BYPASS CHANNELS AND OPERATIONS PLAN

Bypass Channel for Continued Navigation During Construction

B.2.81. As closing of the Inner Harbor Navigation Canal would cause a severe hardship to vessels traveling along the Gulf Intracoastal Waterway and those traveling from within the canal to the Mississippi River, the need for a bypass channel was recognized. Consideration was given to both the east and west sides of the new lock construction with the east side being selected due to the railroads and turning basin along the west side.

B.2.82. The Lock North of Claiborne Avenue site plan will permit passage of most navigation during construction (see plates B-13 thru B-15T). Some limitations are required as a compromise between navigation and construction interests. This provides the minimum area needed for lock construction, while having as little effect as possible on navigation's passage through the narrow Industrial Canal corridor.

B.2.83. The construction plan will designate areas either as navigation priority or construction priority. These areas will be planned not to conflict to the greatest extent possible. To achieve this, the Corps is planning to develop the construction plan with input from all stakeholders, and will, by extensive construction sequencing, allow both navigation and construction to co-exist within tolerable limitations during replacement of the lock.

B.2.84. Navigation priority areas will be available to navigation first and construction activities must yield to navigation in these areas. For example, the transit and laying bypass channels will be navigation priority areas. Similarly, construction priority areas will be available to construction first, and navigation must yield to construction in these areas. For example, the lock construction area between the protection cells will be a construction priority area. We will construct physical barriers to keep navigation safely away from construction areas to the extent practicable (see plate B-16 for the ship lock and plate B-26 for the barge lock). The specifics of the rights and responsibilities of navigation and construction will be developed prior to construction with input from all stakeholders.

SUMMARY OF CANAL LIMITATIONS AND CANAL CLOSURE

B.2.85. The Corps' intent is to reduce canal CLOSURE to an absolute minimum because of the extreme cost of CLOSURE to navigation. Alternate routes such as through Baptiste Collette, will provide temporary passage during CLOSURE periods. Ample advance notices of the effects of construction activities on navigation will be issued.

B.2.86. Note that the lock and related construction are built over an estimated 10-11 year construction period. We must distinguish LIMITATIONS on the canal use from CLOSURE of the canal. The construction and existing lock demolition will place LIMITATIONS on the canal for an estimated 6-7 years. These limitations include items such as a two-way (laying/transit) bypass channel, a one-way demolition phase bypass channel, tug assistance, and limits on vessel size and tow configuration as detailed herein. Although navigation will be slowed somewhat by these limitations, the canal will NOT be CLOSED.

B.2.87. The canal will have to be CLOSED as follows:

a. Prior to opening the demolition bypass channel to navigation, with navigation passing through the existing channel and lock: Removal of the St. Claude bridge foundation (east side only) and tie-in of demolition bypass channel to existing approach channel (riverside); estimated duration is less than 30 days.

b. After opening the demolition bypass channel to navigation: during detonation of explosives in demolishing existing lock; estimated duration is a series of about 8-10 shutdowns, about 2-4 hours long each, occurring intermittently during an 18-24 month long lock demolition and debris removal operation by the demolition contractor. This is a safety measure for explosives.

B.2.88. Certain construction equipment, for dredging, bridge construction, installation of pipelines and utility crossings, and similar work will be in the canal from time to time throughout construction. Some construction activities will be completed prior to opening the transit and laying bypass channels to avoid conflicts with navigation entering and exiting the bypass channels. For example, pipeline and utility crossings at Claiborne and Florida Avenues must be placed in a trench at the same location as the vessels' entrance and exit from the north bypass channel. This trenching is sequenced such that it is completed prior to opening the north bypass channel.

B.2.89. Two types of bypass channel are required at different phases of the lock replacement: 1) a two-way bypass channel between Claiborne and Florida Avenues on the east side of the canal during new lock construction and, 2) a one-way, demolition phase bypass channel between St. Claude and Claiborne Avenues on the east side, after the replacement lock is in operation and during demolition of the existing lock.

North (Two-Way) Transit and Laying Bypass Channel

B.2.90. The two-way bypass channel consists of a TRANSIT bypass channel and a LAYING bypass channel as shown on plates B-13 Thru B-15T. Each channel is 110-feet wide; the laying channel depth is 20 feet, and the transit channel depth is 31 feet (below low water elevation 0 NGVD). Three protection cells will be placed at the south end of the bypass channel to shield the Claiborne Bridge piers. Navigation aid markers and lighting will be provided for safe channel passage. Tug assistance vessels will be stationed at the north and south protection cells and will have two-way, marine radio communication with vessels.

B.2.91. Two-way traffic was considered for vessels no wider than 70'(two barge widths). A 220-foot bottom width was chosen to provide 40 feet in between passing vessels and 20 feet of clearance on both sides. A depth of (-)22 NGVD was used for the barge lock option, consistent with the main channel depth. A split level channel with one deeper lane to(-)31 NGVD was used for the ship lock option to continue to pass any vessel which could pass through the existing lock. Due to limited space, the bypass channel angles sharply back into the main channel at each end of the new lock construction without adequate length for safe, unassisted vessel maneuvering. A plan was developed for 24-hour vessel assistance to be provided by two picket boats. These tugs would be contracted from outside the Corps and radio dispatched to intercept and assist tows and vessels through the bypass channel while it was in use.

North (Two-Way) Bypass Channel Operation

B.2.92. Lock operations at the existing lock are conducted in groups, i.e., 3-5 northbound tows (2-3 lockages) are passed and then operations are reversed to pass 3-5 southbound tows. The proposed bypass channels will permit lock operations to continue in this pattern with the following limitations:

B.2.93. Northbound Operations - About 3-5 southbound tows can line up end-to-end in the LAYING bypass channel while northbound tows pass through in the TRANSIT bypass channel. Note that tug assistance would be used to help vessels negotiate the tight corners of the bypass channel. Navigation in the TRANSIT bypass channel is to a depth of 31 feet, which allows a draft of up to 25 feet with six feet of freeboard. However, deep draft vessel sizes are limited as described below.

B.2.94. Southbound Operations - About 3-5 northbound tows can line up end-to-end in the LAYING bypass channel (awaiting the Florida Bridge opening). Navigation in the LAYING bypass channel is limited to a depth of 22 feet, allowing a draft of 16 feet with six feet freeboard.

Vessel Size and Configuration Limitations - North Bypass

B.2.95. The maximum vessel size will be limited during construction. Due to operational problems anticipated for deep draft navigation, we recognize that many deeper draft vessels (over 16 feet) cannot safely enter and exit the north bypass channel and thus must use other routes throughout construction. Some vessels over 16-foot draft may safely pass with tug assistance, but several factors dictate whether safe passage can occur. These factors include weather conditions (wind speed and direction, visibility, etc.), exposed sail area of vessel, vessel tonnage and maneuverability limitations of tug assistance. For instance, the inability of tug assistance to "see over" the vessel being pushed into the bypass channel is a limiting factor.

B.2.96. For shallow draft navigation, a maximum length of 470 feet and a maximum beam width of 70 feet are necessary. This will accommodate up to a 4-barge (2-by-2) tow of barges each 35 feet by 195 feet with a tug length of 80 feet. The length restriction of approximately 470 feet is required because of the bypass channel entrance at Claiborne Avenue. A total length of 700 feet (See plate B-13) is available from the entrance to the bypass channel near the bridge pier at Claiborne Avenue to the protection cells for the lock construction. The 700-foot space allows a 450-foot vessel with 150 feet forward of the vessel and 100 feet aft to clear the Claiborne Bridge pier and to reach the elevation (-)12 foot contour. In the 700-foot length, the vessel must decelerate to a stop (or near stop) to permit tug assistance to hook up and maneuver them into the bypass channel. We anticipate that smaller tows may be able to maneuver into the bypass channel without tug assistance, depending on the weather and condition factors listed above for deeper draft vessels.

B.2.97. In the vicinity of the Florida Avenue Bridge, a total length of 900-feet (See plate B-13) is available for maneuvering into and out of the bypass channel. Some utility pipeline work will be located between the end of the bypass channel and the Florida Avenue bridge. Utility and pipeline work will be sequenced to be constructed prior to opening the bypass channel to the extent practicable. Note also that the 900-foot length generally coincides with the opening to the existing turning basin, and thus tug assistance for vessels being pushed into the bypass channels must be done so as to minimize the effects on access to the turning basin.

BYPASS CHANNEL FOR OLD LOCK DEMOLITION (Demolition Phase (South) Bypass Channel)

B.2.98. To maintain navigation during the demolition process, navigation interests requested, and the Corps developed a separate "demolition phase bypass channel" between the Mississippi River and the north end of the existing lock as shown on plate B-50. The south bypass channel will be a one-way bypass, 12-foot depth (at low river), approximately 85' wide (see plate B-50) and will only be operated after the new lock is completed. The Corps has consulted with an expert in demolition to minimize the canal closure time required to demolish the existing lock.

B.2.99. The need for a "demolition" bypass channel was confirmed when the duration for demolishing the existing lock was estimated to exceed 4 to 6 months. The east side of the existing lock appeared to be the logical location as it was free of development outside of the Corps' reservation. Room existed within the template of the future "post-demolition" main channel to provide a 12 X 85 foot bypass channel during demolition. This would be adequate for one-way tow traffic, one barge wide.

B.2.100. Insufficient room exists on the east side to permit construction of the new bridge pier, concurrent with demolition bypass channel operation.

B.2.101. The demolition bypass channel will be open for approximately 18-24 months while the existing lock chamber is being demolished. Deep draft vessels must use an alternate route for the 18-24 month period. At this point in construction, river stages will be present in the demolition bypass channel.

The average low river elevation is about 3 feet NGVD, thus a 15-foot depth occurs with an elev (-)12 bottom.

B.2.102. The demolition bypass channel will start about 450 feet from the existing lock in the Mississippi River forebay. The existing channel transitions on a 1 on 4 slope into the bypass channel; the bypass channel transitions on a 1 on 1 slope back into the existing channel. Navigation buoys will guide operators.

CHANNEL DESIGN AND REPLACEMENT

Permanent Channel Alignment

B.2.103. The concept of the "North of Claiborne Avenue Site" initially included placing the new lock along the existing centerline of the Inner Harbor Navigation Canal (IHNC), the same alignment as the existing lock. However, the Port of New Orleans (Port) requested a 40-foot westward shift of the centerline at Florida Avenue to accommodate mooring limits north of Florida Avenue. Upon review, we decided that the shift could be incorporated into our design (see plates B-13 Thru B-15T). The new centerline was laid out using coordinates provided by the Port and field measurements through the existing lockwalls and bridge piers. The centerline segment north of the Florida Avenue Bridge was shifted parallel, 40 feet west. This segment was tied back into the southern segment at a point 5,000 feet to the south of Florida Avenue, approximately 1600 feet south from the proposed lock's entrance. Since the deflection angle calculated to approximately ½ of a degree, simple points of intersection were considered adequate in lieu of calculating curves.

Channel Dimensions

B.2.104. The depth of cut is (-)36 NGVD for the ship lock option, and (-)22 feet NGVD for the barge lock option, with channel bottom widths of 200 and 284 feet, respectively. These bottom widths provide the same top edge of cut for the respective options and provide safe two-way traffic for any vessels up to 17 feet in draft. The bottom width transitions to 180 feet at the St. Claude Bridge, 150 feet at the Claiborne Avenue bridge, and 110 feet at the new lock, for both options. At the Florida Avenue Bridge the bottom width narrows to 150 feet for the ship lock option, and to 234 feet for the barge lock option. Side slopes of 1 vertical on 3 horizontal were used.

B.2.105. The new centerline ties into a point 200 feet south of the existing Florida Avenue bridge. The centerline continues past Florida Avenue, along the 40-foot offset, parallel to the existing centerline, as shown on plates B-13, B-15N and B-15T. This centerline is aligned with the Port of New Orleans navigation fairway between the existing wharf facilities located north of Florida Avenue.

Channel Surveys and Quantities

B.2.106. Dredging quantity computations for this study were largely based on surveys taken in August 1992, from the south end of the existing lock to the Florida Avenue Bridge. Existing levee surveys from April 1992 were used for the forebay of the existing lock.

B.2.107. A digital terrain model was created from the surveys and quantities were run using InRoads software. Channel quantities vary only slightly for the 900 foot lock option to the 1200 foot lock option.

Dredging Activities Sequence and Disposal Areas

B.2.108. Sequencing of the dredging activities was developed with relocations impacts, construction of the new lock, and demolition of the existing lock in mind.

B.2.109. The first phase of dredging would occur in the area between the Claiborne and Florida Avenue bridges. A prerequisite to this work is completion of the site preparation contract which removes all existing facilities along the east bank and the southern portion of the Galvez Street Wharf along the west bank. First order of work would be to remove the channel material at the Claiborne and Florida Avenue Bridge utility relocation corridors. The material will be stockpiled in the immediate vicinity for backfilling of the two relocation trenches. The Contractor would then proceed with the north bypass channel allowing the relocations to take place. Concurrent with bypass dredging will be the excavation and proper disposal of approximately 26,000 CY of contaminated material. Once the north bypass channel is in operation, the contractor would be free to perform the excavation for the new lock without being hindered by marine traffic. The dredging will then continue in the main channel north of the new lock. The dredged material from the lock excavation, main channel north of the new lock, and top five feet of the north bypass channel will be pumped to the confined disposal area located on the south bank of the MRGO. The balance of the bypass channel excavation will be pumped to the Mitigation Site.

B.2.110. The second phase of dredging will be at the last remaining utility relocation corridor located just south of the St. Claude bridge. Material dredged from this area will be stockpiled in the immediate vicinity and used as backfill. Any excess would be disposed of in the Mississippi River, below the (-)50 foot contour.

B.2.111. The third phase of work will not occur until the new lock structure is complete, including the installation of the riverside tie-in levee. This phase of dredging concentrates on removing material between the Claiborne Avenue bridge and the demolition bypass channel. Some material adjacent to the existing lock, above elevation 2.0, will have already been removed and used for levee construction. At this phase, MRL flood protection will be completed. Also, the St. Claude bridge removal would have to be substantially complete so as not to obstruct the demolition bypass channel. Material dredged from the main channel south of the new lock and the south bypass shall be deposited behind the new lock as random backfill.

B.2.112. A fourth phase will occur from the St. Claude Bridge to the river. Approximately 55,000 CY of main channel dredged material will be deposited as random backfill at the new lock. The remaining main channel material and material dredged in the vicinity of the old lock site, after demolition is complete, will be disposed of in the Mississippi River, below the (-)50 foot contour.

LEVEES AND FLOODWALLS

B.2.113. The Mississippi River flood protection levees and floodwalls for this plan must be extended from the existing lock downstream approximately 2500 feet on the east and west banks to tie into the new lock as shown on plates B-42 and B-43. The MRL design grade at this location is elevation 22.4 feet NGVD.

B.2.114. The existing hurricane protection floodwall cross-section on the east bank is a concrete-capped I-wall with top elevation 14.0 feet NGVD on the east bank. The west bank floodwall is a concrete T-wall with top elevation 15.0 feet NGVD. The existing hurricane protection floodwalls will serve as hurricane flood protection during project construction, but will have to be selectively demolished as required to construct the new MRL levee/floodwall to elevation 22.4 feet NGVD.

B.2.115. Construction plans and specifications will provide a contingency plan to close gaps in the flood protection due to construction of the new MRL levee floodwall. Also, scheduling the floodwall construction contracts during non-hurricane season will avoid problems with gaps in the flood protection. The new MRL floodwall design sections are:

B.2.116. A combined earth/concrete-capped I-wall section with backfill on both sides of the wall to elevation 18.0 NGVD as shown on plate B-43. Elevation 18.0 feet NGVD is approximately 0.5 feet above the MRL flowline at this location. The intent of the earth fill up to elevation 18.0 feet NGVD is to cause a marine vessel to run aground prior to reaching and damaging the floodwall. One levee reach on the east side will have a crown elevation 15.0 for soil stability. Further studies will address whether sufficient marine impact protection exists since the floodwalls are located behind, and thus are shielded by, permanent mooring facilities.

B.2.117. A combination earth/pile-supported T-wall section with earth backfill to elevation 18.0 feet NGVD floodside and elevation 9.0 feet NGVD landside. This cross-section will eliminate the need to relocate railroad tracks on the west side of the existing IHNC between St. Claude and Claiborne Avenues.

B.2.118. A concrete T-wall with top elevation 22.4 and backfill to natural ground elevation approximately 2.0 feet NGVD. This will be used under the existing bridge at Claiborne Avenue. Note that the existing (and to be reused) Claiborne Bridge east and west approaches present an overhead clearance restriction for pile driving at this location. Steel H-pile and sheet pile cutoff lengths must be driven within the available vertical clearance.

B.2.119. Existing MRL forebay levees will be maintained as an all-earth section and will be shaped where needed to a crown elevation 22.4 feet NGVD, with 1 vertical on 3 horizontal side slopes landside and floodside.

DEMOLITION OF EXISTING LOCK

General.

B.2.120. The existing lock will be demolished after the new lock is in place and in operation. Demolition requires a partial shutdown of the existing lock to navigation for the barge lock, and a complete, temporary shutdown of the existing lock for the ship lock. The disruption to navigation will be kept to the minimum possible time to complete demolition and debris removal. A shutdown time estimate and schedule is given below and in the construction sequence section of this report.

B.2.121. The bottom elevation of the existing lock chamber is about elevation (-)33.6 feet NGVD. Thus, for the barge lock (elevation (-)22 feet NGVD), only the concrete walls of the existing lock (including machinery, miter gates, etc.) will be removed. The ship lock (elevation (-)36 feet NGVD) will require removal of the concrete base slab of the existing lock, which is 9-12 feet thick.

Demolition Plan

B.2.122. After the replacement lock and tie-in levees are in place and the pool is raised, the existing lock will be demolished as shown on plate B-49. The existing lock must be removed in its entirety for completion of the 200-foot bottom width replacement channel to full width. The demolition phase bypass channel depth of (-)12 feet is contained in the (-)36 foot final channel cross-section for the ship lock and within the (-)22 foot cross-section for the barge lock as shown on plate B-50.

B.2.123. A demolition expert was consulted to find the best demolition method for the existing lock. Methods were considered to demolish the lock using: 1) conventional (non-explosive) demolition methods, and, 2) explosive methods or 3) a combination. Also, the demolition was considered as either "in the wet" or "in the dry". Site preparation costs were determined to cofferdam and dewater the lock, as well as the estimated cost of downtime to navigation. Debris removal costs were also developed. Duration of demolition was developed for wet and dry plans.

Comparison of "In the Dry" and "In the Wet" Demolition Plans

B.2.124. In the Dry" Plan - This requires cofferdamming and dewatering of the entire existing lock structure for demolition in dry conditions. This speeds demolition operations since lock features are visually accessible and construction equipment can work at a higher production rate. Debris removal will be by truck to barge loading areas outside the cofferdam. Navigation must be shut down for the duration of debris removal operations, plus any cofferdam installation and removal time. No navigation bypass channel is provided, thus alternate routes such as Baptiste Collette must be used for navigation. To provide a bypass channel in this option would require major degrading of an MRL mainline levee, thus no bypass channel is practical.

B.2.125. "In the Wet" Plan - No cofferdam or dewatering system is required; all demolition operations are done in wet conditions. Demolition operations are slower than "in the dry" due to drilling of holes in locations not visually accessible and thus the production rate is lower. Debris removal will be by barging to a suitable disposal site. Heavier construction equipment is required for debris removal since pieces may be larger and less accessible. Diver operations will be needed for many features.

B.2.126. A one-way, approximately 85-foot wide bypass channel to elevation (-)12 NGVD (shallow draft only) will be constructed to allow navigation to continue during most of demolition operations. Navigation is stopped only for a matter of hours during actual detonation. Demolition in segments would proceed probably from the (south) river end.

B.2.127. The demolition expert, DYKON, Inc. of Tulsa, OK, recommended an "in the wet" demolition method because it was less costly overall. The following chart is a comparison of the methods:

Description	"In the Dry" ($ million)	"In the Wet" ($ million)
Demolition Costs	5.0	12.5
Other Costs to Facilitate Demolition/Navigation:		
Demolition Bypass Channel	0.0	1.0
Dewatering & Cofferdamming	10.0	0.0
Navigation Losses (Months x $M/Month)	33.0 (6 x 5.5)	22.5 (18 x 1.25)
Total Demolition Cost	48.0	36.0

DEMOLITION SCHEDULE IN MONTHS

	"In the Wet"	"In the Dry"
Site Preparation for Demolition	9	1
St. Claude Bridge Removal	6	6
Actual Demolition Duration	6	18
Total Duration for Demolition	15	24

Summary - Existing Lock Demolition Plan

B.2.128. The "In the Dry" plan offers the lower cost for lock demolition alone. But the additional cost of dewatering and cofferdamming the old lock as well as a greater financial loss to navigation due to rerouting makes this the more costly alternative. The "In the Wet" plan will take longer to complete, however, the bypass channel called for by this plan will allow the IHNC to remain open during demolition except for the periods of actual detonation. Thus, the "In the Wet" plan is recommended.

B.2.129. DYKON recommends demolition by a combination of explosive and conventional (non-explosive) methods. The above-ground portion of the lock will be demolished using conventional methods such as a hoe-ram and/or wrecking ball. The underwater portion will be demolished with explosives. Debris removal will be using heavy crane equipment to handle the larger pieces of an "In the Wet" operation.

EXISTING ST. CLAUDE AVENUE BRIDGE DEMOLITION PLAN

B.2.130. The St. Claude bridge demolition will be done prior to demolition of the lock concrete as shown on plate B-51. Bridge demolition will be done after completion of the replacement lock and raising of the pool. Navigation traffic will continue to pass through the existing lock as it will be used as a "pass-through" lock only (no lockages or head differential). The demolition bypass channel will be constructed on the east side of the existing lock. The east side bridge pier and retaining walls within the limits of the demolition bypass channel must be demolished. The demolition bypass channel will be dredged to elev. (-) 12, which requires only partial removal of the east side bridge pier (plate B-51).

B.2.131. The length of CLOSURE of the canal to navigation during removal of the St. Claude Bridge will be minimal. Demolition of the steel superstructure will be limited to the minimum time required by the contractor to take down the bridge. Bridge demolition equipment shall work without occupying the lock chamber. The canal will be closed only when safety hazards exist to navigation. This is expected to be only a few hours per day, during actual debris removal operations, within a 30-day time frame for the steel superstructure. Concrete masonry removal and earth excavation down to the cantilever slab (approx. elev. (-) 20, top of slab) will require an estimated 30 additional days during which navigation will be impeded only minutes per day (work is underwater) for actual safety hazards during debris removal operations.

B.2.132. Navigation will use the existing lock chamber while the St. Claude Bridge foundation is being excavated and masonry removed. On the east side bridge pier, only 20 feet of the cantilever slab, and the two easternmost columns need to be removed prior to opening the demolition bypass channel. The southeast and northeast wingwalls forming the present bridge approaches of the St. Claude bridge must be demolished within 220 feet of the canal centerline to accommodate the demolition bypass channel. After the entire lock is demolished, and navigation returned to the main channel, the remaining piece of the cantilever can be removed.

LOCK GUIDEWALLS AND PROTECTION CELLS

B.2.133. Fixed timber guidewalls are provided on the lakeside as shown on plates B-44 thru B-46. The lakeside eastern guidewalls will extend 800 feet and 645 feet for the ship and barge locks respectively. Placing the guidewall on the east side avoids obstructing entrance into the turning basin south of Florida Avenue. The riverside (south) guidewall is also located on the east side. The ship lock guidewall is 1200 feet long; the barge lock guidewall is 645 feet. If selected, post-feasibility studies will consider the need for extending the barge lock south guidewall through the existing Claiborne Avenue Bridge for navigation.

Navigation interests will be consulted to see if the guidewall is acceptable for safe navigation into the replacement lock.

B.2.134. The riverside (south) guidewalls were designed as floating guidewalls (See plates B-44 [ship lock] and B-45 [barge lock]) for feasibility cost estimates. This will be reviewed in post-feasibility studies to see if a more cost effective alternative exists, such as fixed guidewalls. Sheet piling cells will be used at the ends of the fixed timber guidewalls, ends of guardwalls, at the south end of the bypass channel, and outside the lock construction area.

CONSTRUCTION SEQUENCE - LOCK

B.2.135. The detailed construction sequence and bar chart will be furnished in the Project Management Plan (PMP). See also paragraphs B.2.33 to B.2.77, for additional details of the lock construction sequence.

REPLACEMENT OF ST. CLAUDE AND CLAIBORNE AVENUE BRIDGE CROSSINGS

General

B.2.136. Three existing movable bridges are located on the Inner Harbor Navigation Canal between the Mississippi River and the Mississippi River Gulf Outlet: Florida Avenue (northernmost), Claiborne Avenue (LA Route 39), and St. Claude Avenue (LA Route 46)(southernmost).

B.2.137. The Florida Avenue bridge is not included in the Corps IHNC lock replacement project. This bridge is operated and maintained by the Port of New Orleans. The existing Florida Avenue bridge is a single leaf bascule with two vehicular lanes (one eastbound, one westbound) and two railroad lines. The status of the bridge is described in paras. B.2.78 to B.2.80.

St. Claude Bridge Replacement

B.2.138. The existing St. Claude Bridge will be demolished and replaced with a low-level, double bascule bridge with a 200-foot clear horizontal span as shown on plates B-61 thru B-63. The replacement bridge is intended to give priority to navigation traffic (no curfews); vehicular traffic is intended to remain about status quo (post-construction). The bridge will have an unlimited vertical clearance within the 200-foot clear span.

B.2.139. The bridge will be replaced to meet the United States Coast Guard requirements. The Coast Guard agreed to permit a 200-foot clear span at this location in view of its acceptance by the deep draft industry, the LDOTD and the Port of New Orleans. Limiting channel widths in the permanent mooring area between St. Claude and Claiborne Avenues (planned after lock demolition) make 200 feet a reasonable maximum width, even in view of the 300-foot horizontal clearance being used at the Florida Avenue replacement bridges.

B.2.140. The bridge design concept involves constructing the replacement bridge along the same alinement as the existing bridge. Also, it includes partial reuse of the existing bridge approach ramps. Design criteria for low steel is a minimum elevation 22.4 feet NGVD, which will provide five feet of vertical clearance in the closed position. The vertical clearance is above maximum high water elev. 17.4 feet NGVD in the Mississippi River.

B.2.141. The bridge approaches must conform to LDOTD "UA-1" design standards (for urban arterials). The overall width of approach ramps will be kept within the existing structure to prevent encroachment into the residential area. The replacement approach ramps are four-lane divided roadway, that matches the existing cross-section and avoids roadway transitions. Shoulders are provided although they are not required. Two 12-foot travel lanes are provided in each direction, with a four-foot outside shoulder in each direction. A Jersey barrier divides the seven-foot wide median, for a total roadway width of 63'-0". This matches the existing roadway width (See plate B-63).

B.2.142. Construction of the bridge will require an estimated 18 months. Traffic will be detoured to Claiborne and Florida Avenues. A temporary bridge would be impractical because of marine traffic. The existing bridge will have to be demolished in a sequenced construction. Combined demolition and removal operations, in conjunction with the demolition phase (south) bypass channel, will result in an estimated 24-27 month shutdown of the bridge. See DETOUR ROUTES for details.

B.2.143. The replacement is designed for a design life of 50 years. Since the bridge is estimated to be opened 12 times per day, design will consider fatigue stresses caused by stress reversals. The steel thickness will be increased to allow for corrosion, and vibrations will be dampened to limit their effect on the structure. The main damage exposure to the bridge is by collision. Fender systems and protection cells will be installed to minimize collision risk.

B.2.144. The plan and profile of the main bascule bridge and approaches are shown on plate B-61. A 4.0% grade is used to reach the crown of the bridge (at the canal centerline) at elev. 39.0. Five percent is the limiting grade commonly used by LDOTD for bridge approaches. This grade accommodates the 23-foot vertical clearance required over the New Orleans Public Belt Railroad tracks on the west side of the canal. It also provides symmetry for the overall structure, and avoids a change in grade within the length of the approaches. The resulting project is 892 feet long on each side of the centerline, with 679 feet of open structure on the east side with 213 feet of revised retaining wall approach roadway, and 684 feet of open structure on the west side with 208 feet of revised retaining wall approach roadway.

B.2.145. Mitigation measures will be required to avoid undesirable social impacts to the adjacent neighborhoods in the underbridge structure on the east and west sides of the canal. Some type of recreational or community development facilities must be included to prevent this area from becoming an eye sore and collector for debris, abandoned cars and other detractors to the neighborhood.

B.2.146. Note also that some visual impacts will result from the higher roadway surface above the existing bridge. The crown elevation is 39.0, which is about 17.5 feet above the existing roadway. This is about the lowest bridge deck possible to provide five feet clearance of low steel above the maximum high water elevation 17.4 feet NGVD, and to avoid changing to a vertical lift type bridge with undesirable towers. Residences on the east side of the canal begin 400 feet from the canal centerline. The new bridge profile at that point is about ten feet higher than the existing profile, but tapers to zero in one city block. Residences on the west side begin about 500 feet from the canal centerline, where the new bridge profile is seven feet higher than the existing profile, but tapers to zero in less than one city block. Some mitigation is advisable for the affected residences.

B.2.147. The open approaches consist of a concrete deck supported by Type IV precast, prestressed concrete girders spanning approx. 86 feet. The girders are supported on two-column concrete bents on 14-inch square precast, prestressed pile foundations.

B.2.148. The bascule will be constructed of composite welded plate girders combining high strength steel with structural grade steel. The bridge deck will be open steel grating deck to minimize the weight of the bridge leaves.

B.2.149. The trunnion type bascules will take about 90 seconds to fully open or close. Four leaves (See plate B-62) are used (in lieu of two) to facilitate smaller movable spans and quicker openings. The adjacent spans on either side of the main span will be welded plate girders with stringers supporting a concrete deck. Steel is required in these sections to facilitate counterweight clearance. These spans will provide clearance for the planned MRL levee/floodwall at this location. It is recommended that the floodwall sheet piling be driven prior to bridge construction so that overhead clearance is not restricted.

B.2.150. The bridge pier is designed with a "pit" to permit tailswing of the counterweight. The bridge pier foundation is designed to have no net tension in the piles. HP 14x89 piles 5'-8" on centers in one direction and approx. 9-foot centers in the other direction are used in a 48-foot by 83-foot base foundation pile cap. The top of the concrete cap is at elevation (-)36 feet NGVD for the ship lock, and will be raised to elev (-)22 for the barge lock. Each pier will be constructed in a cofferdam. The east bridge pier must be constructed in accordance with the construction sequence for the south bypass channel to avoid impacts to navigation.

B.2.151. The main span will cost an estimated $19,900,000, including operating machinery, movable traffic barriers, power plant and the operator's house. The overall cost of the replacement bridge is $25,300,000. This cost has a 25% contingency factor and is based on February 1993 price levels.

Claiborne Avenue Bridge Superstructure Replacement and Pier Retrofit

B.2.152. The Claiborne Avenue bridge superstructure will be replaced and the existing bridge piers retrofitted and reused as shown on plates B-64 thru B-66. The replacement bridge is the same type as the existing bridge type--a mid-level, vertical lift span bridge. The Claiborne bridge superstructure will be replaced with higher towers and a new movable span. New mechanical and electrical equipment will be installed.

B.2.153. Previous discussions with the LDOTD have ruled out the possibility of raising the existing superstructure and towers. This is because the increased high water levels from exposure to river stages make bridge openings more frequent. Since the structure is over 35 years old (constructed 1955-1958), the more frequent openings would place a greater demand on aged components and quickly reduce any remaining service life.

B.2.154. The existing Claiborne Avenue Bridge carries LA Route 39 over the Inner Harbor Navigation Canal. The main vertical lift span provides a four-lane roadway (without shoulders) divided by a median barrier, with a 26'-0" clear roadway on either side, and a total width of 59-3" inside-to-inside of handrails (See plate B-65). The 360'-0" lift span results in a navigation channel horizontal clearance of 305 feet (145 feet west and 160 feet east of the existing lock centerline).

B.2.155. The existing Claiborne Avenue bridge has a nominal clearance of 40 feet above average high water elevation 5.0 NGVD (lakeside). The extension of MRL levees into the new lock will increase the average high water from elevation 5 feet NGVD to a maximum elevation 17.4 feet NGVD. The replacement bridge will have a minimum clearance of low steel at extreme highwater of 27.6 feet in the closed position, and 156 feet (per Coast Guard regulations) in the open position. The acceptability of a low steel clearance in the closed position must be agreed to by consensus of Corps, state and other interested parties. The decision will consider the number of bridge openings, vessel height ranges per bridge tender records, economics and other data for anticipated marine traffic. The Corps proposes to maintain the existing finish roadway grade in the closed position. LDOTD has proposed a comprehensive study of all three IHNC bridges (St. Claude, Claiborne and Florida Avenues) including possibly raising the finish grade (roadway surface) elevation at Claiborne Avenue. This will be addressed further in post-feasibility studies and in coordination with the Regional Planning Commission and other interested agencies.

B.2.156. The replacement superstructure and pier and foundation retrofit were designed in accordance with the AASHTO Standard Specifications for Movable Highway bridges (See plate B-66). The bridge is designed for the greater of HS20-44 or Alternate Military Loading. A wind load based on a maximum wind speed of 120-mph is applied to the structure. This was proportioned from the AASHTO maximum of 100 mph. The structure was designed for seismic category A. The truss design is based on the AASHTO Guide Specifications for Strength of Truss Bridges.

B.2.157. The replacement main lift span provides 28'-0" clear roadway width (2-12'-0" lanes and a 4'-0" outside shoulder) in each direction separated by a 2'-0" median barrier. Outside barrier rails are 1'-5" each, resulting in an out-to-out bridge width of 60'-10".

B.2.158. The superstructure consists of a vertical lift span with new towers and a retrofitted pile foundation on the existing pier (plates B-64 and B-65). The movable span is a parallel chord Warren Truss, with no vertical members, spanning 360 feet. The distance between centerlines of the trusses is 68 feet and the truss depth is constant at 32 feet. The truss chords and diagonals are simple box sections with simple H-sections as bracing. The floor system is an open steel grid floor with 5" open grating supported on rolled stringers 9'-10" on center. The floor beams are welded plate girders four feet deep spanning 66 feet between trusses. Low steel elevation is approximately 46.0 feet NGVD resulting in a 28.6 feet vertical clearance above elevation 17.4 feet NGVD. The centerlines of the new tower columns will be placed in the location of the existing tower centerlines so no modifications to the substructure will be required. The new towers will be approximately 14 feet higher than the existing towers to accommodate the greater vertical clearance that is required.

B.2.159. The tower machinery consists of an individual drive assembly located in a machinery room atop each lift tower. Steel counterweight ropes attach to the main trusses of the lift span at each corner. The ropes pass over grooved counterweight sheaves at the lift span side of each tower. Each rope is anchored into the counterweight.

B.2.160. The bridge substructure and piers are founded on untreated timber pile groups spaced 3 feet on centers. Piles are either vertical or on a very slight batter of 1/2 to 1-1/2 on 12. The piles are designed to elevation (-)90 feet NGVD. This corresponds to pile lengths of 55 feet at pier one and 50 feet at pier 2. No actual pile length data of the in-place, driven piles is available, nor any pile driving records. Pile load data on the bridge drawings indicates pile loads of 16-18 tons per pile, but no actual load capacity is available. Some construction test pile data is available but is of limited value in determining current load capacities. Thus, it is difficult to determine the adequacy of the in-place foundation which must be certified for another 50 years of future life. Both vertical and lateral load capacity are required and a comprehensive inspection, sampling and testing program would be needed if the present piers and foundation are reused without a retrofit.
Feasibility level cost studies are based on a full foundation retrofit with new piling driven outside of, and a prestressed, post-tensioned concrete pier mated to the existing pier.

B.2.161. The retrofitted pier will consist of 30-inch diameter steel pipe piles located about 5-1/2 feet on centers in each direction (plate B-66). The number of piles will be determined based on ship impact and other design loadings. Post-tensioning ducts approximately 5 feet on centers in each direction are used to secure the retrofit to the existing pier in a rectangular collar. The collar extends about 25 feet outside the existing pier on four sides. The retrofitted footing will carry the existing loads as well as any additional loads from the replacement superstructure.

B.2.162. The construction sequence assumes the existing truss will need to be removed prior to driving new piles for the foundation retrofit. This results in a vehicular outage of approximately FIFTEEN MONTHS. It is recommended that the bridge be closed to traffic prior to driving new piles. The pile driving operations may disturb the existing soils and may cause shifting or settling of the existing foundation. This may prevent the lift span from operating correctly. During this time, marine traffic will have free access to the channel. Construction activity will be concentrated around the piers which are clear of the shipping channel.

B.2.163. During erection of the truss, construction vessels may periodically block the channel, but their activity can be scheduled around peak marine use. Prefabrication of truss elements will reduce the amount of time required to erect the superstructure. The truss will be erected in the "up" position so as not to restrict navigation.

B.2.164. The new foundation will cost an estimated $5,312,000, the superstructure including towers is estimated at $6,982,000. The overall cost of the retrofit, including new mechanical and electrical components is $18,220,000. This cost has a 33% contingency factor and is based on February 1993 price levels. The contingency factor was increased due to the uncertainty of the existing structure condition.

MECHANICAL DESIGN

General

B.2.165. The machinery and mechanical systems presented here and on the plates are preliminary and forms the bases for estimating the cost of the mechanical equipment and systems for a replacement ship lock and barge lock near the present site of the existing IHNC Ship Lock.

Miter Gate Machinery

B.2.166. The miter gate machinery consist of the Modified Ohio River linkage mechanism driven by an hydraulic cylinder. The Modified Ohio River linkage is characterized by a 0 degree angularity between the strut and sector arm with the gate mitered and something other than 0 degree angularity when the gate is in the recessed position. Linkage and drive machinery sizes for both locks are shown on plate B-53. Two load cases were considered, normal operating loads based on Waterways Experiment Station Technical Report No. 2-651 dated June 1964, titled Operating Forces On Miter-Type Lock Gates and temporal hydraulic loads as per ETL 1110-2-223, dated 30 June 1977, titled Navigation Lock Sill Depths And Hydraulic Loads On Gates as shown on plate B-54.

Tainter Valves

B.2.167. The tainter valves operating machinery consist of a cylinder driving a bell crank with a strut connecting the bell crank to the valve. Details of the machinery considered in preparing the cost estimates are shown on plates B-55N & B-55T. The machinery loads are based on the estimate weight of the valve plus 10% for contingencies and the load resulting from the hydraulic cylinder and system with the tainter valve jammed.

Hydraulic System

B.2.168. The hydraulic system consist of two identical hydraulic power units, 3" supply and return line on each side of the lock and hydraulic control valves at each gate and valve cylinder and at each lowering carriage machine. The hydraulic power units will consist of a multiple speed hydraulic pump with a minimum rating of 85 GPM at 2,000 psi driven by a single speed electric motor rated for 125 horsepower. Normally one pump will power the gates and valves on the west side of the lock and the other pump will power gates and valves on the east side of the lock. The pumps will have a cross over valves so that either pump can be used to operate both sides of the lock. Pressure piping of 3" in diameter will be Sch 160 Grade B and return line piping Sch 40 Grade B. Pipe fittings will be socket welded. Special cleaning requirements for the piping was estimated and included in the cost of the hydraulic piping. Plate B-52 shows a schematic drawing of the basic lock hydraulic system.

Compressed Air System

B.2.169. The compressed air system consist of a single 400 SCFM, 125 psi compressor driven by a 100 horsepower motor, a 300 gallon receiver, 3" Sch 40 supply air line on one side of the lock and bubblers on the direct head miter gates.

Washdown Pump System

B.2.170. The washdown pump system consist of two 15 Hp, 100 GPM at 100 psi turbine pumps, 14 hose stations, each with 100' of 1.5" diameter hose and an adjustable fire nozzle. Each side of the lock will have its own pump and 7 hose stations. The water washdown system design will be in accordance with EM 1110-2-2608 dated 30 March 1962.

Sump Pumps

B.2.171. Sump pumps piping and float controls will be required for the cross over gallery. It is anticipated that two pumps will be required, each 7-1/2 hp and rated for 50 GPM at a 125' head. The sump pumps will be the submersible type and located in a common sump at one end of the gallery.

Bulkhead Crane

B.2.172. The bulkhead crane considered for the lock will be either a diesel powered stiff leg derrick or pedestal type crane with a capacity of 175 tons at an operating radius of 85'.

Lowering Carriage Machinery

B.2.173. The lowering carriage machinery for the bulkhead will have to have a capacity of 250 tons per side for the barge lock per side and 350 tons per side for the ship lock. The lowering carriage machinery will be powered by the lock's hydraulic system.

ELECTRICAL DESIGN

General

B.2.174. This section presents the a preliminary design of the electrical system for the lock and appurtenant facilities. The purpose of this design is for general material and cost estimation. Final design may vary from this preliminary design. The electrical system will comply with appropriate provisions of the current National Electrical Code. The electrical system includes the power supply, power distribution system, control system, closed circuit TV, lock and control house lighting, signal and communication system, grounding system, and cathodic protection system described generally herein. A one-line electrical diagram is shown on plates B-56.

Power Supply

B.2.175. Normal Supply. Commercial power will be used for normal operations. Power will be supplied by New Orleans Public Service Incorporated (NOPSI). The power company will connect to a transformer pad located on the lock property. Service to the equipment building will be at 480 volts, 3-phase, 60-Hz.

B.2.176. Emergency Supply. A diesel engine driven generating unit will be installed in the equipment building on the reservation area to provide emergency power for lock operation. The unit will be of sufficient capacity to operate the lock machinery and to supply necessary power for the equipment building, control houses, and the lock lighting. The generator is estimated to be rated at 300 Kw, 0.8 power factor, 480 volts, 3-phase, 60-Hz. Fuel supply for the engine generator will be sufficient for 5 days of continuous operation.

Power Distribution System

B.2.177. General. Power will be supplied to the main distribution switchboard in the equipment building through cable placed in conduit encased in concrete from the main service transformer or from the engine generator. Power for the operation of the lock machinery, lighting, and auxiliary equipment will be distributed from the main switchboard to the motor control center in the equipment building.

B.2.178. Motor Control Center. he motor control center will include emergency generator service switch, normal service switch, automatic transfer switch and control panel, control house feeders, programmable logic controller cabinet, panelboards, transformers, starters, motor circuit protectors, contactors, circuit breakers, and control accessories.

B.2.179. Electrical Cable. Minimum wire size will be #12 AWG for power and lighting, #10 AWG for current transformer secondary circuits, #12 AWG for potential transformer, relaying, and control circuits; #16 for annunciator, video and RTD circuits and #19 AWG for alarm and detection circuits. Insulation, generally, will be XLPE or EPR.

Control Systems

B.2.180. There will be two full control consoles, capable of operating all gates, valves, cameras etc, and two local control consoles with limited controls. All control consoles will be constructed of 14 gage, cold rolled, smooth, select steel sheets assembled on a rigid steel framework. Control consoles will be designed for indoor use and be freestanding.

B.2.181. Lock Operation. The lock machinery will be controlled from two main control consoles each located in the two larger control houses at both ends on the west lock wall and from two local control consoles located at both ends on the east lock wall.

Closed Circuit Television System

B.2.182. A closed circuit television system consisting of two cameras operable under low and high light levels and two monitors. Both cameras will be equipped with pan, tilt, zoom, and focus controls. Both units will be self contained and sealed, environmental resistant TV cameras, and will be operated from the main control console in the control houses. Both monitors will be installed in the main control houses on the west side and will be equipped with controls for their respective camera.

Lock Lighting System

B.2.183. High Mast Lighting. High mast lighting will consist of the pole, cable keeper with power cable, supporting ring with luminaries, lowering system, power disconnect switch, 3 phase, 3 wire lightning arrester and air terminal.

B.2.184. Floating Mooring Bitt Lights. Marine light fixtures, 120V, 150 W HPS.

B.2.185. Navigation Guard Lights. Double fixture obstruction lights with traffic signal rated bulbs, and Fresnel lenses.

B.2.186. Control House Lighting. Control house lighting will consist of fluorescent fixtures controlled by wall-mounted light switches. Emergency and exit lights consisting of self-contained battery charger units with sealed beam lights will be provided at strategic locations in the control houses.

Signal and Communication System

B.2.187. Navigation Signal and Traffic Lights. Navigation signal lights will be provided on the east side of the lock at each end of the lock chamber. Navigation signal lights will be photo-controlled, gate position dependent, with Fresnel fixtures and mounted on 25 foot tapered aluminum poles.

B.2.188. Loudspeaker System. The loudspeaker system will consist of four loudspeaker trumpets. Microphones and the necessary pre-amplifiers and amplifiers will be provided.

B.2.189. Horn Signals. Air horns will be installed on both lock ends and will be connected to the lock compressed air system.

B.2.190. Radio Equipment. Radio equipment for communication with land stations and with boats will be provided.

B.2.191. Sound Powered Telephone System. A sound-powered-common-talking selective-ringing telephone system with five stations will be provided. One station will be located in the Administration Bldg., Equipment Bldg., and one in each of the control houses.

B.2.192. Telephone System. Conduits will be provided in the Administration building for future telephone service. Conduit will also be provided for underground telephone service entrance to the lock.

Grounding System

B.2.193. A grounding system will be provided to which all steel conduit and electrical equipment will be connected. Ground rods will be driven under the base slab of the lock. The grounding system will be specified to have a ground resistance of 30 ohms or less.

Corrosion Mitigation System

B.2.194. Corrosion mitigation of the lock miter gates and tainter valves, will be accomplished by means of paint system supplemented by a cathodic protection system.

DETOUR ROUTES

B.2.195. Traffic on St. Claude and Claiborne Avenues alternately will be closed and traffic rerouted to the replacement bridge at Florida Avenue and either remaining open bridge. The bridges will be tied into commuter routes in Orleans Parish and St. Bernard Parish.

B.2.196. During feasibility, the Corps coordinated with the Regional Planning Commission (RPC), which is an umbrella planning agency for four parishes: Orleans, Jefferson, St. Bernard and St. Tammany. The RPC has a 21-member commission with five representatives from each parish and an LDOTD representative. The members include a variety of backgrounds including elected officials, business and economic development interests, transportation planners and engineers, among others. RPC serves as the Metropolitan Planning Officer (MPO) for federal and state transportation funds.

B.2.197. RPC maintains a transportation computer model that includes the project area for the lock replacement. The model considers data on population volume and density, location of major employers, income levels, school enrollment and similar items affecting traffic patterns and volumes. The model subdivides the project area into units and sub-units to develop trip origins and destinations and their effects on traffic patterns and volumes. The 1990 U.S. Census records were recently added to the model database. The model can predict general patterns in traffic volumes and volume shifts that will occur during bridge closures at St. Claude or Claiborne Avenues during lock replacement. This data will be used to develop suitable detour routes.

COST ESTIMATES

B.2.198. Project cost estimates are shown in Section 4.

RIGHTS OF WAY

B.2.199. The rights of way for the lock North of Claiborne Avenue site are shown on plates B-57 thru B-59.