U.S. Army Corps of Engineers
Mississippi Valley Division
New Orleans District

Review Plan for Restoration of Levee Section prior to Armoring for the Lake Pontchartrain and Vicinity (LPV) and West Bank and Vicinity (WBV) USACE Civil Works Projects

Pursuant to 33 USC § 408

APPROVED
BY:

6 JUN 16

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Major General, USA
Commanding

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Attachments

1. Introduction

a. Purpose of This Review Plan

This Alteration-Specific Review Plan is intended to ensure quality of the review by the New Orleans District (MVN) for a series of similar requests to alter a US Army Corps of Engineers (USACE) civil works project within the MVN's area of responsibility. This review plan was prepared in accordance with Engineer Circular (EC) 1165-2-216, "Policy and Procedural Guidance for Processing Requests to Alter US Army Corps of Engineers Civil Works Projects Pursuant to 33 USC 408" (reference paragraph 7.c.(4) in EC 1165-2-216) and Engineering Circular (EC) 1165-2-214, Civil Works Review Policy, 15 December 2012. This review plan provides the review guidelines associated with a series of similar alteration(s) requests pursuant to 33 USC 408 (Section 408).

b. Guidance and Policy References

- EC 1165-2-214, Civil Works Review Policy, 15 December 2012
- ECB 2016-9, Civil Works Review, 04 March 2016
- EC 1165-2-216, Policy and Procedural Guidance for Processing Request to Alter US Army Corps of Engineers Civil Works Projects Pursuant to 33 USC 408, 30 September 2015
- Memorandum, Subject: Alterations to Federally Constructed Projects within the Mississippi Valley Division, 24 May 2015
- ER 1110-1-12, Quality Management, 31 Mar 2011
- ER 1110-2-1150, Engineering Design for Civil Works Projects, 31 August 1999
- EM 1110-2-1913 Design, Construction, and Evaluation of Levees, 30 April 2000
- District Quality Management Plan(s)
- EM 1110-2-1205 Environmental Engineering for Flood Control Channels
- WM 1110-2-2300 General Design and Construction Considerations for Earth and Rock-Fill Dams
- Greater New Orleans (GNO) Hurricane and Storm Damage Risk Reduction System (HSDRRS) Design Guidelines, May 2012

c. Description and Information

This Review Plan covers a series of similar proposed alteration(s) of the Lake Pontchartrain and Vicinity (LPV) and West Bank and Vicinity (WBV), LA, Projects, which are part of the Greater New Orleans Hurricane and Storm Damage Risk Reduction System (HSDRRS), specifically, raising earthen levee section within the LPV and WBV

projects. The requestor, Coastal Protection and Restoration Authority Board (CPRA-B) has proposed alteration(s) that consist of raising the levee sections of the Federal project to the geotechnical design/construction grade and section, plus 6-inches, prior to the placement of armoring thereon authorized under P.L. 109-234. The proposed alteration(s) will remain within the current contract footprint previously constructed by MVN and environmentally assessed in respective Individual Environmental Reports (IERs) for both the LPV and WBV project.

The purpose of the LPV and WBV earthen levees is to provide the required level of risk reduction associated with the HSDRRS project to reduce the risk of flooding from a storm surge that has a 1% annual chance of exceedance in any single year (100-yr event) The elevation required for each earthen levee section varies across the LPV and WBV projects. Each earthen levee section was constructed to an elevation that provided the required level of risk reduction in year 2007 and has an associated required elevation for year 2057 to account for the 50-year project life. The change in elevation from 2007 to 2057 accounts for projected subsidence and sea level rise. All elevations are currently expressed in NAVD88 (2004.65).

Since initial construction completion between 2012 and 2014, the subject earthen levee sections of both the LPV and WBV projects have continued to settle and subside. Many existing reaches need a lift or may need a lift within a few years to stay above the 2057 1% annual chance of exceedance project grade. The proposed alteration(s) will restore the earthen levee sections to the required elevations plus 6 inches, thus continuing to provide the required level of risk reduction without having to remove and replace the armoring within a couple of years. The lifts are planned to provide sufficient elevation to the project grade so that armoring will not need to be removed or replaced for at least 10 years.

If the proposed alteration(s) are not performed within the next few years, the earthen levee may not provide the required level of risk reduction and meet FEMA accreditation requirements for the 1% annual exceedance probability flood. Also, the proposed work will reduce the risk to overtopping in the near future.

In general the construction sequence for the proposed alteration(s) will be as outlined below:

- Clearing and grubbing of the specified reach;
- Processing and hauling borrow material to the contract area;
- Placing and compacting borrow material in horizontal lifts to meet the required project grade; and,
- Establishing turf on completed earthen levee sections.

Other items of work, specific to each earthen levee reach, may include:

- Removing concrete scour protection at earthen levee and floodwall transitions and replacing the scour protection after the earthen levee section has been raised to the required elevation; and,
- Remove and replace existing access roads. Access roads may be crushed stone or asphalt.

Depending on the specific attributes of each individual reach, other items of work may be included in the general scope of work outlined above.

The proposed alteration(s) will include raising of the earthen levee section only (excluding the wave/stability berms on both the flood and landside). The proposed alteration(s) will not include degrading of the earthen levee section during construction, however the specific reaches will be cleared and grubbed as necessary. As bare earth has more erosion potential than turf, should it be subject to an overtopping event, detailed contingency plans will be included in the final plans and specifications to minimize risk.

Once the proposed alteration(s) is approved and construction is complete, the earthen levee sections will be armored with High Performance Turf Reinforcement Mat (HPTRM) and sod, and in some locations Articulated Concrete Blocks to provide resiliency for storm surge events that are greater than the 1% annual chance of exceedance, in accordance with the Armoring Program.

d. Federal Project Background

Congress has fully authorized and funded the Hurricane and Storm Damage Risk Reduction System (HSDRRS) for southeast Louisiana. The HSDRRS includes 2 projects: the Lake Pontchartrain and Vicinity Project (LPV) and the West Bank and Vicinity Project (WBV). Combined, the two projects include five parishes and consist of 350 miles of levees and floodwalls; 73 non-Federal pumping stations; 3 canal closure structures with pumps; and 4 gated outlets.

1) Lake Pontchartrain and Vicinity Project

Many of the earthen levee sections included in the proposed alternation for restoration to design grade plus 6 inches prior to installation of armoring are in the Lake Pontchartrain and Vicinity Project. Levee sections in St Charles Parish, East Jefferson Parish, and Orleans Parish all have levee reaches include in the proposed alteration(s). In St. Charles parish the levee reaches include: LPV-4.2A and LPV-4.2B. In Orleans Parish the levee reaches are located in New Orleans East and include: LPV-109 and LPV-111. All reaches

in Jefferson Parish are included in the proposed alteration. This includes reaches LPV-00.2, LPV-01.1, LPV-02.2, LPV-19.2 and LPV-20.1.

1a) St Charles

Project Background:

Improvements to the risk reduction features in St. Charles Parish are a part of the Lake Pontchartrain and Vicinity portion of the HSDRRS. Located on the east bank of the Mississippi River, boundaries of the St. Charles Parish polder include the Bonnet Carré Spillway Lower Guide Levee which runs from the Mississippi River until slightly north of Airline Highway (US Hwy 61) then turns east roughly paralleling Airline Hwy (US 61) to the Jefferson-St. Charles Parish boundary near the Louis Armstrong New Orleans International Airport. The features built by the Corps reduce the risk associated with a storm surge event that has a one percent chance of occurring in any given year, or a 100-year storm surge. This portion of the risk reduction system is divided into four construction contract reaches which include approximately 9.5 miles of levees, four drainage structures, four floodwalls, and a railroad gate. All 100-year level risk reduction features in the LPV-St. Charles Parish project area were completed in May 2011.

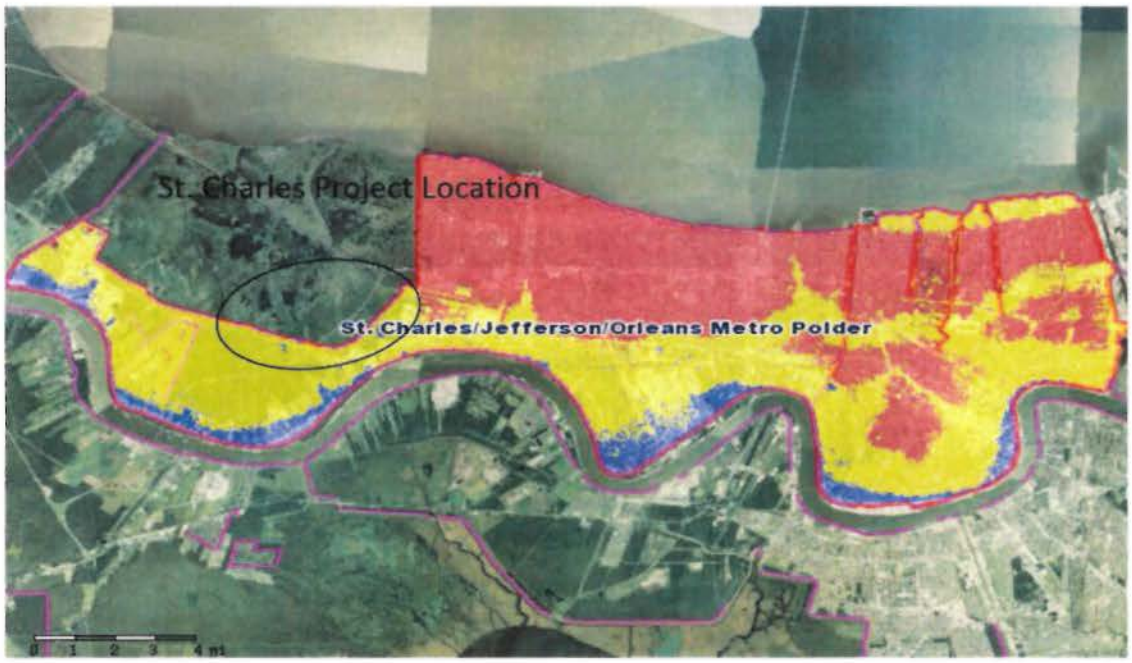


Figure 1: Location of St. Charles Parish Levees included in the proposed alteration(s)

Risk Characterization for St. Charles

The MVN performed a screening level risk assessment of the system in 2011. The assessment was approved by the Levee Safety Oversight Group in January 2016. Headquarters has not given final approval.

The LSOG considers the risk associated with the St. Charles area to be moderate (LSAC 3) for Prior to Overtopping due to the anticipated good performance and very high consequences and to be high (LSAC 2) for Overtopping due to relatively frequent likelihood of overtopping and very high associated consequences. The levee is expected to perform well under significant loading. The levee is in good condition with no noted performance concerns, however there is a very large population residing in the leveed area. The concern of the densely populated leveed area is somewhat offset by the high level of Community Awareness, Evacuation Planning, and Flood Warning Effectiveness. Oil and gas facilities within the LPV leveed area could be affected in an overtopping scenario which would have a regional and national impact to the economy.

Table 1: St Charles Overview of Flood Risk Management Project

Levee Information	
USACE District:	**MVN**
USACE Division:	MVD
NLD Segment ID#:	4404000503
NLD System ID#:	4405000553
Levee Screening ID#:	756
Proposed LSAC:	High
LSAC:	
Length (Miles):	21.79
Inspection Date:	NOV 2009
Inspection Rating:	A
Elevations (NAVD 88)	
Top of Levee Segment - Max:	33.14
Top of Levee Segment - Min:	14
Top of Levee System - Min:	14
Leveed Area Min Elev:	-6
Typical Section Height (ft.)	-
Annual Chance Exceedance (ACE)	
Toe:	1.00E+00
Authorized Capacity:	1.00E-02
Overtopping:	5.00E-03
Largest Historic Load (% of height):	25%
Flood Duration Characteristics	Medium

Table 2: St Charles LST Computed Consequences

Leveed Area Information	
Population (Day)	425373
Population (Night)	483441
# Structures	191216
Property Value (1000s)	$67,641,536
LST Computed Consequences	
% Area Inundated (> 2')	99.52
PAR (Day)	425001
PAR (Night)	483213
Evacuation Effectiveness (Prior)	79% (D) : 79% (N)
Loss of Life (Day)	2643
Loss of Life (Night)	3192
Weighted Fatality Rate (%)	2.98
Property Damages (1000s)	$47,711,606
# Structures Inundated	191114

Table 3: St Charles Annualized Consequences

Annualized Consequence	Percent Rank
Life Loss - Prior to Overtopping	98
Life Loss - Overtopping	100
Property Damage - Prior	96
Property Damage - Overtopping	100
The percent rank for this levee is relative to all levees in the Corps portfolio that have been screened to date.	

Table 4: St Charles Contribution to Risk Prior to Overtopping

Contribution to Risk Prior to Overtopping Performance Type	API	AALL	AAPD
Embankment and Foundation Seepage and Piping	32.76%	33.58%	32.75%
Embankment Stability	7.82%	8.02%	7.82%
Embankment Erosion	32.28%	33.08%	32.27%
Closure Systems	3.65%	1.24%	3.67%
Floodwall Stability	6.85%	7.02%	6.85%
Floodwall Underseepage and Piping	16.64%	17.05%	16.64%

1b) East Jefferson

Project Background:

Improvements to the risk reduction features in Jefferson Parish are a part of the Lake Pontchartrain and Vicinity portion of the HSDRRS. Located on the east bank of the Mississippi River, boundaries of the Jefferson Parish polder are the St. Charles Levee

reaches to the west and the Orleans Levee reaches to the east. This segment of the HSDRRS is oriented generally east/west along Lake Pontchartrain turning south at its western end to meet St. Charles segment near the Louis Armstrong New Orleans International Airport. In addition, the segment is bordered on the east side by the 17th St. Canal which connects an interior pump station to Lake Pontchartrain. The structures at the end of the 17th St. Canal works in conjunction with the interior pump stations to maintain a maximum water elevation in each of the canals which are much less than the expected storm surge for the 1% event along the perimeter protection.

The features built by the Corps reduce the risk associated with a storm surge event that has a one percent chance of occurring in any given year, or a 100-year storm surge. This portion of the risk reduction system is comprised of a 3.5 miles of floodwall along the Jefferson-St. Charles Parish line from the Louis Armstrong New Orleans International Airport to Lake Pontchartrain, and 10 miles of levees, floodwalls, floodgates, and fronting protection for pump stations along the Jefferson Parish Lakefront. All 100-year level risk reduction features in the LPV-Jefferson Parish polder were completed in May 2011.

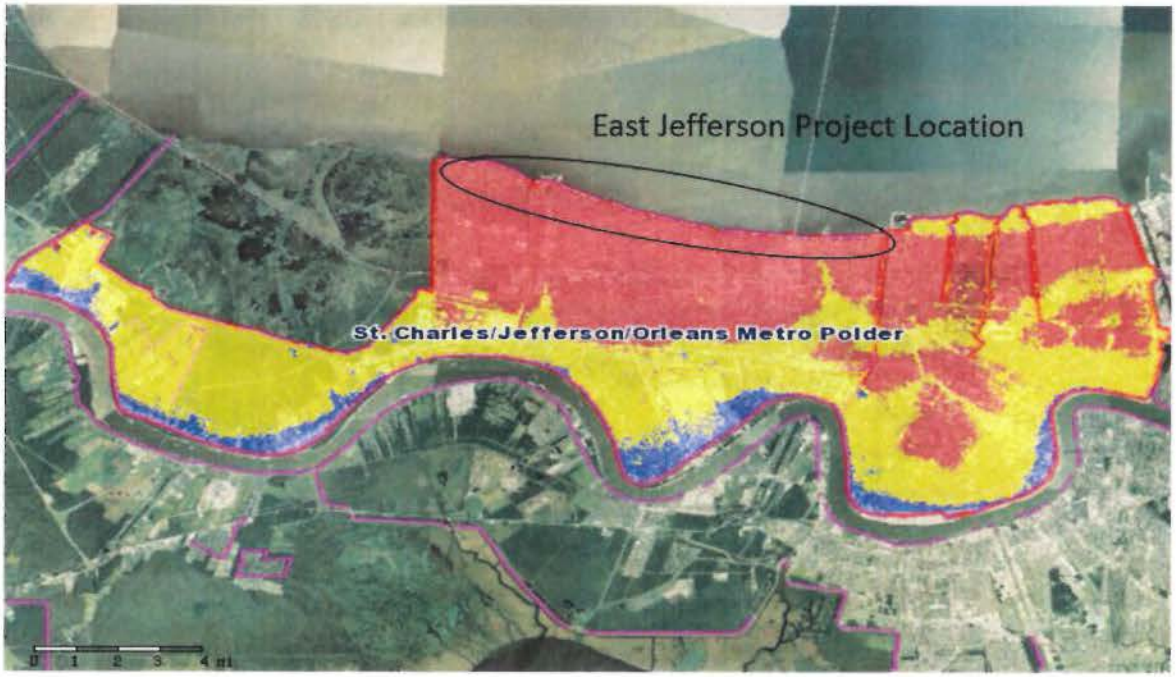


Figure 2 – Location of East Jefferson Parish Levees inlcuded in the proposed alteration(s)

Risk Characterization for East Jefferson

The MVN performed a screening level risk assessment of the system in 2011. The assessment was approved by the Levee Safety Oversight Group in January 2016. Headquarters has not given final approval.

The LSOG considers the risk associated with the East Jefferson area to be moderate (LSAC 3) for Prior to Overtopping due to the anticipated good performance and very high consequences and to be high (LSAC 2) for Overtopping due to relatively frequent likelihood of overtopping and very high associated consequences. The levee is expected to perform well under significant loading. The levee is in good condition with no noted performance concerns, however there is a very large population residing in the leveed area. The concern of the densely populated leveed area is somewhat offset by the high level of Community Awareness, Evacuation Planning, and Flood Warning Effectiveness. Oil and gas facilities within the leveed area could be affected in an overtopping scenario which would have a regional and national impact to the economy. Oil and gas facilities within the leveed area could be affected in an overtopping scenario which would have a regional and national impact to the economy.

Table 5: East Jefferson Overview of Flood Risk Management Project

Levee Information	
USACE District:	**MVN**
USACE Division:	MVD
NLD Segment ID#:	4404000504
NLD System ID#:	4405000553
Levee Screening ID#:	771
Proposed LSAC:	High
LSAC:	
Length (Miles):	28.6
Inspection Date:	MAY 2009
Inspection Rating:	M
Elevations (NAVD 88)	
Top of Levee Segment - Max:	31.52
Top of Levee Segment - Min:	15.5
Top of Levee System - Min:	14
Leveed Area Min Elev:	-6
Typical Section Height (ft.)	-
Annual Chance Exceedance (ACE)	
Toe:	1.00EIE00
Authorized Capacity:	1.00E-02
Overtopping:	5.00E-03
Largest Historic Load (% of height):	75%
Flood Duration Characteristics	Medium

Table 6: East Jefferson LST Computed Consequences

Leveed Area Information	
Population (Day)	425373
Population (Night)	483441
# Structures	191216
Property Value (1000s)	$67,641,536
LST Computed Consequences	
% Area Inundated (> 2')	99.59
PAR (Day)	425040
PAR (Night)	483241
Evacuation Effectiveness (Prior)	79% (D) : 79% (N)
Loss of Life (Day)	2643
Loss of Life (Night)	3192
Weighted Fatality Rate (%)	2.98
Property Damages (1000s)	$47,714,179
# Structures Inundated	191126

Table 7: East Jefferson Annualized Consequence

Annualized Consequence	Percent Rank
Life Loss - Prior to Overtopping	98
Life Loss - Overtopping	100
Property Damage - Prior	97
Property Damage - Overtopping	100
The percent rank for this levee is relative to all levees in the Corps portfolio that have been screened to date.	

Table 8: East Jefferson Contribution to Risk Prior to Overtopping

Contribution to Risk Prior to Overtopping Performance Type	API	AALL	AAPD
Embankment and Foundation Seepage and Piping	31.58%	32.34%	31.58%
Embankment Stability	7.54%	7.72%	7.54%
Embankment Erosion	31.12%	31.87%	31.11%
Closure Systems	3.52%	1.20%	3.54%
Floodwall Stability	10.20%	10.44%	10.20%
Floodwall Underseepage and Piping	16.04%	16.43%	16.04%

1c) New Orleans East

Project Background:

Improvements to the risk reduction features in Orleans Parish are a part of the Lake Pontchartrain and Vicinity portion of the HSDRRS. The Orleans Parish contract reaches cover both the Orleans Metro and Orleans East polders. The proposed alteration(s) included in this review plan are located in the Orleans East polder. The Orleans East Polder is comprised of seven reaches identified as LPV-105 through LPV-111 located in

Orleans Parish, Louisiana, on the south shore of Lake Pontchartrain. The contract reaches extend from the east side of the Inner Harbor Navigation Canal (IHNC) and continues eastward along the north side of New Orleans East and the US Fish and Wildlife Service (USFWS) Bayou Sauvage National Wildlife Refuge (NWR), then continue in a southerly direction along the Bayou Sauvage NWR to the Gulf Intracoastal Waterway (GIWW) and then in a westerly direction along the GIWW to the Michoud Canal. The combined length of the reaches from LPV-105 through LPV-111 is approximately 134,300 feet (~25.45 mi). It is comprised of levees, floodwalls, gates, and various closure structures. Of the seven reaches that comprise the Orleans East Polder, only two LPV-109 and LPV-111 are included in the proposed alteration(s).

The population in the New Orleans East Polder declined from 94,563 residents in the year 2000 to 63,411 residents in 2011. The New Orleans East area was greatly impacted by Hurricane Katrina in 2005. The number of residential and non-residential structures declined from 27,020 in the year 2006 to approximately 17,462 structures in the year 2012.

Figure 3 – Location of New Orleans East levees included in the proposed alteration(s)

Risk Characterization for New Orleans East:

The MVN performed a screening level risk assessment of the system in 2012. The assessment was approved by the Levee Safety Oversight Group in January 2016. Headquarters has not given final approval.

The LSOG considers the risk associated with the Orleans-New Orleans East Polder to be moderate(LSAC 3) for Prior to Overtopping due to the anticipated good performance and very high consequences and to be high (LSAC 2) for Overtopping due to relatively frequent likelihood of overtopping and very high associated consequences. The levee is expected to perform well under significant loading. The levee is in good condition with no noted performance concerns, however there is a very large population residing in the leveed area. The concern of the densely populated leveed area is somewhat offset by the high level of Community Awareness, Evacuation Planning, and Flood Warning Effectiveness. Oil and gas facilities within the LPV leveed area could be affected in an overtopping scenario which would have a regional and national impact to the economy.

Table 9: New Orleans East Overview of Flood Risk Management Project

Levee Information	
USACE District:	**MVN**
USACE Division:	MVD
NLD Segment ID#:	4404000506
NLD System ID#:	4405000504
Levee Screening ID#:	683
Proposed LSAC:	High
LSAC:	High
Length (Miles):	39.89
Inspection Date:	
Inspection Rating:	
Elevations (NAVD 88)	
Top of Levee Segment - Max:	0
Top of Levee Segment - Min:	11.4
Top of Levee System - Min:	11.4
Leveed Area Min Elev:	-6
Typical Section Height (ft.)	12 - 28.5
Annual Chance Exceedance (ACE)	
Toe:	1.00E+00
Authorized Capacity:	1.00E-02
Overtopping:	5.00E-03
Largest Historic Load (% of height):	75%
Flood Duration Characteristics	Medium

Table 10: New Orleans East LST Computed Consequences

Leveed Area Information	
Population (Day)	39942
Population (Night)	61358
# Structures	17563
Property Value (1000s)	$5,534,123
LST Computed Consequences	
% Area Inundated (> 2')	99.91
PAR (Day)	39942
PAR (Night)	61358
Evacuation Effectiveness (Prior)	83% (D) : 79% (N)
Loss of Life (Day)	222
Loss of Life (Night)	437
Weighted Fatality Rate (%)	3.34
Property Damages (1000s)	$2,433,343
# Structures Inundated	17563

Table 11: New Orleans East Annualized Consequence

Annualized Consequence	Percent Rank
Life Loss - Prior to Overtopping	93
Life Loss - Overtopping	98
Property Damage - Prior	86
Property Damage - Overtopping	96
The percent rank for this levee is relative to all levees in the Corps portfolio that have been screened to date.	

Table 12: New Orleans East Contribution to Risk Prior to Overtopping

Contribution to Risk Prior to Overtopping Performance Type	API	AALL	AAPD
Embankment and Foundation Seepage and Piping	15.66%	16.38%	15.65%
Embankment Stability	6.47%	6.76%	6.47%
Embankment Erosion	10.93%	11.43%	10.93%
Closure Systems	6.01%	1.70%	6.04%
Floodwall Stability	51.70%	54.07%	51.68%
Floodwall Underseepage and Piping	9.24%	9.66%	9.23%

2) West Bank and Vicinity Project

Many of the earthen levee sections included in the proposed alternation are part of the West Bank and Vicinity Project. This includes levee sections in Lake Cataouatche, Harvey-Westwego, Algiers-Gretna, and Belle Chasse. Belle Chasse has three levee sections that are included in the proposed alteration(s): WBV-09a, WBV-12, and WBV-MRL-6.1. Lake Cataouatche, Harvey-Westwego, and Algiers-Gretna are included in the

same polder. Levee reaches included in the proposed alteration(s) for this polder are: WBV-14b.2, WBV-14c.2, WBV-14e.2, WBV-15a.2, and WBV-18.2.

2a) Belle Chasse

Project Background:

In the Belle Chasse Polder, perimeter levees including the Mississippi River Levees, and the levees which run from the Mississippi River Levee (MRL) at Oakville to the Western Closure Complex (WCC), are intended to provide hurricane risk reduction. Along the east bank of Algiers Canal from the Western Closure Complex to the Plaquemines/Orleans Parish line, the levees are intended for retention of storm water discharge from the six pumping stations along Algiers Canal.

The perimeter HSDRRS levee within the Belle Chasse Polder consists of 13 contract reaches. The contract reaches include 8 contracts located along the Mississippi River Levee. Of these 8 contract reaches 6 are still under construction, and two are complete. WBV-MRL 6.1, which begins at the Plaquemines/Orleans Parish line and extends down river for 3.3 miles, is the only reach along the MRL that is included in the proposed alteration(s). Between the MRL and the WCC and perimeter levee consists of the following contract reaches: WBV-09a, WBV-09b, WBV-09c, WBV-12, and WBV-90. Of these reaches WBV-09A, WBV-12, and WBV-90 are included in the proposed alteration(s). WBV-09b and WBV-09c are floodwall/structures reaches.

The population for the Belle Chasse/Algiers area for October 2013 equals 17,137 residents and there are 5,395 households. The total number of structures in the area increased from 3,738 in the year 2000 to an estimate of 5,888 structures for 2013. The total value of property in the area was estimated to increase from $1.12 billion to $2.1 billion. The leveed area is very large and it would take a considerable hydraulic event for an extensive duration to inundate the leveed area to the elevation of the segment profile minimum.

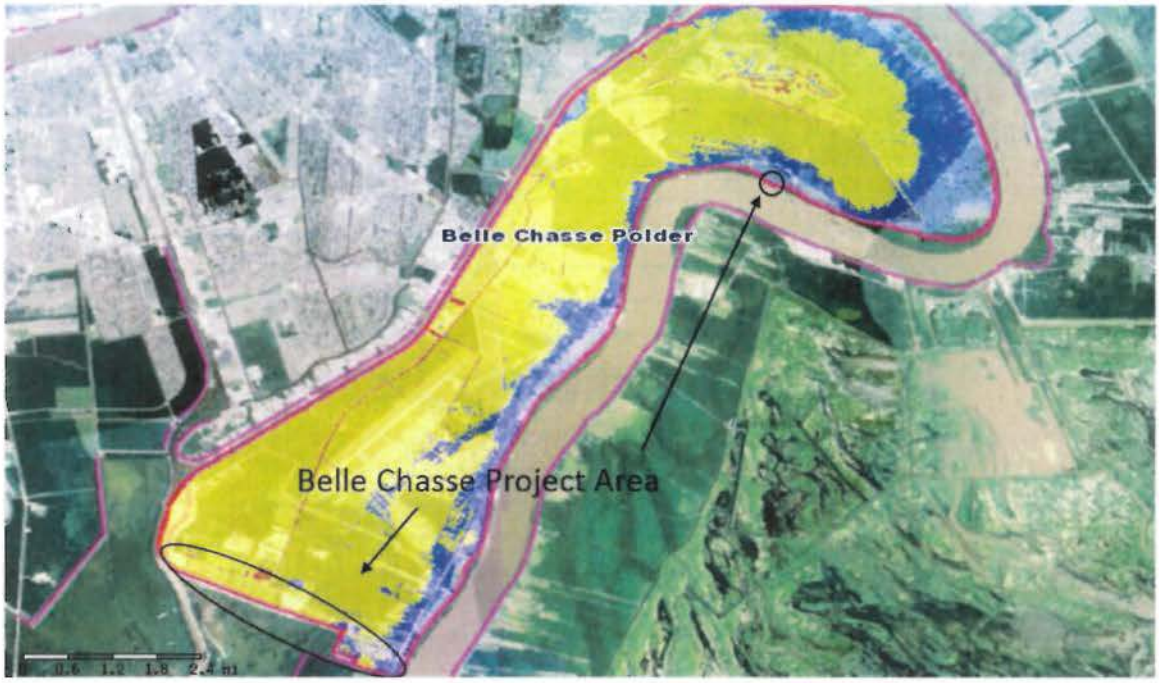


Figure 4 – Location of Belle Chasse levees included in the proposed alternation

Risk Characterization for Belle Chasse:

The MVN performed a screening level risk assessment of the system in 2014. The assessment was approved by the Levee Safety Oversight Group in January 2016. Headquarters has not given final approval.

The LSOG recommends the Plaquemines Levee District - Belle Chasse Polder, Segment as an LSAC 3 for Prior to Overtopping based on anticipated good performance but significant consequences if breach were to occur and an LSAC 3 for Overtopping due to relatively frequent likelihood of overtopping and significant associated consequences. There were no specific risk drivers for poor performance prior to overtopping since observed performance, inspections and analyses did not identify any significant concerns, evidence of distress or unacceptable maintenance issues. These concerns are somewhat balanced by extended warning times, a very active sponsor, very good community awareness, and very good evacuation planning. Oil and gas facilities within the leveed area could be affected in an overtopping scenario which would have a regional and national impact to the economy.

Table 13: Belle Chasse Overview of Flood Risk Management Project

Levee Information	
USACE District:	**MVN**
USACE Division:	MVD
NLD Segment ID#:	4404000515
NLD System ID#:	4405000510
Proposed LSAC:	
LSAC:	
Length (Miles):	21.63
Inspection Date:	MAR 2011
Inspection Rating:	M
Elevations (NAVD 88)	
Top of Levee Segment - Max:	21.35
Top of Levee Segment - Min:	12.5
Top of Levee System - Min:	8.2
Leveed Area Min Elev:	-4.25
Typical Section Height (ft.)	16 - 19
Annual Chance Exceedance (ACE)	
Toe:	1.00E+00
Authorized Capacity:	1.00E-02
Overtopping:	5.00E-03
Largest Historic Load (% of height):	50%
Flood Duration Characteristics	Medium

Table 14: Belle Chasse LST Computed Consequences

Leveed Area Information	
Population (Day)	10786
Population (Night)	16953
# Structures	5906
Property Value (1000s)	$2,061,216
LST Computed Consequences	
% Area Inundated (> 2')	99.52
PAR (Day)	10779
PAR (Night)	16940
Evacuation Effectiveness (Prior)	83% (D) : 83% (N)
Loss of Life (Day)	25
Loss of Life (Night)	39
Weighted Fatality Rate (%)	1.38
Property Damages (1000s)	$1,119,422
# Structures Inundated	5901

Table 15: Belle Chasse Annualized Consequences

Annualized Consequence	Percent Rank
Life Loss - Prior to Overtopping	82
Life Loss - Overtopping	79
Property Damages - Prior	83
Property Damages - Overtopping	91
The percent rank for this levee is relative to all levees in the Corps portfolio that have been screened to date.	

Table 16: Belle Chasse Contribution to Risk Prior to Overtopping

Contribution to Risk Prior to Overtopping Performance Type	Perf	LSI	Econ
Embankment and Foundation Seepage and Piping	15.74%	16.24%	15.74%
Embankment Stability	3.76%	3.86%	3.76%
Embankment Erosion	5.77%	5.96%	5.77%
Closure Systems	3.50%	0.43%	3.50%
Floodwall Stability	65.79%	67.88%	65.79%
Floodwall Underseepage and Piping	5.44%	5.61%	5.44%

2b) Westwego/Harvey/Algiers

Project Background:

This segment is part of the West Bank and Vicinity project and extends approximately 39 miles from the St. Charles/Jefferson Parish line to the Jefferson/Plaquemines Parish line and the Orleans/Plaquemines Parish line. This segment consists of and Exterior and Interior Alignment. The exterior alignment is serves as the perimeter of the Hurricane and Storm Damage Risk Reduction System. It extends from the St. Charles/Jefferson Parish line to the Western Closure Complex, which is located at the confluence of the Harvey Canal, Algiers Canal and the Intracoastal Waterway. The interior alignment located along the Harvey Canal and the west side of the Algiers Canal up to the Orleans/Plaquemines Parish line are intended for retention of storm water discharge from the pumping stations located along the canals. The Harvey and Algiers Canals merge into the Intracoastal Waterway at the Western Closure Complex. For a tropical event the canals are closed off at the upper end by locks and at the southern end by the Western Closure Complex. The canals are then used to drain rain water during the tropical event by use of the Western Closure Complex pumping station. The water level within the canals are maintained to a maximum level which is much less than the expected 1% event on the exterior protection. All levee reaches being lifted for armoring installation are on the exterior alignment.

The population for the Westwego/Harvey/Algiers area totaled 235,717 residents which was lower than the 247,034 residents from the 2000 census before Hurricane Katrina. Population in the area declined after Hurricane Katrina impacted the area in the year 2005; however, the number of residents has increased 9 percent between 2010 and 2013. The population for the area as of October 2013 is now estimated to be 256,523 residents. There are 90,494 residential and non-residential structures in the area for the year 2010. The average property value per structure was $315,552.The leveed area is very large and it would take a considerable hydraulic event for an extensive duration to inundate the leveed area to the elevation of the segment profile minimum.

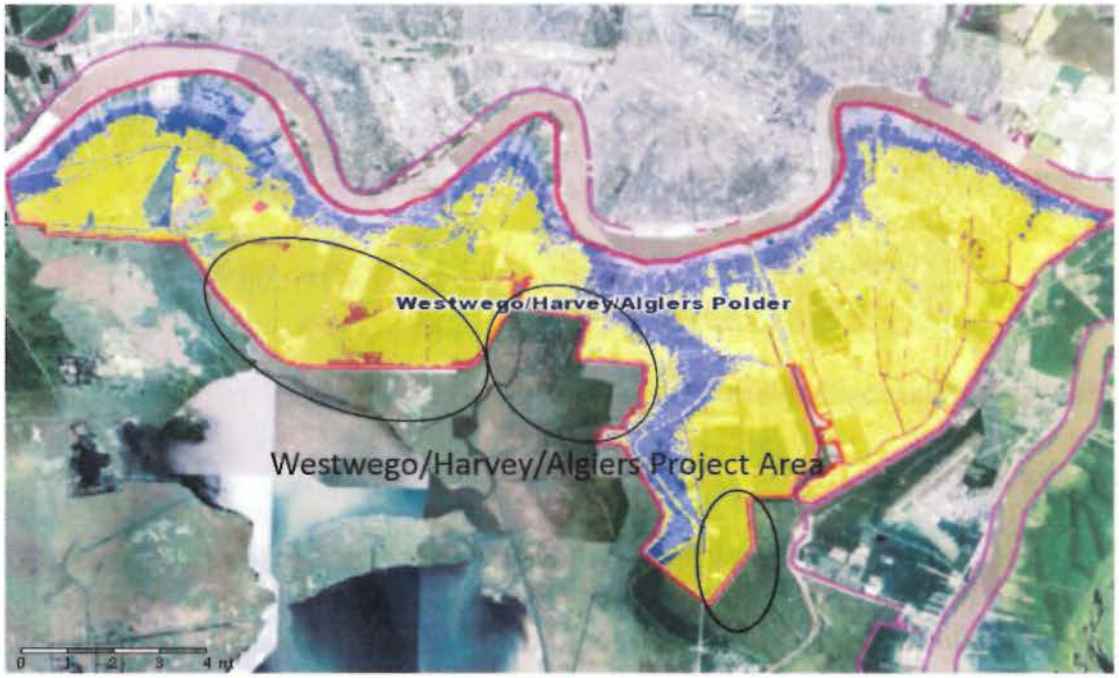


Figure 5 – Location of Westwego/Harvey/Algiers WBV levee reaches included in the proposed alteration(s)

Risk Characterization for Westwego/Harvey/Algiers:

The MVN performed a screening level risk assessment of the system in 2014. The assessment was approved by the Levee Safety Oversight Group in January 2016. Headquarters has not given final approval.

The LSOG considers the risk associated with the Orleans-New Orleans East Polder to be moderate (LSAC 3) for Prior to Overtopping due to the anticipated good performance and very high consequences and to be moderate (LSAC 3) for Overtopping due to the moderate likelihood of overtopping and very high associated consequences. The levee is expected to perform well under significant loading. The levee is in good condition with

no noted performance concerns, however there is a large population residing in the leveed area. The concern of the densely populated leveed area is somewhat offset by the high level of Community Awareness, Evacuation Planning, and Flood Warning Effectiveness. Oil and gas facilities within the WBV leveed area could be affected in an overtopping scenario which would have a regional and national impact to the economy.

Table 17: Westwego/Harvey/Algiers Overview of Flood Risk Management Project

Levee Information	
USACE District:	**MVN**
USACE Division:	MVD
NLD Segment ID#:	4404000513
NLD System ID#:	4405000552
Levee Screening ID#:	2945
Proposed LSAC:	Moderate
LSAC:	Moderate
Length (Miles):	9.61
Inspection Date:	FEB 2011
Inspection Rating:	M
Elevations (NAVD 88)	
Top of Levee Segment - Max:	26.46
Top of Levee Segment - Min:	18.7
Top of Levee System - Min:	8.2
Leveed Area Min Elev:	-5
Typical Section Height (ft.)	18.665 - 26.459
Annual Chance Exceedance (ACE)	
Toe:	1.00E+00
Authorized Capacity:	2.00E-01
Overtopping:	1.00E-03
Largest Historic Load (% of height):	50%
Flood Duration Characteristics	Long

Table 18: Westwego/Harvey/Algiers LST Computed Consequences

Leveed Area Information	
Population (Day)	169205
Population (Night)	248579
# Structures	90510
Property Value (1000s)	$33,458,417
LST Computed Consequences	
% Area Inundated (> 2')	99.77
PAR (Day)	169202
PAR (Night)	248578
Evacuation Effectiveness (Prior)	79% (D) : 75% (N)
Loss of Life (Day)	509
Loss of Life (Night)	948
Weighted Fatality Rate (%)	1.44
Property Damages (1000s)	$19,978,680
# Structures Inundated	90510

Table 19: Westwego/Harvey/Algiers Annualized Consequence

Annualized Consequence	Percent Rank
Life Loss - Prior to Overtopping	93
Life Loss - Overtopping	97
Property Damage - Prior	93
Property Damage - Overtopping	98
The percent rank for this levee is relative to all levees in the Corps portfolio that have been screened to date.	

Table 20: Westwego/Harvey/Algiers Contribution to Risk Prior to Overtopping

Contribution to Risk Prior to Overtopping Performance Type	API	AALL	AAPD
Embankment and Foundation Seepage and Piping	37.42%	38.33%	37.42%
Embankment Stability	8.93%	9.16%	8.93%
Embankment Erosion	13.72%	14.05%	13.72%
Closure Systems	4.16%	1.83%	4.16%
Floodwall Stability	7.83%	8.02%	7.83%
Floodwall Underseepage and Piping	27.95%	28.63%	27.95%

e. Review Management Organization (RMO) Coordination

The RMO is responsible for managing the overall peer review effort described in this Review Plan. The district for the peer review effort described in this Review Plan is the USACE Risk Management Center (RMC).

The products applicable to determination of impacts to the operation and maintenance of the flood risk reduction project will be reviewed against published guidance, including Engineering Regulations, Engineering Circulars, and Engineering Manuals, Engineering Technical Letters, Engineering Construction Bulletins, Policy Guidance Letters, implementation guidance, project guidance memoranda and other formal guidance memoranda issued by HQUSACE.

2 Execution Plan and Review Requirements

a. Level of Review Required by the Requester

The MVN has carefully evaluated potential impacts to LPV and WBV projects and determined the following level of reviews are appropriate.

1) Quality Assurance and Quality Control (QA/QC) Review

The requester, or its consultant, is responsible for its own internal design quality control, but quality control should minimally include review of the structural adequacy, geotechnical stability, suitability borrow material, and concurrence with all applicable USACE design regulations, guidance and practices for this type of work. The requester should provide USACE with documentation regarding the quality control/quality assurance procedures followed in the development of the project design. This documentation should be in the form of a report that identifies:

- Purpose and scope of the review;
- Description of the review team and a short statement on their qualifications;
- Summary of the review performed during design;
- Lessons learned and major changes made during the review;
- All internal QC comments and resolutions; and,
- Supplemental studies or analyses performed during the design, e.g. geotechnical report.

2) Safety Assurance Review (SAR)

A Safety Assurance Review, also known as a Type II Independent External Peer Review (IEPR), shall be conducted on design and construction activities for flood risk management projects, as well as other projects where potential hazards pose a significant threat to human life. External panels will review the design and construction activities prior to initiation of physical construction and periodically thereafter until construction activities are completed. The charges to the SAR panels complement the ATR process and do not duplicate it, the SAR will be accomplished by the requestor CPRA-B.

The SAR panel will be selected and managed by the requestor CPRA-B. Selection of SAR panel members will be made up of independent, recognized experts from outside of the USACE in the appropriate disciplines, representing a balance of expertise suitable for the review being conducted. Per EC 1165-2-214, selection of the SAR Panel members for IEPR efforts will adhere to the National Academy of Science Policy on Committee Composition and Balance and Conflicts of Interest, which set the standard for "independence" in review processes and complexity in a national context.

b. Decision-Level Determination

The requester's level of review was determined based on the guidance outlined in EC 1165-2-214 "Civil Works Review Policy" which evaluates the need for a SAR. The position of the MVN is based on a risk informed determination that carefully weighed the potential detriments of the proposed alteration(s). According to MVD's guidance published 27 May

2015 (Subject: Alteration to Federally Constructed Projects within the Mississippi Valley Division), a "yes" answer to either of the first two questions (1 and 2) mandates the requirement for a SAR. A "yes" answer to the following three questions (3, 4, and 5) requires consideration for a SAR. Furthermore referencing EC 1165-2-214 Section 13b, "When a non-Federal interest...requests permission to alter a Federal project, the non-Federal interest is required to undertake, at its own expense, any IEPR that the Government determines would have been required if the Government were doing the work."

The following identifies the questions based on MVD's guidance and MVN's responses:

1) Is this project justified by life safety?

Yes. The LPV and WBV projects as originally authorized and constructed are life safety projects. The proposed alteration(s) are to restore the levee reaches within the projects to the original construction elevation plus 6 inches, prior to USACE armoring the levee.

2) Would the project's failure pose a significant threat to human life?

Yes. Failure of the of levee reaches within the LPV and WBV project pose a significant threat to human life. The engineering analyses associated with this alteration are necessary to ensure the stability of the altered levee section and ensure that the risk to life safety is not increased. As proposed the alteration(s) will maintain the intended level of risk reduction throughout construction.

3) Does the project involve the use of innovative materials or techniques where the engineering is based on novel methods, presents complex challenges for interpretations, contains precedent setting methods or models, or presents conclusions that are likely to change prevailing practices?

No. The proposed alteration(s) do not align itself with any item presented in this question. The section of levee will be rebuilt in accordance to USACE, Hurricane and Storm Damage Risk Reduction System Design Guidelines, and does not presenting any novel methodologies during its implementation.

4) Does the project design require redundancy, resiliency, or robustness?

No. The section of the earth embankment will be restored to its original conditions at design grade or design grade plus 6 inches and level of protection.

5) Does the project have unique construction sequencing or a reduced or over lapping design construction schedule?

No. The construction will follow a traditional sequence consistent with any similar USACE earth embankment projects.

Based on the responses to question 1, a SAR is required for the proposed alternations. External panels will review the design and construction activities prior to initiation of physical construction and periodically thereafter until construction activities are completed. A site visit will be conducted by the SAR review panel.

c. Scope of the SAR

The SAR will be scoped such that it focuses on the aspects of the work that pose a life safety threat, specifically the stability of the levee. The SAR shall consider all reaches where a lift of the levee section only is anticipated, with a detailed review of the worst case conditions: (1) where the highest fill placement is required and (2) where the worst soil conditions are present.

The table below provides a list of the reaches where an alteration of the Levee Section only (excluding berms) will be considered. Refer to Attachment 3 for a map that shows the location of each reach. It is recommended that the SAR be conducted on Alteration Project WBV-18.2, as shown in the table below. This project has similar design complexity and similar potential of posing levee risks to the occupants in the leveed areas. Alteration Project WBV-18.2 is proposed to have a 2.5 ft. levee lift and has weaker foundation soils than other projects within the HSDRRS. The design for Alteration Project WBV-18.2 used more strength gain at both the Center Line (C/L) of the levee and at the break point between the levee toe and the top of berm on the protected/land side of the levee, as compared to other contract reaches. The total cross sectional levee footprint for WBV-18.2 is approximately 402 feet. The design for Alteration Project WBV-18.2 utilized a gain in strength at the original protected/land side toe location. The original protected/land side levee toe is approximately at the break point (levee toe and the top of stability berm) location of the new levee and this area received approximately 7.5 feet of embankment fill. Typical cross sections showing the proposed alteration and the Phase II first lift are included in Attachment 4. The outcome of the SAR including recommendations made and issues identified will be considered and incorporated (as necessary) by the requestor on this alteration and other possible alteration(s) shown in the table below. It should be noted that although WBV-09a, WBV-14b.2, WBV-14c.2, and WBV-15a.2 have higher maximum proposed lifts, the design of these contract reaches did not utilize any strength gain and therefore were not selected as the subject for the SAR.

At this time it is anticipated for LPV-4.2a, LPV-4.2b, and LPV-111 the design and construction to restore to construction grade plus 6 inches, will be completed by MVN as part of the armoring contracts. The SAR of WBV-18.2 will be sufficient to cover the requirements for these contract reaches, as the design and construction to restore to construction grade plus 6 inches will follow the same approach as the alteration(s) that are performed by the requestor.

Table 1. List of Possible Alteration(s) to restore the Levee Section (excluding berms)

Alteration Project	Levee Reach (Sta. Limits are Approximate)	Level of Risk Reduction in 2007 (NAVD 88 2004.65)	Level of Risk Reduction in 2057 (NAVD 88 2004.65)	Maximum Proposed Lift Height (ft) (See Note 1)	Planned Construction Completion Date
LPV-00.2	Station 9+32 to 114+61	15.5	17.5	1.0	2016
LPV-01.1	Station 125+00 to 205+00	15.5	17.5	1.0	2016
LPV-02.2	Station 215+00 to 332+00	15.5	17.5	1.0	2016
LPV-4.2a	Station 260+35 to 353+66	14.5	16.5	2.6	2016
LPV-4.2b	Station 373+00 to 469+72	14.0	15.5	2.0	2016
LPV-19.2	Station 342+98 to 419+58	15.5	17.5	1.0	2016
LPV-20.1	Station 424+40 to 524+28	15.5	17.5	1.0	2016
LPV-109	NE 31 (See Note 2) NE 17 (722+00 to 724+00) NE 10-A (724+00 to 764+00) NE 10-B (764+00 to 816+00) NE 10-C (816+00 to 940+00) NE 11-A (944+00 to 1058+00)	16.5 16.5 17 17 17 22	18 18 18 18 19 23.5	N/A 1.0 1.0 1.0 1.0 1.0	2016 2016 2016 2016 2016 2016
LPV-111	Station 1283+00 to 1323+00 (See Note 3)	27.5	30	1.0	2016
WBV-09a	Station 4+78 to 62+12	10.5	14	4.5	2016
WBV-12	Station 244+90 to 124+35	10.5	14	2.5	2016
WBV-14b.2	Station 259+00 to 430+38	10.5	14	3.0	2016
WBV-14c.2	Station 69+95 to 185+90	10.5	14	3.0	2016
WBV-14e.2	Station 648+17 to 799+35	10.5	14	1.0	2016
WBV-15a.2	Station 309+00 to 518+50	11.5	15.5	3.0	2016
WBV-18.2	Station 155+87 to 308+00	11.5	15.5	2.5	2016
WBV-MRL-6.1	79 W-L (106+00 to 118+00) (See Note 4)	20.5	24.5	(See Note 3)	2016

Notes:

1) The maximum proposed lift height includes the 6-inches above previous construction grade.
2) LPV-109, NE-31, Sta 666+00 to Sta 722+00, is included in the LPV-108 armoring contract and will not receive

a second lift prior to armoring. As noted there are multiple hydraulic reaches with varying elevations for LPV-109.

3) Limits of work for the second lift of LPV-111 are Sta. 1283+00 to Sta. 1323+00.
4) Limits of work for the NFS second lift of WBV-MRL-6.1 are Sta. 106+00 to Sta. 118+00. Maximum proposed lift height to be determined upon receipt of geotech analysis and P&S from the NFS.

d. Level of Review Required by the District

The review of the alteration request(s) shall include a District-led Agency Technical Review (ATR), reference paragraph 7.c.(4) in EC 1165-2-216. Per EC 1165-2-216 the MVN's Chief of Engineering has determined that a Safety Assurance Review (SAR) will be required.

The SAR/Type II IEPR plan is included in Attachment 4. The Risk Management Center (RMC) is the Review Management Organization (RMO) and is required to endorese in writing the SAR/Type II IEPR plan. The RMC will also determine if the Levee Senior Oversight Group (LSOG) will be required to review the proposed alteration. The SAR/Type II IEPR review plan must be approved by the Division Commander.

e. Decision-Level Determination for District Review

Per EC 1165-2-216, Policy and Procedural Guidance for Processing Request to Alter US Army Corps of Engineers Civil Works Projects Pursuant to 33 USC 408, seven questions must be addressed to determine required review and decision level. If the answer to any of the questions is "yes", and the District and Division recommend approval of the alteration(s), then the Section 408 request requires HQUSACE level review and decision. The questions, and MVN's responses, are provided below:

1) Does the proposed alteration(s) require a SAR reference EC 1165-2-214?

Yes. As described above a SAR will be conducted on the proposed alternations.

2) Does the proposed alteration(s) require an Environmental Impact Statement (EIS) in which USACE is the lead agency?

No. The proposed alteration(s) will remain within the current project footprint previously constructed by CEMVN and environmentally assessed in respective Individual Environment Reports (IERs) for both the LPV and WBV projects.

3) Does the proposed alteration(s) change how the USACE project will meet its authorized purpose?

No.

4) Does the proposed alteration(s) preclude or negatively impact alternatives for a current General Investigation (GI) or other study?

No.

5) Is the non-federal sponsor for a USACE project proposing to undertake the alteration(s) as in-kind contributions eligible for credit under Section 221 of Flood Control Act of 1970, as amended?

Yes. It is recommended that the proposed be evaluated to determine whether or not the alteration will be included as a project feature eligible for rehabilitation assistance pursuant to P.L. 84-99.

6) Is the proposed alteration(s) for installation of hydropower facilities?

No.

7) Is there a desire for USACE to assume operations and maintenance responsibilities of the proposed navigation?

No.

Based on the responses to questions 1 and 5 above HQ USACE review and approval will be required.

f. District Review Purpose

The review of all work products will be in accordance with the guidelines established within this Review Plan. The ATR will serve as the District's review of the request. The purpose of this review is to ensure the proper application of established criteria, regulations, laws, codes, principles and professional practices.

For the purposes of Section 408, the ATR team will make the following determinations:

1) Impair the Usefulness of the Project Determination. The objective of this determination is to ensure that the proposed alteration(s) will not limit the ability of the project to function as authorized and will not compromise or change any authorized project conditions, purposes or outputs.

2) Injurious to the Public Interest Determination. Proposed alteration(s) will be reviewed to determine the probable impacts, including cumulative impacts, on the public interest. The decision whether to approve an alteration(s) will be determined by the consideration of whether benefits are commensurate with risks.

3) Legal and Policy Compliance Determination. A determination will be made as to whether the proposed alteration(s) meet all legal and policy requirements.

3. District-Led Agency Technical Review Team

The District-led Agency Technical Review (ATR) Team is comprised of reviewers with the appropriate independence and expertise to conduct a comprehensive review in a manner commensurate with the type of proposed alteration(s) described in Section 1.c of this review plan. The ATR team will be composed of the District Section 408 Coordinator and designated the MVN Division Chiefs; Division Chiefs and/or Branch Chiefs may assign qualified individuals to perform the review on their behalf. Reviewers will be assigned to each proposed alteration(s) at the time the Section 408 request and associated submittals are received. Reviewers will be assigned based on the location and nature of the proposed alteration(s), and the reviewer's expertise. If the Division Chief and/or Branch delegates the review to a staff member, the Division Chief and Branch Chief will be required to review the comments and the Division Chief will be required to sign the ATR report indicating concurrence with the staff member's review.

The MVN will conduct an ATR with a team comprised of senior USACE personnel and may be supplemented by outside experts as appropriate. If lacking the appropriate expertise, the MVN will supplement their staff through appropriate Communities of Practice, Centers of Expertise, or other offices.

For the project alteration(s), the ATR team will include personnel from the disciplines of geotechnical, hydraulics, civil, real estate, counsel and environmental. Other disciplines may be ultimately added through the process if required, in which case the added personnel will have the appropriate expertise pertinent to the project.

a. Review Procedures

Reviews will be conducted in a fashion which promotes dialogue regarding the quality and adequacy of the required documentation.

1) Due to the nature of the specific alteration(s), the MVN has been engaged in coordination efforts with the requestor Coastal Protection and Restoration Authority Board (CPRA-B) to ensure the proper plans, specifications, design, and environmental documents are submitted to perform an adequate review in a timely manner. The District Section 408 Coordinator will determine if adequate information has been provided to start a review. The requestor will be notified in writing if its proposal is missing documentation. Proposed alteration(s) submittal packages may be submitted by the civil works project sponsor, its agent or consultant, or third party. Alteration proposals must be submitted via

electronic format. A hard copy is recommended but not required. The proposal must address all applicable documentation as outlined in EC 1165-2-216. The Section 408 Coordinator will be the responsible party for tracking and coordinating the ATR.

2) The Section 408 Coordinator will consult with the ATR team to determine the level of review required once a submittal is deemed complete. The ATR team has formulated a risk informed recommendation to the Levee Safety Program Manager (LSPM) and the Levee Safety Officer (LSO). As set forth herein, it has been determined that HQUSACE review and approval is required. This review plan must be endorsed by the RMC and ultimately approved by the Mississippi Valley Division (MVD) Commander.

3) The submittal will undergo a thorough New Orleans District ATR. Upon completion of the review, reviewer's comments will be compiled into an ATR report. Each review should address the following four key components:

- The review concern: identify the deficiency or incorrect application of policy, guidance, or procedures.
- The basis for the concern: cite the appropriate law, policy, guidance, or procedure that has not been properly followed.
- The significance of the concern: indicate the importance of the concern with regard to its potential impact on the District's ability to make a decision as to whether to approve or deny the Section 408 request.
- The probable specific action needed to resolve the concern: identify the action(s) that the requester must take to resolve the concern.

In some situations, especially addressing incomplete or unclear information, reviewers may seek clarification in order to then assess whether further specific concerns may exist.

4) The ATR documentation will include the text of each ATR concern, the ATR team response, a brief summary of the pertinent points in any discussion, including any vertical team coordination (the vertical team includes the MVN, RMO, MSC, and HQUSACE), and the agreed upon resolution.

The report will document the following:

- The name and location of the proposed alteration that underwent review by the ATR team;
- The name, organization, qualifications, and relevant experience of each ATR team member;

- The charge of the reviewers including objective of the review, the specific technical questions, as well as the broad technical approach applied to the review;
- Description of the nature of the review, findings, conclusions, and/or recommendations;
- A brief summary of the pertinent points in any discussion, including any vertical team coordination (the vertical team includes the District, RMO, MSC, and HQUSACE), and the agreed upon resolution; and
- A verbatim copy of each reviewers comments, or a representation of the views of the ATR team as a whole, including any disparate and dissenting views;

Ultimately, the requestor will modify the submittals in accordance with USACE ATR report, and will resubmit them for verification until all issues are addressed and satisfied.

5) The ATR is complete when the ATR team determines whether or not the proposed alteration:

- Will be injurious to the public interest;
- Will impair the usefulness of the project; and,
- Complies with laws and/or regulations.

If the ATR team cannot determine that the proposed alteration will not be injurious to the public interest, will not impair the usefulness of the project, and complies with laws, regulations and policies, the ATR team should recommend the proposed alteration(s) be denied. Upon notification by the Section 408 Coordinator to the LSO and/or Dam Safety Officer (DSO) that the ATR has been satisfactorily completed, the LPSM, LSO, and/or DSO will perform a final review of all documents and either endorse approval or recommend denial prior to the proposed alteration package being forwarded to the MVN District Commander for the District Commander's recommendation and transmittal to the MVD Commander.

6) The review requires the following information to determine whether the proposed alteration(s) will impair the usefulness of the project to be injurious to the public interest.

a) Technical Analysis and Design. A review of the technical analysis and design will be performed on plans and specifications that are at a 60% level of detail at a minimum. Supporting analysis for the proposed alternation should include at a minimum, the following information:

- Consistency with previous HSDRRS construction;

- Use of consistent datum and epoch information, including datum/epoch conversions, as appropriate;
- Proposed alternation will meet all applicable Greater New Orleans HSDRRS design procedures and factors of safety;
- Standard for placing construction materials
- Quality Control procedures; and,
- Proper review and approval by the contracting authority of contractor submittals.

b) Geotechnical Analysis. In addition to the above review, the following geotechnical analysis will be completed:

- The initial geotechnical design for the proposed alteration to restore to construction grade plus 6 inches shall consist of an analysis of the existing levee only without the restoration of berm height provided that factors of safety (FOS) are met per HSDRRS criteria. The geotechnical design will be based upon MVN's existing soil design data/parameters from existing soil design reports. Slope stability analysis shall be performed using the Spencer method on critical soil reaches to obtain the FOS. If the FOS is 1.5 or greater for still water level (SWL) or 1.4 or greater for low water level (LWL), the geotechnical criteria for HSDRRS are met and the design is acceptable for approval of the Section 408 permission; Low water level analysis can be 1.3 if it is in an area where flood water levels are not quickly lowered.

- If the geotechnical analysis for the second lift of the levee only results in a FOS less than 1.5 for SWL or less than 1.4 for LWL, additional soil investigations consisting of data from a Cone Penetrometer Test and selective soil borings to assess shear strength gains in the critical soil reaches will be obtained. Based on new strength data, slope stability will re-analyze using the Spencer method. If the FOS is 1.5 or greater for SWL or 1.4 or greater for LWL, the geotechnical criteria for HSDRRS is met and the design is acceptable for approval of the Section 408 permission.

- If the geotechnical analysis for the proposed alteration of the levee only using new strength data results in a FOS less than 1.5 for SWL or 1.4 or greater for LWL two options are available:

- The berms will be restored to the original design slope and elevation. In this case no additional geotechnical analysis will be required based on original USACE guidance for lifts.

-

- If CPRAB chooses to raise the berms to an intermediate elevation then they shall re-analyze the levee to include partial restoration of berm height to achieve an acceptable FOS of 1.5 or greater for SWL or 1.4 or greater for LWL to meet HSDRRS criteria for approval of the Section 408 permission.

Additionally, detailed geotechnical data will include soil properties, soil shear strengths from submitted soil strength lines, CPT data, and other geotechnical design features inclusive of a detailed geotechnical soils report shall be submitted as part of the geotechnical procedures.

c) Hydrologic and Hydraulic System Performance Analysis. The District will determine if such an analysis is needed and, if so, determine the appropriate scope of analysis based on the alteration's complexity.

d) Environmental Compliance. A decision on a Section 408 proposed alteration(s) request is a federal action and therefore subject to National Environmental Policy Act (NEPA) and other environmental compliance requirements. The requester is responsible for providing all information that the District identifies as necessary to satisfy all applicable federal laws, executive orders, regulations, policies, and ordinances. . The Requestor will prepare an Environmental Assessment (EA) for the Section 408 proposed alteration(s) or an EIS if it is determined that there are significant impacts and a Finding of No Significant Impact cannot be approved. The environmental assessment will include an evaluation of the prospective borrow sites. To evaluate prospective borrow sites in that EA, it will be requested that the requestor identify the Borrow Area(s) it intends to use and submit all required contractor-furnished borrow Environmental Compliance checklist items, including the map of proposed site to be excavated. The requestor will obtain all environmental compliance for all evaluated sites and will document the environmental compliance in the EA. Once complete environmental compliance is demonstrated, MVN-OC will provide an opinion on legal sufficiency for the Draft EA/FONSI. Any Section 408 proposed alteration(s) approval is conditioned on the requestor's use of the borrow sites evaluated in the EA and for which there is full Environmental Compliance evidenced in the Section 408 submittal. In the event the requestor's contractor wishes to use a borrow site for which there wasn't full Environmental Compliance in the Sec. 408 approval, a supplemental EA evaluating the requested site and completion of the Environmental Compliance thereon will be required, which will require routing through MVD and HQ for approval by the Director of Civil Works. Future 408 requests will include an EA/EIS prepared by the requestor that includes NEPA evaluation of and complete environmental compliance for proposed borrow sources.

There shall be four (4) EAs prepared for these proposed alterations, as follows:

- An EA for levee reaches WBV-09a, WBV-12, WBV-14b.2, WBV-14c.2, WBV-15a.2, WBV-14e.2, and WBV-18.2;
- An EA for levee reach LPV-00.2;
- An EA for levee reaches LPV-01.1, LPV-02.2, LPV-19.2 and LPV-20.1; and,
- An EA for levee reaches LPV-109, LPV-111, LPV-4.2a, and LPV-4.2b

A Section 408 permission, if granted, will contain "special conditions" stating that use of a borrow site other than the sites evaluated in the EA will require a modification to the Section 408 approval (and supplemental NEPA) and prohibiting impacts to wetlands (except where a Section 404 permit has been obtained), to upland bottomland hardwood forests, to cultural resources, and to endangered and threatened species and/or to other resources as deemed appropriate.

e) Real Estate Requirements. The requestor should provide a list of all real property interests required to support the proposed work/alteration. This should be supported by a map which clearly depicts both the existing real estate rights and the additional real estate required (existing right-of-way and new right-of-way required, if any). This should include both permanent and temporary real property rights needed. Alternatively, if all work will be constructed within existing rights-of-way, the requestor may so state. If the project requires the acquisition of new right-of-way, USACE approved standard estates should be utilized for project purposes by the requestor. If the requestor should propose a non-standard estate, approval requirements as outlined in EC 405-1-11 and Chapter 12, ER 405-1-12 will be followed. All potential requestors for this levee lift work were so advised by letter dated 23 July 2015. No use of lands under the control of the Army/USACE is anticipated.

7) The District Counsel will be responsible for performing the legal and policy review in accordance with EC 1165-2-216. This is part of the ATR, but after the LPSM and LSO have reviewed the alteration documents, and either endorsed approval or recommended denial of the proposed alteration, and prior to the proposed alteration package being forwarded to the MVN District Commander for the District Commander's recommendation and transmittal to the MVD Commander.

8) The LPSM and the LSO will review the Summary of Findings (SOF) report and either endorse approval or recommend denial to the District Commander. The District Commander will recommend approval or denial of the alteration to the MVD Commander.

9) The Section 408 Coordinator will forward the District Commander's recommendation transmittal letter, review package and SOF report to the MVD Commander.

10) Following the review from MVD and the RMC, the requestor will address and correct review comments. If necessary, the District Section 408 Coordinator in conjunction with the ATR team will make the appropriate corrections to their technical, environmental and policy determinations. The process will be repeated until all comments have been satisfied by the requestor and the MVN.

11) The Division Levee Safety Program Manager (DLSPM) and the Division Levee Safety Officer (DLSO) are required to review and either endorse the recommended approval or recommend denial of the proposed alteration.

12) After endorsement by MVD, the proposed alteration package will be forwarded to the HQUSACE Office of Water Project Review (CECW-PC) for a policy compliance review and the HQUSACE Levee Safety Program Manager. The Regional Integration Team (RIT) will ensure participation of the appropriate reviewers, such as personnel with expertise in engineering, navigation, levee safety, real estate and environmental. Additionally, the RIT will be coordinating with the District to address comments. The process will be repeated until all comments have been satisfied by the requestor and the MVN. The RIT will draft a decision memorandum for the Director of Civil Works signature as to whether the proposed alteration(s) is accepted or denied.

13) The HQUSACE Levee Safety Officer Program Manager and HQUSACE Office of Water Project Review are required to review and either endorse the recommended approval or recommend denial.

14) After endorsement by HQUSACE and the Director of Civil Works, a letter of permission will be sent to the District. The District Section 408 Coordinator will send the requestor a permission letter signed by the District Commander for acceptance or denial of the proposed alteration(s).

b. Products to Undergo ATR

The ATR team will review the following products:

- Written Request;
- Geotechnical Analysis and Report;
- Plans and Specifications;
- All NEPA documentation;
- As-built drawings and construction documentation;
- All Real Estate documentation deemed necessary; and,
- Public Comments.

c. Required ATR Team Expertise and Requirements

The following provides an estimate of the ATR members and the types of expertise that should be represented on the review panel.

ATR Lead: The ATR team lead will be the District Section 408 Coordinator. The District Section 408 Coordinator is an individual appointed by the District Engineer as having the appropriate expertise in EC 1165-2-216 comprehension and possesses the ability to adequately scale a review in accordance with paragraph 7.b of EC 1165-2-216. The ATR lead has extensive experience in reviewing Section 408 Alteration(s) and the skills necessary to lead a team through the ATR process.

Geotechnical Engineer: The Geotechnical Engineering team member should be a senior-level geotechnical engineer with experience in the field of geotechnical engineering, analysis, design, and construction of embankment levees. The team member will hold a degree in Civil Engineering, or Geotechnical Engineering. The team member should have knowledge and experience in evaluation of seepage, settlement, and slope stability problems associated with levee embankments. The team member should have experience in failure mode analysis, risk assessment of embankment levees, and evaluating risk reduction measures for levee safety assurance projects.

Hydraulic Engineer: The senior-level team member should have experience with engineering analysis related to flood risk management and levee safety projects. The team member will hold a degree in Civil Engineering, or Hydrology and Hydraulics Engineering. Reviewer should have experience in analyzing levee hydraulics along with experience in the analysis and design using hydrology models.

Civil Engineer: The Civil Engineering team member should be a senior-level civil engineer with experience in design and construction of embankment levees with engineering analysis related to flood risk management and levee safety projects. The team member will hold a degree in Civil Engineering. The team member should have experience in the preparation of plans and specifications for the construction of earthen embankment levees.

Levee Safety: The reviewer will ensure that the proposed project meets Corps of Engineers standards for flood risk reduction and levee safety guidelines.

Construction Engineer: The reviewer should be a senior level, professionally registered engineer with extensive experience in the engineering construction field with particular emphasis on levee safety projects. The Construction reviewer should have a minimum of 15 years of experience.

Real Estate: The Real Estate team member should be a senior-level realty specialist with experience in identifying right-of-way requirements for project purposes, estates, process for obtaining approval of non-standard estate approval, validating real estate requirements for project purposes, basic requirements for management out grant and consent actions, experience in reviewing plans and specifications, and critical thinking skills.

Operations: The Operations Division team member should be a senior level civil engineer with experience in the operations & maintenance and inspection of all types flood damage risk reduction features. The team member will hold a degree in Civil Engineering. The team member will have knowledge and experience in operations and maintenance and inspection of these features and be proficient in the Inspection of Completed Works (ICW) programs, policies, and procedures. The team member may also be the 408 District coordinator.

Environmental: Responsible for reviewing NEPA and other environmental compliance documents prepared by the requester. Coordination with MVN Regulatory personnel will be required to evaluate potential Section 10 or 404 actions.

Counsel: The reviewer will ensure that the proposed alteration evaluation meets all of the legal and policy requirements. The Section 408 permission will not be recommended for approval until it has concurrence by the MVN Office of Counsel. The reviewer will have experience in analyzing project authority, policy, environmental, and federal decision documents.

4. Completion and Certification of the ATR

At the conclusion of each ATR effort, the ATR team will prepare a Review Report summarizing the review. Review Reports will be considered an integral part of the ATR documentation and shall:

- Identify the documents reviewed and the purpose of the review;
- Disclose the names of the reviewers, their organizational affiliations, and include a short paragraph on both the credentials and relevant experiences of each reviewer;
- Include the charge to the reviewers;
- Describe the nature of their review and their findings and conclusions;
- Identify and summarize each unresolved issue (if any); and Include a verbatim copy of each reviewer's comments (either with or without specific attributions), or

represent the views of the group as a whole, including any disparate and dissenting views.

ATR may be certified when all ATR concerns are either resolved or referred to the vertical team for resolution and the ATR documentation is complete. The ATR lead will prepare a completion of ATR and certification of ATR. It will certify that the issues raised by the ATR team have been resolved (or elevated to the vertical team). The completion and certification should be completed based on the work reviewed to date for the project. A sample Completion of ATR and Certification of ATR are included in Attachment 1.

The ATR team members will determine whether or not the proposed alteration(s) would impair the usefulness of the federal project, be injurious to the public interest, and meets legal and policy requirements. ATR team members will provide their comments to the District Section 408 Coordinator, who will use the comments to determine if the proposed alteration(s) can be approved in accordance with EC 1165-2-216. Conflicts in addressing ATR comments will be elevated to the functional chief and MVD for resolution if necessary. Following ATR, the District Section 408 Coordinator will compile a Summary of Findings in accordance with from EC 1165-2-216 (with an appendix of ATR Comments and Resolution) and obtain the endorsement of the District Levee Safety Program Manager, the District Levee Safety Officer, the District Counsel, and other District leadership before recommending to the District Commander that the proposed alteration(s) be approved or denied.

5. Requester-Led SAR

a. Products to Undergo a SAR

The Geotechnical Analysis and Report for the proposed alteration for WBV-18.2 will undergo a SAR.

b. Required SAR Expertise

The SAR panel will be selected and managed by the requestor CPRA-B. Selection of SAR panel members will be made up of independent, recognized experts from outside of the USACE in the appropriate disciplines, representing a balance of expertise suitable for the review being conducted. Per EC 1165-2-214, selection of the SAR Panel members for IEPR efforts will adhere to the National Academy of Science Policy on Committee Composition and Balance and Conflicts of Interest, which sets the standard for "independence" in review processes and complexity in a national context.

Geotechnical Engineer: The Geotechnical Engineer panel member shall be a registered professional geotechnical engineer from an Architect-Engineer or consulting firm, a public agency, or academia with a minimum of 15 years of demonstrated experience in the specific field of levee engineering in evaluating, designing, and constructing large levees embankments; and a minimum MS degree or higher in engineering is preferred. Geotechnical panel member experience shall be in soil compaction and earthwork construction; pile founded floodwall design and construction; soil mechanics; seepage and piping; landslide and slope stability evaluations; bearing capacity and settlement; and foundation inspection and assessment. The Geotechnical panel member shall have knowledge and experience in the forensic investigation of seepage, settlement, stability, and deformation problems associated with embankments constructed on foundations with soft soils. The Geotechnical panel member shall have familiarity with preparing plans and specifications for levee embankment, levee rehabilitation projects, and floodwall projects. The Geotechnical panel member shall also have knowledge of best practices regarding levee and floodwall design and construction procedures and policies.

The Geotechnical panel member shall have recent and relevant experience on multi-million dollar projects verifying the constructability of the proposed designs and then verifying that these projects were being constructed per the plans and specifications.

c. Completion and Certification of the SAR

DrChecks review software may be used to document the SAR comments and aid in the preparation of the Review Report but is not required. Panel comments will be compiled into a letter to the requestor and should address the adequacy and acceptability of the engineering, models, and analyses used. SAR comments should generally include the same four key parts as described for ATR comments in Section 3a Review Procedures.

A suggested report outline includes an introduction, the composition of the review team, a summary of the review during design, a summary of the review during construction, any lessons learned in both the process and/or design and construction, and appendices for conflict of disclosure forms, for comments to include any appendices for supporting analyses and assessments of the adequacy and acceptability of the methods, models, and analyses used. All comments in the report will be finalized by the panel prior to their release to USACE for each review plan milestone. Written responses to the SAR Review Report will be prepared to explain the agreement or disagreement with the views expressed in the report, the actions undertaken or to be undertaken in response to the report, and the reasons those actions are believed to satisfy the key concerns stated in the report (if applicable). The final report will be provided to the RMO and MVD. After the MVD Commander's approval, the District will make the report and responses available to the public on the District's website located at the following:

http://www.mvn.usace.army.mil/About/Offices/ProgramsProjectManagement/ProjectReviewPlans.aspx

6. Review Schedule and Cost

a. ATR Schedule

To the extent practical, reviews should not extend the design schedule but should be embedded in the design process. Reviewers should be involved at key decision points and are encouraged to provide timely over the shoulder comments.

Review schedules are commensurate with the scale and complexity of review. The District 408 Coordinator will work with the ATR team to achieve timely reviews and will maintain contact with the requestor and/or the non-Federal sponsor to keep them informed about the review time. ATR reviews will be conducted during the requester's design process and will be completed to allow planned construction completion in calendar year 2016 as shown in Table 1 above.

b. ATR Cost

The initial review and pre-coordination for the Section 408 requests have been funded through the ICW, O&M General project funds. Future review costs for these Section 408 requests will be requested and funded nationally through the Section 408 Operation & Maintenance General account. However, if funds are denied, either the Section 408 request(s) could not be processed or the requester would have to request and initiate 214 agreements with USACE. It is estimate that the ATR will cost between $40,000 and $50,000.

c. SAR Schedule and Cost

As discussed above a SAR will be required for this project. More specific milestone dates will be added in the future during the construction phase, but it can be assumed to occur near the mid-point of construction and at project completion. It is estimate that the SAR will cost between $40,000 and $50,000.

7. Public Participation of Review Plan

As required by EC 1165-2-214, the approved Review Plan will be posted on the District public website:

http://www.mvn.usace.army.mil/About/Offices/ProgramsProjectManagement/ProjectReviewPlans.aspx.

The public will have 14 days to provide comments on the documents; after all comments have been submitted, the comments will be provided to the technical reviewers. This is not a formal comment period and there is no set timeframe for the opportunity for public comment. If and when comments are received, the ATR Team will consider them and decide if revisions to the review plan are necessary. This engagement will ensure that the peer review approach is responsive to the wide array of stakeholders and customers, both within and outside the federal government.

8. Review Plan Points of Contact

Table 22. Points of Contact

Name/Title	Organization	Email
Amy Powell District Section 408 Coordinator	CEMVN-OD-W	Amy.e.powell@usace.army.mil
Soheila Holley Senior Project Manager	CEMVN-PM-OP	Sohelia.n.holley@usace.army.mil
RMC Review Manager	CEIWR-RMC	304-399-5217 rmc.review@usace.army.mil

ATTACHMENT 1: COMPLETION OF AGENCY TECHNICAL REVIEW

The Agency Technical Review (ATR) has been completed for the *<short description of proposed alteration>* for *<project name and location>*. The ATR was conducted as defined in the Alteration-Specific Review Plan to comply with the requirements of EC 1165-2-216. During the ATR, compliance with established policy principles and procedures and legal requirements was verified. This included the determination whether the proposed alteration would impair the usefulness of the federal project or was injurious to the public interest. All comments resulting from the ATR have been resolved.

SIGNATURE _____ _____

Name, Chief Engineering Division Date
ATR Team Leader
CEMVN-ED

SIGNATURE _____ _____

Amy Powell Date
District Section 408 Coordinator
CEMVN-OD-W

SIGNATURE _____ _____

Richard Pinner Date
MVN Levee Safety Officer
CEMVN-ED-F

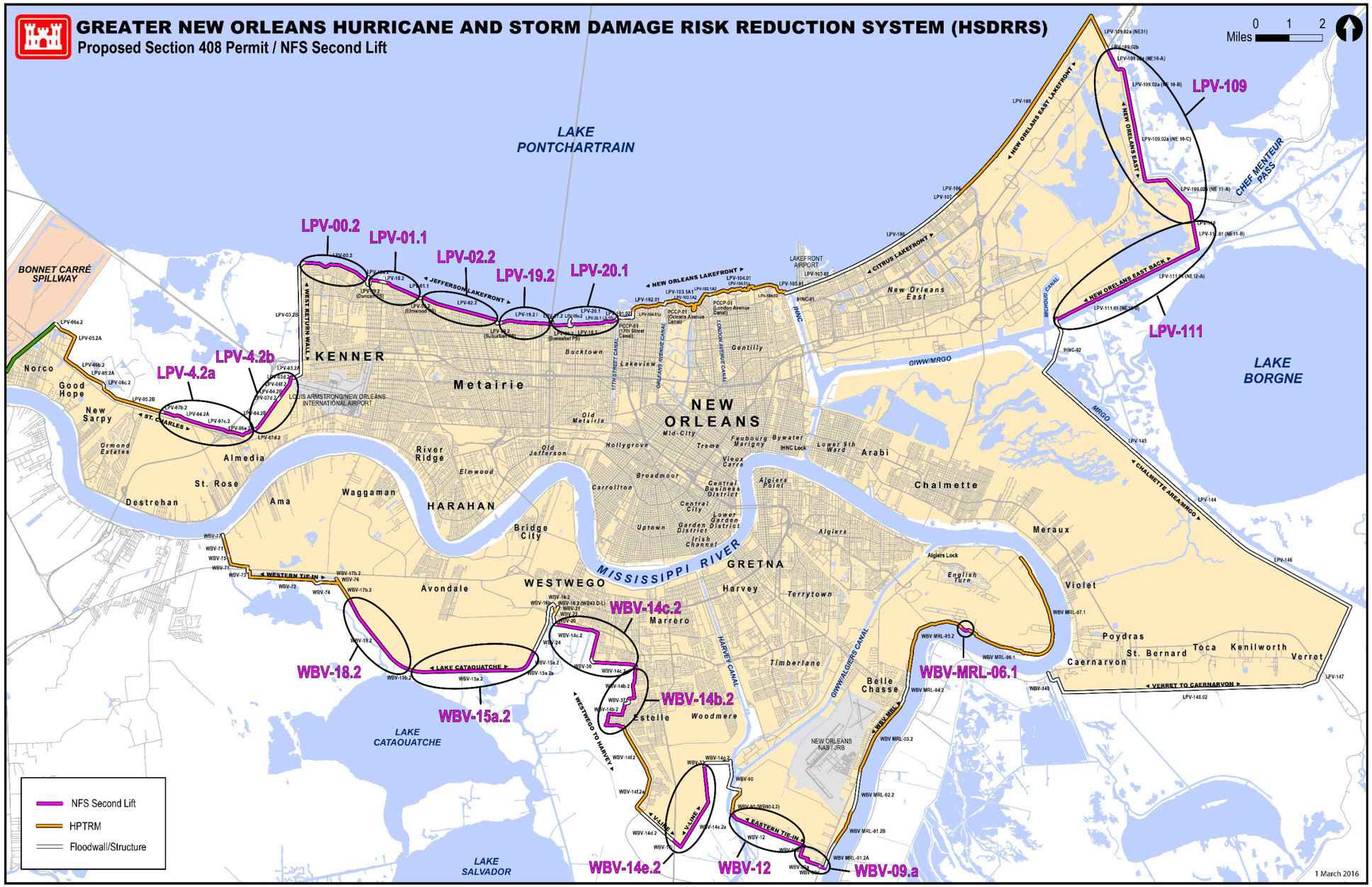
SIGNATURE _____ _____

Mark Woodward Date
MVN Levee Safety Program Manager
CEMVN-ED-F

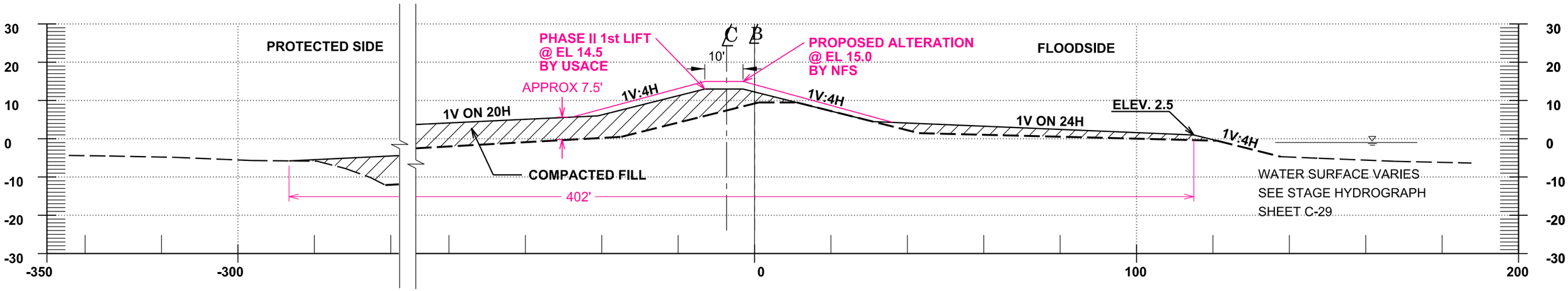
SIGNATURE _____ _____

Nathan Snorteland Date
Director
CEIWR-RMC

ATTACHMENT 3: MAP OF PROPOSED ALTERATION(S



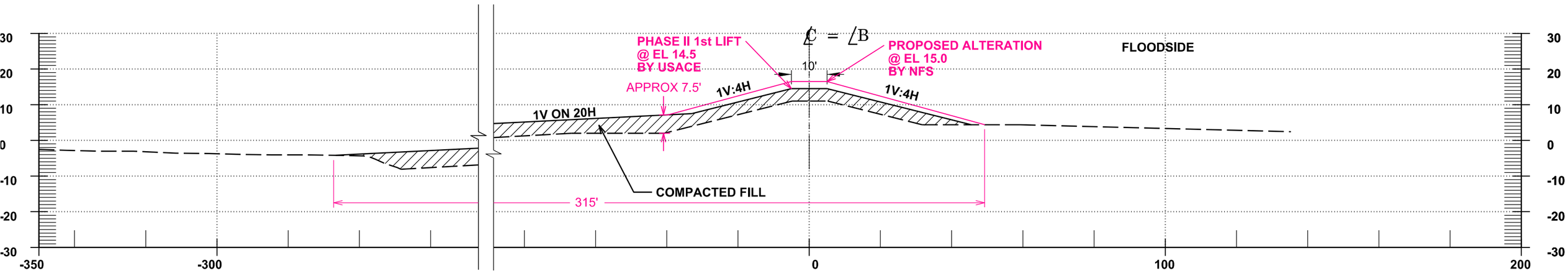
PROPOSED ALTERATION



TYPICAL SECTION 1
STA. 160+00 TO STA. 262+50

N.T.S.

PROPOSED ALTERATION



TYPICAL SECTION 2
STA. 263+00 TO STA. 300+17

N.T.S.

ATTACHMENT 4 – Safety Assurance Review (SAR) Plan

This plan serves to satisfy the Safety Assurance Review (SAR) requirements for the proposed Restoration of Levee Section prior to Armoring for the Lake Pontchartrain and Vicinity (LPV) and West Bank and Vicinity (WBV) projects as required by Engineering Circular (EC) 1165-2-216, Policy and Procedural Guidance for Processing Requests to Alter US Army Corps of Engineers Civil Works Projects Pursuant to 33 USC 408, dated 31 July 2014.

The Louisiana Coastal Protection and Restoration Authority (CPRA) working in conjunction with the Southeast East Louisiana Flood Protection Authority – East (SLFPA-E), the Southeast East Louisiana Flood Protection Authority – West (SLFPA-E), the Orleans Levee District (OLD), East Jefferson Levee District (EJLD), Pontchartrain Levee District (PLD), and Plaquemines Parish Government (PPG) are proposing to complete second lifts on several Hurricane and Storm Damage Risk Reduction System (HSDRRS) levee project reaches within the Greater New Orleans Metro area. These second lifts are intended to restore the levee project reach to the required elevation, plus 6-inches, in advance of the armoring projects as required by the Armoring Program.

The USACE New Orleans District is working with the Non-Federal Sponsors (NFS) for the HSDRRS, including, CPRA, SLPFA-E, SLPFA-W, OLD, EJLD, PLD and PPG, to ensure the SAR of the project meets the requirements of EC 1165-2-216. This document outlines how the SAR will be performed and identifies the independent consultant who will complete the SAR charged and ensure an adequate review for the NFS's second lift project(s).

1. Project Background

The HSDRRS includes 2 projects: the Lake Pontchartrain and Vicinity Project (LPV) and the West Bank and Vicinity Project (WBV). Combined, the two projects include five parishes and consist of 350 miles of levees and floodwalls; 73 non-Federal pumping stations; 3 canal closure structures with pumps; and 4 gated outlets. The intent of this Section 408 is to restore the levee project reach to the required elevation, plus 6-inches, in advance of the armoring projects and to demonstrate that the proposed alterations are designed in accordance with applicable criteria and standards.

2. Purpose

This document outlines the SAR Plan for the second lift levee projects. EC 1165-2-216 outlines the policy on review of decision documents, including with regard to SAR, which is also referred to as Type II IEPR. As discussed in more detail in the Levee Section prior to Armoring for the Lake Pontchartrain and Vicinity (LPV) and West Bank and Vicinity (WBV) Review Plan, Section 3.c, an SAR is required and is recommended that project WBV-18.2 undergo SAR review as the design for this project reach included more strength gain in foundation soils at both the Centerline (C/L) and at the break point between the levee toe and top of the protected/land side berm.

The SAR Panel provides and impartial and independent review of the project. The review shall be on a regular schedule sufficient to inform the Chief of Engineers on the adequacy, appropriateness and acceptability of the design and construction activities for the purpose of assuring that good science, sound engineering and public health, safety and welfare are the most important factors that determine a project's fate.

Specifically, the SAR will address the following questions:

General questions;

1. Is the direction of the project appropriate?
2. Has the Requester(s) or Designer of Record overlooked any critical items?
3. Does the panel have any other observations to add?

For the design phase of the project;

1. Has the analysis and design been complete in accordance with USACE Standards?
2. Are the steps (input data, assumptions, methods, analyses, etc.) for determining the stability of the proposed levee lift appropriate?
3. Are the steps (input data, assumptions, methods, analyses, etc.) for selecting the borrow material for the levee lift appropriate?
4. Do the design assumptions made during the decision document phase or previous studies remain valid through the completion of design as additional knowledge is gained and the state-of-the-art evolves?
5. Do the project features adequately address redundancy, resiliency, or robustness with an emphasis on interfaces between structures, materials, members, and project phases?
    - Redundancy. The use of multiple lines of defense that are linked to potential failure modes. The most vulnerable failure modes need the greatest redundancy.
    - Resilience. The use of enhancements to improve the ability of the system to sustain loads greater that the design load to achieve gradual failure modes over some duration rather than sudden failure modes.
    - Robustness. The use of more conservative assumptions to increase capacity to compensate for greater degrees of uncertainty and risk.
6. Do the project features and/or components effectively work as a system before and after the proposed alteration is performed?
7. Are the design methodologies and SAR/IEPR recommendations of the alteration project applicable to the other alterations projects identified in Table 1?

For the construction phase of the project;

1. Do the assumptions made during design remain valid through construction as additional knowledge is gained and the state-of-the-art evolves? (Final DDR's, CO QMPs, site visits, QA/QC reports, and other similar documents will be provided to the expert reviewer for this assessment.)
2. Will the project monitoring adequately reveal any deviations from assumptions made for performance?

3. References

- EC 1165-2-214, Civil Works Review Policy, 15 December 2012
- ECB 2016-9, Civil Works Review, 04 March 2016
- EC 1165-2-216, Policy and Procedural Guidance for Processing Request to Alter US Army Corps of Engineers Civil Works Projects Pursuant to 33 USC 408, 30 September 2015
- Memorandum, Subject: Alterations to Federally Constructed Projects within the Mississippi Valley Division, 24 May 2015
- ER 1110-1-12, Quality Management, 31 Mar 2011
- ER 1110-2-1150, Engineering Design for Civil Works Projects, 31 August 1999
- EM 1110-2-1913 Design, Construction, and Evaluation of Levees, 30 April 2000
- District Quality Management Plan(s)
- EM 1110-2-1205 Environmental Engineering for Flood Control Channels
- WM 1110-2-2300 General Design and Construction Considerations for Earth and Rock-Fill Dams
- Greater New Orleans (GNO) Hurricane and Storm Damage Risk Reduction System (HSDRRS) Design Guidelines, May 2012

4. SAR Review Expertise and Management

CPRA, as the project applicant, will identify and select a geotechnical engineer to serve as the SAR panel. A one member panel has been determined to be applicable due to the limited the size and complexity of the project and also considering all of the design considerations are limited to the field of geotechnical engineering.

The expert reviewer shall be an industry leader in their required field of review stated below and have experience in design and construction of projects similar in scope to HSDRRS earthen levee projects.

The panel members shall not have any financial or litigation association with the USACE; the DOTD or the Designer of Record; their engineering teams, sub-consultants or construction consultants. The panel member shall fully disclose any known or potential conflict of interest that may arise from the performance of the work. Areas of

conflict may include current employment by the Federal or State governments, participation in developing the subject project, a publicly documented statement advocating for or against the subject project, current or future interests in subject project or future benefits from the project, and paid or unpaid participation in litigation against the USACE and/or DOTD or the Designer of Record.

The Geotechnical Engineer panel member shall serve as the panel lead and shall have a minimum of 15 years of experience in the specific field of levee engineering in evaluating, designing, and constructing large levees embankments; and with a minimum MS degree or higher in engineering is preferred. Geotechnical panel member experience shall be in soil compaction and earthwork construction; soil mechanics; seepage and piping; landslide and slope stability evaluations; bearing capacity and settlement; and foundation inspection and assessment. The Geotechnical panel member shall have knowledge and experience in the forensic investigation of seepage, settlement, stability, and deformation problems associated with embankments constructed on foundations with soft soils. The Geotechnical panel member shall have familiarity with preparing plans and specifications for levee embankment and levee rehabilitation projects. The Geotechnical panel member shall also have knowledge of best practices regarding levee design and construction procedures and policies.

The Geotechnical panel member shall have recent and relevant experience on multi-million dollar projects verifying the constructability of the proposed designs and then verifying that these projects were being constructed per the plans and specifications.

The SAR Panel shall:

- Conduct the review in a timely manner in accordance with the project and SAR Plan schedule;
- Follow the "charge", but when deemed appropriate by the panel lead, feel free to request other products relevant to the project and purpose of the review;
- Receive from the USACE any public written and/or oral comments provided on the project;
- Provide timely written and oral comments throughout the development of the project as requested;
- Submit reports in accordance with the review plan milestones; and
- The panel lead shall be responsible for ensuring comments represent the group, be non- attributable to individuals and where there is lack of consensus and note the non-concurrence and reasoning.

5. SAR Review Panel Expertise

Per EC 1165-2-214, selection of expert reviewers for SAR efforts will adhere to the National Academy of Science (NAS) Policy on Committee Composition and Balance and Conflicts of Interest. Prior to submitting the SAR panel for approval, the CPRA shall obtain a statement from the panel members indicating willingness to participate and the absence of a conflict of interest (COI). CPRA will require the proposed panel members to submit the NAS COI form for the sole purpose of validating that there is no

conflict of interest. If necessary, panel members will be replaced during a review if a conflict arises. All potential reviewers carry professional and personal biases, and it is important that these biases be disclosed when reviewers are considered and selected.

Panel members shall be registered professional engineers in the United States. The reviewers must have an engineering degree. A master's degree in engineering is preferred, but not required. Hands-on, relevant engineering experience in the listed disciplines is critical. The panel members shall have a minimum fifteen years' experience in each of their respective fields.

6. Comment Tracking

The SAR Panel will provide written comments and recommendations to the CPRA and design team for response. Based on a panel review of the design team responses, the issues raised will be closed for items resolved satisfactorily or remain open for unresolved items.

Upon completion of each stage of the review, the panel lead shall prepare a response detailing any actions undertaken or not taken in response to the comments. Comments that lack consensus shall be clarified to explain the non-concurrence. All comments shall be addressed.

7. Schedule and Costs

The SAR team will be allowed approximately two (2) weeks to complete the Design Phase SAR, once the SAR reviewer has been approved. Included in this time period, is a one (1) day workshop for the SAR reviewer to review the plans and ask questions of USACE, DOTD, and designer of record. The design of WBV-18.2 project is currently at or near 95% complete, and it is anticipated that once the review plan and the review team have been approved the SAR will begin shortly thereafter.

After completion of the Design Phase SAR, it is anticipated that the 50% construction review will begin within 6 months or when the project is approximately 50% construction complete.

The SAR reviewer has the option to request additional review time warranted and reasonable. In advance of each review, CPRA and/or design team will prepare an agenda including important topics, questions for the panel, etc., as well as provide and supporting reports and/or project briefing materials.

The estimated cost of the SAR's is between $20,000 and $30,000.

8. Adequacy of the SAR

The information provided in this SAR Plan demonstrates CPRA's effort to ensure good science and sound engineering, as well as public health, safety and welfare are the most important considerations for the WBV-18.2 project. The planned actions outlined

in this document satisfy the intent of EC 1165-2-216 and 33 USC 408. This SAR Plan is a living document and may be modified in the future as warranted.

9. Proposed SAR Panel Roster

The SAR Panel listed below is accurate for the initial submittal, but may be updated in the future when the project progresses to the next phase of review. Resumes for the SAR Panel members are included as part of this appendix.

SAR Panel Roster	
Role	**Name**
Geotechnical Engineer and Panel Lead	George L. Sills, P.E.

George Sills Geotechnical
Engineering Consultant, LLC
470 Dogwood Lake Drive
Vicksburg, MS 39183
Office: 601-638-0436
Cell: 601-529-3407

Sills Engineering

Simple Solutions for Complex Engineering Problems

Qualifications for George L. Sills, PE

EDUCATION

- Advanced graduate work, Civil Engineering, Louisiana State University, toward Ph.D.
- ME, Civil Engineering, Texas A & M University. 1981
- BS, Civil Engineering, Mississippi State University, 1975

REGISTRATION

Professional Engineer: MS, TX, LA

AWARDS

- Tau Beta Pi Member
- Selected by National Society of Professional Engineers as USACE National Engineer of the year and one of the Top 10 Federal Engineers of the Year-1999
- Award for Outstanding Team Effort for planning and testing of temporary, barrier-type flood-fighting technologies. Award-May 2008
- Commander's Award for Superior Civilian Service, 2007-for service to ERDC
- Commander's Award for Superior Civilian Service, 2007- for service to IPET Team
- Certificate of Appreciation from Sacramento District, U.S. Army Corps of Engineers for leading the Levee Seepage Task Force for developing criteria for flood protection – 2003
- Commander's Award for Civilian Service-1995, 1999
- Commander's Award for Community Service-1994, 1999

- Appointed to MS State University National Board of Directors and recipient of the Distinguished Service Award-1994

- Commander's Award for Civilian Service-1994. During the 1993 Midwest flood, George served as technical advisor for the USACE St. Louis District to answer seepage related questions in the field during the flood event.

PROFESSIONAL SUMMARY

George currently serves as manager of his private consultant company, George Sills Geotechnical Engineering Consultant, LLC, which he opened in 2008. George is retired from the U.S. Army Corps of Engineers (Corps) where he worked for over 36 years. He was employed by the Vicksburg District for 32 of those years and the Engineer Research & Development Center (ERDC) for 4 years. He has extensive experience in the evaluation, design, and construction of dams, levees, and flood fighting. George has lead several investigations into the causes and mechanisms of seepage distress along levees and dams, and has helped the Corps develop a comprehensive understanding of these issues. He has lectured and published numerous technical papers on levee seepage distress and levee design.

While at ERDC, George led the joint Corps and Bureau of Reclamation (Reclamation) team that developed a toolbox for use in performing Probabilistic Risk Assessments (PRAs) on Corps and Reclamation dams with regard to seepage and piping distress. Much of this effort involved leading a diverse group to resolve complex and conflicting guidance criteria to create useable tools for practitioners from different agencies. The original guidance contained in the current USACE "Internal Erosion Toolbox A Method for Estimating probabilities of Failure of Embankment Dams due to Internal Erosion Best Practices Guidance Document" was developed by George's team. The document was originally published as, "A Unified Method for Estimating Probabilities of Failure of Embankment Dams by Internal Erosion and Piping" Delta Version, Issue 2, dated August 2008. George also served on the Corps' National Levee Safety Program to help set policy/methodology for Corps levee assessments in the future. George also led the team assigned to rewrite the Corps Levee Design Engineering Manual, which instructs engineers in proper design procedures for levee underseepage. This document is currently in draft form and undergoing review.

George served on a team from 2006 through 2007 to provide Independent Technical Review of the design for repairs to the Herbert Hoover Dike in Florida. This 145-mile-long dam/dike was constructed over peat and limestone which created seepage problems. Currently, George was a member of the Independent Consulting Board reviewing the ongoing design work for urban and non-urban levees in the Central Valley of California from 2006 through March 2013. He also serves on numerous Independent External Peer Review Boards: he is member of the Senior Board of Consultants for the review of levee designs for the Natomas Levee Improvement Program for the Sacramento Area Flood Control Agency. He also serves on a similar Board of Senior Consultants for the Cities of

West Sacramento, CA, Sutter-Butte, CA, and Dallas, TX. He has also performed IEPR review for the Whitewater and Walnut Rivers Levee Project in Augusta, KS and for the Turkey Creek Restored Channel Project in Kansas City, KS. During 2008, George was selected and served as a member of the National Levee Safety Committee Review Team which reviewed the new levee proposals made to Congress.

George is currently a sub-consultant supporting the GEI/HDR Design Team as a member of the Value Engineering, Constructability Reviews, Cost Estimating (VCC) Panel. As a member, he participated in Alternatives Identification workshops, assisted in determining design criteria, reviews and provides feedback to geotechnical analyses performed by the GEI team, reviews preliminary design details and supports the GEI team with evaluations for construction sequencing and site access constraints, provides constructability reviews, and cost estimating reviews. The goal of this design approach is to provide a project with the highest degree of public safety at the lowest cost.

In 2005, George was selected to serve on the Corps' Interagency Performance Evaluation Task Force (IPET) following Hurricane Katrina as a member of the Perishable Data Team and also as a member of the Performance Analysis Team. He made major contributions to these efforts and to the IPET document that summarized the team's findings. He has also testified in court about their efforts on this study.

During 2003, George was selected to lead the Sacramento District (SPK) Levee Seepage Task Force. The Task Force consisted of six levee experts: two from the federal government, one from the State of California, one private consultant, and two consultants from universities. George led this diverse team to accomplish their mission within budget and within schedule. George later took the information from this study and wrote an Engineering Technical Letter to change procedures currently used by USACE for their nationwide approach to seepage design.

While at the Vicksburg District, Mr. Sills led a study to determine the effects on area groundwater along the Red River which might occur from impounding the pools for navigation on the Red River.

Mr. Sills has been performing structural and foundation inspections, evaluations, and assessments for residential and commercial buildings from 1985 until present. These assessments have dealt with all aspects of issues relating to foundation problems as well as poor construction techniques.

RELEVANT EXPERIENCE

1994-2003
While working at the Vicksburg District George performed the following as a Geotechnical Coordinating Specialist: George assisted the Branch Chief with the overall management, direction, control, administration, planning, and review of the engineers and design functions of the Geotechnical Branch of the Vicksburg District (MVK). He evaluated technical staffing and performance and made recommendations on the most economical, efficient, and feasible methods and/or manner to accomplish work. He also established schedules and priorities. He served as Technical Expert and Consultant for

guidance and recommendations to MVK, other Corps Districts, A-E firms, and higher Corps echelons. During this period, George led the design effort for the soil nailing of the Natchez Bluffs.

July 1994-December 1994
Served as a Project Engineer in the Programs and Project Management Division, managing the $1.8 billion Red River Basin Project. Daily, he coordinated all District functions concerning District policies and procedures. He served as major liaison between the project sponsor and Corps. He also worked closely with Congressional staff in order to meet project milestones. He used innovative problem solving techniques to enable the District to begin pool impoundments as scheduled.

December 1994-December 1995
Supervisory Civil Engineer, GS-0810-13, Acting Chief of the Analytical Section with the responsibility of supervising twelve engineers and professionals. This responsibility included personnel and administrative matters as well as scheduling and programming funds. During this period, the Section met or exceeded all schedule requirements and operated within budget requirements.

December 1989-July 1994
Geotechnical Specialist responsible for the designs and reviews of all geotechnical work associated with the Red River Project. This work included designing the foundations for the locks and dams, dewatering requirements, and all other Geotechnical requirements. During this project, George invented a method of slide repair reported in ASCE and currently used by private and government sectors.

January 1991-November 1991
Served as a professional specialist in Project Management, CEMVD General Management Branch. Responsibilities included executing the project management function for Engineering Division by furnishing staff assistance and managerial and technical advice to Districts and MVD staff. He also coordinated the review of reports and studies, monitored District schedules, identified potential slippages, and took corrective action when necessary.

January 1981-December 1989
Served as Project Engineer in the Analytical Section where George was responsible for geotechnical design of complex multimillion dollar projects, as well as supervision of as many as 20 engineers and professionals in the execution of field testing operations. These field tests included the pile load test at John H. Overton Lock and Dam for a period of 8 months, as well as field pumping tests at Locks and Dams No. 4 and 5 on the Red River. He was also responsible for programming funds for the entire Red River in CEMVK-ED-G. George was the primary point of contact for design and/or construction problems for Locks and Dams No. 2, 3, 4, and 5 on the Red River.

CONCRETE LOCKS AND DAMS

- Served as Geotechnical Project Engineer for the Red River Waterway Project and was responsible for designing and reviewing all Geotechnical designs of this $1.8 billion dollar project. This design work included the foundations for the locks and dams, dewatering requirements, and all other Geotechnical requirements.
- Geotechnical Project Engineer for the Joe D. Waggoner, Jr. L&D (Lock & Dam No. 5) on the J. Bennett Johnston Waterway Project (Red River Waterway). His design and construction experience on this project included a slurry trench design and dewatering wells to unwater the excavation. He also led a field pumping test at this site.
- Geotechnical Project Engineer for the design and construction of the Russell B. Long L&D (Lock & Dam No. 4) on the Red River Waterway, this design included a slurry trench, dewatering wells, and excavation through a rock formation. He also led a field pumping test at this site.
- Geotechnical Project Manager for Lock & Dam No. 3 for the design and construction which also included a field pump test.
- Geotechnical Project Manager for John H. Overton L&D (Lock & Dam No. 2) for the construction phase which included the redesign of the field pile load test program. The pile test program was modified using a method never tried before. Because of these changes, the modified program was able to collect more useable data while saving the Government a sum of $450,000.
- Geotechnical Project Manager for the construction of Lindy C. Boggs L&D (Lock & Dam No. 1) where he answered all geotechnical related questions during construction.
- Geotechnical Engineer performing all phases of geotechnical design for the foundation of Felsenthal L&D and T.K. Thatcher L&D (Calion L&D) on the Ouachita-Black Navigation Project.

DAMS AND LEVEES

- Served on a group to provide Independent Technical Review for the Herbert Hoover Dike in Florida. This 145 mile long dam/dike was constructed over peat and limestone which has created seepage problems. This review team was responsible for assuring the safety of the design repair.
- He led a diverse team of Corps, State of California personnel, and leading academic experts to review the Sacramento Districts practices of levee construction. Results from this study have led to major changes in the procedures the Corps used nationwide in levee design.

- Geotechnical Engineer managing the geotechnical designs of the Sicily Island Levee system. This project included numerous drainage structures, several large pumping plants, and approximately 70 miles of levees.
- Geotechnical Engineer designing numerous miles of mainline Mississippi River Levee enlargements that included stability berms, seepage berms, and relief well designs.
- Geotechnical Engineer designing and providing construction design support for the Swan Lake levee project. This project was constructed over very soft soils with shear strengths less than 100 psf.

  Geotechnical Project Manager for the geotechnical design for the earthen closures at Locks & Dams 2, 3, 4, and 5 on the Red River. All these closures were constructed in the wet.

OTHER EXPERIENCE

- George has worked on numerous deep slurry trenches and has been heavily involved both in design and in the oversight of construction. He is widely known as an expert in several fields of Geotechnical Engineering.
- Publication and expertise in long-term behavior of soils and slope stability, pile design and driving.
- Experience in dewatering, slope stability, slurry trench design and construction, ground water movements, seepage, and foundation design.
- Ameristar Casino (Vicksburg) – review of cofferdam cell keyed into limestone that was sliding – including the development of recommendations to stabilize (for Sverdrup).
- Served as lead geotechnical designer for the $1.8 billion Red River Waterway project that included five locks and dams. Work included pile design, cofferdam cells, dewatering, slope stability, etc.
- Invented a method of slide repair using stone filled trenches that was later published by the American Society of Civil Engineers.
- Responsible geotechnical engineer for the Natchez Bluff Stabilization Project which used "soil nailing".

Expert Witness for Litigation

- Prepared an expert report and assisted in mediation in connection with the Appeal of Nicholson Construction Co., ASBCA Nos. 58145, 58182, 58183, and 58184 December 2012, Washington, DC.
- Prepared an expert report and testified in Court Deposition in case: John Douglas Coots, et ux.v. James Terrell Machen, et al, Number 44284 Div: D, 18th Judicial

Court Parish of Pointe Coupee, State of Louisiana, File #5356.135, for Kyle Law Firm, Baton Rouge, LA, December 2012.

- Retained as expert witness in a case of Miller v. KCP & L. In this case the power company of Kansas City Power and Light had refused to allow the local levee district to raise the levee during a flood event within their property and they also refused to raise it when it only need approximately one foot of raise to prevent it from overtopping. I performed a deposition on 9/8/11 and gave testimony to the fact that there was no engineering reason not to raise the levee. After deposition, KCP&L settled the dispute.

- 2006 testified on IPET forensic work for New Orleans in: Colleen Berthelot, et al., v. BOH Brothers Construction Co., LLC, et al., Civil Action No. 05-4182, May 4, 2006, United States District Court, E.D. Louisiana.

- Calion Lock and Dam - dewatering and differing site condition construction claim - a second claim for rock in the outlet channel.

- Felsenthal Lock and Dam - dewatering construction claim

- John H. Overton Lock and Dam - access road construction claim differing site conditions

- Lock and Dam No. 3 - access road claim - differing site conditions construction claim

- Lock and Dam No. 4 - differing site conditions construction claim - rock in the inlet channel evaluation of difficult driving of sheep pile in rock

- Provided technical assistance to EPA in trial conducted in Texas (1995).

- Provided testimony and assistance concerning "sudden drawdown failures" in lawsuit defended by the Red River Waterway Commission

- Provided numerous depositions in the above listed cases and disputes.

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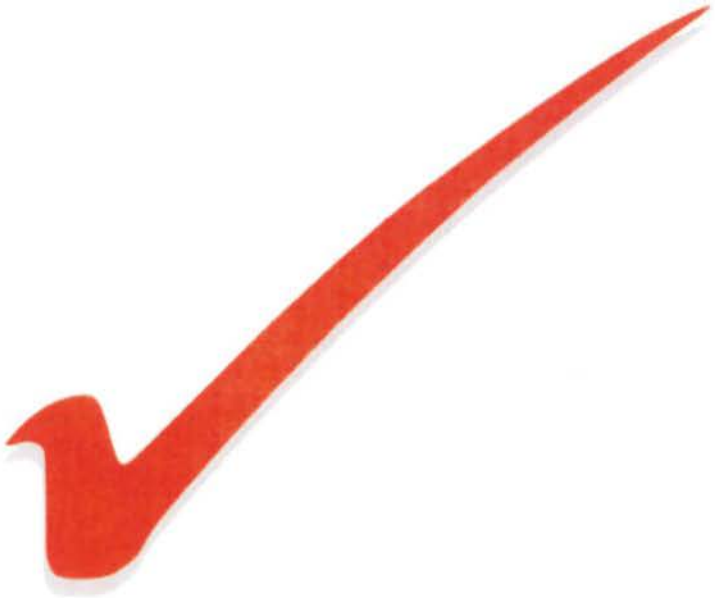
NOTE: Numerous publications prior to 2002 available upon request.

HNTB

Gulf Coast District
Quality Management Plan



Revised: Winter 2011/2012

QUALITY MANAGEMENT PLAN

INTRODUCTION

The HNTB doctrine states – sustainability, profitable growth, best business practices and "4 for 4". HNTB's "4 for 4" is our performance standard for each and every project as stated below:

- Quality Work
- On Time
- On Budget
- To the Client's Satisfaction

Quality is a key component of this doctrine and is expected in everything we do. HNTB has defined the standard of quality that is to be achieved in our *Manual of Professional Practice (MPP)* and has established general guidelines for achieving this goal and documenting the results.

The Gulf Coast Quality Management Plan (QMP) establishes planned and systematic processes necessary to provide adequate confidence that a project will conform to the established quality requirements. It consists of two key components, Quality Control and Quality Assurance.

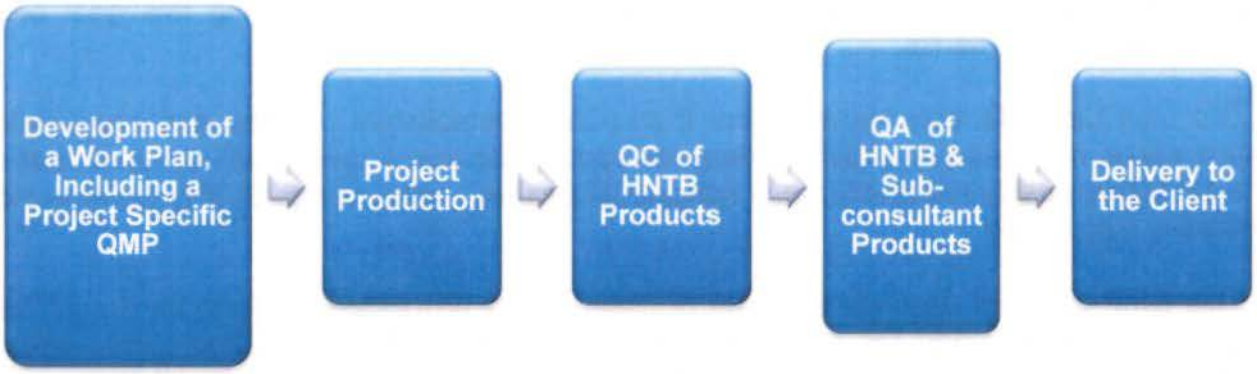
This QMP provides an understanding of basic quality processes set forth for the HNTB Gulf Coast offices and the procedures established for implementing those processes. The general procedures outlined herein are recommended for use on all tasks and projects, including the management of our sub-consultant's work products. These procedures are intended to serve as guidelines, and are not intended to be a replacement for sound professional judgment. They have been developed to supplement the general guidelines of HNTB's *MPP*, and other instructive documents such as Administrative Policy Memoranda and Service Group Standards, and are intended to become part of the detailed work plan developed for each project.

Adherence to good quality best practices is expected during all phases of the project life cycle, from client selection and marketing, to proposal preparation, to contracting and execution, to project closeout. Good quality best practices are conducive to effective control of all project types at HNTB.

1.0 WORK PLAN IMPLEMENTATION

Quality shall be planned into each project through an orderly process which includes procedures, actions, verification and identification of appropriate review personnel and budget. A project work plan is recognized as one of the most important planning tools available to the project management team. In accordance with the *MPP*, a quality plan is to be included as an element of the work plan to define the quality process, appropriate review milestones and required resources to accomplish the reviews. Typically, this Gulf Coast QMP can be referenced for use in the work plan, (see Appendix for example).

The following is a typical project quality work flow:



1.1 SUBCONSULTANTS

Any work being performed by a sub-consultant to HNTB, shall be held to the same quality standards as described herein for HNTB produced work. The subconsultant shall submit proof of quality control per the contract agreement. If the subconsultant does not have a QA/QC procedure, they shall be provided with the Gulf Coast Quality Management Plan for implementation. At a minimum, the subconsultant shall provide HNTB with a completed QUALITY CONTROL SIGN-OFF SHEET (Form 3.0), along with backup documentation (check prints, commentary, etc.).

2.0 QUALITY CONTROL PROCESS (QC)

QC is defined as the procedures and processes established to meet the project requirements for quality as stated in the Quality Management Plan and the accepted standard of care. It is our basic checking procedures for ensuring accuracy and completeness. The following are the standard checking formats for hard copy documents (such as hand calculations, maps and plans) and electronic documents (such as financial spreadsheets and input data) that should be implemented for all QC processes:

Hard Copy Documents

A check print of the original document is made for documentation of all review activities.

Review of the document for correctness and completeness is performed by the **Checker**.

- Changes are shown in red
- Correct items are yellowed
- Correct full paragraphs (or pages) marked with a yellow diagonal or check mark

A back-check of all comments/proposed changes is performed by the **Back-checker** (usually the **Originator**)

- Agreement shown with a green check mark
- Disagreement is discussed with **Checker** and noted with a green "STET" or "ok as is" upon concurrence with original value

All agreed upon changes are made to the original document by the **Updater**

- Items are circled or checked in blue to show that the change has been made

All updates to the document are verified for completeness and correctness by the **Verifier** (usually the **Checker**)

- Blue circles or checks are yellowed to show that updates were made

Electronic Documents

A review of the document for correctness and completeness is performed by the **Checker**.

- Changes are shown in an inserted comment box or using Track Changes (Word Document)
- Correct items are highlighted with yellow
- Correct full paragraphs (or pages) are highlighted in yellow

A back-check of all comments/proposed changes is performed by the **Back-checker** (usually the **Originator**)

- Agreement is shown by typing "concur" and initialing in comment box or Accepting Changes (Word Document)
- Disagreement is discussed with **Checker** and noted with a "STET" or "ok as is" in comment box with initials of both parties or by Rejecting Changes (Word Document) upon concurrence with original value

All agreed upon changes are made to the original document by the **Originator or Updater**

All updates to the original document are verified for completeness and correctness by the **Verifier** (usually the **Checker**)

- Type verified and initials in the comment box of the "check print"

A basic checking procedure is displayed below:

2.1 LEVELS OF REVIEW - There are two levels of review that are utilized within the QC process, as defined below. A given project task could receive a Level 1 or a Level 2 review, or both as deemed appropriate by the PM or PQM.

Level 1 - 100% checking of a produced document to include *drawings, calculations, spreadsheets, special provisions, tables within reports, graphic elements for reports or presentations, design programs, CADD modeling input.*

Level 1 - 100% Document Check

- Everything on a sheet is checked
- Use the appropriate standard checking format
- Checking procedures are documented on an attached check print sign off sheet or by check print stamp (see Appendix for examples)
- Original checked documents are copied and uploaded as color pdf files to the project "QC" directory, to await audit

Level 1 - 100% Input Check

- Checking is only for input data
- Use the appropriate standard checking format
- Verify that the software or spreadsheet used is appropriate
- HNTB developed Software does not require validation
- Non-HNTB Software only needs one project-wide validation
- Check the input only to pre-validated computer programs, individual and client provided spreadsheet templates
- Checking procedures are documented on an attached check print sign off sheet (see Appendix)
- Original checked documents are copied and uploaded as color pdf files to the project "QC" directory, to await audit

Level 2 - Peer Review of documents to include *drawings, calculations, report text, CADD documents, shop drawings and RFIs, presentation materials, quality assurance checklists*; Inter-disciplinary, Constructability and independent technical reviews; Review and oversight of *sub-consultant* submittals.

- Only specific items are checked or validated as determined by the PM or Task Leader
- Use the appropriate standard checking format
- Checking procedures are documented on an attached check print sign off sheet or by check print stamp (see Appendix for examples)
- Original checked documents are copied and uploaded as color pdf files to the project "QC" directory, to await audit

2.2 DELIVERABLE GROUPINGS – All common client deliverables produced within the Gulf Coast offices have been grouped by task similarity and required level of review. These groupings are located in the following Sections 2.3 through 2.7 along with specific quality procedures and documentation requirements for each group.

The individual responsible for performing the QC review of a particular deliverable should identify the appropriate grouping for that document and then follow the specific review procedures provided for that group.

GROUP A

Report Text
Report Narrative
Technical Specs
Special Provisions
Scope Narrative

2.3 Deliverable Group A

Scope

Level 2 Review of written documents using standard checking format. All drawings, tables, and calculations included in or appended to such documents are to be checked per their appropriate deliverable group.

Responsibilities

PM or Task Leader – Selects a *Checker,* determines scope of review and provides any pertinent checklist.

Originator – Provide hard copy of written documents.

Checker –Review of the written document with attention to:

- Content accuracy
- References
- Omissions
- Grammar

Project Quality Manager is responsible for verification that the QC is implemented in accordance with this procedure.

Procedures – Level 2

Originator prepares narrative package, fills in the project info portion of Form 3.0 – "Level 2 Review Memorandum", attaches the form to the package, places the package in the project "QC" folder, logs it into the PQM log and notifies the PM that it is ready for QC.

Checker completes review in accordance with standard checking procedures and Level 2 criteria, and records the review findings on Form 3.0.

Originator and *Checker* resolve comments, make corrections, and complete the records on Form 3.0; place the package in the project "QA" folder; log the review into the QMP log and notify the PM that it is ready for QA.

2.4 Deliverable Group B

GROUP B

Financial Spreadsheets
Input Data
Estimate Templates
Hand Calculations
Design Spreadsheets
Model Input
Fee Estimates

Scope

Level 1 Review of calculations using standard checking format.

Responsibilities

PM or Task Leader – Selection of a *Checker* with task related technical qualifications equal to those of the *Originator* and provides any pertinent checklist.

Originator – Provide all calculations and/or input data in a neat, logical, complete package conducive for checking,

Checker –100% check of the calculation or input data package with attention to:

- Accuracy
- Assumptions
- Mandated parameters
- References
- Given values and formulas
- Omissions
- Arithmetic

The *Checker* shall ask questions of the *Originator* in areas that are not clear or seek technical advice as required for any particular element of the calculation.

Project Quality Manager is responsible for verification that the QC is implemented in accordance with this procedure.

Procedures – Level 1

Originator prepares complete package of calculations or input data, fills in the project info portion of Form 2.0 – "Level 1 Check Print Signoff Sheet", attaches the form to the calc package, places the package in the project "QC" folder, logs it into the PQM log and notifies the PM that it is ready for QC.

Checker completes review in accordance with standard checking procedures and Level 1 criteria, and records the review on Form 2.0.

Originator and *Checker* complete the backcheck, correction and verification steps of the QC process; complete the records on Form 2.0; place the package in the project "QA" folder; log the review into the QMP log and notify the PM that it is ready for QA.

2.5 Deliverable Group C

GROUP C

- Graphs
- Charts
- Exhibits
- Report or Presentation Graphics
- Model Graphics

Scope

Level 2 Review of graphic elements using standard checking format.

Responsibilities

PM or Task Leader – Selects a *Checker,* determines scope of review and provides any pertinent checklist.

Originator – Provide hard copy of graphic elements.

Checker –Review of the graphics with attention to:

- Content accuracy
- References
- Omissions
- Consistency within the document
- Model Input Data

Project Quality Manager is responsible for verification that the QC is implemented in accordance with this procedure.

Procedures – Level 2

Originator prepares graphic package, fills in the project info portion of Form 3.0 – "Level 2 Review Memorandum", attaches the form to the package, places the package in the project "QC" folder, logs it into the PQM log and notifies the PM that it is ready for QC.

Checker completes review in accordance with standard checking procedures and Level 2 criteria, and records the review findings on Form 3.0.

Originator and *Checker* resolve comments, make corrections, and complete the records on Form 3.0; place the package in the project "QA" folder; log the review into the QMP log and notify the PM that it is ready for QA.

2.6 Deliverable Group D

GROUP D

Cross-Check Data Design Software Checklists

Scope

Level 2 Review or validation of design software, checklists cross-check data including *Independent Quality Reviews, Constructability Reviews, Inter-Disciplinary Reviews*, and other items requiring validation using standard checking format.

Responsibilities

PM or Task Leader – Selects a *Checker,* determines scope of review and provides any pertinent checklist. *PM* makes the final determination on the acceptability of the item being validated.

Originator – Provide hard copy of documentation package to be reviewed; or input, output and program description of software to be validated.

Checker –Review of the documents with attention to:

- Content accuracy
- References
- Omissions
- Consistency across all disciplines represented
- Software Output Accuracy (may require independent calculations)

Checker shall select an appropriate number of items to spot check for completeness.

Project Quality Manager is responsible for verification that the QC is implemented in accordance with this procedure.

Procedures – Level 2

Originator prepares documentation package, fills in the project info portion of Form 3.0 – "Level 2 Review Memorandum", attaches the form to the package, places the package in the project "QC" folder, logs it into the PQM log and notifies the PM that it is ready for QC.

Checker completes review in accordance with standard checking procedures and Level 2 criteria, and records the review findings on Form 3.0.

Originator and *Checker* resolve comments, make corrections, and complete the records on Form 3.0; place the package in the project "QA" folder; log the review into the QMP log and notify the PM that it is ready for QA.

2.7 Deliverable Group E

GROUP E

Plan Sheets
Check Prints
GIS Maps

Scope

Level 1 Review of drawings, construction documents and maps using standard checking format. Timely checking of drawings is important for efficient performance. A drawing used as a base by several disciplines should be checked and corrected before further additions are made; this will eliminate the need to check and correct the same items on subsequent drawings. Drawing files will be kept as per the project's document control system.

Responsibilities

PM or Task Leader – Selection of a *Checker* not directly responsible for the design and provides any pertinent checklist.

Originator – Provide all drawings or maps as hard copies in a neat, logical, complete check print package conducive for checking;

Checker –100% check of the calculation or input data package with attention to:

- Accuracy and Completeness
- Project CADD Standards
- Mandated parameters
- References
- Omissions

Project Quality Manager is responsible for verification that the QC is implemented in accordance with this procedure.

Procedures – Level 1

Originator prepares complete package of calculations or input data, fills in the project info portion of Form 2.0 – "Level 1 Check Print Signoff Sheet", attaches the form to the calc package, places the package in the project "QC" folder, logs it into the PQM log and notifies the PM that it is ready for QC.

Checker completes review in accordance with standard checking procedures and Level 1 criteria, and records the review on Form 2.0.

Originator and *Checker* complete the backcheck, correction and verification steps of the QC process; complete the records on Form 2.0; place the package in the project "QA" folder; log the review into the QMP log and notify the PM that it is ready for QA.

3.0 QUALITY ASSURANCE PROCESS (QA)

QA is defined as the systematic activities implemented to provide confidence that the QC processes are being followed in compliance with the Quality Management Plan. These are our audit processes for verifying that the appropriate checking procedures have been performed and documented, and our corrective action plans for addressing problems that have been identified within the processes. The keys to an effective quality program lie in the accountability, compliance and continual improvement of the program.

Once the quality control processes have been performed, a quality assurance process must be implemented to confirm that the quality control procedures were performed to the expectations documented in the work plan. The following procedures should be part of the assurance/ validation process.

3.1 Audits

All completed QC documents should be in the project "QA" folder awaiting audit. The *Project Quality Manager* will audit the *Quality Control Records* prior to each submission to confirm that all quality control procedures have been performed for each task of the deliverable, and record the findings on FORM 4.0 (see Appendix). Upon approval of the quality documents, the *Project Quality Manager* move each approved document into the project "Quality Records" folder and will inform the *Project Manager* that the submittal is ready for release to the client. The *Office Leader* will also receive a hard copy of that verification.

Additionally, the *Office Quality Manager* may choose a project or submittal for review at an executive level. An audit will be performed similar to the routine project audit, but will also include interviews with staff to determine if the quality management process is clearly understood and is being performed unbiased and independently of the design or production process.

The purpose of the audit is twofold:

1. Identify and correct a breakdown in quality or any instance of noncompliance to established HNTB best practice procedures through a defined corrective action plan.
2. Identify opportunities for implementation of preventive action, training and continual improvement processes to enhance quality, efficiency and value to our projects and clients.

All audit findings, including good and bad performances, should be documented as a part of the *Quality Records*.

3.2 Corrective Action and Preventive Action Plans

A corrective action plan is a strategy for correcting or eliminating a problem impacting project quality or performance that has already occurred or been identified. The focus of the

plan is to systematically review the root cause of the problem in an attempt to prevent the problem from recurring. The primary concepts of the plan are as follows:

- Task leads identify the problem and presents to PM or PQM
- Determine the cause of the problem or unintended result
- Identify action items or plan to correct to the problem

Preventive actions are implemented in response to the identification of a trend that would potentially impact quality and lead to a project issue or problem. Preventive action should be considered as a proactive undertaking. For example, if we anticipate a potential problem and take action to eliminate the causes and prevent the occurrence of that problem, this is considered to be preventive action.
If a problem or breakdown in quality is discovered during an audit, the *Project Manager* should be notified immediately. The *Project Manager* and *Project Quality Manager* should perform a root cause analysis to determine the extent of the problem and develop and a *Corrective Action Plan* for implementation. A follow-up meeting should be conducted with all responsible individuals to convey the CAP expectations. If a resolution cannot be reached, the *Office Leader* will be involved in the process.

3.3 After Action Review (AAR)

An after action review should be performed for every project that requires a CAP, to determine the effectiveness of the plan and to identify any "best practices" that should be implemented on future projects. AARs will typically be performed by the *Office Quality Manager* or a designee, and documented as part of the *Quality Control Records.* AARs may also be performed on large, multi-discipline projects, projects achieving outstanding "four for four" performance, and financially unsuccessful projects to develop office trends for future improvement. The AAR trends shall be developed and maintained by the *Office Quality Manager,* at the direction of the *Office Leader.*

3.4 Training

This Quality Management Plan is intended to be a living document. The *Office Quality Manager* will develop a training program to provide all employees with initial training on these procedures. Each employee will be expected to update their training on annual basis, or as deemed appropriate by the *Office Quality Manager.*

A *Project Quality Manager* may also choose to do supplemental or project specific training as deemed necessary for a project team.

4.0 QUALITY MANAGEMENT IMPLEMENTATION

For a quality program to be effective it must be a planned and implemented as part of the project work plan, and budgeted accordingly. A Quality Management Plan Log - FORM 1.0 (see Appendix) should be filled out by the *Project Manager* for every project, incorporated into the Project Work Plan and forwarded to the Project Quality Manager for execution.

Proper documentation of the process throughout is also key to successfully managing quality. The following file structure should be setup within the project directory for each project:

\\Batw00\Projects\#####\QMP\QC
" " " " \QA
" " " " \Quality Records

The **QMP** folder will contain the Quality Management Plan Log (Form 1.0) and all project specific quality requirements, checklists, etc.

The **QC** sub-folder will receive each task item or deliverable that has been produced and is ready for review. Each deliverable will be accompanied by either Form 2.0 or Form 3.0, as determined by the *PM* or *Task Leader*. All assigned *Checkers* will go here to get their assigned documents.

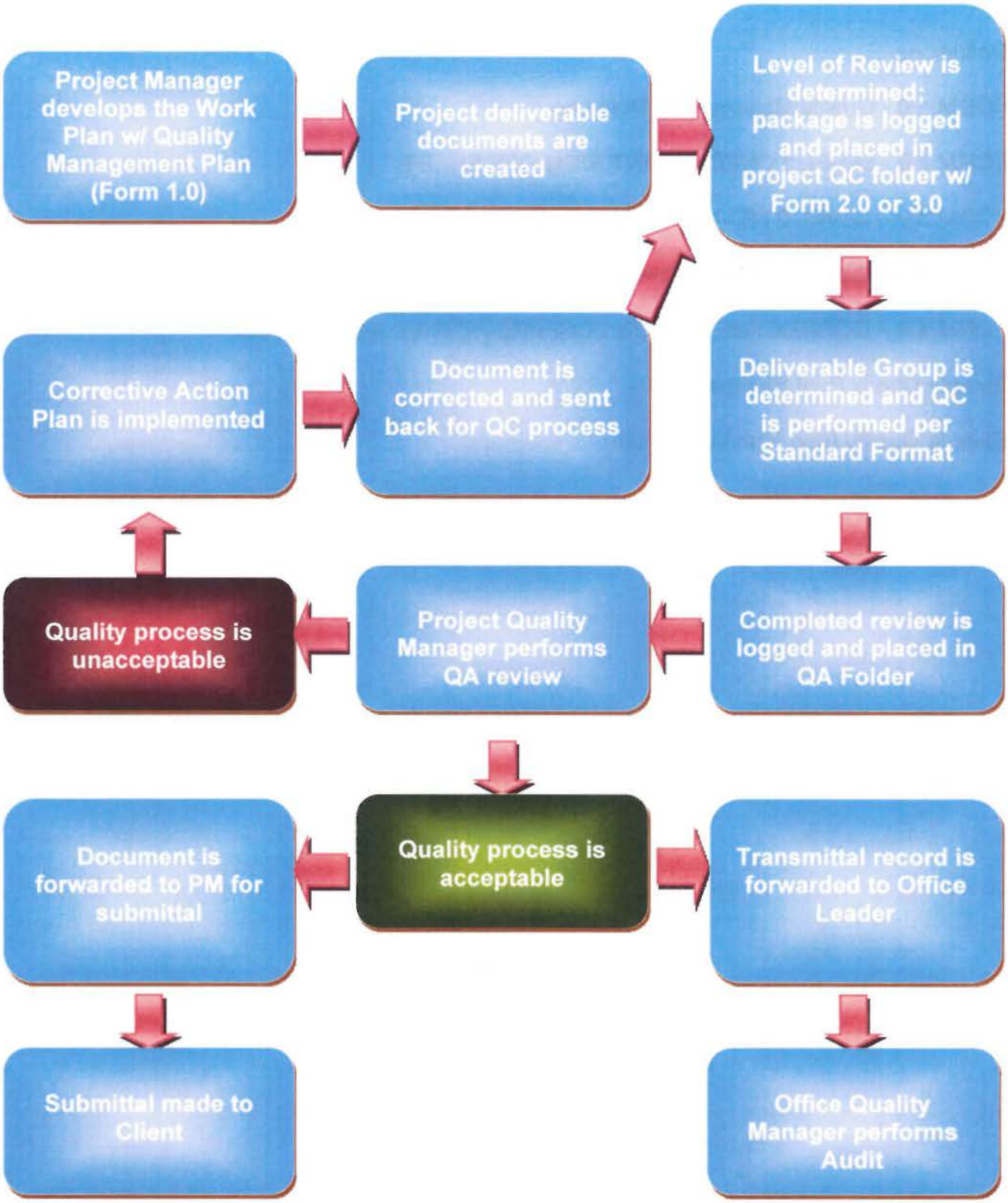
The **QA** sub-folder will receive each completed item or deliverable from the QC folder along with a completed Form 2.0 or Form 3.0. The *PQM* will go here to find all documents ready for QA.

The **Quality Records** sub-folder will receive all completed quality documentation that has been signed off by the *PQM* and the *PM*, all audit findings, CAP and AAR documentation.

4.1 QMP Process Diagram

The diagram below depicts all key activities and the work flow required for the Quality Management Process. This diagram is only intended as a guide and can be supplemented as required by the PM or PQM, based upon project complexity or client requirements.

Quality Process Diagram



5.0 APPENDIX

Key Roles

Definitions

FORM 1.0 - Quality Management Plan Log

FORM 2.0 - LEVEL 1 CHECK PRINT SIGN-OFF SHEET

FORM 3.0 – LEVEL 2 REVIEW MEMORANDUM

FORM 4.0 – QUALITY AUDIT CHECKLIST

FORM 5.0 – CORRECTIVE ACTION LOG/ PREVENTIVE ACTION LOG

Sample Check Print Stamps

Sample Quality Plan from Work Plan

KEY ROLES

The following defines key roles within a project work plan and the quality process:

Back-checker -- The individual (usually the Originator) who reviews the comments, suggested changes, additions, and corrections to design calculations, drawing or report made by the Checker. The Back-checker and the Checker must reach consensus on proposed changes or additions.

Checker -- The individual who reviews design calculations, analyses, plans, reports or graphics prepared by the Originator. The Checker must possess technical qualifications at least to the level of the Originator.

Office Leader (OL) -- The individual responsible for the overall operation and direction of an HNTB office, to include the quality and profitability of all work performed. The OL shall be copied on all quality audit documentation and shall be a part of all monthly project reviews, to include quality assurance documentation.

Office Quality Manager (OQM) -- The individual assigned by the Office Leader to oversee the quality management processes for the office, perform periodic reviews of project quality documentation and conduct quality training. The OQM or an appointed quality assurance manager is responsible for conducting project quality audits on a prescribed basis.

Originator -- The individual who prepares design calculations, construction documents, reports, studies, analyses or graphics.

Project Manager (PM) -- Individual responsible for overall design and plan production of the project in accordance with the project requirements, approved design criteria and the project work plan.

Project Quality Manager (PQM) -- Individual responsible for the implementation of the Quality Management Plan and for compliance monitoring through the duration of the design phase. The PQM reports to the Office Quality Manager.

Quality Assurance Managers -- Individuals identified by the Office Quality Manager, responsible for conducting office audits to verify compliance with quality procedures and processes.

Subconsultant -- A company performing specific tasks or defined responsibilities on the project under a subcontract to HNTB.

Task Leader – Individual responsible for a specific project task and associated budget. Task leaders are typically assigned for each discipline of a project.

Updater – Individual responsible for updating the document or product to reflect all agreed upon changes.

Verifier -- Individual (usually the Checker) responsible for verifying that all changes or additions to a drawing, calculation, report or graphic element have been accurately incorporated.

DEFINITIONS

The following definitions identify some key components of a project quality process:

Audit -- A systematic, independent and documented activity performed to verify that applicable elements of the QMP have been effectively implemented and documented in accordance with the specific requirements.

Constructability Review -- A design review performed by the Contractor or appropriate construction services personnel to assess the feasibility of the proposed design from a construction perspective.

Design Criteria -- A set of project-specific parameters that define the design requirements, specifications and functional classifications of the project.

Inter-Discipline Review -- A discipline specific design review of a design package by all applicable design disciplines.

Quality Records -- A completed document or recordkeeping evidence of successful implementation of any given aspect of the Quality System.

Stet – No change required.

HNTB

FORM 1.0

Quality Management Plan Log

Project Description:	Job No.
	PM:
Project Fee:	QA/QC Budget:

Deliverable		QA/QC Budget	Review Level	Reviewer	Date	Completed

HNTB

Gulf Coast Quality Management Plan **FORM 2.0**

LEVEL 1 CHECK PRINT SIGN-OFF SHEET

Client Name: _____

Job Title: _____

Job Number: _____

Document Title: _____

Check Level (Mark One):

☐ 1 - 100% Document Check

☐ 1 - 100% Input Check (When Pre-Validated Software in Used)

		Name	Received Date	Completion Date
Originated By:	☐			
Checked By:	☐			
Backchecked By:	☐			
Verified By:	☐			

Comments:

HNTB

Gulf Coast Quality Management Plan **FORM 3.0**

LEVEL 2 REVIEW MEMORANDUM

Client Name: _____

Job Title: _____

Job Number: _____

Document Title: _____

Check Level (Mark One):

- ☐ Studies or Report Type Documents
- ☐ Documents Prepared by Others
- ☐ Checklist
- ☐ CADD QC Audit
- ☐ Other

Specify below:

		Name	Received Date	Completion Date
Reviewed By:	☐			

Review Findings:

HNTB

FORM 4.0

QUALITY AUDIT CHECKLIST

AUDITED AREA:	DATE(S) OF AUDIT:
AUDITOR:	AUDIT:

AUDIT ITEM	REFERENCE	METHOD OF VERIFICATION	CONFORMS	
			YES	NO
1. Have computer programs utilized been validated?	QMP Group D	Review validation records.		
2. Are calculation check prints available?	QMP Group B	Review originals and check prints		
3. Were calculations checked prior to drawing checking?	QA Folder, QMP Log	Review check prints.		
4. Are drawing check prints available?	QMP Group E	Review record set and check prints.		
5. Are check prints of specifications available?	QMP Group A	Review record set and check prints.		
6. Is checking of input to computer programs being accomplished?	QMP Group B	Review originals and check prints		
7. Are check prints of studies or report-type documents available?	QMP Group A	Review check prints.		
8. Are procedures for marking up check prints being followed? Checker - Yellow/Red Backchecker - Green Updater - Blue Verifier - Yellow	QA Folder	Review check prints.		
10. Are check prints properly signed and dated?	QA Folder	Review check prints.		
11. Are plan reviews completed?	QMP Log	Review package to verify that comment sheets are available.		
12. Are the review comments incorporated into the final documents or disposed of as otherwise noted?	QA Folder	Review for verification that Design Reviews comments have been		

		incorporated. Review for verification that comments from prior Design Reviews have been incorporated.		
13. Are check prints of graphic elements available?	QMP Group C	Review check prints.		
14. Are all checklists validated?	QMP Group D	Review check prints.		

Corrective Action Log

Form 5.0

Office 003 - Quality Manager:

Project #	PM or PQM	Issue Summary	Corrective Action	Implemented
12345	Joe Smith	Subs delayed project submittal	Updated schedule for additional time for subs; weekly conference calls initiated	1/1/2012

Preventative Action Log

Office 003 - Quality Manager:

Project #	PM or PQM	Issue Summary	Preventative Action	Implemented
12345	Joe Smith	Task 50% complete - 65% spent	Weekly monitoring by PM	1/1/2012

Sample Check Print Stamps

CHECKING PRINT

Checked by_____ Date_____
Back Checked by_____ Date_____
Corrected by_____ Date_____
Tracing Signed by_____ Date_____

AUXILIARY
CHECKING PRINT NO.____

Checked by_____ Date_____
Back Checked by_____ Date_____
Corrected by_____ Date_____
Tracing Signed by_____ Date_____

PROJECT QUALITY PLAN:

Project: IH 35 – 3d2 (North of Troy to Woodlawn Road)

PM: Tom Diamond

Team: Bill Fleming, Jeremy Kraft, Ashley Jones, Erik Nelson, Phil Elzeanni, Matt Gautreaux & Bridge Group

Fee: $5,552,832.47

QA/QC Budget: Hours provided in budgets task lines.

QC Approach:

- Reference Dallas Office Quality Assurance Plan.
- Check and Backcheck all project deliverables by project team members
- Document checks
- Save all QC and QA check plans for future reference and for client if requested

Submittal QA: Independent QA for all milestone submittals to client

PM QA: QA for all submittals to client.

Project Quality Manager: Jeremy Kraft (Tom Diamond & Pat Ellis – support QA Team)

Define and Agree with Client to Project Criteria Early on the Project

Filing: Efiles; Hard files; Flat Files

1/5/2010