Conceptual Study Report

I-44 Flood Study at Little Piney Creek

(Mile Marker 172.6 to 174.0)

Near the City of Jerome, Phelps County

January 18, 2019

MoDOT Job No. J5I3182

Prepared By:

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MEMORANDUM

Missouri Department of Transportation

DATE: January 18, 2019

TO: David Silvester, P.E.
District Engineer

FROM: Matthew Dawson, P.E., PTOE
Project Engineer

SUBJECT: District Central District - Design - Design
Route Interstate 44, Phelps County
Flood Study
Between Log Miles 172.6 and 174.0
Job No. J5I3182
Conceptual Study Report

REMARKS

☒ Major Route ☐ Minor Route

DESIGN TRAFFIC

ADT (Const.)	= TBD
ADT (Design)	= 27,476
DHV	= 10%
D	= 50%
% Trucks	= 52.2% Single Unit/ Panel Trucks & Buses 21.3% Multi Unit Trucks
Operational (Posted) Speed	= 70 mph

CONCEPTUAL COST ($1,000's)

Right of Way: None Anticipated
(Unless railroad will allow)
Construction: $10,950
(Includes 20% Contingency)
Utility: None Anticipated
Engineering: $550
(5% of construction)
Construction
Administration: $1,095
(10% of construction)

Purpose

Successively higher record flood elevations in 2013, 2015, and 2017 have led to the overtopping of I-44 resulting in multi-day closures. Given the rural setting of the project site, the posted detour route starts in Rolla, ends in Springfield, and adds 31 miles, and 48 minutes to a through trip. In 2017, the District began the process of looking at options for addressing existing flood concerns.

A benefit-cost analysis was prepared to examine the cost and relative merits of raising mainline I-44 above flood elevation (Option 1) compared to constructing a new bridge over Little Piney

Creek to connect Arlington Outer Road east of the creek to South Outer Road to the west of the creek (Option 2). With I-44 being the second most used corridor in the state, the current hydraulic conditions were analyzed for both alternatives to minimize the chance of future interstate closures at this location. Based on this analysis, it was recommended with concurrence from the District, that raising I-44 (Option 1) be advanced as the preferred alternative for development of this concept study report based on initial cost and utility provided to the traveling public.

Concept level design was developed to raise both directions of I-44 pavement and shoulders above the current flood of record plus one foot of free board. Existing 12 feet wide lanes, 10 feet wide outside shoulders, and four feet inside shoulders would be maintained. Existing guardrail and low-tension guard cable will also be reestablished. No work is proposed on the existing I-44 structures over Little Piney Creek.

EXISTING FACILITIES

I-44 is an east-west roadway through central Missouri traveling between St. Louis and Springfield before entering Oklahoma west of Joplin. The project site is located southwest of the City of Jerome (Appendix A) and consists of four lanes of traffic, two in each direction, separated by an open turf median. Guardrail is present approaching and departing the existing I-44 bridges over Little Piney Creek to protect the safety barrier curb on the bridge, and steep side slopes immediately off of the bridge. Low-tension guard cable is present along the inside shoulders for both directions of travel. Little Piney Creek flows northwest under I-44 and merges into the Gasconade River near Jerome. Short-term flooding issues have impacted I-44 in this vicinity since its original construction. In the last 10 years, the frequency and duration of the flooding issues have been increasing. In 2013, a storm resulted in record flooding, up to five feet in depth over the interstate, along a 0.5 mile section of I-44, closing the interstate. In 2015, a new record flood event eclipsed the 2013 flood, inundating the interstate by six feet, forcing a three day closure. In 2017, a new record flood overtopped the interstate by up to eight feet in depth, forcing a longer closure.

Existing 1960's record drawings, consisting of plan and profile sheets, for the original construction of the I-44 roadway were reviewed. Record drawings for the two mainline bridges were are also reviewed.

Beginning Log Mile	Pavement		Year Built	Roadbed Width	Min. R/W Width	Access Control
	Width	Type				
172.6 EB/WB	24'-0"	Reinf. Conc. w/ Asphalt Overlay	1966	38'-0"	275 FT (Approx.)	Fully Controlled

EXISTING BRIDGES

Two bridges carrying I-44 over Little Piney Creek are located within the limits of the proposed improvements. No structural modifications are proposed for these structures. Proposed roadway work will impact the bridge approach slabs but are planned to stay off of the actual structure.

Bridge No.	Location	Type	Length	Width	Year Built	Condition Ratings		
						Deck	Super	Sub
A6671	WB I-44	Steel Continuous	1,115'-10"	38'-1"	2002	6	8	7
G0418	EB I-44	Steel Continuous	1,091'-10"	32'-2"	1966	7	7	7

An existing 10 feet wide by eight feet tall concrete box culvert passing under both directions of I-44 will need to be extended beyond the limits of the widened roadway embankment. Along eastbound the structure is located near proposed station 145+69 and needs to be extended approximately 35 feet. From westbound the structure is located near proposed station 245+31 and needs to be extended approximately 30 feet.

PROPOSED DESIGN CRITERIA

Selection of the design high-water elevation was critical in designing the new I-44 profiles. Typical design per the EPG would require the roadway to be placed at or above the 100 year storm event plus one foot of freeboard which is barely above the high water mark from the 2017 flood, which was found to be equivalent to a 150 year event. To avoid impacting the existing I-44 bridges over Little Piney Creek, the roadway was set to a flood elevation of 697.55, equivalent to the flood of record (April 2017) plus one foot of freeboard. Raising the roadway further would require modification or reconstruction of the existing I-44 bridges which is not desirable given their current condition and remaining service life.

Functional Classification	Design Speed	No. & Width Of Lanes	Roadbed Width	Right of Way	
				Width	Control
Interstate	70 mph	2-12' Lanes Each Direction	38'-0"	Existing	Fully Controlled

PROPOSED DESIGN

Lidar survey data, provided by the District, was utilized in developing the concept plans for raising I-44 above the desired flood elevation. Limited field survey was also conducted to help establish computer simulation modeling of existing hydraulic conditions in Little Piney Creek. During design the project area should be surveyed to refine the roadway design and confirm impacts to the areas alongside the roadway.

Attempts to reestablish the existing roadway alignment based on the 1960's record drawings and match them with the current Lidar data were not successful. Instead, best fit alignments were established independently for the eastbound and westbound pavements. Record drawings were consulted to help verify existing curve radii and rates of super elevation.

The roadway profiles were set above the desired flood elevation to account for the full maximum super elevation rate of 5.6% found in this section to ensure the shoulders and pavement remain above the desired flood elevation. Existing profile grades just west of the existing structures are at or near 0%. To help minimize fill and overall length of improvement a similar 0% grade is being proposed along the low portion of the profile. SAG vertical curves are proposed at either end of this grade to tie back into existing. The eastern vertical curves approaching each structure will end within the limits of approach slab but before the bridge deck begins on each structure. This is a key area that will need to be verified by detailed survey during design.

Proposed roadway profiles will have maximum grade increases of approximately seven feet for eastbound and eight feet for westbound. Where possible, the existing side slopes will be reestablished at either end of the improvements until the higher profile pushes those slopes into existing ditches. When necessary, the side slopes would be steepened to help reduce the footprint of the new embankment, required fill volumes, and impacts to existing drainage.

Guardrail length of need has been evaluated both for the ultimate condition and during stage construction operations for the western quadrants of the existing structures. Depending on the construction methods, additional guardrail and/or temporary concrete barrier design may be necessary to protect temporary conditions away from the bridge.

Existing right of way information was limited to what could be extracted from the original I-44 Record Drawings from the 1960's. Based on these plans, the Department of Defense (DOD) railroad to Fort Leonard Wood, parallel to and south of eastbound I-44, has 50 feet of right of way on either side of the track centerline. This would place the toe of any new embankment slopes on DOD property requiring an easement. Since the easement may be difficult or impossible to obtain it has been assumed that a mechanically stabilized earth wall system would be built to keep the improvements within existing right of way. A 12 feet wide access road is shown along the face of wall for maintenance access in the future. During design the acquisition of an easement should still be explored since it will likely be more cost effective than construction of a retaining wall. It is estimated that an easement 40 feet wide by 1,900 feet long, or 1.75 acres, would be needed from the DOD railroad property.

See Appendix B for proposed typical sections and Appendix C for proposed plan and profile exhibits. Appendix D includes the cost estimate for the improvements to which a 20 percent contingency was added to arrive at the conceptual construction cost estimate on the first page of the report.

CONSTRUCTION STAGING

To allow for the existing eastbound and westbound I-44 roadway profiles to be raised 7 to 8 feet above existing it will be necessary to close both lanes in one direction of travel on I-44 at a time and utilize the opposing lanes to maintain bidirectional traffic throughout construction. Staging configurations are limited by the narrow existing bridge widths of 38'-1" westbound and 32'-2" eastbound. A total of three options were examined for maintaining traffic.

Option 1 – 1 Lane in Each Direction

Two total lanes of traffic, one in each direction, would be provided during construction of each of the two stages. Temporary concrete barrier with glare screen would be used between the opposing directions of travel during two-way operations. Eastbound configuration would be 12 feet lanes, a 2 feet concrete barrier with 1 foot inside shoulders, and 2 feet outside shoulders in each direction.

Option 2 – 2 Lanes in One Direction and 1 Lane in the Opposite Direction

3 total lanes would be divided to provide two lanes in one direction and one lane in the opposing direction. The eastbound structure is not wide enough to support this configuration and would require unacceptably narrow lane widths. Assuming 1 foot inside and outside shoulders and a 2 feet wide concrete barrier the resulting lanes would only be 8'-8" which is too narrow for interstate traffic.

Option 3 – 2 Lanes Each Direction with Bridge Widening

In order to maintain two lanes of travel in each direction both bridges would need to be widened to 52 feet to accommodate 4-11 feet wide lanes, a 2 feet concrete barrier with 1 foot inside shoulders, and 2 feet wide outside shoulders in each direction. Both structures could be widened to the outside with the addition of two new girder lines to support the wider deck and the existing piers could be widened at the cap level. Due to the existing bridge piers being hammer heads, the pier widenings will consist of two columns per bent. It is anticipated that the columns will be supported on drilled shafts due to the relatively shallow nature of existing rock, as well as reducing the scour susceptibility of the foundations. The span lengths of the existing bridges, as well as the height of the piers, are the driving factors in the cost of the widenings estimated to be $4.8 million for westbound and $4.5 million for eastbound.

Based on the available existing structure widths, it is recommended that two lanes of traffic, one in each direction, be provided during each of the two construction stages as outlined in Option 1 above. It is further recommended that eastbound improvements be built first, to take advantage of the lower profile increase which helps to reduce the impact of temporary slopes and drainage on the median area. Once eastbound is completed, traffic would be switched to the new pavement to allow westbound to be rebuilt.

CONSTRUCTION IMPACT ON TRAFFIC

During the summer of 2018 the eastbound I-44 bridge over Tater Hollow Tributary, just west of the limits for this project, was reduced to a single lane for repair work. On the afternoon of August 5th an 8 mile back up was reported by the Districts twitter account and various news outlets. Hourly traffic volume data available through the Transportation Management System (TMS) database showed volumes too low to cause such a backup. However, these counts we likely collected on a typical weekday and not during a summer weekend when volumes are likely to increase heading to and from Lake of the Ozarks, Branson, and other locations.

Using additional traffic volumes provided by the District a traffic analysis was completed using the MoDOT developed spreadsheet for queues through a workzone. The conditions were analyzed for reducing the two existing lanes at 70 mph down to a single lane in each direction posted at 50 mph.

According to the adjusted vehicle counts provided by the District, the heaviest peak hour volume for the eastbound direction is at 12:00 pm on Sunday with a peak hour volume of 2033 vehicles. The figure below shows the adjusted number of vehicles per hour for the last week of May.

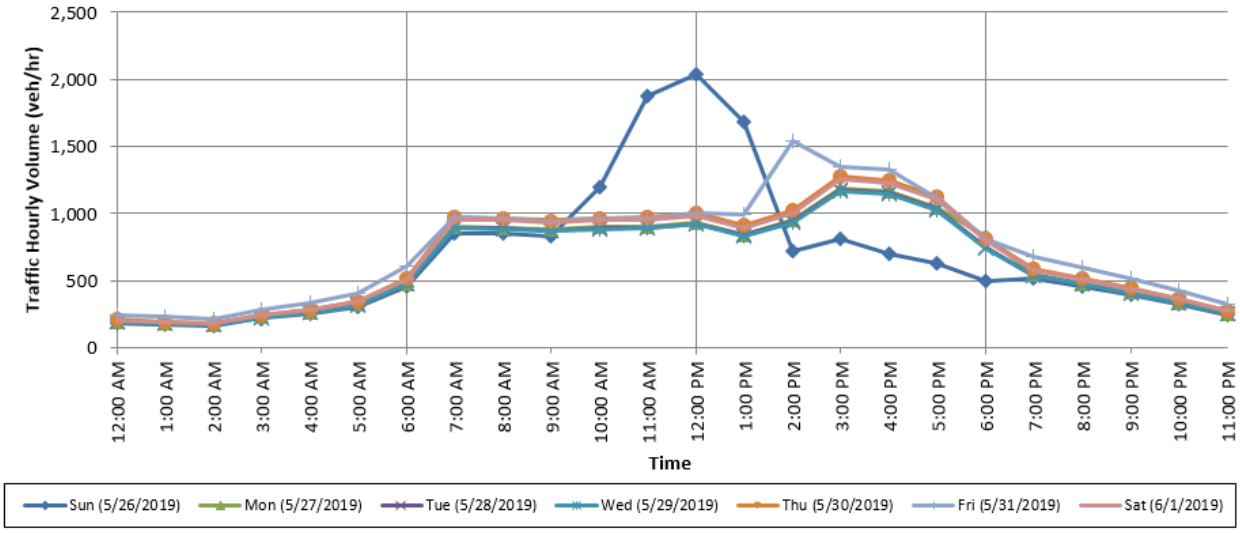

Figure 1: Eastbound Hourly Volumes

According to the adjusted counts, the heaviest peak hour volume for the westbound direction is at 1:00 PM on Friday with a peak hour volume of 1603 vehicles.

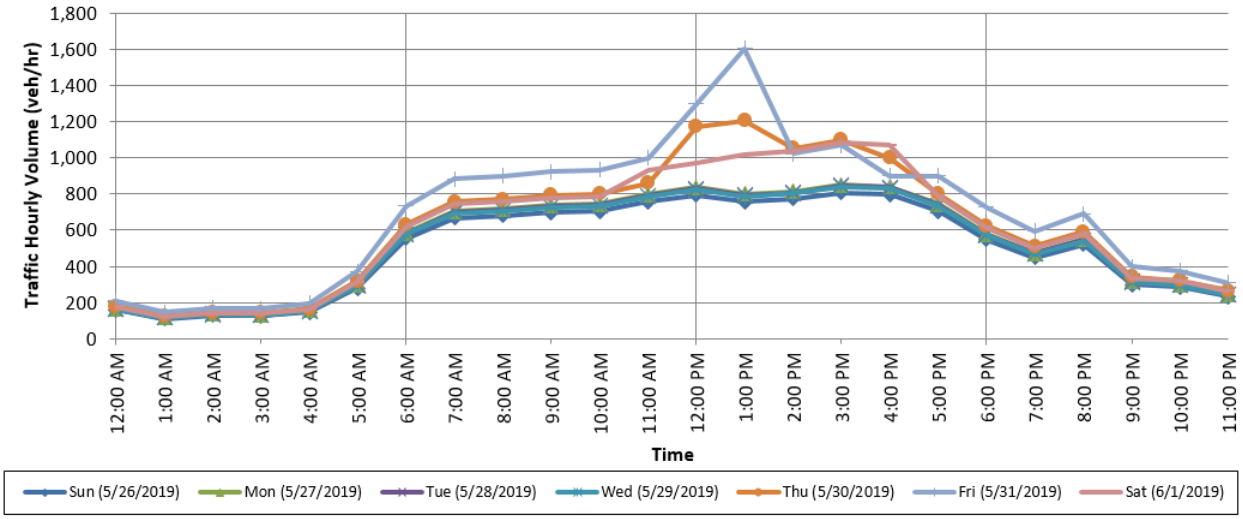

Figure 2: Westbound Hourly Volumes

With the reduced speed, and based on previous experience, MoDOT recommended an expected capacity of 1000 vehicles per lane for a single lane workzone. The table below shows the maximum queues and delays expected based on the above volumes.

The eastbound direction is expected to have significant queues and delays almost every day of the week. The volumes in the eastbound direction are consistently higher than the volumes in the westbound direction. The Sunday queue in the Eastbound direction is expected to reach almost 8-miles and cause up to 2 hours and 45 minutes of delay. The Friday queue in the westbound direction is expected to reach 2.8 miles in length and result in a delay of approximately one hour.

Maximum Queue Length and Delay

Day of the Week	Maximum Queue (Miles)		Maximum Delay (Minutes)	
	Eastbound	Westbound	Eastbound	Westbound
Sunday	7.9	0	167	0
Monday	1.1	0	23	0
Tuesday	1.0	0	21	0
Wednesday	1.0	0	20	0
Thursday	1.9	1.5	40	32
Friday	3.8	2.8	80	60
Saturday	1.7	0.6	35	12

Assuming that the proposed improvements outlined in this report are constructed during the summer month's similar lengthy queues will be a possibility throughout construction. One possible strategy for addressing this would be to have the contractor preposition changeable message signs that could be activated when the delay reaches a certain threshold so that through traffic could be directed to an alternate route (Route 360 to US 60 to US 63). When a detour is

not needed, such as the overnight hours, the signs could simply warn of possible delays between mile markers 172 and 174.

New concrete crossovers would be located east and west of the work zone to facilitate traffic on the side being closed moving to the opposing lanes of traffic. Potential cross over locations are found east of the existing Little Piney Creek structures and west of the project between the Hog Hollow Road interchange and the I-44 bridges over the Tater Hollow Tributary. This option would allow for the following minimum dimensions when using the existing eastbound bridge:

- Two 11-feet travel lanes
- Two feet concrete barrier with One foot inside shoulders
- Three feet outside shoulders

HYDRAULICS

There are three drainage channels that define hydraulic conditions along I-44: the Gasconade River, Little Piney Creek and Tater Hollow. Little Piney Creek passes under the I-44 bridge and discharges into the Gasconade River near Jerome, Missouri. Tater Hollow is a tributary draining to Little Piney Creek that parallels the north embankment before entering Little Piney Creek just downstream of the bridge. Evaluation of the three drainage channels was conducted to identify flooding conditions and define the potential impacts of the proposed improvements.

The Gasconade River (2,840 sq.mi. drainage area) is the source of recent flooding that has overtopped I-44 and forced several closures. While the Gasconade River does not cross I-44, its backwater rises up Little Piney Creek, filling the valley and overtopping the roadway. The Gasconade River flows parallel to I-44 passing through the community of Jerome. Two bridges cross the river near the confluence with Little Piney Creek, Route D and BNSF Railway. Of these crossings, the BNSF Railway bridge has potential to impact backwater elevations projected onto I-44.

Little Piney Creek (266 sq.mi. drainage area) crosses beneath I-44 one-quarter mile upstream of the Gasconade River. While the I-44 bridge is elevated high above all historical flood events, its in-water features, such as, piers, abutments and embankments influence hydraulics within Little Piney Creek. The I-44 road profile has a sag on the west side of the bridge making a one-half mile section of interstate prone to flood inundations.

Tater Hollow (9 sq.mi. drainage area), a tributary to Little Piney Creek travels along the north side of I-44 before entering Little Piney Creek. This tributary collects upstream runoff from Tater Hollow, Smith Hollow and an Unnamed Tributary which pass beneath I-44 through a bridge, box culvert and pipe culvert to the west. The bridge is outside of the proposed project limits; however, the culverts will be impacted by the embankment widening and will need to be extended.

An analysis of recent flood events on Little Piney Creek was conducted using USGS stream gage #0693200 data near Newburg, MO. This gage has a 90-year flood record. The 2017 flood was the tenth highest on record at 21,000 cfs and the December 2015 event was the seventh highest at 24,000 cfs. The flood of record of 32,500 cfs results in a statistical frequency near a 50-year event. The 2017 flood is estimated near a 15-year frequency and the 2015 flood is near a 25-year event. According to this analysis the Little Pine Creek watershed has not yet experienced the magnitude of a 100-year event (near 40,000 cfs).

Recent Flood Events on Little Piney Creek

Flood Event	Rank	Year	Peak Flow	Frequency
Flood of Record	1st	1946	32,500 cfs	50-year
2015 Flood	7th	2015	24,000 cfs	25-year
2017 Flood	10th	2017	21,000 cfs	15-year
2013 Flood	13th	2013	20,100 cfs	10-year
2008 Flood	14th	2008	17,800 cfs	9-year
2010 Flood	15th	2010	15,800 cfs	7-year

The backwater produced by the Gasconade River is the most critical hydraulic component in the area. USGS stream gage #06933500 in Jerome, MO provides 99 years of record dating back to 1897. The three highest recorded flood events have all occurred in the past four years. The third largest flood of record occurred on August 7, 2013 producing a peak discharge of 138,000 cfs. The second largest flood of record occurred on December 29, 2015 producing a peak discharge of 140,000 cfs. The highest flood of record occurred on May 1, 2017 producing a peak discharge of 197,000 cfs. All of these events overtopped I-44 and forced road closure for several days.

Recent Flood Events on Gasconade River

Flood Event	Rank	Year	Peak Flow	Frequency
Flood of Record	1st	2017	197,000 cfs	150-year
2015 Flood	2nd	2015	140,000 cfs	50-year
2013 Flood	3rd	2013	138,000 cfs	50-year
2008 Flood	6th	2008	118,000 cfs	30-year
2011 Flood	11th	2001	85,100 cfs	10-year

Frequency information is an evolving statistic that changes with each additional year of gage data input. A side note to the Gasconade gage analysis was developed by eliminating recent data from 2000-2017. This removes the three highest recorded events and five of the top eleven. Doing so provides 82 years of prior record and significantly shifts the discharge-frequency relationship. If the 2017 flood of record had occurred prior to the recent shift in probability, it would have been considered a 600 year flood event. This shows how significantly the recent extreme events have shifted the expected probability relationship. The following table provides the current effective Elevation-Flood Frequency relationship for I-44.

Elevation (ft)	Frequency (yr)	
687.46	10-yr	
691.10	25-yr	
693.43	50-yr	
695.48	100-yr	
696.55	150-yr	May 2017
699.42	500-yr	

Based on surveys, the lowest asphalt elevation on I-44 is 689.90, representing the edge of pavement elevation for the right shoulder on the west bound lanes. Using elevation 689.90 as the overtopping elevation for I-44, correlates to a 20-year flood frequency overtopping event.

Raising the road as proposed places the edge of shoulder, on the low side of the super elevated curve, at 697.55 which correlates to a 150-year storm event. Roadway pavement is expected to be covered and flood waters flowing over the top of roadway embankment at 699.45 which correlates to a 500-year storm event.

Raising the road and widening the embankment has the greatest potential to impact Tater Hollow. Review of the proposed embankment footprint found minimal fill within the tributary floodplain. No adverse impacts are expected for hydraulic conditions on any of the area drainage channels.

ACCIDENT DATA AND SAFETY ENHANCEMENTS

Project Accident Rate (2017) – 174.15 (Westbound) / 133.8 (Eastbound)
A summary of accident data is attached (Appendix E).

Statewide rate for a similar class of roadway - 98.02

Locations within or adjacent to the project limits which are on the "High Severity Location Lists" in the TMS database – As of 2016 this section of I-44 is included on the High Severity List.

New guardrail will be provided along I-44 to protect the west end of each existing bridge and slopes steeper than 3(H):1(V) along the outside of the roadway. Existing low-tension guard cable will be provided along the inside median shoulders in both directions.

No design exceptions have been identified for substandard geometry.

UTILITIES

Missouri One Call was contacted to open a design ticket for the project. From this two utilities were identified as possibly having facilities within the project, with one of those indicating that they did not have anything present on site. Centurylink Fiber Optic provided asbuilt plans indicating a buried fiber optic cable along the existing southern right of way line for I-44 that continue east under Little Piney Creek. Based on the location of the facility relative to proposed roadway work there is potential for impacts associated with grading of the ditches. In general the proposed work is less than 12 inches below the existing ground surface and likely clear of the actual fiber optic cables. During design development additional design coordination will be required to determine what impact, if any, may be required for this utility.

ENVIRONMENTAL SUMMARY

Hg Consult Inc. conducted the environmental screening and preliminary identification of environmental permits for the project. A copy of their full technical memorandum is attached to this report as Appendix F.

No documented threatened and endangered species critical habitats, FEMA/SEMA buyout properties, hazardous materials sites, parks or public use areas, LWCF 6(f) properties or NRHP sites, sinkhole or cave locations, underground mines, or certified wells were identified within the construction limits of the preferred alternative.

However, 0.12 acres of NWI Riverine wetlands, 15.24 acres of 100-year floodplain, and karst geology were identified with the construction limits of the preferred alternative. In addition, there are protected waters, the potential for sensitive species habitat, two previously recorded archaeological sites, and two springs that were identified within the near proximity of the preferred alternative construction limits.

POTENTIAL ENVIRONMENTAL PERMITS/COMMITMENTS

1. Prior to final design, MoDOT should conduct a biological survey of the preferred alternative construction limit area to determine the presence/absence/extent of impacted waters of the U.S. and endangered species habitat. Depending on the outcome of the survey, an Individual or Nationwide 404 permit #14 Linear Projects may be obtained from the USACE including a Section 401 Water Quality Certification from MDNR for impacts to waters of the U.S. Based on the type and extent of wetlands identified from the NWI maps, it would appear that a Nationwide 404 permit may suffice. In addition, mitigation measures or further consultation may be necessary with the USFWS to mitigate potential impacts to threatened or endangered species (see attached USACE, USFWS and MDC correspondence/information for further details).

2. Prior to final design, MoDOT should conduct an archaeological survey, with potentially testing as deemed appropriate, prior to the initiation of project related construction activities (see attached MDNR SHPO correspondence).

3. Prior to construction MoDOT should obtain a Land Disturbance Permit from the MDNR (see attached MDNR correspondence for further details).

4. MoDOT should ensure that an engineering analysis is conducted during final design for the preferred alternative prior to submission of a floodplain development permit to SEMA or the Phelps County local floodplain coordinator. The contractor shall obtain a floodplain development permit and, if there are impacts to the floodway an Engineering "no-rise" certification prior to construction. If the floodplains impacted are within State right-of-way, the floodplain development permit should be obtained from SEMA, but if floodplains impacted are outside of State right-of-way then the floodplain development

permit should be obtained from the Phelps County local floodplain coordinator (see attached SEMA correspondence).

5. MoDOT's Storm Water Pollution Prevention Plan (SWPPP) should be implemented prior to construction to prevent or minimize adverse impacts to streams, springs, wells, public drinking water supplies, water courses, lakes, ponds, or other impoundments within and adjacent to the project area. The project will comply with MoDOT's NPDES permitting requirements, including the implementation of permanent best management practices to reduce stormwater impacts to the watershed (see attached MDNR correspondence for further details).

6. MoDOT should ensure that any abandoned water wells be plugged prior to any land disturbance as these wells can act as conduits of pollutants to groundwater sources (see attached MDNR correspondence for further details).

7. Little Piney Creek is considered an Outstanding State Resource Water. Due to the nature of this project, and the designation of Outstanding State Resource Water, only flood control practices that do not adversely affect the stream should be considered. There shall be no lowered water quality in outstanding State Resource Waters (see attached MDNR correspondence for further details).

8. Prior to final design, MoDOT should coordinate with the MDC about specific design options and proposed impacts to streams, riparian corridors, wetlands or other floodplain activities (see attached MDC correspondence for further details).

9. MoDOT should ensure that construction noise is addressed in construction plans and specifications for determining measures to minimize or eliminate temporary adverse construction noise impacts to the community.

10. If regulated solid or hazardous wastes are found during construction activities, the construction inspector shall direct the contractor to cease work at the suspect site. The construction inspector shall contact the appropriate environmental specialist to discuss options for remediation. The environmental specialist, the construction office, and the contractor shall develop a plan for sampling, remediation, and continuation of project construction. Independent consulting, analytical, and remediation services shall be contracted, if necessary. The MDNR and USEPA shall be contacted for coordination and approval of required activities.

11. MoDOT should dispose of all solid waste encountered including but not limited to domestic trash, furniture appliances, empty containers, tires, etc., in accordance with Missouri's solid waste disposal regulations (see attached MDNR correspondence for further details).

12. MoDOT will require that contractors control fugitive dust to keep it from leaving the project limits. Watering the ground or using dust-retarding chemicals and washing vehicles prior to leaving the construction site may be used to reduce the generation and transport of fugitive dust. All methods must comply with applicable Federal, state, and local laws and regulations.

13. If changes in the project footprint or scope occur that were not evaluated in this memo, MoDOT shall re-evaluate this document to ensure the determinations remain valid.

Consultant Project Engineer	Date	Consultant Project Engineer	Date

Recommendations or Comments: _____

Attachments
A. Location Map
B. Typical Sections
C. Plan and Profile Sheets
D. Crash Summary

Approved by:

David Silvester, P.E. Date
District Engineer

cc: Design Division
Construction and Materials Division
Traffic Division