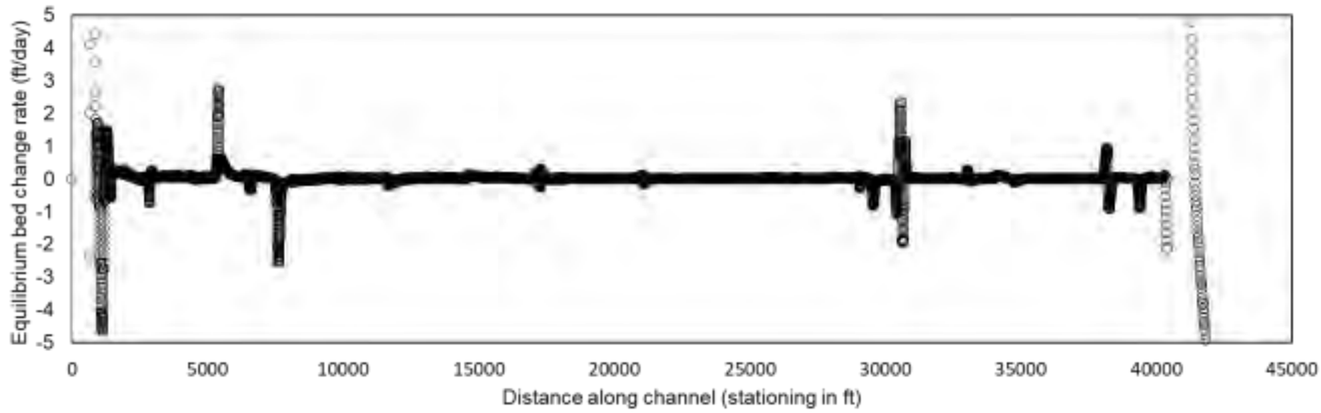


Figure 59: Modeled total equilibrium bed change rate for 10,000 cfs diversion discharge. Stationing increases from upstream to downstream in this plot.

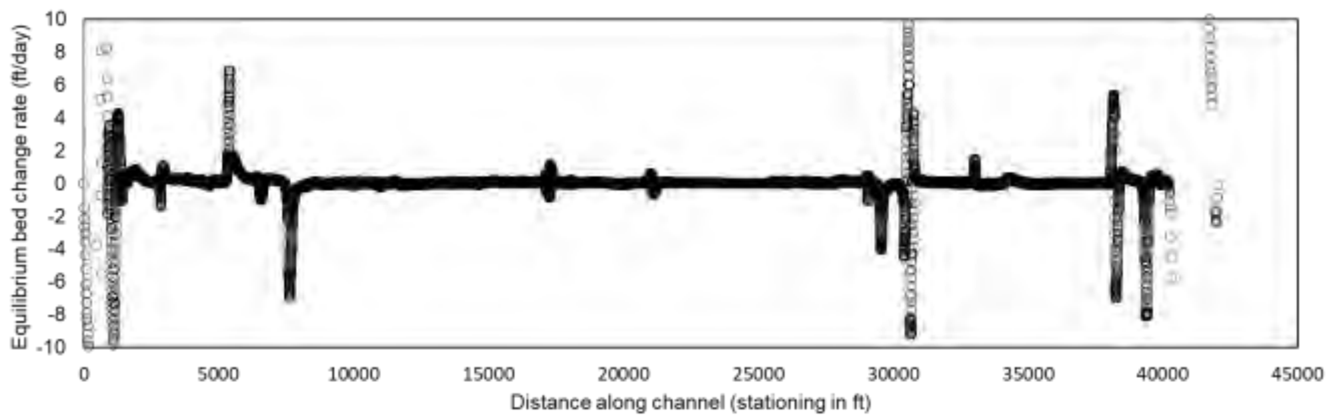


Figure 60: Modeled total equilibrium bed change rate for 20,000 cfs diversion discharge. Stationing increases from upstream to downstream in this plot.

These plots identify four channel areas of concern (i.e., recurrent clusters of spikes): [1] the initial mile immediately downstream of the inlet, [2] tributary junctions (e.g., station 21 000), [3] channel bends (e.g., station 35 000), and [4] approaching the Lilly Bayou control structure. EBCR maps of these locations are shown in Figure 61.

The resolution of the numerical model limited the precision of the analysis around the Lilly Bayou control structure. The model predicts sharp gradients of aggradation and (potential) erosion around the structure. Given that the structure is constructed and the precise dimensions are finalized, it may be beneficial to perform higher resolution sediment modeling of the structure to better understand the risk of sediment aggradation.

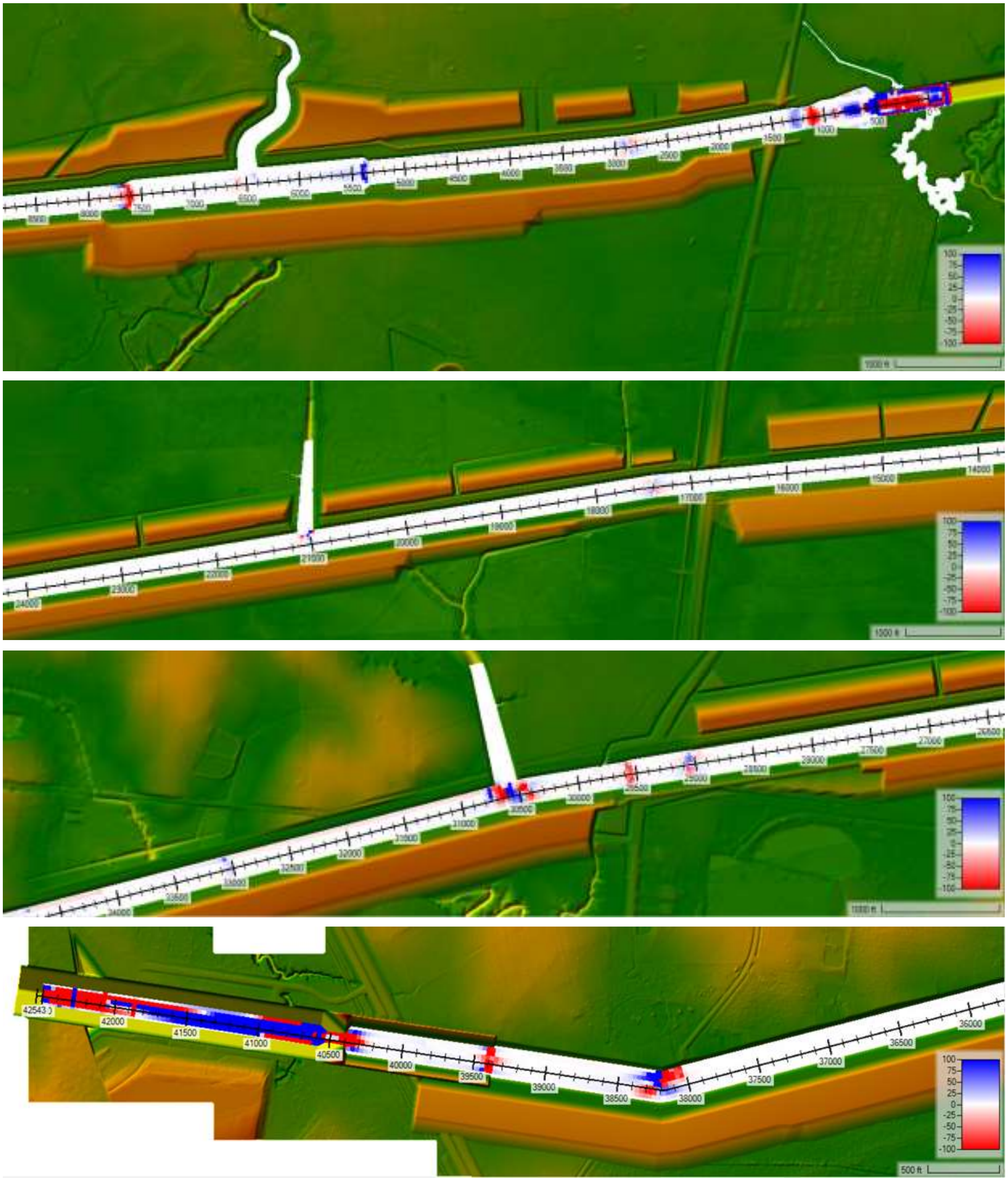


Figure 61: Maps of channel locations potentially prone to sediment aggradation: (top) the diversion inlet area, (2nd and 3rd from top) tributary junctions, (bottom) channel bends and the Lilly Bayou control structure. Mapped values are equilibrium bed change rate (in units in/day) for a 20,000 cfs discharge; positive (blue) values are aggradation. For this analysis, zones of predicted erosion (red) should be ignored.

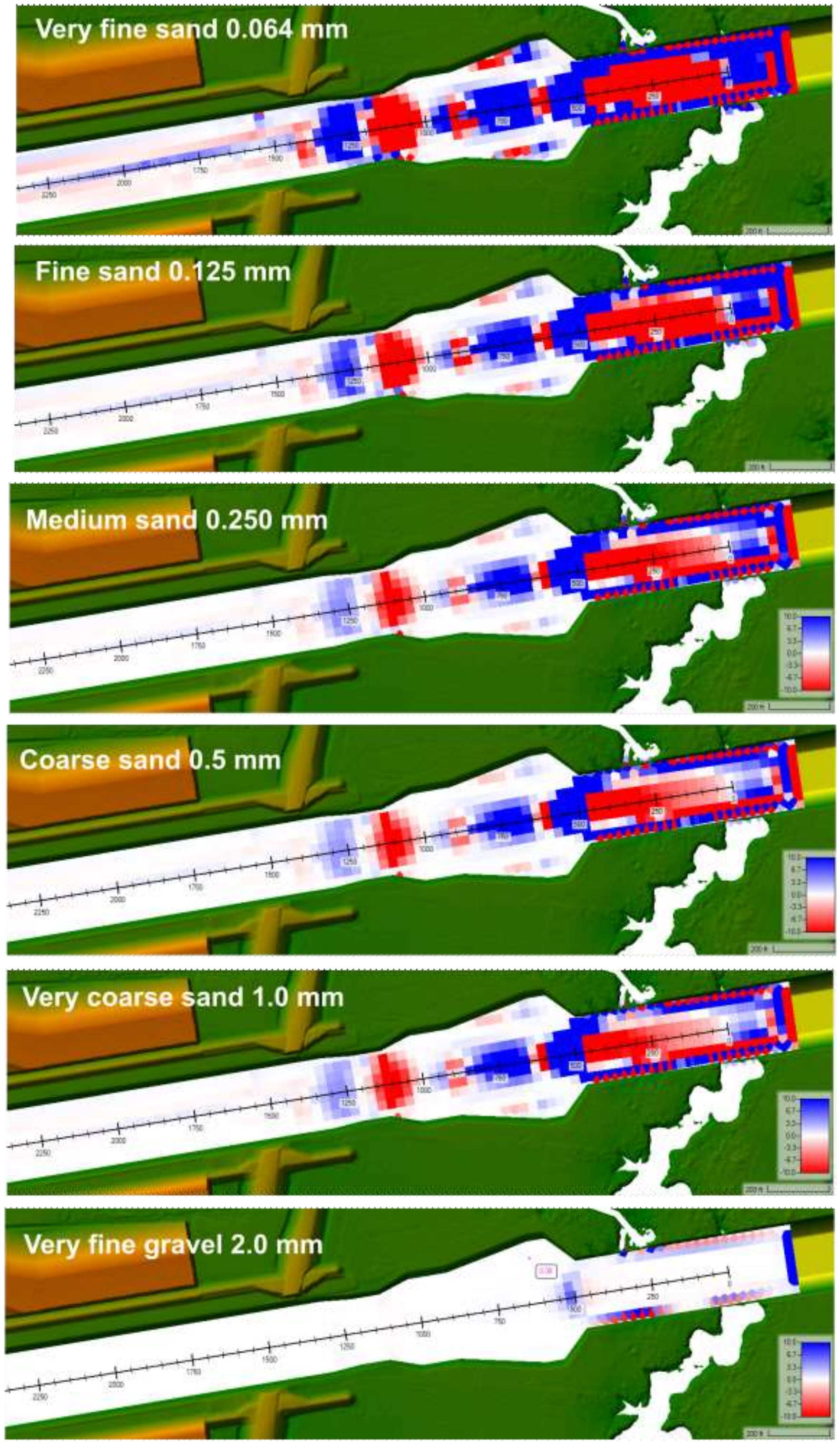


Figure 62:Calculated equilibrium bed change rates for different grain size fractions at the diversion inlet for a 20,000 cfs discharge. For this analysis, zones of predicted erosion (red) should be ignored.

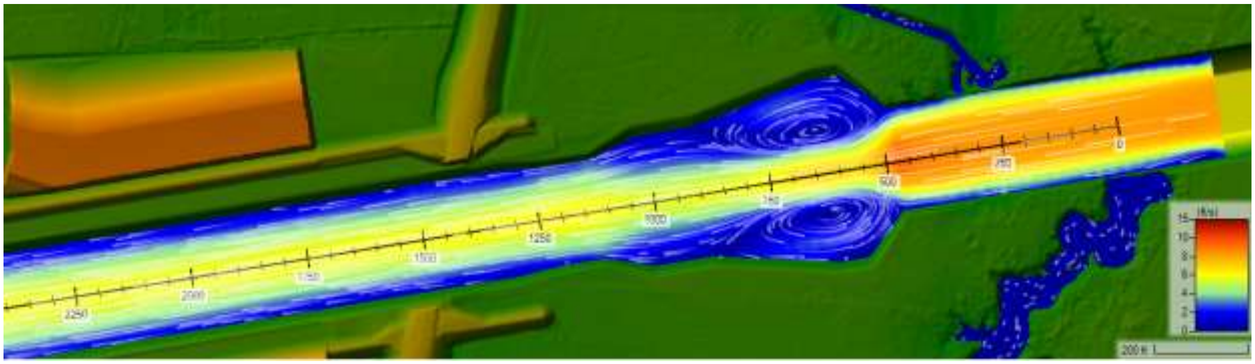


Figure 63:Velocity and streamlines for flow at 20,000 cfs. Zoomed to diversion channel area near inlet prone to local sediment aggradation.

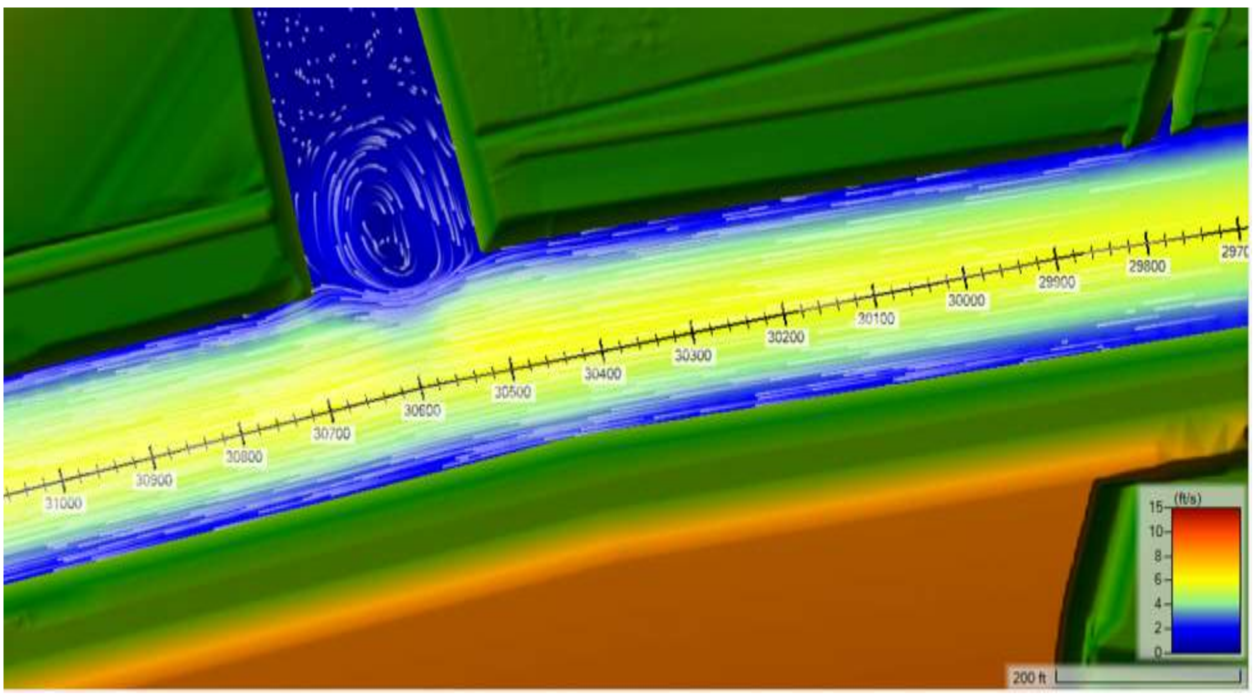


Figure 64: Velocity and streamlines for flow at 20,000 cfs. Zoomed to a diversion channel area near a tributary channel junction with no tributary inflow, this area is prone to local sediment aggradation.

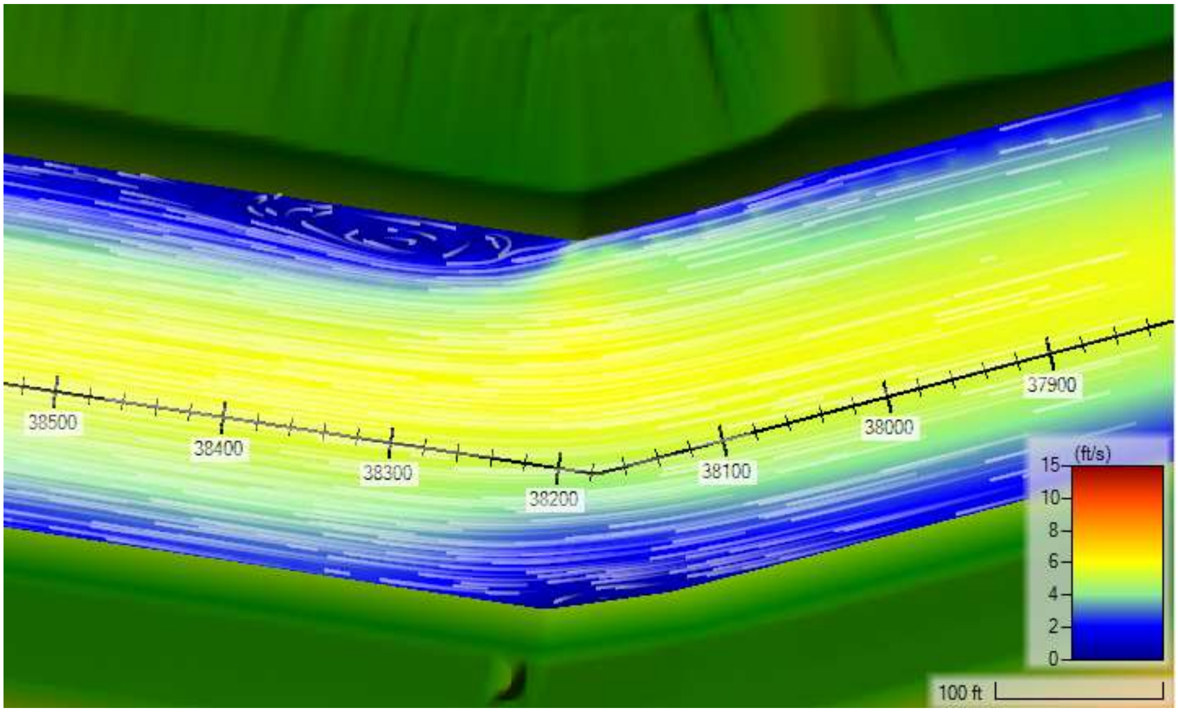


Figure 65: Velocity and streamlines for flow at 20,000 cfs. Zoomed to diversion channel bend in downstream reach prone to local sediment aggradation.

Figure 63 to Figure 65 suggest that aggradation is driven by localized flow recirculation which are typified by zones of negligible flow velocity in close proximity to much swifter moving currents. In equilibrium conditions (i.e., when each grain size is supplied at transport capacity), finer sands will aggrade faster and over a wider area than those coarser grains. This is logical as sediment transport flux generally has an exponential relationship with bed stress. A unit change in bed stress will have a greater effect on smaller grains transported at a higher flux value than coarser grains and finer grains are transported higher in the flow column than coarser grains, and therefore, travel a longer distance before settling to the bed.

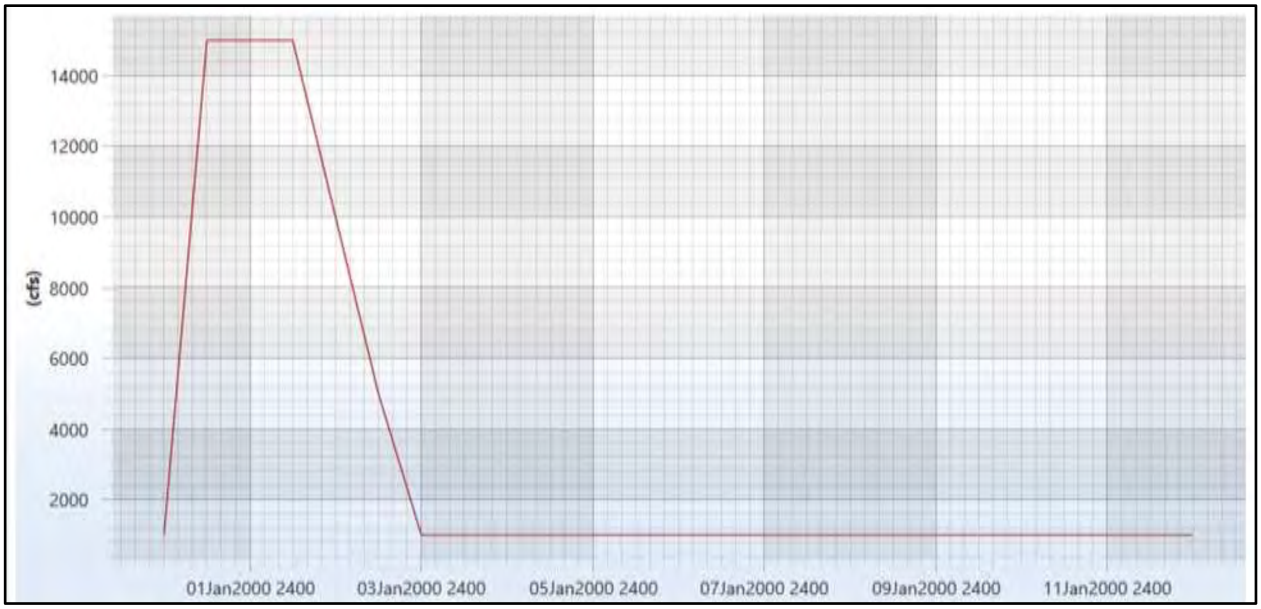


Figure 66: Example of the hydrograph inflows introduced during the dynamic flow sedimentation scenarios. The 10-year recurrence flow is shown here.

The diversion channel model was used to execute two additional scenarios that simulated traditional sediment transport mechanics during a dynamic hydrograph. These scenarios simulated very-fine sand transport over a 10-day period. Day one and two consisted of a pulse of high discharge (10-year recurrence flow of 15,000 cfs (Figure 66) and a 500-yr recurrence flow of 30,000 cfs) followed by an eight-day period of steady 1000 cfs flow. The objective of the scenarios was to test whether sediment deposition occurred preferentially during a specific part of a hydrograph (e.g., rising limb, peak, falling limb). These scenarios did not indicate that the conveyance channel would experience significant deposition throughout the tested flow conditions. The exception was that deposition was calculated in the energy dissipation pool immediately downstream of the drop structure at the inlet control (i.e., the location shown in Figure 62). Deposition was highest at the falling limb of the hydrograph for both scenarios. Over the duration of the 10-day event, total sediment deposition within this area was 7661 yd^3 for the 10-yr flow and 7046 yd^3 for the 500-year flow. These results suggest that, under the current design, the energy dissipation pool area may retain 5000 to 10,000 yd^3 of sediment during large flow events. The period of 1000 cfs flow showed no tendency to evacuate sediment deposited during the hydrograph peak.

Two-dimensional analysis of sediment-transport capacity in the Comite River channel

In addition to performing a two-dimensional sediment transport capacity analysis of the diversion channel, a with and without project simulation were executed that included the entire 2D RAS sediment transport model domain which included the natural Comite River channel. The objective of these simulations was to investigate the broad sedimentation trends predicted by the two-dimensional model relative to the one-dimensional model. The two-dimensional simulations included all sand fractions (phi-scale) at a steady-state 20,000 cfs discharge.

Figure 67 shows the difference in the 2D bed stress and sediment transport capacity fields with and without diversion operations (FWP-FWOP). Red zones indicate areas where diversion operations generated relatively greater values; blue values are relatively less. The maps indicate that diversion operations generally reduced bed stress and transport capacity downstream of the diversion inlet; however, the degree of the reduction significantly varied both longitudinally and laterally.

Figure 68 shows an example calculation of the equilibrium bed change rate simulated at the downstream margin of the Comite River model domain. While the reach is on-average predicted to be depositional, the local variability between depositional and erosional areas is fairly extreme. This variability showcases the influential role that bathymetry plays in 2-D calculations of bed change. Because the channel bathymetry incorporated into our 2-D model was extrapolated from 1-D cross section surveys, there are likely many extrapolation artifacts generating unrealistic predictions of bed change at the local level, and actual observed landforms that affect river flow and sediment transport, such as point bars, may not be adequately represented. The reached averaged sediment and hydrodynamics calculated in the 2-D and 1-D model are generally similar; for example, bed stress and sediment transport capacity is increased upstream of the diversion, when in operation, due to reduced stage.

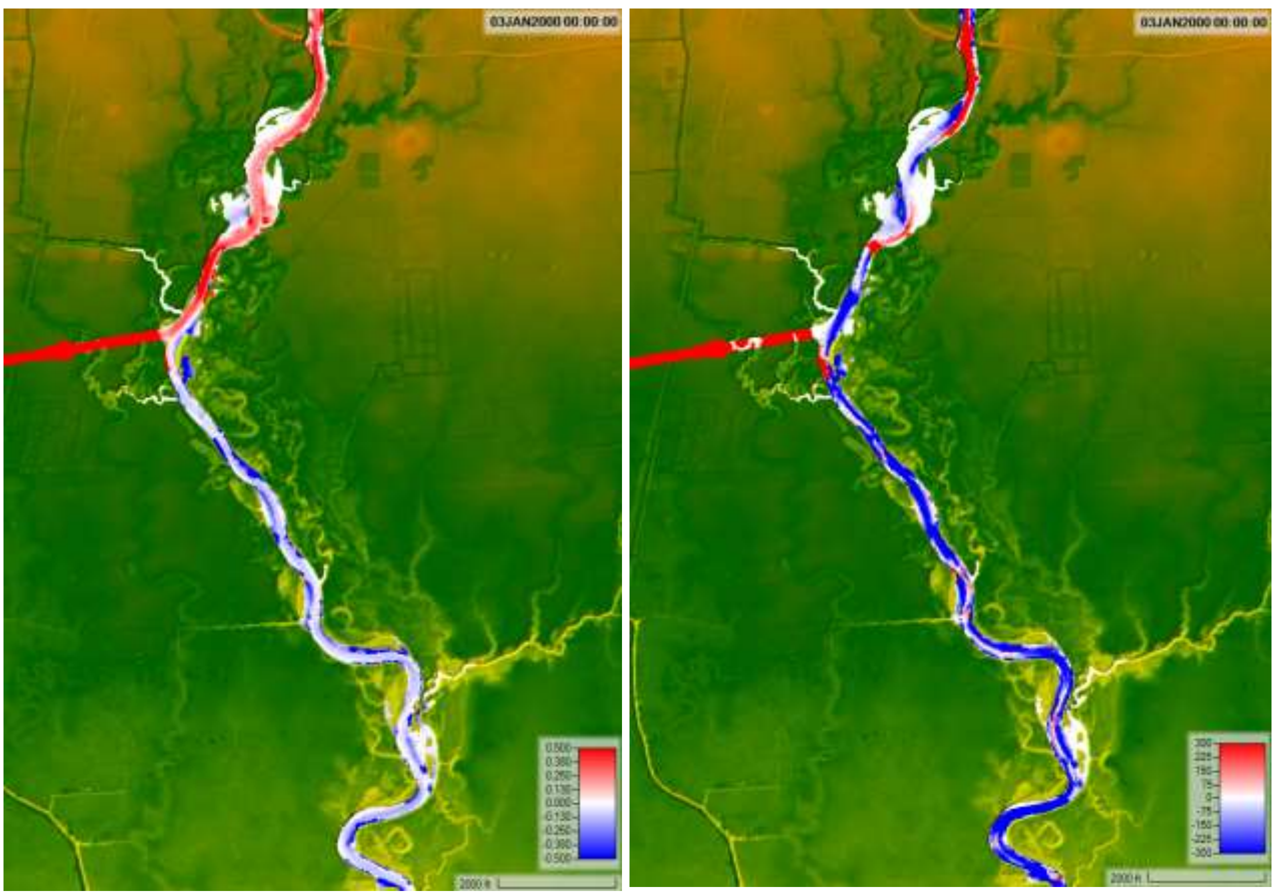


Figure 67:Predicted difference in bed stress (left map) and total sediment transport capacity for sand transport (right map) around the planned diversion inlet between future with project and future without project (FWP-FWOP); Comite River at 20,000 cfs.

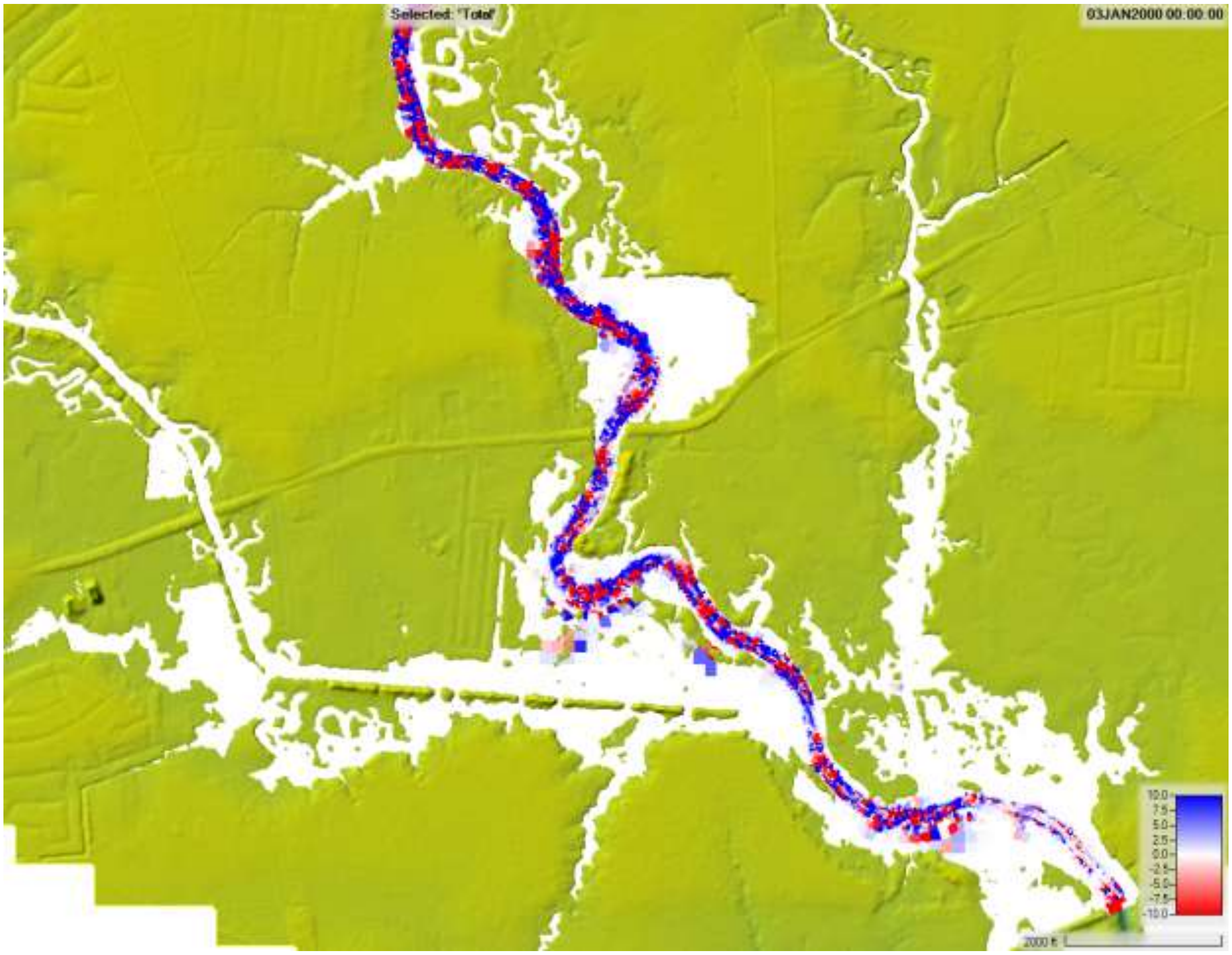


Figure 68:Predicted equilibrium bed change rate (assuming uniformly distributed all sands bed) at the downstream margins of the FWOP simulation; Comite River at 20,000 cfs.

Effect of bayou inflows on sedimentation

To investigate the effect of bayou inflow on diversion channel sediment dynamics, a simple test was performed at the junction with Bayou Baton Rouge (Figure 69). The diversion flow was kept constant at a moderate/high discharge (10,000 cfs). Sediment transport was simulated using the 'capacity only' method. This method assumes sediment transport supply equals transport capacity. The diversion inflow contained a uniform distribution of fractions between very fine sand (0.064 mm) and very fine gravel (2 mm). The three bayous in this simulation (including Bayou Baton Rouge) were given a discharge ramped from 0 to 1000 cfs over a two day period (Figure 70). The bayou inflows contained no sediment; they were assumed to primarily transport clay and silts.

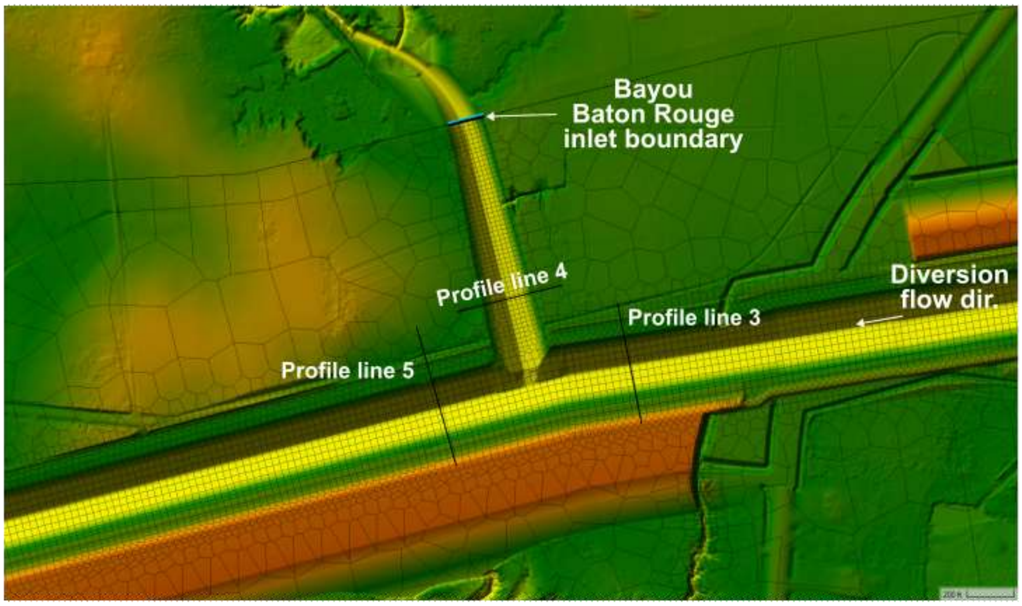


Figure 70:Map of Bayou Baton Rouge test area and cross sections (referred to as 'profile lines' in HEC-RAS) used in analysis.

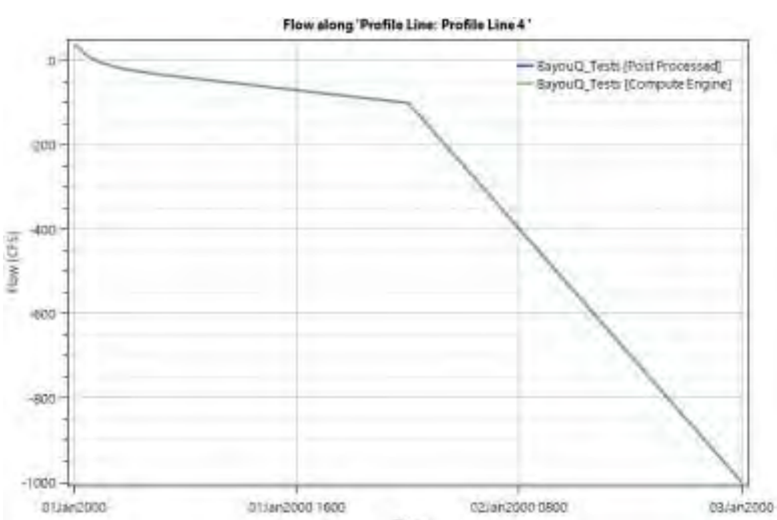


Figure 69: Flow hydrograph for Bayou Baton Rouge as measured at Profile line 4. The y-axis is negative, which in the context of this model, designates positive flow entering the domain from the top of the mesh.

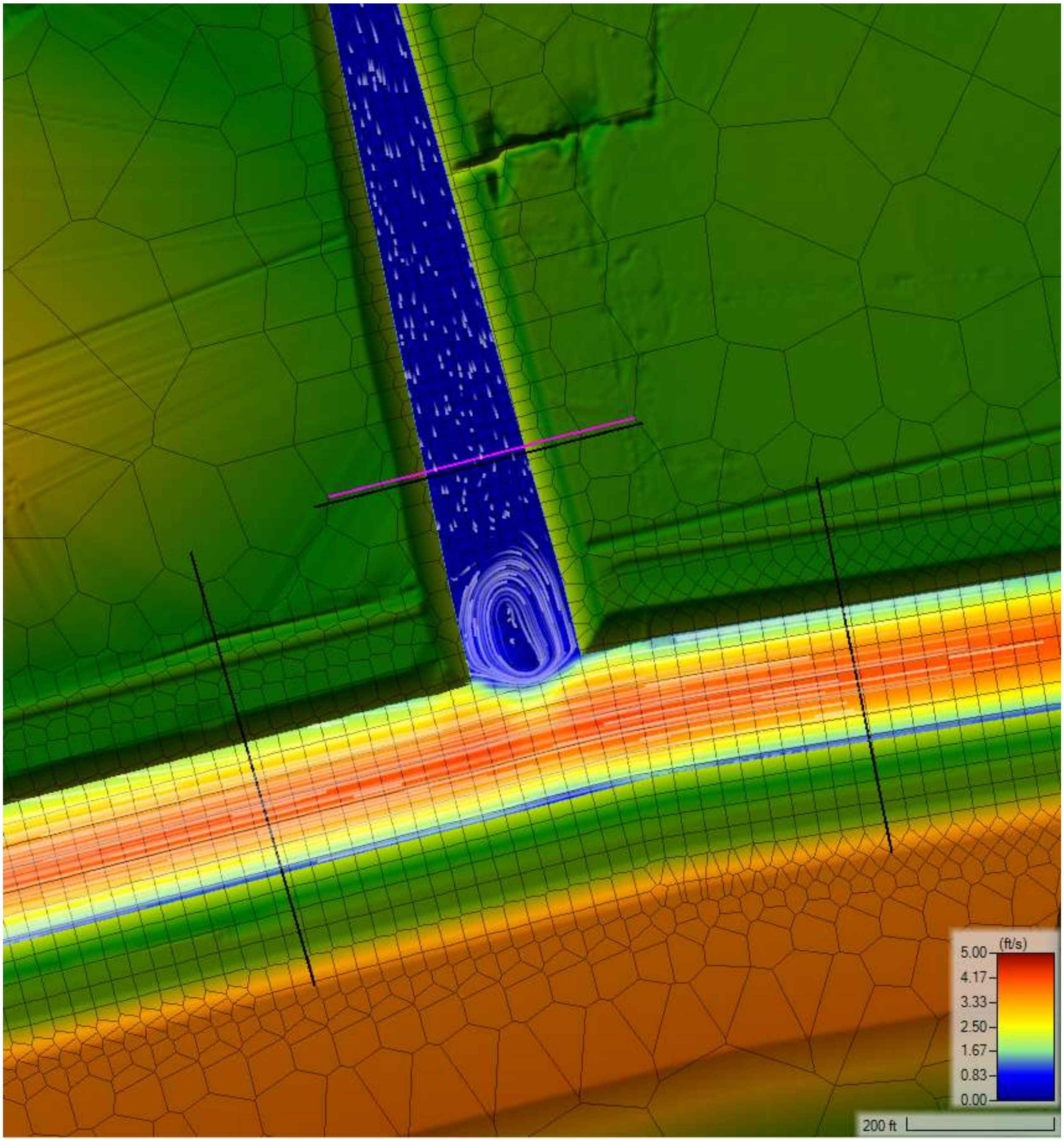


Figure 71: Bayou Baton Rouge discharge at 3.0 cfs

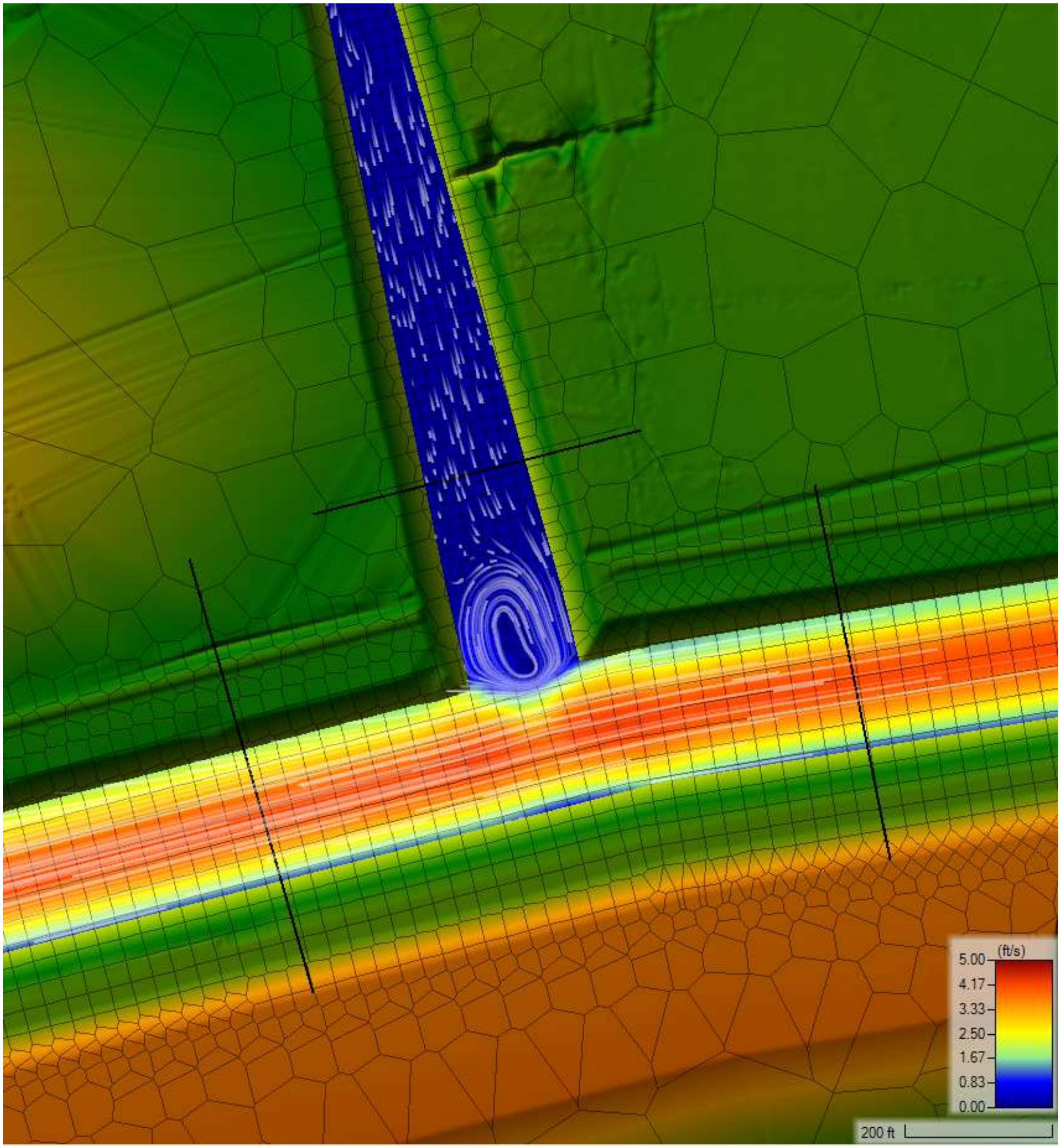


Figure 72: Bayou Baton Rouge discharge at 50 cfs.

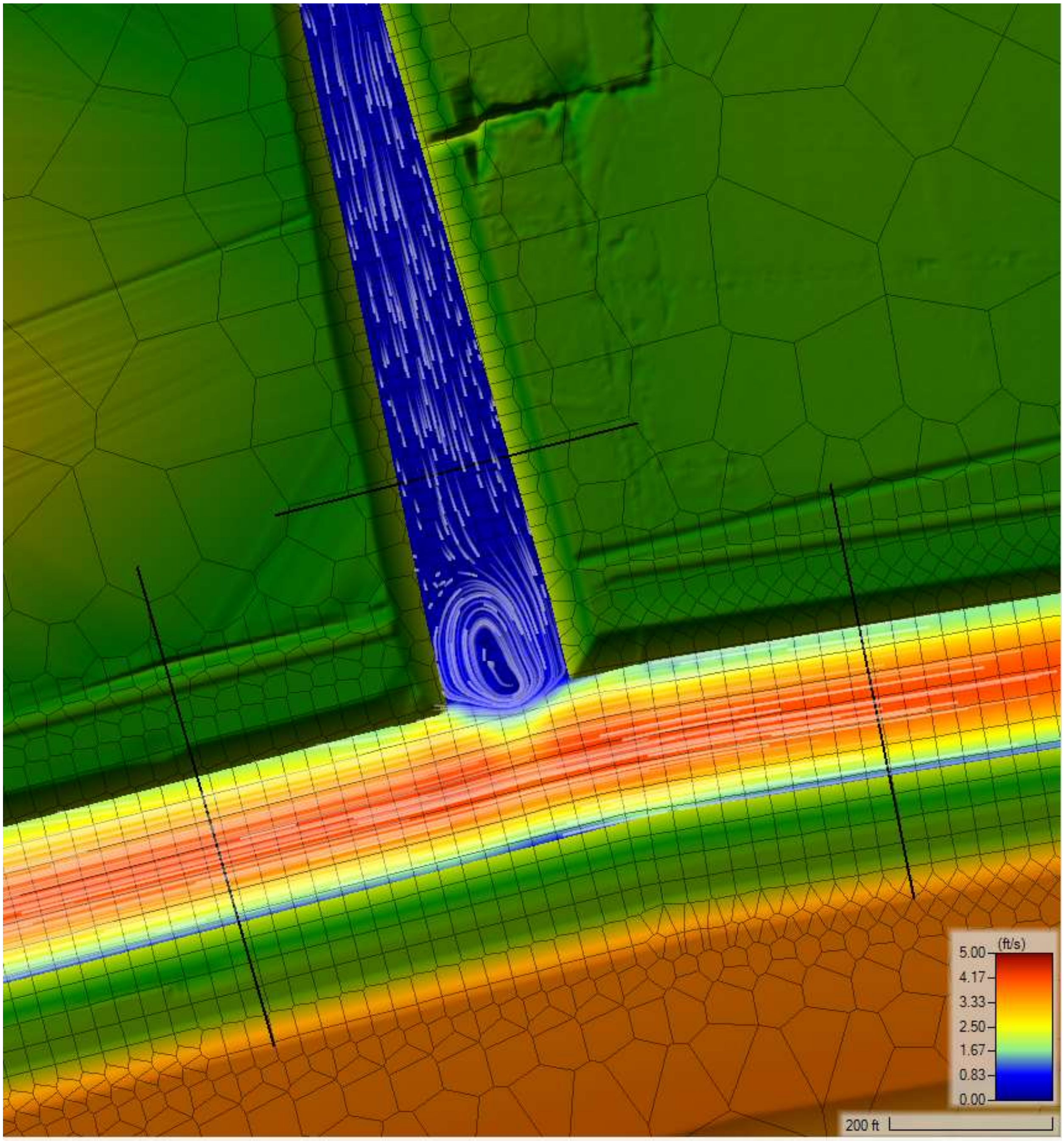


Figure 73: Bayou Baton Rouge discharge at 100 cfs

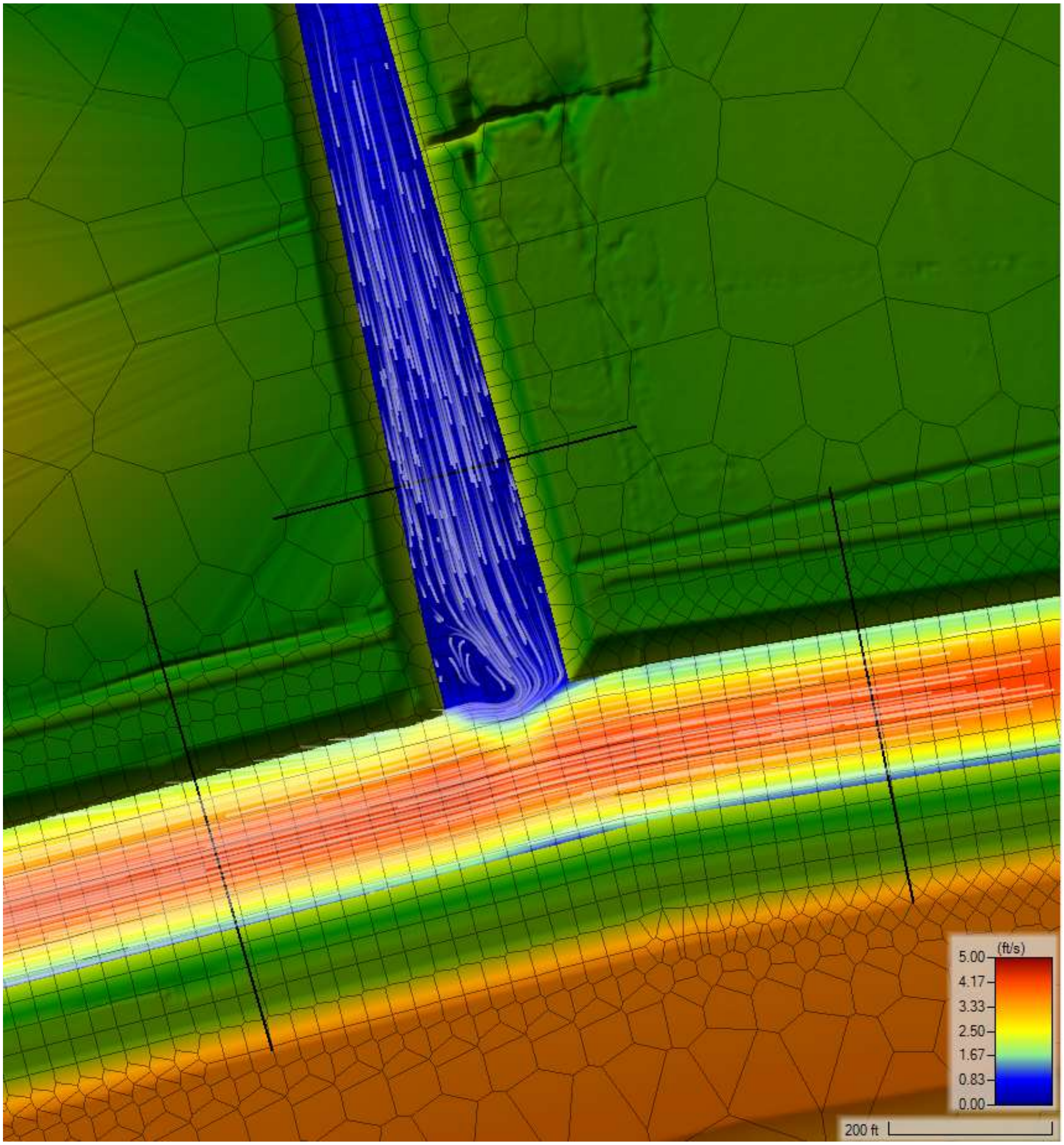


Figure 74: Bayou Baton Rouge discharge at 320 cfs

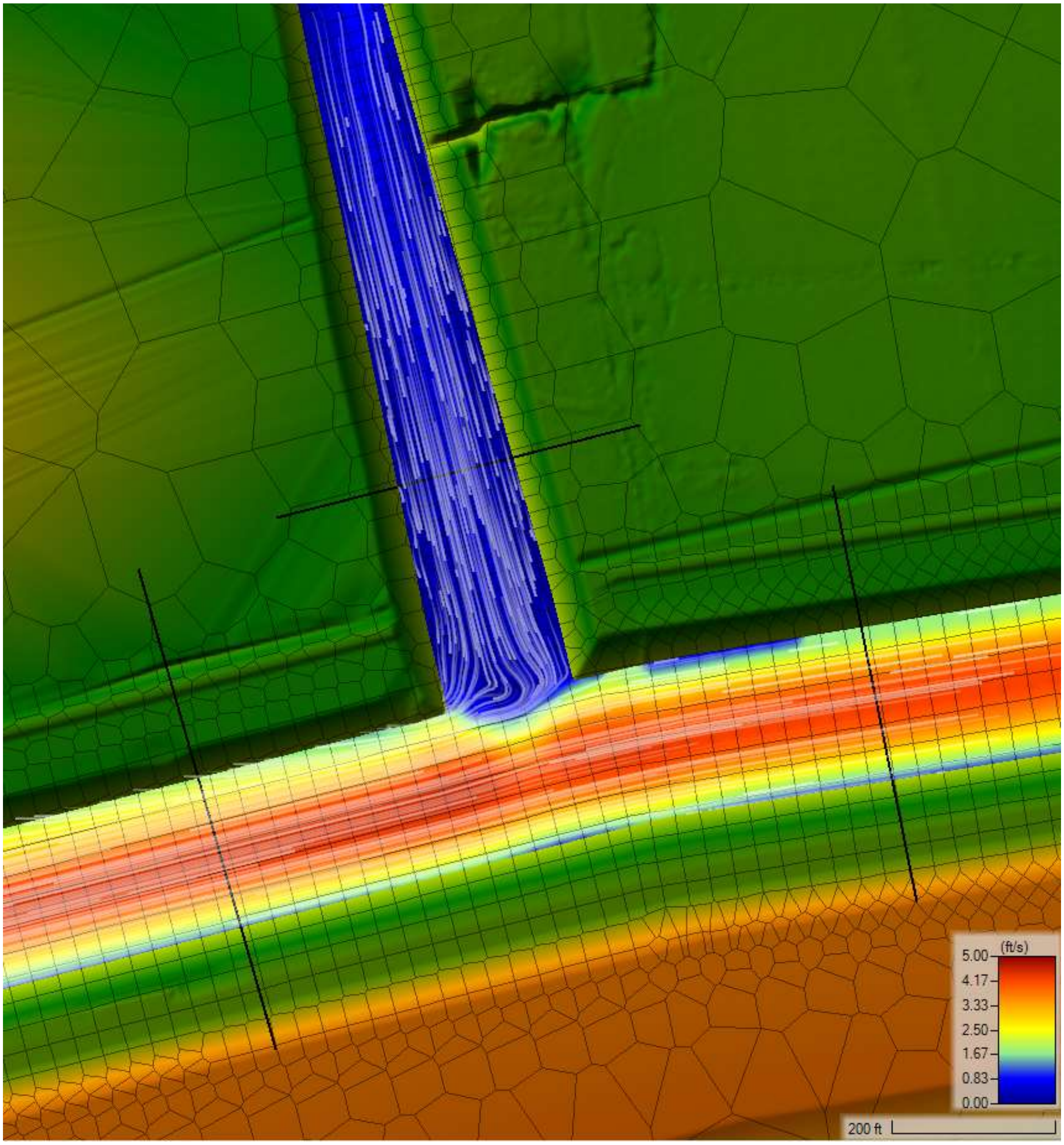


Figure 75: Bayou Baton Rouge discharge at 500 cfs.

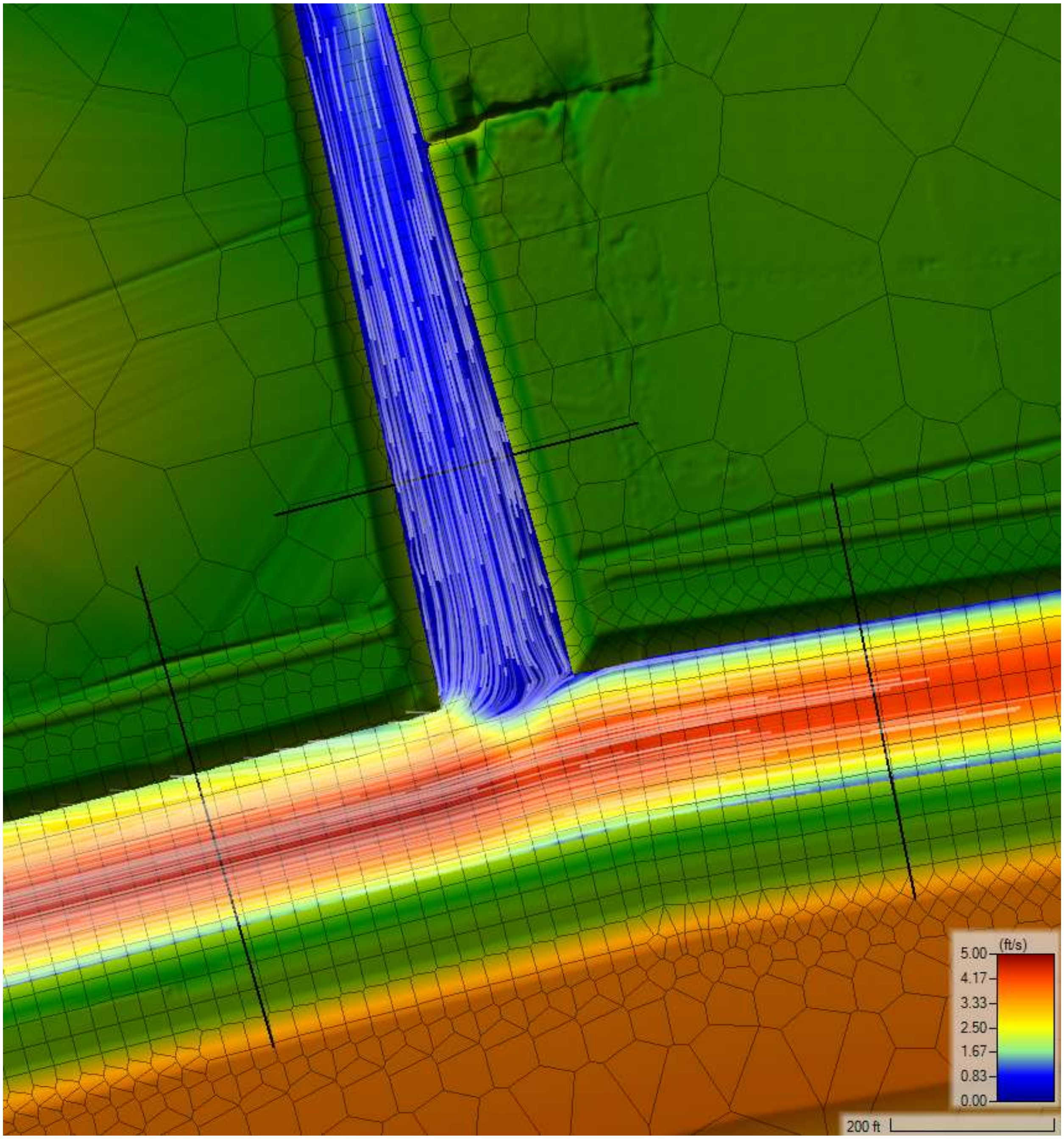


Figure 76: Bayou Baton Rouge discharge at 1000 cfs.

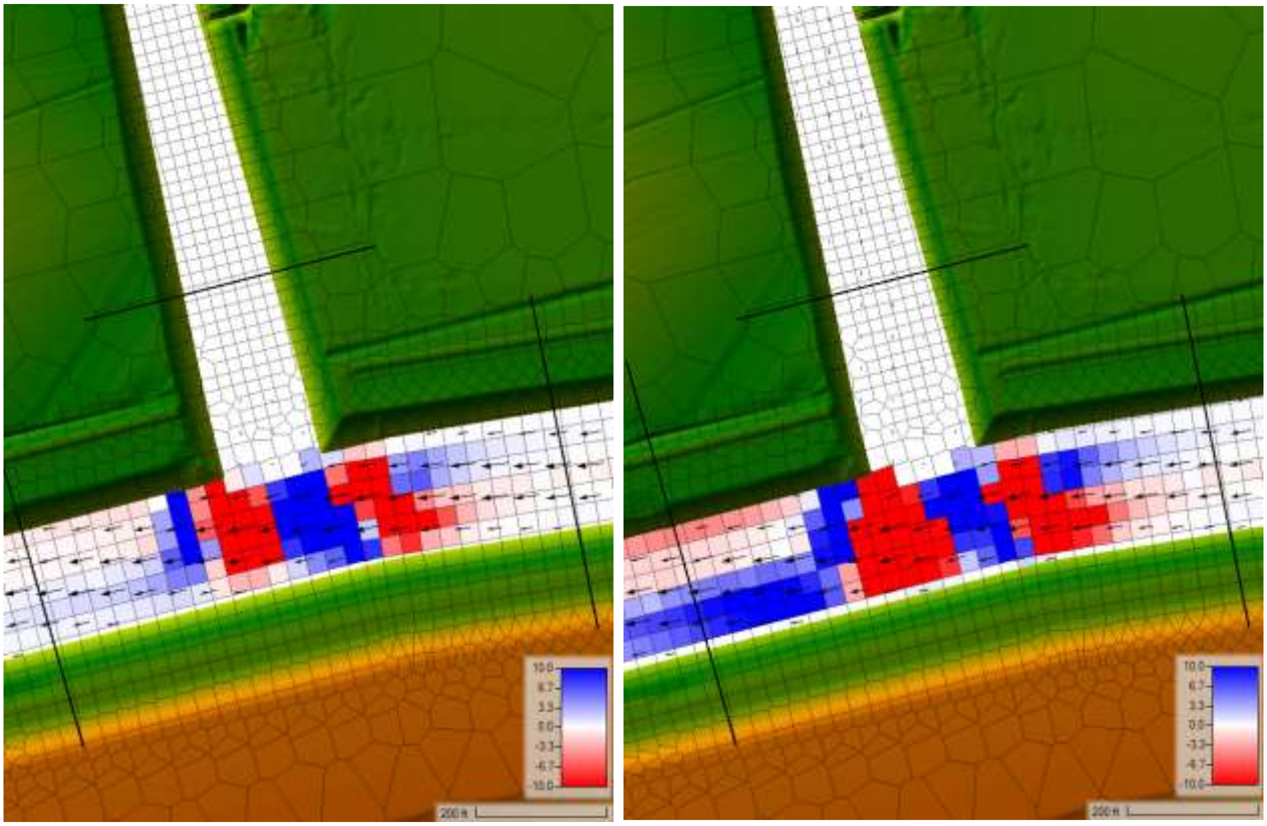


Figure 77: Calculated equilibrium bed change rate with bayou discharge at +3 cfs (left) and +1000 cfs (right).

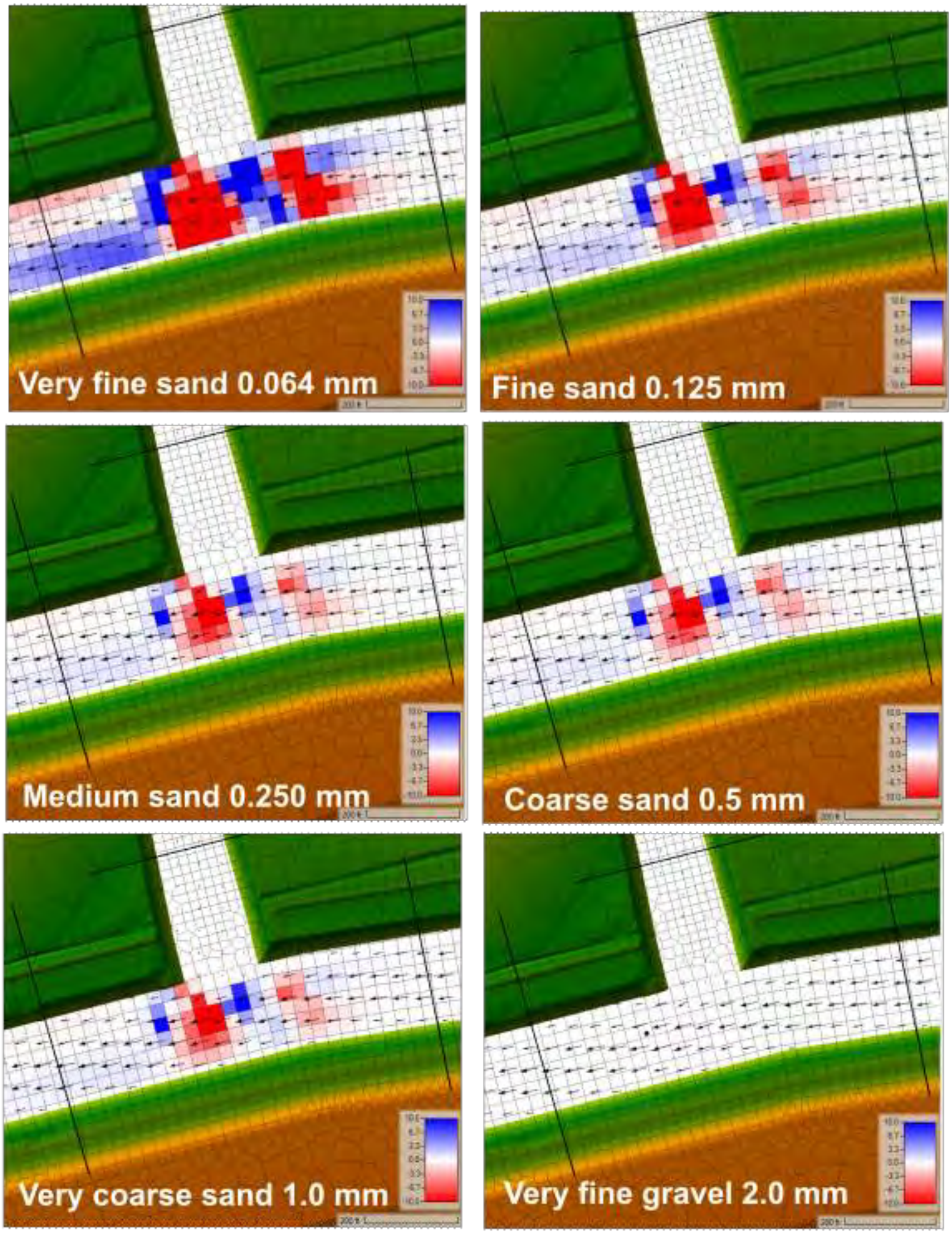


Figure 78: : Calculated equilibrium bed change rate with bayou discharge at 1000 cfs for individual grain size fractions.

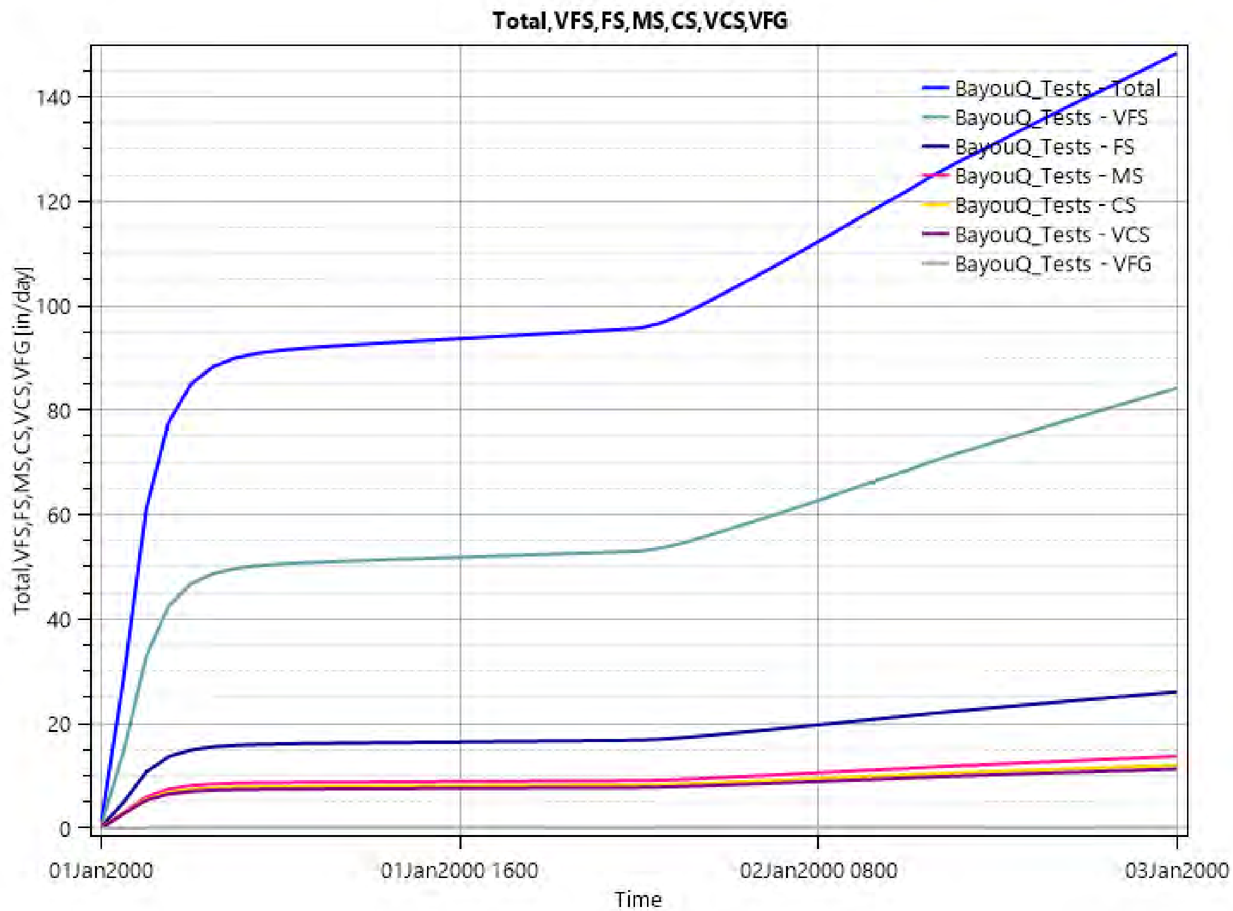


Figure 79: Calculated equilibrium bed change rate over the duration of the simulation at a cell with relatively very high rates of change (Cell with black point (small circle) in the following figure).

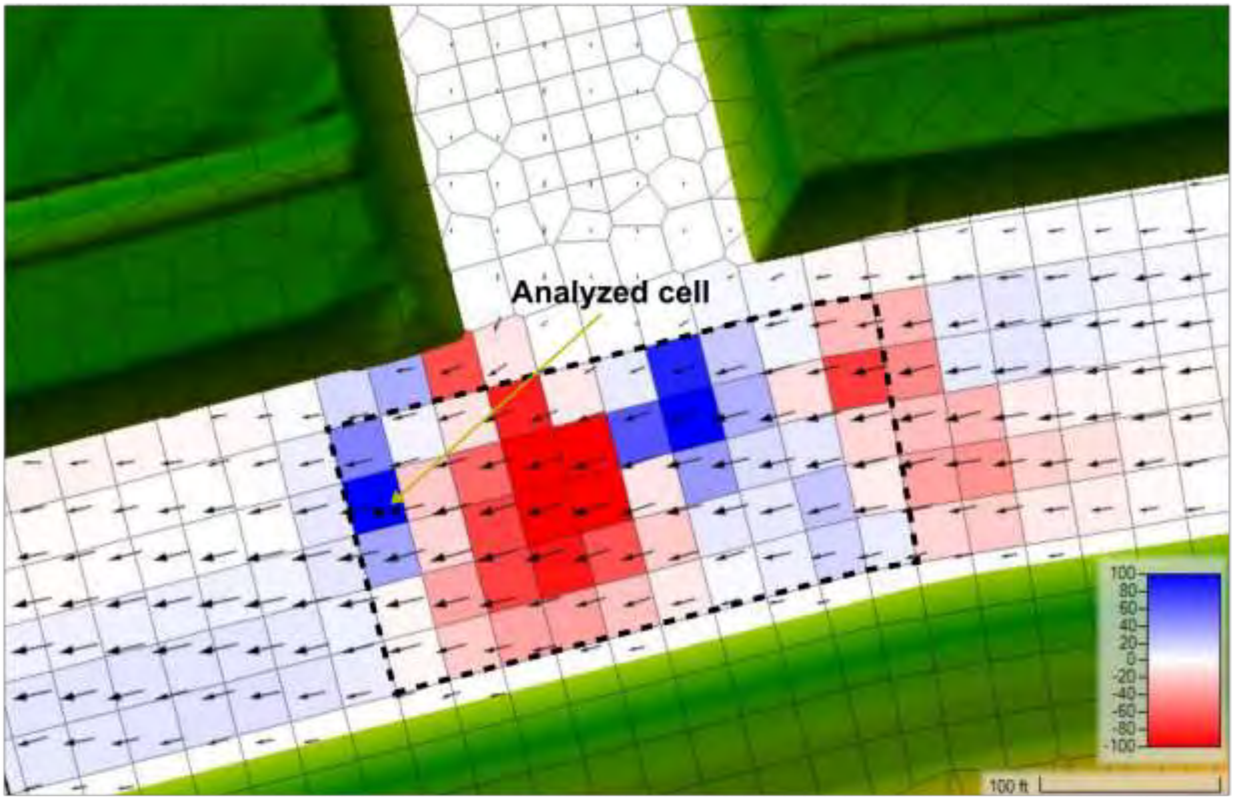


Figure 80:Map of calculated total equilibrium bed change rate (in/day) at the bayou junction showing cell from Figure 79 and example bed area where data was extrapolated (discussed in text).

The effective sediment aggradation for the situation illustrated above (10,000 cfs diversion flow and a ~1000 cfs bayou flow) may be calculated as follows. Assuming a 1-day event at these discharges, the volume of sediment deposited within blue (depositional) cells is on the order of 37,500 ft^3 (**1388 yd^3**). Assuming that the sediment deposition is diffused over a larger fraction of the bed in a more realistic manner (5 cells wide x 10 cells length), the aggradation depth would be **0.83 ft/day**. This is a very conservative (high) estimate because it assumes sediment supply equals transport capacity, which is unlikely in a diversion channel.

4. Discussion and conclusions

Our interpretation of the results of this analysis are summarized in the following sections.

4.1 The impact of diversion operations on the Comite River channel

The 1-D RAS sediment model indicated that the Comite River channel around the planned diversion inlet location is currently degradational, eroding approximately 1 ft in bed elevation over 10 to 20 years. The downstream-most channel sub-reaches of our study area (model domain), 7 to 10 miles downstream of the diversion, are locally aggradational. These trends are expected to generally continue over the 30-year period of analysis. A sensitivity analysis of HEC-RAS sediment parameters found that varying common parameters within the plausible range of values for sandy/sand-gravel bedded rivers, such as the Comite River, typically does not alter the degradational nature of the channel system.

Because of the erosional nature of the current Comite River channel, diversion operations were not calculated to induce significant sediment aggradation within the channel. While diversion operations do reduce the sediment transport capacity of the channel downstream of the diversion inlet location, the estimated resultant sediment deposition is likely of similar magnitude or less than the bed sediment removed by natural erosional processes. Our analysis estimates that diversion operations may cause the Comite channel to gain approximately 2500 cubic yards of sediment within the channel sub-reach 1-mile downstream of the planned diversion inlet location (relative to the present-day channel) over the 30-year period of analysis. Sedimentation on this order would not be expected to negatively impact the diversion or ecosystem functions. Because of the sparsity of observational data available to validate our model, we simulated additional scenarios with increasing conservatism to provide insight on the plausible and physically possible 'high end' range of channel sedimentation. The conservative estimate defining the high end of plausible sedimentation rates, calculates that diversion operations could plausibly induce 88,000 cubic yards of sediment aggradation over 30 years. The most conservative estimate defining the high end of physically possible sedimentation rates, calculates that diversion operations could possibly, but is unlikely to, induce 130,000 cubic yards of sediment aggradation over 30 years. These estimates of sedimentation are lower than that predicted by the sedimentation modeling conducted to support the 1995 Design Study (i.e., 275,000 cubic yards).

In the context of Lane's Balance (Figure 1), our analyses suggest that the balance is naturally tilted towards the right-hand side, with transport capacity outweighing sediment supply, leading towards degradation. Diversion operations will likely remove a significantly larger fraction of water from the bucket than sediment from the pile. The rightward tilt will lessen but not fully abate.

Figure 81 shows the calculated sediment storage within the channel for the Base scenarios at projected 30, 60, and 90 years into the future. The 60- and 90-year scenarios utilized the same boundary conditions as the 30-year scenario, repeated once or twice. The magnitude of the storage declines over time suggesting that the channel degradation brings the longitudinal channel slope closer to equilibrium; but even at 90-years equilibrium is not reached. The magnitude of the impact of the diversion operations on channel sedimentation also declines, and becomes more uniform over the channel length, over time.

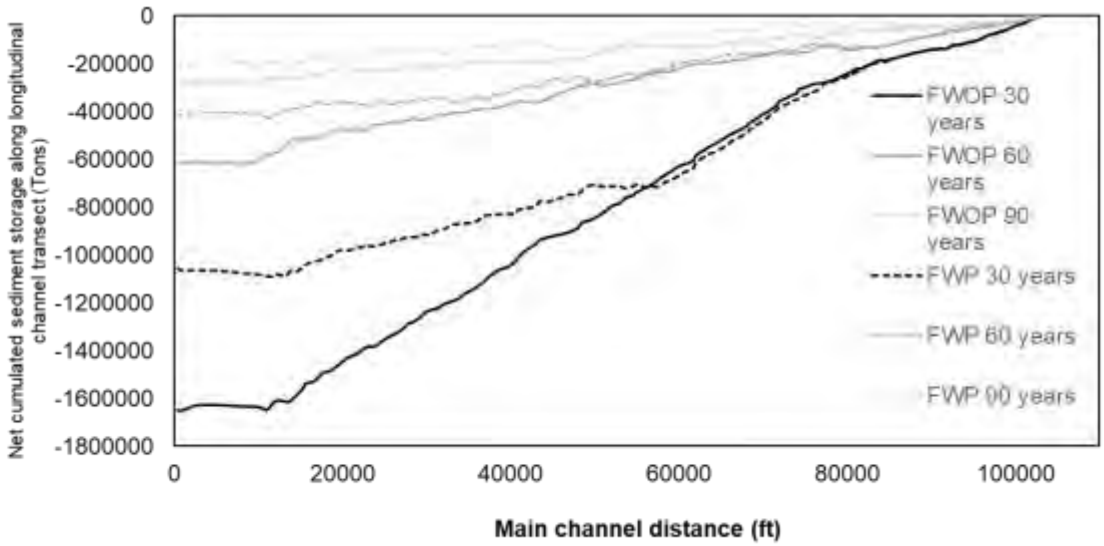


Figure 81: Net channel sediment storage for the Base scenario over an extended 90-year time period, showing data at 30-year intervals (i.e., 0-30, 30-60, 60-90), with (FWP) and without diversion operations (FWOP).

The processes governing the sediment transport process are complex and difficult to predict at extended time scales, such as over decades. Model output should be considered a 'best guess' within the context of the available information and physical assumptions. Our 1-D RAS sediment model relies on significant simplification of the Comite River geomorphic system; however, it provides useful insight into reach scale-sedimentation processes over the period of analysis, especially in assessing the relative difference between sediment aggradation with and without diversion operations. The model does not resolve multidimensional influences such as channel sinuosity, channel bars, lateral variation in bed material, and secondary currents. Typically, these influences act over more local special scales; however, if consequential in areas, our model may lead to less accurate assessment.

4.2 The impact of diversion operations on Lilly and Cooper Bayou

This analysis includes a simple analysis of the impact of diversion operations on the Lilly and Cooper bayou channels. Currently, the channels are small, having evolved to convey on the order of tens of cubic feet of flow per second. The outflow of the Lilly Bayou control structures directs all diverted water into these bayou channels. Based on Comite River discharge history, the diversion will typically discharge 500 to 10,000 cfs into the bayous approximately 5 to 15 time a years, with discharge events lasting 2 to 7 days.

ERDC performed calculations on the hydraulics of a large, 500-year flood event and found that it would likely cause scour throughout much of the bayou channel network. Measurements of bayou bed grain-size indicate that the bed is primarily composed of silts with some finer sand present. Unless these sediments are well consolidated, they are likely erodible by discharge values introduced during routine diversion operations. There is no indication that the bayou channels would be prone to significant or long term sediment aggradation due to diversion operations.

In the near future, additional sediment transport modeling will be conducted to better predict: [1] bayou channel dimensions in response to the diversion inflows of flow and sediment, and [2] sedimentation patterns (generalized locations and rates) within the proximal wetlands north of Cooper Bayou. This modeling will also address the effect of timing between diversion operations and Mississippi River high and low water events. The results of this modeling will be included as an appendix to the final version of the report.

4.3 Depositionary processes within the diversion conveyance channel.

The depositionary processes within the diversion channel were analyzed using a 2-D HEC RAS sediment model. To promote computationally efficiency, the analysis utilized the 'transport capacity only' method available in HEC-RAS 6+. This method estimates sediment transport dynamics assuming the transport capacity of the flow is fully satiated everywhere, i.e., sediment supply equals sediment demand within each computational cell. Because there are no sediment supply storages anyway within the model, the model will predict the maximum amount of sediment deposition possible given the flow conditions. Calculated sediment scour, which is the result of a positive gradient (increasing) sediment transport capacity and supply limitation, will be underpredicted using this method, which only resolves scour related to transport capacity.

The results of this analysis suggest that conveyance channel will generate the transport capacity to convey the load of diverted sediment. The analysis identifies localized areas that will be prone to sediment deposition due to flow recirculation generated by the channel geometry, such as near zones of flow expansion, channel bends, or tributary junctions. At each identified area of concern, we calculate a likely maximum deposition rate on the order of 1000 cubic yards per day of diversion operations. It is likely that deposition will be limited to the flow recirculation zone and will subside when some equilibrium bed morphology is obtained. As designed, the diversion conveyance channel is relatively large and sediment deposition on the order of 1000 cubic yards, if diffused by flow over a significant bed area, would not equate to a sediment thickness large enough to affect adjacent flow fields. The possible exception to this interpretation is the energy dissipation pool downstream of the inlet control structure. Based on our simplified mobile-bed sedimentation analysis, the pool is expected to generate 5000 to 10000 yd^3 over a large flow event, which is on the order of that predicted above. The aggradation occurs over a small area, making it thick, and the model predicts little diffusion over time. The only mechanism to remove this sediment may be dredging.

The diversion channel areas of most uncertainty regarding sedimentation are the energy dissipation pool immediately downstream of the inlet control structure and the area immediately upstream of the weir in the Lilly Bayou outlet control structure. To reduce this uncertainty, it may be useful to perform high resolution sediment analyses of this individual structures with updated design specifications.

4.4 The impact of climate change on diversion effects

Over the 30-year period of analysis, the magnitude of the impact of climate change on how the diversion will influence regional sedimentation is uncertain although it is likely non-negligible. The signal of sea-level rise will be apparent in the Mississippi River stage within the study area. This signal will likely result in increased stage during low river discharges. An additional impact of climate change is the modification of the probability distribution of future rainfall, and therefore pluvial flooding, from that observed in the historical record. This loss of hydrologic stationarity reduces the applicability of the statistical recurrence calculations referenced in this document.

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Appendix A: 2-D RAS sediment model calibration

The following figures show indicative results of the 2-D RAS sediment model calibration and validation testing. The results, interpreted as a whole, indicate that the model generally simulates the flood hydrograph in a realistic manner, including peak magnitude, hydrograph shape, and wave celerity. The model exhibited no systematic over- or underestimation of observed values. It should be noted that comparison with observed hydrographs required simulation of ungaged tributary inputs, which required complimentary hydrological modeling. For these tests, the 'rain-on-grid' capability of HEC-RAS was utilized and parameterized using the NCEP/EMC Stage IV gridded rainfall product and infiltration rates were estimated using ESRI SSURGO Downloader dataset.

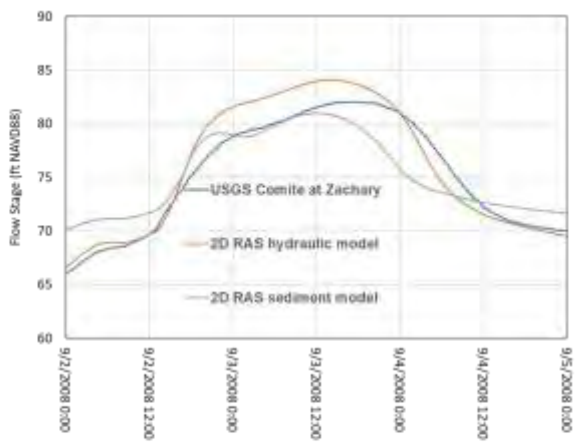


Figure 1: 2D RAS sediment model calibration results. The plot shows flow stage calculated at the USGS gage at Zachary, LA relative to measured values for a 2008 flood event.

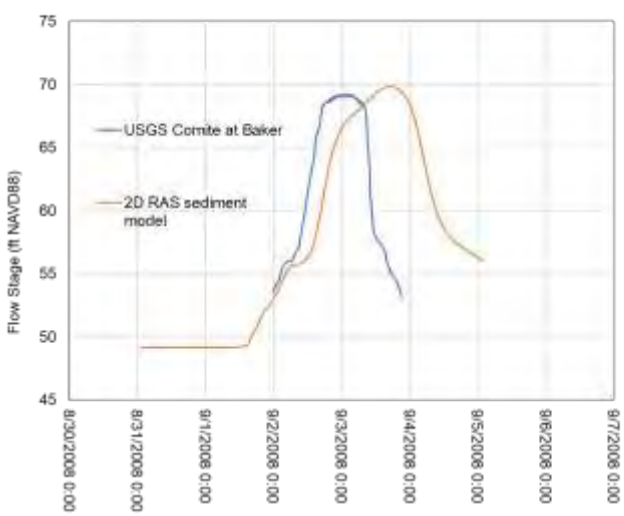


Figure 82: 2D RAS sediment model calibration results. The plot shows flow stage calculated at the USGS gage at Baker, LA relative to measured values for a 2008 flood event.

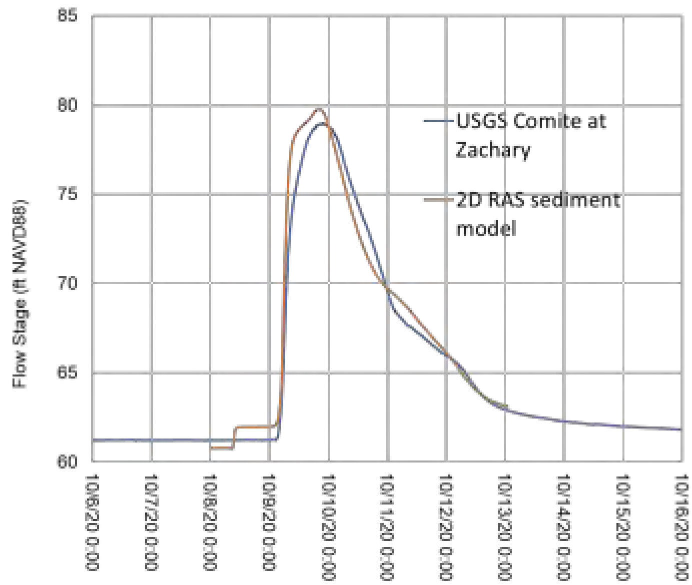


Figure 2: 2D RAS sediment model calibration results. The plot shows flow stage calculated at the USGS gage at Zachary, LA relative to measured values for a 2020 flood event.

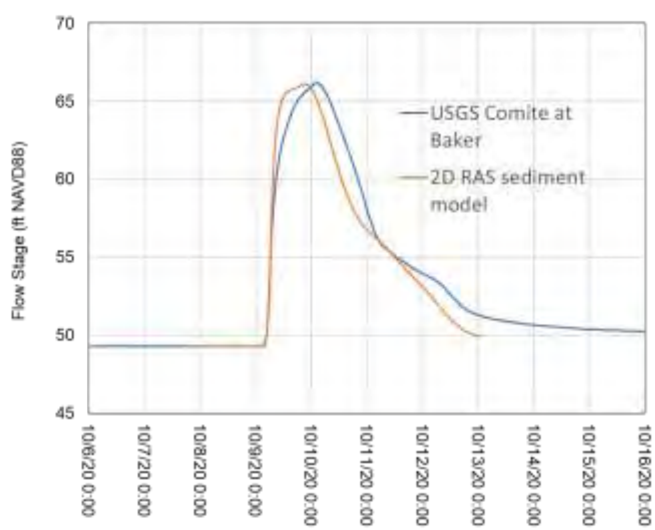


Figure 3: 2D RAS sediment model calibration results. The plot shows flow stage calculated at the USGS gage at Baker, LA relative to measured values for a 2020 flood event.

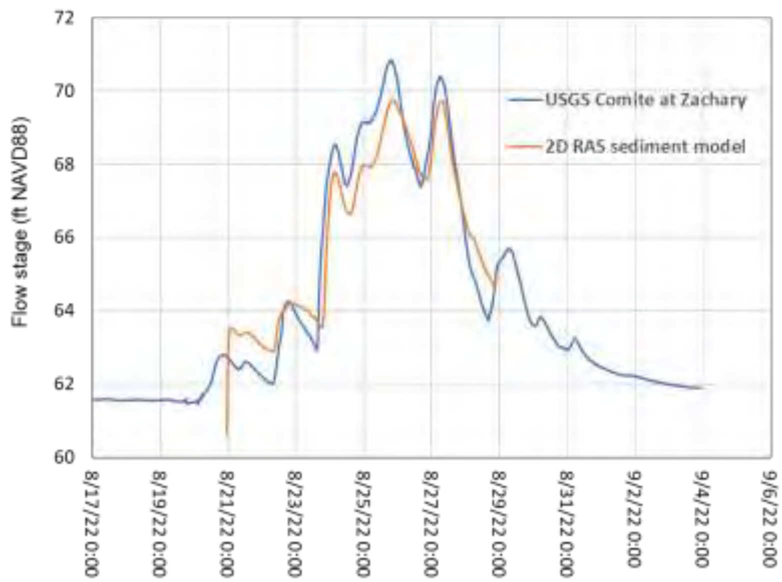


Figure 5: 2D RAS sediment model validation results. The plot shows flow stage calculated at the USGS gage at Zachary, LA relative to measured values for a 2022 flood event.

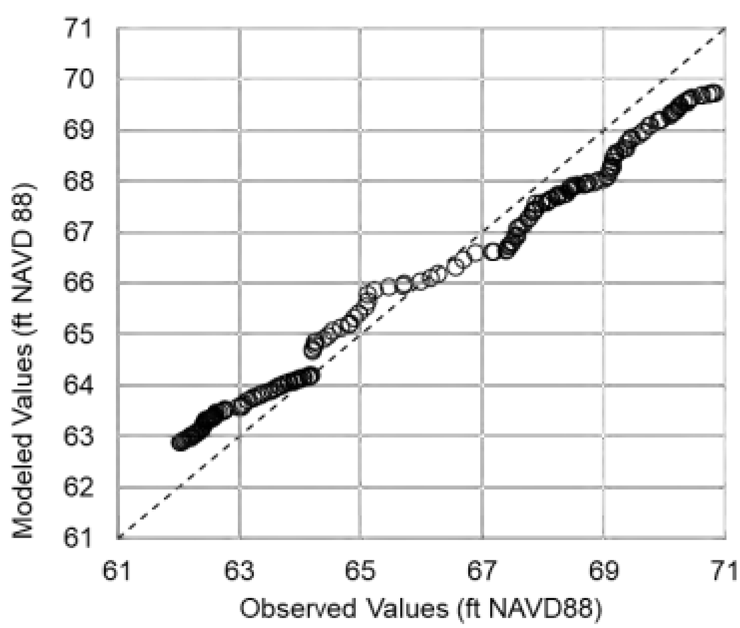


Figure 4: 2D RAS sediment model validation results. Quantile-Quantile plot showing modeled stage data relative to those observed ranked by magnitude which displays the degree of potential systematic bias.

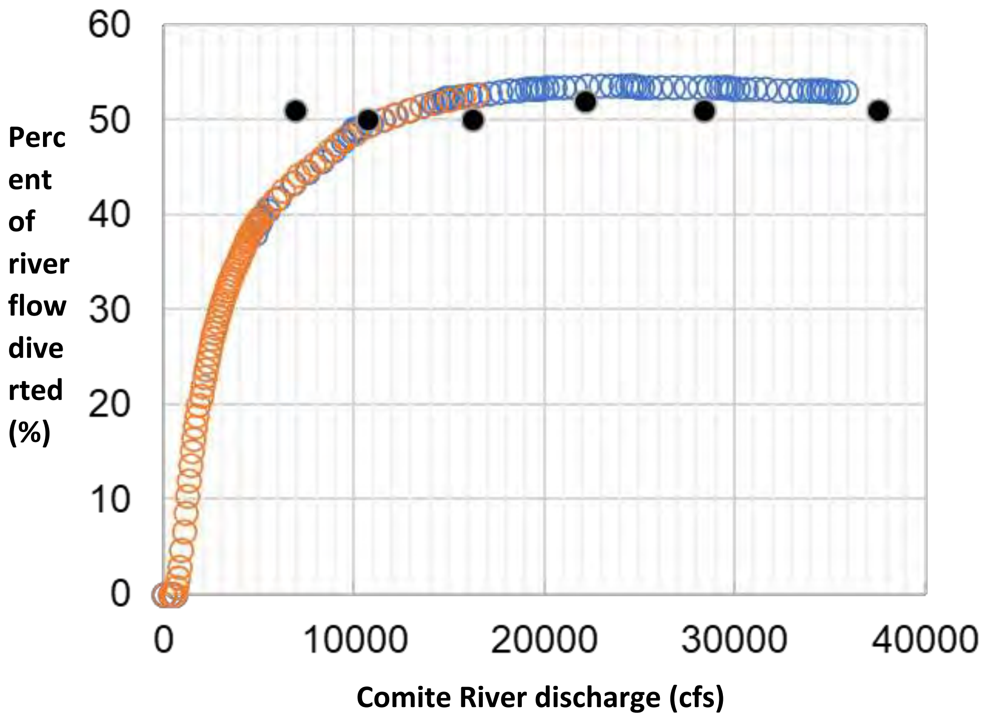


Figure 6: Modeled relationship between Comite discharge and the percent of flow diverted into the diversion channel. The black dots show the design target values as determined by physical modeling that supported the 1995 design study.

Appendix B: Comparison between longitudinal cross-sectional averaged velocities simulated using the 1D RAS sediment model and the pre-existing calibrated and validated Arcadis 1D HEC-RAS model.

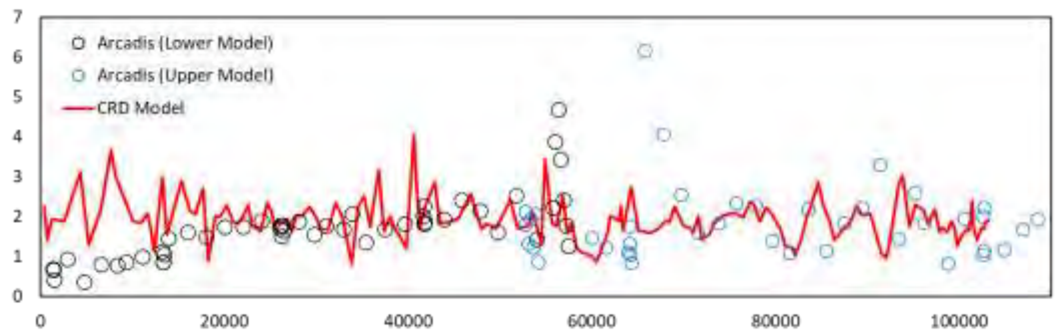


Figure 7: Velocity for a steady 1000 cfs discharge. The 1D RAS sediment model (CRD) replicated the Arcadis hydrodynamics similarly for a range of steady discharges.

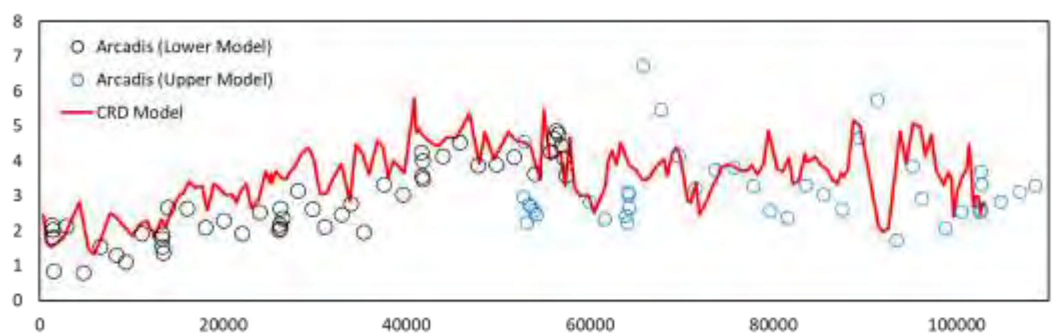


Figure 8: Velocity for a steady 10,000 cfs discharge. The 1D RAS sediment model (CRD) replicated the Arcadis hydrodynamics similarly for a range of steady discharges.

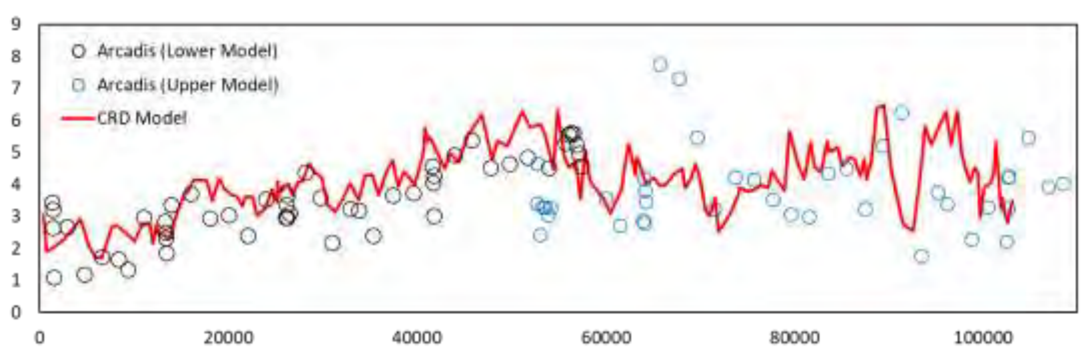


Figure 9: Velocity for a steady 20,000 cfs discharge. The 1D RAS sediment model predicted higher discharges than the Arcadis model at the downstream end of the model but very similar values elsewhere.

Appendix C: Observed Comite River bed gradation from previous study

This appendix documents sediment grain-size measurements collected to support previous studies of the Comite River. These data inform our study's sediment parameterization; however, because of a lack of fidelity of where these measurements were collected within the channel, they were not directly ingested. In 2019, the USGS collected bed sediment samples at 5 mi intervals. While their approximate location was recorded, the position within the channel (i.e., thalweg, bar, bank) was not identified. Arcadis also contracted Fugro engineering to collect bed sediment data. While the relative position within the channel was recorded, the coordinates of the sampling locations were not available.

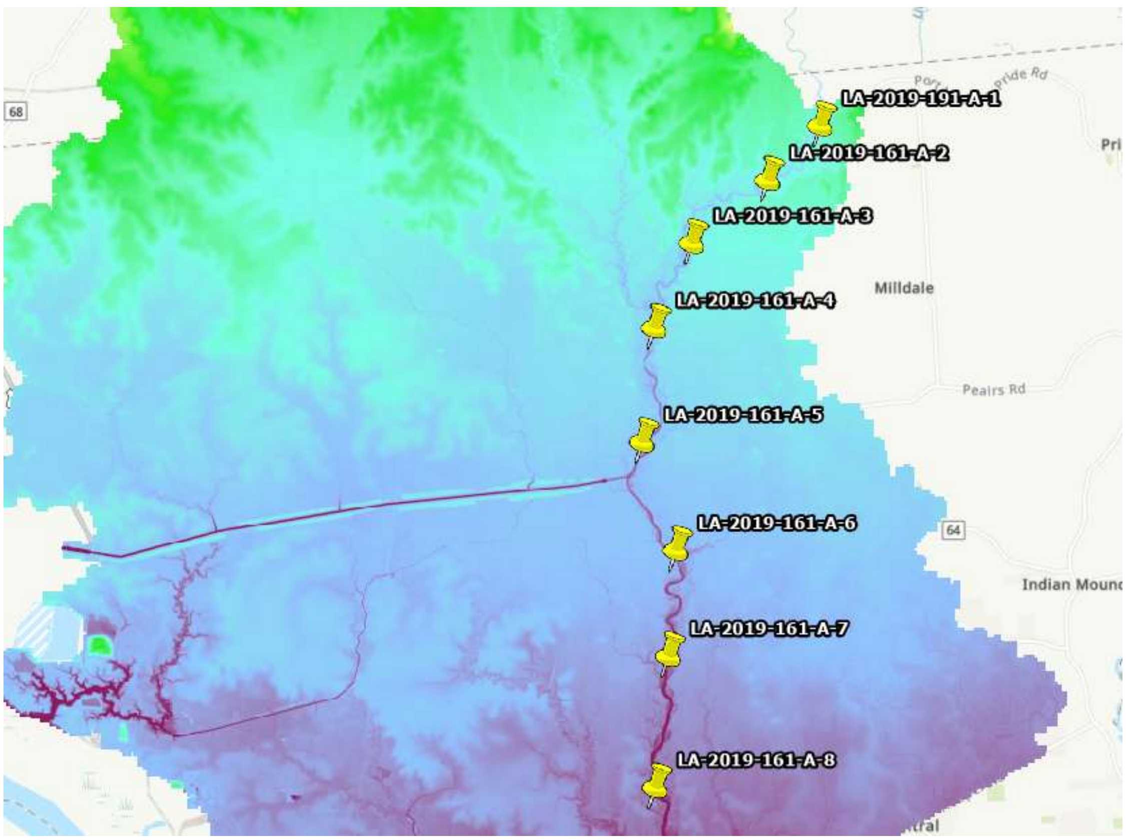


Figure 10: Map showing the relative location of the 2019 USGS bed sediment sampling. Sample locations are approximately 5 miles apart.

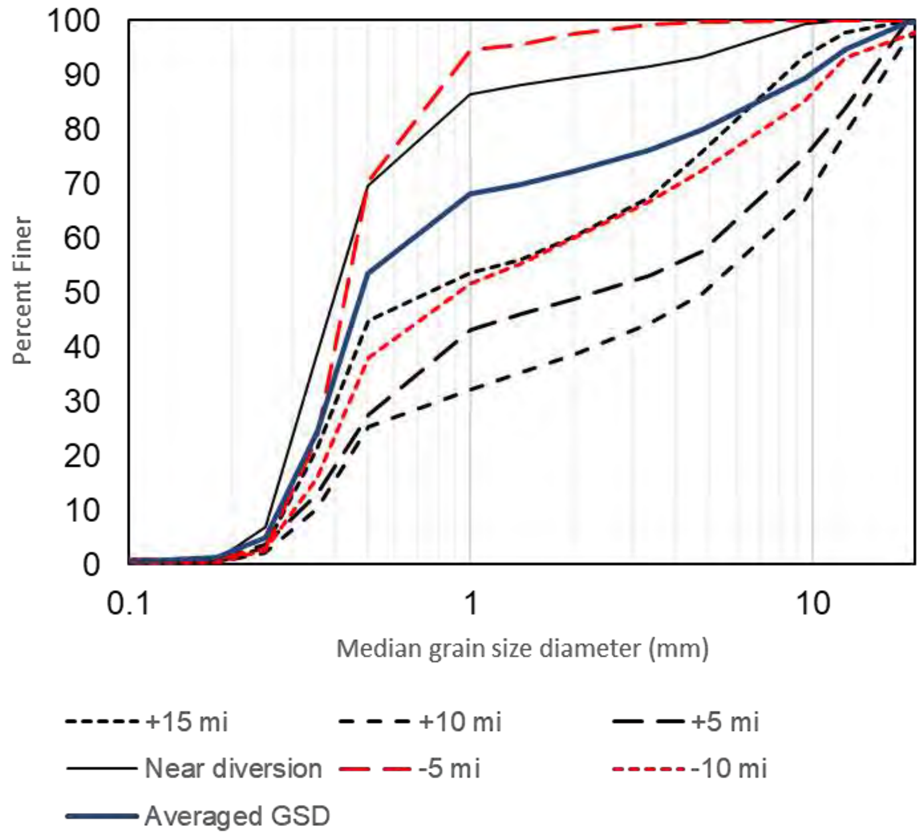
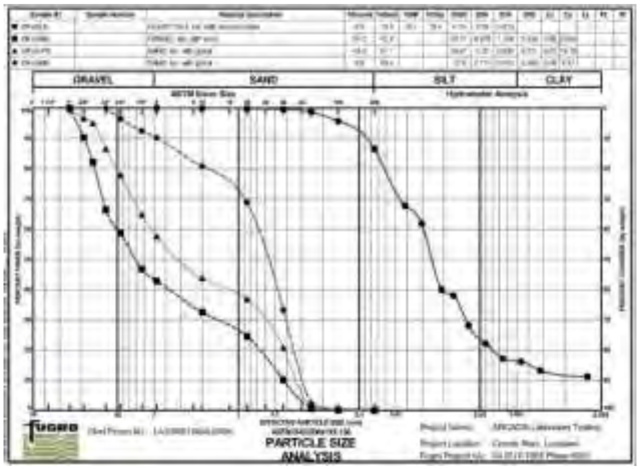
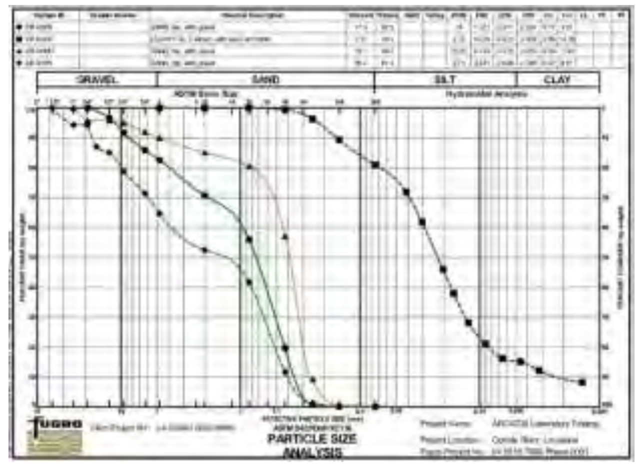
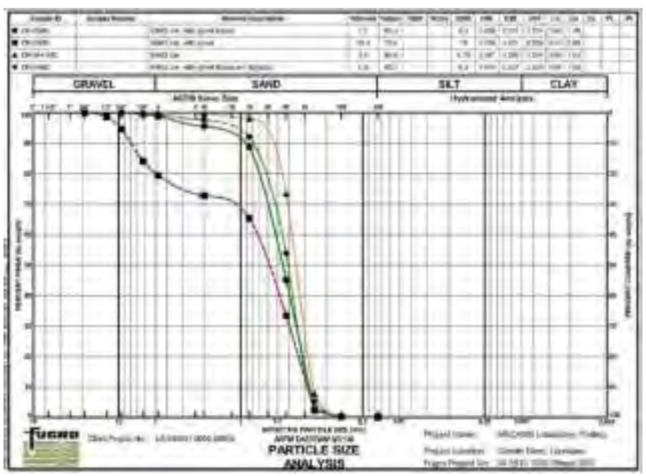


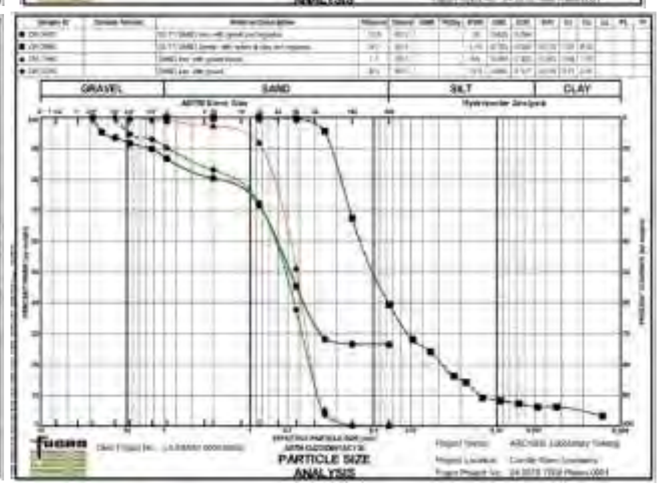
Figure 11: Grain-size distributions for the 2019 USGS bed sample measurements. Distributions are labeled by the relative distance of the sample collection location from the diversion. The sample A-5 in Figure 10 is labeled 'near diversion'.

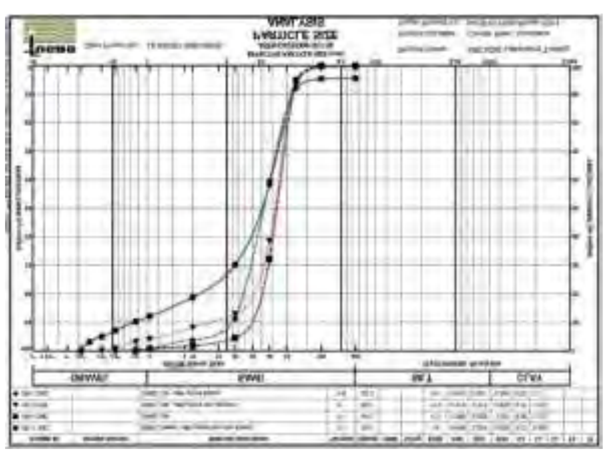
The following plots are sediment grain-size measurements for samples collected in support of the Arcadis sediment modeling study.

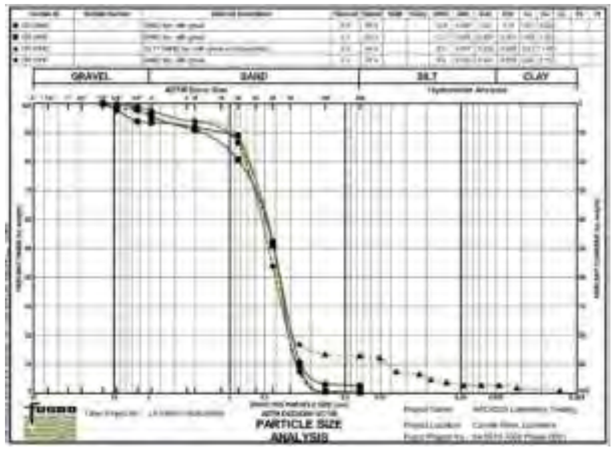




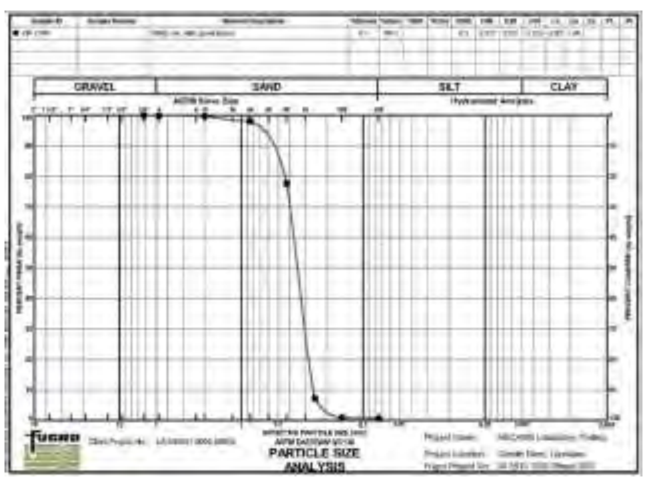







GRAVEL
SAND
SILT
CLAY
PARTICLE SIZE ANALYSIS


GRAVEL
SAND
SILT
CLAY
PARTICLE SIZE ANALYSIS


GRAVEL
SAND
SILT
CLAY
PARTICLE SIZE ANALYSIS

Appendix D: Use of the Delft3D numerical model to predict diversion flow and sediment dynamics.

To calculate the fraction of the Comite River sediment load captured by the diversion inflow, a three-dimensional (3-D) Delft3D sediment model was developed. The model was developed from the HEC-RAS 2D sediment model terrain. The model domain is shown in **Error! Reference source not found.**, cells were approximate 15 by 15 ft and the mesh had 20 vertical (sigma) layers. Flow viscosity and constituent diffusivity was calculated using the Horizontal Large Eddy Simulation module and the K-E turbulence model. The model results were used to determine what percentage of sediment for each sand grain-size fraction entered the diversion channel relative to the concentration calculated in the Comite River channel immediately upstream of the diversion inlet location. Boundary conditions were interpolated from the 2D RAS sediment model.

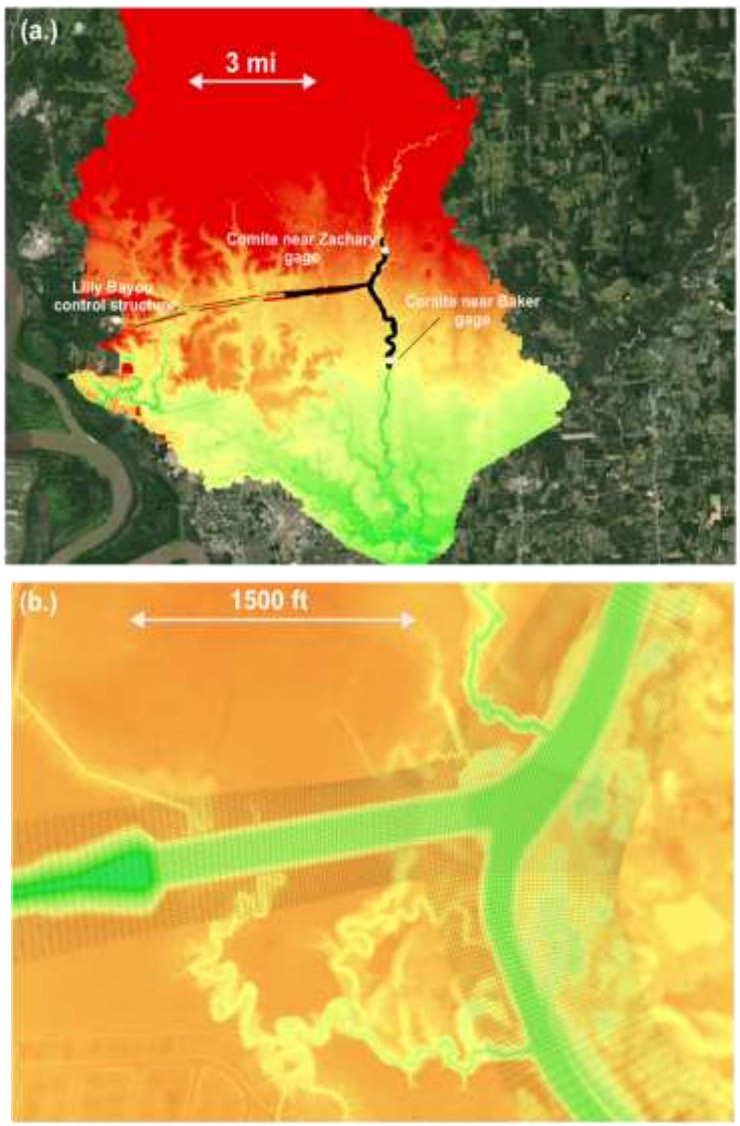


Figure 12:Extent of the Delft3D model, spanning from upstream of the USGS gage at Zachary to 5 mi below the diversion inlet and below the USGS gage at Baker, LA.

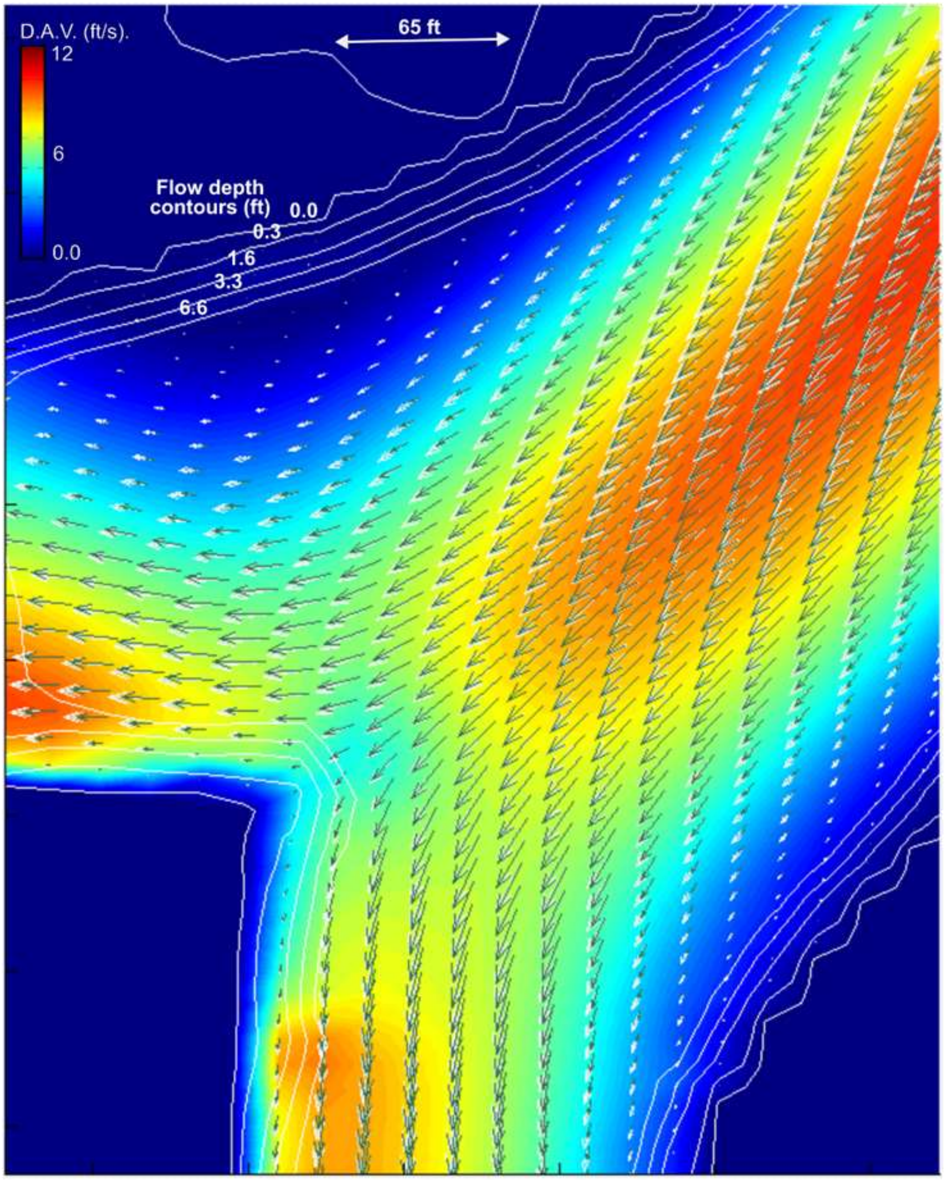


Figure 13: Example of the calculated velocity fields using the Delft3D model at the diversion inlet at a 10,000 cfs discharge.

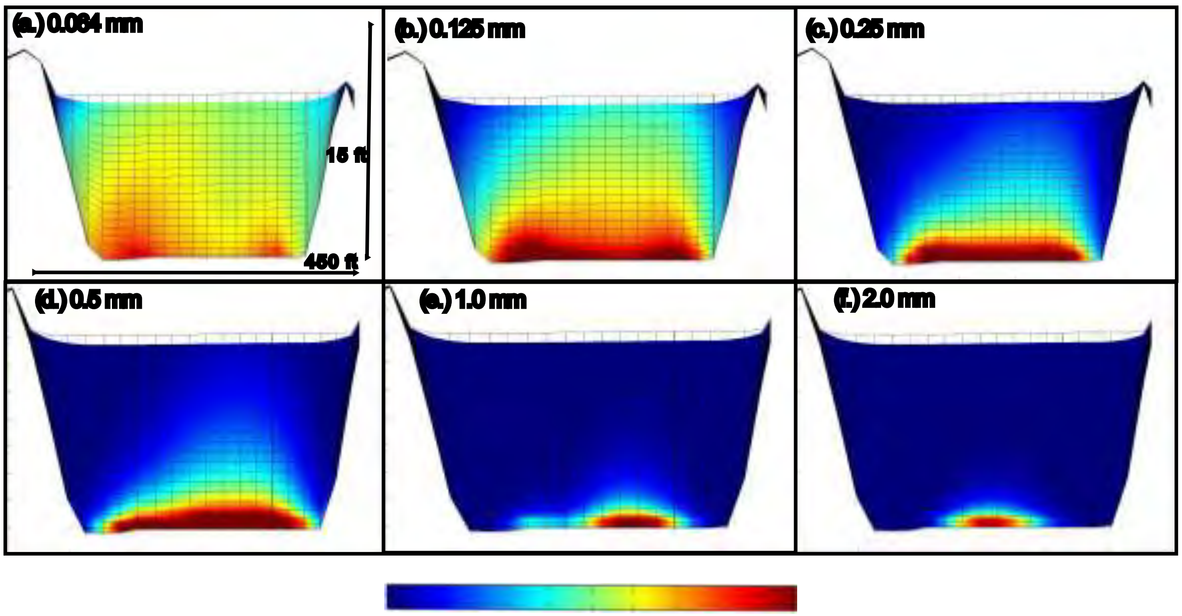


Figure 14:Modeled sediment concentration within a Comite River cross section profile immediately upstream of the diversion inlet at a 10,000 cfs discharge. The fine sand concentrations in the top row utilize the values shown on the colorbar X 2.

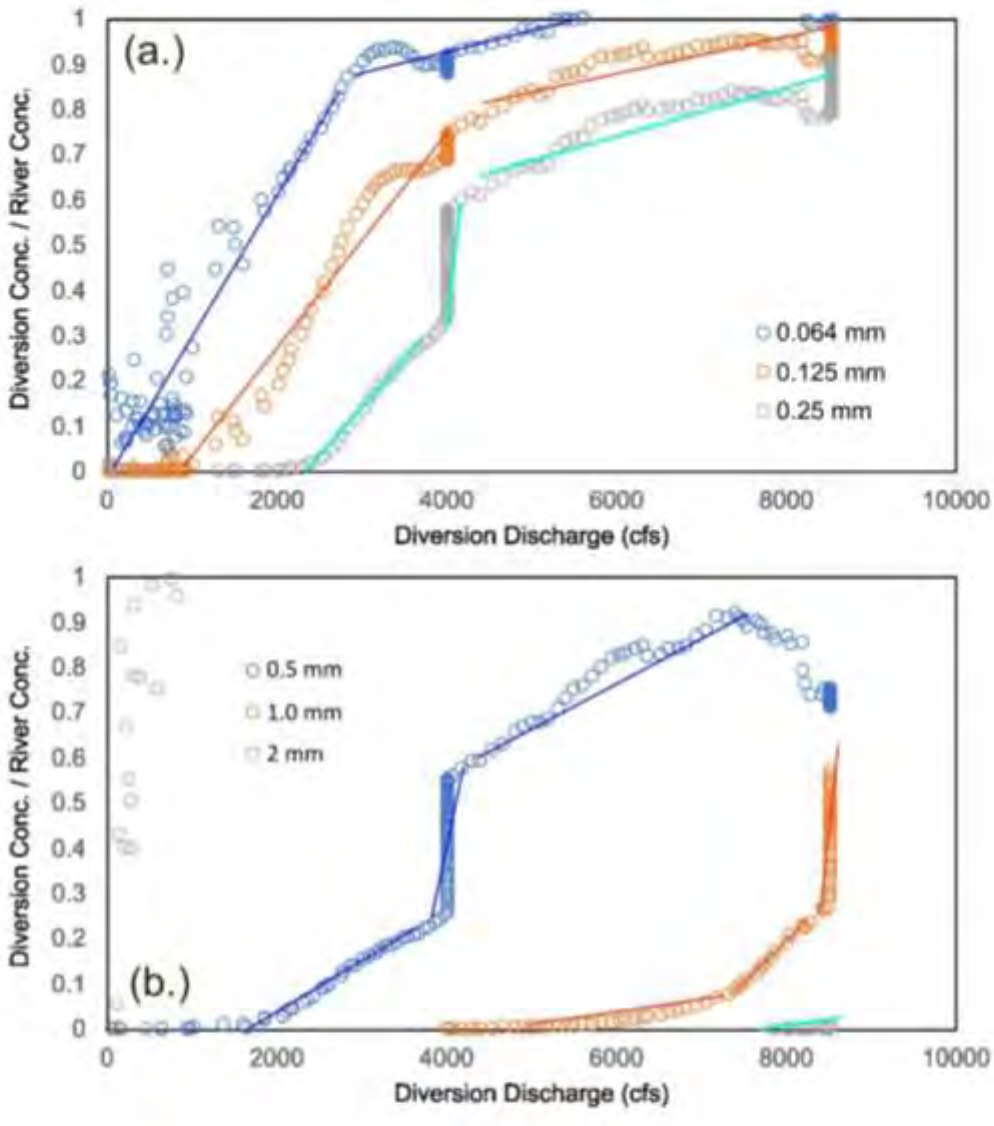


Figure 15: Calculated relationship between the sediment concentrations within the Comite River channel and that diverted into the diversion channel by diversion flow discharge.

Appendix E: Calculations used to define sediment storage summary results.

Table 18: Example table detailing summary sediment storage results as used in this report.

Reach	Position (approx. mi)		Length	Change in bed mass (Tons/30 yrs)		Diff. bed vol./elev. (FWP – FWOP)			Estimated Excess sediment
	DS	US	ft	FWOP	FWP	Yd^3	Yd^3/yr	ft/yr	$Yd^3/30$ yr
1	-11	-7	19,891	-119,232	-163,290	-27,618	-921	-0.008	0
..n	..n	..n	..n	..n	..n	..n	..n	..n	..n
Total	*last*	*first*	*sum*	*sum*	*sum*	*sum*	*sum*	*sum*	*Avg.*

[1] Completed HEC-RAS sediment simulation generate an output variable "Longitudinal Cumulative Mass Moveable Limit". This variable gives the total change in sediment mass along the longitudinal model profile, summing the values per cross section from right (upstream) to left (downstream) so that the value on the right of the profile equals the bed mass change in the upstream most cross section and the value on the left of the profile equals the summed bed mass change of all cross sections in the model domain. Bed mass equals the total sediment in a cross section located between the user defined 'moveable [bed] limits', which was set to the approximate channel width in our model. The values along the profile are in units tons.

[2] The total bed mass change per cross section was calculated by subtracting the cumulative mass at each cross section along the profile from the cumulative mass value at the cross section immediately downstream. The cross section bed mass values are then summed into bins representing sub-reaches of the model domain (labeled in column 1). The extents of each sub-reach are given in the 'Position' columns. The extents are miles distal from the planned diversion location. Negative values represent distance downstream. The sub-reach bed mass values are given in the 'Change in bed mass' columns. These columns retain the units tons.

[3] The next three columns show calculated values for the difference in the change in bed mass due to diversion operations for each sub-reach. The differences are calculated by subtracting the scenario values without diversion operations from the scenario values with diversion operations. The units are converted from tons to cubic yards using the following assumptions:

- 1 tons x 2000 pounds/ton x 165.4341[A] pounds/cubic foot x 1.4[B] porosity correction = 16.9 ft^3
- 1 cubic foot x 0.037037 cubic yards/cubic feet = 0.037 cubic yards
- Cubic foot / (sub-reach length x 150 mean channel width[C]) = mean change in bed elevation (ft)

  [A] Assumed density of sediment (same as 2650 kg/m^3).

  [B] Assumed 40% void space in dry alluvial sediment.

  [C] Assumed mean channel width based on average of measurements.

[4] Estimated excess sediment was calculated to equal the volume of net sediment aggradation due to diversion operations. Excess sediment (ES) was calculated using these assumptions:

- $ES = \partial FWP_{>0} - \partial FWOP_{>0}$

with $\partial FWP_{>0}$ and $\partial FWOP_{>0}$ equal to the change in bed sediment mass over the simulation duration above zero (i.e., only net aggradation relative to the initial bed considered) for the with diversion operations and without diversion operations scenarios, respectively.

This definition of excess sediment assumes that only the fraction of future sediment aggradation estimated to be generated from diversion operations is considered as a potentially mitigatable environmental project impact. A plausible alternative assumption might consider all future aggradation after the start of diversion operations to be a mitigable environmental project impact. However, that alternative assumes that the channel is not aggradational under current conditions.

Appendix F: ERDC Lilly Bayou Scour Analysis

This is a report drafted by ERDC to support understanding of potential Lilly Bayou sediment problems with diversion operations.

Lily Bayou Scour Analysis

Julia Zimmerman

Coastal and Hydraulics Laboratory
U.S. Army Engineer Research and Development Center
3909 Halls Ferry Road
Vicksburg, MS 39180-6199

Analysis Interpretation

Approved for public release; distribution is unlimited.

Prepared for U.S. Army Corps of Engineers, New Orleans District

Under Work Unit

Overview

To support the New Orleans District (MVN) Comite River diversion design project and resilience study, ERDC CHL executed an analysis of the likely scour of the Lilly Bayou channel using shear stress for a 500-year Comite River Discharge during a 50th percentile Mississippi River Stage condition. The Comite River diversion is expected to operate intermittently with approximately 10 annual events lasting between one and five days and will divert flow from the Comite River through the diversion channel into Lily Bayou and ultimately the Mississippi River. The outputs of this analysis are multiple raster files showing calculated shear stress and grain sizes likely to scour based on that calculated shear stress and a range of constants. Due to the short duration allowed for this analysis, only one flow condition will be evaluated, and a full sediment model is not possible. Results from this analysis should be interpreted as having a high degree of uncertainty and cannot show amounts of scour or deposition or change in these parameters over time as the diversion channel is operated. The bed conditions used from the previously developed 2-D Adaptive Hydraulics (AdH) depth-averaged model are stationary and do not reflect channel changes in Lily Bayou that will occur as a result of the operation of the Comite River Diversion Channel. Instead, these results show grain sizes likely to erode based on calculated bed shear stress using the initial conditions currently present as represented in the existing model.

Methods

Shear stress was calculated using the depth-averaged velocity from the AdH model of the hydrodynamic conditions. A 500-year flow for the Comite Diversion channel, or 945.78 cms, and a 50th percentile tailwater and inflow on the Mississippi River, equivalent to a 6.28 m tailwater at Baton Rouge and 13,350 cms inflow were used as boundary conditions. The model used the Louisiana State Plane South (meters) as the horizontal projections and NAVD88 (meters) as the vertical datum. A sand friction height (k) of 0.001 meters was selected based on recommendations from the SedLIB Manual version 1.2. Using this value, shear stress at the bed in Pa was calculated using equations 1 and 2 below. ρ is equal to 1,000 kg/m^3, g is 9.806 m/s^2, v is the depth averaged velocity in m/s^2, and h is water depth in meters.

$$M = \frac{8.25\sqrt{g}}{k^{1/6}} \quad (1)$$

$$\tau = \frac{\rho g}{M^2} \times \frac{v^2}{h^{1/3}} \quad (2)$$

Using the shear stress returned by equation 2, the d50 grain size likely to erode was calculated using the below equation solved for d50:

$$\tau = k\rho g(S-1)d_{50};\ d_{50} = \frac{\tau}{k\rho g(S-1)} \quad (3,4)$$

S is the specific gravity of the soil, 2.65, and k is the dimensionless critical shear stress which has a realistic range of 0.035 to 0.058. The d50 in equations 3 and 4 is the mean grain size diameter that will erode. This was compared to in situ surface soil samples taken by the USGS in September of 2023 to identify areas where scour is likely. The USGS samples show the in situ d50 is equivalent to very fine sand in the majority of the area.

Limitations

There are many limitations to the method that greatly increase the uncertainty of this approach including the lack of a dynamic change in the bed and limitations in the sediment data available at the time of analysis. No information relating to grain size gradations below the surface soil was included as sediment cores in the area were not taken or analyzed. Additionally, the impacts of any cohesive soil presence and the potential stabilization from overbank and batture vegetation are not included in this analysis. Care should be taken when drawing any engineering conclusions from this study, especially outside of the modeled conditions. Additionally, no supplemental modeling was included in the scope of this work. Therefore, a previous, hydrodynamic model of the reach was used. The resolution of this model may not be adequately refined for sediment analysis and caution should be taken when interpreting results. The 500-year event in the Comite Channel Diversion is an extreme case that is expected to have significant morphological impacts along the entire reach. The impacts shown in this analysis may not be valid when extrapolated to other, smaller events and do not fully capture erosion and deposition potential, especially in the channel, as a large portion of the modeled flow for this scenario occurs in the overbanks of the channel. The best practice for fully analyzing morphological changes due to the introduction of the Comite Diversion Channel into Lily Bayou is a full sediment model which is not possible given the current scope of funding and timeline of this effort.

Results

The results of the analysis above are shown in Figures 1, 2, and 3 below. Raster versions of these files are included as supplemental data in the file “lilyBayourRasters.lpkx”. The layer names of

each raster are included in the figure description.

Figure 1. Results of shear stress calculations in Lily Bayou including velocity vectors from the original two-dimensional hydrodynamic AdH Model. Shear stress is shown in Pascals and velocity in meters per

second. The raster layer of this file is “comitetau.tif”.

Figure 2. Results of critical erosion mean grain size (d50) calculations in Lily Bayou. Grain size diameters are in meters and 0.035 is used as k (equations 3 and 4). Contour Ranges are from green (smallest diameter) to blue (largest diameter) and are divided by associated grain size classification with the lightest green equivalent to very fine sand and the darkest blue corresponding to boulders. The raster layer of this file is “comited50_035.tif”.

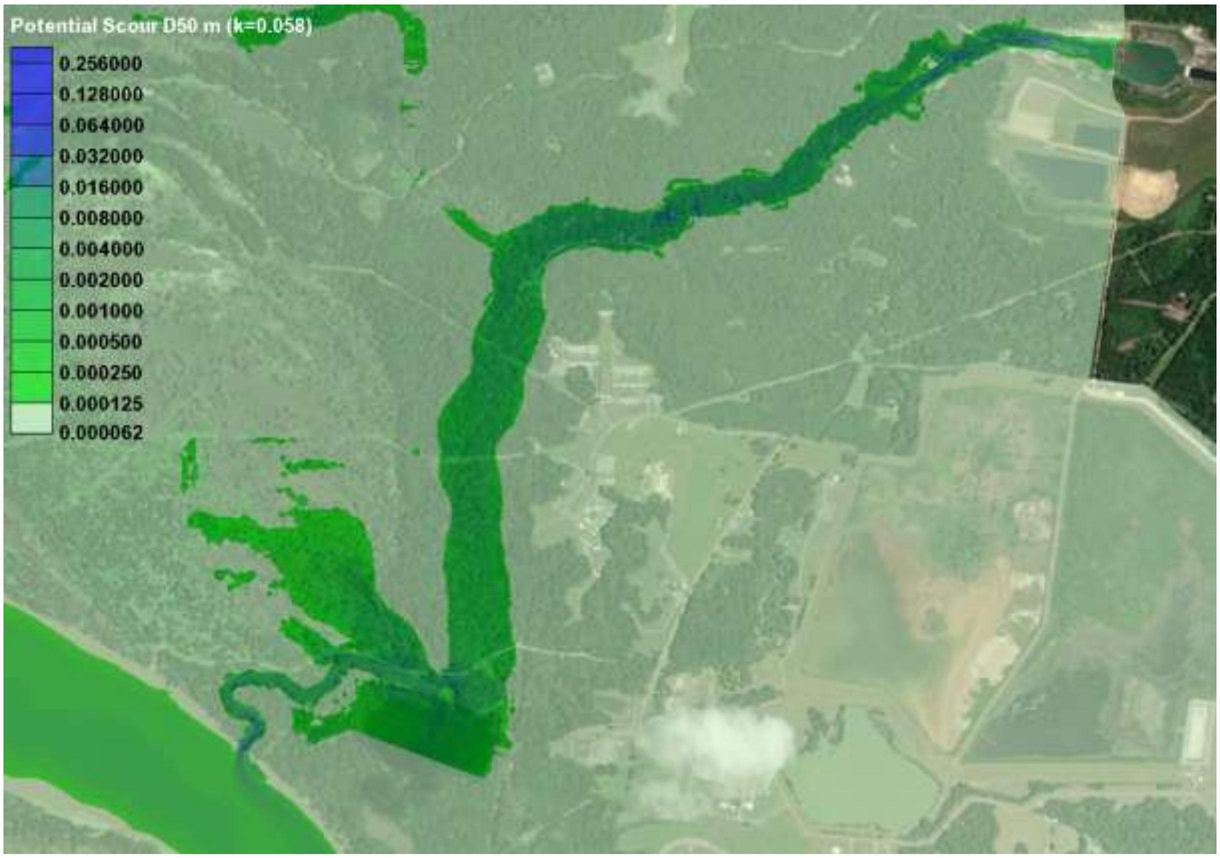


Figure 3. Results of critical erosion mean grain size (d50) calculations in Lily Bayou. Grain size diameters are in meters and 0.058 is used as k (equations 3 and 4). Contour Ranges are from green (smallest diameter) to blue (largest diameter) and are divided by associated grain size classification with the lightest green equivalent to very fine sand and the darkest blue corresponding to boulders. The raster layer of this file is “comited50_058.tif”.

The results shown in all the above figures have been rasterized and provided to the New Orleans District in the formats previously described. Analysis shows that for the conditions tested, scour is likely in the channel across the range of reasonable values for k. Figures 2 and 3 were contoured to grain size classifications based on the Udden-Wentworth grain size chart ranging from very fine sand to boulders. Figure 2 is the most conservative condition, or the worst potential scour case. The shown d50 can be compared to the measured d50 value from the USGS soil samples to infer a likelihood of scour. The majority of the USGS sample fell in the “very fine sand’ range. This means the shear stress would be large enough to scour most portions of the channel. From this analysis, scour would likely be most extreme, at least initially, in the upper and lower regions of the channel and less prevalent in the midsection. This effect is likely due to the presence of backflow through the middle portion of the channel over the floodplain which resulted in lower velocities in the mid-section of the channel; directly corresponding to lower shear stresses and therefore lower erosion potential. This analysis and these figures are only valid for the conditions analyzed, a 50th percentile Mississippi River tailwater condition with a 500-year flow through the Comite River diversion channel and assuming that the current bed conditions in the model are accurate, meaning that erosion and deposition impacting the bathymetry used in the initial hydrodynamic model are not included. At higher Mississippi River percentiles shoaling and deposition would be more likely, however, this was not included in the analysis. This report represents the worst-case scenario simulation with regard to scour potential in the Lily Bayou channel as a result of the Comite River Diversion channel.

APPENDIX B

Draft Coordination Act Report

United States Department of the Interior

FISH AND WILDLIFE SERVICE
200 Dulles Drive
Lafayette, Louisiana 70506

April 21, 2025

Colonel Cullen Jones
District Commander
U.S. Army Corps of Engineers
New Orleans District
7400 Leake Avenue
New Orleans, LA 70118-3651

Dear Colonel Jones:

Please reference the U.S. Army Corps of Engineers' (USACE) Amite River and Tributaries, Louisiana, Comite River Basin, Comite River Diversion, Inundation Effects, East Baton Rouge Parish, Draft Supplemental Environmental Assessment (SEA #601). The proposed action consists of the acquisition of flowage easement adjacent to the previously authorized project boundaries. Updated hydraulic modeling identified new areas that could be inundated during operation of the diversion channel. Once the project becomes operational, it is possible that 1,234 acres of additional property could be impacted. This SEA will also address project modifications (i.e., larger construction footprints than originally designed) that have occurred throughout construction of the project. Those modifications necessitate the completion of additional mitigation to offset impacts.

In addition, approximately 51.3 acres of bottomland hardwoods, that were evaluated in the original project NEPA documents and included in the subsequent mitigation procured for the project related impacts, will be avoided. The avoidance of those areas generates a mitigation surplus of 16.06 Average Annual Habitat Units (AAHUs) which will be deducted from the bottomland hardwood mitigation required for the additional construction impacts.

The overall Comite River Diversion Project is authorized as part of the Amite River and Tributaries Study. It was conducted in response to a resolution of the United States Senate, Committee on Public Works, adopted April 14, 1967. A plan to reduce flooding in the Comite River basin portion was authorized for construction by the Water Resources Development Act (WRDA) of 1992. The Energy and WRDA of 1994 required that Bayou Duplantier in East Baton Rouge Parish be analyzed as a potential mitigation site and that channel modification on Bayou Baton Rouge, Cypress Bayou, and White Bayou, above their intercept with the planned Comite River Diversion, also be analyzed in the design memorandum. Specifically, the proposed action is authorized by Section 101(11) of the WRDA of 1992 (Public Law 102-580), as amended and reauthorized by Section 301(b)(5) of the WRDA of 1996 (Public Law 104-303), and as amended by Section 371 of the WRDA of 1999, Public Law 106-53, with technical corrections to Section 371 contained in Section 6 of Public Law 106-109.

The Fish and Wildlife Service (Service) submits this draft Letter Report in accordance with provisions of the Fish and Wildlife Coordination Act (FWCA; 48 Stat. 401, as amended; 16 U.S.C.

661 et seq.). This draft FWCA report does not constitute the final report of the Secretary of the Interior on this project. A copy of the draft FWCA report was provided to the Louisiana Department of Wildlife and Fisheries (LDWF) and their comments will be incorporated into the final report.

FISH AND WILDLIFE RESOURCES

Bottomland Hardwoods

Project area bottomland hardwoods (BLH) are comprised of red maple (*Acer rubrum*), bald cypress (*Taxodium distichum*), American elm (*Ulmus americana*), green ash (*Fraxinus pennsylvanica*), sweet gum (*Liquidambar styraciflua*), water oak (*Quercus nigra*), post oak (*Quercus stellata*), black willow (*Salix nigra*) and Chinese tallow (*Triadica sebifera*). The wooded midstory and understory is composed of red maple, American elm, sweet gum, bald cypress, black willow, water oak, and Chinese tallow. Herbaceous plants and vines present include Virginia creeper (*Parthenocissus quinquefolia*), *Rubus* spp., ironweed (*Vernonia* spp.), *Aster* spp., *Smilax* spp., trumpet vine (*Campsis radicans*), lizard's tail *(Saururus cernuus*), arrowhead (Sagittaria latifolia) and various grasses.

Fish and Wildlife

Mammals likely to occur in the study-area bottomland hardwoods include swamp rabbit (*Sylvilagus aquaticus*), Eastern cottontail (*Sylvilagus floridanus*), gray squirrel (*Sciurus carolinensis*), fox squirrel (*Sciurus niger*), raccoon (*Procyon lotor*), opossum (*Didelphis virginiana*), and white-tailed deer (*Odocoileus virginianus*). BLH habitats also support a variety of birds including herons (*Ardeidae*), egrets (*Ardea alba*), red-shouldered hawk *(Buteo lineatus*), barn owl (*Tyto furcate*), common screech owl (*Megascops asio*), great horned owl (*Bubo virginianus*), barred owl (*Strix varia*), warblers (*Setophaga*), orioles (*Icterus*), thrushes (*Catharus*), vireos (*Vireo)*, tanagers (*Piranga*), blue grosbeak (*Passerina caerulea*), rose breasted grosbeack (*Pheucticus ludovicianus*), buntings (*Passerina*), flycatchers (*Empidonax*), and cuckoos (*Coccyzus*). Amphibians such as the Gulf coast toad (*Incilius valliceps*) are expected to occur in the project area.

Endangered Species

There is one endangered species occurring within the project area.

Pallid sturgeon

The pallid sturgeon (Scaphirhynchus albus) is an endangered, bottom-oriented, fish that inhabits large river systems from Montana to Louisiana. Within this range, pallid sturgeon tend to select main channel habitats in the Mississippi River and main channel areas with islands or sand bars in the upper Missouri River. In Louisiana, it occurs in the Atchafalaya and Mississippi Rivers, and below Lock and Dam Number 3 on the Red River (with known concentrations near the Old River Control Structure Complex). The pallid sturgeon is adapted to large, free-flowing, turbid rivers with a diverse assemblage of physical characteristics that are in a constant state of change. Many life history details and subsequent habitat requirements of this fish are not known. However, the pallid sturgeon is believed to utilize Louisiana riverine habitat during reproductive stages of its life cycle. Habitat loss through river channelization and dams has adversely affected this species throughout its range.

At Risk Species

The Service's Southeast Region has defined "at-risk species" as those that are: 1) proposed for listing under the Endangered Species Act of 1973, as amended (ESA; 16 U.S.C. 1531 *et. seq.*); 2) candidates for listing under the ESA, which means the species has a "warranted but precluded 12-month finding"; or 3) petitioned for listing under the ESA, which means a citizen or group has requested that the Service add them to the list of protected species. Petitioned species include those for which the Service has made a substantial 90-day finding as well as those that are under review for a 90-day finding. As the Service develops proactive conservation strategies with partners for at-risk species, the states' Species of Greatest Conservation Need (defined as species with low or declining populations) will also be considered.

The Service's goal is to work with private and public entities on proactive conservation to conserve these species, thereby precluding the need to federally list as many at-risk species as possible. While not all species identified as at-risk will become ESA listed species, their potentially reduced populations warrant their identification and attention in project planning. Under the ESA, a federal agency is responsible for consulting with the Service to ensure that any actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of a proposed species or destroy or adversely modify its proposed critical habitat. Listed below are species currently designated as "at-risk" that may occur within the proposed study area.

Proposed Species

Tri-colored Bat
The tricolored bat (*Perimyotis subflavus*), also known as the eastern pipistrelle, is proposed for listing as threatened. The tricolored bat is small, weighing 4-8 grams with a head to tail length ranging from 77-89 millimeters (mm) and wingspan of 220-225 mm. The bat gets its name from their individual hairs being "tri-colored": brown at tip, yellow in the middle, dark at the base. Overall, the fur appears yellow brown, with reddish forearm skin. This small bat flies slowly with an erratic pattern while foraging, causing it to sometimes be mistaken for a moth.

Tricolored bats appear to inhabit landscapes that are partly open, with large trees and plentiful woodland edges. They are found in a variety of terrestrial habitats, including grasslands, old fields, suburban areas, orchards, urban areas, and woodlands, especially hardwood woodlands. Little is known about daytime summer or maternity roosts. These bats are among the first bats to emerge at dusk each night, and their appearance at tree-top level indicates that they may roost in foliage or in high tree cavities and crevices. They are not often found in buildings or in deep woods, seeming to prefer edge habitats near areas of mixed agricultural use. Hibernation sites are found deep within caves or mines in areas of relatively warm, stable temperatures. However, research is ongoing to determine small bat hibernation habitats other than caves and mines.

The main threat to this species is White Nose Syndrome (*Pseudogymnoascus destructans*), with affected hibernation sites resulting in more than 75 percent decline of bats, with some sites declining by 90 percent. Other threats include habitat modification and destruction including forest and grassland conversion to urban/suburban land use, and mortality during migration from winter hibernaculum to summer roosting habitat due to wind energy development. On September 13, 2022, the Service announced a proposal to list the tricolored bat as endangered under the ESA.

Alligator Snapping Turtle

The alligator snapping turtle (proposed as threatened) is the largest species of freshwater turtle in North America and is highly aquatic and somewhat secretive. They are primitive in appearance and are characterized by a large head, long tail, and an upper jaw with a strongly hooked beak. Hatchlings look very similar to adults. Sexual maturity is achieved in 11 to 21 years for males and 13 to 21 years for females. No more than one clutch per year per female has been observed in the wild.

Alligator snapping turtles are opportunistic scavengers and consume a variety of foods. Fish comprise a significant portion of their diet; however, they also eat crayfish, mollusks, smaller turtles, insects, nutria, snakes, birds and vegetation (including acorns). The alligator snapping turtle is the only turtle species that has a predatory lure (a small, worm-like appendage on the tongue). Both adults and juveniles use this lure to attract fish into striking range. The lure is white or pale pink in juveniles and mottled or gray in adults.

The alligator snapping turtle is confined to river systems that flow into the Gulf of Mexico, extending from the Suwannee River in Florida to the San Antonio River in Texas. They are found in large rivers, major tributaries, bayous, canals, swamps, lakes, ponds and oxbows. It is most common in freshwater lakes and bayous, but also found in coastal marshes and sometimes in brackish waters near river mouths. The alligator snapping turtle is highly associated with in-stream structure (e.g., tree root masses, stumps, submerged trees, etc.).

Extensive commercial and recreational harvesting in the last century resulted in significant declines to many alligator snapping turtle populations. Commercial harvesting is now prohibited in all states within its range and recreational harvest is prohibited in every state except for Mississippi and Louisiana. Currently, the primary threats to the species are legal and illegal intentional harvest, bycatch associated with commercial fishing of catfish and buffalo, nest predation and habitat alteration.

Monarch Butterfly

The monarch butterfly (*Danaus plexippus*) is proposed for listing as threatened. The North American monarch population has severely declined. Habitat loss, pesticides, disease, climate change, predators, extreme weather, and other anthropogenic factors all threaten monarchs. Since the late 1990s both the eastern and western overwintering populations have declined by over 70 percent, as documented by World Wildlife Federation Mexico in collaboration with Secretariat of the Environment and Natural Resources, Comisión Nacional de Áreas Naturales Protegidas and the Monarch Butterfly Biosphere Reserve (Semmens et. al 2016). Monarchs make an excellent flagship species for pollinator conservation. Creating habitat for monarchs by planting diverse, native nectar plants and milkweed also creates habitat for other pollinators which we rely on for pollination services in agricultural and natural settings. Conserving pollinators and their habitat have positive cascading effects leading to conservation of other animals like songbirds and mammals. This pays dividends towards the health of our natural and managed habitats, paving a future for our own species.

Adult monarch butterflies are large and conspicuous, with bright orange wings surrounded by a black border and covered with black veins. The black border has a double row of white spots, present on the upper side of the wings. In many regions where monarchs are present, monarchs breed year-round. Individual monarchs in temperate climates, such as eastern and western North

America, undergo long-distance migration, and live for an extended period of time. In the fall, in both eastern and western North America, monarchs begin migrating to their respective overwintering sites. This migration can take monarchs distances of over 3,000 km and last for over two months.

Bald Eagles and Migratory Birds

During project construction, on-site personnel should be informed of the possible presence of nesting bald eagles near the project boundary, and should identify, avoid, and immediately report any such nests to this office. If an active or inactive eagle nest is discovered within 2 miles of the project footprint, then follow the bald and golden eagle guidelines to determine whether disturbance will occur and/or an incidental take permit is needed.

The Migratory Bird Treaty Act (MBTA) prohibits the take (including killing, capturing, selling, trading, and transport) of protected migratory bird species without prior authorization by the Service. The following migratory birds may be present at your project location at certain times of the year.

Species	Breeding Season
Kentucky Warbler	April 15 to Aug 21
Wood Thrush	May 10 to Aug 31
Prothonotary Warbler	Apr 1 to Jul 31
Swallow-tailed Kite	March 8 to June 30
Chimney Swift	Mar 15 to Aug 25

IMPACTS

The proposed project was designed to avoid and minimize adverse impacts which was initially addressed in the 1990 EIS. The most recent adjustment to the mitigation plan was evaluated in EA 576 which confirmed the need of 704.6 AAHUs for compensatory mitigation. USACE generated 33.15 AAHUs from onsite mitigation (Carmena Tract) and purchased the remaining mitigation credits (671.45 AAHU) from an approved mitigation bank(s).

Minor project modifications during construction have resulted in direct impacts to an additional 44.1 acres (-19.73 AAHUs) (Table 2), and previously unidentified inundation (indirect impacts) from operation of the structure could potentially affect another 1,234 acres (-62.47 AAHUs) (Table 3).

Direct Impact Totals	
NET CHANGE IN AAHUs DUE TO PROJECTS	
A. Future Without Project AAHUs =	19.83
B. Future With Project AAHUs =	0.11
Net Change (FWP - FWOP) =	**-19.73**

Table 1. Direct Impact AAHUs.

Indirect Impact Totals	
NET CHANGE IN AAHUs DUE TO PROJECTS	
A. Future Without Project AAHUs =	1044.96
B. Future With Project AAHUs =	982.61
Net Change (FWP - FWOP) =	**-62.47**

Table 3. Indirect Impact AAHUs.

CEMVN was able to avoid approximately 51.3 acres (16.06 AAHUs) that was part of the original designed project which have already been mitigated as part of the mitigation credits (704.6 AAHUs) previously procured for the project (Table 4). Therefore, CEMVN proposes to reduce the mitigation requirement identified for the additional impacts (-19.73 AAHUs) and inundation (-62.47 AAHUs) by the avoided impacts (16.06 AAHUs). This would result in a need for an additional -66.14 AAHUs in mitigation.

Avoided Impact Totals	
NET CHANGE IN AAHUs DUE TO PROJECTS	
A. Future Without Project AAHUs =	0.1
B. Future With Project AAHUs =	16.16
Net Change (FWP - FWOP) =	**16.06**

Table 3. Avoided Impact AAHUs.

In review of the additional impacted areas, CEMVN noted impacts to a mowed lawn/field (2.5 acres) and a pine plantation (4.1 acres). The original project impacted similar areas that were considered in development of the original mitigation plan which has been completed. The original project included an 8.8-acre field and a 16.6-acre pine plantation that are now being avoided. Since these areas were considered in the original mitigation plan and are now being avoided, CEMVN proposes to allow avoidance of these areas to mitigate any minor habitat effects resulting from the newly identified 2.5-acre field and 4.1-acre pine plantation. None of these areas were considered in development of the AAHUs mentioned above.

SERVICE RECOMMENDATIONS

Forested wetlands are considered by the Service to be aquatic resources of national importance due to their increasing scarcity and high habitat value for fish and wildlife within Federal trusteeship (i.e., migratory waterfowl, wading birds, other migratory birds, threatened and endangered species, and interjurisdictional fisheries).

The Service's Mitigation Policy (Federal Register, Volume 46, No. 15, January 23, 1981) identifies four resource categories that are used to ensure that the level of mitigation recommended by Service biologists will be consistent with the fish and wildlife resource values involved.

The forested wetlands of the project fall under Resource Category 2 which are considered to be habitats of high value for evaluation species and are relatively scarce or becoming scarce on a national basis or in the ecoregion section. The mitigation goal for habitat in this category is that there should be no net loss of in-kind habitat value.

Project impacts to bottomland hardwoods should be minimized to the greatest degree possible, and unavoidable impacts should be mitigated in a manner approved by the Service and other natural resource agencies. Additionally, proper care should be taken to ensure that bald eagles and migratory birds listed above will not be adversely affected. After reviewing the proposed action, its impacts to fish and wildlife resources, and the need for protection from future flood events, the Service does not object to the proposed action provided the following recommendations are included in the proposed action.

1. The Corps shall fully compensate for any unavoidable losses to forested habitat caused by project implementation. That compensatory mitigation shall be "in-kind" and within, or as close as possible to, the same watershed as the project impacts.

2. Forest clearing shall be minimized to the maximum extent practicable.

3. Forest clearing associated with project features should be conducted during the fall or winter, when practicable, to minimize impacts to nesting migratory birds.

4. The Service recommends that the USACE contact the Service and the LDWF for additional ESA section 7 consultation if: 1) the scope or location of the proposed project is changed significantly, 2) new information reveals that the action may affect listed species or designated critical habitat, 3) the action is modified in a manner that causes effects to listed species or designated critical habitat, or 4) a new species is listed or critical habitat designated.

We appreciate the cooperation of your staff during the project planning process. Should your staff have any questions or require additional information, please contact Karen Soileau (337/291-3132) of this office.

Sincerely,

Brigette D Firmin

Brigette D. Firmin BRIGETTE FIRMIN Digitally signed by BRIGETTE FIRMIN Date: 2025.04.21 16:49:34 -05'00'
Field Supervisor
Louisiana Ecological Services Office

cc: Environmental Protection Agency, Dallas, TX
LA Dept of Wildlife and Fisheries, Baton Rouge, LA
LA Dept. of Energy and Natural Resources (CMD), Baton Rouge, LA

APPENDIX C

Agency Coordination

From: Soileau, Karen
To: Ladner, Howard W CIV USARMY CEMVN (USA)
Subject: [Non-DoD Source] Comite Diversion - Service Recommendations
Date: Wednesday, March 12, 2025 7:30:58 AM

Hi Howard,

Below are the Service's recommendations for the Comite Diversion project:

1. The Corps shall fully compensate for any unavoidable losses to forested habitat caused by project implementation. That compensatory mitigation shall be "inkind" and within, or as close as possible to, the same watershed as the project impacts.
2. Forest clearing shall be minimized to the maximum extent practicable.
3. Forest clearing associated with project features should be conducted during the fall or winter, when practicable, to minimize impacts to nesting migratory birds.
4. The Service recommends that the USACE contact the Service and the LDWF for additional ESA section 7 consultation if: 1) the scope or location of the proposed project is changed significantly, 2) new information reveals that the action may affect listed species or designated critical habitat, 3) the action is modified in a manner that causes effects to listed species or designated critical habitat, or 4) a new species is listed or critical habitat designated.

Please let me know if you have any questions. Thanks,

Karen Soileau
Fish and Wildlife Biologist

U.S. Fish and Wildlife Service

200 Dulles Drive

Lafayette, La 70506

Office: 337/291-3132

From:	DEQ Water Quality Certifications
To:	Ladner, Howard W CIV USARMY CEMVN (USA); DEQ Water Quality Certifications
Cc:	Brown, Michael T CIV USARMY CEMVN (USA)
Subject:	[Non-DoD Source] RE: Pre-file Meeting Request: Comite River Diversion; WQC 120529-02/AI 182232/CER 20120001
Date:	Monday, March 17, 2025 9:05:43 AM

Thank you for submitting the Clean Water Act (CWA), Section 401 Water Quality Certification (WQC) pre-filing meeting request for USACE, MVN Comite River Diversion project.

LDEQ serves as the certifying authority for the state of Louisiana for CWA Section 401 WQC. At this time we do not require a scheduled pre-filing meeting.

Application may not be submitted until 30 days has lapsed after submittal of the pre-filing meeting request. Application should be complete and the USACE should have public noticed the 404 application prior to submittal of application for certification. Please submit the ENG Form 4345 (application or equivalent (OCM JPA, PCN, etc.), and permit application figures no sooner than April 14, 2025.

DEQ-WaterQualityCertifications@la.gov

Per 40 CFR 121.5(b)(7), include documentation that a pre-filing meeting request was submitted to the certifying authority at least 30 days prior to submitting the certification request.

Mailbox space is limited (20 MB). PLEASE DO NOT INCLUDE ANY STUDIES, REPORTS OR PLANS when applying. Please do not include needs analysis, sampling studies, alternative analysis, environmental analysis, environmental impact assessments, avoidance and minimization analysis, mitigation and related analysis, U.S. Fish and Wildlife Service (USFWS) IPAC Consistency Letters and Official Species Lists, Cultural Resources Survey Reports, SHPO Concurrences, complete preliminary jurisdictional determinations, complete Drainage Impact Studies, or complete hydrological and/or wetland studies.

From: Ladner, Howard W CIV USARMY CEMVN (USA) <Howard.W.Ladner@usace.army.mil>
Sent: Friday, March 14, 2025 3:03 PM
To: DEQ Water Quality Certifications <DEQ-WaterQualityCertifications@la.gov>
Cc: Brown, Michael T CIV USARMY CEMVN (USA) <Michael.T.Brown@usace.army.mil>

Subject: Pre-file Meeting Request: Comite River Diversion; WQC 120529-02/AI 182232/CER 20120001

EXTERNAL EMAIL: Please do not click on links or attachments unless you know the content is safe.

Per 40 CFR 121.5(b)(7), the US Army Corps of Engineers, New Orleans District, is submitting this pre-file meeting request 30 days prior to submitting a request to modify our current Water Quality Certification (WQC 120529-02/AI 182232/CER 20120001) for the Comite River Diversion. We are currently constructing the project, but have had some minor project changes along the way. USACE also updated the hydrological modeling and noted a potential to induce flooding on properties that were not identified previously. The plan is for USACE and the local sponsor (LDOTD) to acquire all the properties impacted by the potential inundation. We are preparing a Supplemental Environmental Assessment to bring all these items into one comprehensive document which will hopefully complete environmental compliance for this action. Attached you will find an overview drawing generally depicting the plan and a vicinity map. The drawing shows the flowage easements (inundation areas) as a worst-case scenario (500 yr event at a 50% Mississippi River stage). In the real world, we will be seeing much less inundation during most typical years. We have also worked with USFWS to develop WVAs for these areas and are revising the mitigation plan to account for the potential impacts. USACE intends to submit an official request to modify our existing WQC approximately 30 days from now. In the meantime, USACE will be happy to provide any additional information you need or meet to discuss the details of the proposed modification request.

Should you have any questions, please let me know.

Thanks,

Howard Ladner
Biologist, PDC-C
New Orleans, USACE
504-862-2021

State of Louisiana

Billy Nungesser
Lieutenant Governor

Office of the Lieutenant Governor
Department of Culture, Recreation & Tourism
Office of Cultural Development

Carrie Broussard
Interim Assistant Secretary

April 1, 2025

Jason A. Emery
Acting Chief, Environmental Planning Branch
Army Corps of Engineers, New Orleans District
7400 Leake Ave
New Orleans, LA 70118-3651

Re: SECTION 106 REVIEW CONSULTATION
INUNDATION EFFECTS FROM THE OUTFLOW OF THE COMITE RIVER DIVERSION PROJECT
ARMY CORPS OF ENGINEERS, NEW ORLEANS DISTRICT (CEMVN)
EAST BATON ROUGE PARISH, LOUISIANA

Dear Jason Emery,

Thank you for your letter received March 14, 2025, and additional information received March 28, regarding the above referenced project. Based on the information provided in the letter, the State Historic Preservation Office has the following comments to offer. The proposed undertaking will have no adverse effect on historic properties subject to the conditions detailed within the consultation letter. Therefore, our office has no objection to the implementation of this project. This effect determination could change should new information come to our attention or the conditions are not implemented.

Consultation with the State Historic Preservation Office does not constitute consultation with Tribal Historic Preservation Offices, other Native American tribes, local governments, or the public. If archaeological materials are encountered during construction, the procedures codified at 36 CFR 800.13(b) will apply. Archaeological materials consist of any items, fifty years old or older, which were made or used by man. These items include but are not limited to, stone projectile points (arrowheads), ceramic sherds, bricks, worked wood, bone and stone, metal, and glass objects. The federal agency or the applicant receiving federal assistance should contact our office immediately. If human remains are encountered, the provisions of the Louisiana Unmarked Human Burial Sites Preservation Act (Revised Statute 8:671-681) should be followed.

If you have questions or concerns, please contact Sadie Whitehurst at swhitehurst@crt.la.gov in our Division of Archaeology or Jennie Garcia at jgarcia@crt.la.gov in our Division of Historic Preservation.

Sincerely,

Carrie Broussard

Carrie Broussard
State Historic Preservation Officer

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, NEW ORLEANS DISTRICT
7400 LEAKE AVE
NEW ORLEANS LA 70118-3651

March 14, 2025

Regional Planning and
Environment Division, South
Environmental Planning Branch
Attn: CEMVN-PDS-N

Carrie Broussard, Interim Assistant Secretary
LA State Historic Preservation Officer
P.O. Box 44247
Baton Rouge, LA 70804-4241

RE: Section 106 Review Consultation
Undertaking: Inundation Effects from the Outflow of the Comite River Diversion Project, East Baton Rouge Parish, Louisiana.
Determination: **No Adverse Effect to Historic Properties**

Dear Ms. Broussard:

The U.S. Army Corps of Engineers (USACE), New Orleans District, proposes to enlarge the Right-of-Way (ROW) of the Comite River Diversion Project (CRD) in East Baton Rouge Parish, due to recognition of additional Areas of Potential Effect (APE).

As part of USACE's evaluation and in partial fulfillment of responsibilities under the National Environmental Policy Act and Section 106 of the National Historic Preservation Act, USACE offers you the opportunity to review and comment on the potential of the proposed action described in this letter to affect historic properties. Additionally, in accordance with the responsibilities of Executive Order 13175, USACE offers Federally-recognized Tribes the opportunity to review and comment on the potential of the proposed undertaking described in this letter to significantly affect protected tribal resources, tribal rights, or tribal lands.

Description of the Undertaking

A Supplemental Environmental Assessment (SEA #601) is being prepared to address the acquisition of flowage easements adjacent to previously authorized project boundaries. Once the project becomes operational, it is possible that 1,234 acres of additional property could see inundation from the diversion flows. On the included Figures 1 - 4, these flowage easements (inundation areas) are marked as FE1 – FE11. The majority portion of these acres is located in a lowland area (FE1) adjacent to the Mississippi River, an area that already frequently is seasonally flooded by high river waters.

There also have become identified some necessary additional lands to complete project components, such as rerouting the intersection of Carney Road with Highway 964, and fortifying the banks of Bayou Baton Rouge with stone to prevent washout and damage to the road. These areas are a total of 44.1 acres. Figures 1 - 4 displays these areas as I1 – I10. These actions and areas constituted the Undertaking.

Figure 1 also displays areas A1 – A6. These areas are identified as no longer necessary ROW for construction of the Comite River Diversion (CRD). They will not be discussed further and they are no longer part of the Undertaking.

Area of Potential Effects (APE)

The entire area demarcated for each individual additional impact area has been identified as the APE. There are several discontinuous APEs for these projects because all are associated to the Comite River Diversion (CRD) but are unique locations. Likewise, these new APE define all direct and indirect effects from the project, as all associated effects will not be separately identifiable from the CRD once that project is completed.

Figure 1, and the above Description of the Undertaking, display and describe the new APE for this project.

Identification and Evaluation

Background and literature review has been conducted by USACE staff. Historic properties in the project vicinity were identified based on a review of the NRHP database, the Louisiana Cultural Resources Map, historic map research, and a review of cultural resources survey reports, both contracted for this Undertaking and for other undertakings. Figures 1-6 are added to this letter to aid in understanding the overlap of these new areas and previous cultural resource survey findings. Figures 1 – 4 were created by ArcGIS and combine CRD ROW and SHPO data. Please observe that Figure 1 encompasses the entire CRD and utilizes different colors to display the ROW (blue), the Flow Easements (green), and the Areas Impacted (peach). Please observe that there is very little of the CRD ROW visible due to its coverage by Phase 1 cultural resources survey. This letter exists to narrate any areas where Flow Easements or Areas Impacted are not overlain by Phase 1 survey or where cultural resource sites (red) are present.

Areas F2 – F11 and Areas I2, I3, I9 and I10 are all within areas previously subject to Phase I cultural resources survey, and no historic properties were identified. As further described below, Areas I1, I4A, I4B, I5, I7, and I8 have such high percentage overlap to previous cultural resources survey with no findings of historic properties adjacent to the new APE, that the remaining portions are determined to have no potential of undiscovered historic properties.

Areas I1, I7, and I8 all received Phase I cultural resources survey and have been reported within a Management Summary prepared by R. Christopher Goodwin and Associates (Heller et al. 2020). Figure 2 displays a closer view of this project area. Due to the Covid Pandemic and human error, this Management Summary was not previously coordinated with consulting parties. The report (attached) concludes that the areas I1, I7, and I8 do not contain historic properties. USACE accepts and repeats this finding of no historic properties within I1, I7, and I8. The Management Summary is included in this letter, for your review and reference. Figure 5 and Figure 6 are included

in this letter as extracted from the Management Summary, to display Areas now termed I1, I7, and I8, for your easiest reference.

Areas I4B, I4A, and I5 all overlap with previous cultural resource survey but contain additional unsurveyed areas (Figure 2). Area I4B contains approximately 0.5 acre of land that has no cultural resources survey. It is immediately adjacent to a survey (Markell et al. 1997; State Report 22-1978) that recorded no historic properties in this immediate area, and the remainder of Area I4B is determined to have no potential for historic properties. Area I4A straddles the northern boundary of a Phase I cultural survey area (Markell et al. 1997; State Report 22-1978). No historic properties were located by this Phase I survey and the remainder of Area I4A is determined to be low potential for historic properties. Area I5 also overlaps this previous cultural resources survey (Markell et al. 1997; State Report 22-1978). A late 19th Century historic artifact scatter (16EBR153) was discovered and does overlap Area I5. However this site is listed on the SHPO database as ineligible for the National Register of Historic Places (NRHP). There is a small portion of Area I5 that is outside the previous survey but is mostly an overlap with the existing Carney Road. This area is previously disturbed and is determined to be low potential for an undiscovered cultural resource.

Area I6 (Figure 3) shows a slight overlap with the presumed but unmarked boundaries of the Penny-Newport Plantation African American Cemetery (16EBR220). In a field visit during January 2020, archaeologists Nathanael Heller (Goodwin and Associates), Paul Hughbanks (USACE) and Chip McGimsey (LA SHPO) used past research and current landscape clues to determine a best-probable boundary of the cemetery including the currently collapsing bluff on which the cemetery is located above Bayou Baton Rouge. The activity and ROW related to the CDP at this location is two-fold: the channel of Bayou Baton Rouge is being fortified by the placement of stone to prevent meander and erosion and further collapse of the bluff containing 16EBR220; also Carney Road is being rerouted towards Highway 964, to pass north of the Comite Diversion Channel and below the bluff of Bayou Baton Rouge. The CDP ROW lines contain buffer to prevent erroneous or incidental shaving of the bluff that contains 16EBR220. Specifications have been written into all USACE Design Plans, that caution and care must be used for any activity within this area. Likewise, an unanticipated discovery clause is present, that work must cease until coordination of any discovery and any necessary action has occurred (see below)

Area FE1 (Figure 4) overlaps a Phase I cultural resources survey (Ryan et al. 1986; State Report 22-1822). The majority and remainder portion of Area FE1 has not been surveyed for cultural resources, but modern and historic aerial imagery and topographic maps show that this area is frequently inundated by the Mississippi River and has experienced movement of its bankline due to the meandering river. The boundaries as depicted of Area FE1 exist due to modeling to determine where water flowing from the CRD may accumulate, and it is the lowest topography on the landscape. This area is

determined to contain a very low potential to contain historic properties, and does not require a cultural resources survey.

Assessment of Effects

In summary, only one historic property/cemetery as defined in 36 CFR 800.16(l) is within the APE:16EBR220. The site is recorded as the Penny-Newport Plantation African American Cemetery. The impact area of Comite ROW overlaps with this historic property. This overlap is very small and at the edge of a cemetery not well-defined by fence or other markings. The cemetery is on a bluff above Bayou Baton Rouge, while the activity of USACE is to reinforce the banks of the bayou that have eroded and threaten portions of that bluff. USACE has identified the cemetery on the construction plans and required that heavy equipment keep off the bluff portion of the cemetery to ensure its protection. When working on the erosion protections measure adjacent to the channel of Bayou Baton Rouge, USACE will condition that care must be taken. Further refinement to the design plans prior to contracting the work, will be undertaken to reduce or eliminate this overlap, however the conditions will remain attached to the project. Ultimately the USACE proposed activity will reinforce the existing integrity of the cemetery and protect it against future destruction by natural forces. Although overlaps is seen between a historic property and a CDP ROW, there will be no adverse effect to the historic property.

Based on the information presented in this letter, USACE has determined that there are **No Adverse Effects to Historic Properties** due to this undertaking, as defined in 36 CFR 800.5(b). In addition to the conditions state above, this project will be subject to the standard change in scope of work, unexpected discovery, and unmarked human burial sites act provisions. USACE requests your comments within 30 days.

We look forward to your concurrence with this determination. Should you have any questions or need additional information with this undertaking, please contact Dr. Paul Hughbanks, Archaeologist; U.S. Army Corps of Engineers, New Orleans District at paul.j.hughbanks@usace.army.mil; or Brian Ostahowski, Archaeologist and Tribal Liaison at (504) 862-2188 brian.e.ostahowski@usace.army.mil.

Sincerely,

JASON A. EMERY
Acting Chief, Environmental Planning Branch

CC:File
LA SHPO
An electronic copy of this letter with enclosures will be provided to the Section 106 Inbox, section106@crt.la.gov.

Sources Cited

Markell, Ann, Ralph Draughon, Susan Barrett Smith, Thomas Fenn, Michele Williams, James A. Green, Jeremy Pincoske, and Rick Wappenstein
1997
Cultural Resources Survey and National Register Testing of Comite River Diversion Project,East Baton Rouge Parish, Louisiana. Prepared for the US Army Corps of Engineers, New Orleans District. On file at the Louisiana Department of Culture, Recreation, and Tourism, Baton Rouge, Louisiana. Report no. 22-1978.

Ryan, Joanne, Whitney J. Autin, Wayne Lawrence Coco, and William D . Reeves
1994
Cultural Resources Survey of the Proposed Comite River Diversion Alignment, East Baton Rouge Parish, Louisiana. Prepared for the US Army Corps of Engineers, New Orleans District. On file at the Louisiana Department of Culture, Recreation, and Tourism, Baton Rouge, Louisiana. Report no. 22-1822.

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, NEW ORLEANS DISTRICT
7400 LEAKE AVE
NEW ORLEANS LA 70118-3651

March 14, 2025

Regional Planning and
Environment Division, South
Environmental Planning Branch
Attn: CEMVN-PDS-N

Kanicu Donnis Battise, Tribal Council Chairperson
Alabama-Coushatta Tribe of Texas
571 State Park Rd 56
Livingston, TX 77351

RE: Section 106 Review Consultation
Undertaking: Inundation Effects from the Outflow of the Comite River Diversion Project, East Baton Rouge Parish, Louisiana.
Determination: **No Adverse Effect to Historic Properties**

Dear Mikko Battise:

The U.S. Army Corps of Engineers (USACE), New Orleans District, proposes to enlarge the Right-of-Way (ROW) of the Comite River Diversion Project (CRD) in East Baton Rouge Parish, due to recognition of additional Areas of Potential Effect (APE).

As part of USACE's evaluation and in partial fulfillment of responsibilities under the National Environmental Policy Act and Section 106 of the National Historic Preservation Act, USACE offers you the opportunity to review and comment on the potential of the proposed action described in this letter to affect historic properties. Additionally, in accordance with the responsibilities of Executive Order 13175, USACE offers Federally-recognized Tribes the opportunity to review and comment on the potential of the proposed undertaking described in this letter to significantly affect protected tribal resources, tribal rights, or tribal lands.

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There also have become identified some necessary additional lands to complete project components, such as rerouting the intersection of Carney Road with Highway 964, and fortifying the banks of Bayou Baton Rouge with stone to prevent washout and damage to the road. These areas are a total of 44.1 acres. Figures 1 - 4 displays these areas as I1 – I10. These actions and areas constituted the Undertaking.

Figure 1 also displays areas A1 – A6. These areas are identified as no longer necessary ROW for construction of the Comite River Diversion (CRD). They will not be discussed further and they are no longer part of the Undertaking.

Area of Potential Effects (APE)

The entire area demarcated for each individual additional impact area has been identified as the APE. There are several discontinuous APEs for these projects because all are associated to the Comite River Diversion (CRD) but are unique locations. Likewise, these new APE define all direct and indirect effects from the project, as all associated effects will not be separately identifiable from the CRD once that project is completed.

Figure 1, and the above Description of the Undertaking, display and describe the new APE for this project.

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Background and literature review has been conducted by USACE staff. Historic properties in the project vicinity were identified based on a review of the NRHP database, the Louisiana Cultural Resources Map, historic map research, and a review of cultural resources survey reports, both contracted for this Undertaking and for other undertakings. Figures 1-6 are added to this letter to aid in understanding the overlap of these new areas and previous cultural resource survey findings. Figures 1 – 4 were created by ArcGIS and combine CRD ROW and SHPO data. Please observe that Figure 1 encompasses the entire CRD and utilizes different colors to display the ROW (blue), the Flow Easements (green), and the Areas Impacted (peach). Please observe that there is very little of the CRD ROW visible due to its coverage by Phase 1 cultural resources survey. This letter exists to narrate any areas where Flow Easements or Areas Impacted are not overlain by Phase 1 survey or where cultural resource sites (red) are present.

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in this letter as extracted from the Management Summary, to display Areas now termed I1, I7, and I8, for your easiest reference.

Areas I4B, I4A, and I5 all overlap with previous cultural resource survey but contain additional unsurveyed areas (Figure 2). Area I4B contains approximately 0.5 acre of land that has no cultural resources survey. It is immediately adjacent to a survey (Markell et al. 1997; State Report 22-1978) that recorded no historic properties in this immediate area, and the remainder of Area I4B is determined to have no potential for historic properties. Area I4A straddles the northern boundary of a Phase I cultural survey area (Markell et al. 1997; State Report 22-1978). No historic properties were located by this Phase I survey and the remainder of Area I4A is determined to be low potential for historic properties. Area I5 also overlaps this previous cultural resources survey (Markell et al. 1997; State Report 22-1978). A late 19th Century historic artifact scatter (16EBR153) was discovered and does overlap Area I5. However this site is listed on the SHPO database as ineligible for the National Register of Historic Places (NRHP). There is a small portion of Area I5 that is outside the previous survey but is mostly an overlap with the existing Carney Road. This area is previously disturbed and is determined to be low potential for an undiscovered cultural resource.

Area I6 (Figure 3) shows a slight overlap with the presumed but unmarked boundaries of the Penny-Newport Plantation African American Cemetery (16EBR220). In a field visit during January 2020, archaeologists Nathanael Heller (Goodwin and Associates), Paul Hughbanks (USACE) and Chip McGimsey (LA SHPO) used past research and current landscape clues to determine a best-probable boundary of the cemetery including the currently collapsing bluff on which the cemetery is located above Bayou Baton Rouge. The activity and ROW related to the CDP at this location is two-fold: the channel of Bayou Baton Rouge is being fortified by the placement of stone to prevent meander and erosion and further collapse of the bluff containing 16EBR220; also Carney Road is being rerouted towards Highway 964, to pass north of the Comite Diversion Channel and below the bluff of Bayou Baton Rouge. The CDP ROW lines contain buffer to prevent erroneous or incidental shaving of the bluff that contains 16EBR220. Specifications have been written into all USACE Design Plans, that caution and care must be used for any activity within this area. Likewise, an unanticipated discovery clause is present, that work must cease until coordination of any discovery and any necessary action has occurred (see below)

Area FE1 (Figure 4) overlaps a Phase I cultural resources survey (Ryan et al. 1986; State Report 22-1822). The majority and remainder portion of Area FE1 has not been surveyed for cultural resources, but modern and historic aerial imagery and topographic maps show that this area is frequently inundated by the Mississippi River and has experienced movement of its bankline due to the meandering river. The boundaries as depicted of Area FE1 exist due to modeling to determine where water flowing from the CRD may accumulate, and it is the lowest topography on the landscape. This area is

determined to contain a very low potential to contain historic properties, and does not require a cultural resources survey.

Assessment of Effects

In summary, only one historic property/cemetery as defined in 36 CFR 800.16(l) is within the APE:16EBR220. The site is recorded as the Penny-Newport Plantation African American Cemetery. The impact area of Comite ROW overlaps with this historic property. This overlap is very small and at the edge of a cemetery not well-defined by fence or other markings. The cemetery is on a bluff above Bayou Baton Rouge, while the activity of USACE is to reinforce the banks of the bayou that have eroded and threaten portions of that bluff. USACE has identified the cemetery on the construction plans and required that heavy equipment keep off the bluff portion of the cemetery to ensure its protection. When working on the erosion protections measure adjacent to the channel of Bayou Baton Rouge, USACE will condition that care must be taken. Further refinement to the design plans prior to contracting the work, will be undertaken to reduce or eliminate this overlap, however the conditions will remain attached to the project. Ultimately the USACE proposed activity will reinforce the existing integrity of the cemetery and protect it against future destruction by natural forces. Although overlaps is seen between a historic property and a CDP ROW, there will be no adverse effect to the historic property.

Based on the information presented in this letter, USACE has determined that there are **No Adverse Effects to Historic Properties** due to this undertaking, as defined in 36 CFR 800.5(b). In addition to the conditions state above, this project will be subject to the standard change in scope of work, unexpected discovery, and unmarked human burial sites act provisions. USACE requests your comments within 30 days.

We look forward to your concurrence with this determination. Should you have any questions or need additional information with this undertaking, please contact Dr. Paul Hughbanks, Archaeologist; U.S. Army Corps of Engineers, New Orleans District at paul.j.hughbanks@usace.army.mil; or Brian Ostahowski, Archaeologist and Tribal Liaison at (504) 862-2188 brian.e.ostahowski@usace.army.mil.

Sincerely,

JASON A. EMERY
Acting Chief, Environmental Planning Branch

CC:File
LA SHPO
An electronic copy of this letter with enclosures will be provided to Mr. Delvin Johnson, Tribal Historic Preservation Officer, Alabama Coushatta Tribe of Texas, Johnson.Delvin@actribe.org.

Sources Cited

Markell, Ann, Ralph Draughon, Susan Barrett Smith, Thomas Fenn, Michele Williams, James A. Green, Jeremy Pincoske, and Rick Wappenstein
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DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, NEW ORLEANS DISTRICT
7400 LEAKE AVE
NEW ORLEANS LA 70118-3651

March 14, 2025

Regional Planning and
Environment Division, South
Environmental Planning Branch
Attn: CEMVN-PDS-N

Sam Marshall, Chief
Alabama-Quassarte Tribal Town
2122 Hwy 27
Wetumka, OK 74883

RE: Section 106 Review Consultation
Undertaking: Inundation Effects from the Outflow of the Comite River Diversion Project, East Baton Rouge Parish, Louisiana.
Determination: **No Adverse Effect to Historic Properties**

Dear Chief Marshall:

The U.S. Army Corps of Engineers (USACE), New Orleans District, proposes to enlarge the Right-of-Way (ROW) of the Comite River Diversion Project (CRD) in East Baton Rouge Parish, due to recognition of additional Areas of Potential Effect (APE).

As part of USACE's evaluation and in partial fulfillment of responsibilities under the National Environmental Policy Act and Section 106 of the National Historic Preservation Act, USACE offers you the opportunity to review and comment on the potential of the proposed action described in this letter to affect historic properties. Additionally, in accordance with the responsibilities of Executive Order 13175, USACE offers Federally-recognized Tribes the opportunity to review and comment on the potential of the proposed undertaking described in this letter to significantly affect protected tribal resources, tribal rights, or tribal lands.

Description of the Undertaking

A Supplemental Environmental Assessment (SEA #601) is being prepared to address the acquisition of flowage easements adjacent to previously authorized project boundaries. Once the project becomes operational, it is possible that 1,234 acres of additional property could see inundation from the diversion flows. On the included Figures 1 - 4, these flowage easements (inundation areas) are marked as FE1 – FE11. The majority portion of these acres is located in a lowland area (FE1) adjacent to the Mississippi River, an area that already frequently is seasonally flooded by high river waters.

There also have become identified some necessary additional lands to complete project components, such as rerouting the intersection of Carney Road with Highway 964, and fortifying the banks of Bayou Baton Rouge with stone to prevent washout and damage to the road. These areas are a total of 44.1 acres. Figures 1 - 4 displays these areas as I1 – I10. These actions and areas constituted the Undertaking.

Figure 1 also displays areas A1 – A6. These areas are identified as no longer necessary ROW for construction of the Comite River Diversion (CRD). They will not be discussed further and they are no longer part of the Undertaking.

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JASON A. EMERY
Acting Chief, Environmental Planning Branch

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LA SHPO
An electronic copy of this letter with enclosures will be provided to Ms. Brina Wiliams, Tribal Historic Preservation Officer, Alabama-Quassarte Tribal Town, brina.williams@alabama-quassarte.org.

Sources Cited

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DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, NEW ORLEANS DISTRICT
7400 LEAKE AVE
NEW ORLEANS LA 70118-3651

March 14, 2025

Regional Planning and
Environment Division, South
Environmental Planning Branch
Attn: CEMVN-PDS-N

Melissa Darden, Chairman
Chitimacha Tribe of Louisiana
155 Chitimacha Loop
P.O. Box 661
Charenton, LA 70523

RE: Section 106 Review Consultation
Undertaking: Inundation Effects from the Outflow of the Comite River Diversion Project, East Baton Rouge Parish, Louisiana.
Determination: No Adverse Effect to Historic Properties

Dear Chairman Darden:

The U.S. Army Corps of Engineers (USACE), New Orleans District, proposes to enlarge the Right-of-Way (ROW) of the Comite River Diversion Project (CRD) in East Baton Rouge Parish, due to recognition of additional Areas of Potential Effect (APE).

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Sincerely,

JASON A. EMERY
Acting Chief, Environmental Planning Branch

CC:File
LA SHPO
An electronic copy of this letter with enclosures will be provided to Mrs. Kimberly Walden, M. Ed., Cultural Director/Tribal Historic Preservation Officer, Chitimacha Tribe of Louisiana, kim@chitimacha.gov.

Sources Cited

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DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, NEW ORLEANS DISTRICT
7400 LEAKE AVE
NEW ORLEANS LA 70118-3651

March 14, 2025

Regional Planning and
Environment Division, South
Environmental Planning Branch
Attn: CEMVN-PDS-N

Gary Batton, Chief
Choctaw Nation of Oklahoma
Attn: Choctaw Nation Historic Preservation Department
P.O. Box 1210
Durant, OK 74702-1210

RE: Section 106 Review Consultation
Undertaking: Inundation Effects from the Outflow of the Comite River Diversion Project, East Baton Rouge Parish, Louisiana.
Determination: No Adverse Effect to Historic Properties

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damage to the road. These areas are a total of 44.1 acres. Figures 1 - 4 displays these areas as I1 – I10. These actions and areas constituted the Undertaking.

Figure 1 also displays areas A1 – A6. These areas are identified as no longer necessary ROW for construction of the Comite River Diversion (CRD). They will not be discussed further and they are no longer part of the Undertaking.

Area of Potential Effects (APE)

The entire area demarcated for each individual additional impact area has been identified as the APE. There are several discontinuous APEs for these projects because all are associated to the Comite River Diversion (CRD) but are unique locations. Likewise, these new APE define all direct and indirect effects from the project, as all associated effects will not be separately identifiable from the CRD once that project is completed.

Figure 1, and the above Description of the Undertaking, display and describe the new APE for this project.

Identification and Evaluation

Background and literature review has been conducted by USACE staff. Historic properties in the project vicinity were identified based on a review of the NRHP database, the Louisiana Cultural Resources Map, historic map research, and a review of cultural resources survey reports, both contracted for this Undertaking and for other undertakings. Figures 1-6 are added to this letter to aid in understanding the overlap of these new areas and previous cultural resource survey findings. Figures 1 – 4 were created by ArcGIS and combine CRD ROW and SHPO data. Please observe that Figure 1 encompasses the entire CRD and utilizes different colors to display the ROW (blue), the Flow Easements (green), and the Areas Impacted (peach). Please observe that there is very little of the CRD ROW visible due to its coverage by Phase 1 cultural resources survey. This letter exists to narrate any areas where Flow Easements or Areas Impacted are not overlain by Phase 1 survey or where cultural resource sites (red) are present.

Areas F2 – F11 and Areas I2, I3, I9 and I10 are all within areas previously subject to Phase I cultural resources survey, and no historic properties were identified. As further described below, Areas I1, I4A, I4B, I5, I7, and I8 have such high percentage overlap to previous cultural resources survey with no findings of historic properties adjacent to the new APE, that the remaining portions are determined to have no potential of undiscovered historic properties.

Areas I1, I7, and I8 all received Phase I cultural resources survey and have been reported within a Management Summary prepared by R. Christopher Goodwin and Associates (Heller et al. 2020). Figure 2 displays a closer view of this project area. Due to the Covid Pandemic and human error, this Management Summary was not previously coordinated with consulting parties. The report (attached) concludes that the areas I1, I7, and I8 do not contain historic properties. USACE accepts and repeats this

finding of no historic properties within I1, I7, and I8. The Management Summary is included in this letter, for your review and reference. Figure 5 and Figure 6 are included in this letter as extracted from the Management Summary, to display Areas now termed I1, I7, and I8, for your easiest reference.

Areas I4B, I4A, and I5 all overlap with previous cultural resource survey but contain additional unsurveyed areas (Figure 2). Area I4B contains approximately 0.5 acre of land that has no cultural resources survey. It is immediately adjacent to a survey (Markell et al. 1997; State Report 22-1978) that recorded no historic properties in this immediate area, and the remainder of Area I4B is determined to have no potential for historic properties. Area I4A straddles the northern boundary of a Phase I cultural survey area (Markell et al. 1997; State Report 22-1978). No historic properties were located by this Phase I survey and the remainder of Area I4A is determined to be low potential for historic properties. Area I5 also overlaps this previous cultural resources survey (Markell et al. 1997; State Report 22-1978). A late 19th Century historic artifact scatter (16EBR153) was discovered and does overlap Area I5. However this site is listed on the SHPO database as ineligible for the National Register of Historic Places (NRHP). There is a small portion of Area I5 that is outside the previous survey but is mostly an overlap with the existing Carney Road. This area is previously disturbed and is determined to be low potential for an undiscovered cultural resource.

Area I6 (Figure 3) shows a slight overlap with the presumed but unmarked boundaries of the Penny-Newport Plantation African American Cemetery (16EBR220). In a field visit during January 2020, archaeologists Nathanael Heller (Goodwin and Associates), Paul Hughbanks (USACE) and Chip McGimsey (LA SHPO) used past research and current landscape clues to determine a best-probable boundary of the cemetery including the currently collapsing bluff on which the cemetery is located above Bayou Baton Rouge. The activity and ROW related to the CDP at this location is two-fold: the channel of Bayou Baton Rouge is being fortified by the placement of stone to prevent meander and erosion and further collapse of the bluff containing 16EBR220; also Carney Road is being rerouted towards Highway 964, to pass north of the Comite Diversion Channel and below the bluff of Bayou Baton Rouge. The CDP ROW lines contain buffer to prevent erroneous or incidental shaving of the bluff that contains 16EBR220. Specifications have been written into all USACE Design Plans, that caution and care must be used for any activity within this area. Likewise, an unanticipated discovery clause is present, that work must cease until coordination of any discovery and any necessary action has occurred (see below)

Area FE1 (Figure 4) overlaps a Phase I cultural resources survey (Ryan et al. 1986; State Report 22-1822). The majority and remainder portion of Area FE1 has not been surveyed for cultural resources, but modern and historic aerial imagery and topographic maps show that this area is frequently inundated by the Mississippi River and has experienced movement of its bankline due to the meandering river. The boundaries as depicted of Area FE1 exist due to modeling to determine where water flowing from the

CRD may accumulate, and it is the lowest topography on the landscape. This area is determined to contain a very low potential to contain historic properties, and does not require a cultural resources survey.

Assessment of Effects

In summary, only one historic property/cemetery as defined in 36 CFR 800.16(l) is within the APE:16EBR220. The site is recorded as the Penny-Newport Plantation African American Cemetery. The impact area of Comite ROW overlaps with this historic property. This overlap is very small and at the edge of a cemetery not well-defined by fence or other markings. The cemetery is on a bluff above Bayou Baton Rouge, while the activity of USACE is to reinforce the banks of the bayou that have eroded and threaten portions of that bluff. USACE has identified the cemetery on the construction plans and required that heavy equipment keep off the bluff portion of the cemetery to ensure its protection. When working on the erosion protections measure adjacent to the channel of Bayou Baton Rouge, USACE will condition that care must be taken. Further refinement to the design plans prior to contracting the work, will be undertaken to reduce or eliminate this overlap, however the conditions will remain attached to the project. Ultimately the USACE proposed activity will reinforce the existing integrity of the cemetery and protect it against future destruction by natural forces. Although overlaps is seen between a historic property and a CDP ROW, there will be no adverse effect to the historic property.

Based on the information presented in this letter, USACE has determined that there are **No Adverse Effects to Historic Properties** due to this undertaking, as defined in 36 CFR 800.5(b). In addition to the conditions state above, this project will be subject to the standard change in scope of work, unexpected discovery, and unmarked human burial sites act provisions. USACE requests your comments within 30 days.

We look forward to your concurrence with this determination. Should you have any questions or need additional information with this undertaking, please contact Dr. Paul Hughbanks, Archaeologist; U.S. Army Corps of Engineers, New Orleans District at paul.j.hughbanks@usace.army.mil; or Brian Ostahowski, Archaeologist and Tribal Liaison at (504) 862-2188 brian.e.ostahowski@usace.army.mil.

Sincerely,

JASON A. EMERY
Acting Chief, Environmental Planning Branch

CC:File
LA SHPO
An electronic copy of this letter with enclosures will be provided to Dr. Ian Thompson, Director/Tribal Historic Preservation Officer, Choctaw Nation of Oklahoma, ithompson@choctawnation.com and Ms. Lindsey Bilyeu, NHPA Program Coordinator, Choctaw Nation of Oklahoma, lbilyeu@choctawnation.com.

Sources Cited

Markell, Ann, Ralph Draughon, Susan Barrett Smith, Thomas Fenn, Michele Williams, James A. Green, Jeremy Pincoske, and Rick Wappenstein
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DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, NEW ORLEANS DISTRICT
7400 LEAKE AVE
NEW ORLEANS LA 70118-3651

March 14, 2025

Regional Planning and
Environment Division, South
Environmental Planning Branch
Attn: CEMVN-PDS-N

Jonathan Cernek, Chairman
Coushatta Tribe of Louisiana
P.O. Box 818
Elton, LA 70532

RE: Section 106 Review Consultation
Undertaking: Inundation Effects from the Outflow of the Comite River Diversion Project, East Baton Rouge Parish, Louisiana.
Determination: **No Adverse Effect to Historic Properties**

Dear Chairman Cernek:

The U.S. Army Corps of Engineers (USACE), New Orleans District, proposes to enlarge the Right-of-Way (ROW) of the Comite River Diversion Project (CRD) in East Baton Rouge Parish, due to recognition of additional Areas of Potential Effect (APE).

As part of USACE's evaluation and in partial fulfillment of responsibilities under the National Environmental Policy Act and Section 106 of the National Historic Preservation Act, USACE offers you the opportunity to review and comment on the potential of the proposed action described in this letter to affect historic properties. Additionally, in accordance with the responsibilities of Executive Order 13175, USACE offers Federally-recognized Tribes the opportunity to review and comment on the potential of the proposed undertaking described in this letter to significantly affect protected tribal resources, tribal rights, or tribal lands.

Description of the Undertaking

A Supplemental Environmental Assessment (SEA #601) is being prepared to address the acquisition of flowage easements adjacent to previously authorized project boundaries. Once the project becomes operational, it is possible that 1,234 acres of additional property could see inundation from the diversion flows. On the included Figures 1 - 4, these flowage easements (inundation areas) are marked as FE1 – FE11. The majority portion of these acres is located in a lowland area (FE1) adjacent to the Mississippi River, an area that already frequently is seasonally flooded by high river waters.

There also have become identified some necessary additional lands to complete project components, such as rerouting the intersection of Carney Road with Highway 964, and fortifying the banks of Bayou Baton Rouge with stone to prevent washout and damage to the road. These areas are a total of 44.1 acres. Figures 1 - 4 displays these areas as I1 – I10. These actions and areas constituted the Undertaking.

Figure 1 also displays areas A1 – A6. These areas are identified as no longer necessary ROW for construction of the Comite River Diversion (CRD). They will not be discussed further and they are no longer part of the Undertaking.

Area of Potential Effects (APE)

The entire area demarcated for each individual additional impact area has been identified as the APE. There are several discontinuous APEs for these projects because all are associated to the Comite River Diversion (CRD) but are unique locations. Likewise, these new APE define all direct and indirect effects from the project, as all associated effects will not be separately identifiable from the CRD once that project is completed.

Figure 1, and the above Description of the Undertaking, display and describe the new APE for this project.

Identification and Evaluation

Background and literature review has been conducted by USACE staff. Historic properties in the project vicinity were identified based on a review of the NRHP database, the Louisiana Cultural Resources Map, historic map research, and a review of cultural resources survey reports, both contracted for this Undertaking and for other undertakings. Figures 1-6 are added to this letter to aid in understanding the overlap of these new areas and previous cultural resource survey findings. Figures 1 – 4 were created by ArcGIS and combine CRD ROW and SHPO data. Please observe that Figure 1 encompasses the entire CRD and utilizes different colors to display the ROW (blue), the Flow Easements (green), and the Areas Impacted (peach). Please observe that there is very little of the CRD ROW visible due to its coverage by Phase 1 cultural resources survey. This letter exists to narrate any areas where Flow Easements or Areas Impacted are not overlain by Phase 1 survey or where cultural resource sites (red) are present.

Areas F2 – F11 and Areas I2, I3, I9 and I10 are all within areas previously subject to Phase I cultural resources survey, and no historic properties were identified. As further described below, Areas I1, I4A, I4B, I5, I7, and I8 have such high percentage overlap to previous cultural resources survey with no findings of historic properties adjacent to the new APE, that the remaining portions are determined to have no potential of undiscovered historic properties.

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Area I6 (Figure 3) shows a slight overlap with the presumed but unmarked boundaries of the Penny-Newport Plantation African American Cemetery (16EBR220). In a field visit during January 2020, archaeologists Nathanael Heller (Goodwin and Associates), Paul Hughbanks (USACE) and Chip McGimsey (LA SHPO) used past research and current landscape clues to determine a best-probable boundary of the cemetery including the currently collapsing bluff on which the cemetery is located above Bayou Baton Rouge. The activity and ROW related to the CDP at this location is two-fold: the channel of Bayou Baton Rouge is being fortified by the placement of stone to prevent meander and erosion and further collapse of the bluff containing 16EBR220; also Carney Road is being rerouted towards Highway 964, to pass north of the Comite Diversion Channel and below the bluff of Bayou Baton Rouge. The CDP ROW lines contain buffer to prevent erroneous or incidental shaving of the bluff that contains 16EBR220. Specifications have been written into all USACE Design Plans, that caution and care must be used for any activity within this area. Likewise, an unanticipated discovery clause is present, that work must cease until coordination of any discovery and any necessary action has occurred (see below)

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determined to contain a very low potential to contain historic properties, and does not require a cultural resources survey.

Assessment of Effects

In summary, only one historic property/cemetery as defined in 36 CFR 800.16(l) is within the APE:16EBR220. The site is recorded as the Penny-Newport Plantation African American Cemetery. The impact area of Comite ROW overlaps with this historic property. This overlap is very small and at the edge of a cemetery not well-defined by fence or other markings. The cemetery is on a bluff above Bayou Baton Rouge, while the activity of USACE is to reinforce the banks of the bayou that have eroded and threaten portions of that bluff. USACE has identified the cemetery on the construction plans and required that heavy equipment keep off the bluff portion of the cemetery to ensure its protection. When working on the erosion protections measure adjacent to the channel of Bayou Baton Rouge, USACE will condition that care must be taken. Further refinement to the design plans prior to contracting the work, will be undertaken to reduce or eliminate this overlap, however the conditions will remain attached to the project. Ultimately the USACE proposed activity will reinforce the existing integrity of the cemetery and protect it against future destruction by natural forces. Although overlaps is seen between a historic property and a CDP ROW, there will be no adverse effect to the historic property.

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JASON A. EMERY
Acting Chief, Environmental Planning Branch

CC:File
LA SHPO
An electronic copy of this letter with enclosures will be provided to Mr. Dakota John, Tribal Historic Preservation Officer, Coushatta Tribe of Louisiana, dakotajohn@coushatta.org and Ms. Kassie Dawsey, Section 106 Coordinator, kdawsey@coushatta.org.

Sources Cited

Markell, Ann, Ralph Draughon, Susan Barrett Smith, Thomas Fenn, Michele Williams, James A. Green, Jeremy Pincoske, and Rick Wappenstein
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DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, NEW ORLEANS DISTRICT
7400 LEAKE AVE
NEW ORLEANS LA 70118-3651

March 14, 2025

Regional Planning and
Environment Division, South
Environmental Planning Branch
Attn: CEMVN-PDS-N

Libby Rogers, Principal Chief
Jena Band of Choctaw Indians
P.O. Box 14
Jena, LA 71342

RE: Section 106 Review Consultation
Undertaking: Inundation Effects from the Outflow of the Comite River Diversion Project, East Baton Rouge Parish, Louisiana.
Determination: **No Adverse Effect to Historic Properties**

Dear Principal Chief Rogers:

The U.S. Army Corps of Engineers (USACE), New Orleans District, proposes to enlarge the Right-of-Way (ROW) of the Comite River Diversion Project (CRD) in East Baton Rouge Parish, due to recognition of additional Areas of Potential Effect (APE).

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Assessment of Effects

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We look forward to your concurrence with this determination. Should you have any questions or need additional information with this undertaking, please contact Dr. Paul Hughbanks, Archaeologist; U.S. Army Corps of Engineers, New Orleans District at paul.j.hughbanks@usace.army.mil; or Brian Ostahowski, Archaeologist and Tribal Liaison at (504) 862-2188 brian.e.ostahowski@usace.army.mil.

Sincerely,

JASON A. EMERY
Acting Chief, Environmental Planning Branch

CC:File
LA SHPO
An electronic copy of this letter with enclosures will be provided to Ms. Johnna Flynn, Tribal Historic Preservation Officer, Jena Band of Choctaw Indians, JFlynn@jenachoctaw.org.

Sources Cited

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DEPARTMENT OF THE ARMY
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March 14, 2025

Regional Planning and
Environment Division, South
Environmental Planning Branch
Attn: CEMVN-PDS-N

Cyrus Ben, Chief
Mississippi Band of Choctaw Indians
101 Industrial Road
Choctaw, MS 39350

RE: Section 106 Review Consultation
Undertaking: Inundation Effects from the Outflow of the Comite River Diversion Project, East Baton Rouge Parish, Louisiana.
Determination: **No Adverse Effect to Historic Properties**

Dear Chief Ben:

The U.S. Army Corps of Engineers (USACE), New Orleans District, proposes to enlarge the Right-of-Way (ROW) of the Comite River Diversion Project (CRD) in East Baton Rouge Parish, due to recognition of additional Areas of Potential Effect (APE).

As part of USACE's evaluation and in partial fulfillment of responsibilities under the National Environmental Policy Act and Section 106 of the National Historic Preservation Act, USACE offers you the opportunity to review and comment on the potential of the proposed action described in this letter to affect historic properties. Additionally, in accordance with the responsibilities of Executive Order 13175, USACE offers Federally-recognized Tribes the opportunity to review and comment on the potential of the proposed undertaking described in this letter to significantly affect protected tribal resources, tribal rights, or tribal lands.

Description of the Undertaking

A Supplemental Environmental Assessment (SEA #601) is being prepared to address the acquisition of flowage easements adjacent to previously authorized project boundaries. Once the project becomes operational, it is possible that 1,234 acres of additional property could see inundation from the diversion flows. On the included Figures 1 - 4, these flowage easements (inundation areas) are marked as FE1 – FE11. The majority portion of these acres is located in a lowland area (FE1) adjacent to the Mississippi River, an area that already frequently is seasonally flooded by high river waters.

There also have become identified some necessary additional lands to complete project components, such as rerouting the intersection of Carney Road with Highway 964, and fortifying the banks of Bayou Baton Rouge with stone to prevent washout and damage to the road. These areas are a total of 44.1 acres. Figures 1 - 4 displays these areas as I1 – I10. These actions and areas constituted the Undertaking.

Figure 1 also displays areas A1 – A6. These areas are identified as no longer necessary ROW for construction of the Comite River Diversion (CRD). They will not be discussed further and they are no longer part of the Undertaking.

Area of Potential Effects (APE)

The entire area demarcated for each individual additional impact area has been identified as the APE. There are several discontinuous APEs for these projects because all are associated to the Comite River Diversion (CRD) but are unique locations. Likewise, these new APE define all direct and indirect effects from the project, as all associated effects will not be separately identifiable from the CRD once that project is completed.

Figure 1, and the above Description of the Undertaking, display and describe the new APE for this project.

Identification and Evaluation

Background and literature review has been conducted by USACE staff. Historic properties in the project vicinity were identified based on a review of the NRHP database, the Louisiana Cultural Resources Map, historic map research, and a review of cultural resources survey reports, both contracted for this Undertaking and for other undertakings. Figures 1-6 are added to this letter to aid in understanding the overlap of these new areas and previous cultural resource survey findings. Figures 1 – 4 were created by ArcGIS and combine CRD ROW and SHPO data. Please observe that Figure 1 encompasses the entire CRD and utilizes different colors to display the ROW (blue), the Flow Easements (green), and the Areas Impacted (peach). Please observe that there is very little of the CRD ROW visible due to its coverage by Phase 1 cultural resources survey. This letter exists to narrate any areas where Flow Easements or Areas Impacted are not overlain by Phase 1 survey or where cultural resource sites (red) are present.

Areas F2 – F11 and Areas I2, I3, I9 and I10 are all within areas previously subject to Phase I cultural resources survey, and no historic properties were identified. As further described below, Areas I1, I4A, I4B, I5, I7, and I8 have such high percentage overlap to previous cultural resources survey with no findings of historic properties adjacent to the new APE, that the remaining portions are determined to have no potential of undiscovered historic properties.

Areas I1, I7, and I8 all received Phase I cultural resources survey and have been reported within a Management Summary prepared by R. Christopher Goodwin and Associates (Heller et al. 2020). Figure 2 displays a closer view of this project area. Due to the Covid Pandemic and human error, this Management Summary was not previously coordinated with consulting parties. The report (attached) concludes that the areas I1, I7, and I8 do not contain historic properties. USACE accepts and repeats this finding of no historic properties within I1, I7, and I8. The Management Summary is included in this letter, for your review and reference. Figure 5 and Figure 6 are included

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Areas I4B, I4A, and I5 all overlap with previous cultural resource survey but contain additional unsurveyed areas (Figure 2). Area I4B contains approximately 0.5 acre of land that has no cultural resources survey. It is immediately adjacent to a survey (Markell et al. 1997; State Report 22-1978) that recorded no historic properties in this immediate area, and the remainder of Area I4B is determined to have no potential for historic properties. Area I4A straddles the northern boundary of a Phase I cultural survey area (Markell et al. 1997; State Report 22-1978). No historic properties were located by this Phase I survey and the remainder of Area I4A is determined to be low potential for historic properties. Area I5 also overlaps this previous cultural resources survey (Markell et al. 1997; State Report 22-1978). A late 19th Century historic artifact scatter (16EBR153) was discovered and does overlap Area I5. However this site is listed on the SHPO database as ineligible for the National Register of Historic Places (NRHP). There is a small portion of Area I5 that is outside the previous survey but is mostly an overlap with the existing Carney Road. This area is previously disturbed and is determined to be low potential for an undiscovered cultural resource.

Area I6 (Figure 3) shows a slight overlap with the presumed but unmarked boundaries of the Penny-Newport Plantation African American Cemetery (16EBR220). In a field visit during January 2020, archaeologists Nathanael Heller (Goodwin and Associates), Paul Hughbanks (USACE) and Chip McGimsey (LA SHPO) used past research and current landscape clues to determine a best-probable boundary of the cemetery including the currently collapsing bluff on which the cemetery is located above Bayou Baton Rouge. The activity and ROW related to the CDP at this location is two-fold: the channel of Bayou Baton Rouge is being fortified by the placement of stone to prevent meander and erosion and further collapse of the bluff containing 16EBR220; also Carney Road is being rerouted towards Highway 964, to pass north of the Comite Diversion Channel and below the bluff of Bayou Baton Rouge. The CDP ROW lines contain buffer to prevent erroneous or incidental shaving of the bluff that contains 16EBR220. Specifications have been written into all USACE Design Plans, that caution and care must be used for any activity within this area. Likewise, an unanticipated discovery clause is present, that work must cease until coordination of any discovery and any necessary action has occurred (see below)

Area FE1 (Figure 4) overlaps a Phase I cultural resources survey (Ryan et al. 1986; State Report 22-1822). The majority and remainder portion of Area FE1 has not been surveyed for cultural resources, but modern and historic aerial imagery and topographic maps show that this area is frequently inundated by the Mississippi River and has experienced movement of its bankline due to the meandering river. The boundaries as depicted of Area FE1 exist due to modeling to determine where water flowing from the CRD may accumulate, and it is the lowest topography on the landscape. This area is

determined to contain a very low potential to contain historic properties, and does not require a cultural resources survey.

Assessment of Effects

In summary, only one historic property/cemetery as defined in 36 CFR 800.16(l) is within the APE:16EBR220. The site is recorded as the Penny-Newport Plantation African American Cemetery. The impact area of Comite ROW overlaps with this historic property. This overlap is very small and at the edge of a cemetery not well-defined by fence or other markings. The cemetery is on a bluff above Bayou Baton Rouge, while the activity of USACE is to reinforce the banks of the bayou that have eroded and threaten portions of that bluff. USACE has identified the cemetery on the construction plans and required that heavy equipment keep off the bluff portion of the cemetery to ensure its protection. When working on the erosion protections measure adjacent to the channel of Bayou Baton Rouge, USACE will condition that care must be taken. Further refinement to the design plans prior to contracting the work, will be undertaken to reduce or eliminate this overlap, however the conditions will remain attached to the project. Ultimately the USACE proposed activity will reinforce the existing integrity of the cemetery and protect it against future destruction by natural forces. Although overlaps is seen between a historic property and a CDP ROW, there will be no adverse effect to the historic property.

Based on the information presented in this letter, USACE has determined that there are **No Adverse Effects to Historic Properties** due to this undertaking, as defined in 36 CFR 800.5(b). In addition to the conditions state above, this project will be subject to the standard change in scope of work, unexpected discovery, and unmarked human burial sites act provisions. USACE requests your comments within 30 days.

We look forward to your concurrence with this determination. Should you have any questions or need additional information with this undertaking, please contact Dr. Paul Hughbanks, Archaeologist; U.S. Army Corps of Engineers, New Orleans District at paul.j.hughbanks@usace.army.mil; or Brian Ostahowski, Archaeologist and Tribal Liaison at (504) 862-2188 brian.e.ostahowski@usace.army.mil.

Sincerely,

JASON A. EMERY
Acting Chief, Environmental Planning Branch

CC:File
LA SHPO
An electronic copy of this letter with enclosures will be provided to Ms. Melanie Carson, Tribal Historic Preservation Officer, Mississippi Band of Choctaw Indians, Section106@choctaw.org.

Sources Cited

Markell, Ann, Ralph Draughon, Susan Barrett Smith, Thomas Fenn, Michele Williams, James A. Green, Jeremy Pincoske, and Rick Wappenstein
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DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, NEW ORLEANS DISTRICT
7400 LEAKE AVE
NEW ORLEANS LA 70118-3651

March 14, 2025

Regional Planning and
Environment Division, South
Environmental Planning Branch
Attn: CEMVN-PDS-N

Mr. David Hill, Principal Chief
Muscogee (Creek) Nation
Attn: Historic and Cultural Preservation Office
P.O. Box 580
Okmulgee, OK 74447

RE: Section 106 Review Consultation
Undertaking: Inundation Effects from the Outflow of the Comite River Diversion Project, East Baton Rouge Parish, Louisiana.
Determination: No Adverse Effect to Historic Properties

Dear Principal Chief Hill:

The U.S. Army Corps of Engineers (USACE), New Orleans District, proposes to enlarge the Right-of-Way (ROW) of the Comite River Diversion Project (CRD) in East Baton Rouge Parish, due to recognition of additional Areas of Potential Effect (APE).

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JASON A. EMERY
Acting Chief, Environmental Planning Branch

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An electronic copy of this letter with enclosures will be provided to Dr. Savannah J. Waters, Tribal Historic Preservation Officer, Muscogee (Creek) Nation, Section106@muscogeenation.com.

Sources Cited

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DEPARTMENT OF THE ARMY
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7400 LEAKE AVE
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March 14, 2025

Regional Planning and
Environment Division, South
Environmental Planning Branch
Attn: CEMVN-PDS-N

Lewis J. Johnson, Principal Chief
Seminole Nation of Oklahoma
36645 US-270
Wewoka, OK 74884

RE: Section 106 Review Consultation
Undertaking: Inundation Effects from the Outflow of the Comite River Diversion Project, East Baton Rouge Parish, Louisiana.
Determination: **No Adverse Effect to Historic Properties**

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An electronic copy of this letter with enclosures will be provided to Mr. Benjamin Yahola, Tribal Historic Preservation Officer, Seminole Nation of Oklahoma, Yahola.b@sno-nsn.gov .

Sources Cited

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Regional Planning and
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Attn: CEMVN-PDS-N

Marshall Pierite, Chairman
Tunica-Biloxi Tribe of Louisiana
P.O. Box 1589
150 Melacon Road
Marksville, LA 71351

RE: Section 106 Review Consultation
Undertaking: Inundation Effects from the Outflow of the Comite River Diversion Project, East Baton Rouge Parish, Louisiana.
Determination: No Adverse Effect to Historic Properties

Dear Chairman Pierite:

The U.S. Army Corps of Engineers (USACE), New Orleans District, proposes to enlarge the Right-of-Way (ROW) of the Comite River Diversion Project (CRD) in East Baton Rouge Parish, due to recognition of additional Areas of Potential Effect (APE).

As part of USACE's evaluation and in partial fulfillment of responsibilities under the National Environmental Policy Act and Section 106 of the National Historic Preservation Act, USACE offers you the opportunity to review and comment on the potential of the proposed action described in this letter to affect historic properties. Additionally, in accordance with the responsibilities of Executive Order 13175, USACE offers Federally-recognized Tribes the opportunity to review and comment on the potential of the proposed undertaking described in this letter to significantly affect protected tribal resources, tribal rights, or tribal lands.

Description of the Undertaking

A Supplemental Environmental Assessment (SEA #601) is being prepared to address the acquisition of flowage easements adjacent to previously authorized project boundaries. Once the project becomes operational, it is possible that 1,234 acres of additional property could see inundation from the diversion flows. On the included Figures 1 - 4, these flowage easements (inundation areas) are marked as FE1 – FE11. The majority portion of these acres is located in a lowland area (FE1) adjacent to the Mississippi River, an area that already frequently is seasonally flooded by high river waters.

There also have become identified some necessary additional lands to complete project components, such as rerouting the intersection of Carney Road with Highway 964, and fortifying the banks of Bayou Baton Rouge with stone to prevent washout and

damage to the road. These areas are a total of 44.1 acres. Figures 1 - 4 displays these areas as I1 – I10. These actions and areas constituted the Undertaking.

Figure 1 also displays areas A1 – A6. These areas are identified as no longer necessary ROW for construction of the Comite River Diversion (CRD). They will not be discussed further and they are no longer part of the Undertaking.

Area of Potential Effects (APE)

The entire area demarcated for each individual additional impact area has been identified as the APE. There are several discontinuous APEs for these projects because all are associated to the Comite River Diversion (CRD) but are unique locations. Likewise, these new APE define all direct and indirect effects from the project, as all associated effects will not be separately identifiable from the CRD once that project is completed.

Figure 1, and the above Description of the Undertaking, display and describe the new APE for this project.

Identification and Evaluation

Background and literature review has been conducted by USACE staff. Historic properties in the project vicinity were identified based on a review of the NRHP database, the Louisiana Cultural Resources Map, historic map research, and a review of cultural resources survey reports, both contracted for this Undertaking and for other undertakings. Figures 1-6 are added to this letter to aid in understanding the overlap of these new areas and previous cultural resource survey findings. Figures 1 – 4 were created by ArcGIS and combine CRD ROW and SHPO data. Please observe that Figure 1 encompasses the entire CRD and utilizes different colors to display the ROW (blue), the Flow Easements (green), and the Areas Impacted (peach). Please observe that there is very little of the CRD ROW visible due to its coverage by Phase 1 cultural resources survey. This letter exists to narrate any areas where Flow Easements or Areas Impacted are not overlain by Phase 1 survey or where cultural resource sites (red) are present.

Areas F2 – F11 and Areas I2, I3, I9 and I10 are all within areas previously subject to Phase I cultural resources survey, and no historic properties were identified. As further described below, Areas I1, I4A, I4B, I5, I7, and I8 have such high percentage overlap to previous cultural resources survey with no findings of historic properties adjacent to the new APE, that the remaining portions are determined to have no potential of undiscovered historic properties.

Areas I1, I7, and I8 all received Phase I cultural resources survey and have been reported within a Management Summary prepared by R. Christopher Goodwin and Associates (Heller et al. 2020). Figure 2 displays a closer view of this project area. Due to the Covid Pandemic and human error, this Management Summary was not previously coordinated with consulting parties. The report (attached) concludes that the areas I1, I7, and I8 do not contain historic properties. USACE accepts and repeats this

finding of no historic properties within I1, I7, and I8. The Management Summary is included in this letter, for your review and reference. Figure 5 and Figure 6 are included in this letter as extracted from the Management Summary, to display Areas now termed I1, I7, and I8, for your easiest reference.

Areas I4B, I4A, and I5 all overlap with previous cultural resource survey but contain additional unsurveyed areas (Figure 2). Area I4B contains approximately 0.5 acre of land that has no cultural resources survey. It is immediately adjacent to a survey (Markell et al. 1997; State Report 22-1978) that recorded no historic properties in this immediate area, and the remainder of Area I4B is determined to have no potential for historic properties. Area I4A straddles the northern boundary of a Phase I cultural survey area (Markell et al. 1997; State Report 22-1978). No historic properties were located by this Phase I survey and the remainder of Area I4A is determined to be low potential for historic properties. Area I5 also overlaps this previous cultural resources survey (Markell et al. 1997; State Report 22-1978). A late 19th Century historic artifact scatter (16EBR153) was discovered and does overlap Area I5. However this site is listed on the SHPO database as ineligible for the National Register of Historic Places (NRHP). There is a small portion of Area I5 that is outside the previous survey but is mostly an overlap with the existing Carney Road. This area is previously disturbed and is determined to be low potential for an undiscovered cultural resource.

Area I6 (Figure 3) shows a slight overlap with the presumed but unmarked boundaries of the Penny-Newport Plantation African American Cemetery (16EBR220). In a field visit during January 2020, archaeologists Nathanael Heller (Goodwin and Associates), Paul Hughbanks (USACE) and Chip McGimsey (LA SHPO) used past research and current landscape clues to determine a best-probable boundary of the cemetery including the currently collapsing bluff on which the cemetery is located above Bayou Baton Rouge. The activity and ROW related to the CDP at this location is two-fold: the channel of Bayou Baton Rouge is being fortified by the placement of stone to prevent meander and erosion and further collapse of the bluff containing 16EBR220; also Carney Road is being rerouted towards Highway 964, to pass north of the Comite Diversion Channel and below the bluff of Bayou Baton Rouge. The CDP ROW lines contain buffer to prevent erroneous or incidental shaving of the bluff that contains 16EBR220. Specifications have been written into all USACE Design Plans, that caution and care must be used for any activity within this area. Likewise, an unanticipated discovery clause is present, that work must cease until coordination of any discovery and any necessary action has occurred (see below)

Area FE1 (Figure 4) overlaps a Phase I cultural resources survey (Ryan et al. 1986; State Report 22-1822). The majority and remainder portion of Area FE1 has not been surveyed for cultural resources, but modern and historic aerial imagery and topographic maps show that this area is frequently inundated by the Mississippi River and has experienced movement of its bankline due to the meandering river. The boundaries as depicted of Area FE1 exist due to modeling to determine where water flowing from the

CRD may accumulate, and it is the lowest topography on the landscape. This area is determined to contain a very low potential to contain historic properties, and does not require a cultural resources survey.

Assessment of Effects

In summary, only one historic property/cemetery as defined in 36 CFR 800.16(l) is within the APE:16EBR220. The site is recorded as the Penny-Newport Plantation African American Cemetery. The impact area of Comite ROW overlaps with this historic property. This overlap is very small and at the edge of a cemetery not well-defined by fence or other markings. The cemetery is on a bluff above Bayou Baton Rouge, while the activity of USACE is to reinforce the banks of the bayou that have eroded and threaten portions of that bluff. USACE has identified the cemetery on the construction plans and required that heavy equipment keep off the bluff portion of the cemetery to ensure its protection. When working on the erosion protections measure adjacent to the channel of Bayou Baton Rouge, USACE will condition that care must be taken. Further refinement to the design plans prior to contracting the work, will be undertaken to reduce or eliminate this overlap, however the conditions will remain attached to the project. Ultimately the USACE proposed activity will reinforce the existing integrity of the cemetery and protect it against future destruction by natural forces. Although overlaps is seen between a historic property and a CDP ROW, there will be no adverse effect to the historic property.

Based on the information presented in this letter, USACE has determined that there are **No Adverse Effects to Historic Properties** due to this undertaking, as defined in 36 CFR 800.5(b). In addition to the conditions state above, this project will be subject to the standard change in scope of work, unexpected discovery, and unmarked human burial sites act provisions. USACE requests your comments within 30 days.

We look forward to your concurrence with this determination. Should you have any questions or need additional information with this undertaking, please contact Dr. Paul Hughbanks, Archaeologist; U.S. Army Corps of Engineers, New Orleans District at paul.j.hughbanks@usace.army.mil; or Brian Ostahowski, Archaeologist and Tribal Liaison at (504) 862-2188 brian.e.ostahowski@usace.army.mil.

Sincerely,

JASON A. EMERY
Acting Chief, Environmental Planning Branch

CC:File
LA SHPO
An electronic copy of this letter with enclosures will be provided to Mr. Earl J. Barbry, Jr., THPO / Director, Planning & Development, Tunica-Biloxi Tribe of Louisiana, earlii@tunica.org.

Sources Cited

Markell, Ann, Ralph Draughon, Susan Barrett Smith, Thomas Fenn, Michele Williams, James A. Green, Jeremy Pincoske, and Rick Wappenstein
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Cultural Resources Survey and National Register Testing of Comite River Diversion Project,East Baton Rouge Parish, Louisiana. Prepared for the US Army Corps of Engineers, New Orleans District. On file at the Louisiana Department of Culture, Recreation, and Tourism, Baton Rouge, Louisiana. Report no. 22-1978.

Ryan, Joanne, Whitney J. Autin, Wayne Lawrence Coco, and William D . Reeves
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Cultural Resources Survey of the Proposed Comite River Diversion Alignment, East Baton Rouge Parish, Louisiana. Prepared for the US Army Corps of Engineers, New Orleans District. On file at the Louisiana Department of Culture, Recreation, and Tourism, Baton Rouge, Louisiana. Report no. 22-1822.