APPENDIX C
ENGINEERING – DESIGN & COST

MCCLELLAN-KERR ARKANSAS RIVER NAVIGATION SYSTEM
FEASIBILITY REPORT

ENGINEERING – DESIGN & COST APPENDIX
(with Addenda)

EXECUTIVE SUMMARY

PURPOSE OF MKARNS STUDY

The McClellan-Kerr Arkansas River Navigation System Study is a system feasibility study addressing navigation improvement planning and ecosystem maintainability for the Arkansas River Navigation System ova a 50-year planning period. The study started in 2003 following a Reconnaissance-level report.

The principal problem addressed by this study results from sustained high flows on the MKARNS. High flows have resulted in several problems including decreased navigation traffic, flooding, reduced recreational use, and other adverse conditions. The primary opportunities are to reduce or eliminate commercial traffic delays and improve the national and regional economic conditions while maintaining, protecting, and enhancing the environment. The goal of the Study is to outline an integrated plan to ensure the economic and environmental sustainability of the MKARNS.

PURPOSE OF THE ENGINEERING - DESIGN & COST APPENDIX

The Design & Cost Appendix describes the existing navigation system in terms of its composition of locks and dams and waterways. Similar descriptions are provided for the system, as it would be improved with improvement measures including flow management, channel deepening, and maintenance dredging and disposal alternatives. The scope of the study is very broad – 17 lock locations and a total of approximately 445 miles of waterways. Sufficient engineering was performed to determine the feasibility and cost of navigation efficiency measures and alternatives for the plan formulation process. Additional detailed site-specific engineering will be required (and is planned as part of any authorization for construction) in order to implement any of the structural measures discussed in this Appendix.

This appendix does not contain engineering study for ecosystem restoration or environmental sustainability. These engineering works are under the Environmental Impact Appendix and its supplemental reports.

1.0 INTRODUCTION

The purpose of Section 1 of this Appendix is to introduce the reader to the contents and organization of the Design & Cost Appendix, describe the subject system of rivers, introduce the problem of sustained high flows on the MKARNS and the potential solutions of channel modification measures and their characteristics targeted at solving the problem of high flows, and development of such measures as well as their screening based on various criterion. The Appendix also includes some presentation of the combination of measures into alternative plans. This Appendix also includes Addenda that present certain material in greater detail in support of this Appendix.

The reader must be aware that this Appendix is organized geographically into an Arkansas portion and an Oklahoma portion. This Appendix was developed under a partnership between the Little Rock and Tulsa Districts. While the overall strategy for developing a solution to high flows on the MKARNS has been addressed by both districts, each district team dealt with issues and concerns that were specific to their geographic location. Due to the segregation of this Study, the reader will find that some issues dealt with at one district may not have been a problem for the other district.

1.1 Purpose of MKARNS Navigation System Study

The McClellan-Kerr Arkansas River Navigation System Study (hereinafter referred to as "Study) is a system feasibility study addressing navigation improvement planning and ecosystem sustainment opportunities for the Arkansas River over a 50-year planning period. The principal navigation problem addressed by this study is the existence of sustained high flows on the MKARNS. The primary alternatives of this study have been developed to correct problems of decreased navigation traffic, flooding, loss of recreation use, and other adverse conditions, and also to improve the national and regional economic conditions while protecting and enhancing the environment. The goal of the study is to outline an integrated plan to relieve problems caused by high flows, while ensuring the economic and environmental sustainability of the MKARNS.

1.1.1 Description of the MKARNS. The navigation system is defined as the segment of the Arkansas, White, and Verdigris Rivers from the mouth of the White River (Navigation Mile (NM) 0.0), to the Arkansas River via the Arkansas Post Canal (NM 19.0), to the mouth of the Verdigris River in Oklahoma (NM 395.0), and ending at the Port of Catoosa near Tulsa, Oklahoma. For the purposes of this report, the system has been further divided into six river reaches (4 in Arkansas and 2 in Oklahoma) by marine terminals:

- Reach 1: Mouth of White River to NM 75.2
- Reach 2: NM 75.2 to NM 119.5
- Reach 3: NM 119.5 to NM 220.3
- Reach 4: NM 220.3 to NM 308.7 (Ark-OK State Line)
- Reach 5: Mayo Lock and Dam to Chouteau Lock and Dam
- Reach 6: Chouteau Lock and Dam to the Port of Catoosa

The area includes 445 miles of navigable waterway (see Figure A-1). The navigation system contains 17 lock sites. Table A-1 provides some basic data on the locks and dams of the Arkansas River Navigation System. The dams provide no storage of water for flood control. The dams provide reliable 9-foot navigable depths. Several of the dams are also used to produce hydroelectric power. The navigation pools created by the dams also provide cities with water supply. The increased volumes of water in the rivers also serve for increased wastewater assimilation and dilution. Electrical power plants located near the rivers use the navigation pools for cooling water. In addition, abundant water-based recreational opportunities exist in the pools that are widely used by the public throughout Arkansas and Oklahoma.

This study does not address any major improvements or modifications to the locks and dams at this point. Any significant changes to lock design will be addressed in the Planning, Engineering, and Design (PED) phase of this project.

2.0 Purpose of the Engineering Effort and General Discussion about this Appendix

The scope of the Study is very broad. Sufficient engineering was performed to determine the feasibility and cost of the individual alternatives for the plan formulation process. However, additional detailed site-specific engineering will be required (and is planned as part of authorization for any construction) in order to implement any of the measures discussed in this Appendix. This Design Appendix is the culmination of several months of engineering work centered on the purpose defined above.

The purpose of this Appendix is to present the engineering and design, including associated costs, for deepening the MKARNS from the original depth that would allow 9' draft barge traffic to 10', 11', and 12' draft barge traffic. Each pool within the system requires some degree of dredging for the three depths being studied.

3.0 Alternatives Studied

3.1 No Action. The no action, or future without project condition, defines what the likely conditions will be for the MKARNS in the absence of any Federal action. The without project conditions serves as a baseline against the alternatives evaluated. The future demand for waterway transportation is a key factor in defining the without-project condition and determining the need for future navigation improvements. The no action plan was evaluated as the first alternative for flow management, channel deepening and widening, and maintenance dredging and disposal. Under this alternative, the reliability and efficiency of shipping would be greatly reduced compared to what can be achieved if the navigation channel is deepened to 12 feet. This condition results from limits placed on tow sizes, increased horsepower requirements of navigation vehicles, and other adverse factors. Subsequently, further action must be taken to ensure that the efficiency and cost effectiveness of the navigation system is maintained.

3.2 Raising Pool Elevations. This Study reviewed the option of increasing each pool depth along the navigation channel by increments of 1', 2', and 3'. However, it was determined that this alternative would prove too costly to justify its use due to significantly increased costs associated with increasing elevations of several utility transmission lines and one bridge to maintain adequate clearance for barge traffic; additional real estate costs associated with the construction of a large amount of flood control levees, including two pumping stations; mitigation to reduce environmental impacts of constructing the additional levees; and anticipated structural, mechanical, and electrical modifications to lock and dam gates and embankments. This alternative was subsequently abandoned for those reasons.

3.3 Combination of Raising Pools & Increasing Channel Depth. This alternative involved the combination of raising pool elevations and conducting additional dredging to maintain the additional channel depth needed to reduce the effects of sustained high flows on the MKARNS. Although this alternative was determined to be significantly less costly than raising all pool elevations, there was still significant cost impacts associated with the same channel modifications as listed above. This alternative was subsequently abandoned for the same reasons.

3.4 Increasing Channel Depth. This alternative includes initial and O & M dredging to provide the additional channel depth required to reduce high flow effects on the MKARNS. This option was also studied incrementally by additional depths of 1', 2', and 3'. The ongoing study indicates that this alternative would be the most beneficial approach to solve the existing problems. By choosing this option, the modifications required in the previous two alternatives would not be needed; thus, proving the least costly alternative studied. In order to increase the channel depth under this alternative, several issues must be investigated to ensure that the proper depths can be obtained. These issues are listed below as components of the proposed projects.

4.0 Project Components

For each depth, the main components include dredging, disposal areas, finger dikes, utility relocation, real estate and higher barge impact forces. Below is a description of the components. All components can be seen as laid out on Map Sheets 1 through 95.

4.1 Dredging

To locate areas along the channel that require deepening, a hydrographic survey was completed and the areas to be dredged identified. The survey was modeled into a program, which utilized the channel width required, and quantities were computed. Dredging costs were completed utilizing a cutter head dredge. Some areas indicated rock would be encountered. The rock in these areas was assumed to be soft enough for the cutter head dredge to remove. The current ongoing dredging locations and areas requiring additional dredging to obtain the 12' channel are shown on Map Sheets 1 through 95.

4.2 Disposal Areas

Disposal areas include both upland and open water disposal. These areas were located in reference to the dredging areas such that dredged material would have to be pumped no more than 1.5 miles. Other considerations were land ownerships, habitat and archeological impacts. The upland sites consist of excavating a pit and utilizing the excavated material to form a dike around the pit. This maximizes the volume of dredge material that can be stored. The pit also has a discharge pit for returning dredge water to the channel after settling. In addition to the discharge pit, submersible pumps will be required to return the dredge water to the channel in some areas where gravity or overland flow is not possible. The volumes of the pits were designed to store twice as much as the initial channel dredging volume to allow for future (O&M) dredging storage. An access road to disposal areas will be required in some areas for construction and operation. A typical upland disposal area is shown in the Dredge Disposal Site Sketches in Appendix C-4.2. Reference Tables C1, C2, and C3 below, which lists the upland and open water disposal areas, their location, and acreage and volume required. No surveys or soil analyses have been performed on the proposed disposal areas. These tasks will be performed as part of the PED phase of this project.

Open water disposal areas are created by installing a floating silt curtain around the disposal area to control the release of silt generated by the dredging activity. The area will be filled to varying heights in relation to the normal pool elevation to generate various habitat conditions. In addition, some open water sites received riprap breakwater dikes to protect the habitat generated by the redredge disposal from wave action. A small opening was left in the breakwater dike, which then received a silt curtain. The design of the open water areas can be seen in the Dredge Disposal Site Sketches in Appendix C-4.2.

TABLE C1
ARKANSAS PORTION - DREDGE DISPOSAL SITES

SITE #	RIVER MILE	REACH	SITE ACREAGE	CAPACITY (CY)	REQUIRED CAPACITY (CY)	SHEET #
1	13.35-14.00	1	267	8,615,200	6,570,000	3
2	16.10-16.50	1	100	3,226,667	2,179,488	3
3	18.20-18.85	1	17	548,534	370,512	4

TABLE C2 - OKLAHOMA PORTION UPLAND DREDGE DISPOSAL SITES

Disposal #	Pit #	River Mile	Site Acreage	C.Y. Initial Capacity	C.Y. Maint. Capacity
0	OK 309.1 R-DI	309.05 - 309.3	28	96267.6	96267.6
1	OK PRL-DI	1.5PR - 1.8PR	9	129867.6	129867.6
2	OK 315.4 R-DI	315.4 - 315.8	36	113601.6	113601.6
3	OK 318.6 L-DI	318.6 - 319.1	40	155060.4	155060.4
Alt 4	OK 335.9 L-DI	335.8 - 336.1	22	59358.9	59358.9
20	OK 338.0 R-DI	337.7 - 337.5	11	43046.7	43046.7
6	OK 342.3 L-DI	342.1 - 342.3	29	75121.8	75121.8
7	OK 345.3 L-DI	345.2 - 345.3	21	62616.9	62616.9
18	OK 354 L-DI	354.15 - 357.1	14	249411.2	249411.2
21	OK 366.5 L-DI	366.3 - 366.6	6	32982.5	32982.5
10	OK 375.2 L-DI	375.0 - 375.4	31	155346.5	155346.5
11	OK 379.1 L-DI	379.1 - 379.4	31	121229.3	121229.3
12	OK 382.0 L-DI	381.9 - 382.5	23	66915.6	66915.6
13	OK 383.9 R-DI	383.9 - 384.3	42	190513.4	190513.4
14	OK 389.7 L-DI	389.7 - 390.1	37	130590.9	130590.9
15	OK 393.8 L-DI	393.7 - 394.1	45	188543.2	188543.2
16	OK 394.4 L-DI	392.8 - 394.0	27	139123.2	139123.2
24	OK 396.6 L-DI	396.55 - 396.75	12	17788.8	17788.8
27	OK 398.2 R-DI	398.2 - 398.8	44	61560.7	61560.7
28	OK 400.7 R-DI	400.7 - 401. 5	31	31426.8	31426.8
29	OK 401.6 R-DI	401.5 - 402.2	39	131220.2	131220.2
31a	OK 414.9 R-DI	414.9 - 415.15	8	125160.5	125160.5
32	OK 416.4 L-DI	416.4 - 416.65	14	112940.2	112940.2
33a	OK 418.5 R-DI	418.5 - 418.8	33	671826.6	671826.6
34	OK 421.3 R-DI	421.3 - 421.7	13	44787.2	44787.2
35	OK 422.9 L-DI	421.85 - 422.0	7	3206308.3	3206308.3
36a	OK 429.3 R-DI	429.2 - 429.4	10	188946.6	188946.6
37	OK 429.4 R-DI	429.5 - 429.7	14	131688.9	131688.9
38	OK 434.3 R-DI	434.0 - 434.8	10	133846.4	133846.4
41	OK 443.7 L-DI	443.7 - 444.0	27	26053.8	26053.8

TABLE C3 - OKLAHOMA PORTION

OPEN WATER (OW) DREDGE DISPOSAL SITES

OW Site #	Pit Number	River Mile	Site Acreage
24	OK-SBC 0.4 L-DI	AC 4.0 - SBC 1.0	26
25	OK-SBC 4.8 L-DI	SBC 4.2 - 5.3	97
41SBC	OK-SBC 6.6 L-DI	SBC 6.2 - 6.6	15
42	OK-SBC 6.9 L-DI	SBC 6.8 - 7.15	27
5	OK 336.3 L-DI	336.3 - 336.4	17
19	OK 336.4 R-DI	336.5 - 336.6	11
8	OK 348.3 L-DI	348.3 - 348.75	48
9	OK 367.2 L-DI	367.2 - 367.6	32

4.3 Finger Dikes

Several areas were identified in this study, which have been continuing dredging problems. Since the deepening of the channel will result in an increased cross sectional area thus decreasing velocities more dredging may result. To keep current velocities at or near existing conditions, finger dikes were designed that jut out from the bank to reduce the cross sectional areas and restore the velocities to current or near current conditions. The top of the dike's elevation was set at the 60,000 cfs water surface profile at each location. The model HECRAS was utilized to compute the dike lengths needed for the various depths. 14-inch riprap is used for construction and will be placed from barges. Refer to Table C4 below for locations of finger dikes.

TABLE C4 - FINGER DIKE LOCATIONS

DIKE NO.	BM	EM
1	311.5	313.3
2	311.5	313.3
3	311.5	313.3
4	311.5	313.3
5	311.5	313.3
6	311.5	313.3
7	311.5	313.3
8	311.5	313.3
9	313.3	313.8
10	313.3	313.8
11	314.7	315.8
12	314.7	315.8
13	314.7	315.8
14	314.7	315.8
15	314.7	315.8
16	352.7	356.3
17	352.7	356.3
18	352.7	356.3
19	352.7	356.3
20	352.7	356.3
21	352.7	356.3
22	352.7	356.3
23	6.3	7.6
24	392.2	392.7
25	392.2	392.7
26	392.2	392.7
27	392.2	392.7
28	392.7	393.2
29	392.7	393.2
30	392.7	393.2
31	392.7	393.2
32	393.9	394.8
33	393.9	394.8
34	393.9	394.8
35	393.9	394.8
36	393.9	394.8
37	393.9	394.8
38	393.9	394.8
39	393.9	394.8

4.4 Utility Relocation

There are several existing utility transmission lines crossing the MKARNS along the bottom of the channel at various locations throughout the navigation system. All utility owners possessing such transmission lines were contacted during the course of this study. Through telephone conversations and review of existing navigation charts, it was determined that there are no utility relocations necessary for the Oklahoma portion of the navigation system where channel deepening will take place. However, in conversations with representatives from Centerpoint Energy/Mississippi River Transmission Corporation, one utility transmission pipeline must be removed/relocated. The area of concern includes six abandoned 10" pipes, which are currently located at river mile 61. The pipes have little cover if any and some are known to be exposed along the channel bottom. This pipeline must be removed in order to deepen the navigation channel to the desired depth. This relocation has been included in the cost estimate provided as an attachment to this appendix.

4.5 Real Estate

Acreages for the upland disposal areas and the lengths of the access roads required have been calculated. These quantities were provided to Real Estate study team members and are located in the Real Estate Appendix and cost estimate.

4.6 Barge Impact Study

See Appendix C-4.6.

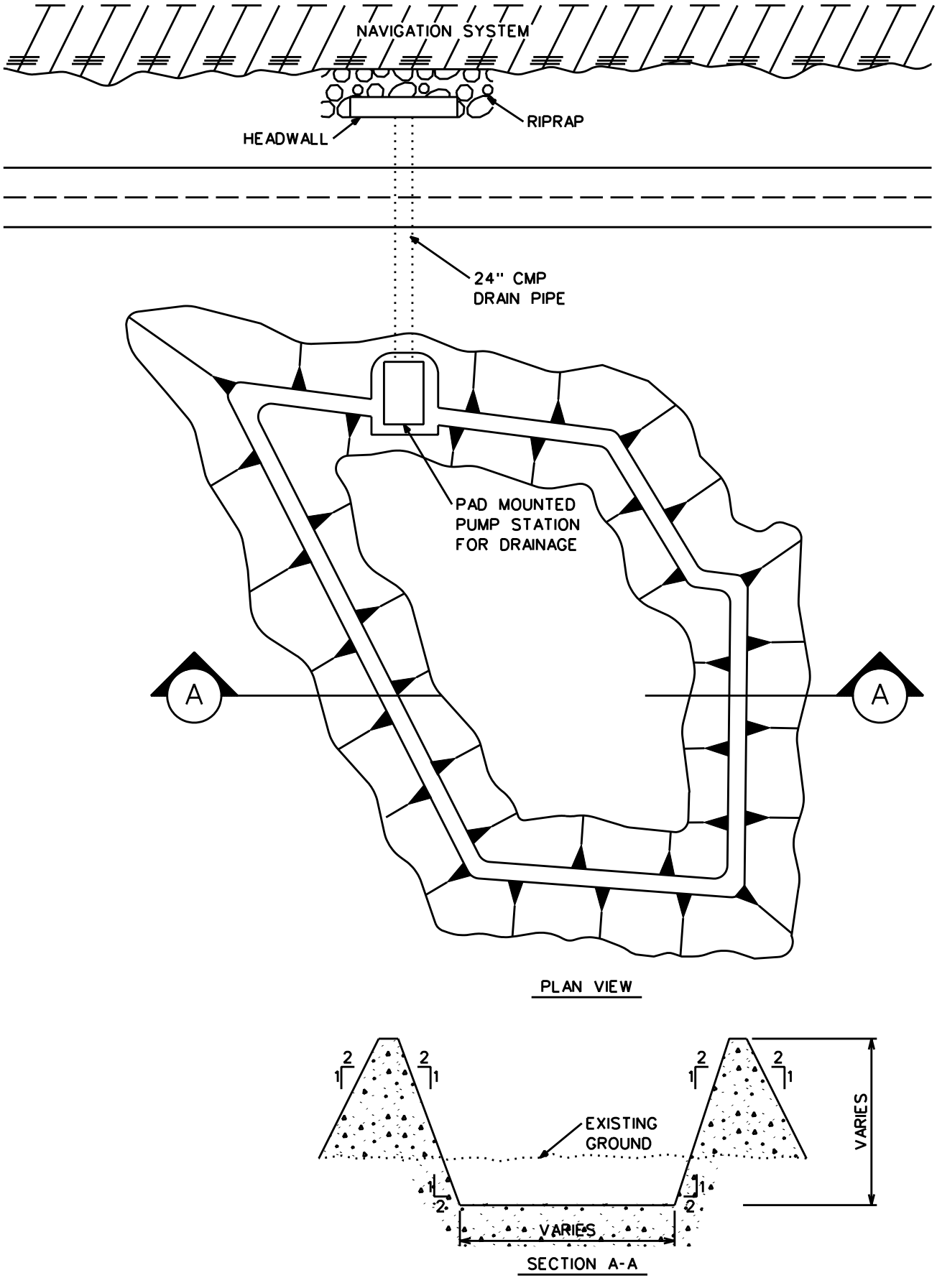
5.0 Cost Estimate

See Appendix C5.0 Cost Estimates.

APPENDIX C – 4.2
DREDGE DISPOSAL SITE SKETCHES

MKARNS (McClellan-Kerr Arkansas River Navigation System) SKETCHES

PROJECT	ARKANSAS NAVIGATION STUDY	**PAGE** 1 **OF** 3	**DESIGNED BY** E. KREBS	**DATE** 7/04
SUBJECT	DREDGE DISPOSAL PIT 1-RM 13.5		**CHECKED BY**	**DATE**



MKARNS (McClellan-Kerr Arkansas River Navigation System) SKETCHES			
PROJECT ARKANSAS NAVIGATION STUDY	**PAGE** 2 **OF** 3	**DESIGNED BY** E. KREBS	**DATE** 7/04
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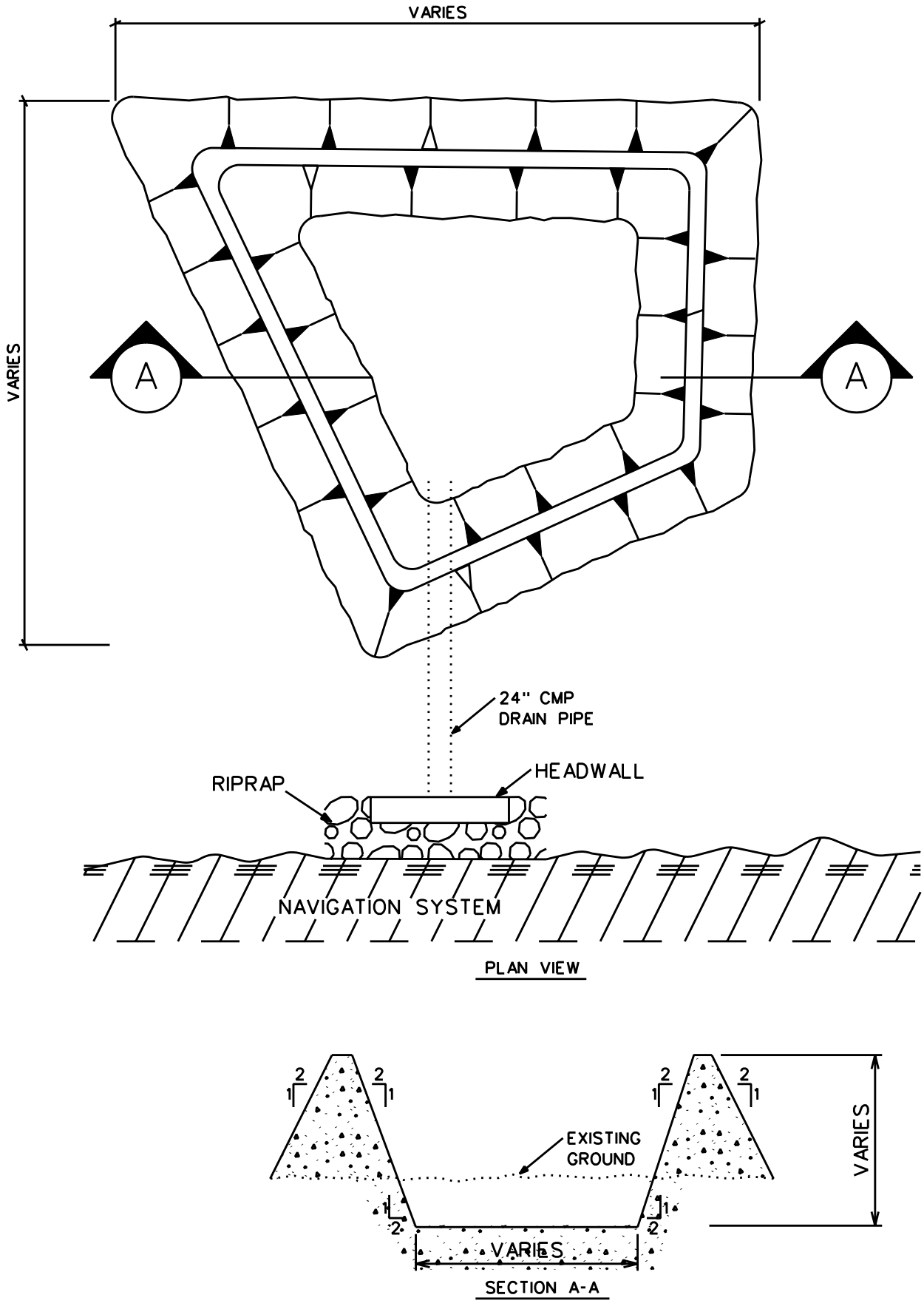

MKARNS (McClellan-Kerr Arkansas River Navigation System) SKETCHES

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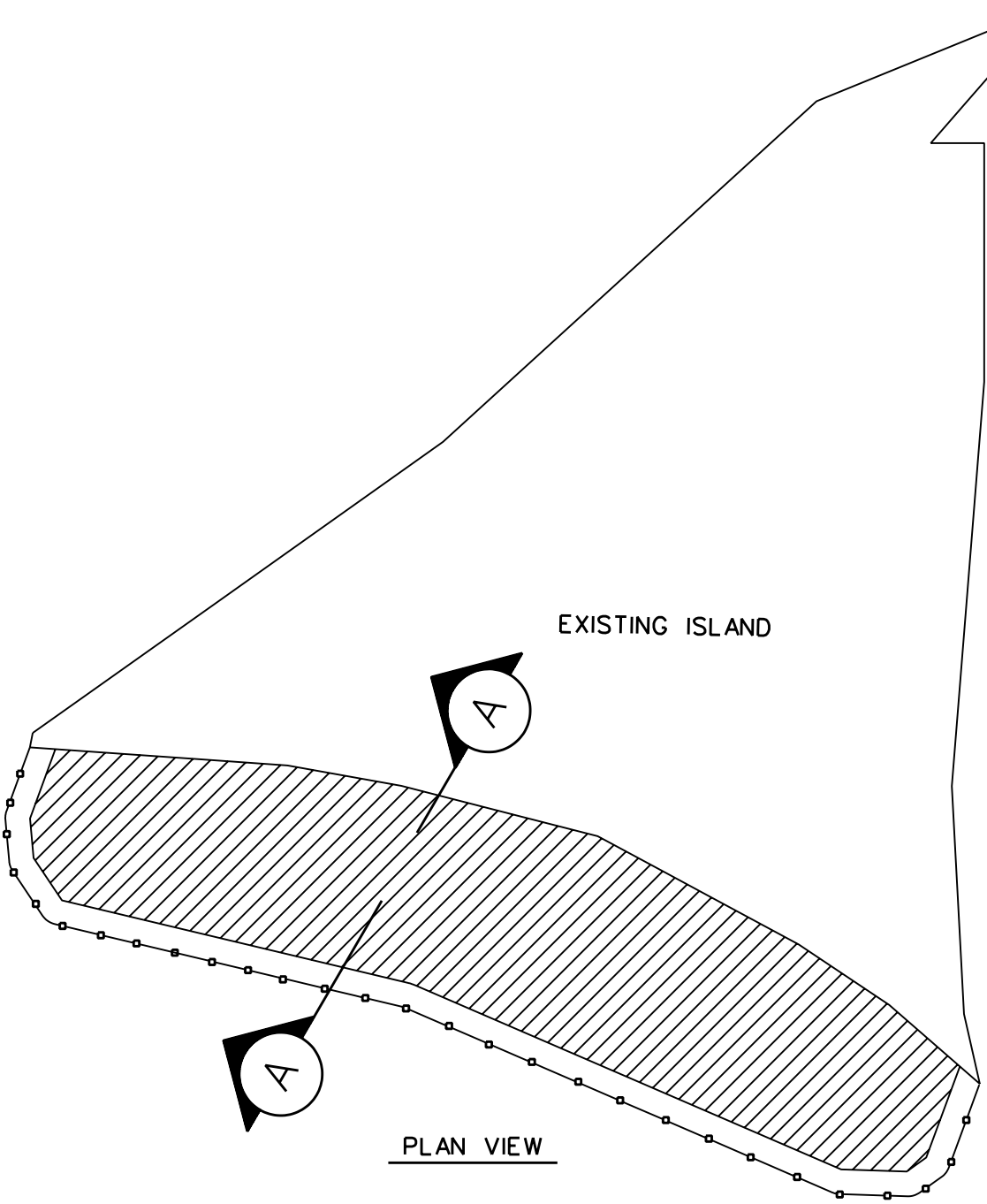
SUBJECT OPEN WATER DREDGE DISPOSAL -PIT1 @ RM 19		**CHECKED BY**	**DATE**



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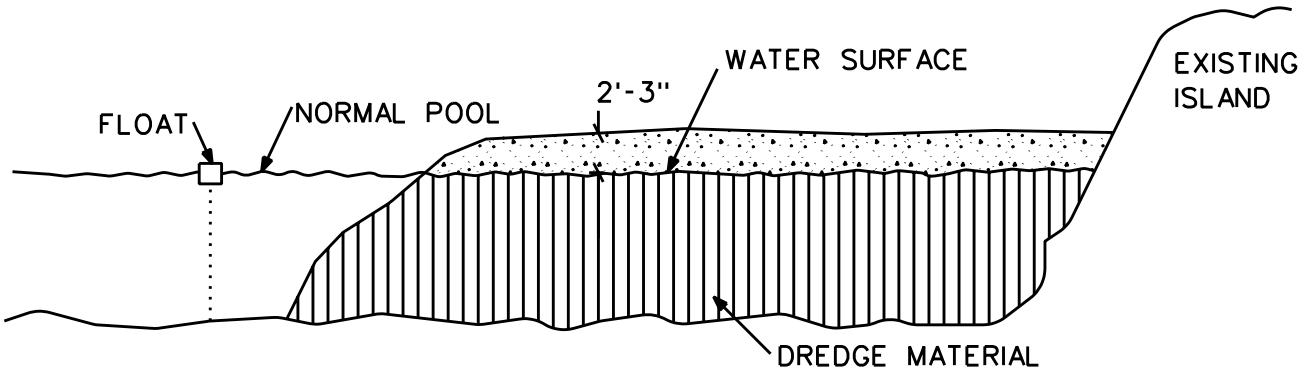

SECTION A-A

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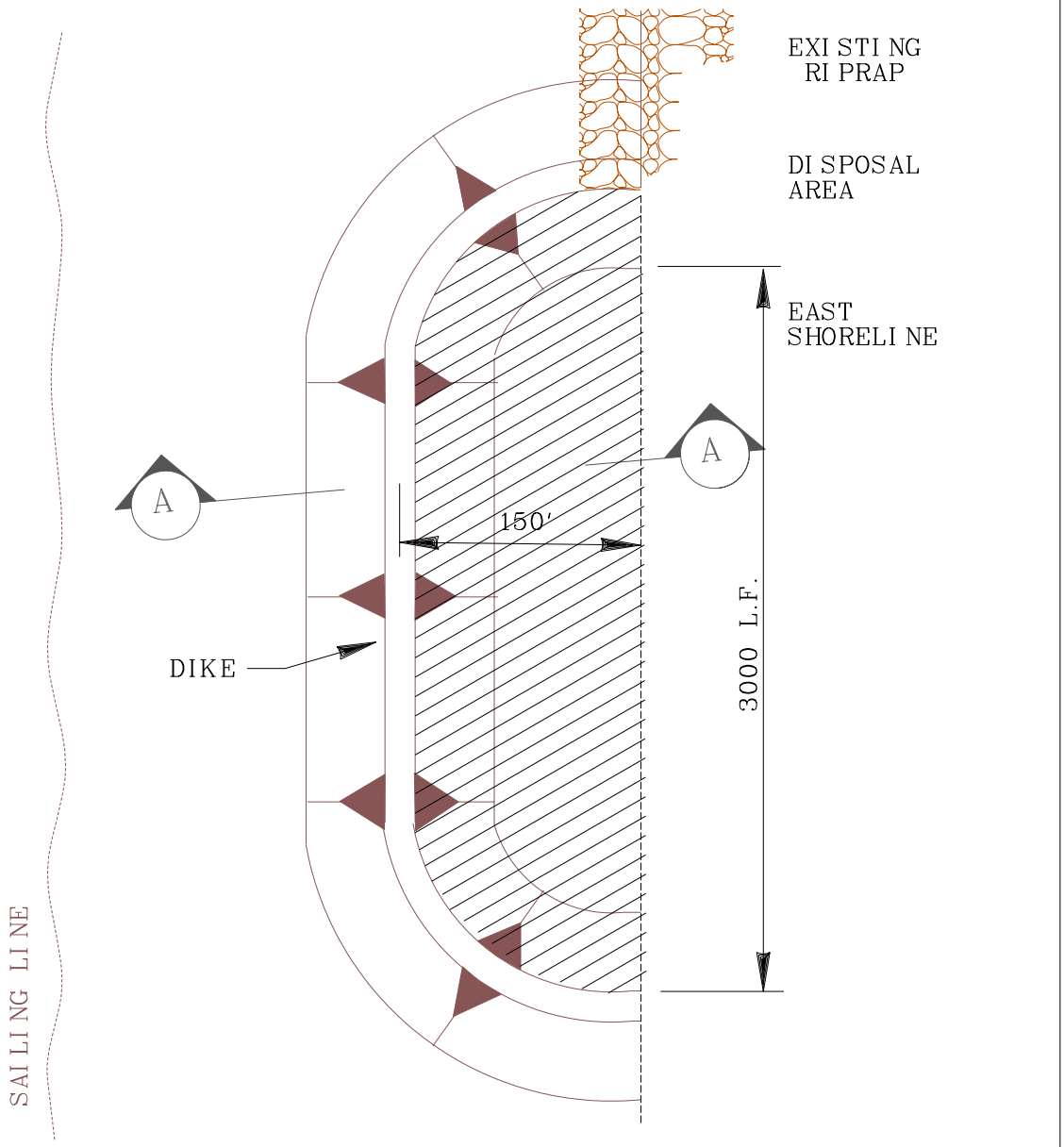

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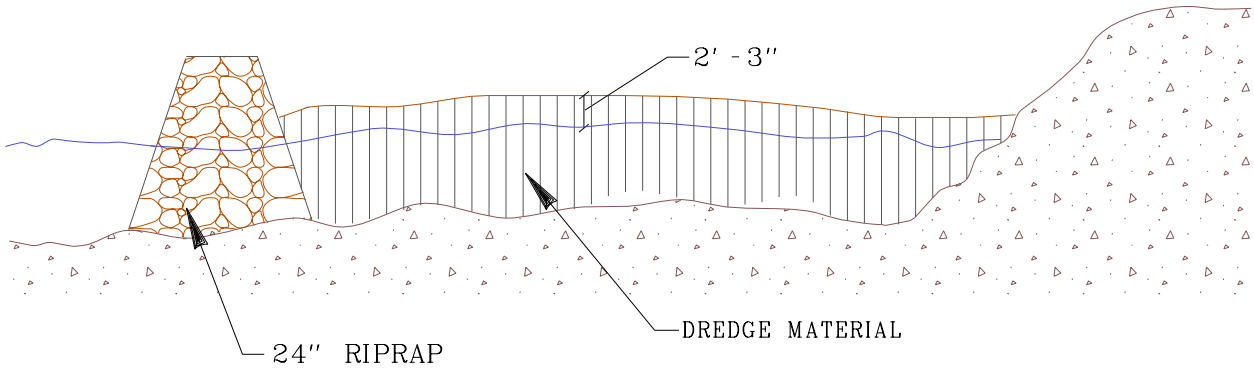

SECTION A-A

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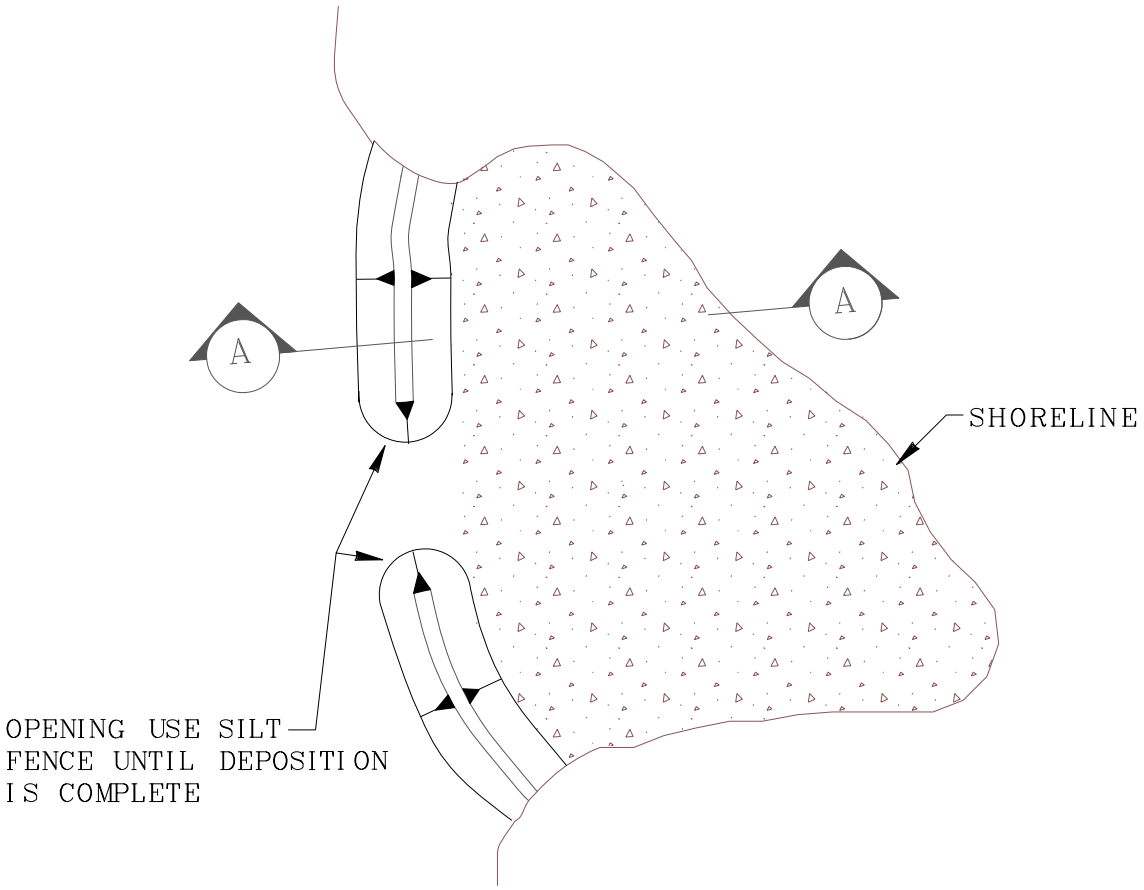
SUBJECT SAN BOIS DREDGE DISPOSAL @ PIT 9, 24 & 25		CHECKED BY	DATE



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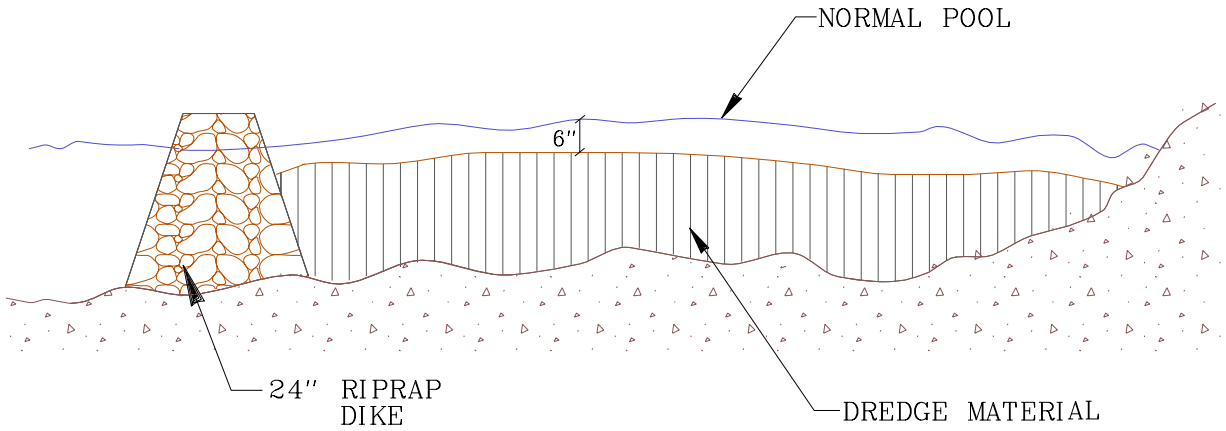

SECTION A-A

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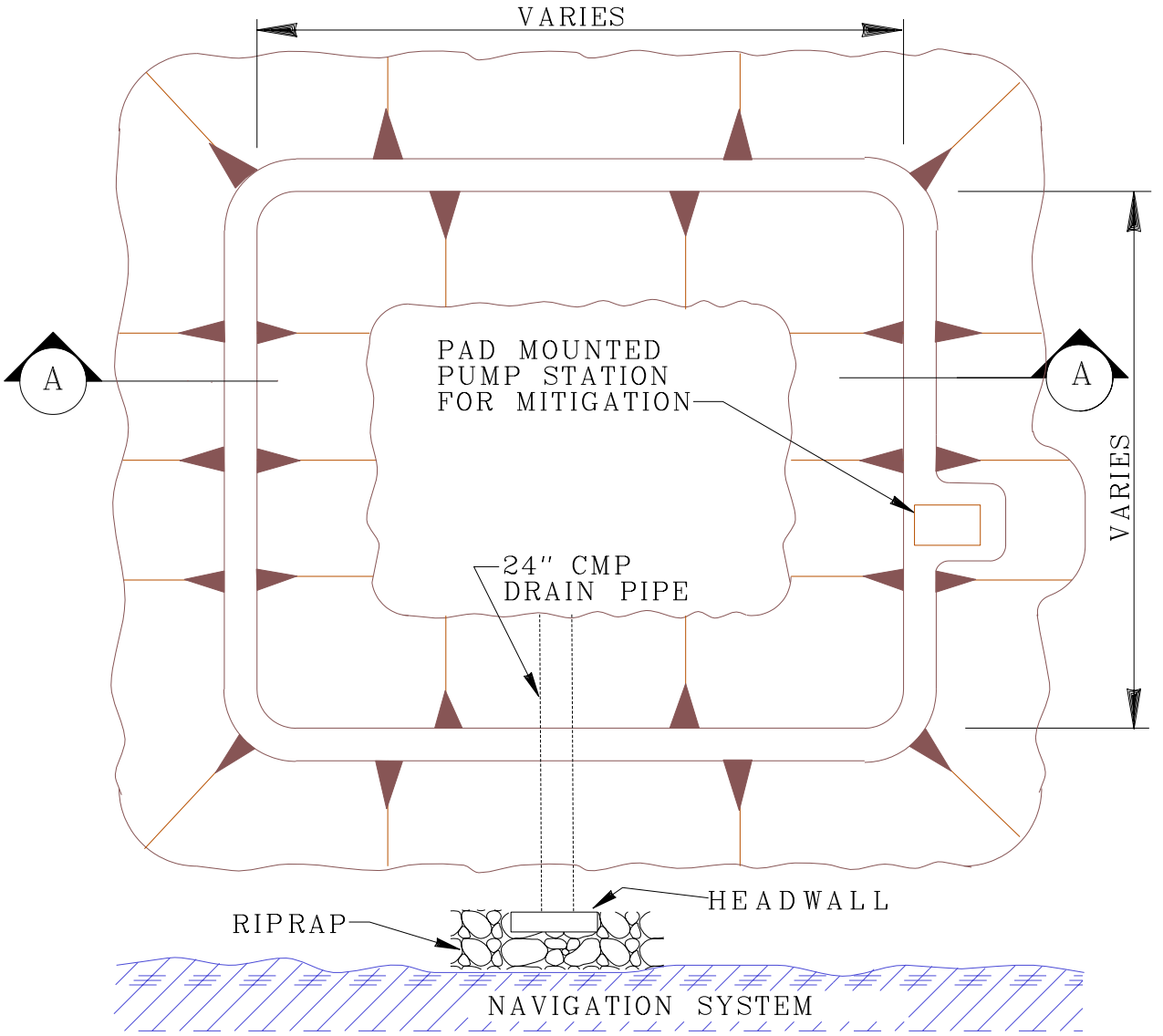

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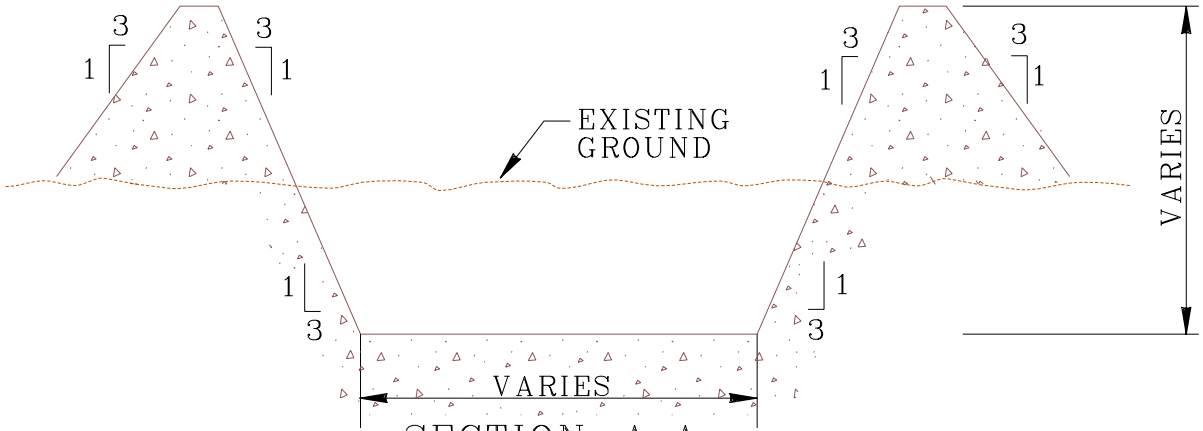

SECTION A-A

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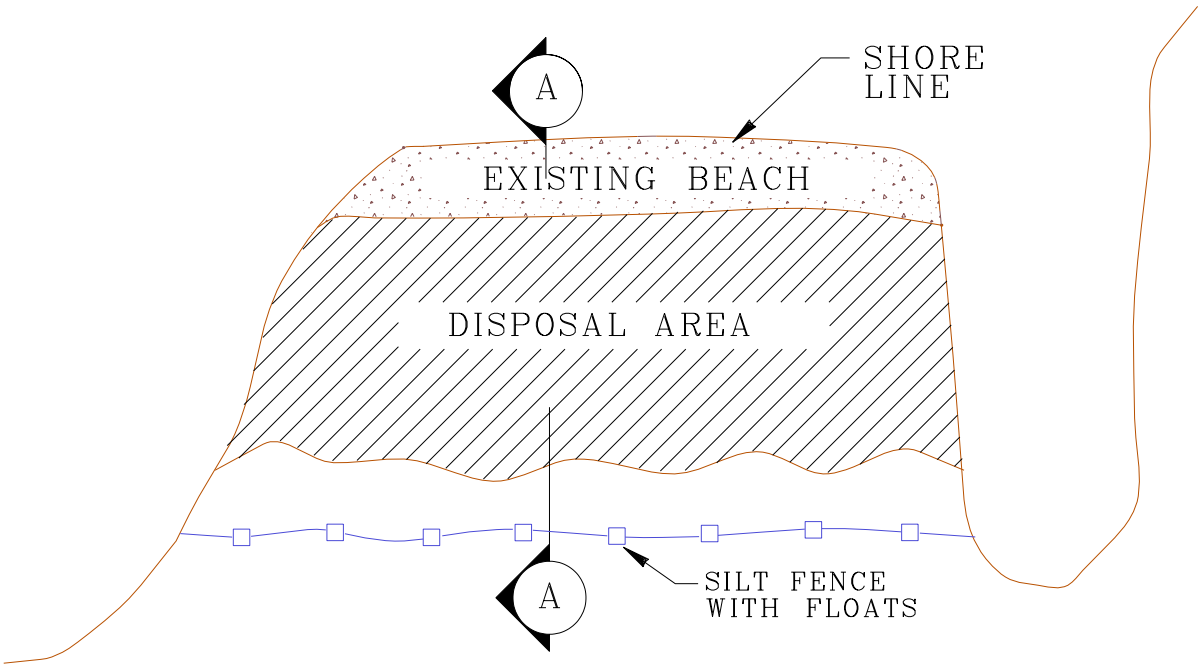

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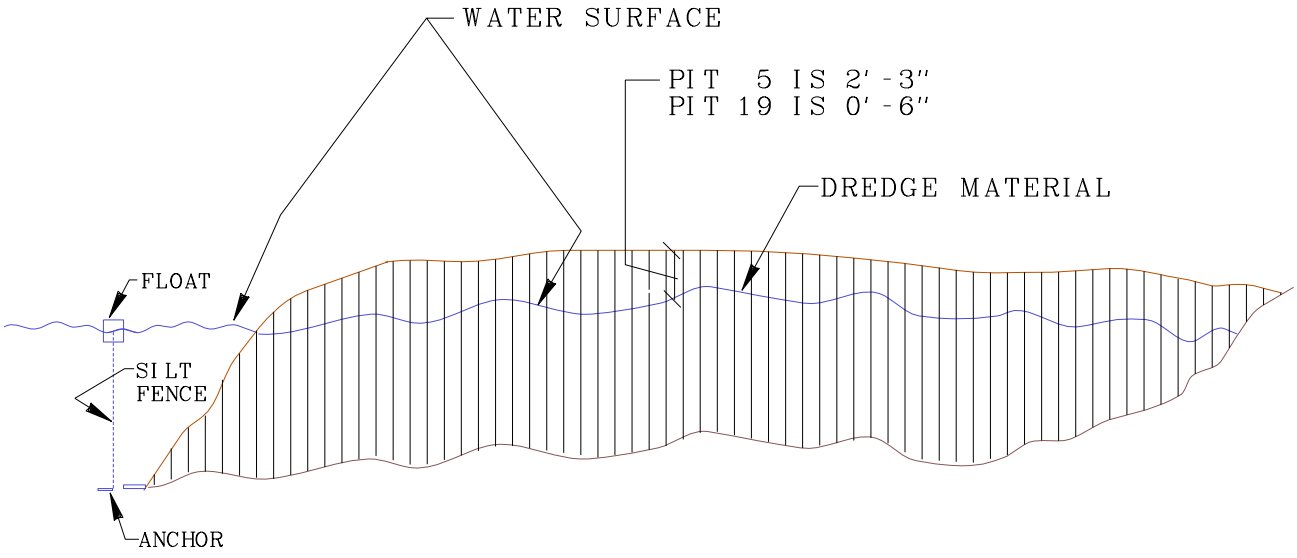

SECTION A-A

PROJECT ARKANSAS NAVIGATION STUDY	Page 5 of 10	DESIGNED BY F. KLOECKLER	DATE 6/04
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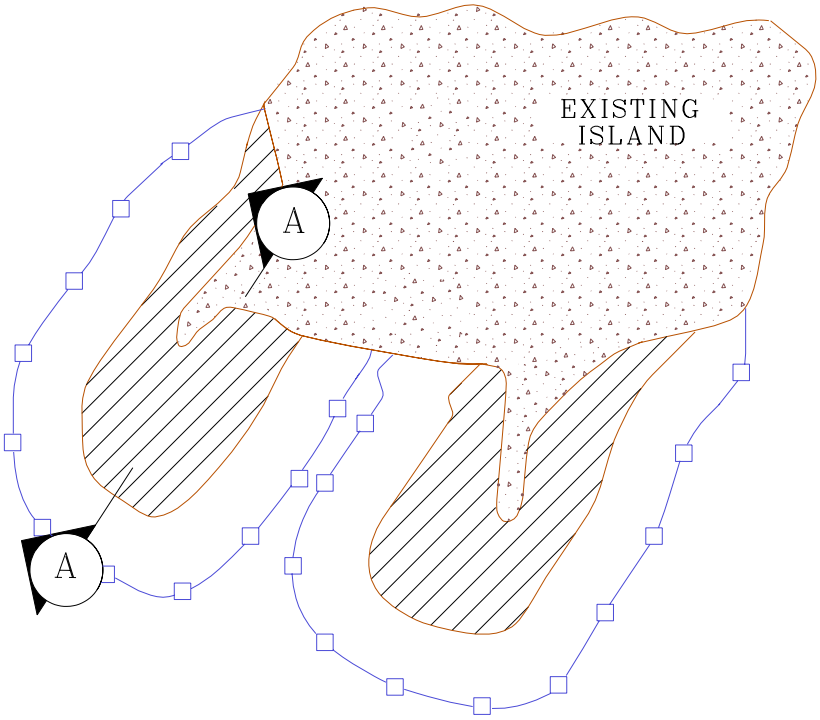

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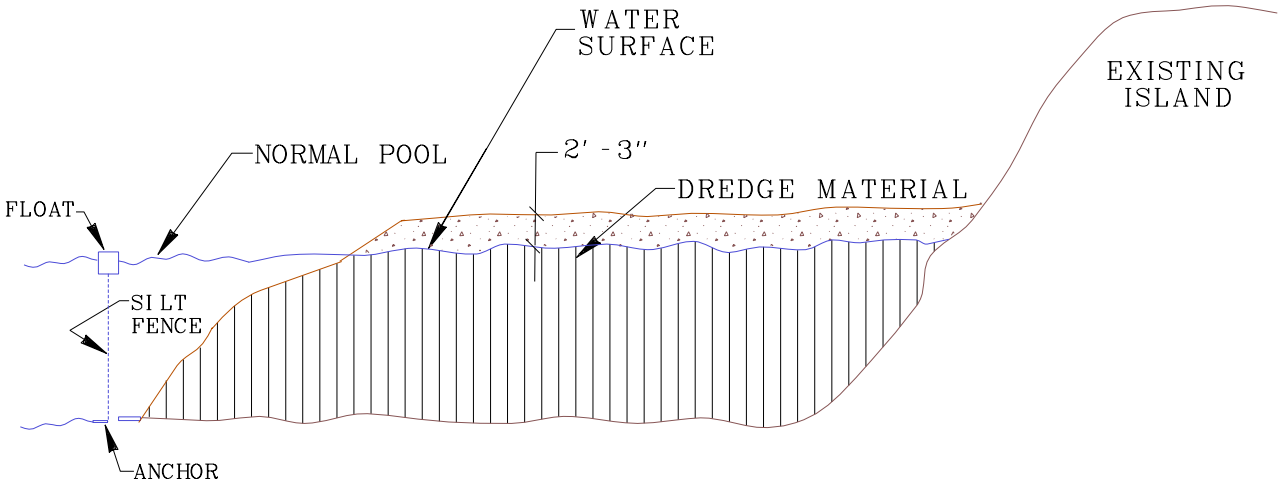

SECTION A-A

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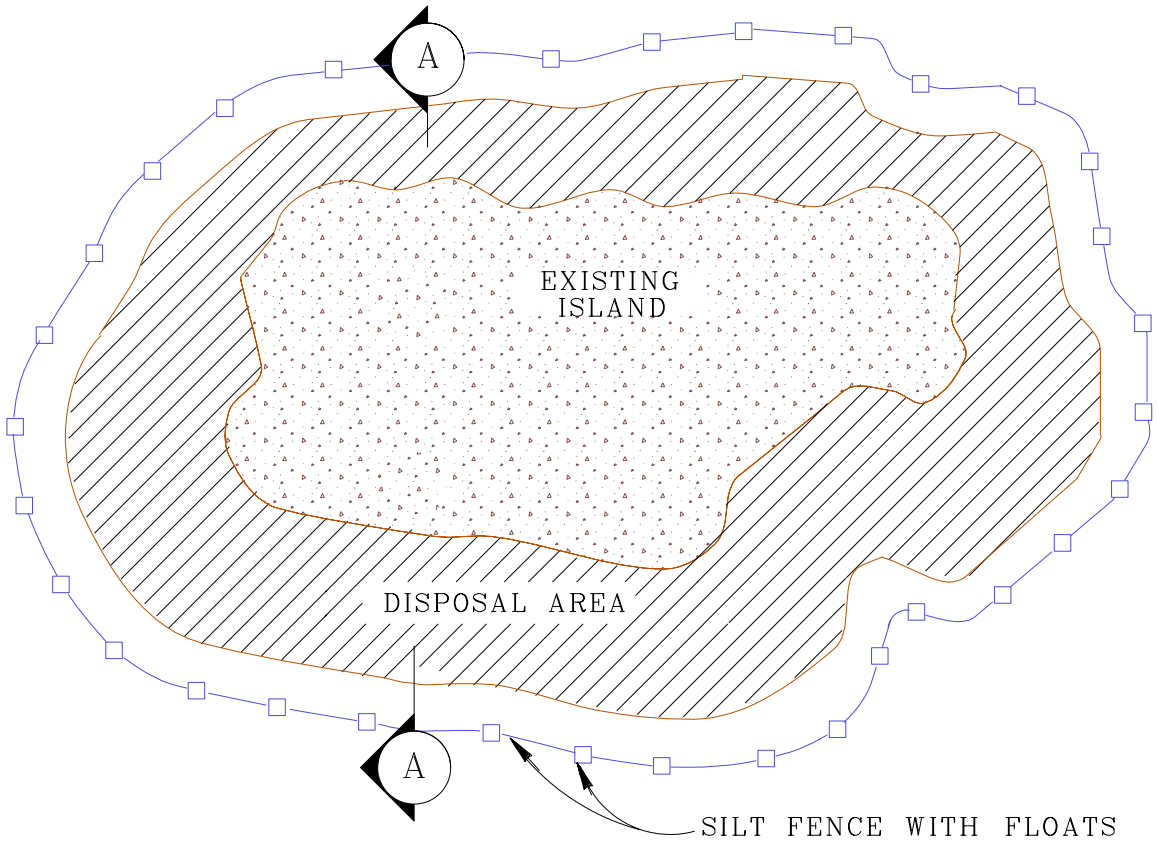

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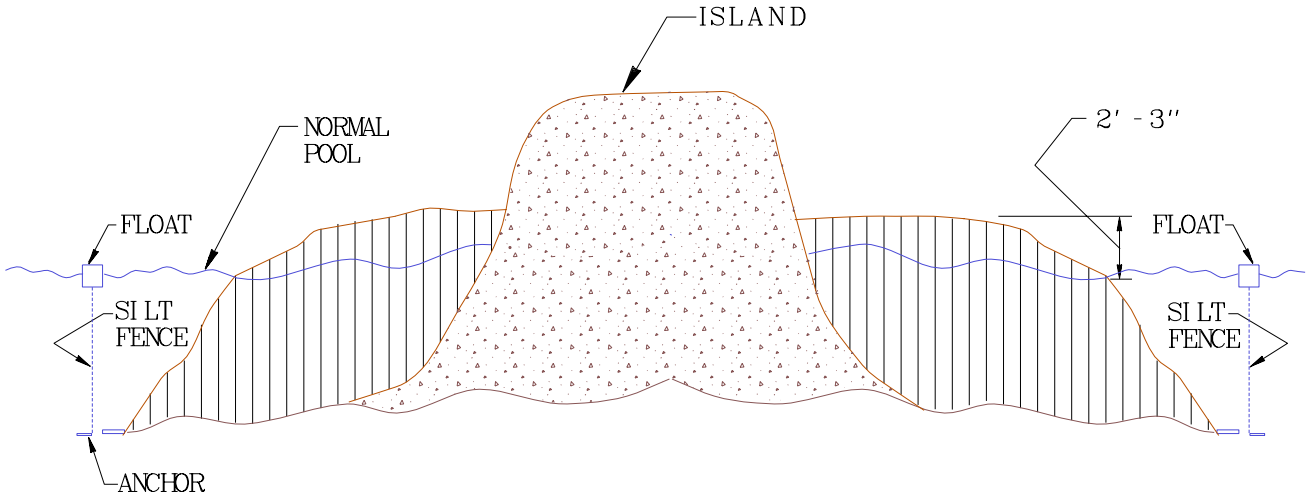

SECTION A-A

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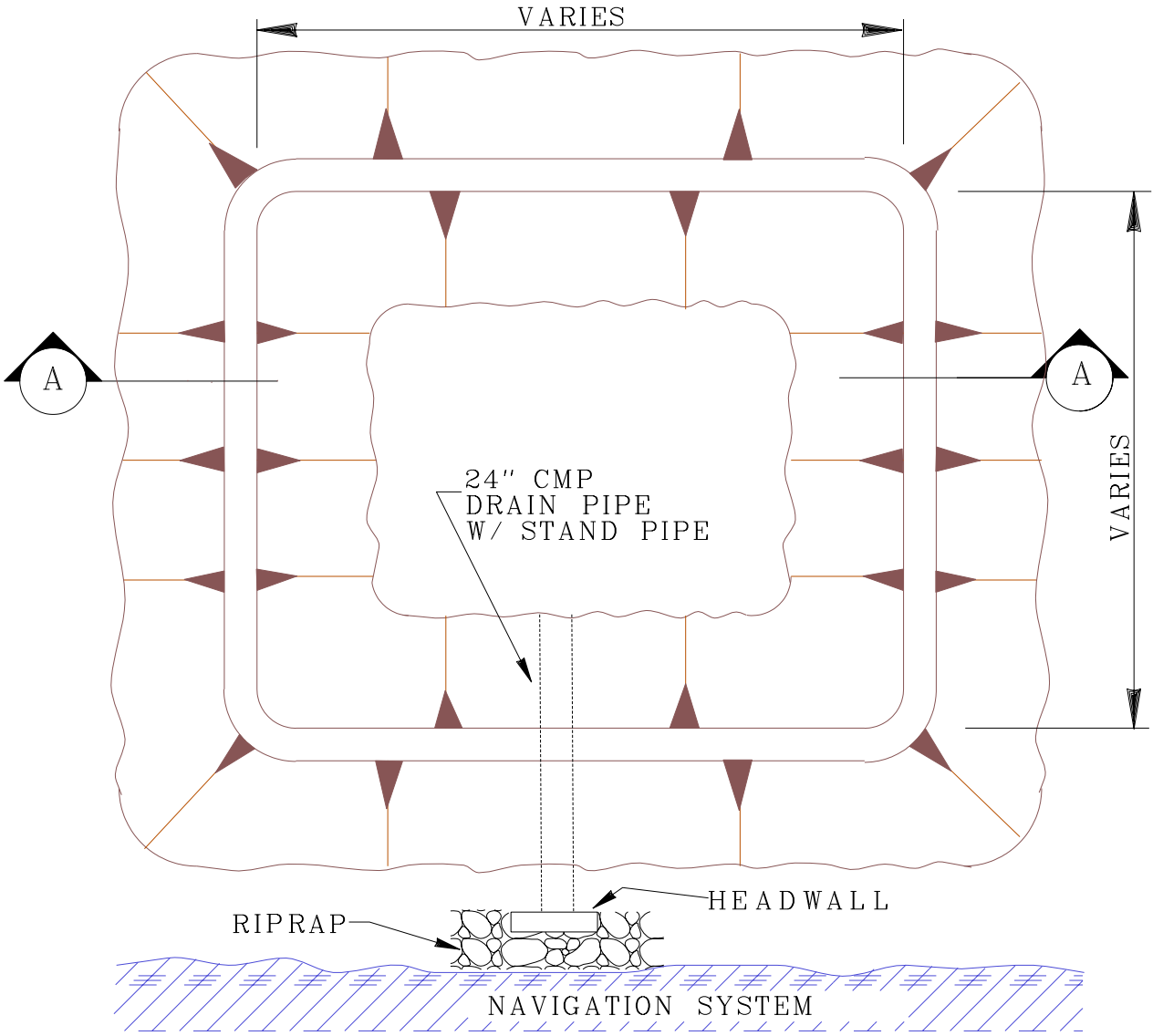
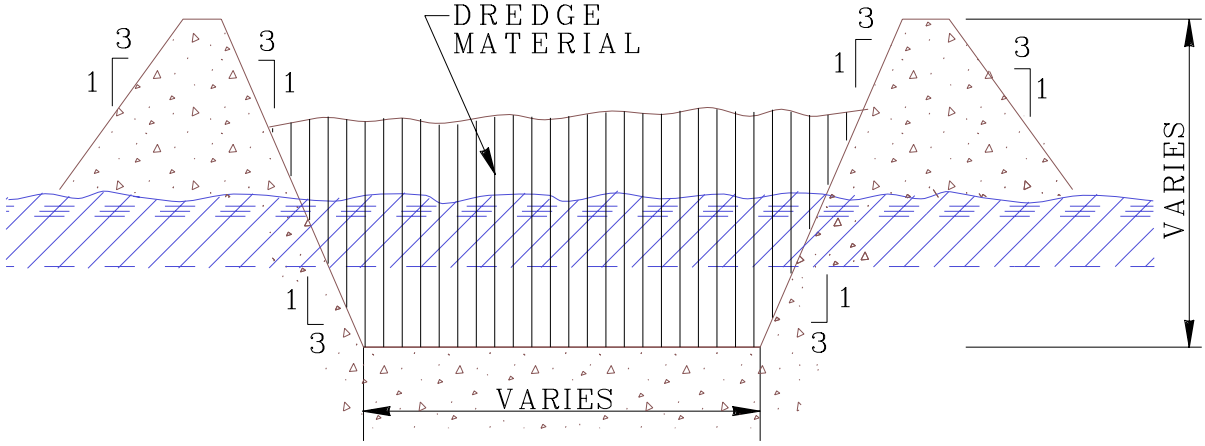


PLAN VIEW



SECTION A-A

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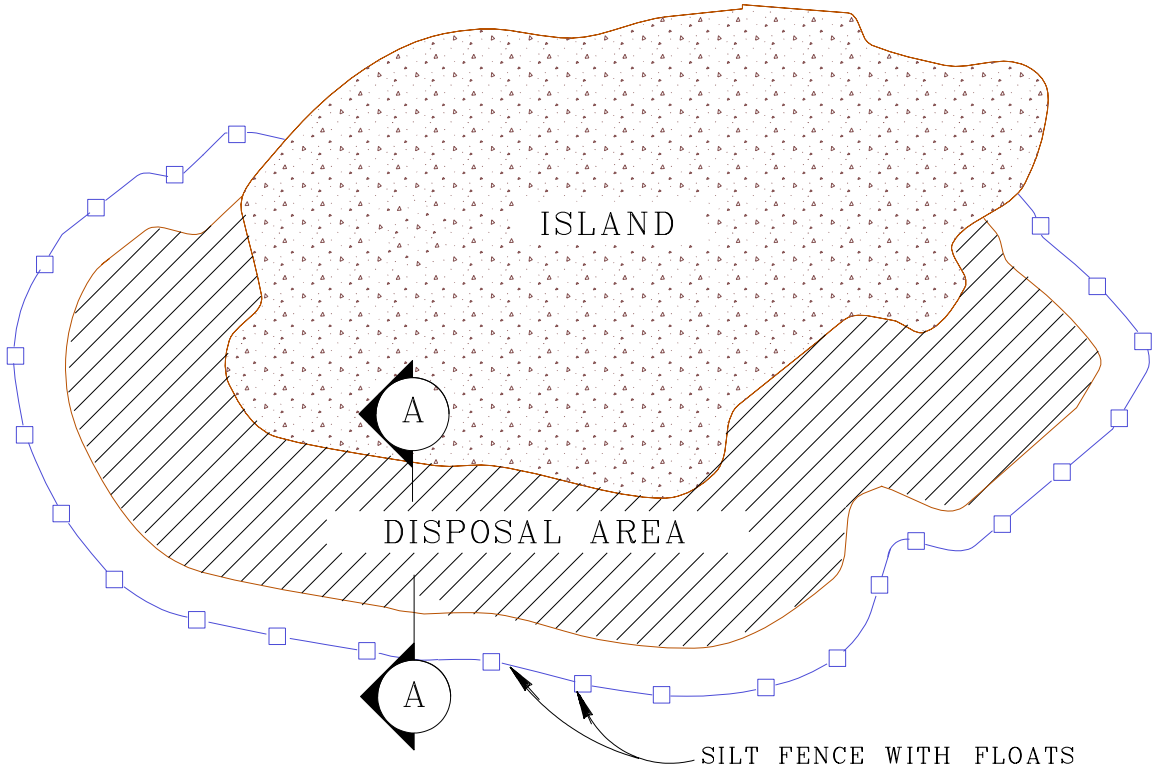

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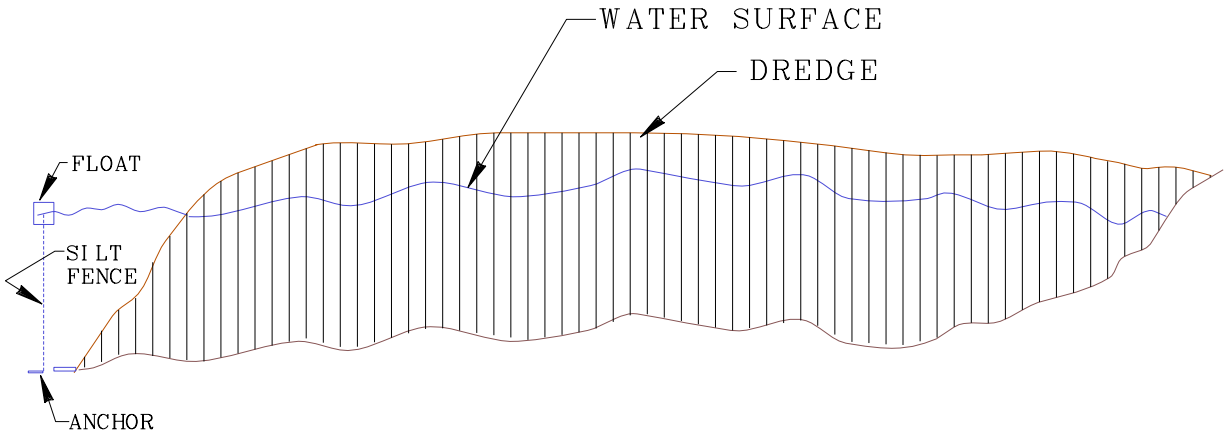

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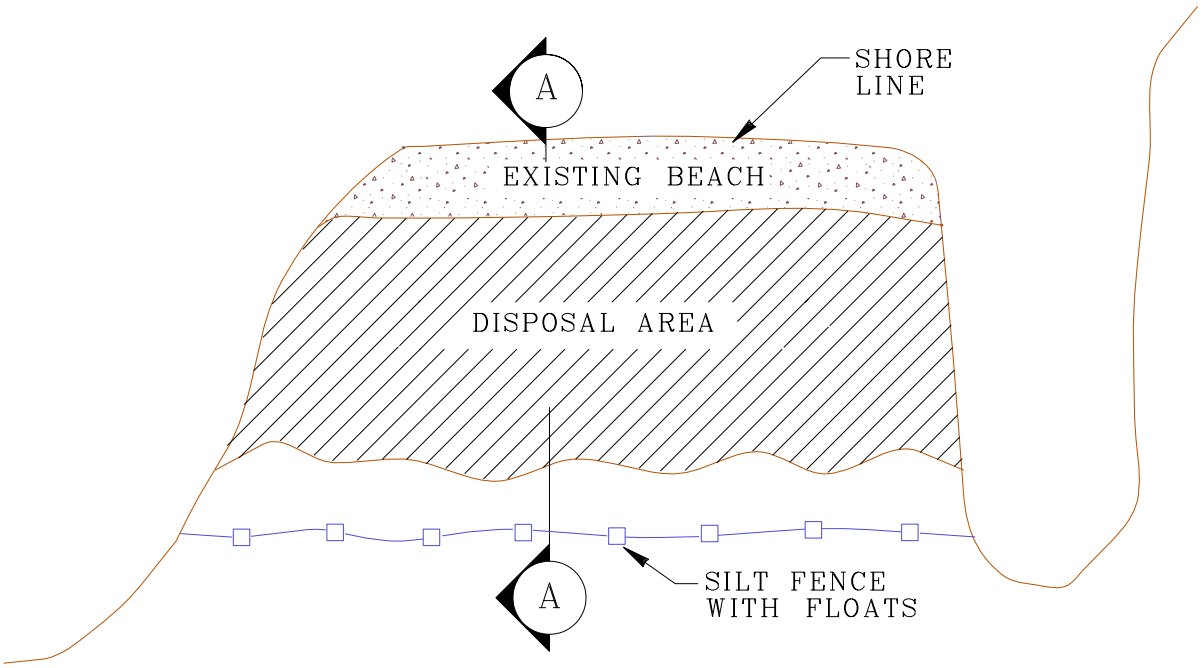

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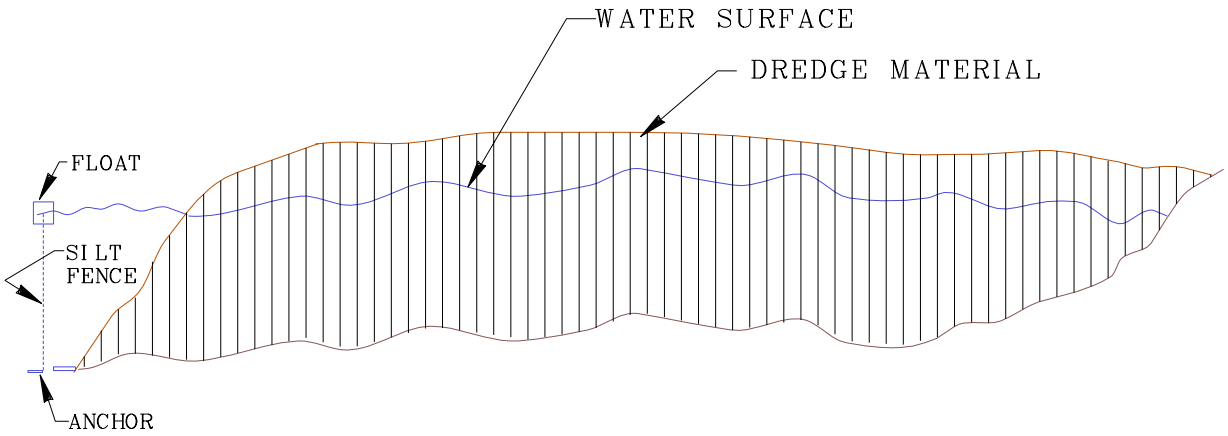

SECTION A-A

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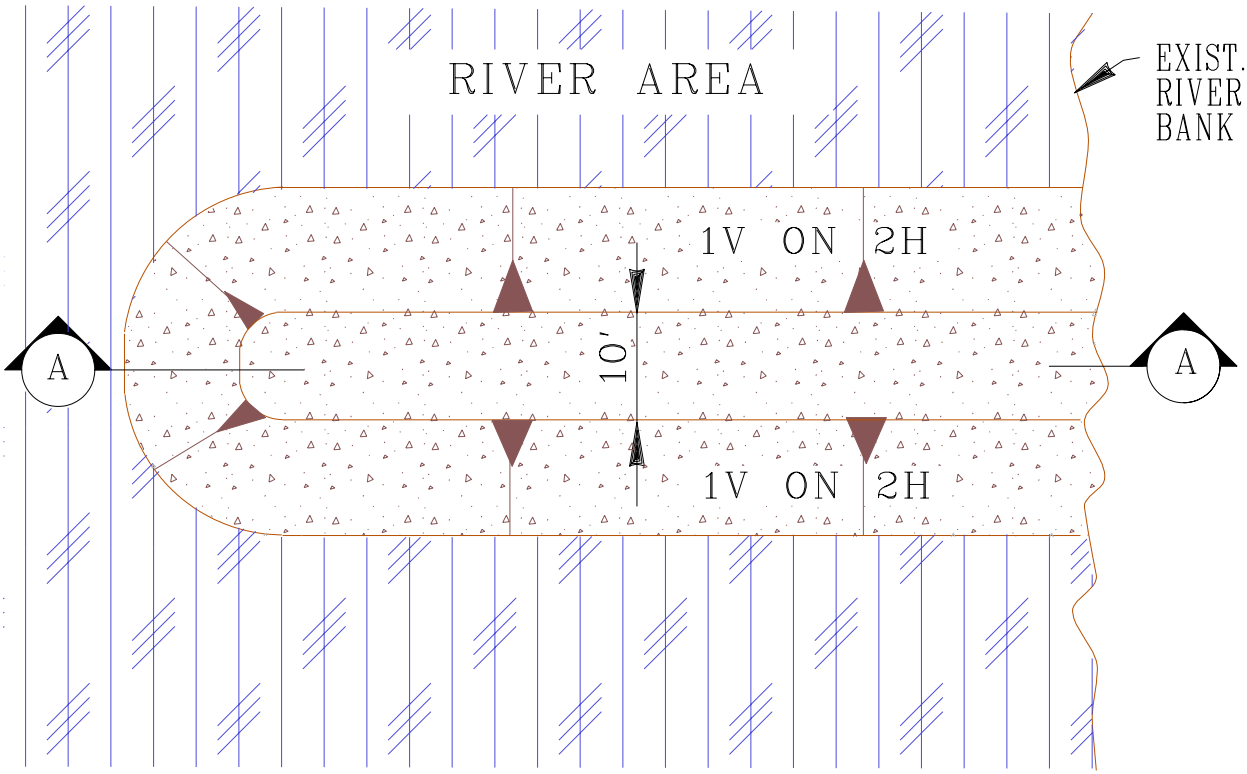
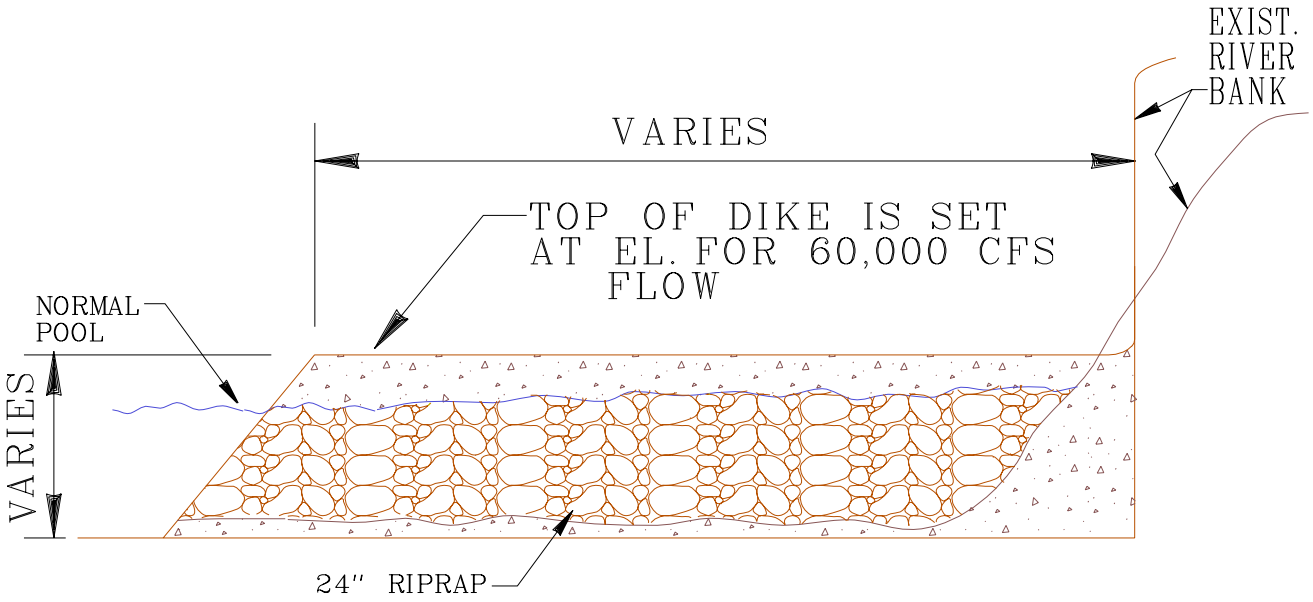


PLAN VIEW



SECTION A-A

APPENDIX C - 4.6
BARGE IMPACT STUDY

Arkansas River Navigation Study
Arkansas and Oklahoma
Barge Impact Appendix C-4.6

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EXCUTIVE SUMMARY

This Appendix presents the results of a barge impact study to investigate the effects of increasing the draft from nine ft. up to twelve ft. over the entire length of the McClellan-Kerr Arkansas River Navigation System (MKARNS) in Arkansas and Oklahoma. The actual drafts being studied are 9.5 ft., 10.5 ft. and 11.5 ft. Our usual design simplifications and assumptions for a conventional channel depth of 9 ft. are a conservatively safe basis for most feasibility studies. However, increasing the navigation channel depth to 11.5 ft. requires us to work at the leading edge of our experience as some of our fundamental design practices and simplifying assumptions may not be valid.

Concern has been raised as to the engineering feasibility of safely operating and maintaining the navigation channel and locks that would pass deeper draft barges. Increasing the draft of barges from 9 ft. to 11.5 ft. corresponds to an increase in the barge mass of about 28% which directly translates into significantly higher impact forces. The increased draft will also adversely affect the maneuverability of the tow and change the location, velocity and angle of impact on the approach walls. This study will calculate barge impact forces for the existing condition and the expected loads for the deeper draft conditions. These loads will then be applied to the approach walls which will be analyzed for expected results. The study also includes numerical modeling to estimate the cumulative damage to a typical pile founded cellular approach wall due to the increased barge impact forces.

A review of the Periodic Inspection Reports for a majority of the projects and discussion with SWL and SWT personnel have found that the approach walls are generally in good condition, with a few notable deficiencies. The existing approach walls fall into five typical designs: beams with buttresses on cellular pile founded structures, beams on flow-thru-semi-gravity walls, flow-thru-gravity walls, gravity walls, and one floating wall. Many of the structures are pile founded.

In general the MKARNS projects have good upper approach conditions. A few of the projects have out-draft problems. Most severe barge impacts occur in the upper approach to the locks. The existing approach walls are NOT massive concrete structures. Their design can be characterized as structural elements with the design based on a given barge impact load. The original design of all the approach walls on the system was based on a barge impact load of 125 KIPS. Based on this low design barge impact value, the walls have minimum reinforcement and do not have the tensile capacity of a heavily reinforced concrete wall. Hence these lightly reinforced brittle walls are especially susceptible to damage caused by the repetitive, large magnitude and low amplitude impact loads due to normal barge operations.

The determination of barge impact loads used for the feasibility design of the approach walls on the MKARNS projects follows the procedures for Probabilistic Barge Impact Analysis (PBIA) defined in ETL 1110-2-563. The PBIA was performed for three typical types of navigation projects: canal locks, typical river locks, and locks with out-draft problems. The scenarios analyzed were for barge drafts of 9 ft. (existing), 9.5 ft., 10.5 ft. and 11.5 ft. The impact forces were selected for a usual load case with a return period of 2 years, an unusual load case with a return period of 150 years, and an extreme load case with a return period of 750 years.

The approach walls were analyzed for their ability to resist the calculated barge impact loads and compared to their ultimate barge impact capacity. It was determined that a typical approach wall

beam has an ultimate capacity of approximately 600 KIPS. An overturning analysis was performed for the gravity and semi-gravity approach walls. The overturning analysis shows that for the deeper draft vessels the impact loads will cause some of the wall systems to exceed stability criteria. With an estimated extreme impact of about 900 KIPS, it is expected that the walls will have more frequent damage similar to what happened at Ormond (9) Lock and Dam. The beams with buttresses on cellular pile founded structures are not applicable to overturning analysis. Therefore, a numerical model was developed for these walls. The results of the 2D Finite Element Model show that these walls have an ultimate dynamic capacity from barge impact of approximately 560 KIPS.

To mitigate the expected increased damage from barge impact several possible solutions were investigated: install fenders or precast panels, anchor the walls, protect end monoliths, extension of tow haulage capability to the ends of the walls, and stiffening the beams with buttresses on cellular pile founded structures. The beams with buttresses on cellular pile founded structures are flexible walls and could be dramatically stiffened by pinning the sheet piling to the concrete cell cap. The pinning operation would have to be performed underwater for all of the cellular structures.

The conclusions from the study are from the analysis, experience and judgment. While it is anticipated that more barge impact damage will occur, this damage is expected to be infrequent. The more economical retrofit may be a "Fix-as-Fails" approach. The loss of an approach wall beam due to an impact above the ultimate calculated load of 600 KIPS will likely have most damage occur above water and would be relatively easy to repair. However, the cell failure predicted from the Pushover Analysis described in section 4.3 would be difficult and expensive to correct. Therefore it is recommended to pin the sheetpiling to the concrete cap as part of any dredging work to deepen the draft. The estimated cost of this work is $1,900,000.

It should also be noted that a significant amount of this study was performed based on limited site specific knowledge. To more adequately understand the behavior of all the approach walls within the navigation system, each specific wall type should undergo a detailed analysis. It is also recommended that full scale barge impact tests be performed on the flexible walls to better understand their response under barge impact loadings. Based on the findings of the Pushover Analysis described in section 4.3, the dynamic response of the cell to the barge impact load is a significant factor and a better understanding of this response may reduce the need for stiffening.

1 INTRODUCTION

1.1 The Report

This Appendix presents the results of a barge impact study for the McClellan-Kerr Arkansas River Navigation System (MKARNS) in Arkansas and Oklahoma.

1.2 Concern for Barge Impact

A study is underway to investigate increasing the depth of the MKARNS from nine to twelve feet (The actual draft would be 11.5 feet) over the entire length, and increasing the width of the Verdigris River waterway in Oklahoma. Concern has been raised as to the engineering feasibility of safely operating and maintaining the navigation channel and locks that would pass barges drafting up to 11.5 feet.

1.2.1 Entrance and Exit Safety

Increasing the draft of the barges from nine to twelve feet may adversely affect the maneuverability of the tow as it approaches the lock. The upper approach walls are designed to balance the flows in the upper lock approach region toward the spillway (out draft current) and through the approach wall (draw current) by providing ports and/or curtains in the approach wall, using submerged dikes, or reshaping the channel. The ratio of additional mass to power supplied by the tows boats raises the concern for loss of maneuverability for all approaches. Increasing the draft of the barge may change the flow through these ports and alter the existing out draft and draw flows, thereby degrading the maneuverability of the tow. All the project flows that impact navigation should be more fully evaluated in model tests during PED.

1.2.2 Study Approach

This study will calculate barge impact forces for the existing condition and the expected loads for the deeper draft conditions. These loads will then be applied to the walls and analyzed for expected results. The study also includes numerical modeling (to estimate the cumulative damage to a typical pile founded cellular approach wall due to the increased barge impact forces. The study assumes that dredging is used to accomplish the deeper draft verses raising the pools. The study did not investigate any expected increase damage to tow haulage equipment or to the miter gates. Our usual design simplifications and assumptions for a conventional channel depth of 9 feet are a conservatively safe basis for most feasibility studies, and we know from experience that design refinements during PED will result in more economical designs. Increasing the navigation channel depth to 12 feet requires us to work at the leading edge of our experience, and some of our fundamental design practices and simplifying assumptions may not be valid.

2 EXISTING CONDITION

2.1 Description of Existing Project

The MKARNS provides 445 miles of channel improvements on the Arkansas River from the Mississippi River to the Port of Catoosa, 15 miles east of Tulsa, Oklahoma. It includes a series of 18 locks and dams, 17 existing and 1 currently under construction, Montgomery Point Lock & Dam (not included in this study). Project purposes of these reservoirs include navigation, flood control, water supply, hydropower, water quality, recreation, and fish and wildlife habitat. A map of the MKARNS is shown in Figure 1. The lock and dam structures are constructed along the waterway in a stair step pattern that gradually follows the natural elevation changes of the topography and also maintains a navigation pool. Figure 2 shows a profile of the MKARNS. The Corps maintains a minimum 9-feet channel depth on the system. Passage through MKARNS lock chambers was configured for 8 barges, but can accommodate up to 15 barge tows using double lockage and tow haulage equipment. Each of the seventeen locks measures 110 feet wide and 600 feet long. A summary of the Pertinent Data of the existing projects is presented in Table 1.

2.2 Existing Condition of Guide and Guard Walls

A review of the Periodic Inspection Reports for a majority of the projects and discussion with SWL and SWT personnel have yielded that the guide and guard walls are in generally good condition. The existing upper and lower guide walls fall into five typical designs: beams with buttresses on cellular pile founded structures (Figure 3), beams on flow-thru-semi-gravity walls (Figure 4), flow-thru-gravity walls (Figure 5), gravity walls (Figure 6), and one floating wall (Figure 7). (See Table 1, Pertinent Data for summary.) Many of the structures are pile founded.

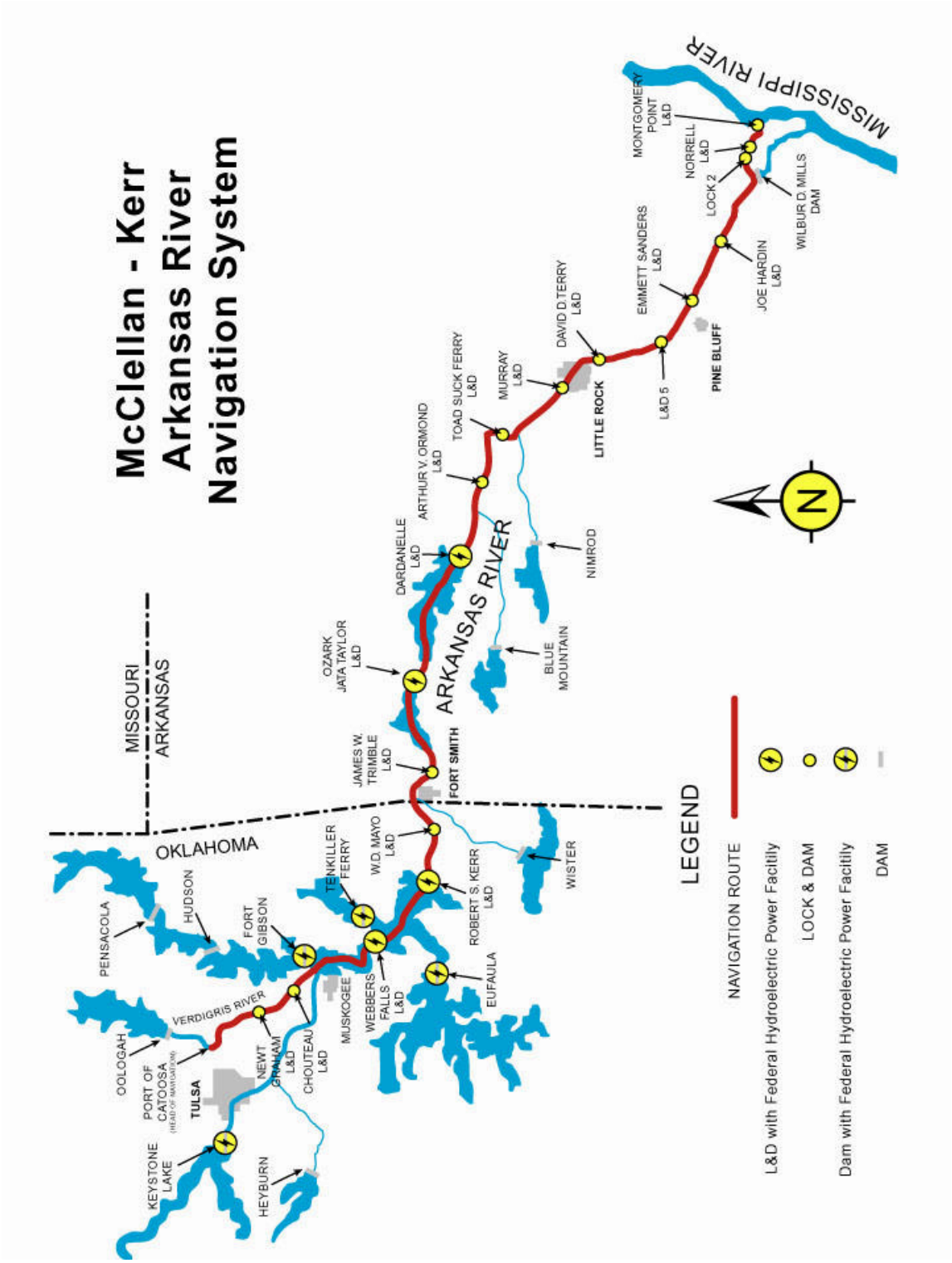


Figure 1, McClellan-Kerr Arkansas River Navigation System

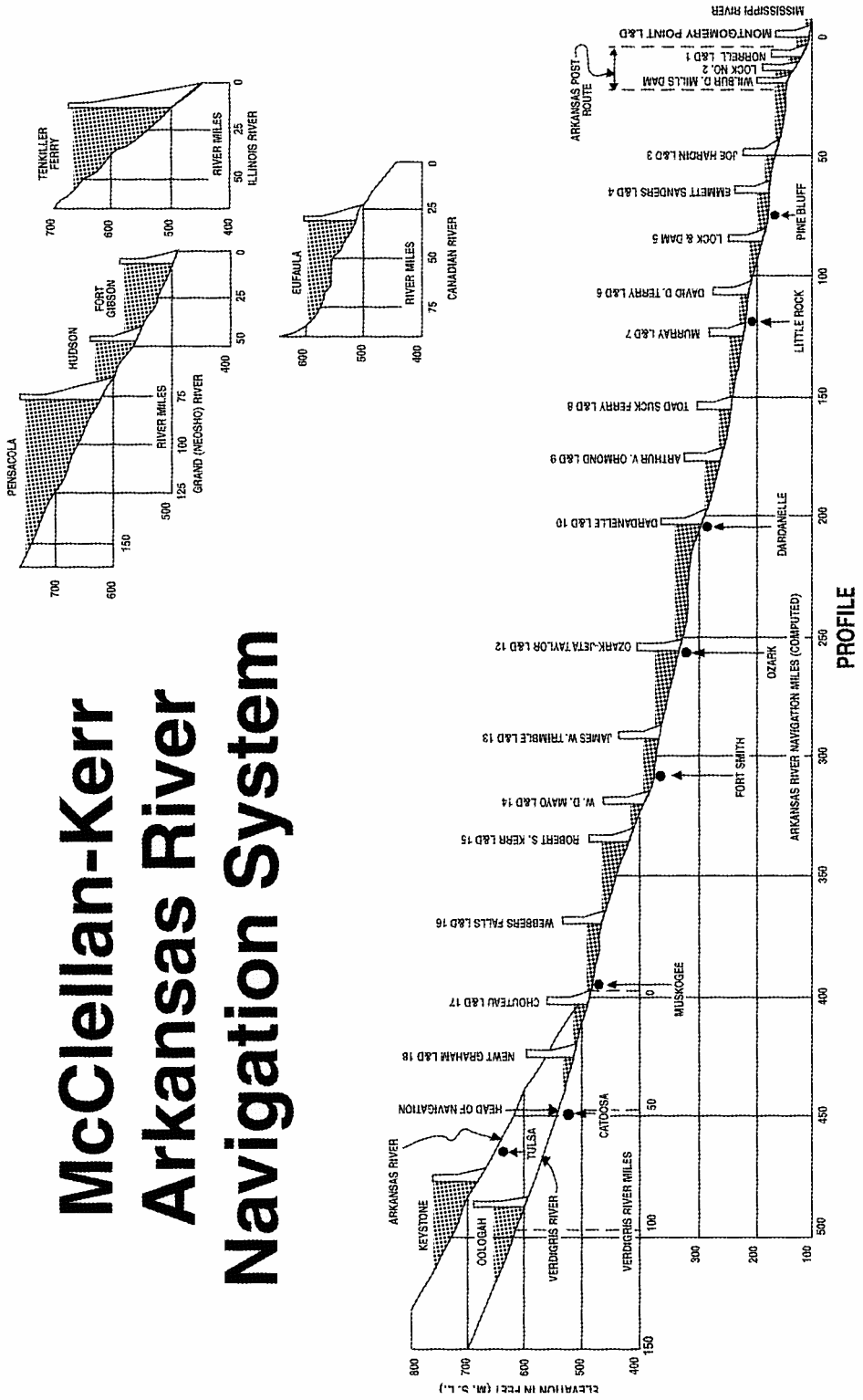


Figure 2, Profile of the McClellan-Kerr Arkansas River Navigation System

TABLE 1 - PERTINENT DATA

		LOCK AND DAM NUMBER	1 NORRELL	2	3 JOE HARDIN	4 EMMETT SANDERS	5	6 TERRY	7 MURRY	8 TOAD SUCK FERRY	9 ARTUR V ORMOND	10 DARDANELLE	12 OZARK JETA TAYLOR	13 JAMES W TRIMBLE	14 W D MAYO	15 ROBERT S KERR	16 WEBBERS FALLS	17 CHOUTEAU	18 NEWT GRAHAM
GENERAL		PURPOSE	NAVIGATION	NAVIGATION	NAVIGATION	NAVIGATION	NAVIGATION	NAVIGATION	NAVIGATION	NAVIGATION	NAVIGATION	POWER AND NAVIGATION	POWER AND NAVIGATION	POWER STORAGE AND NAVIGATION	NAVIGATION	POWER AND NAVIGATION	POWER AND NAVIGATION	NAVIGATION	NAVIGATION
		LOCATION NAVIGATION MILE	10.4	13.4	50.2	66	86.3	108.1	125.4	155.9	176.9	205.5	256.8	292.8	319.6	336.2	366.6	401.4	421.6
DAM		GATES: NUMBER AND SIZE	Ungated Weir	16- 60 x 25	18- 60 x 25	9- 60 x 28 8- 60 x 23	15- 60 x 31	17- 60 x 27	14- 60 x 33	16- 60 x 24	14- 60 x 35	20- 39 x 50	15- 50 x 46	15- 60 x 30	12- 60 x 21	18- 50 x 44	12- 50 x 41	3- 60 x 27	3- 60 x 27
		PIER WIDTH	NONE	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
		TOTAL LENGTH	277	1110	1260	1190	1050	1190	980	1120	980	2113	900		850	1875	1350	290	290
		ELEVATION OF CREST (m.s.l.)	142	137	158	9 Bays - 169 8 Bays - 174	183	206	218	242	253	300	327	363	392	417	450	485	505
		FULLY OPEN GATE LIP El. (m.s.l.)	N/A	180	207	217	238	252	266	290	310	341	380	411	434.5	465.5	504	531.5	551.5
EMBANKMENT		RIGHT BANK LENGTH		8900	960	1480	NONE	2850	210	85	NONE	NONE	Approx. 2150	200	750	2640	2300	3700	
		RIGHT BANK CREST ELEVATION	147.0	180 165-172	185	208	N/A	236	259	269	N/A	N/A	375	402	424	483	517.5	518.5	
		LEFT BANK LENGTH	758.6	32,000	4300	3805	6100	4850	2550	250	500	587	250	5650	6733	2700	NONE	7500	
		LEFT BANK CREST ELEVATION	170.0	180	192	Nav. Pass-197 199	223	241	252	279	292	354	382	395	413.5	483	N/A	530	
		OVERFLOW SECTION LOCATION & LENGTH	Right Bank	Right Bank 5750	Right Bank 960	Left Bank 3805	Left Bank 6100	Right Bank 2850	Left Bank 2550	Right Bank 85	L. Bank - 500 Crest - 292	NONE	Right Bank Approx. 2150	Left Bank Approx. 5650	Left Bank 6733	Right Bank 176	NONE	Right Bank 3200	
LOCK	ELEVATIONS (ABOVE m.s.l.)	UPPER POOL NORMAL	142	162	182	196	213	231	249	265	284-287	338	372	392 (Top Pwr Pool)	412	460	490	511	532
		UPPER POOL MINIMUM	142	157	177	191	208	226	244	260	279	336	370	391	412	458	487	511	532
		UPPER POOL (max. navigation)	NONE	172.0	191.4	203.5	222.8	240.9	256.4	276.4	290.3	338	372	398	421.5	460	490	518.1	
		LOWER POOL (normal) (no flow)	(min.) 112.0 (mean) 130.0	142	162	182	196	213	231	249	265	284	338	372	392	412 (418 with Pwr)	460	490	511
		LOWER POOL (max. navigation condition)	NONE	155	190.4	202.2	221.4	239.7	255.2	275.2	289.1	313.6	362	397	420.3	440	473.6	517.3	
		TOP OF LOCK WALL, UPPER GUIDE AND GUARD WALLS	156.0	Chamber-174 Up. Guide-177 Up.Gate Bay-179	194	206	225	243	259	279	297	348	382	402	424	470	500	521	542
		TOP OF LOWER GUIDE AND GUARD WALLS	156.0	174	194	206	225	243	259	279	297	315	370	402	424	442.4	476	521	542
		UPPER SILL	126	144	164	178	195	213	231	247	266	321	354	374	398	442	471	496	517
		LOWER SILL	97	128	148	168	182	199	217	235	251	270	321	356	377	396	444	473	497
		CHAMBER FLOOR	95	127	147	165	179	196	Varies 192-197	Varies 218-230	247	263	Varies 303-	352	373	397	438	472	
		MITER GATE (top girder)	U.S. - 151 D.S. - 149	Upper - 177 Lower - 172	192	203	Upper - 223 Lower - 222	241	257	277	291	U.S. - 342 D.S. - 339.5	U.S. - 379 D.S. - 378	Upper - 399 Lower - 398	422	Upper - 467 Lower - 463	496	519	
		APPROACH CHANNEL UPSTREAM	122-125	144	165	178	195	214	Approx. 200	247	Approx. 230	299	357	365	400	414	465	499	520
		APPROACH CHANNEL DOWNSTREAM	96	128	150	168	182	201	Approx. 200	232	Approx. 240	263	319	358	379	400	447	478	499
	DIMENSIONS (in feet)	CHAMBER WIDTH	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110
		CHAMBER LENGTH (usable)	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600
		CHAMBER LENGTH (between pintles)	670	670	670	670	670	670	670	670	670	670	670	670	670	670	670	670	670
		LIFT NORMAL	30	20	20	14	17	18	18	16	19	54	34	20	20	48	30	21	21
		DEPTH ABOVE LOWER SILL (min.)	15	14	14	14	14	14	14	14	14	14	15	14	15	14	16	14	14
		HEIGHT OF UPPER GATE	25	34	28	28	28	28	26	30	25	21' - 6"	25	25	24	25	25	23	
		HEIGHT OF LOWER GATE	52	46	44	35	41	42	40	42	40	70	57	42	45	65	52	43	
		MIN. CUSHION DEPTH IN CHAMBER	17	15	15	17	17	17	29	17	17	21 - 24	19 - 35	18	17	15	21	17	17
		GUIDE WALL LENGTH (up & downstream)	250	250	600	600	600	600	U.S. - 588 D.S. - 600	600	600	600	600	600	600	U.S. - 605.5 D.S. - 636	600	250	600
		GUARD WALL LENGTH (up & downstream)	60	U.S. - 120 D.S. - 60	60	60	60	60	60	100	60	200 115	60	60	U.S. - 60 D.S. - 100	U.S. - 146.67 D.S. - 78	60	60	60
		TOW HAULAGE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO	NO	NO	NO	NO
		PARAPET WALLS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO	NO
		WIDTH TOP OF GUIDE & GUARD WALLS	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
		WIDTH TOP OF CHAMBER WALL	9	9	8	8	8	8	12	12	12	12	12	12	12	10	10	12	12
		CULVERT SIZE	12 x 12	12x12	12x12	12x12	12x12	12x12	12x12	12x12	12x12	14.5 x 13.0	12x12	12x12	12x12	14.5 x 13	12x12	12x12	12x12
FOUNDATIONS	MATERIAL		CONC. PILES IN SAND, FINE TO MEDIUM	CONC. PILING IN SAND	STEEL PILING IN SAND	CONCRETE PILING IN SAND	TERTIARY DENSE CLAY	STEEL PILES IN SAND	SHALE	SHALE AND SANDSTONE	SHALE	HARTSHORNE SANDSTONE	SANDSTONE	SHALE AND SANDSTONE	SHALE	SHALE AND SANDSTONE	LIMESTONE AND SHALE	SHALE	
	TYPE STRUCTURE	GUIDE WALLS	U.S.-Cellular D.S.-Floating	U.S.-Cellular D.S.-Cellular	U.S.-Cellular D.S.-Cellular	U.S.-Cellular D.S.-Cellular	U.S.-Beam on Semi-Gravity D.S.-Gravity	U.S.-Cellular D.S.-Cellular	U.S.-Beam on Semi-Gravity D.S.-Gravity	U.S.-Flow thru Gravity D.S.-Gravity	U.S.-Beam on Semi-Gravity D.S.-Gravity	U.S.-Cellular D.S.-Gravity	U.S.-Beam on Semi-Gravity D.S.-Gravity	U.S.-Beam on Semi-Gravity D.S.-Gravity	U.S.-Flow thru Gravity D.S.-Gravity	U.S.-Cellular D.S.-Gravity	U.S.-Cellular D.S.-Gravity	U.S.-Flow thru Gravity D.S.-Gravity	U.S.-Flow thru Gravity D.S.-Gravity
		GUARD WALLS	Concrete Semi-Gravity	Concrete Semi-Gravity	Concrete Semi-Gravity	Concrete Semi-Gravity	Concrete Gravity	Concrete Semi-Gravity	Concrete Gravity	Concrete Gravity	Concrete Gravity	Concrete Gravity	Concrete Gravity	Concrete Gravity	Concrete Gravity	Concrete Gravity	Concrete Gravity	Concrete Gravity	Concrete Gravity
		GATE BAY WALLS	Concrete Semi-Gravity	Concrete Semi-Gravity	Concrete Semi-Gravity	Concrete Semi-Gravity	Concrete Bath Tub	Concrete Semi-Gravity	Concrete Gravity	Concrete Gravity	Concrete Gravity	Concrete Gravity	Concrete Gravity	Concrete Gravity	Concrete Gravity	Concrete Gravity	Concrete Gravity	Concrete Gravity	Concrete Gravity
		CHAMBER WALLS	Concrete Semi-Gravity	Concrete Semi-Gravity	Concrete Semi-Gravity	Concrete Semi-Gravity	Concrete Bath Tub	Concrete Semi-Gravity	Concrete Gravity	Concrete Gravity	Concrete Gravity	Concrete Gravity	Concrete Gravity	Concrete Gravity	Concrete Gravity	Concrete Gravity	Concrete Gravity	Concrete Gravity	Concrete Gravity

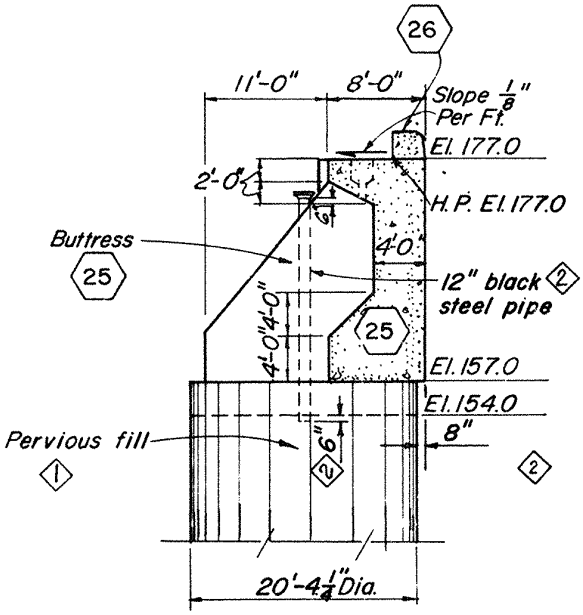


Figure 3 Beam with Buttress on Cellular Pile Founded Structure

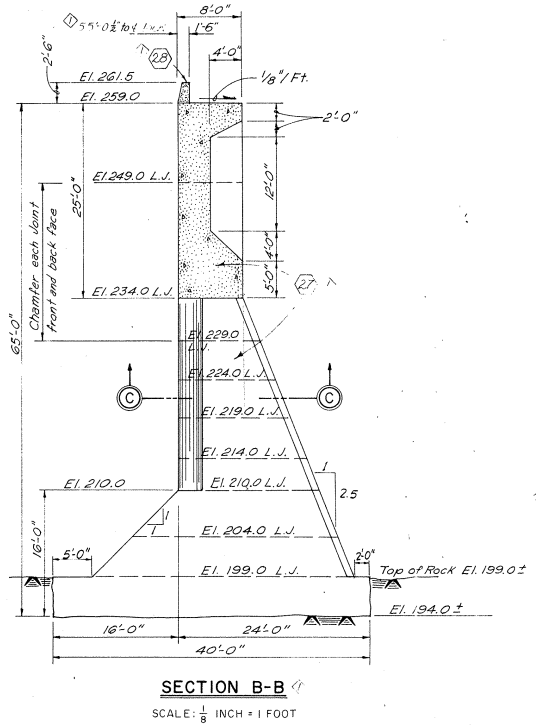


Figure 4 Beam on Semi-Gravity Wall

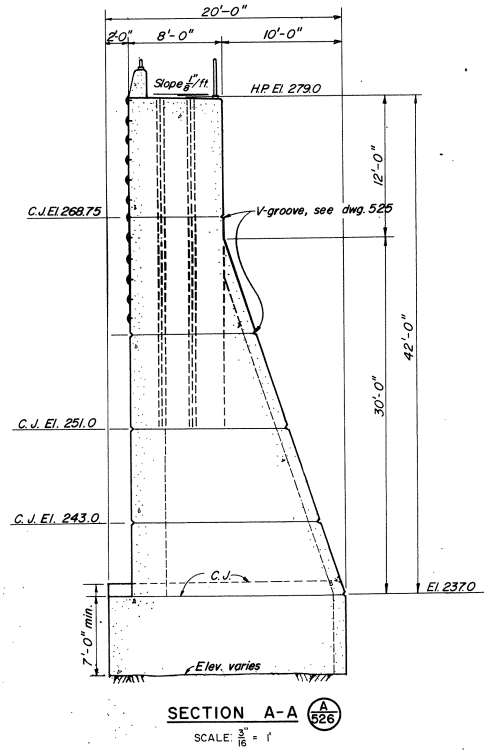


Figure 5 Flow-thru-Gravity Wall

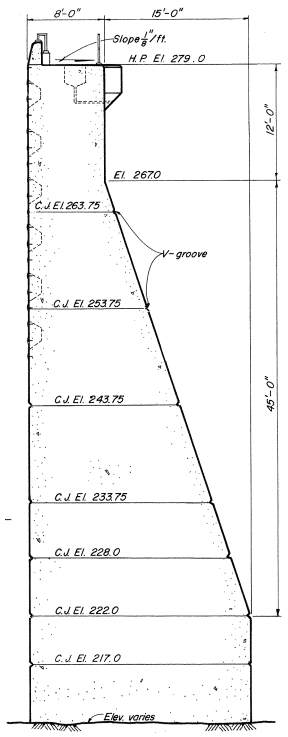


Figure 6 Gravity Wall

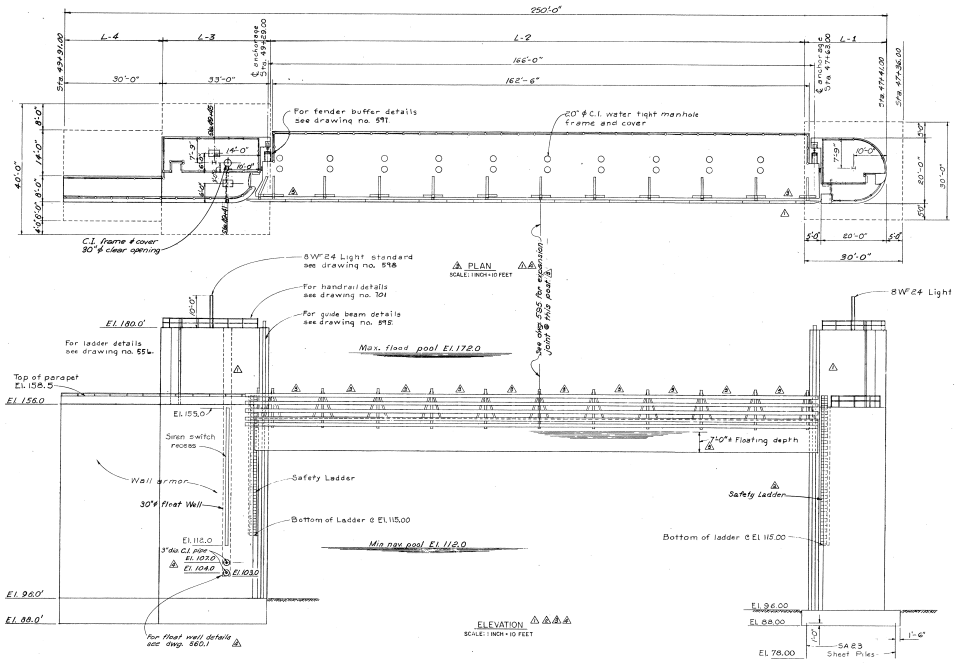


Figure 7 Floating Lower Guard Wall at Lock and Dam No. 1

A site visit of all but L&D 3, 5 and 6 have yielded the following deficiencies, see Photographs, Appendix A:

Emmett Sanders (4) Lock and Dam – The upper guide wall has a bulging joint. The upper guide wall has barge impact damage at about the 100 ft. mark. Monolith L-26 has moved riverward by about an inch.

Ormond (9) Lock and Dam – Monolith R-9 was impacted by a barge at about the 200 ft. mark and caused a crack at a lift joint, see discussion 4.4 Evaluation of Accident at Monolith R-9, Ormond (9) Lock and Dam. Many open key joints. Downstream guide wall showed movement at R44 and R45 at 600 ft. mark and at R45 and R46 at the 700 ft. mark.

Dardanelle (10) Lock and Dam – Upstream guide wall at just above 100 ft. has some movement at monolith joint.

Ozark (12) Lock and Dam – Downstream guide wall at R43-R44, joint is open about 1.5 inches.

Trimble (13) Lock and Dam – Upstream guide wall at about 100 ft. reported parapet wall damaged by barge rake.

Kerr (15) Lock and Dam – Barge impact to parapet wall, several patches along the upper guide wall.

2.3 Upper Approach Conditions

Most severe barge impacts occur in the upper approach to the locks. In general the projects for MKARNS have good upper approach conditions with a few noteworthy comments. Norrell (1) Lock and Dam, Lock and Dam 2, Chouteau (17) Lock and Dam and Newt Graham (18) Lock and Dam are in a canal; and have relatively better approach conditions. There are some minor problems with Newt Graham (18) Lock and Dam with reported build up of debris at the structure. Dardanelle (10) Lock and Dam, Ozark (12) Lock and Dam, Kerr (15) Lock and Dam and Weber Falls (16) Lock and Dam have slightly better conditions since they have lake type upper approaches. Out-draft problems exist at Lock and Dam 5 and Murray (7) Lock and Dam and Mayo (14) Lock and Dam. Underwater dikes were placed in the upstream approach to Murray (7) about three years ago to minimize the out-draft conditions there and have been somewhat effective.

3 BARGE IMPACT ANALYSIS

3.1 Introduction

The determination of barge impact loads used for the feasibility design of the approach structures for the Arkansas River navigation projects follows the procedures for Probabilistic Barge Impact Analysis (PBIA) defined in ETL 1110-2-563 (30 September 2004). The PBIA process utilizes the combination of random variables for mass, approach angles, and normal and tangential velocities using the empirical model defined in ETL 563 to define the impact load for each return period for the structures.

The PBIA was performed for three typical types of navigation projects found in the existing Arkansas River navigation system. The lock structures were separated into three categories: canal locks, typical river locks, and locks with out-draft problems. In addition, the navigation system was broken out into two reaches, a lower and an upper, based on data provided in the Draft Economics Report for the McClellan Kerr Arkansas River Navigations System (MCKARNS). This distinction was based on the difference in traffic information (e.g., barges per tow, tonnage) between the locks in the system and the availability of tow haulage units at the lower lock projects. The return periods from the PBIA were determined for four different barge traffic scenarios based on deepening the draft of the navigation system. The scenarios analyzed were for barge drafts of 9 ft. (existing), 9.5 ft., 10.5 ft., and 11.5 ft.

3.2 Tow Mass

The data for tow mass, existing and future traffic, was estimated from the results of the MKARNS Draft Economics Report. The distributions used for the PBIA were discrete distributions (i.e., probability and mass) based on the number of barges in a tow. A continuous distribution was tried but could not capture the proper variation in barge traffic. The tow masses were broken out into lower and upper reaches to represent better the differences in traffic at those locks. These reaches were different broken into upper and lower reaches based on the barges per tow. This distinction was made at Arthur V. Ormond (9) Lock and Dam because the percentage of less than 8 barges per tow increases from 65 percent at Dardanelle (10) to 89 percent at Ormond (see Econ Report, Table 23). The mass of each barge was determined based on using a tare weight of the barge of 300 short tons. The mass of the towboat was assumed to be 100 short

tons. The per barge mass (including tare weight) used for each draft increment was 1650, 1750, 2000, and 2200 short tons for a draft of 9 ft, 9.5 ft, 10.5 ft and 11.5 ft, respectively. See Table 2 for the mass distributions for existing conditions at the lower locks is shown below. A shift in mass distribution (i.e., increase in 15 barge tows) was accounted for in the PBIA based on the results shown in the Draft Economics Report.

Barges per Tow	Percentage
1	3%
2	5%
3	13%
4	2%
5	3%
6	17%
7	2%
8	20%
9	19%
10	1%
11	1%
12	1%
13	3%
14	2%
15	8%

Table 2 Tow Mass Distribution

3.3 Tow Approach Velocities and Angles

The approach velocities and angles of impact for the feasibility report were determined based on existing information of river and flow conditions, a comparison of approaches to similar navigation projects, and discussions with SWL and SWT personnel. The approach conditions were separated out into three types of structures: canal locks, typical river locks, and out-draft problem locks. Adjustments to the data were also made for the upper and lower reaches due to the differing size of the tows transiting the locks. The distributions used for the velocity and angle in the PBIA were truncated lognormal distribution. Table 3 summarizes the parameters for the velocities and angles used in the PBIA.

3.4 PBIA Results

The impact forces were selected for a usual load case with a return period of 2 years, an unusual load case with a return period of 150 years, and an extreme load case with a return period of 750 years. These return periods were selected in accordance with the probabilistic definitions set forth in ETL 563. The results from the PBIA are shown for the three types of structures, lower and upper reaches and drafts of 9 foot (existing), 9.5 ft., 10.5 ft., and 11.5 ft. Table 4 shows the design barge impacts for the various conditions (CL = Canal Locks, MR = Main River Locks, and OD = Out-draft Locks).

		Lower (Mean, Std Dev, Max)	Upper (Mean, Std Dev, Max)
Canal	V_t (ft/sec)	1.5, 1, 6	1.5, 1, 6
	V_n (ft/sec)	0.1, 0.05, 0.4	0.1, 0.05, 0.4
	Θ (degrees)	6, 2, 15	6, 2, 25
River	V_t	1.75, 1, 6	2.0, 1.25, 6
	V_n	0.2, 0.1, 0.7	0.2, 0.1, 0.7
	Θ	8, 3, 25	8, 3, 30
Out-draft	V_t	2, 1, 6	2.25, 1, 6
	V_n	0.25, 0.1, 0.9	0.25, 0.1, 0.9
	Θ	10, 3, 25	10, 3, 30

Table 3 Tow Approach Velocities and Angles

4 CAPACITY ANALYSIS

The guide and guard walls were analyzed for their ability to resist barge impact loads and compared to its ultimate barge impact capacity.

4.1 Basic Design Assumptions

Unit weight of water, pcf 62.5
Unit weight of concrete, pcf 145.0
Unit weight of moist earth, pcf 100.0
Unit weight of saturated earth, pcf 130.0
Phi, degrees (cell fill)…… 32-34
Reinforcing steel, yield strength, psi (f_y) ….. 40,000
Concrete, compressive strength, psi (f'_c) …… 3000

4.2 Overturning Analysis

An overturning analysis was performed for the guide and guard walls. The results are summarized in Table 5, Summary of Capacity Analysis (see Appendix C for the computations). This table shows a comparison of the design barge impact values to the calculated capacity for each wall system for the different scenarios analyzed: 9 ft. (existing), 9.5 ft., 10.5 ft., and 11.5 ft. The highlighted sections show the walls that do not meet the criteria. The overturning analysis shows that as expected, the impact loads from deeper draft vessels will cause some of the wall systems to exceed stability criteria. It should be noted that the walls may have additional capacity due to the fact that the loads were applied in a static manner as opposed to the dynamic real world situation of quickly loaded and unloaded (This effect is much more applicable for flexible structures of the type studied in 4.3 Pushover Analysis). Also, many of the walls are keyed which would increase their load carrying ability. Conversely, the loads were applied at normal pool conditions, whereas high pool conditions would yield lower overturning resistance.

9 ft Tow Draft – Existing Condition (in KIPS)

Return Period	Lower Locks CL	MR	OD	Upper Locks CL	MR	OD
2 year	60	115	135	50	100	120
150 year	285	425	485	210	340	365
750 year	400	540	600	280	435	450

9.5 ft Tow Draft (in KIPS)

Return Period	Lower Locks CL	MR	OD	Upper Locks CL	MR	OD
2 year	75	140	170	65	125	155
150 year	350	550	595	310	500	570
750 year	470	725	735	435	665	735

10.5 ft Tow Draft (in KIPS)

Return Period	Lower Locks CL	MR	OD	Upper Locks CL	MR	OD
2 year	85	155	190	70	140	170
150 year	395	610	675	345	580	630
750 year	525	810	820	480	755	795

11.5 ft Tow Draft (in KIPS)

Return Period	Lower Locks CL	MR	OD	Upper Locks CL	MR	OD
2 year	95	170	210	80	155	190
150 year	450	675	740	380	610	715
750 year	595	895	910	515	850	900

Table 4 Design Barge Impacts Values

TABLE 5 - SUMMARY OF CAPACITY ANALYSIS
HIGHLIGHTED AREAS SHOW APPROACH WALLS THAT DO NOT MEET THE REQUIRED BARGE IMPACT

LOCK AND DAM NUMBER			1 NORRELL	2	3 JOE HARDIN	4 EMMETT SANDERS	5	6 TERRY	7 MURRY	8 TOAD SUCK FERRY	9 ARTUR V ORMOND	10 DARDANELLE	12 OZARK JETA TAYLOR	13 JAMES W TRIMBLE	14 W D MAYO	15 ROBERT S KERR	16 WEBBERS FALLS	17 CHOUTEAU	18 NEWT GRAHA
GENERAL		PURPOSE	NAVIGATION	NAVIGATION	NAVIGATION	NAVIGATION	NAVIGATION	NAVIGATION	NAVIGATION	NAVIGATION	NAVIGATION	POWER AND NAVIGATION	POWER AND NAVIGATION	POWER STORAGE AND NAVIGATION	NAVIGATION	POWER AND NAVIGATION	POWER AND NAVIGATION	NAVIGATION	NAVIGATION
FOUNDATIONS	MATERIAL		CONC. PILES IN SAND, FINE TO MEDIUM	CONC. PILING IN SAND	STEEL PILING IN SAND	CONCRETE PILING IN SAND	TERTIARY DENSE CLAY	STEEL PILES IN SAND	SHALE	SHALE AND SANDSTONE	SHALE	HARTSHORNE SANDSTONE	SANDSTONE	SHALE AND SANDSTONE	SHALE	SHALE AND SANDSTONE	LIMESTONE AND SHALE	SHALE	
	TYPE STRUCTURE	GUIDE WALLS	U.S.-Cellular D.S.-Floating	U.S.-Cellular D.S.-Cellular	U.S.-Cellular D.S.-Cellular	U.S.-Cellular D.S.-Cellular	U.S.-Beam on Semi-Gravity D.S.-Gravity	U.S.-Cellular D.S.-Cellular	U.S.-Beam on Semi-Gravity D.S.-Gravity	U.S.-Flow thru Gravity D.S.-Gravity	U.S.-Beam on Semi-Gravity D.S.-Gravity	U.S.-Cellular D.S.-Gravity	U.S.-Beam on Semi-Gravity D.S.-Gravity	U.S.-Beam on Semi-Gravity D.S.-Gravity	U.S.-Flow thru Gravity D.S.-Gravity	U.S.-Cellular D.S.-Gravity	U.S.-Cellular D.S.-Gravity	U.S.-Flow thru Gravity D.S.-Gravity	U.S.- Flow thru Gravity
		GUARD WALLS	Concrete Semi-Gravity	Concrete Semi-Gravity	Concrete Semi-Gravity	Concrete Semi-Gravity	Concrete Gravity	Concrete Semi-Gravity	Concrete Gravity	Concrete Gravity	Concrete Gravity	Concrete Gravity	Concrete Gravity	Concrete Gravity	Concrete Gravity	Concrete Gravity	Concrete Gravity	Concrete Gravity	Concrete Gravity
		UPPER APPROACH	CANAL	CANAL	RIVER	RIVER	REPORTED OUTDRAFT	RIVER	REPORTED OUTDRAFT	RIVER	RIVER	LAKE	RIVER	RIVER	REPORTED OUTDRAFT	LAKE	RIVER	CANAL	CANAL W/ EXCESS DEBRIS
VALUES 9'		USUAL	60	60	115	115	135	115	135	115	115	115	115	115	120	100	100	50	50
		UNUSUAL	285	285	425	425	485	425	485	425	425	425	425	425	365	340	340	210	210
		EXTREME	400	400	540	540	600	540	600	540	540	540	540	540	450	435	435	280	280
BARGE IMPACT	US GUIDE	100%	NA	NA	NA	NA	342	NA	253	621	334	NA	387	160	743	NA	NA	348	582
		75%	NA	NA	NA	NA	517	NA	400	803	431	NA	522	241	947	NA	NA	444	748
		50%	NA	NA	NA	NA	693	NA	549	986	528	NA	659	323	1152	NA	NA	541	916
		0%	560	560	560	560	1045	560	846	1353	724	560	932	488	1562	560	560	735	1250
	DS GUIDE	100%	NA	NA	NA	NA	328	NA	292	739	644	959	348	815	893	235	220	1010	882
		75%	NA	NA	NA	NA	491	NA	446	934	833	1195	464	1042	1141	308	286	1290	1124
		50%	NA	NA	NA	NA	655	NA	601	1130	1022	1432	583	1271	1390	383	352	1571	1367
		0%	560	560	560	560	983	560	911	1522	1401	1905	819	1727	1889	532	485	2132	1853
VALUES 9.5'		USUAL	75	75	140	140	170	140	170	140	140	140	140	140	155	125	125	65	65
		UNUSUAL	350	350	550	550	595	550	595	550	550	550	550	550	570	500	500	309	309
		EXTREME	470	470	725	725	735	725	735	725	725	725	725	725	735	665	665	435	435
BARGE IMPACT	US GUIDE	100%	NA	NA	NA	NA	342	NA	253	621	334	NA	387	160	743	NA	NA	348	582
		75%	NA	NA	NA	NA	517	NA	400	803	431	NA	522	241	947	NA	NA	444	748
		50%	NA	NA	NA	NA	693	NA	549	986	528	NA	659	323	1152	NA	NA	541	916
		0%	560	560	560	560	1045	560	846	1353	724	560	932	488	1562	560	560	735	1250
	DS GUIDE	100%	NA	NA	NA	NA	328	NA	292	739	644	959	348	815	893	235	220	1010	882
		75%	NA	NA	NA	NA	491	NA	446	934	833	1195	464	1042	1141	308	286	1290	1124
		50%	NA	NA	NA	NA	655	NA	601	1130	1022	1432	583	1271	1390	383	352	1571	1367
		0%	560	560	560	560	983	560	911	1522	1401	1905	819	1727	1889	532	485	2132	1853
VALUES 10.5'		USUAL	85	85	155	155	190	155	190	155	155	155	155	155	170	140	140	70	70
		UNUSUAL	395	395	610	610	675	610	675	610	610	610	610	610	630	580	580	345	345
		EXTREME	525	525	810	810	820	810	820	810	810	810	810	810	795	755	755	480	480
BARGE IMPACT	US GUIDE	100%	NA	NA	NA	NA	342	NA	253	621	334	NA	387	160	743	NA	NA	348	582
		75%	NA	NA	NA	NA	517	NA	400	803	431	NA	522	241	947	NA	NA	444	748
		50%	NA	NA	NA	NA	693	NA	549	986	528	NA	659	323	1152	NA	NA	541	916
		0%	560	560	560	560	1045	560	846	1353	724	560	932	488	1562	560	560	735	1250
	DS GUIDE	100%	NA	NA	NA	NA	328	NA	292	739	644	959	348	815	893	235	220	1010	882
		75%	NA	NA	NA	NA	491	NA	446	934	833	1195	464	1042	1141	308	286	1290	1124
		50%	NA	NA	NA	NA	655	NA	601	1130	1022	1432	583	1271	1390	383	352	1571	1367
		0%	560	560	560	560	983	560	911	1522	1401	1905	819	1727	1889	532	485	2132	1853
VALUES 11.5'		USUAL	95	95	170	170	210	170	210	170	170	170	170	170	190	155	155	80	80
		UNUSUAL	450	450	675	675	740	675	740	675	675	675	675	675	715	610	610	380	380
		EXTREME	595	595	895	895	910	895	910	895	895	895	895	895	900	850	850	515	515
BARGE IMPACT	US GUIDE	100%	NA	NA	NA	NA	342	NA	253	621	334	NA	387	160	743	NA	NA	348	582
		75%	NA	NA	NA	NA	517	NA	400	803	431	NA	522	241	947	NA	NA	444	748
		50%	NA	NA	NA	NA	693	NA	549	986	528	NA	659	323	1152	NA	NA	541	916
		0%	560	560	560	560	1045	560	846	1353	724	560	932	488	1562	560	560	735	1250
	DS GUIDE	100%	NA	NA	NA	NA	328	NA	292	739	644	959	348	815	893	235	220	1010	882
		75%	NA	NA	NA	NA	491	NA	446	934	833	1195	464	1042	1141	308	286	1290	1124
		50%	NA	NA	NA	NA	655	NA	601	1130	1022	1432	583	1271	1390	383	352	1571	1367
		0%	560	560	560	560	983	560	911	1522	1401	1905	819	1727	1889	532	485	2132	1853

4.3 Pushover Analysis

The beams with buttresses on cellular pile founded structures as shown in Figure 3 are not applicable to overturning analysis. Therefore, a numerical model was developed for these walls. Appendix B shows the analysis to estimate the cumulative damage of a typical pile founded cellular approach wall due to the increased barge impact forces. The results of the 2D Finite Element Model show that these walls have an ultimate dynamic capacity from barge impact of approximately 560 KIPS. This value is highly dependent on the natural frequency of the structure and how it responds to the short duration barge impact load. This analysis can be improved by performing full scale barge impact tests on the flexible walls to better understand their response under barge impact loadings.

The cells for Dardanelle (10) Lock and Dam, Robert S. Kerr (15) Lock and Dam, and Webber Falls (16) Lock and Dam will need further investigation to determine the extend of stiffening required since they do not have bearing piles. The cost of pinning these cells is included in the estimate but further investigation may yield that bearing piles may be required to no additional work is required.

4.4 Capacity of Various Structural Elements

The upstream guide wall of Emmett Sanders (4) Lock and Dam was chosen as a typical project to determine the capacity of a cellular bearing pile founded structures. Lock and Dam 4 is located at river mile 66.0 on the Arkansas River. The purpose of the project is navigation and is located on the right descending bank of the river. The lock chamber is 110 feet wide and 600 feet long. The upstream approach wall is approximately 500 feet long and consists of a concrete beam placed upon soil filled sheet pile cells. The sheet pile cells are sand filled and have a concrete cap 5 feet in thickness. The concrete cap is supported on nine 16" square pre-cast pre-stressed concrete piles. The cell cap is not attached to the sheet piling. The cells are spaced at 50 feet center-center. Each concrete beam is 19 feet high and 100 feet long between expansion joints. Expansion joints with shear keys are located at mid span between the cells (reference drawing 55/541).

The design documentation indicates that the approach wall beam was designed to sustain an impact load of 125 KIPS. Based on the possibility that the approach wall could experience larger barge impact loads due to deeper draft, the approach wall beam was evaluated to determine its ultimate strength. Based on the cross section of the existing beam and the reinforcing steel indicated on the drawings, it was determined that the beam has an ultimate capacity of approximately 600 KIPS. See Appendix C for the computations.

The shear capacity of the concrete beam/cell cap connection was evaluated. Based on this evaluation, it was determined that the shear capacity of the beam to cell cap connection is 1550 KIPS. The shear capacity of the shear key located at the expansion joint was also evaluated. Based on this evaluation it was determined that the shear capacity of the shear key is approximately 1470 KIPS. These values are well above other values calculated so failure at these locations should not be a concern. See Appendix C for the computations.

4.5 Evaluation of Accident at Monolith R-9, Ormond (9) Lock and Dam

Lock and Dam 9 is located at river mile 176.9 on the Arkansas River. The purpose of the project is navigation. The lock is located on the right descending bank of the river. The lock chamber is 110 feet wide and 600 feet long. The upstream approach wall consists of a vertical concrete cantilever 25 feet in height supported on concrete piers founded on bedrock. The concrete piers are 20 feet in width, with a clear distance of 20 feet between the piers (reference drawing 63/520). Monolith R-9 of Lock and Dam 9 is located immediately upstream of the miter gate and contains a portion of the intake system. The monolith consists of a gravity section with a vertical cantilever. The vertical cantilever is eight feet in width and 22 feet high. The reinforcement in the vertical cantilever consists of #6 reinforcing steel spaced at 12 inches in both directions and in each face (reference drawing 63/532).

This monolith was chosen for analysis because it has been impacted by a barge tow and experienced considerable damage. The impact occurred on 17 December 2003 at approximately 3:00 a.m. The tow size was 694' x 105' consisting of what was reported to be 8 loaded barges and one empty barge. The estimated mass of the tow was approximately 11,600 tons. The point of impact was approximately 7.5 feet above normal high pool (reference Photograph No. 1).

The entire cantilever portion of the monolith rotated approximately 2 inches, measured at the top of the lock wall. The offset tapers at lower elevations (reference Photograph No. 2). This validates the assumption that the cantilever rotated rather than translated horizontally. Monolith was analyzed for overturning capacity and was determined not to be the controlling case. See Appendix C for the computations. Concrete in the ladder recess behind and adjacent to the point of impact was also crushed. Assuming rigid body rotation of the cantilever portion of the wall, it is estimated that a crack 5/8" thick was formed at the base of the cantilever.



Photograph 1 – Location of Barge Impact



Photograph 2 – View of Ladder Recess Showing Movement at Top of Wall

Monolith R-9 was evaluated to determine the barge impact load that would initiate cracking. The modulus of rupture (f_r) of the concrete was calculated using the formula $2.3*(f'_c)^{2/3}$. This yields a modulus of rupture equal to 480 psi. The tensile strength of the concrete was then obtained by reducing the modulus of rupture by a factor of 0.75, yielding a tensile strength of 360 psi. This is in accordance with the article titled Tensile Strength of Concrete (Raphael) published in the ACI Journal and also in accordance with EP 1110-2-12.

Based on the tensile strength of 360 psi, the cracking moment at the base of the cantilever was calculated using the equation $f_b = Mc/I$. The axial component of load corresponding to the self weight of the structure was ignored and has little effect on the results. The corresponding barge impact load was then determined. Based on this information, it was determined that the barge impact load that would initiate cracking at the base of the cantilever would approximately equal 1000 KIPS, see Appendix C for the computations. This barge impact value was also compared to guidance contained in ETL 1110-2-563, Barge Impact Analysis for Rigid Walls currently under development. Table 6 includes barge impact values for various velocities and angles of impact on rigid walls based on a tow mass of 11,600 tons. Based on these results, it is reasonable to expect that an impact of 1000 KIPS could occur at the project and the calculated value is a realistic estimate. The current guidance in ETL 1110-2-563 indicates that a calculated value greater than 800 KIPS for a draft of 9 feet may not be valid. It should be noted that this value is approximately 1000 KIPS for drafts of 11.5 feet.

BARGE IMPACT WITH 8 BARGE CONFIGURATION @ L&D 9 * (KIPS)							
Mass of tow	Vx ft/s	0.5	2	3	4	5	6
11,600 short tons	Vy ft/s	0.01	0.1	0.4	0.5	0.7	1
ANGLE OF IMPACT (degrees)	2	28.44	175.87	522.68	662.39	~~905.65~~	~~1252.46~~
	4	46.47	247.91	630.27	~~805.91~~	~~1084.91~~	~~1467.26~~
	5	55.47	283.83	683.79	~~877.31~~	~~1174.05~~	~~1574.01~~
	6	64.46	319.66	737.10	~~948.45~~	~~1262.84~~	~~1680.28~~
	8	82.36	391.01	~~843.02~~	~~1089.83~~	~~1439.24~~	~~1891.25~~
	10	100.16	461.88	~~947.92~~	~~1229.88~~	~~1613.88~~	~~2099.92~~
	12	117.85	532.20	~~1051.66~~	~~1368.44~~	~~1786.56~~	~~2306.03~~
	14	135.38	601.86	~~1154.13~~	~~1505.32~~	~~1957.06~~	~~2509.32~~
	16	152.76	670.79	~~1255.18~~	~~1640.38~~	~~2125.17~~	~~2709.57~~
	20	186.92	~~806.12~~	~~1452.59~~	~~1904.33~~	~~2453.43~~	~~3099.90~~
	25	228.33	~~969.68~~	~~1689.28~~	~~2221.07~~	~~2846.77~~	~~3566.37~~
	30	268.01	~~1125.86~~	~~1913.12~~	~~2520.91~~	~~3218.44~~	~~4005.70~~

Table 6 Estimation of Barge Impact Values Based on Mass of Tow, Flow Velocity and Angle of Impact using ETL 1110-2-563

5 RESULTS OF THE STUDY

5.1 Mitigation

To mitigate the expected increased damage from barge impact several possible solutions were investigated.

5.1.1 Install Fenders or Precast Panels

The installation of fenders in front of the walls to absorb the additional energy or precast panels to strengthen the walls, see Photograph Nos. 3 and 4, was considered. Although these methods have been successfully used elsewhere, the installation of these structures would limit the useful width of the lock approach. Therefore, the option of installing anything in front of the existing walls was not evaluated further.



Photograph No. 3 Fender Installation



Photograph No. 4 Precast Panel Installation

5.1.2 Anchoring

The stability of all the rigid walls (not the beams with buttresses on cellular pile founded structures which are flexible walls as shown in Figure 3) could be anchored to meet all overturning criteria. It should be noted that sliding stability was not evaluated. Additional site specific information would be required to permit an adequate evaluation of the sliding stability of these structures.

5.1.3 Protect End Monoliths

The nose piers at each of the locks and dam were designed to resist an impact load of 650 KIPS. Since the impact loads are likely to increase, protection of the nose piers may be required. The installation of sacrificial donut fenders or mooring cells, see Photograph Nos. 5 and 6, could be implemented.



Photograph No. 5 Donut Fender Installation



Photograph No. 6 Mooring Cells at end of Wall

5.1.4 Extension of Tow Haulage Capability to the Ends of the Walls

By extending the tow haulage units to the upstream limits of the approach walls, see Photograph No. 7, the tows would be directed into the locks under greater control therefore minimizing expected approach wall damage. Photograph No. 8 shows the current limit is approximately midway up the guide wall. Any expected damage would more likely be at the ends of the walls. This would require an additional mooring cell or two at each end of the lock as a place for the tows to land.



Photograph No. 7 Typical Tow Haulage



Photograph No. 8 Tow Haulage Only Extends Midway up Wall

5.1.5 Beams with Buttresses on Cellular Pile Founded Structures

The beams with buttresses on cellular pile founded structures, as shown in Figure 3, are flexible walls. These structures could be dramatically stiffened by pinning the sheet piling to the concrete cell cap. The vertical bearing piles are also embedded into the concrete cell cap. The pining operation would have to be performed underwater for all of the cellular structures. Others methods considered were chemical grouting of the cell fill, soil cement mixing of the cell fill or to hydraulically excavate the upper portion of the cells and replace with tremie concrete. These processes would significantly stiffen the cellular foundation.

5.2 Conclusions

5.2.1 Expected Approach Wall Damage

The conclusions from the study are from the analysis, experience and judgment. Increasing the draft of barges from 9 ft. to 11.5 ft. corresponds to an increase in the barge mass of about 28% and this directly translates into significantly higher impact forces. The increased draft will also adversely affect the maneuverability of the tow and change the location, velocity and angle of impact on the approach walls. The existing approach walls are NOT massive concrete structures. Their design can be characterized as structural elements with the design based on a given barge impact load. The original design of all the approach walls on the system was based on a barge impact load of 125 KIPS. The original design of all the nose piers on the system was based on a barge impact load of 650 KIPS. Based on this low barge impact value, the walls have minimum reinforcement and do not have the tensile capacity of a heavily reinforced

concrete wall. Hence these lightly reinforced brittle walls are especially susceptible to damage caused by the repetitive, large magnitude and low amplitude impact loads due to normal barge operations. The approach walls also do not have the overturning capacity of a typical gravity concrete wall. As shown in Table 5, Summary of Capacity Analysis, many of the upstream approach walls do not meet current stability criteria using estimated barge impact values when the draft is increased. With an estimated extreme impact of about 900 KIPS, it is expected that the walls will have more frequent damage similar to what happened at Ormond (9) Lock and Dam.

5.2.2 Recommendations

While it is anticipated that more barge impact damage will occur, this damage is expected to be infrequent and the more economical retrofit may be a "Fix-as-Fails" approach. The loss of an approach wall beam due to an impact above ultimate calculated load of 600 KIPS will likely have most damage occur above water and would be relatively easy to repair. However, the cell failure as predicted by the Pushover Analysis described in section 4.3 would be difficult and adversely impact navigation to correct. Therefore it is recommended to do the repairs described in section 5.1.5 as part of any dredging work to increase the draft. The estimated cost is $1,900,000, see Appendix D.

It should also be noted that a significant amount of this study was performed based on limited site specific knowledge. To more adequately understand the behavior of all the approach walls within the navigation system, each specific wall type should undergo a detailed analysis. It is also recommended that full scale barge impact tests be performed on the flexible walls to better understand their response under barge impact loadings. Based on the findings of the Pushover Analysis described in section 4.3, the dynamic response of the cell to the barge impact load is a significant factor.

Appendix A
Photographs

Lock and Dam No.1 – Norrell Lock and Dam

Lock and Dam No. 2

Lock and Dam No. 3 – Joe Hardin

Lock and Dam No. 4 – Emmett Sanders

Lock and Dam No. 5

Lock and Dam No. 6 – David D. Terry

Lock and Dam No. 7 - Murray

Lock and Dam No. 8 – Toad Suck Ferry

Lock and Dam No. 9 – Arthur V. Ormond

Lock and Dam No. 10 – Dardanelle Lock and Dam

Lock and Dam No. 12 – Ozark Lock and Dam

Lock and Dam No. 13 – James W. Tribble Lock and Dam

Lock and Dam No. 14 – W. D. Mayo Lock and Dam

Lock and Dam No. 15 – Robert S. Kerr Lock and Dam

Lock and Dam No. 16 – Weber Falls Lock and Dam

Lock and Dam No. 17 – Chouteau Lock and Dam

Lock and Dam No. 18 – Newt Graham Lock and Dam



UPPER GUIDE WALL
Lock and Dam No. 1 – Norrell Lock and Dam **14 September 2004**
Photograph No. 1 – View from L-26.



LOWER FLOATING GUIDE WALL
Lock and Dam No. 1 – Norrell Lock and Dam **14 September 2004**
Photograph No. 2 – View from River Wall.



PANARAMIC
Lock and Dam No. 2 14 September 2004
Photograph No. 1 – View from Bridge.



UPPER GUIDE WALL
Lock and Dam No. 2 14 September 2004
Photograph No. 2

LOCK AND DAM NO. 2



UPPER GUIDE WALL
Lock and Dam No. 2 14 September 2004
Photograph No. 3 – View from top of River Wall.



KEYED JOINT
Lock and Dam No. 2 14 September 2004
Photograph No. 4 – View from top of Upper Guide Wall.



UPPER GUIDE WALL
Lock and Dam No. 4 14 September 2004
Photograph No. 1 – View from Dam.



DAMAGED UPPER GUIDE WALL
Lock and Dam No. 4 14 September 2004
Photograph No. 2 – View from Miter Gate.



DAMAGED UPPER GUIDE WALL
Lock and Dam No. 4 14 September 2004
Photograph No. 3 – View from Upper Guide Wall.



BULGING KEYED JOINT
Lock and Dam No. 2 14 September 2004
Photograph No. 4 – View from Upper Guide Wall.



LOWER GUIDE WALL
Lock and Dam No. 2 14 September 2004
Photograph No. 5 – View from Upper Guide Wall.



DAMAGED JOINT ON L25-L26
Lock and Dam No. 4 , 14 September 2004
Photograph No. 6



DAMAGED JOINT ON L25-L26
Lock and Dam No. 4, 14 September 2004
Photograph No. 7



AERIAL VIEW OF LOCK FROM PI NO. 9
Lock and Dam No. 5
Photograph No. 5 – View from Dam.



UPSTREAM VIEW OF INTERRIOR OF LOCK FROM PI NO. 9
Lock and Dam No. 5
Photograph No. 5 – View from Lower Miter Gates.



UPPER GUIDE WALL
Lock and Dam No. 6
Photograph No. 1 – View from Dam.



LOWER GUIDE WALL
Lock and Dam No. 6
Photograph No. 2



UPPER GUIDE WALL
Lock and Dam No. 7 15 September 2004
Photograph No. 1 – View from Upper Guide Wall.



LOWER GUIDE WALL
Lock and Dam No. 15 September 2004
Photograph No. 4 – View from Lower Guide Wall.

MURRAY LOCK AND DAM – NO. 7



UPPER GUIDE WALL
Lock and Dam No. 8 15 September 2004
Photograph No. 1 – View from Upper Guide Wall.



LOWER GUIDE WALL
Lock and Dam No. 8 , 15 September 2004
Photograph No. 2



LOWER GUIDE WALL
Lock and Dam No. 8, 15 September 2004
Photograph No. 3



UPPER GUIDE WALL
Lock and Dam No. 9 15 September 2004
Photograph No. 1 – View from Dam.



KEYED JOINT ON UPPER GUIDE WALL
Lock and Dam No. 9 15 September 2004
Photograph No. 2



DAMAGED MONOLITH R-9 ON UPPER GUIDE WALL
Lock and Dam No. 9 15 September 2004
Photograph No. 3 – View from Land Wall.



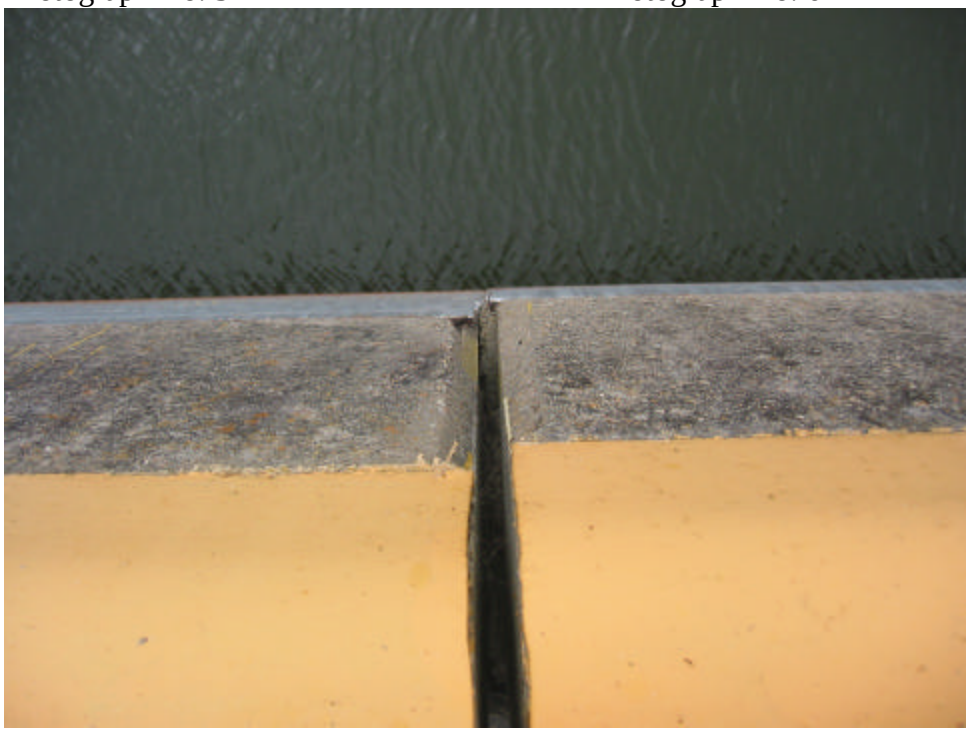
R-9 - MISALIGNMENT OF TOW HAULAGE RAIL AND HAND RAIL
Lock and Dam No. 9 15 September 2004
Photograph No. 4



DAMAGED JOINT ON R8-R9
Lock and Dam No. 9, 15 September 2004
Photograph No. 5



DAMAGED JOINT ON R45-R46
Lock and Dam No. 9, 15 September 2004
Photograph No. 6



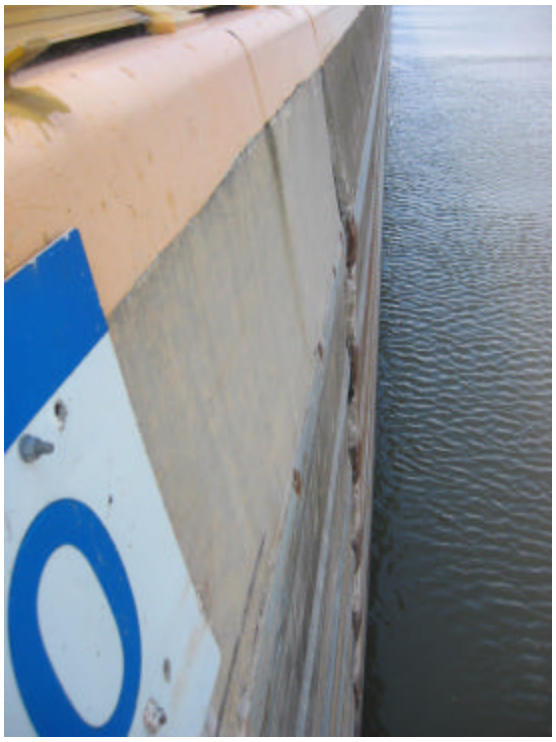
DAMAGED JOINT ON R45-R46 ON LOWER GUIDE WALL
Lock and Dam No. 9 15 September 2004
Photograph No. 7



UPPER GUIDE WALL
Lock and Dam No. 10 **15 September 2004**
Photograph No. 1 – View from Dam.



SETTELEMENT AT KEYED JOINT ON UPPER GUIDE WALL
Lock and Dam No. 10 **15 September 2004**
Photograph No. 2



UPPER GUIDE WALL AT JUST ABOVE 100 FOOT MARK HAS MOVEMENT
Lock and Dam No. 10 **15 September 2004**
Photograph No. 3



UPPER GUIDE WALL AT JUST ABOVE 100 FOOT MARK HAS MOVEMENT
Lock and Dam No. 10 **15 September 2004**
Photograph No. 4



UPPER GUIDE WALL
Lock and Dam No. 12 **15 September 2004**
Photograph No. 1

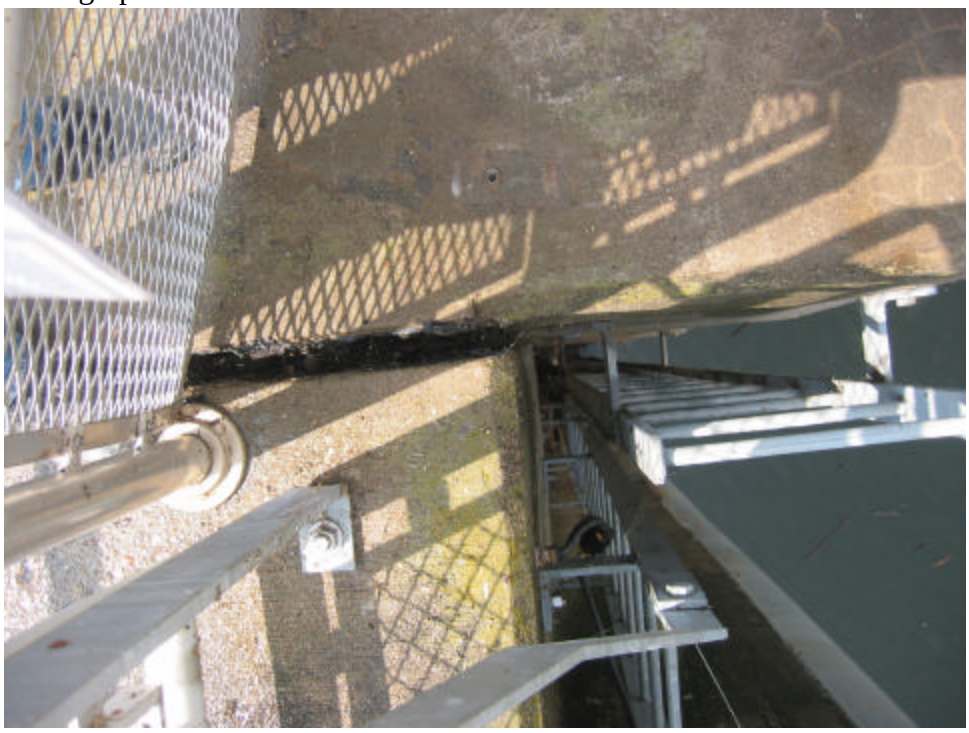


UPPER GUIDE WALL
Lock and Dam No. 10 **15 September 2004**
Photograph No. 2

OZARK JETA TAYLOR LOCK AND DAM – NO. 12



LOWER GUIDE WALL - R43-R44 IS OPEN ABOUT 1.5 INCHES
Lock and Dam No. 12 **15 September 2004**
Photograph No. 3



LOWER GUIDE WALL - R43-R44 IS OPEN ABOUT 1.5 INCHES
Lock and Dam No. 10 **15 September 2004**
Photograph No. 4



UPPER GUIDE WALL
Lock and Dam No. 13 **15 September 2004**
Photograph No. 1



UPPER GUIDE WALL – PARAPET REPAIR FROM BARGE DAMAGE
Lock and Dam No. 13 **15 September 2004**
Photograph No. 2



UPPER GUIDE WALL
Lock and Dam No. 14 **15 September 2004**
Photograph No. 1



UPPER GUIDE WALL - NOTE CELLS ADDED FOR OUTDRAFT
Lock and Dam No. 14 **15 September 2004**
Photograph No. 2

W. D. MAYO LOCK AND DAM – NO. 14



UPPER GUIDE WALL
Lock and Dam No. 15 **16 September 2004**
Photograph No. 1



UPPER GUIDE WALL – BARGE IMPACT DAMAGE
Lock and Dam No. 15 **16 September 2004**
Photograph No. 2

ROBERT S. KERR LOCK AND DAM – NO. 15



UPPER GUIDE WALL – REPAIRED BARGE IMPACT DAMAGE
Lock and Dam No. 15 16 September 2004
Photograph No. 3



UPPER GUIDE WALL – REPAIRED BARGE IMPACT DAMAGE
Lock and Dam No. 15 16 September 2004
Photograph No. 4



UPPER GUIDE WALL – REPAIRED BARGE IMPACT DAMAGE
Lock and Dam No. 15 **16 September 2004**
Photograph No. 5



DEWATERED LOCK
Lock and Dam No. 15 **16 September 2004**
Photograph No. 6



UPPER GUIDE WALL
Lock and Dam No. 16 **16 September 2004**
Photograph No. 1



LOWER GUIDE WALL
Lock and Dam No. 16 **16 September 2004**
Photograph No. 2



UPPER GUIDE WALL
Lock and Dam No. 17 **16 September 2004**
Photograph No. 1



LOWER GUIDE WALL
Lock and Dam No. 17 **16 September 2004**
Photograph No. 2



UPPER GUIDE WALL
Lock and Dam No. 18 **16 September 2004**
Photograph No. 1



LOWER GUIDE WALL
Lock and Dam No. 18 **16 September 2004**
Photograph No. 2

NEWT GRAHAM LOCK AND DAM – NO. 18

Appendix B
Development of Demand-Capacity Curves for Approach Walls in McCellan-Kerr Arkansas River Navigation System

Development of Demand-Capacity Curves for Approach Walls in McClellan-Kerr Arkansas River Navigation System

DRAFT REPORT

Prepared for

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Report No. QS04-05

October 31, 2004

Development of Demand-Capacity Curves for Approach Walls in McClellan-Kerr Arkansas River Navigation System

October 31, 2004

Draft Report

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By

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Development of Demand-Capacity Curves for Approach Walls in McClellan-Kerr Arkansas River Navigation System

1. Introduction

This report summarizes the findings of a nonlinear pushover analysis conducted to develop demand-capacity curves for approach walls in McClellan-Kerr Arkansas River Navigation System. The study was performed for the U.S. Army Corps of Engineers, Huntington District. This report also includes dynamic response of a single-degree-of-freedom-system (SDOF) to impact loading, from which the maximum response of an approach wall as a function of the impact duration can be estimated and compared with the capacity curve.

2. Review of Project Information

The upstream approach wall at the Lock and Dam No. 4 in the McClellan-Kerr Arkansas River Navigation System was selected for the pushover analysis presented in this report. The information furnished for this study included two photographs (Figures 1 and 2) and several drawings with plan of borings and soils log profiles (Tables 1 and 2).



Figure 1: Lock-side photo of u/s approach wall



Figure 2: River-side photo of u/s approach wall

The basic geometry, pile foundations, and reinforcement's data were obtained from the selected drawings listed in Table 1 below. The drawings show that each intermediate cell consists of a 20.36-ft-diameter sheet piles with 9 internal prestressed concrete piles. The sheet piles are 50 feet long and are driven 20 feet below the mud line. The 16-in-square prestressed concrete piles are 70 feet long and are embedded two feet into the pile cap on the top and driven 45 feet below the mud line. The concrete pile cap is 5 feet in thickness and 20.36 feet in diameter, which is connected to a 50 feet long guide wall with its associated buttress at the top.

Table 1: Selected Structural Drawings of Locks and Dam No. 4

Drawing	Description
8257-55/501	Index II, Lock
8257-55/525	Pile foundations, monolith layout
8257-55/526	Pile foundations, steel piles
8257-55/531	Pile foundations, concrete piles
8257-55/540	Masonry, monolith layout
8257-55/541	Masonry, concrete-monoliths R-1 thru R-7, elevations & sections
8257-55/542	Masonry, reinforcement monoliths R-1 thru R-7
8257-55/543	Masonry, reinforcement monoliths R-1 thru R-7 & L-7, sections & details
8257-55/562	Pile foundations and reinforcements

The selected soil borings for the selected cell are listed in Table 2. Drawing 8431-55/429 indicated that the cell is located along Section E-E between Borings 162 and 163. While Drawing 8431-55/438 provided soils logs for Borings 162 and 163.

Table 2: Selected Plan of Borings and Soils Log Profiles

Drawing	Description
8431-55/index	Index I
8431-55/429	Plan of borings
8431-55/430	Soils Log Profile I; Section A-A
8431-55/431	Soils Log Profile II; Sections B-B, C-C, and D-D
8431-55/432	Soils Log Profile III; Sections E-E, F-F, and G-G
8431-55/433	Soils Log Profile iv; Borrow Areas
8431-55/434	Soils Logs I; LD4-53, LD4-100 thru LD4-102, LD4-110 thru LD4-119
8431-55/435	Soils Logs II; Hole No. LD4-120, LD4-133
8431-55/436	Soils Logs III; Hole No. LD4-135, LD4-147
8431-55/437	Soils Logs IV; Hole No. LD4-148, LD4-157
8431-55/438	Soils Logs II; Hole No. LD4-158, LD4-163, LD4-170
8431-55/439	Soils Notes and Soils Legends

3. Modeling and Analysis Assumptions

The pushover analysis was performed for an intermediate cell of the upstream approach wall by representing the concrete wall, concrete piles, and steel cell by nonlinear fiber elements and the surrounding soil and fill material inside the cell as uncoupled nonlinear springs (Winkler's soil springs). A single cellular sheet pile with tributary guide wall was selected and modeled in two dimensions along the cell axis perpendicular to the guide wall. The soil springs were attached along the concrete piles and the sheet piles to simulate the lateral and axial load-transfer characteristics between the piles and soil (PY and TZ curves, respectively). In addition, soil springs were attached to the tip of the concrete piles to model the end-bearing load transfer (QZ curves).

3.1 2D Idealization of Cellular Sheet piles

The cellular pile, made of 48 interlocking steel sheet piles, were modeled using longitudinal frame elements with transverse truss members to account for the circumferential stiffness of the cell, as shown in Figure 5. The cell was divided into six regions in plan based on locations of the concrete piles. From left to right these regions included 9, 8, 6, 8, 8, and 9 sheet piles, which were collapsed (folded) along the cell diameter for 2D idealization. Each of these regions was represented by a single frame element made of 6 to 9 steel fibers in accordance with the actual numbers of sheet piles in that region. The frame elements were positioned at the center of rigidity of each region, but the location of steel fibers closely matched the actual locations of the sheet piles. These are designated as S1 to S6 longitudinal members in Figure 5. The sheet pile interlock effects were simulated by transverse truss members having an elastic modulus equal to a fraction of the modulus in the axial direction. The ratio of the transverse (circumferential) to the axial modulus was taken equal to 0.1, as an average of four values reported by Wissmann et. al (2003)[1].

The adequacy of the 2D frame model was verified by comparing its stiffness with that of a tube having the same diameter and moment of inertia as the cellular sheet piles. The verification involved subjecting each model to the same lateral load and comparing the resulting displacements. The resulting displacements were in close agreement, an indication that both the tube and frame models have equivalent stiffness.

Apparently there is no indication that the steel sheet piles are connected to the pile cap via shear lugs or other means. Consequently, the top row elements in the sheet pile model are assumed to have negligible shear resistance and thus acting as a shear fuse (Figure 5).

3.2 Prestressed Concrete piles

The cell includes a total of nine prestressed concrete bearing piles arranged in four rows of 2, 4, 1, and 2, as shown in Figure 4. Six concrete piles are located directly beneath the wall footprint and the remaining three beneath the buttress footprint. According to Drawing 8257-55/531, the concrete piles are 16-in-square concrete sections with 13 7/16-in-diameter strands equally spaced around an 11-in-diamter circle (Figure 6). A nominal compressive strength of 3,000 psi was assumed for the concrete. Nominal properties for the strands are listed in Table 3.

Table 3: Nominal Strand Properties

Parameter	Value	
Ultimate Strength	27	kips
Yield Strength	23	kips
Tensioning load	18.9	kips
Elastic Modulus	27,000	ksi
Strand diameter	7/16	in
Section Area	0.108	in^2

[1] Wissmann, K. J., Filz, G. M., Mosher, R. L., and Martin J. R. (2003). "Sheet Pile Tensions in Cellular Structures," J. of Geotechnical and Geoenvironmental Engineering, Vol. 129, No. 3, March 1, 2003.

The concrete piles in each row were combined and represented by inelastic fiber elements made of 8 concrete fibers, as shown in Figure 6. The steel strands were modeled separately as inelastic tension bars prestressed in tension. A prestressed tension value of 15.5 kips, an 18% reduction over the nominal value of 18.9 kips, was used to account for the elastic shortening and bending of the concrete, creep of concrete, shrinkage of concrete, and creep in steel.

3.3 Guide Wall and Associated Buttress

The portion of the guide wall supported by a single intermediate cell is 50 feet long, 19 feet tall, and 4 to 8 feet wide (Figures 4 and 5). The guide wall is supported laterally by 6-foot-wide buttresses at the top of each cell. The reinforced-concrete guide wall was modeled using fiber elements and the buttress was represented by equivalent beam elements with lumped plasticity.

3.4 Pile Cap

The concrete piles are embedded two feet into a circular concrete cap. The pile cap is 5 feet thick and 20.36 feet in diameter. The pile cap was idealized by beam-column elements using stiffness coefficients corresponding to the actual cap.

3.5 Idealized Site Soil Profile

The cell analyzed is located between Borings 162 and 163 (Drawing 8431-55/438). The logs of these two borings revealed similar geologic condition. The idealized site profile is horizontally layered with mudline occurring at Elevation 157 ft. The surficial soil consists of medium dense fine sand extending to Elevation 137 ft. This layer overlies 5 feet of medium dense silty fine sand with occasional existence of gravels. This layer is underlain by medium fine sand to a depth below the tips of the concrete piles. The density and friction angle were assumed to be 120 pcf and 35 degrees, respectively, for all layers.

3.6 PY, TZ, and QZ Load Transfer Curves for Concrete Piles below El. 137 ft

Between Elevation 137 ft and 112 ft, it was assumed that the load transfer curves for the concrete piles are not affected by the sheet piles. Increase in effective vertical soil stress due to superstructure loading and weight of fill inside the cell was accounted for in the generation of the load transfer curves. The weight of the fill was assumed to distribute uniformly within the footprint of the 20.36-foot diameter cell at Elevation 137 ft. The submerged weight of the superstructure was estimated at 700 kips. It was assumed that 50 percent of this weight was transferred by the concrete piles and the soil/fill within the cell to Elevation 137 ft and was superimposed with the weight of the fill. Another 35 percent of the superstructure weight was transferred by the concrete piles to the soil between Elevations 137 ft and 112 ft. It was also assumed that 10 percent of the superstructure weight was transferred by the sheet piles and the soil/fill within the cell to the top 20 ft of the native soil. It was assumed that the effective load spreading area expands vertically at 45 degree.

PY curves for a single pile (without account for interaction among concrete piles) were developed based on the formulation recommended by the American Petroleum Institute (API method). Multiplier (P-multipliers) to be applied to the PY curves for each pile was calculated based on Reese and O'Neill (1987) to account for interaction among the concrete piles. The TZ curves for a single pile were computed based on Reese and O'Neill (1987). A QZ curve was developed based on the API method. Pile group interaction was ignored for the TZ and QZ curves.

3.7 PY and TZ Load Transfer Curves for Sheet Pile between El. 137 and 157 ft

Bulk PY and TZ curves were developed for the sheet piles between Elevations 137 and 157 ft. The effects of superstructure loading and fill weight on the load transfer curves were ignored. The PY curves developed were based on the average of the PY curves calculated by the API method for two cases: a 20.36-ft diameter pile (corresponding to a rigid casing condition) and plane strain condition (corresponding to flexible casing condition). The TZ curves for the sheet piles were estimated assuming plane strain condition. End bearing of the sheet piles were ignored.

3.8 PY and TZ Load Transfer Curves Representing Interaction between Concrete Piles, Soil/Fill, and Sheet Piles between El. 137 and 182 ft

Between Elevations 137 ft and 182 ft, the lateral load transfer forces between the concrete piles, soil/fill, and sheet piles are internal forces. They do not contribute to the lateral load capacity of the cell structure. Therefore, one end of the PY springs is connected to the concrete pile while the other end of the PY springs is attached to the sheet piles. The effect of superstructure loading on the effective vertical stress in the soil/fill inside the cell was ignored. The API method was used to generate the PY curves. The P-multipliers for this elevation interval were estimated based on Reese and O'Neil and were further reduced according to the proximity of individual concrete piles to the sheet piles to account for interaction. The TZ curves were attached only to the concrete piles and were calculated based on Reese and O'Neill (1987). Multipliers applied to the TZ curves were estimated based on the distance between individual piles and the sheet piles.

4. Pushover Analysis

A pushover analysis is a nonlinear static analysis, where a model of the structure incorporating inelastic material response is developed and subjected to loading applied in steps, controlled by load or displacement increments. The analysis proceeds under load control or under displacement control until either the load or displacement target is reached, or the structure becomes unstable. In this study the analysis proceeded under displacement control and the cell model was subjected to increasing lateral loads until load carrying capability of the structure was exhausted. This type of analysis directly accounts for the redistribution of forces and deformations that occur in various structural members of the cell as they undergo inelastic responses.

5. Analysis Results

Pushover analyses were conducted for three different cases to investigate the effects of pile cap connection and cell fill material parameters on lateral resistance capacity of the cell structure. The cases analyzed included: 1) a basic case representative of the field condition where the sheet piles are not connected to the pile cap, 2) a case with the sheet piles connected to the pile cap as a potential strengthening measure to develop additional lateral resistance, and 3) same as Case 1 except that the shear strength of the cell fill were doubled to investigate sensitivity of results to cell fill parameters.

The main result of the pushover analysis includes a plot of the applied load simulating the barge impact versus the lateral displacement of the cell. As shown in Figure 7, in this study the impact load was applied at El. 201, 5 feet above the normal water level, and displacement was computed at the top of the wall at El. 206 ft.

5.1 Pushover curve with sheet piles not connected to pile cap (shear fuse)

Figure 8 displays the results for the basic case as a plot of the lateral load versus displacement of the top of the wall. The capacity curve indicates that the cell can resist a maximum load of 171 kips before becoming unstable due to excessive yielding of the cell fill and the in-situ soil. The allowable maximum lateral load, however, should be set to slightly lower value of 168 kips to ensure the cell structure remains stable. The yielding starts at the top of concrete piles, then moves downward and propagates to the in-situ soil surrounding the sheet piles. Circular, triangular, and square Symbols in Figure 8 illustrate the loads at which PY springs, TZ springs, and prestressed strands yield. Yielding begins at loads as low as 30 kips, but significant yielding occurs at loads greater than 90 kips, as evident by the change of slope of the capacity curve. Figure 9 illustrates the extent of soil yielding around the concrete piles and around the buried portion of the sheet piles. As indicated on this figure both PY and TZ springs connected to the concrete piles yield, while for the sheet piles only TZ springs yield. It appears soil yielding near the top of the concrete piles creates a slip plane that limits load transfer from the concrete piles to the cell. Similarly, yielding of TZ springs attached to the sheet piles causes the sheet piles to slip.

In addition to the pushover curve, member forces for the concrete piles, sheet piles, trusses, and the PY springs were computed and are compared in Figure 10. This figure clearly demonstrates that the lateral load is transferred to concrete piles through the pile cap and then from concrete piles to sheet piles through the PY springs. Figure 10 also show that the load distribution among various components is reasonable.

In summary the results of this preliminary study indicate that the lateral load resisting capability of the cell is governed by the strength of the cell fill and of the in-situ soil. The estimated load capacity of 171 kips appears to be low. However, considering that the lateral resistances of the concrete piles and sheet piles have been adequately represented, any additional resistance is expected to arise from the cell fill and the in-situ soil. The 2D analysis adopted in this study was based on the time constraint and the ability to predict nonlinear response behavior of the concrete and sheet piles. For a more accurate representation of the soil behavior and utilization of possible additional resistance offered

by the soil, a three-dimensional analysis which explicitly models the soil would be required.

5.2 Pushover curve with sheet piles connected to pile cap

The pushover curve for the case with sheet piles connected to the pile cap is shown in Figure 11. The results indicate that the ultimate load capacity has increased to 460 kips as a result of connecting the sheet piles to the pile cap. This capacity, however, is achieved at a lateral displacement as high as 40 inches with significant stiffness degradation beyond the 400 kips. For this reason it is recommended that the maximum allowable load and displacement values to be set to 400 kips and 18 inches, respectively.

The primary nonlinear response behavior includes yielding of the TZ and PY springs and of the prestressed strands, as identified respectively by triangular, circular, and square symbols on Figure 11. The location and extent of yielding are illustrated in Figure 12. The yielding begins with TZ springs and extends to PY springs before affecting the prestressed strands. The yielding affects the in-situ soil inside and outside the sheet piles. It appears slip plane, if any, would occur in this region.

5.3 Pushover curve with doubled cell fill strength

The effect of fill soil and in-situ soil shear strengths on the cell lateral capacity was investigated by increasing stiffness and shear strength of all PY and TZ springs inside the cell by a factor of two. The pushover analysis for this condition resulted in an ultimate load capacity of 190 kips; an 11 percent increase over the value of 171 kips obtained for the base case described in Section 5.1. This finding indicates that increasing friction angle of the cell fill from 34 degrees to say 36 or 38 degrees will have negligible impact on the results.

6. Dynamic Response of Cell to Impact loads

Dynamic response of a cell to barge impact can significantly differ from that under a sustained static load. The maximum dynamic response of a cell structure to barge impact depends on the ratio of the impact duration to the natural period of the cell. For example, an impact load with duration of 0.1 sec affects a long-period cell structure a lot less than a short-period massive concrete structure. With a fundamental period of 1.87 sec, the cell analyzed in this study is characterized as a long-period structure. For demonstration purposes, a single-degree-of-freedom (SDOF) system with a natural period of 1.87, same as the cell structure, was developed and subjected to a series of impact load having different duration. Figures 13 and 14 show the results for two of such linear dynamic analyses. The top graph of Figure 13 shows the impact load, which as a quarter-sine wave begins at the time zero and reaches maximum at 0.6 sec. The lower graph of Figure 13 shows the spring force of the SDOF subjected to this impact load. It can be seen that for the impact duration to period ratio of 0.32 ($t/T = 0.6/1.87 = 0.32$) the maximum spring force for the SDOF system is 534 kips, the same as the magnitude of the impact load. Whereas the same impact load with duration of 0.3 sec ($t/T = 0.3/1.87 = 0.16$) produces a maximum force of 296 kips, as shown in Figure 14. This computation was repeated for various impact durations and in each case the maximum transmitted force was obtained. A plot of the maximum force response ratio versus the impact duration to period ratio is

shown in Figure 15. This graph, known as the response spectra, can be used for estimating the maximum force demand due to impact load, which then can be compared with the cell capacity discussed previously.

Example:

For the cell capacity curve given in Figure 8, what is the maximum impact load that can be resisted by the cell? Assume the impact load has duration of 0.15 sec.

The maximum impact load is determined as follows:

1. Characteristics of the cell under consideration are:

   Cell Period = 1.87 sec
   Load capacity = 168 kips (from Figure 8)

2. Estimate the impact duration to period ratio

   $$\frac{t}{T} = \frac{0.15}{1.87} = 0.08$$

3. Use Figure 15 to obtain the maximum force response ratio at t/T = 0.08

   $$\frac{Maximum\ Force\ \mathrm{Re}sponse}{Impact\ Load} = 0.3$$

4. Since the maximum force response should not exceed the cell load capacity of 168 kips, we have

   $$\frac{168}{Impact\ Load} = 0.3$$

   Impact load = 168/0.3 = 560 kips

Therefore, the maximum impact load for the cell with period of 1.87 sec is 560 kips, provided that the impact duration is 0.15 sec or shorter.

7. Conclusions and Recommendations

The following conclusions and recommendations can be drawn from this preliminary study:

1. The upstream approach wall at Lock and Dam No. 4, with no shear connection between the sheet piles and the pile cap, is capable of resisting up to 168 kips sustained lateral load applied at 5 feet below the top of the wall. The results show that the cell structure responds nonlinearly in the form of yielding of the fill soil and in-situ soil. Yielding begins at lateral loads as low as 30 kips, but becomes significant at loads greater than 90 kips.
2. Even though the lateral load capacity of the cell is limited to 168 kips, the cell can resist higher impact loads if dynamic response of the cell to short-duration impact loads is taken into account. For example the cell under consideration can resist impact loads as high as 560 kips if duration of the impact load is 0.15 sec or shorter.
3. The lateral resistance capacity of the cell is apparently not very sensitive to shear strength of the fill soil. Any potential source of additional lateral resistance, if any, could be drawn from the load-carrying capability of the soil, if the soil behavior is explicitly modeled in a three-dimensional analysis.
4. If the sheet piles are securely connected to the pile cap and can transfer shear, the ultimate lateral load capacity of the cell will be increased from 171 kips to 460 kips. This finding can be utilized to modify the cell for extreme impact loads that exceed 500 kips. One possible scheme for connecting the sheet piles to the pile cap is to use an external post-tensioned ring with anchors.
5. The finding in Step 2 above is based on linear dynamic analysis of a single-degree-of-freedom oscillator. We recommend this finding to be verified by dynamic analysis of the 2D nonlinear model developed for this study. This is because the higher mode of vibration and nonlinear behavior of the cell structure may affect this finding.

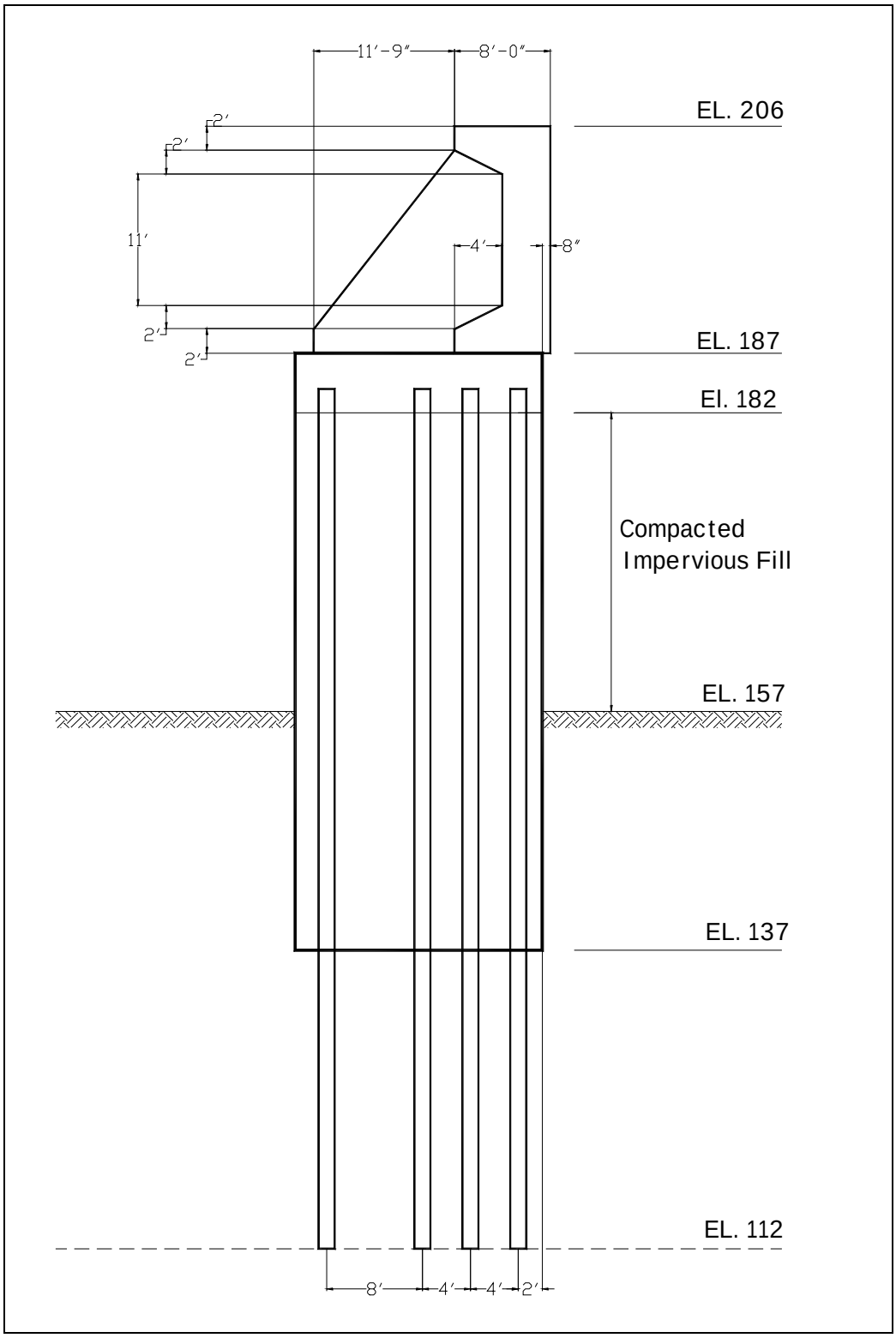


Figure 3: Section view showing various elevations and components of the cell

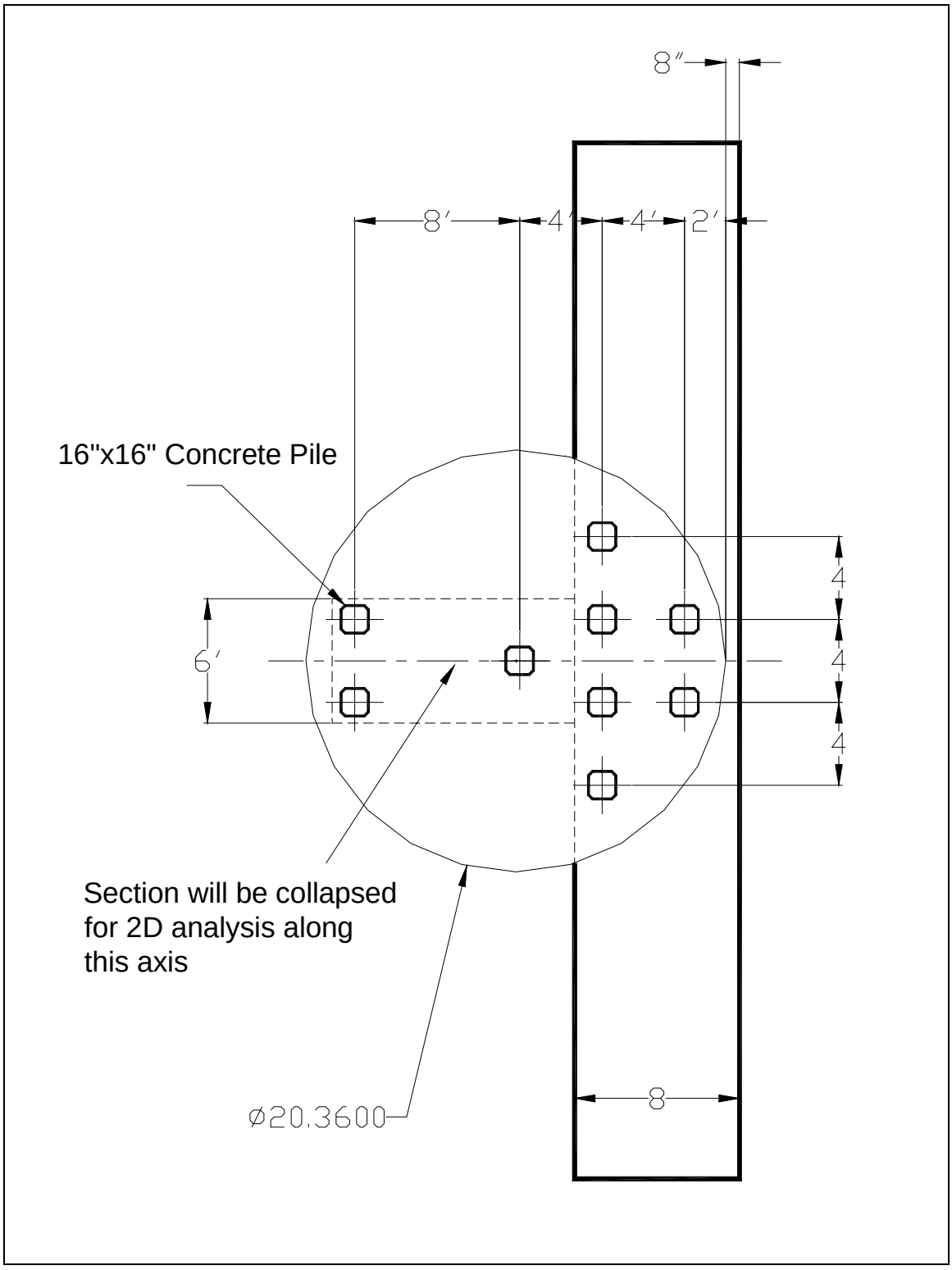


Figure 4: Plan view showing guide wall, cell, and concrete piles

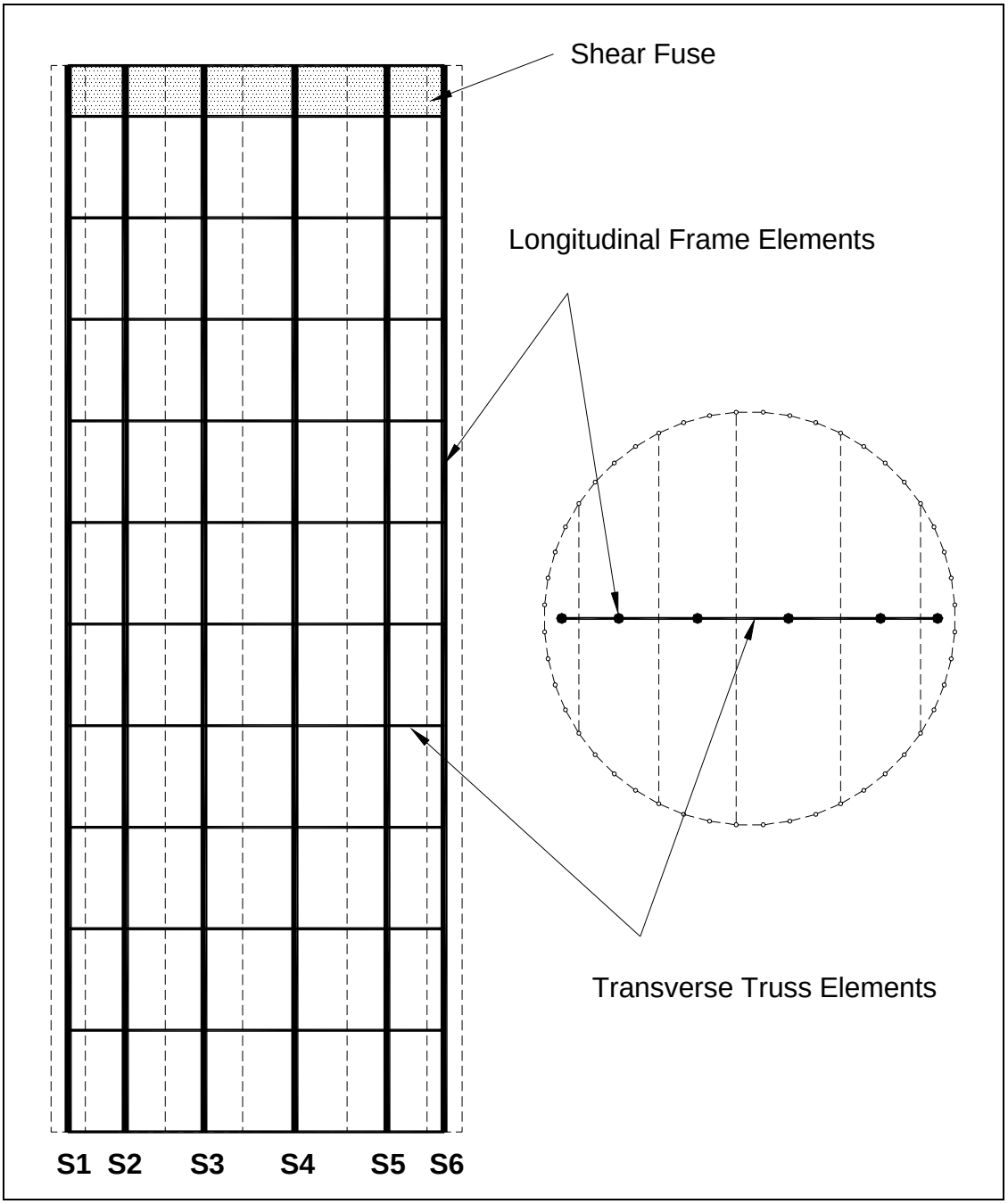


Figure 5: 2D idealization of steel sheet piles by longitudinal frames and transverse trusses

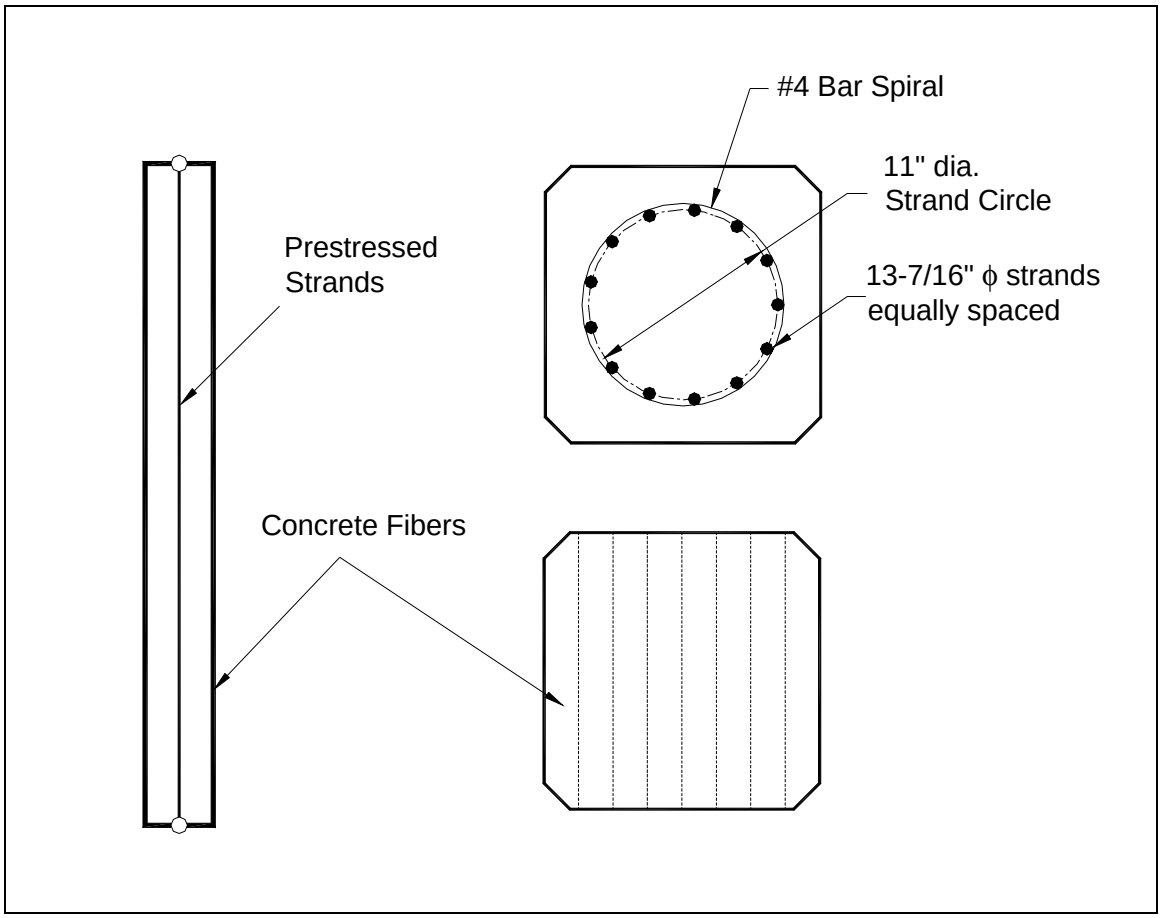


Figure 6: 2D Idealization of prestressed concrete piles

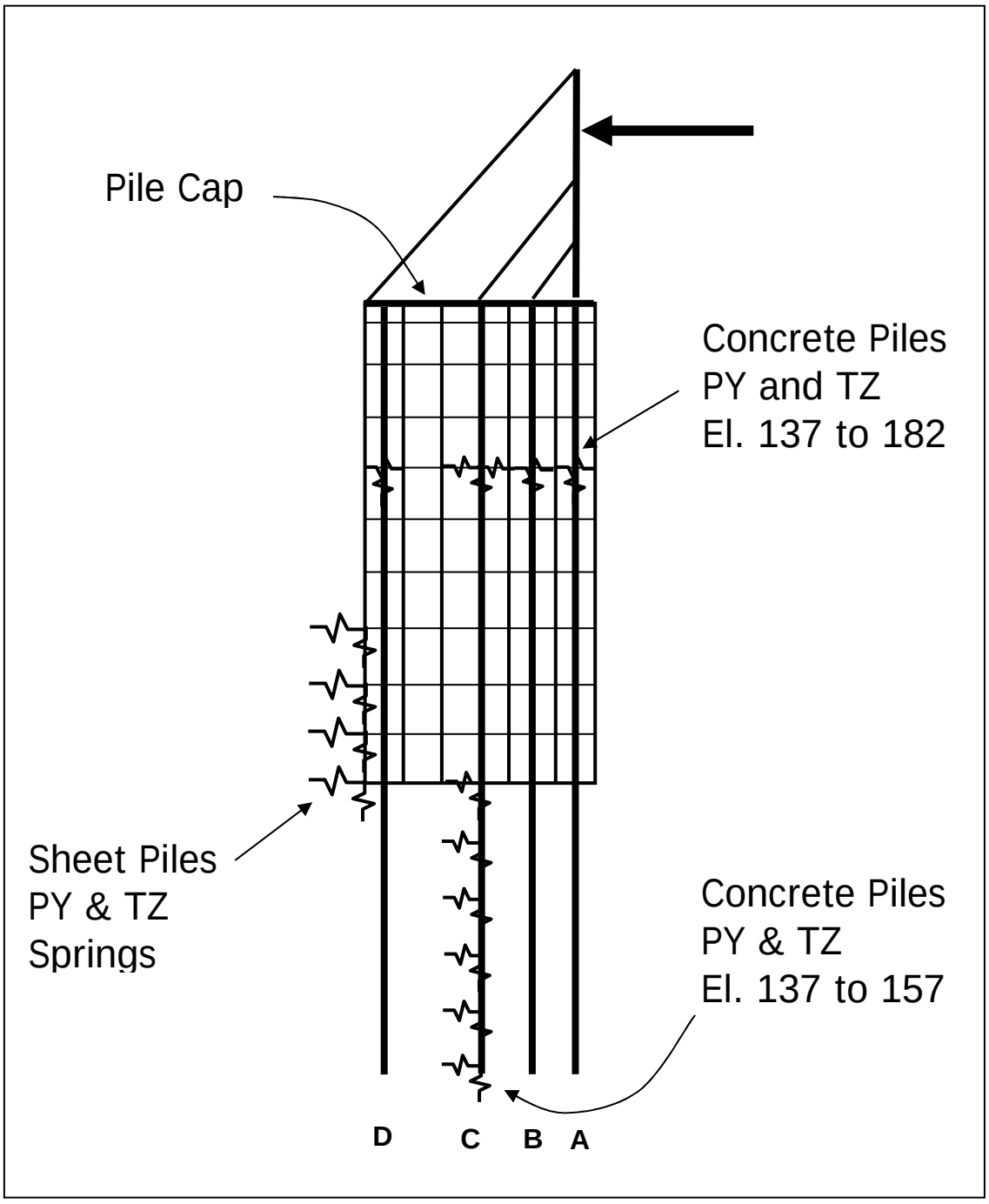


Figure 7: Complete finite-element idealization of cell. Note that for clarity only a limited number of representative nonlinear springs are shown.

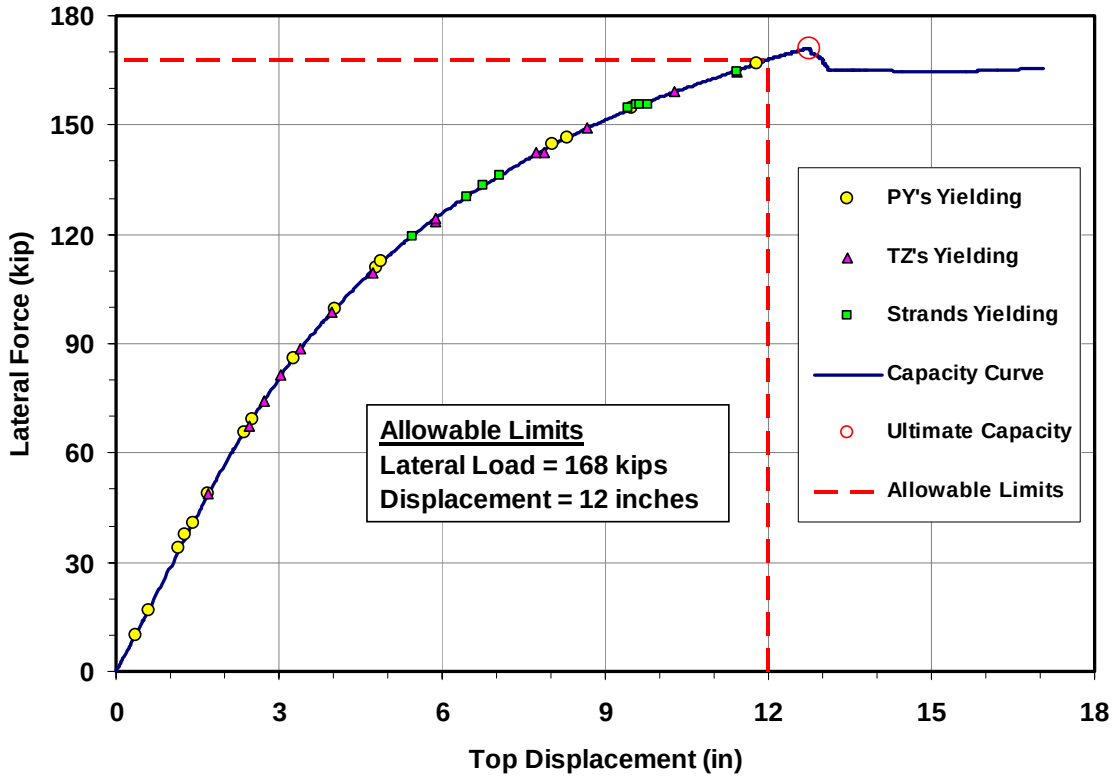


Figure 8: Pushover capacity curve with sheet pile shear fuse

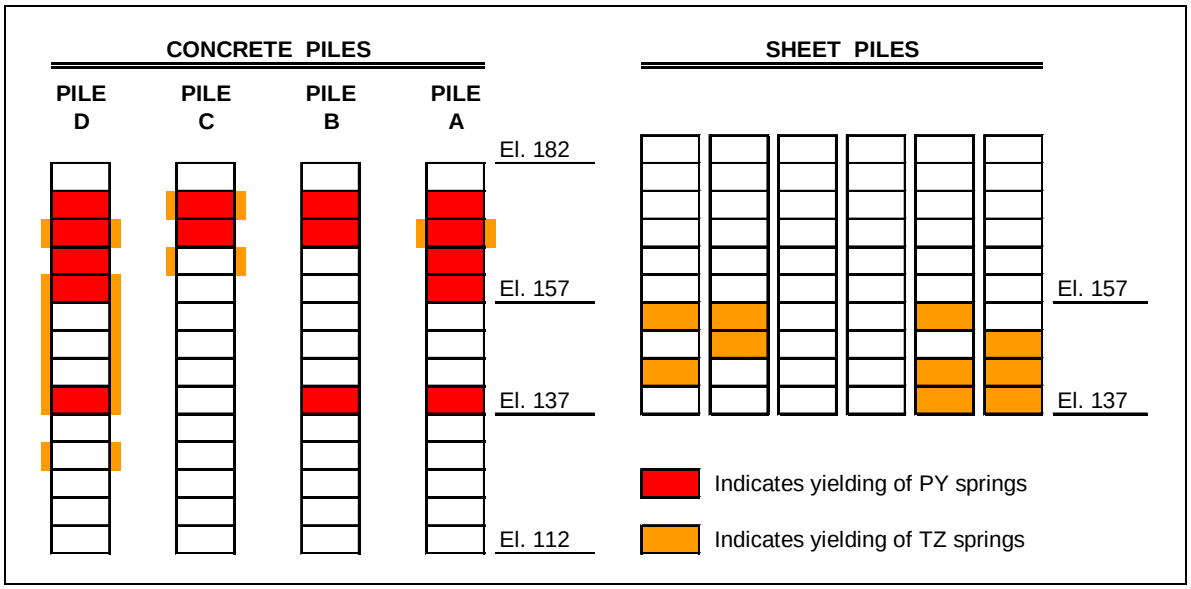


Figure 9: yielding of PY and TZ springs for Sheet Piles and Concrete Piles in Rows A, B, C, and D

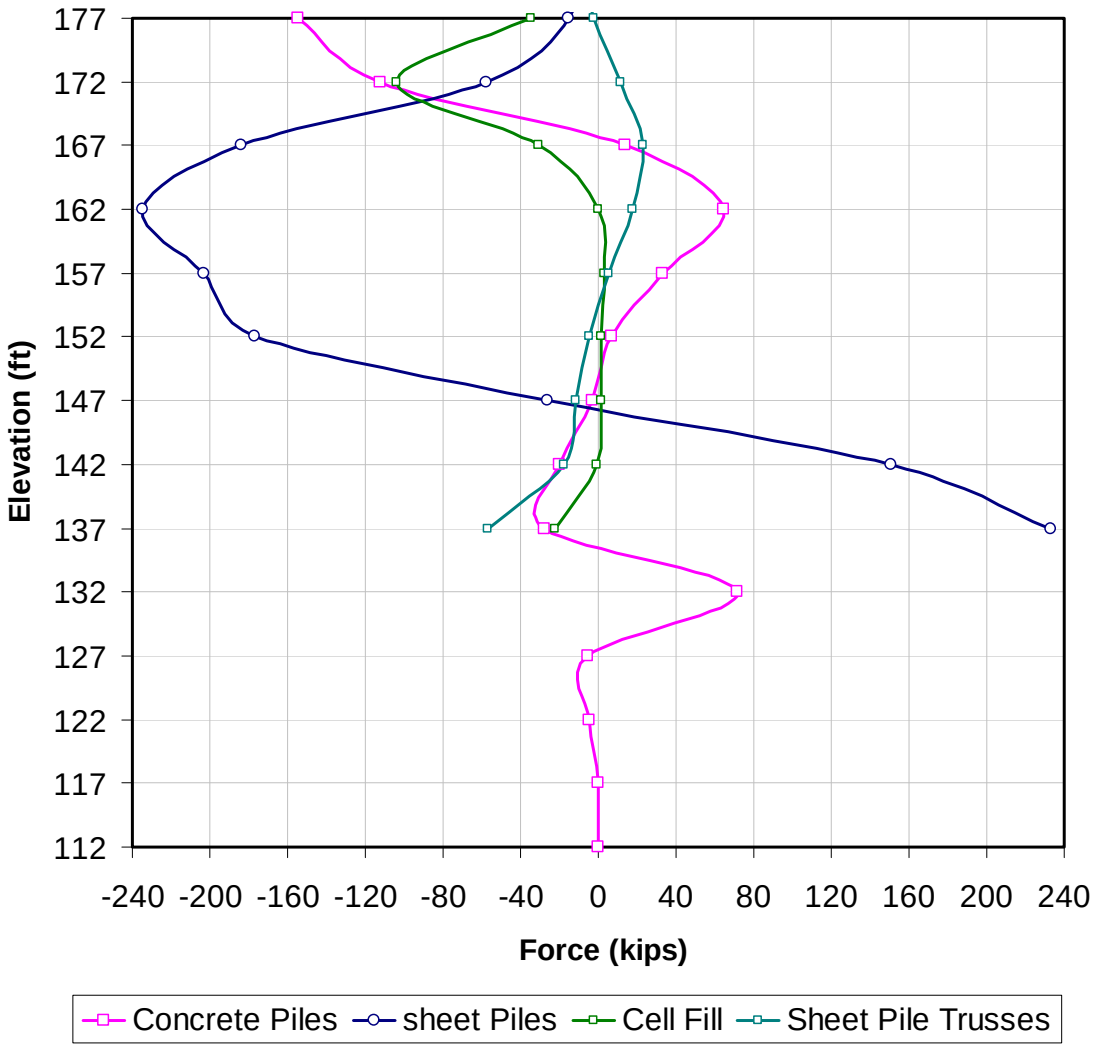


Figure 10: Force diagram showing lateral load distribution among various components of cell structure

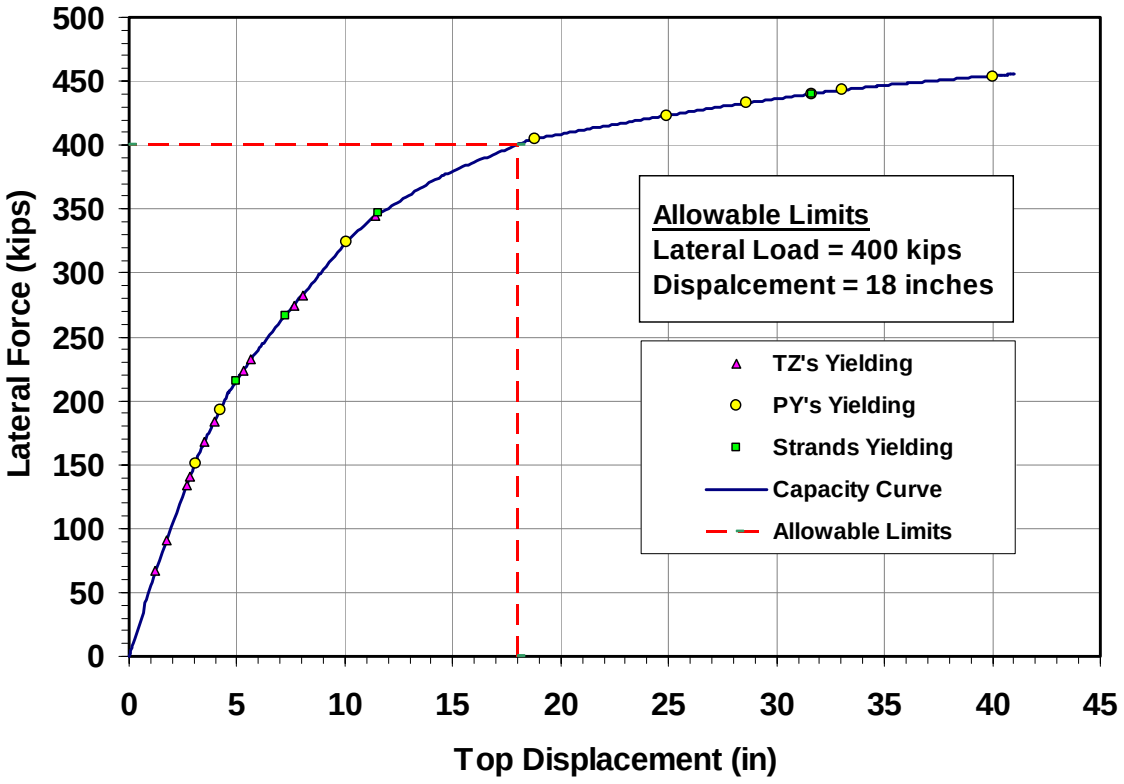


Figure 11: Pushover capacity curve with sheet piles connected to pile cap

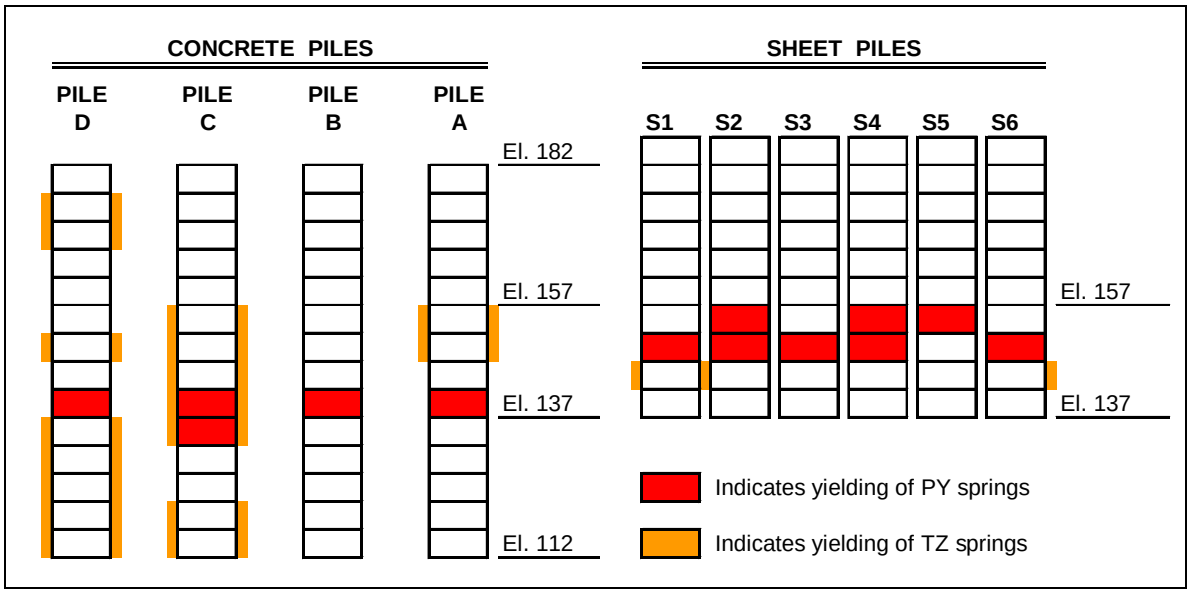
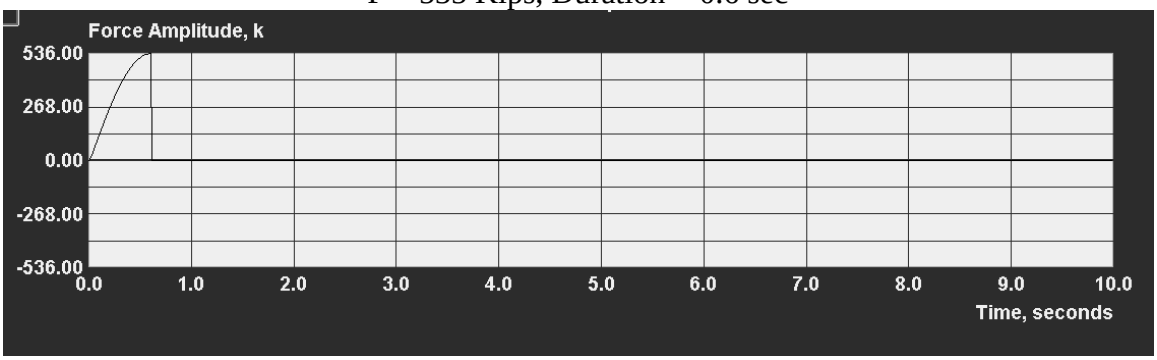


Figure 12: Yielding of PY and TZ springs for Sheet Piles and Concrete Piles in Rows A, B, C, and D

F = 535 Kips, Duration = 0.6 sec



Maximum Transmitted Load = 534 kips

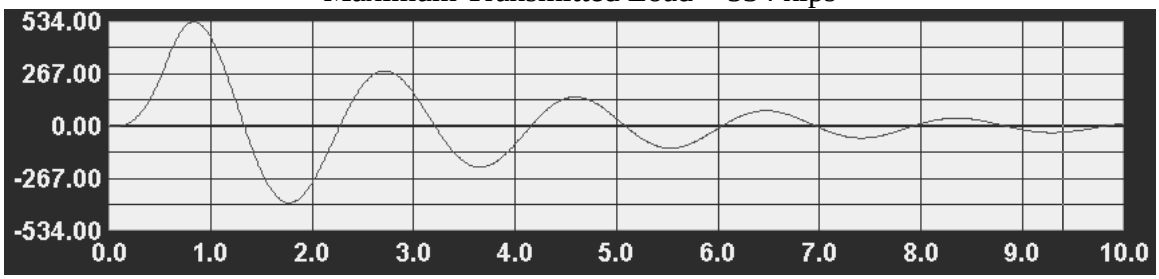
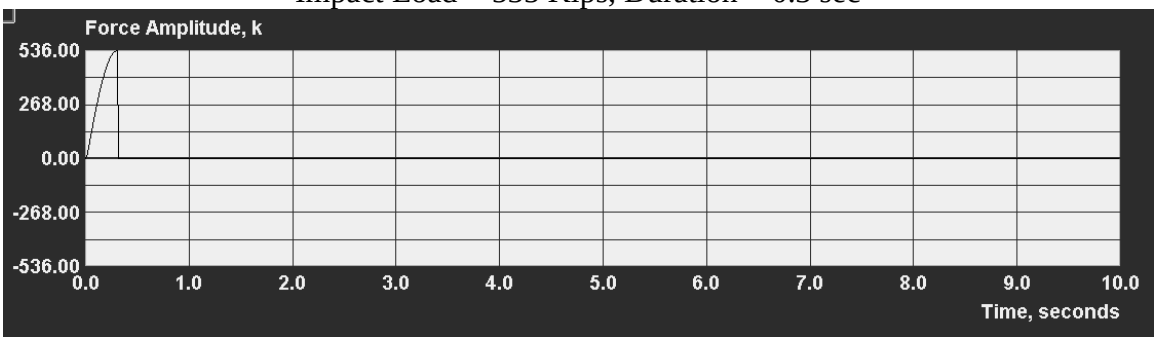


Figure 13: Response of SDOF system to impact load with duration of 0.6 sec

Impact Load = 535 Kips, Duration = 0.3 sec



Maximum Transmitted Load = 296 kips

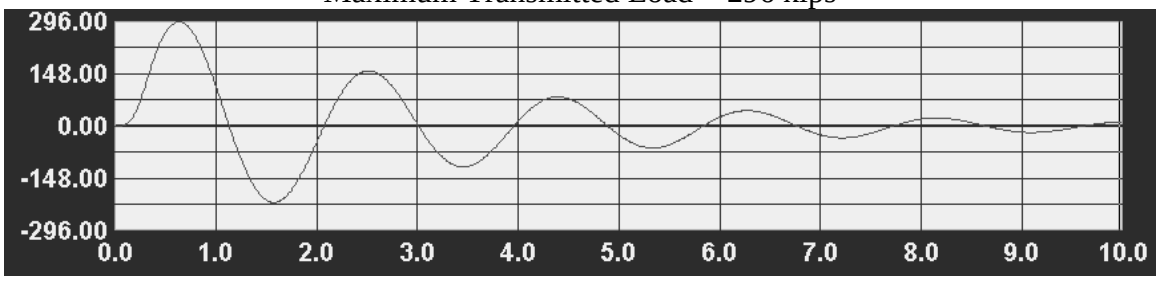


Figure 14: Response of SDOF system to impact load with duration of 0.3 sec

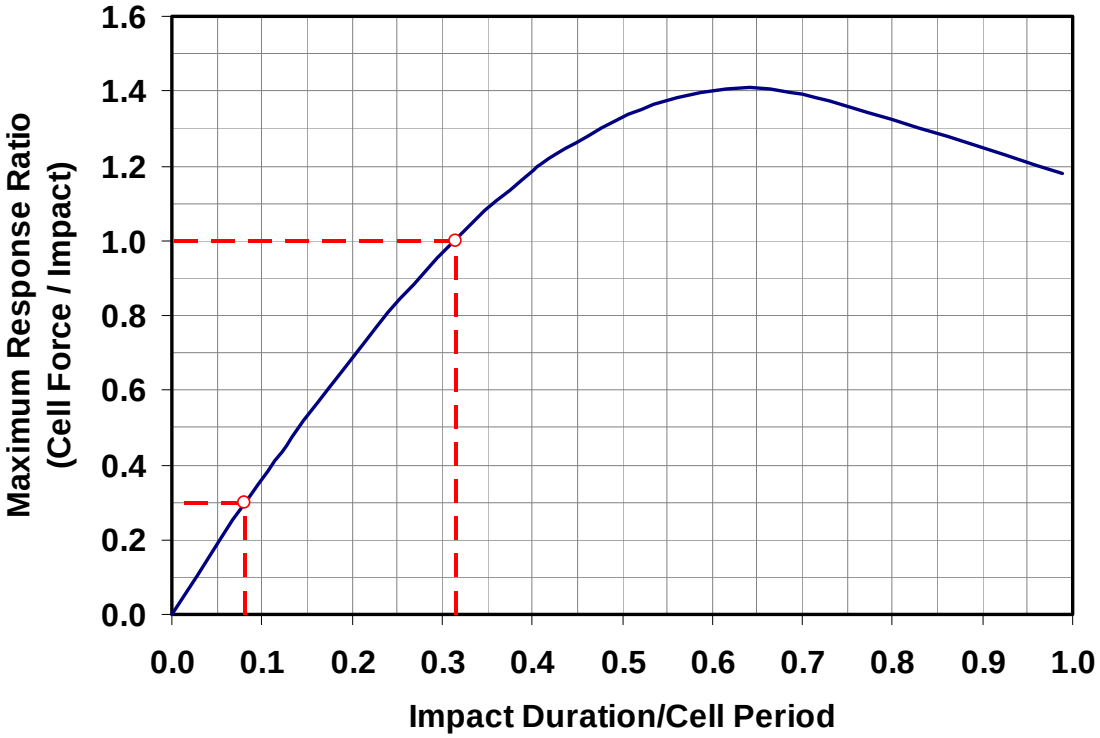


Figure 15: Response spectra for barge impact load

Appendix C
Computations

Shear Computations for Lock and Dam No. 4 – Emmett Sanders

Upper and Lower Guidewalls for Lock and Dam No. 5

Upper and Lower Guidewalls for Lock and Dam No. 7 - Murray

Upper and Lower Guidewalls for Lock and Dam No. 8 – Toad Suck Ferry

Upper and Lower Guidewalls and R-9 for Lock and Dam No. 9 – Arthur V. Ormond

Lower Guidewalls for Lock and Dam No. 10 – Dardanelle Lock and Dam

Upper and Lower Guidewalls for Lock and Dam No. 12 – Ozark Lock and Dam

Upper and Lower Guidewalls for Lock and Dam No. 13 – James W. Tribble Lock and Dam

Upper and Lower Guidewalls for Lock and Dam No. 14 – W. D. Mayo Lock and Dam

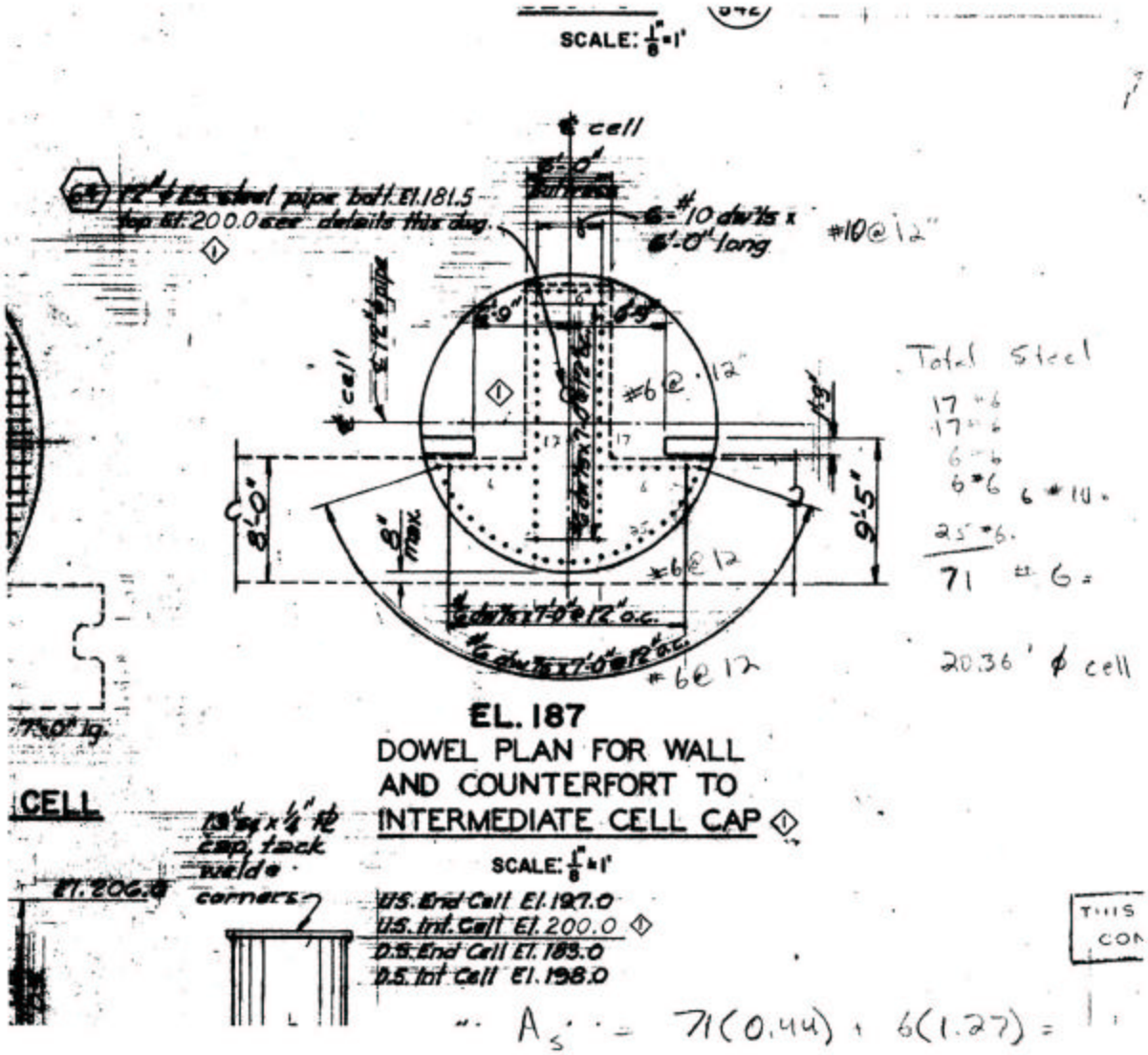
Lower Guidewalls for Lock and Dam No. 15 – Robert S. Kerr Lock and Dam

Lower Guidewalls for Lock and Dam No. 16 – Weber Falls Lock and Dam

Upper and Lower Guidewalls for Lock and Dam No. 17 – Chouteau Lock and Dam

Upper and Lower Guidewalls for Lock and Dam No. 18 – Newt Graham Lock and Dam

Arkansas L&D #4 Michael T. Likavec

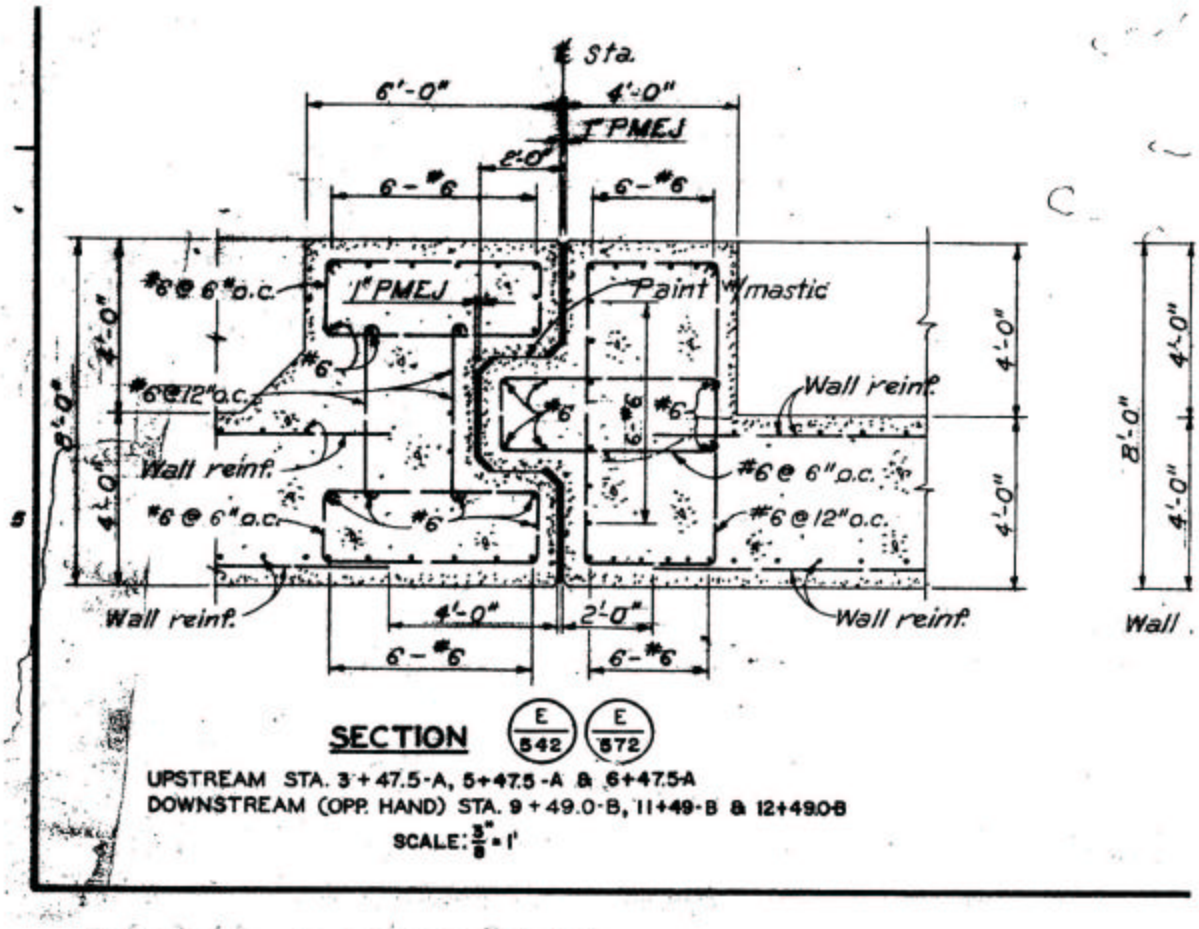


$A_s = 71(0.44) + 6(1.27) =$

$31.24 + 7.62 = 38.86\ in^2$

$F = f_y A_s = 40(38.86) = 1,554.4\ k$

Shear Friction Hypothesis for Shear Transfer in Corbels



SECTION (E/542) (E/572)

UPSTREAM STA. 3+47.5-A, 5+47.5-A & 6+47.5-A
DOWNSTREAM (OPP. HAND) STA. 9+49.0-B, 11+49-B & 12+49.0-B
SCALE: 3/8" = 1'

#6 @ 6" → 15' → 30 #6

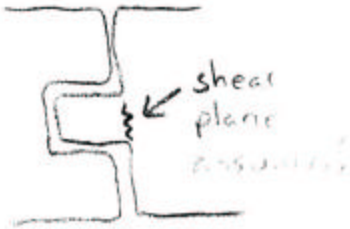
$A_{vf} = 30(2)(0.44) = 26.4 \text{ in}^2$

$\mu = 1.4\lambda$

$\lambda = 1.0$

$V_n = A_{vf} f_y \mu$

$= 26.4(40)(1.4) = 1478.4$ Kips



US Army Corps of Engineers, Ohio River Division	Subject: MKARINS L&D 9, R-9	Page Of Pages
		Computed by DPS Date 10/04
		Checked by Date

Assume section above el 2750 acts as a cantilever beam
$f_b \leq 360$ psi

$f_t = f_b = 360 \text{ psi} = \frac{Mc}{I}$

$I = \frac{1}{12}(b)(h^3) = \frac{1}{12}(12)(96\text{in})^3 = 884{,}736 \text{ in}^4$

$360 \text{ lb/in}^2 = \frac{M\left(\frac{96\text{in}}{2}\right)}{884{,}736 \text{ in}^4}$

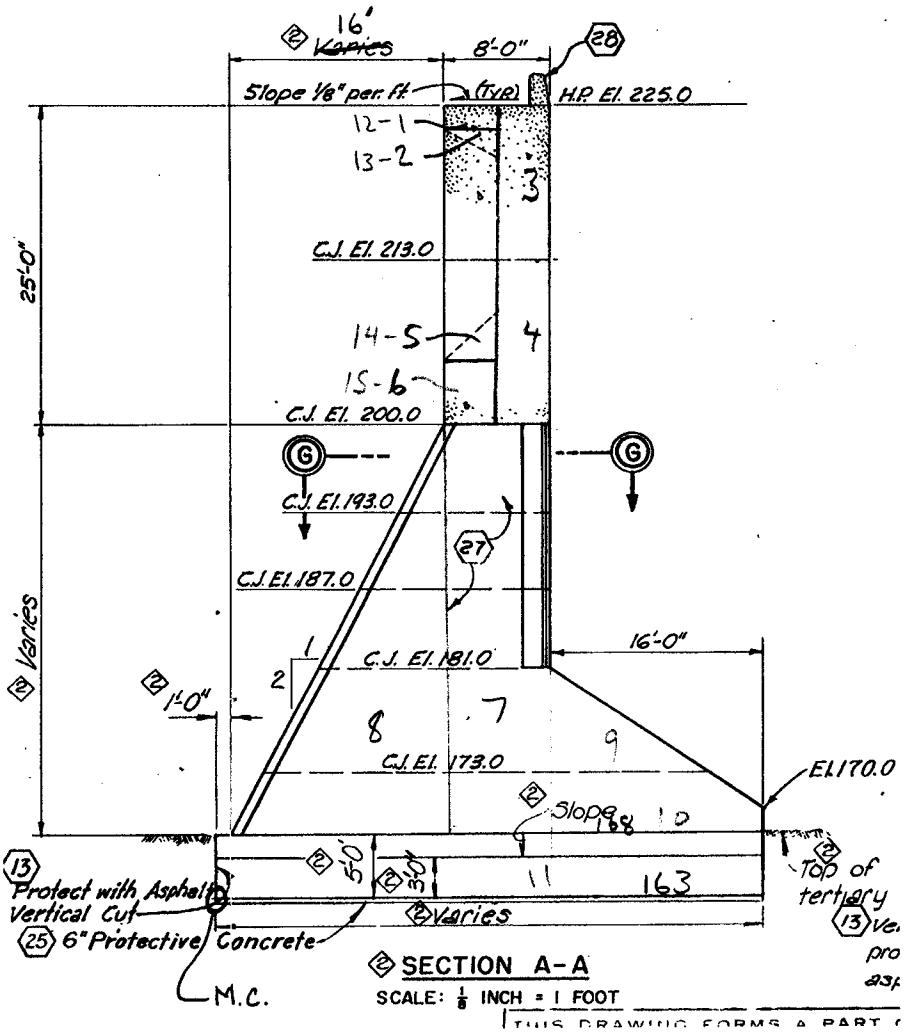
$M = 6.6(10)^6 \text{ lb-in} = 552.96 \text{ K-FT}$

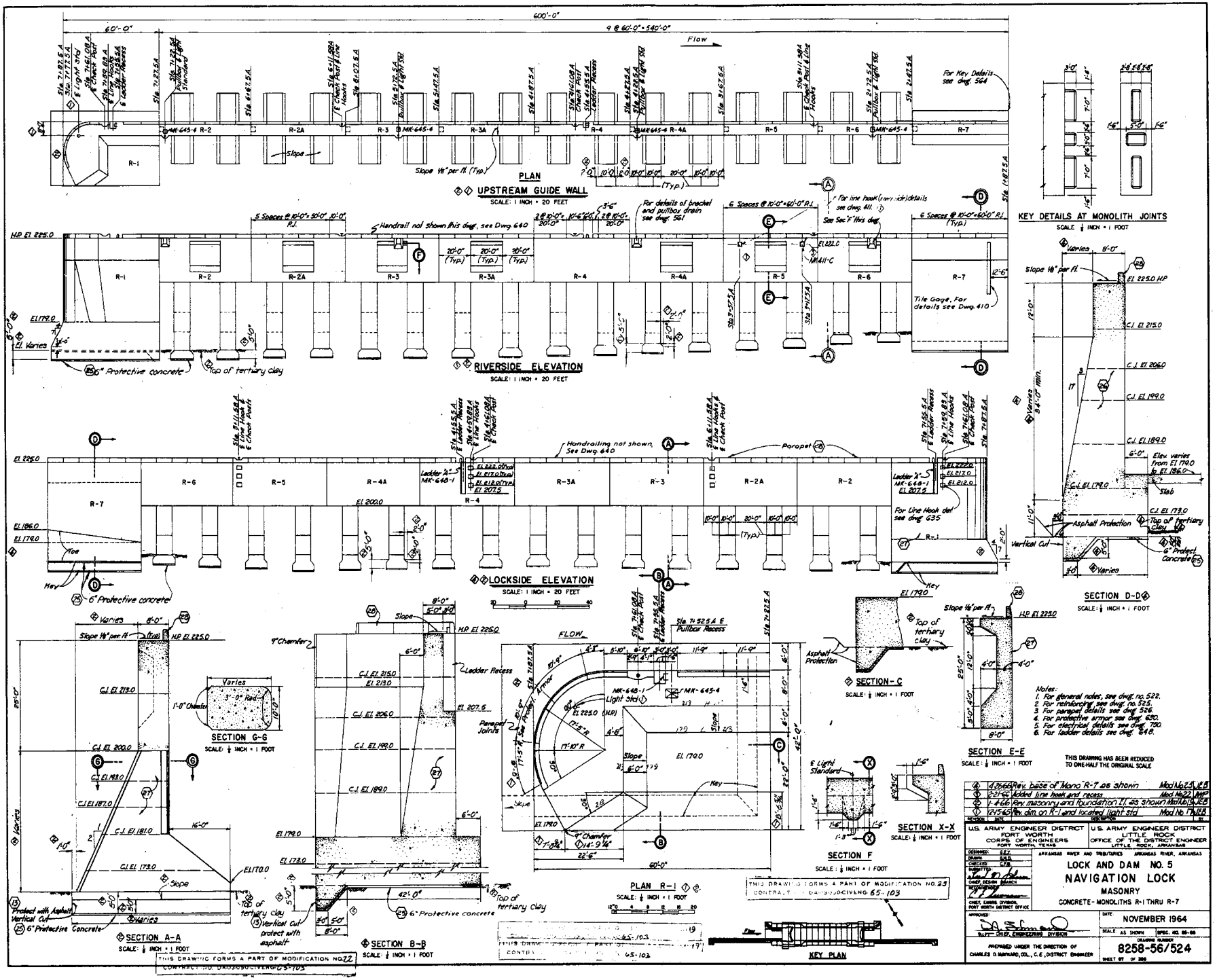
Barge impact

$\frac{552.96 \text{ K-FT}}{17 \text{ FT}} = 32.5 \text{ K/FT}$

$32.5 \text{ K/FT}(31 \text{ FT}) = 1008 \text{ K}$

CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT	ARKANSAS L&D 5 UPPER GUIDE WALL R-2A FOUNDATION SCALED FRO
LOADING CONDITION:	FILL LT.- 163 FILL RT.- 163	POOL LT. - 213 POOL RT. - 213
COMPUTED BY: JDC. SEE DWG 524	CHECKED BY DPS 10/28/04	DATE 19-Oct-04





PLAN
UPSTREAM GUIDE WALL
SCALE: 1 INCH = 20 FEET
RIVERSIDE ELEVATION
SCALE: 1 INCH = 20 FEET
LOCKSIDE ELEVATION
SCALE: 1 INCH = 20 FEET
KEY DETAILS AT MONOLITH JOINTS
SCALE: 1/8 INCH = 1 FOOT
SECTION D-D
SCALE: 1/8 INCH = 1 FOOT
SECTION G-G
SCALE: 1/8 INCH = 1 FOOT
SECTION A-A
SCALE: 1/8 INCH = 1 FOOT
SECTION B-B
SCALE: 1/8 INCH = 1 FOOT
PLAN R-1
SCALE: 1/8 INCH = 1 FOOT
SECTION C
SCALE: 1/8 INCH = 1 FOOT
SECTION E-E
SCALE: 1/8 INCH = 1 FOOT
SECTION F
SCALE: 1/8 INCH = 1 FOOT
SECTION X-X
SCALE: 1/8 INCH = 1 FOOT
KEY PLAN
Notes:
1. For general notes, see dwg. no. 522.
2. For reinforcing, see dwg. no. 525.
3. For parapet details see dwg. 526.
4. For protective armor see dwg. 630.
5. For electrical details see dwg. 750.
6. For ladder details see dwg. 648.
THIS DRAWING HAS BEEN REDUCED TO ONE-HALF THE ORIGINAL SCALE
THIS DRAWING FORMS A PART OF MODIFICATION NO. 22
THIS DRAWING FORMS A PART OF MODIFICATION NO. 23
U.S. ARMY ENGINEER DISTRICT FORT WORTH CORPS OF ENGINEERS FORT WORTH, TEXAS
U.S. ARMY ENGINEER DISTRICT LITTLE ROCK OFFICE OF THE DISTRICT ENGINEER LITTLE ROCK, ARKANSAS
ARKANSAS RIVER AND TRIBUTARIES ARKANSAS RIVER, ARKANSAS
LOCK AND DAM NO. 5
NAVIGATION LOCK
MASONRY
CONCRETE - MONOLITHS R-1 THRU R-7
NOVEMBER 1964
8258-56/524

CORPS OF ENGINEERS, U.S. ARMY — BARGE IMPACT 342 — ARKANSAS L&D 5 UPPER GUIDE WALL R-2A FOUNDATION SCALED FRC

LOADING CONDITION: FILL LT.- 163.000 FILL RT.- 163.000 POOL LT. - 213 POOL RT. - 213

COMPUTED BY: JDC. SEE DWG 524 CHECKED BY DPS 10/28/04 DATE 28-Oct-04

	FORCES			LENG	VERTICAL	HORIZONTAL	ARM	MOMENTS -	MOMENTS +
C1	4 X	2 X	0.15 X	60 1	72.000		19.00		1368.00
C2	4 X	2 X	0.15 X	60 0.5	36.000		19.67		708.00
C3	4 X	12 X	0.15 X	60 1	432.000		23.00		9936.00
C4	4 X	13 X	0.0875 X	60 1	273.000		23.00		6279.00
C5	4 X	4 X	0.0875 X	60 0.5	42.000		19.67		826.00
C6	4 X	5 X	0.0875 X	60 1	105.000		19.00		1995.00
C7	8 X	32 X	0.0875 X	20 1	448.000		21.00		9408.00
C8	16 X	32 X	0.0875 X	20 0.5	448.000		11.67		5226.67
C9	16 X	11 X	0.0875 X	20 0.5	154.000		30.33		4671.33
C10	16 X	2 X	0.0875 X	20 1	56.000		33.00		1848.00
C11	41 X	5 X	0.0875 X	20 1	358.750		20.50		7354.38
C12	4 X	2 X	0.15 X	40 0.5	24.000		18.33		440.00
C13	4 X	8 X	0.15 X	40 1	192.000		19.00		3648.00
C14	4 X	4 X	0.0875 X	40 1	56.000		19.00		1064.00
C15	4 X	5 X	0.0875 X	40 0.5	35.000		18.33		641.67
					0.000		0.00		0.00
					0.000		0.00		0.00
		SUB-TOTAL			2731.750				55414.04
W1					0.000		0.00		0.00
W2					0.000		12.00		0.00
W3					0.000		24.50		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
E1					0.000		0.00		0.00
E2					0.000		0.00		0.00
E3					0.000		0.00		0.00
E4					0.000		0.00		0.00
E5					0.000		0.00		0.00
E6					0.000		0.00		0.00
U1	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U2	0.000 X	-59 X	0.0625	0	0.000		8.00	0.00	
U3	41 X	50 X	0.0625	0	0.000		20.50	0.00	
H1	50 X	50 X	0.0625 X	0.5		> 78.125	16.67		1302.08
H2	50 X	50 X	0.0625 X	0.5		< -78.125	16.67	-1302.08	
H3	0 X	0 X	0.0625 X	0.5		< 0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5		< 0.000	0.00		0.00
H5	BARGE IMPACT					> -342.000	53.00		-18126.00
H5	HORIZONTAL FORCE					> 0	0.00		0.00
H7	HORIZONTAL FORCE					> 0	0		0.00
H8	HORIZONTAL FORCE					> 0	0		0.00

B=	41	Vo=	2731.8	SUM	2731.750	SUM H -342.000	SUM -M -1302.08	SUM +M 38590.13
H/V=	0.13							SUM -M -1302.08
e=	-6.85						Mo= 37288.04	
%=	99.88					M/V= 13.65		SUM M 37288.04
FS=	0.00					B/4= 10.25		
MC=	13.65							40.95 0.00

$$Kmca = \frac{3 \times Mo - 1.5 \times w \times B \times B}{Vo - W \times B} = \frac{40.950}{}$$

$$F.P. = \frac{133.420}{0.000}$$

CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT 517	ARKANSAS L&D 5 UPPER GUIDE WALL R-2A FOUNDATION SCALED FRC

LOADING CONDITION: FILL LT.- 163.000 FILL RT.- 163.000 POOL LT. - 213 POOL RT. - 213

COMPUTED BY: JDC. SEE DWG 524 CHECKED BY DPS 10/28/04 DATE 28-Oct-04

	FORCES	LENG	VERTICAL	HORIZONTAL	ARM	- MOMENTS	+
C1	4 X 2 X 0.15 X	60 1	72.000		19.00		1368.00
C2	4 X 2 X 0.15 X	60 0.5	36.000		19.67		708.00
C3	4 X 12 X 0.15 X	60 1	432.000		23.00		9936.00
C4	4 X 13 X 0.0875 X	60 1	273.000		23.00		6279.00
C5	4 X 4 X 0.0875 X	60 0.5	42.000		19.67		826.00
C6	4 X 5 X 0.0875 X	60 1	105.000		19.00		1995.00
C7	8 X 32 X 0.0875 X	20 1	448.000		21.00		9408.00
C8	16 X 32 X 0.0875 X	20 0.5	448.000		11.67		5226.67
C9	16 X 11 X 0.0875 X	20 0.5	154.000		30.33		4671.33
C10	16 X 2 X 0.0875 X	20 1	56.000		33.00		1848.00
C11	41 X 5 X 0.0875 X	20 1	358.750		20.50		7354.38
C12	4 X 2 X 0.15 X	40 0.5	24.000		18.33		440.00
C13	4 X 8 X 0.15 X	40 1	192.000		19.00		3648.00
C14	4 X 4 X 0.0875 X	40 1	56.000		19.00		1064.00
C15	4 X 5 X 0.0875 X	40 0.5	35.000		18.33		641.67
			0.000		0.00		0.00
			0.000		0.00		0.00
	SUB-TOTAL		2731.750				55414.04
W1			0.000		0.00		0.00
W2			0.000		12.00		0.00
W3			0.000		24.50		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
E1			0.000		0.00		0.00
E2			0.000		0.00		0.00
E3			0.000		0.00		0.00
E4			0.000		0.00		0.00
E5			0.000		0.00		0.00
E6			0.000		0.00		0.00
U1	0.000 X 0 X 0.0625		0.000		0.00	0.00	
U2	0.000 X -59 X 0.0625	0	0.000		8.00	0.00	
U3	41 X 50 X 0.0625	0	0.000		20.50	0.00	
H1	50 X 50 X 0.0625 X	0.5		> 78.125	16.67		1302.08
H2	50 X 50 X 0.0625 X	0.5		< -78.125	16.67	-1302.08	
H3	0 X 0 X 0.0625 X	0.5		< 0.000	0.00	0.00	
H4	0 X 0 X 0.0625 X	0.5		< 0.000	0.00		0.00
H5	BARGE IMPACT			> -517.000	53.00		-27401.00
H6	HORIZONTAL FORCE			> 0	0.00		0.00
H7	HORIZONTAL FORCE			> 0	0		0.00
H8	HORIZONTAL FORCE			> 0	0		0.00
			SUM 2731.750	SUM H -517.000		SUM -M -1302.08	SUM +M 29315.13
							SUM -M -1302.08
						Mo= 28013.04	
							SUM M 28013.04

B= 41 Vo= 2731.8
H/V= 0.19
e= -10.25
%= 75.03
FS= 0.00
MC= 10.25

M/V= 10.25
B/4= 10.25

30.76 0.00

$$Kmca = \frac{3 \times Mo - 1.5 \times w \times B \times B}{Vo - W \times B} = \frac{177.595}{30.764} \quad F.P. = \frac{}{0.000}$$

CORPS OF ENGINEERS, U.S. ARMY | BARGE IMPACT 693 | ARKANSAS L&D 5 UPPER GUIDE WALL R-2A FOUNDATION SCALED FRC

LOADING CONDITION: | FILL LT.- 163.000 | FILL RT.- 163.000 | POOL LT. - 213 | POOL RT. - 213

COMPUTED BY: JDC. | SEE DWG 524 | CHECKED BY DPS 11/20/04 | DATE 28-Oct-04

	FORCES				LENG	VERTICAL	HORIZONTAL	ARM	MOMENTS -	MOMENTS +
C1	4 X	2 X	0.15 X	60	1	72.000		19.00		1368.00
C2	4 X	2 X	0.15 X	60	0.5	36.000		19.67		708.00
C3	4 X	12 X	0.15 X	60	1	432.000		23.00		9936.00
C4	4 X	13 X	0.0875 X	60	1	273.000		23.00		6279.00
C5	4 X	4 X	0.0875 X	60	0.5	42.000		19.67		826.00
C6	4 X	5 X	0.0875 X	60	1	105.000		19.00		1995.00
C7	8 X	32 X	0.0875 X	20	1	448.000		21.00		9408.00
C8	16 X	32 X	0.0875 X	20	0.5	448.000		11.67		5226.67
C9	16 X	11 X	0.0875 X	20	0.5	154.000		30.33		4671.33
C10	16 X	2 X	0.0875 X	20	1	56.000		33.00		1848.00
C11	41 X	5 X	0.0875 X	20	1	358.750		20.50		7354.38
C12	4 X	2 X	0.15 X	40	0.5	24.000		18.33		440.00
C13	4 X	8 X	0.15 X	40	1	192.000		19.00		3648.00
C14	4 X	4 X	0.0875 X	40	1	56.000		19.00		1064.00
C15	4 X	5 X	0.0875 X	40	0.5	35.000		18.33		641.67
						0.000		0.00		0.00
						0.000		0.00		0.00
		SUB-TOTAL				2731.750				55414.04
W1						0.000		0.00		0.00
W2						0.000		12.00		0.00
W3						0.000		24.50		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
E1						0.000		0.00		0.00
E2						0.000		0.00		0.00
E3						0.000		0.00		0.00
E4						0.000		0.00		0.00
E5						0.000		0.00		0.00
E6						0.000		0.00		0.00
U1	0.000 X	0 X	0.0625			0.000		0.00	0.00	
U2	0.000 X	-59 X	0.0625		0	0.000		8.00	0.00	
U3	41 X	50 X	0.0625		0	0.000		20.50	0.00	
H1	50 X	50 X	0.0625 X	0.5			> 78.125	16.67		1302.08
H2	50 X	50 X	0.0625 X	0.5			< -78.125	16.67	-1302.08	
H3	0 X	0 X	0.0625 X	0.5			< 0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5			< 0.000	0.00		0.00
H5	BARGE IMPACT						> -693.000	53.00		-36729.00
H6	HORIZONTAL FORCE						> 0	0.00		0.00
H7	HORIZONTAL FORCE						> 0	0		0.00
H8	HORIZONTAL FORCE						> 0	0		0.00

B=	41	Vo=	2731.8	SUM	2731.750	SUM H	-693.000	SUM -M	-1302.08	SUM +M	19987.13
H/V=	0.25									SUM -M	-1302.08
e=	-13.66								Mo= 18685.04		
%=	50.05					M/V=	6.84			SUM M	18685.04
FS=	0.00					B/4=	10.25				
MC=	6.84									20.52	0.00

$$Kmca = \frac{3 \times Mo - 1.5 \times w \times B \times B}{Vo - W \times B} \qquad 20.520 \qquad F.P. = \frac{266.254}{0.000}$$

CORPS OF ENGINEERS, U.S. ARMY — BARGE IMPACT 1045 — ARKANSAS L&D 5 UPPER GUIDE WALL R-2A FOUNDATION SCALED FRC

LOADING CONDITION: FILL LT.- 163.000 FILL RT.- 163.000 POOL LT. - 213 POOL RT. - 213

COMPUTED BY: JDC. SEE DWG 524 — CHECKED BY DPS 10/28/04 — DATE 28-Oct-04

	FORCES			LENG	VERTICAL	HORIZONTAL	ARM	MOMENTS -	MOMENTS +
C1	4 X	2 X	0.15 X	60 1	72.000		19.00		1368.00
C2	4 X	2 X	0.15 X	60 0.5	36.000		19.67		708.00
C3	4 X	12 X	0.15 X	60 1	432.000		23.00		9936.00
C4	4 X	13 X	0.0875 X	60 1	273.000		23.00		6279.00
C5	4 X	4 X	0.0875 X	60 0.5	42.000		19.67		826.00
C6	4 X	5 X	0.0875 X	60 1	105.000		19.00		1995.00
C7	8 X	32 X	0.0875 X	20 1	448.000		21.00		9408.00
C8	16 X	32 X	0.0875 X	20 0.5	448.000		11.67		5226.67
C9	16 X	11 X	0.0875 X	20 0.5	154.000		30.33		4671.33
C10	16 X	2 X	0.0875 X	20 1	56.000		33.00		1848.00
C11	41 X	5 X	0.0875 X	20 1	358.750		20.50		7354.38
C12	4 X	2 X	0.15 X	40 0.5	24.000		18.33		440.00
C13	4 X	8 X	0.15 X	40 1	192.000		19.00		3648.00
C14	4 X	4 X	0.0875 X	40 1	56.000		19.00		1064.00
C15	4 X	5 X	0.0875 X	40 0.5	35.000		18.33		641.67
					0.000		0.00		0.00
					0.000		0.00		0.00
			SUB-TOTAL		2731.750				55414.04
W1					0.000		0.00		0.00
W2					0.000		12.00		0.00
W3					0.000		24.50		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
E1					0.000		0.00		0.00
E2					0.000		0.00		0.00
E3					0.000		0.00		0.00
E4					0.000		0.00		0.00
E5					0.000		0.00		0.00
E6					0.000		0.00		0.00
U1	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U2	0.000 X	-59 X	0.0625	0	0.000		8.00	0.00	
U3	41 X	50 X	0.0625	0	0.000		20.50	0.00	
H1	50 X	50 X	0.0625 X	0.5		> 78.125	16.67		1302.08
H2	50 X	50 X	0.0625 X	0.5		< -78.125	16.67	-1302.08	
H3	0 X	0 X	0.0625 X	0.5		< 0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5		< 0.000	0.00		0.00
H5	BARGE IMPACT					> -1045.000	53.00		-55385.00
H6	HORIZONTAL FORCE					> 0	0.00		0.00
H7	HORIZONTAL FORCE					> 0	0		0.00
H8	HORIZONTAL FORCE					> 0	0		0.00

B= 41 Vo= 2731.8 — SUM 2731.750 — SUM H -1045.000 — SUM -M -1302.08 — SUM +M 1331.13 — SUM -M -1302.08

H/V= 0.38

e= -20.49 — Mo= 29.04

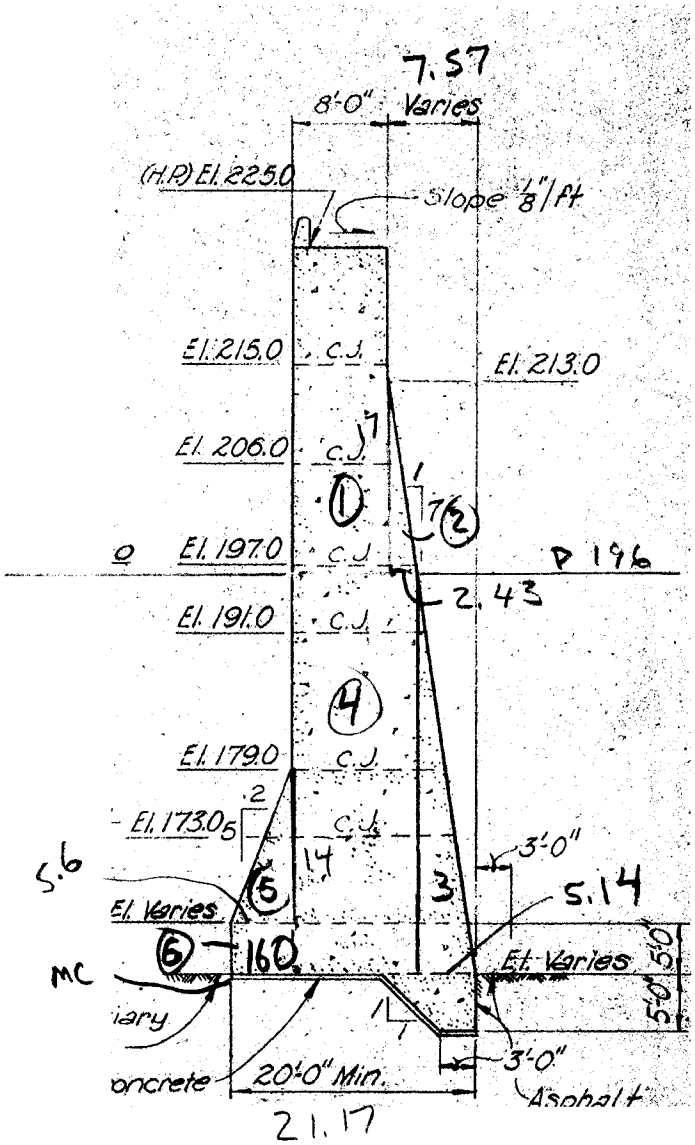
%= 0.08 — M/V= 0.01 — SUM M 29.04

FS= 0.00 — B/4= 10.25

MC= 0.01 — 0.03 0.00

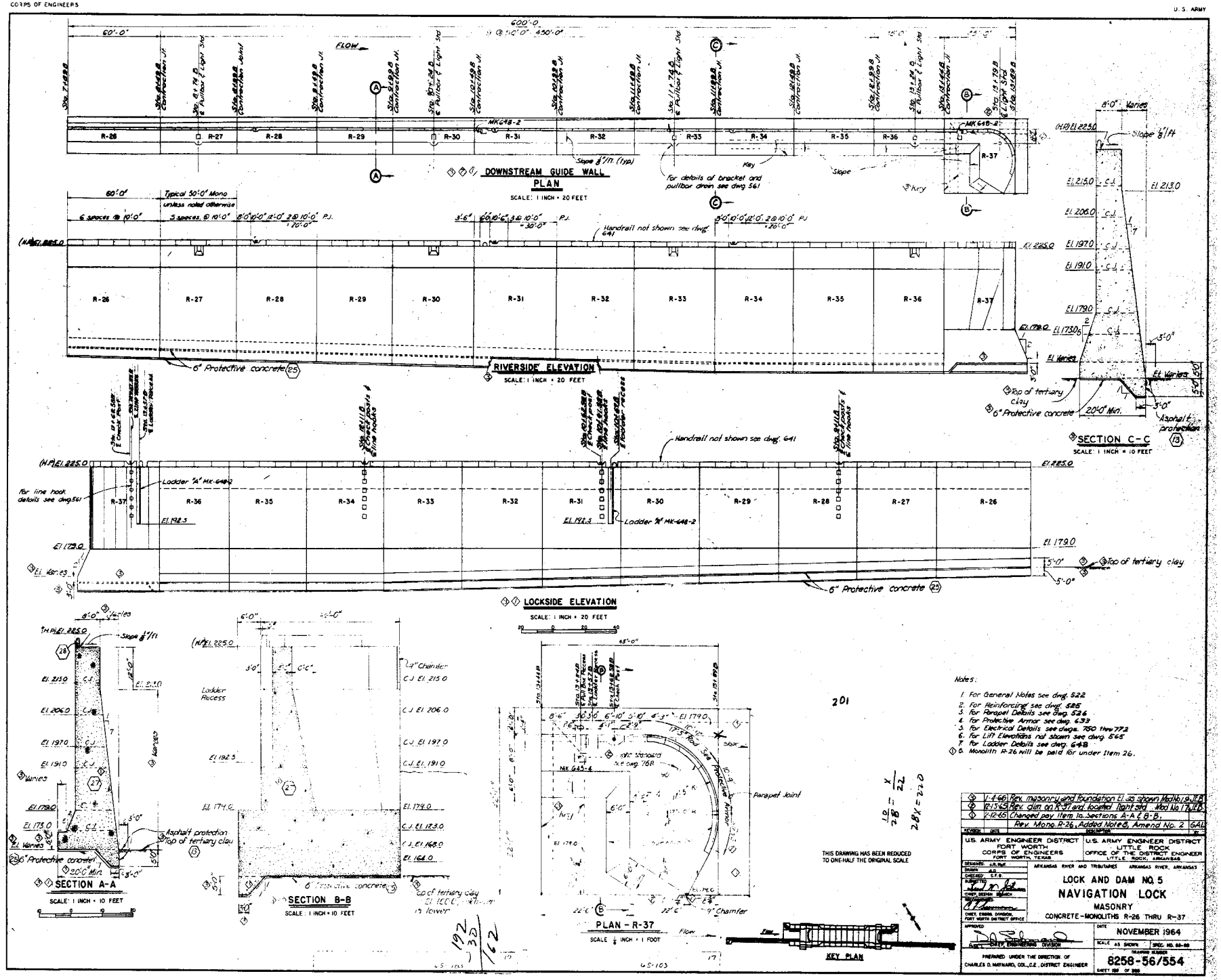
Kmca= (3 X Mo - 1.5 X w X B X B) / (Vo - W x B) = 0.032 — F. P. = ######### / 0.000

CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT	ARKANSAS L&D 5 LOWER GUIDE WALL R-36 - FND EL. 160 - IGNOR
LOADING CONDITION:	FILL LT.- 160 FILL RT.- 160	POOL LT. - .196 POOL RT. - .196
COMPUTED BY: JDC. SEE DWG -56/554	CHECKED BY DB 4/4/05	DATE 28-Oct-04



CORPS OF ENGINEERS

U. S. ARMY



Notes:

1. For General Notes see dwg. 522
2. For Reinforcing see dwg. 525
3. For Parapet Details see dwg. 526
4. For Protective Armor see dwg. 633
5. For Electrical Details see dwgs. 750 thru 772
6. For Lift Elevations not shown see dwg. 565
7. For Ladder Details see dwg. 648
8. Monolith R-26 will be paid for under Item 26.

REVISION	DATE	DESCRIPTION	BY
3	1-4-66	Rev. masonry and foundation El. as shown Mod No. 19	JEB
2	12-15-65	Rev. dim. on R-37 and located light std. Mod No. 17	JEB
1	2-12-65	Changed pay item to Sections A-A & B-B. Rev. Mono. R-26, Added Note 8, Amend No. 2	GAL

U.S. ARMY ENGINEER DISTRICT FORT WORTH CORPS OF ENGINEERS FORT WORTH, TEXAS

U.S. ARMY ENGINEER DISTRICT LITTLE ROCK OFFICE OF THE DISTRICT ENGINEER LITTLE ROCK, ARKANSAS

ARKANSAS RIVER AND TRIBUTARIES ARKANSAS RIVER, ARKANSAS

DESIGNED: J.R.McK. DRAWN: A.D. CHECKED: C.F.B. SUBMITTED: CHIEF, DESIGN BRANCH RECOMMENDED: CHIEF, ENGRG. DIVISION, FORT WORTH DISTRICT OFFICE

LOCK AND DAM NO. 5
NAVIGATION LOCK
MASONRY
CONCRETE-MONOLITHS R-26 THRU R-37

APPROVED: CHIEF, ENGINEERING DIVISION

DATE: NOVEMBER 1964

SCALE: AS SHOWN SPEC. NO. 68-88

PREPARED UNDER THE DIRECTION OF CHARLES D. MAYNARD, COL., C.E., DISTRICT ENGINEER

DRAWING NUMBER: 8258-56/554

SHEET 198 OF 388

CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT 328	ARKANSAS L&D 5 LOWER GUIDE WALL R-36 - FND EL. 160 - IGNOR

LOADING CONDITION: FILL LT.- 160 FILL RT.- 160 POOL LT. - 196 POOL RT. - 196

COMPUTED BY: JDC. SEE DWG -56/554 CHECKED BY DPS 11/2/04 DATE 28-Oct-04

	FORCES			LENG 45	VERTICAL	HORIZONTAL	ARM	- MOMENTS	+
C1	8.00 X 29.00 X	0.15 X	45 1		1566.000		9.60		15033.60
C2	2.43 X 17.00 X	0.15 X	45 0.5		139.421		14.41		2009.06
C3	5.14 X 36.00 X	0.0875 X	45 0.5		364.298		17.74		6463.85
C4	10.43 X 36.00 X	0.0875 X	45 1		1478.453		10.82		15989.46
C5	5.60 X 14.00 X	0.0875 X	45 0.5		154.350		3.73		576.24
C6	~~5.60~~ X 5.00 X	0.0875 X	45 1		110.250		2.80		308.70
	~~ERR~~ OK				0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
	SUB-TOTAL				3812.771				40380.92
					0.000		0.00		0.00
					0.000		12.33		0.00
					0.000		15.00		0.00
					0.000		16.89		0.00
					0.000		22.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
E1					0.000		0.00		0.00
E2					0.000		0.00		0.00
E3					0.000		0.00		0.00
E4					0.000		0.00		0.00
E5					0.000		0.00		0.00
E6					0.000		0.00		0.00
U1	0.000 X 0 X	0.0625			0.000		0.00	0.00	
U2	0.000 X 0 X	0.0625			0.000		0.00	0.00	
U3	5.6 X 36 X	0.0625		0	0.000		2.80	0.00	
H1	36 X 36 X	0.0625 X	0.5			> 40.500	12.00		486.00
H2	36 X 36 X	0.0625 X	0.5			< -40.500	12.00	-486.00	
H3	0 X 0 X	0.0625 X	0.5			< 0.000	0.00	0.00	
H4	0 X 0 X	0.0625 X	0.5			< 0.000	0.00		0.00
H5	BARGE IMPACT					> 328.000	41.00		13448.00
H6	HORIZONTAL FORCE					> 0	0.00		0.00
H7	HORIZONTAL FORCE					> 0	0		0.00
H8	HORIZONTAL FORCE					> 0	0		0.00

B=	21.17	Vo=	3812.8	SUM	3812.771	SUM H	328.000	SUM -M	-486.00	SUM +M	54314.92
H/V=	0.09									SUM -M	486.00
e=	3.53							Mo=	53828.92		
%=	99.93					M/V=	14.12			SUM M	53828.92
FS=	0.00					B/4=	5.29				
MC=	14.12									21.16	0.00

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = 21.156 \qquad F.P. = \frac{360.446}{0.000}$$

CORPS OF ENGINEERS, U.S. ARMY — BARGE IMPACT 491 — ARKANSAS L&D 5 LOWER GUIDE WALL R-36 - FND EL. 160 - IGNOR

LOADING CONDITION: FILL LT.- 160 FILL RT.- 160 POOL LT. - 196 POOL RT. - 196

COMPUTED BY: JDC. SEE DWG -56/554 — CHECKED BY — DATE 28-Oct-04

	FORCES			LENG 45	VERTICAL	HORIZONTAL	ARM	- MOMENTS	+
C1	8.00 X	29.00 X	0.15 X	45 1	1566.000		9.60		15033.60
C2	2.43 X	17.00 X	0.15 X	45 0.5	139.421		14.41		2009.06
C3	5.14 X	36.00 X	0.0875 X	45 0.5	364.298		17.74		6463.85
C4	10.43 X	36.00 X	0.0875 X	45 1	1478.453		10.82		15989.46
C5	5.60 X	14.00 X	0.0875 X	45 0.5	154.350		3.73		576.24
C6	5.60 X	5.00 X	0.0875 X	45 1	110.250		2.80		308.70
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
			SUB-TOTAL		3812.771				40380.92
					0.000		0.00		0.00
					0.000		12.33		0.00
					0.000		15.00		0.00
					0.000		16.89		0.00
					0.000		22.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
E1					0.000		0.00		0.00
E2					0.000		0.00		0.00
E3					0.000		0.00		0.00
E4					0.000		0.00		0.00
E5					0.000		0.00		0.00
E6					0.000		0.00		0.00
U1	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U2	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U3	5.6 X	36 X	0.0625	0	0.000		2.80	0.00	
H1	36 X	36 X	0.0625 X	0.5		> 40.500	12.00		486.00
H2	36 X	36 X	0.0625 X	0.5		< -40.500	12.00	-486.00	
H3	0 X	0 X	0.0625 X	0.5		< 0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5		< 0.000	0.00		0.00
H5	BARGE IMPACT					> 491.000	41.00		20131.00
H6	HORIZONTAL FORCE					> 0	0.00		0.00
H7	HORIZONTAL FORCE					> 0	0		0.00
H8	HORIZONTAL FORCE					> 0	0		0.00

B=	21.17	Vo=	3812.8	SUM	3812.771	SUM H	491.000	SUM -M	-486.00
H/V=	0.13								
e=	5.29							Mo=	60511.92
%=	75.09					M/V=	15.87		
FS=	0.00					B/4=	5.29		
MC=	15.87								

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = 15.897$$

$$F.P. = \frac{479.671}{0.000}$$

SUM +M	60997.92
SUM -M	-486.00
SUM M	60511.92
15.90	0.00

CORPS OF ENGINEERS, U.S. ARMY — BARGE IMPACT 655 — ARKANSAS L&D 5 LOWER GUIDE WALL R-36 - FND EL. 160 - IGNOR

LOADING CONDITION: FILL LT.- 160 FILL RT.- 160 POOL LT. - 196 POOL RT. - 196

COMPUTED BY: JDC. SEE DWG -56/554 — CHECKED BY — DATE 28-Oct-04

	FORCES			LENG 45	VERTICAL	HORIZONTAL		ARM	- MOMENTS	+
C1	8.00 X	29.00 X	0.15 X	45 1	1566.000			9.60		15033.60
C2	2.43 X	17.00 X	0.15 X	45 0.5	139.421			14.41		2009.06
C3	5.14 X	36.00 X	0.0875 X	45 0.5	364.298			17.74		6463.85
C4	10.43 X	36.00 X	0.0875 X	45 1	1478.453			10.82		15989.46
C5	5.60 X	14.00 X	0.0875 X	45 0.5	154.350			3.73		576.24
C6	5.60 X	5.00 X	0.0875 X	45 1	110.250			2.80		308.70
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
			SUB-TOTAL		3812.771					40380.92
					0.000			0.00		0.00
					0.000			12.33		0.00
					0.000			15.00		0.00
					0.000			16.89		0.00
					0.000			22.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
E1					0.000			0.00		0.00
E2					0.000			0.00		0.00
E3					0.000			0.00		0.00
E4					0.000			0.00		0.00
E5					0.000			0.00		0.00
E6					0.000			0.00		0.00
U1	0.000 X	0 X	0.0625		0.000			0.00	0.00	
U2	0.000 X	0 X	0.0625		0.000			0.00	0.00	
U3	5.6 X	36 X	0.0625	0	0.000			2.80	0.00	
H1	36 X	36 X	0.0625 X	0.5		>	40.500	12.00		486.00
H2	36 X	36 X	0.0625 X	0.5		<	-40.500	12.00	-486.00	
H3	0 X	0 X	0.0625 X	0.5		<	0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5		<	0.000	0.00		0.00
H5	BARGE IMPACT					>	655.000	41.00		26855.00
H6	HORIZONTAL FORCE					>	0	0.00		0.00
H7	HORIZONTAL FORCE					>	0	0		0.00
H8	HORIZONTAL FORCE					>	0	0		0.00
					SUM 3812.771	SUM H	655.000		SUM -M -486.00	SUM +M 67721.92
										SUM -M -486.00
									Mo= 67235.92	
										SUM M 67235.92
										10.61 0.00

B= 21.17 Vo= 3812.8
H/V= 0.17
e= 7.05
%= 50.10
FS= 0.00
MC= 17.63

M/V= 17.63
B/4= 5.29

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = 10.607$$

F. P. = 718.929 / 0.000

CORPS OF ENGINEERS, U.S. ARMY — BARGE IMPACT 983 — ARKANSAS L&D 5 LOWER GUIDE WALL R-36 - FND EL. 160 - IGNOR

LOADING CONDITION: FILL LT.- 160 FILL RT.- 160 POOL LT. - 196 POOL RT. - 196

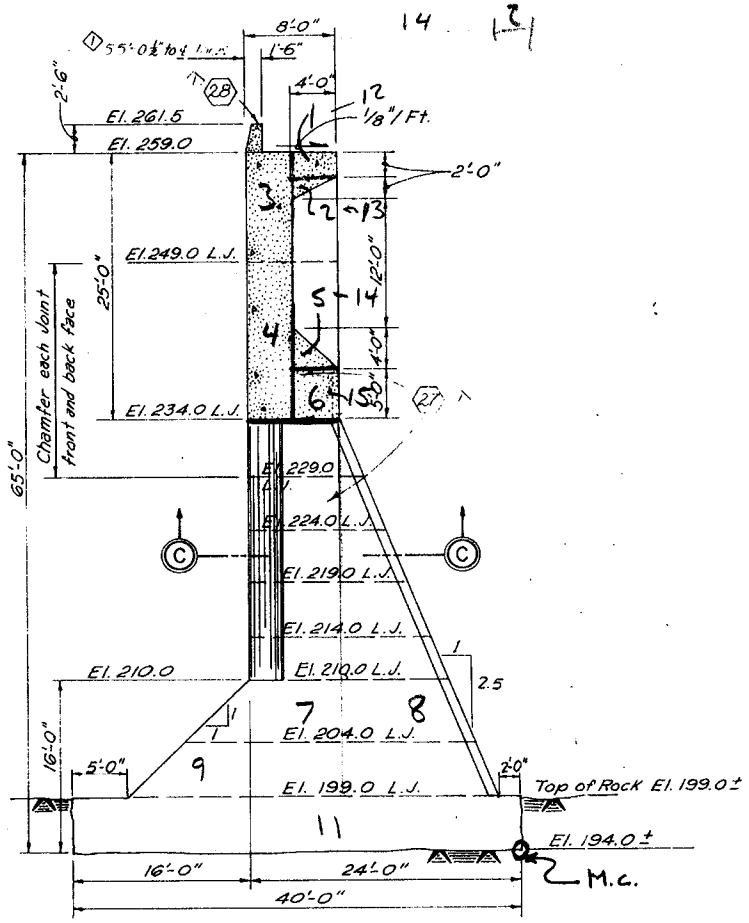
COMPUTED BY: JDC. SEE DWG -56/554 — CHECKED BY — DATE 28-Oct-04

	FORCES			LENG 45	VERTICAL	HORIZONTAL	ARM	- MOMENTS	+
C1	8.00 X	29.00 X	0.15 X	45 1	1566.000		9.60		15033.60
C2	2.43 X	17.00 X	0.15 X	45 0.5	139.421		14.41		2009.06
C3	5.14 X	36.00 X	0.0875 X	45 0.5	364.298		17.74		6463.85
C4	10.43 X	36.00 X	0.0875 X	45 1	1478.453		10.82		15989.46
C5	5.60 X	14.00 X	0.0875 X	45 0.5	154.350		3.73		576.24
C6	5.60 X	5.00 X	0.0875 X	45 1	110.250		2.80		308.70
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
			SUB-TOTAL		3812.771				40380.92
					0.000		0.00		0.00
					0.000		12.33		0.00
					0.000		15.00		0.00
					0.000		16.89		0.00
					0.000		22.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
E1					0.000		0.00		0.00
E2					0.000		0.00		0.00
E3					0.000		0.00		0.00
E4					0.000		0.00		0.00
E5					0.000		0.00		0.00
E6					0.000		0.00		0.00
U1	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U2	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U3	5.6 X	36 X	0.0625	0	0.000		2.80	0.00	
H1	36 X	36 X	0.0625 X	0.5		> 40.500	12.00		486.00
H2	36 X	36 X	0.0625 X	0.5		< -40.500	12.00	-486.00	
H3	0 X	0 X	0.0625 X	0.5		< 0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5		< 0.000	0.00		0.00
H5	BARGE IMPACT					> 983.000	41.00		40303.00
H6	HORIZONTAL FORCE					> 0	0.00		0.00
H7	HORIZONTAL FORCE					> 0	0		0.00
H8	HORIZONTAL FORCE					> 0	0		0.00

B=	21.17	Vo=	3812.8	SUM	3812.771	SUM H	983.000	SUM -M	-486.00	SUM +M	81169.92
H/V=	0.26									SUM -M	-486.00
e=	10.58							Mo=	80683.92		
%=	0.12					M/V=	21.16			SUM M	80683.92
FS=	0.00					B/4=	5.29				
MC=	21.16									0.03	0.00

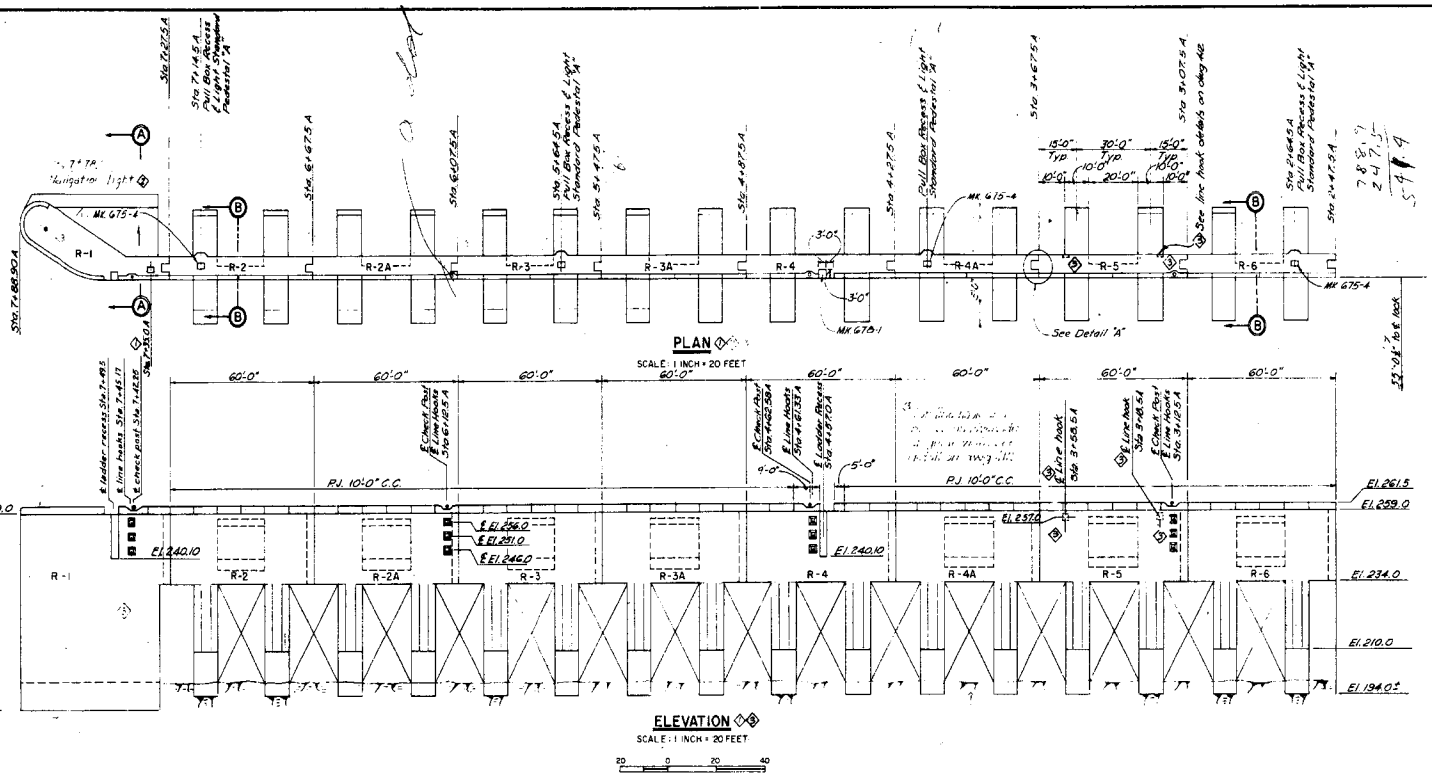
$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = 0.026 \qquad F.P. = \frac{\#\#\#\#\#\#\#\#}{0.000}$$

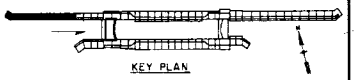
CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT	ARKANSAS L&D 7 UPPER GUIDE WALL R-2A
LOADING CONDITION:	FILL LT.- 194 FILL RT.- 194	POOL LT. - 249 POOL RT. - 249
COMPUTED BY: JDC. SEE DWG 519	CHECKED BY DB 10/28/04	DATE 19-Oct-04

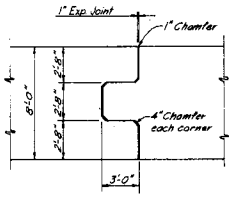


SECTION B-B

SCALE: 1/8 INCH = 1 FOOT

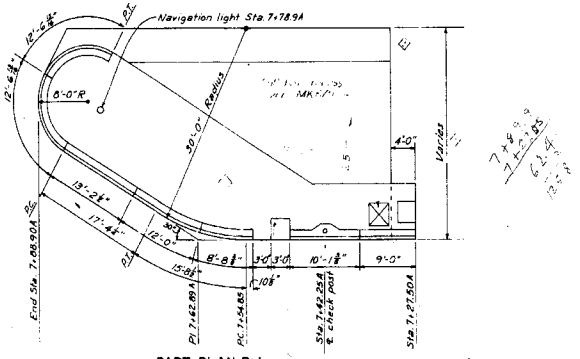


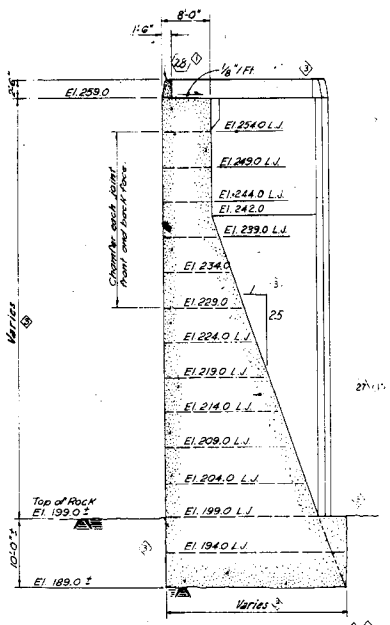


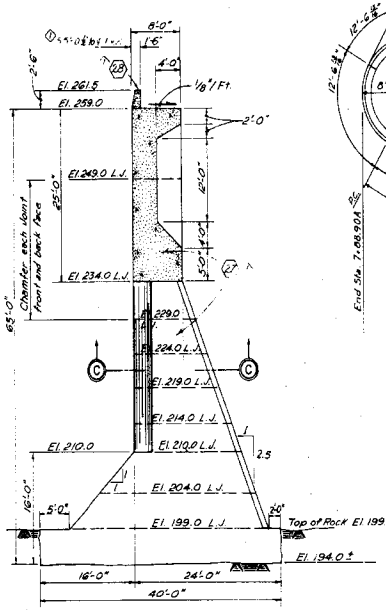


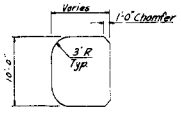
DETAIL "A"

SCALE: 1/2 INCH = 1 FOOT









THIS DRAWING HAS BEEN REDUCED TO ONE-HALF THE ORIGINAL SCALE

Notes:

1. For General Notes, see Dwg. 517
2. For Concrete Parapet Details, see Dwg. 558
3. For Wall Armor Details, see Dwg. 660
4. For Waterstops, see Dwg. 560
5. For Light Standard and Pull Box Details, see Dwg. 558
6. For Ladder Recess and Line Hook Details, see Dwg. 558 (1)
7. For Handrail Locations see Dwgs. 670
8. Concrete in guide wall will be paid for at contract price, Item No. 27, unless otherwise noted.

3	1-66	Revised monolith R-1 and added line hooks. Mod. No. 17	D.J.
2	4-1665	Added Navigation Light Amend. No. 3	D.W.
1	2-2565	Added item nos., relocate pull box, revise elev., change note 6 and added note 8. Amend No. 2.	DWP
NO.	DATE	DESCRIPTION	BY

US ARMY ENGINEER DISTRICT FORT WORTH CORPS OF ENGINEERS FORT WORTH, TEXAS

US ARMY ENGINEER DISTRICT LITTLE ROCK OFFICE OF THE DISTRICT ENGINEER LITTLE ROCK, ARKANSAS

ARKANSAS RIVER AND TRIBUTARIES ARKANSAS RIVER, ARKANSAS

DESIGNED A.D.D.
DRAWN D.F.T.
CHECKED C.F.B.
SUBMITTED
CHIEF, DESIGN BRANCH
RECOMMENDED
CHIEF, ENGINEERING DIVISION, FORT WORTH DISTRICT OFFICE
APPROVED
CHIEF, ENGINEERING DIVISION

LOCK AND DAM NO. 7
NAVIGATION LOCK
MASONRY
CONCRETE - MONOS. R-1 THRU R-6

DATE JANUARY 1965

SCALE AS SHOWN

PREPARED UNDER THE DIRECTION OF
CHARLES D. MAYNARD, COL., C.E., DISTRICT ENGINEER

DRAWING NUMBER 8495-61/519

SHEET 100 OF 265

CORPS OF ENGINEERS, U.S. ARMY — BARGE IMPACT 253 — ARKANSAS L&D 7 UPPER GUIDE WALL R-2A

LOADING CONDITION: FILL LT.- 194.000 FILL RT.- 194.000 POOL LT. - 249 POOL RT. - 249

COMPUTED BY: JDC. SEE DWG 519 — CHECKED BY DPS 10/28/04 — DATE 28-Oct-04

	FORCES			LENG	VERTICAL	HORIZONTAL	ARM	- MOMENTS	+ MOMENTS
C1	4 X	2 X	0.15 X	60 1	72.000		18.00		1296.00
C2	4 X	2 X	0.15 X	60 0.5	36.000		18.67		672.00
C3	4 X	10 X	0.15 X	60 1	360.000		22.00		7920.00
C4	4 X	15 X	0.0875 X	60 1	315.000		22.00		6930.00
C5	4 X	4 X	0.0875 X	60 0.5	42.000		18.67		784.00
C6	4 X	5 X	0.0875 X	60 1	105.000		18.00		1890.00
C7	8 X	35 X	0.0875 X	20 1	490.000		20.00		9800.00
C8	14 X	35 X	0.0875 X	20 0.5	428.750		11.33		4859.17
C9	11 X	11 X	0.0875 X	20 0.5	105.875		27.67		2929.21
C10	0 X	0 X	0.0875 X	20 1	0.000		0.00		0.00
C11	40 X	5 X	0.0875 X	20 1	350.000		20.00		7000.00
C12	4 X	2 X	0.15 X	40 0.5	24.000		17.33		416.00
C13	4 X	6 X	0.15 X	40 1	144.000		18.00		2592.00
C14	4 X	6 X	0.0875 X	40 1	84.000		18.00		1512.00
C15	4 X	4 X	0.0875 X	40 0.5	28.000		17.33		485.33
					0.000		0.00		0.00
					0.000		0.00		0.00
		SUB-TOTAL			2584.625				49085.71
W1					0.000		0.00		0.00
W2					0.000		0.00		0.00
W3					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
E1					0.000		0.00		0.00
E2					0.000		0.00		0.00
E3					0.000		0.00		0.00
E4					0.000		0.00		0.00
E5					0.000		0.00		0.00
E6					0.000		0.00		0.00
U1	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U2	0.000 X	-23 X	0.0625	0	0.000		8.00	0.00	
U3	40 X	55 X	0.0625	0	0.000		20.00	0.00	
H1	55 X	55 X	0.0625 X	0.5		> 94.531	18.33		1733.07
H2	55 X	55 X	0.0625 X	0.5		< -94.531	18.33	-1733.07	
H3	0 X	0 X	0.0625 X	0.5		< 0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5		< 0.000	0.00		0.00
H5	BARGE IMPACT					> -253.000	58.00		-14674.00
H6	HORIZONTAL FORCE					> 0	0.00		0.00
H7	HORIZONTAL FORCE					> 0	0		0.00
H8	HORIZONTAL FORCE					> 0	0		0.00

B=	40	Vo=	2584.6	SUM	2584.625	SUM H	-253.000	SUM -M	-1733.07	SUM +M	36144.78
H/V=	0.10									SUM -M	-1733.07
e=	-6.69								Mo= 34411.71		
%=	99.86					M/V=	13.31			SUM M	34411.71
FS=	0.00					B/4=	10.00				
MC=	13.31									39.94	0.00

$$Kmca = \frac{3 \times Mo - 1.5 \times w \times B \times B}{Vo - W \times B} = \frac{39.942}{}$$

F. P. = 129.419 / 0.000

CORPS OF ENGINEERS, U.S. ARMY — BARGE IMPACT 400 — ARKANSAS L&D 7 UPPER GUIDE WALL R-2A

LOADING CONDITION: FILL LT.- 194.000 FILL RT.- 194.000 POOL LT. - 249 POOL RT. - 249

COMPUTED BY: JDC. SEE DWG 519 CHECKED BY DPS 10/28/04 DATE 28-Oct-04

	FORCES			LENG	VERTICAL	HORIZONTAL	ARM	MOMENTS -	MOMENTS +
C1	4 X	2 X	0.15 X	60 1	72.000		18.00		1296.00
C2	4 X	2 X	0.15 X	60 0.5	36.000		18.67		672.00
C3	4 X	10 X	0.15 X	60 1	360.000		22.00		7920.00
C4	4 X	15 X	0.0875 X	60 1	315.000		22.00		6930.00
C5	4 X	4 X	0.0875 X	60 0.5	42.000		18.67		784.00
C6	4 X	5 X	0.0875 X	60 1	105.000		18.00		1890.00
C7	8 X	35 X	0.0875 X	20 1	490.000		20.00		9800.00
C8	14 X	35 X	0.0875 X	20 0.5	428.750		11.33		4859.17
C9	11 X	11 X	0.0875 X	20 0.5	105.875		27.67		2929.21
C10	0 X	0 X	0.0875 X	20 1	0.000		0.00		0.00
C11	40 X	5 X	0.0875 X	20 1	350.000		20.00		7000.00
C12	4 X	2 X	0.15 X	40 0.5	24.000		17.33		416.00
C13	4 X	6 X	0.15 X	40 1	144.000		18.00		2592.00
C14	4 X	6 X	0.0875 X	40 1	84.000		18.00		1512.00
C15	4 X	4 X	0.0875 X	40 0.5	28.000		17.33		485.33
					0.000		0.00		0.00
					0.000		0.00		0.00
			SUB-TOTAL		2584.625				49085.71
W1					0.000		0.00		0.00
W2					0.000		0.00		0.00
W3					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
E1					0.000		0.00		0.00
E2					0.000		0.00		0.00
E3					0.000		0.00		0.00
E4					0.000		0.00		0.00
E5					0.000		0.00		0.00
E6					0.000		0.00		0.00
U1	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U2	0.000 X	-23 X	0.0625	0	0.000		8.00	0.00	
U3	40 X	55 X	0.0625	0	0.000		20.00	0.00	
H1	55 X	55 X	0.0625 X	0.5		> 94.531	18.33		1733.07
H2	55 X	55 X	0.0625 X	0.5		< -94.531	18.33	-1733.07	
H3	0 X	0 X	0.0625 X	0.5		< 0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5		< 0.000	0.00		0.00
H5	BARGE IMPACT					> -400.000	58.00		-23200.00
H6	HORIZONTAL FORCE					> 0	0.00		0.00
H7	HORIZONTAL FORCE					> 0	0		0.00
H8	HORIZONTAL FORCE					> 0	0		0.00

B=	40	Vo=	2584.6	SUM	2584.625	SUM H	-400.000	SUM -M	-1733.07	SUM +M	27618.78
H/V=	0.15									SUM -M	-1733.07
e=	-9.98								Mo= 25885.71		
%=	75.11					M/V=	10.02			SUM M	25885.71
FS=	0.00					B/4=	10.00				
MC=	10.02									30.05	0.00

$$Kmca = \frac{3 \times Mo - 1.5 \times w \times B \times B}{Vo - W \times B} = \frac{30.046}{}$$

F. P. = 172.046 / 0.000

CORPS OF ENGINEERS, U.S. ARMY — BARGE IMPACT 549 — ARKANSAS L&D 7 UPPER GUIDE WALL R-2A

LOADING CONDITION: FILL LT.- 194.000 FILL RT.- 194.000 POOL LT. - 249 POOL RT. - 249

COMPUTED BY: JDC. SEE DWG 519 — CHECKED BY DPS 11/28/04 — DATE 28-Oct-04

	FORCES			LENG	VERTICAL	HORIZONTAL	ARM	- MOMENTS	+
C1	4 X	2 X	0.15 X	60 1	72.000		18.00		1296.00
C2	4 X	2 X	0.15 X	60 0.5	36.000		18.67		672.00
C3	4 X	10 X	0.15 X	60 1	360.000		22.00		7920.00
C4	4 X	15 X	0.0875 X	60 1	315.000		22.00		6930.00
C5	4 X	4 X	0.0875 X	60 0.5	42.000		18.67		784.00
C6	4 X	5 X	0.0875 X	60 1	105.000		18.00		1890.00
C7	8 X	35 X	0.0875 X	20 1	490.000		20.00		9800.00
C8	14 X	35 X	0.0875 X	20 0.5	428.750		11.33		4859.17
C9	11 X	11 X	0.0875 X	20 0.5	105.875		27.67		2929.21
C10	0 X	0 X	0.0875 X	20 1	0.000		0.00		0.00
C11	40 X	5 X	0.0875 X	20 1	350.000		20.00		7000.00
C12	4 X	2 X	0.15 X	40 0.5	24.000		17.33		416.00
C13	4 X	6 X	0.15 X	40 1	144.000		18.00		2592.00
C14	4 X	6 X	0.0875 X	40 1	84.000		18.00		1512.00
C15	4 X	4 X	0.0875 X	40 0.5	28.000		17.33		485.33
					0.000		0.00		0.00
					0.000		0.00		0.00
			SUB-TOTAL		2584.625				49085.71
W1					0.000		0.00		0.00
W2					0.000		0.00		0.00
W3					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
E1					0.000		0.00		0.00
E2					0.000		0.00		0.00
E3					0.000		0.00		0.00
E4					0.000		0.00		0.00
E5					0.000		0.00		0.00
E6					0.000		0.00		0.00
U1	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U2	0.000 X	-23 X	0.0625	0	0.000		8.00	0.00	
U3	40 X	55 X	0.0625	0	0.000		20.00	0.00	
H1	55 X	55 X	0.0625 X	0.5		> 94.531	18.33		1733.07
H2	55 X	55 X	0.0625 X	0.5		< -94.531	18.33	-1733.07	
H3	0 X	0 X	0.0625 X	0.5		< 0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5		< 0.000	0.00		0.00
H5	BARGE IMPACT					> -549.000	58.00		-31842.00
H6	HORIZONTAL FORCE					> 0	0.00		0.00
H7	HORIZONTAL FORCE					> 0	0		0.00
H8	HORIZONTAL FORCE					> 0	0		0.00

B=	40	Vo=	2584.6	SUM	2584.625	SUM H	-549.000	SUM -M	-1733.07	SUM +M	18976.78
H/V=	0.21									SUM -M	-1733.07
e=	-13.33							Mo=	17243.71		
%=	50.04					M/V=	6.67			SUM M	17243.71
FS=	0.00					B/4=	10.00				
MC=	6.67									20.01	0.00

$$Kmca = \frac{3 \times Mo - 1.5 \times w \times B \times B}{Vo - W \times B} = \frac{20.015}{}$$

F. P. = 258.270 / 0.000

CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT 846	ARKANSAS L&D 7 UPPER GUIDE WALL R-2A

LOADING CONDITION: FILL LT.- 194.000 FILL RT.- 194.000 POOL LT. - 249 POOL RT. - 249

COMPUTED BY: JDC. SEE DWG 519 CHECKED BY DPS 10/28/04 DATE 28-Oct-04

	FORCES				LENG	VERTICAL	HORIZONTAL	ARM	- MOMENTS	+
C1	4 X	2 X	0.15 X	60	1	72.000		18.00		1296.00
C2	4 X	2 X	0.15 X	60	0.5	36.000		18.67		672.00
C3	4 X	10 X	0.15 X	60	1	360.000		22.00		7920.00
C4	4 X	15 X	0.0875 X	60	1	315.000		22.00		6930.00
C5	4 X	4 X	0.0875 X	60	0.5	42.000		18.67		784.00
C6	4 X	5 X	0.0875 X	60	1	105.000		18.00		1890.00
C7	8 X	35 X	0.0875 X	20	1	490.000		20.00		9800.00
C8	14 X	35 X	0.0875 X	20	0.5	428.750		11.33		4859.17
C9	11 X	11 X	0.0875 X	20	0.5	105.875		27.67		2929.21
C10	0 X	0 X	0.0875 X	20	1	0.000		0.00		0.00
C11	40 X	5 X	0.0875 X	20	1	350.000		20.00		7000.00
C12	4 X	2 X	0.15 X	40	0.5	24.000		17.33		416.00
C13	4 X	6 X	0.15 X	40	1	144.000		18.00		2592.00
C14	4 X	6 X	0.0875 X	40	1	84.000		18.00		1512.00
C15	4 X	4 X	0.0875 X	40	0.5	28.000		17.33		485.33
						0.000		0.00		0.00
						0.000		0.00		0.00
			SUB-TOTAL			2584.625				49085.71
W1						0.000		0.00		0.00
W2						0.000		0.00		0.00
W3						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
E1						0.000		0.00		0.00
E2						0.000		0.00		0.00
E3						0.000		0.00		0.00
E4						0.000		0.00		0.00
E5						0.000		0.00		0.00
E6						0.000		0.00		0.00
U1	0.000 X	0 X	0.0625			0.000		0.00	0.00	
U2	0.000 X	-23 X	0.0625		0	0.000		8.00	0.00	
U3	40 X	55 X	0.0625		0	0.000		20.00	0.00	
H1	55 X	55 X	0.0625 X	0.5			> 94.531	18.33		1733.07
H2	55 X	55 X	0.0625 X	0.5			< -94.531	18.33	-1733.07	
H3	0 X	0 X	0.0625 X	0.5			< 0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5			< 0.000	0.00		0.00
H5	BARGE IMPACT						> -846.000	58.00		-49068.00
H6	HORIZONTAL FORCE						> 0	0.00		0.00
H7	HORIZONTAL FORCE						> 0	0		0.00
H8	HORIZONTAL FORCE						> 0	0		0.00
						SUM 2584.625	SUM H -846.000		SUM -M -1733.07	SUM +M 1750.78
										SUM -M -1733.07
									Mo= 17.71	
										SUM M 17.71

B= 40 Vo= 2584.6
H/V= 0.33
e= -19.99
ϕ= 0.05
FS= 0.00
MC= 0.01

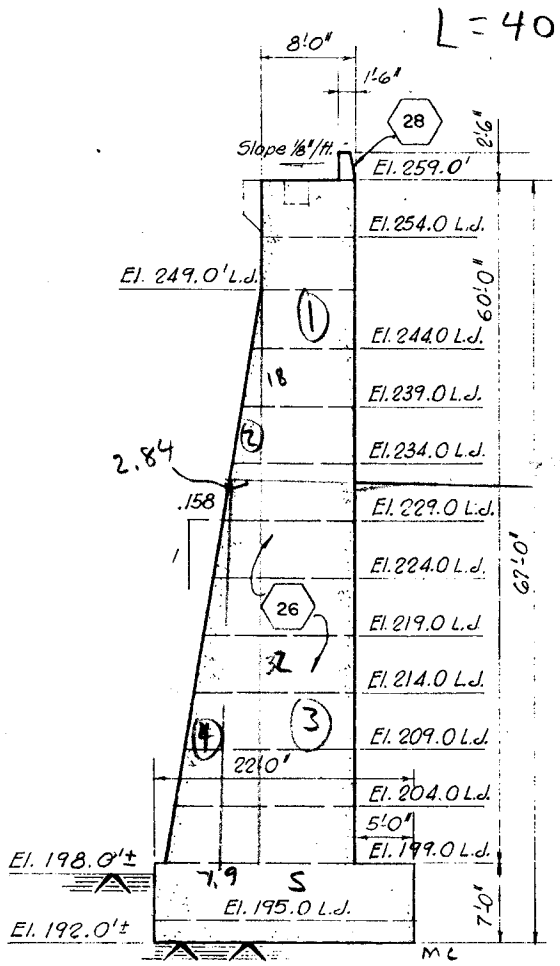
M/V= 0.01
B/4= 10.00

0.02 0.00

$$Kmca = \frac{3 \times Mo - 1.5 \times w \times B \times B}{Vo - W \times B} = 0.021$$

F. P. = ######### / 0.000

CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT	ARKANSAS L&D 7 LOWER GUIDE WALL ~~L-40~~ R-41
LOADING CONDITION: FILL LT.- 192	FILL RT.- 192	POOL LT. - 231 POOL RT. - 231
COMPUTED BY: JDC. SEE DWG 556	CHECKED BY DPS 10/28/04	DATE 19-Oct-04

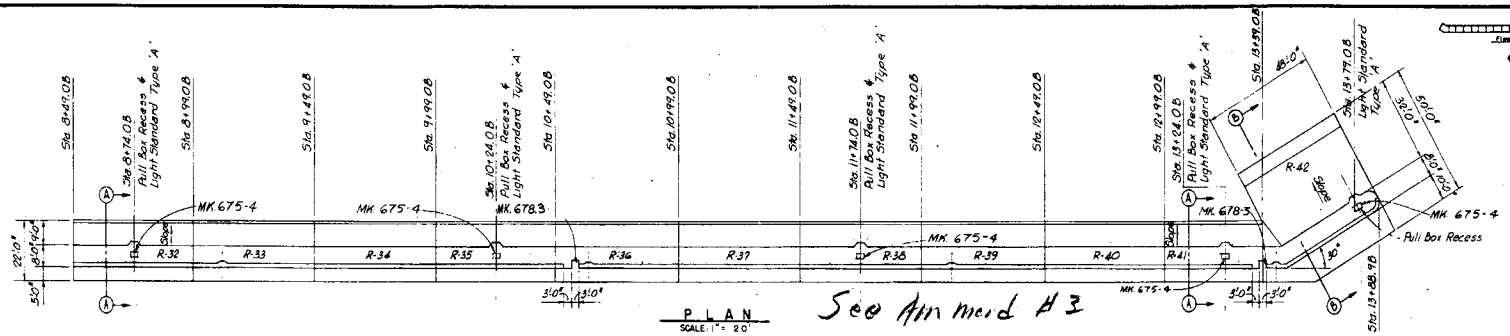


SECTION A-A

SCALE : 1/8" = 1'-0"

CORPS OF ENGINEERS

U.S. ARMY

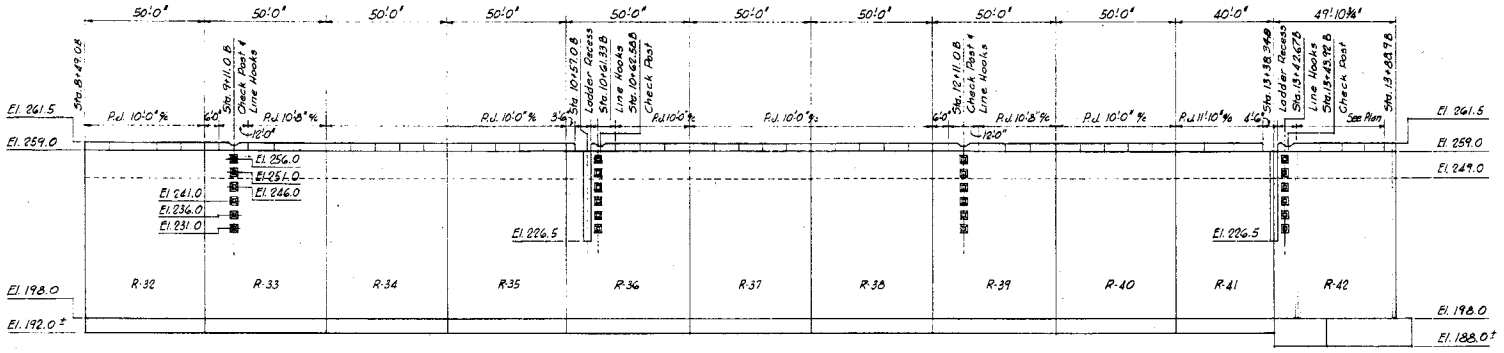


KEY PLAN

PLAN

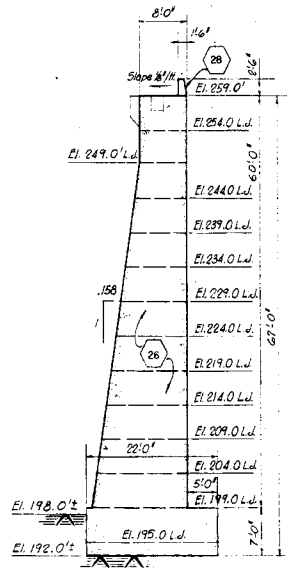
SCALE: 1" = 20'

See Ammend #3



ELEVATION

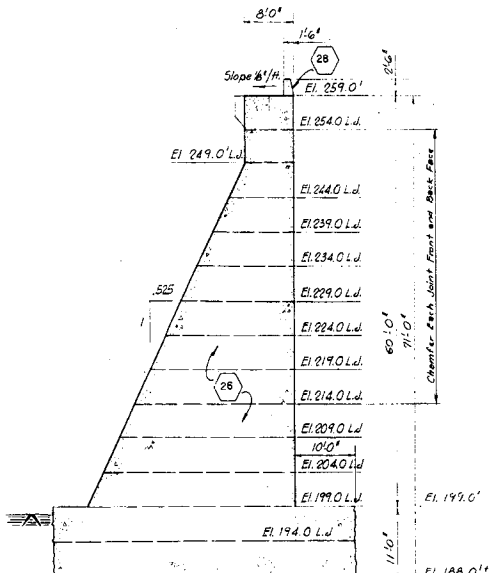
SCALE: 1" × 20"



SECTION A-A

SCALE: 1/8" = 1'-0"

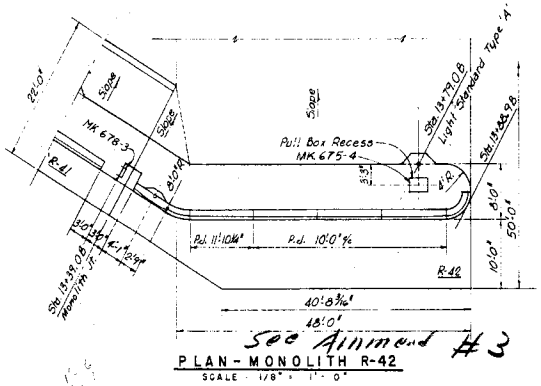
See Ammend #3



SECTION B-B

SCALE: 1/8" = 1'-0"

See Ammend #3



PLAN - MONOLITH R-42

SCALE: 1/8" = 1'-0"

See Ammend #3

Notes

1. For General Notes see Dwg. 517
2. For Details of Pull Box Recess and Light Standard see Dwg. 557
3. For Details of Ladder and Line Hook Recesses see Dwg. 557
4. For Wall Armor Locations and Details see Dwg. 660
5. For Waterstops see Dwg. 560
6. For Concrete Parapet Details see Dwg. 558

GRAPHIC SCALES

1" = 1'-0"
¾" = 1'-0"
½" = 1'-0"
⅜" = 1'-0"
¼" = 1'-0"
1" = 40'
1" = 20'

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DISTRICT
FORT WORTH
CORPS OF ENGINEERS
FORT WORTH, TEXAS

U.S. ARMY ENGINEER DISTRICT
LITTLE ROCK
OFFICE OF THE DISTRICT ENGINEER
LITTLE ROCK, ARKANSAS

DESIGNED
DRAWN
CHECKED
RECOMMENDED
CHIEF, DESIGN BRANCH
RECOMMENDED
CHIEF, ENGRG. DIVISION, FORT WORTH DISTRICT OFFICE

ARKANSAS RIVER AND TRIBUTARIES ARKANSAS RIVER, ARKANSAS

LOCK AND DAM NO. 7
NAVIGATION LOCK
MASONRY
CONCRETE MONOS. R-32 THRU R-42

FREESE, NICHOLS AND ENDRESS
CONSULTING ENGINEERS
FORT WORTH, TEXAS

DESIGNED: R.A.T.
DRAWN: W.W.S
CHECKED: W.B.M.
SUBMITTED
PROJECT ENGINEER

APPROVED
CHIEF, ENGINEERING DIVISION

DATE: JANUARY 1965
SCALE: AS SHOWN
SPEC. NO.

PREPARED UNDER THE DIRECTION OF
CHARLES D. MAYNARD, COL., C.E., DISTRICT ENGINEER

DRAWING NUMBER
8495-61/556
SHEET 137 OF 266

CORPS OF ENGINEERS, U.S. ARMY — BARGE IMPACT 292 — ARKANSAS L&D 7 LOWER GUIDE WALL R-41

LOADING CONDITION: FILL LT.- 192.000 FILL RT.- 192.000 POOL LT. - 231 POOL RT. - 231

COMPUTED BY: JDC. SEE DWG 556 — CHECKED BY DPS 10/28/04 — DATE 28-Oct-04

	FORCES			LENG	VERTICAL	HORIZONTAL		ARM	- MOMENTS	+
C1	8 X	28 X	0.15 X	40 1	1344.000			9.00		12096.00
C2	2.844 X	18 X	0.15 X	40 0.5	153.576			13.95		2142.08
C3	10.844 X	32 X	0.0875 X	40 1	1214.528			10.42		12657.81
C4	5.056 X	32 X	0.0875 X	40 1	566.272			17.53		9926.37
C5	22 X	7 X	0.0875 X	40 0.5	269.500			11.00		2964.50
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
	SUB-TOTAL				3547.876					39786.76
W1					0.000			0.00		0.00
W2					0.000			0.00		0.00
W3					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
E1					0.000			0.00		0.00
E2					0.000			0.00		0.00
E3					0.000			0.00		0.00
E4					0.000			0.00		0.00
E5					0.000			0.00		0.00
E6					0.000			0.00		0.00
U1	0.000 X	0 X	0.0625		0.000			0.00	0.00	
U2	0.000 X	-41 X	0.0625	0	0.000			8.00	0.00	
U3	22 X	39 X	0.0625	0	0.000			11.00	0.00	
H1	39 X	39 X	0.0625 X	0.5		>	47.531	13.00		617.91
H2	39 X	39 X	0.0625 X	0.5		<	-47.531	13.00	-617.91	
H3	0 X	0 X	0.0625 X	0.5		<	0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5		<	0.000	0.00		0.00
H5	BARGE IMPACT					>	292.000	42.00		12264.00
H6	HORIZONTAL FORCE					>	0	0.00		0.00
H7	HORIZONTAL FORCE					>	0	0		0.00
H8	HORIZONTAL FORCE					>	0	0		0.00

B=	22	Vo=	3547.9	SUM	3547.876	SUM H	292.000		SUM -M	-617.91	SUM +M	52668.67
H/V=	0.08										SUM -M	-617.91
e=	3.67								Mo=	52050.76		
%=	99.94					M/V=	14.67				SUM M	52050.76
FS=	0.00					B/4=	5.50					
MC=	14.67										21.99	0.00

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = 21.987 \qquad F.P. = \frac{322.723}{0.000}$$

CORPS OF ENGINEERS, U.S. ARMY — BARGE IMPACT 446 — ARKANSAS L&D 7 LOWER GUIDE WALL R-41

LOADING CONDITION: FILL LT.- 192.000 FILL RT.- 192.000 POOL LT. - 231 POOL RT. - 231

COMPUTED BY: JDC. SEE DWG 556 — CHECKED BY DPS 10/28/04 — DATE 28-Oct-04

	FORCES				LENG	VERTICAL		HORIZONTAL	ARM	- MOMENTS	+
C1	8 X	28 X	0.15 X	40	1	1344.000			9.00		12096.00
C2	2.844 X	18 X	0.15 X	40	0.5	153.576			13.95		2142.08
C3	10.844 X	32 X	0.0875 X	40	1	1214.528			10.42		12657.81
C4	5.056 X	32 X	0.0875 X	40	1	566.272			17.53		9926.37
C5	22 X	7 X	0.0875 X	40	0.5	269.500			11.00		2964.50
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
	SUB-TOTAL					3547.876					39786.76
W1						0.000			0.00		0.00
W2						0.000			0.00		0.00
W3						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
E1						0.000			0.00		0.00
E2						0.000			0.00		0.00
E3						0.000			0.00		0.00
E4						0.000			0.00		0.00
E5						0.000			0.00		0.00
E6						0.000			0.00		0.00
U1	0.000 X	0 X	0.0625			0.000			0.00	0.00	
U2	0.000 X	-41 X	0.0625		0	0.000			8.00	0.00	
U3	22 X	39 X	0.0625		0	0.000			11.00	0.00	
H1	39 X	39 X	0.0625 X	0.5			>	47.531	13.00		617.91
H2	39 X	39 X	0.0625 X	0.5			<	-47.531	13.00	-617.91	
H3	0 X	0 X	0.0625 X	0.5			<	0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5			<	0.000	0.00		0.00
H5	BARGE IMPACT						>	446.000	42.00		18732.00
H6	HORIZONTAL FORCE						>	0	0.00		0.00
H7	HORIZONTAL FORCE						>	0	0		0.00
H8	HORIZONTAL FORCE						>	0	0		0.00

B=	22	Vo=	3547.9	SUM	3547.876	SUM H	446.000	SUM -M	-617.91	SUM +M	59136.67
H/V=	0.13									SUM -M	-617.91
e=	5.49								Mo= 58518.76		
%	75.08					M/V=	16.49			SUM M	58518.76
FS=	0.00					B/4=	5.50				
MC=	16.49									16.52	0.00

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = \frac{16.518}{\text{F. P.}} \quad \text{F. P.} = \frac{429.579}{0.000}$$

CORPS OF ENGINEERS, U.S. ARMY — BARGE IMPACT 601 — ARKANSAS L&D 7 LOWER GUIDE WALL R-41

LOADING CONDITION: FILL LT.- 192.000 FILL RT.- 192.000 POOL LT. - 231 POOL RT. - 231

COMPUTED BY: JDC. SEE DWG 556 — CHECKED BY DPS 10/28/04 — DATE 28-Oct-04

	FORCES			LENG	VERTICAL	HORIZONTAL		ARM	- MOMENTS	+
C1	8 X	28 X	0.15 X	40 1	1344.000			9.00		12096.00
C2	2.844 X	18 X	0.15 X	40 0.5	153.576			13.95		2142.08
C3	10.844 X	32 X	0.0875 X	40 1	1214.528			10.42		12657.81
C4	5.056 X	32 X	0.0875 X	40 1	566.272			17.53		9926.37
C5	22 X	7 X	0.0875 X	40 0.5	269.500			11.00		2964.50
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
	SUB-TOTAL				3547.876					39786.76
W1					0.000			0.00		0.00
W2					0.000			0.00		0.00
W3					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
E1					0.000			0.00		0.00
E2					0.000			0.00		0.00
E3					0.000			0.00		0.00
E4					0.000			0.00		0.00
E5					0.000			0.00		0.00
E6					0.000			0.00		0.00
U1	0.000 X	0 X	0.0625		0.000			0.00	0.00	
U2	0.000 X	-41 X	0.0625	0	0.000			8.00	0.00	
U3	22 X	39 X	0.0625	0	0.000			11.00	0.00	
H1	39 X	39 X	0.0625 X	0.5		>	47.531	13.00		617.91
H2	39 X	39 X	0.0625 X	0.5		<	-47.531	13.00	-617.91	
H3	0 X	0 X	0.0625 X	0.5		<	0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5		<	0.000	0.00		0.00
H5	BARGE IMPACT					>	601.000	42.00		25242.00
H6	HORIZONTAL FORCE					>	0	0.00		0.00
H7	HORIZONTAL FORCE					>	0	0		0.00
H8	HORIZONTAL FORCE					>	0	0		0.00
					SUM 3547.876	SUM H	601.000		SUM -M -617.91	SUM +M 65646.67
										SUM -M -617.91
									Mo= 65028.76	
										SUM M 65028.76
										11.01 0.00

B= 22 Vo= 3547.9

H/V= 0.17

e= 7.33

%= 50.06

FS= 0.00

MC= 18.33

M/V= 18.33

B/4= 5.50

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = \frac{11.013}{}$$

$$F.P. = \frac{644.294}{0.000}$$

CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT 911	ARKANSAS L&D 7 LOWER GUIDE WALL R-41

LOADING CONDITION: FILL LT.- 192.000 FILL RT.- 192.000 POOL LT. - 231 POOL RT. - 231

COMPUTED BY: JDC. SEE DWG 556 CHECKED BY DPS 10/28/04 DATE 28-Oct-04

	FORCES			LENG	VERTICAL	HORIZONTAL	ARM	MOMENTS -	MOMENTS +
C1	8 X	28 X	0.15 X	40	1344.000		9.00		12096.00
C2	2.844 X	18 X	0.15 X	40	153.576		13.95		2142.08
C3	10.844 X	32 X	0.0875 X	40	1214.528		10.42		12657.81
C4	5.056 X	32 X	0.0875 X	40	566.272		17.53		9926.37
C5	22 X	7 X	0.0875 X	40	269.500		11.00		2964.50
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
	SUB-TOTAL				3547.876				39786.76
W1					0.000		0.00		0.00
W2					0.000		0.00		0.00
W3					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
E1					0.000		0.00		0.00
E2					0.000		0.00		0.00
E3					0.000		0.00		0.00
E4					0.000		0.00		0.00
E5					0.000		0.00		0.00
E6					0.000		0.00		0.00
U1	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U2	0.000 X	-41 X	0.0625	0	0.000		8.00	0.00	
U3	22 X	39 X	0.0625	0	0.000		11.00	0.00	
H1	39 X	39 X	0.0625 X	0.5		> 47.531	13.00		617.91
H2	39 X	39 X	0.0625 X	0.5		< -47.531	13.00	-617.91	
H3	0 X	0 X	0.0625 X	0.5		< 0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5		< 0.000	0.00		0.00
H5	BARGE IMPACT					> 911.000	42.00		38262.00
H6	HORIZONTAL FORCE					> 0	0.00		0.00
H7	HORIZONTAL FORCE					> 0	0		0.00
H8	HORIZONTAL FORCE					> 0	0		0.00
					SUM 3547.876	SUM H 911.000		SUM -M -617.91	SUM +M 78666.67
									SUM -M -617.91
								Mo= 78048.76	
									SUM M 78048.76
									0.00 0.00

B= 22 Vo= 3547.9
H/V= 0.26
e= 11.00
%= 0.02
FS= 0.00
MC= 22.00

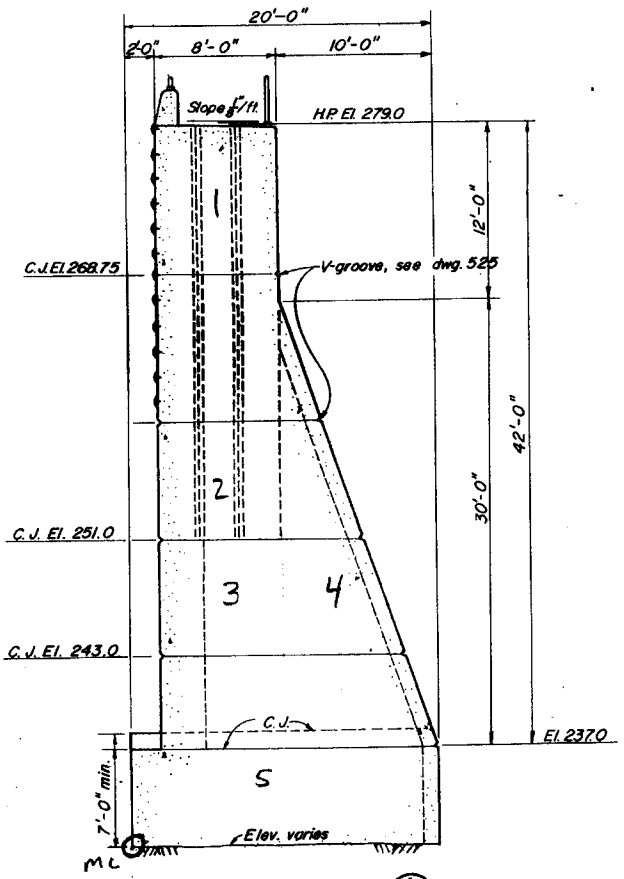
M/V= 22.00
B/4= 5.50

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo}$$

0.004

F. P. ######### 0.000

CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT	ARKANSAS L&D 8 UPPER GUIDE WALL R-4
LOADING CONDITION: FILL LT.- 229 FILL RT.- 229	POOL LT. - 265 POOL RT. - 265	
COMPUTED BY: JDC. SEE DWG 526 & 527	CHECKED BY DPS 16/20/04	DATE 19-Oct-04

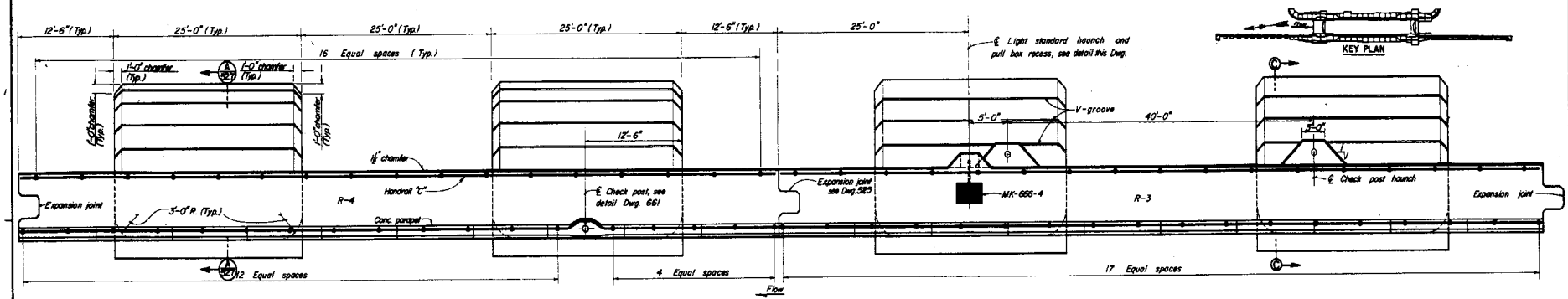


SECTION A-A (A / 526)

SCALE: $\frac{3}{16}$" = 1'

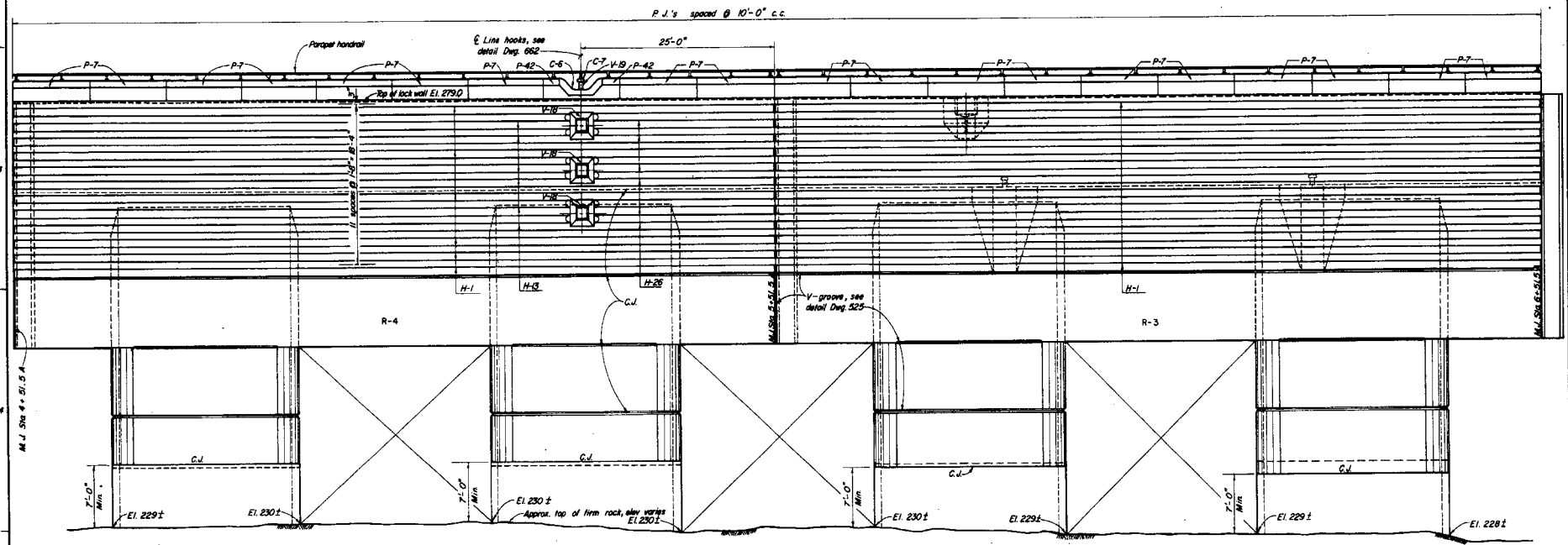
CORPS OF ENGINEERS

U.S. ARMY



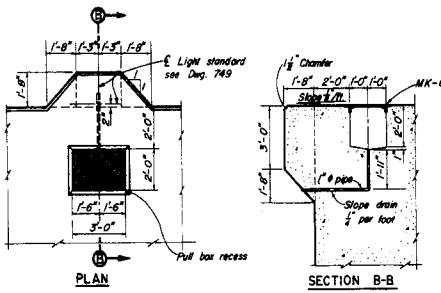
PLAN

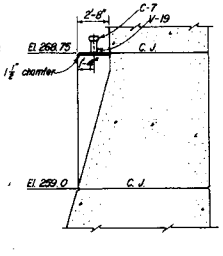
SCALE 3/16" = 1'



ELEVATION

SCALE 1/8" = 1'





LIGHT STANDARD HAUNCH AND PULL BOX RECESS

SCALE 1/2" = 1'

NOTES:

1. For general notes see Dwg. 524
2. For wall armor details, see Dwgs. 660 thru 662.
3. For handrail details, see Dwg 663
4. For concrete parapet details, see Dwg. 558.
5. All concrete on this Dwg except parapet shall be paid for under bid item No. (26)

KEY	DATE	REVISION (INDICATED BY Δ)	CHKD.	REC.	APPR.

U.S. ARMY ENGINEER DISTRICT TULSA, CORPS OF ENGINEERS, TULSA, OKLAHOMA

U.S. ARMY ENGINEER DISTRICT LITTLE ROCK, OFFICE OF THE DISTRICT ENGINEER, LITTLE ROCK, ARKANSAS

DESIGNED: B.D.R. W.C.M. ARKANSAS RIVER & TRIBUTARIES — ARKANSAS RIVER, ARKANSAS

DRAWN: S.M.M.

CHECKED: J.L.J.

SUBMITTED: Chief, Design Branch

RECOMMENDED: Chief, Design Division, Tulsa District Office

APPROVED: Chief, Engineering Division

LOCK AND DAM NO. 8 NAVIGATION LOCK

MASONRY

CONCRETE - MONOLITHS R-3 & R-4

DATE: JULY, 1965

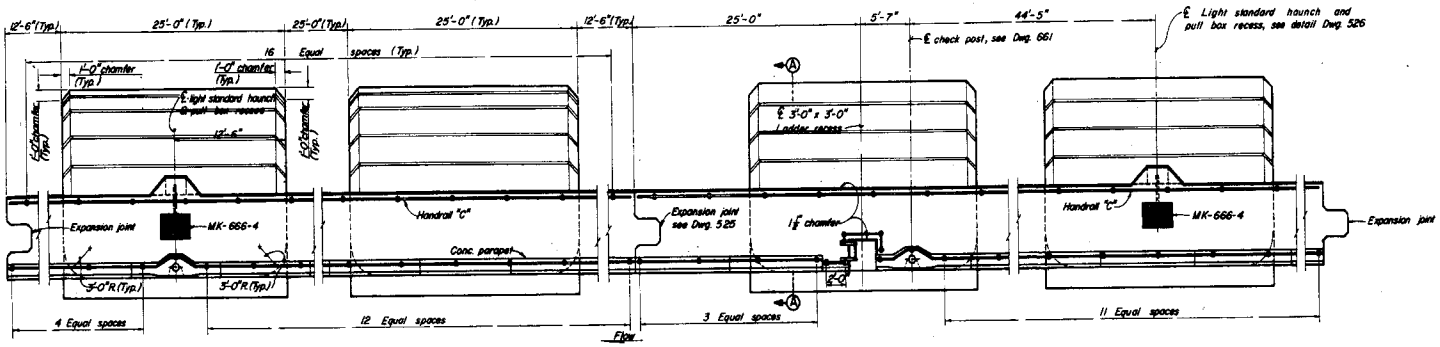
SCALE: AS SHOWN — SPEC. NO. 60-65

DRAWING NUMBER 8503-62/526

SHEET 110 OF 287

PREPARED UNDER THE DIRECTION OF CHARLES D. MAYNARD, COL., C.E., DISTRICT ENGINEER

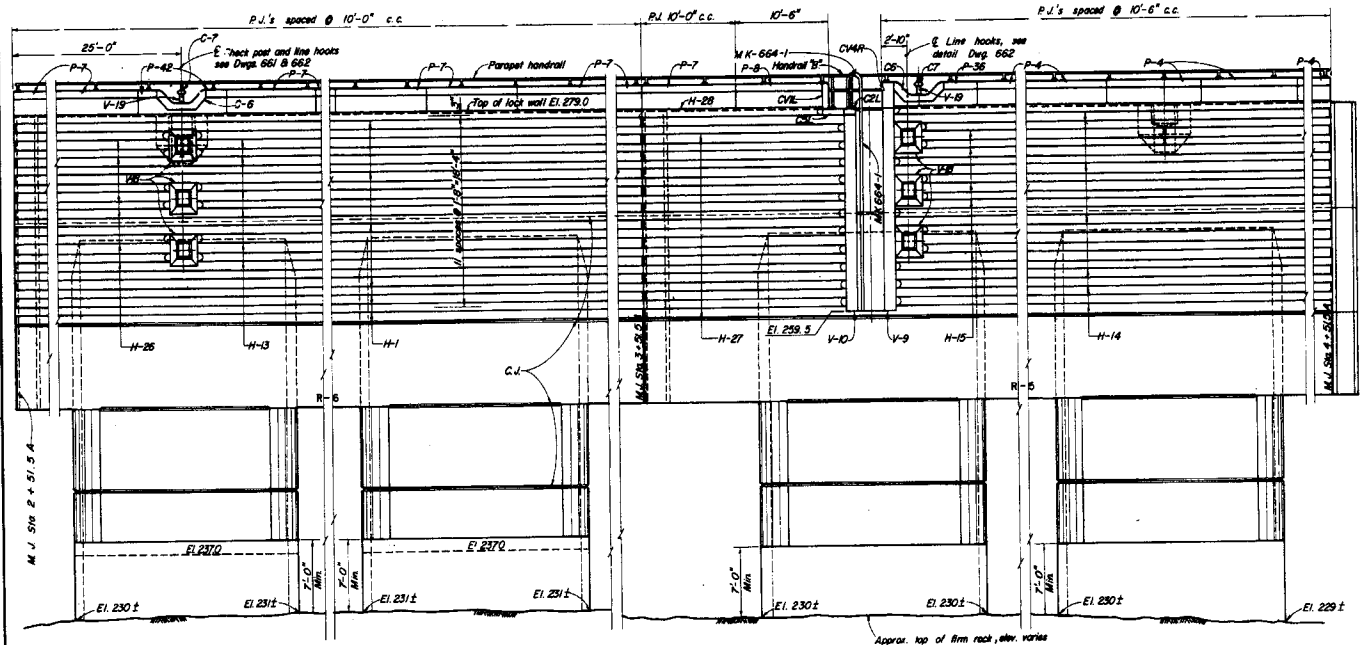
CORPS OF ENGINEERS U.S. ARMY



PLAN

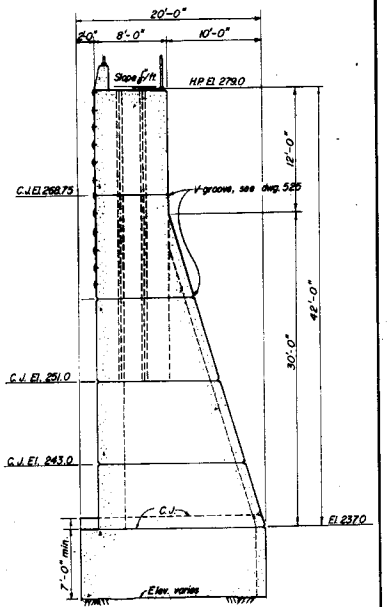
SCALE: 3/16" = 1'





ELEVATION

SCALE: 1/8" = 1'



SECTION A-A (A/526)

SCALE: 3/16" = 1'

NOTES:

1. For general notes see Dwg. 524.
2. For wall armor details, see Dwgs. 660 thru. 662.
3. For handrail details, Dwg. 663.
4. For concrete parapet details, see Dwg. 558
5. All concrete on this Dwg. except parapet shall be paid for under bid item No. (26)

KEY	DATE	REVISION (INDICATED BY Δ)	CHKD.	REC	APPR

U.S. ARMY ENGINEER DISTRICT TULSA CORPS OF ENGINEERS TULSA, OKLAHOMA

U.S. ARMY ENGINEER DISTRICT LITTLE ROCK OFFICE OF THE DISTRICT ENGINEER LITTLE ROCK, ARKANSAS

DESIGNED: B.D.R. W.C.M. | ARKANSAS RIVER & TRIBUTARIES | ARKANSAS RIVER, ARKANSAS

DRAWN: S.M.M.

CHECKED: A.L.J.

SUBMITTED: Chief, DESIGN BRANCH

RECOMMENDED: Chief, ENGRG. DIVISION, TULSA DISTRICT OFFICE

APPROVED: Chief, ENGINEERING DIVISION

PREPARED UNDER THE DIRECTION OF CHARLES D. MAYNARD, COL., C.E., DISTRICT ENGINEER

LOCK AND DAM NO. 8
NAVIGATION LOCK
MASONRY
CONCRETE - MONOLITHS R-5 AND R-6

DATE: JULY, 1965

SCALE: AS SHOWN | SPEC. NO. 98-26

DRAWING NUMBER 8503-62/527

SHEET 111 OF 287

CORPS OF ENGINEERS, U.S. ARMY — BARGE IMPACT — 621 — ARKANSAS L&D 8 UPPER GUIDE WALL R-4

LOADING CONDITION: — FILL LT.- 229.000 — FILL RT.- 229.000 — POOL LT. - 265 — POOL RT. - 265

COMPUTED BY: JDC. — SEE DWG 526 & 527 — CHECKED BY D.P.S. 10/20/04 — DATE 19-Oct-04

	FORCES				LENG 100	VERTICAL	HORIZONTAL	ARM	- MOMENTS	+
C1	8 X	14 X	0.15 X	100	1	1680.000		6.00		10080.00
C2	8 X	14 X	0.0875 X	100	1	980.000		6.00		5880.00
C3	8 X	14 X	0.0875 X	50	1	490.000		6.00		2940.00
C4	10 X	30 X	0.0875 X	50	0.5	656.250	SLIGHT ERROR OK	13.33		8750.00
C5	20 X	8 X	0.0875 X	50	1	700.000		10.00		7000.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
			SUB-TOTAL			4506.250				34650.00
						0.000		0.00		0.00
						0.000		12.33		0.00
						0.000		15.00		0.00
						0.000		16.89		0.00
						0.000		22.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
E1						0.000		0.00		0.00
E2						0.000		0.00		0.00
E3						0.000		0.00		0.00
E4						0.000		0.00		0.00
E5						0.000		0.00		0.00
E6						0.000		0.00		0.00
U1	0.000 X	0 X	0.0625			0.000		0.00	0.00	
U2	0.000 X	0 X	0.0625			0.000		0.00	0.00	
U3	20 X	36 X	0.0625		0	0.000		10.00	0.00	
H1	36 X	36 X	0.0625 X	0.5			> 40.500	12.00		486.00
H2	36 X	36 X	0.0625 X	0.5			< -40.500	12.00	-486.00	
H3	0 X	0 X	0.0625 X	0.5			< 0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5			< 0.000	0.00		0.00
H5	BARGE IMPACT						> 621.000	41.00		25461.00
H6	HORIZONTAL FORCE						> 0	0.00		0.00
H7	HORIZONTAL FORCE						> 0	0		0.00
H8	HORIZONTAL FORCE						> 0	0		0.00

B=	20	Vo=	4506.3	SUM	4506.250	SUM H	621.000	SUM -M	-486.00
H/V=	0.14								
e=	3.34							Mo=	60111.00
%=	99.91					M/V=	13.34		
FS=	0.00					B/4=	5.00		
MC=	13.34								

$$K_{mcb} = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = \frac{19.982}{}$$

F. P. = 451.040 / 0.000

SUM +M	60597.00
SUM -M	-486.00
SUM M	60111.00
	19.98
	0.00

CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT 803	ARKANSAS L&D 8 UPPER GUIDE WALL R-4

LOADING CONDITION: FILL LT.- 229.000 FILL RT.- 229.000 POOL LT. - 265 POOL RT. - 265

COMPUTED BY: JDC. SEE DWG 526 & 527 CHECKED BY D.P.S. 10/20/04 DATE 19-Oct-04

	FORCES			LENG 100	VERTICAL	HORIZONTAL	ARM	- MOMENTS	+
C1	8 X	14 X	0.15 X	100 1	1680.000		6.00		10080.00
C2	8 X	14 X	0.0875 X	100 1	980.000		6.00		5880.00
C3	8 X	14 X	0.0875 X	50 1	490.000		6.00		2940.00
C4	10 X	30 X	0.0875 X	50 0.5	656.250	SLIGHT ERROR OK	13.33		8750.00
C5	20 X	8 X	0.0875 X	50 1	700.000		10.00		7000.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
	SUB-TOTAL				4506.250				34650.00
					0.000		0.00		0.00
					0.000		12.33		0.00
					0.000		15.00		0.00
					0.000		16.89		0.00
					0.000		22.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
E1					0.000		0.00		0.00
E2					0.000		0.00		0.00
E3					0.000		0.00		0.00
E4					0.000		0.00		0.00
E5					0.000		0.00		0.00
E6					0.000		0.00		0.00
U1	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U2	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U3	20 X	36 X	0.0625	0	0.000		10.00	0.00	
H1	36 X	36 X	0.0625 X	0.5		> 40.500	12.00		486.00
H2	36 X	36 X	0.0625 X	0.5		< -40.500	12.00	-486.00	
H3	0 X	0 X	0.0625 X	0.5		< 0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5		< 0.000	0.00		0.00
H5	BARGE IMPACT					> 803.000	41.00		32923.00
H6	HORIZONTAL FORCE					> 0	0.00		0.00
H7	HORIZONTAL FORCE					> 0	0		0.00
H8	HORIZONTAL FORCE					> 0	0		0.00

B=	20	Vo=	4506.3	SUM	4506.250	SUM H 803.000	SUM -M	-486.00	SUM +M 68059.00
H/V=	0.18								SUM -M -486.00
e=	5.00							Mo= 67573.00	
%=	75.07					M/V= 15.00			SUM M 67573.00
FS=	0.00					B/4= 5.00			
MC=	15.00								15.01 0.00

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = 15.014 \qquad F.P. = \frac{600.281}{0.000}$$

CORPS OF ENGINEERS, U.S. ARMY — BARGE IMPACT 986 — ARKANSAS L&D 8 UPPER GUIDE WALL R-4

LOADING CONDITION: — FILL LT.- 229.000 — FILL RT.- 229.000 — POOL LT. - 265 — POOL RT. - 265

COMPUTED BY: JDC. — SEE DWG 526 & 527 — CHECKED BY DPS 10/26/04 — DATE 19-Oct-04

	FORCES			LENG 100	VERTICAL	HORIZONTAL	ARM	- MOMENTS	+
C1	8 X	14 X	0.15 X	100 1	1680.000		6.00		10080.00
C2	8 X	14 X	0.0875 X	100 1	980.000		6.00		5880.00
C3	8 X	14 X	0.0875 X	50 1	490.000		6.00		2940.00
C4	10 X	30 X	0.0875 X	50 0.5	656.250	SLIGHT ERROR OK	13.33		8750.00
C5	20 X	8 X	0.0875 X	50 1	700.000		10.00		7000.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
			SUB-TOTAL		•4506.250				•34650.00
					0.000		0.00		0.00
					0.000		12.33		0.00
					0.000		15.00		0.00
					0.000		16.89		0.00
					0.000		22.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
E1					0.000		0.00		0.00
E2					0.000		0.00		0.00
E3					0.000		0.00		0.00
E4					0.000		0.00		0.00
E5					0.000		0.00		0.00
E6					0.000		0.00		0.00
U1	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U2	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U3	20 X	36 X	0.0625	0	0.000		10.00	0.00	
H1	36 X	36 X	0.0625 X	0.5		> 40.500	12.00		486.00
H2	36 X	36 X	0.0625 X	0.5		< -40.500	12.00	-486.00	
H3	0 X	0 X	0.0625 X	0.5		< 0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5		< 0.000	0.00		0.00
H5	BARGE IMPACT					> •986.000	• 41.00		• 40426.00
H6	HORIZONTAL FORCE					> 0	0.00		0.00
H7	HORIZONTAL FORCE					> 0	0		0.00
H8	HORIZONTAL FORCE					> 0	0		0.00
					SUM •4506.250	SUM H ,986.000		SUM -M -486.00	SUM +M 75562.00
									SUM -M -486.00
								Mo= 75076.00	
									SUM M •75076.00
									10.02 0.00

B= 20 Vo= 4506.3
H/V= 0.22
e= 6.66
%= •50.09
FS= 0.00
MC= 16.66

M/V= • 16.66
B/4= 5.00

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = 10.019$$

F. P. = 899.563 / 0.000

CORPS OF ENGINEERS, U.S. ARMY					BARGE IMPACT 1353			ARKANSAS L&D 8 UPPER GUIDE WALL R-4		
LOADING CONDITION:				FILL LT.- 229.000	FILL RT.- 229.000			POOL LT. - 265	POOL RT. - 265	
COMPUTED BY: JDC.			SEE DWG 526 & 527		CHECKED BY DPS 10/20/04			DATE 19-Oct-04		
	FORCES			LENG / 100	VERTICAL	HORIZONTAL	ARM	- MOMENTS		+
C1	8 X	14 X	0.15 X	100 1	1680.000		6.00			10080.00
C2	8 X	14 X	0.0875 X	100 1	980.000		6.00			5880.00
C3	8 X	14 X	0.0875 X	50 1	490.000		6.00			2940.00
C4	10 X	30 X	0.0875 X	50 0.5	656.250	SLIGHT ERROR OK	13.33			8750.00
C5	20 X	8 X	0.0875 X	50 1	700.000		10.00			7000.00
					0.000		0.00			0.00
					0.000		0.00			0.00
					0.000		0.00			0.00
					0.000		0.00			0.00
					0.000		0.00			0.00
					0.000		0.00			0.00
					0.000		0.00			0.00
					0.000		0.00			0.00
					0.000		0.00			0.00
					0.000		0.00			0.00
					0.000		0.00			0.00
			SUB-TOTAL		4506.250					34650.00
					0.000		0.00			0.00
					0.000		12.33			0.00
					0.000		15.00			0.00
					0.000		16.89			0.00
					0.000		22.00			0.00
					0.000		0.00			0.00
					0.000		0.00			0.00
					0.000		0.00			0.00
					0.000		0.00			0.00
					0.000		0.00			0.00
					0.000		0.00			0.00
					0.000		0.00			0.00
E1					0.000		0.00			0.00
E2					0.000		0.00			0.00
E3					0.000		0.00			0.00
E4					0.000		0.00			0.00
E5					0.000		0.00			0.00
E6					0.000		0.00			0.00
U1	0.000 X	0 X	0.0625		0.000		0.00	0.00		
U2	0.000 X	0 X	0.0625		0.000		0.00	0.00		
U3	20 X	36 X	0.0625	0	0.000		10.00	0.00		
H1	36 X	36 X	0.0625 X	0.5		> 40.500	12.00			486.00
H2	36 X	36 X	0.0625 X	0.5		< -40.500	12.00	-486.00		
H3	0 X	0 X	0.0625 X	0.5		< 0.000	0.00	0.00		
H4	0 X	0 X	0.0625 X	0.5		< 0.000	0.00			0.00
H5	BARGE IMPACT					> 1353.000	41.00			55473.00
H6	HORIZONTAL FORCE					> 0	0.00			0.00
H7	HORIZONTAL FORCE					> 0	0			0.00
H8	HORIZONTAL FORCE					> 0	0			0.00

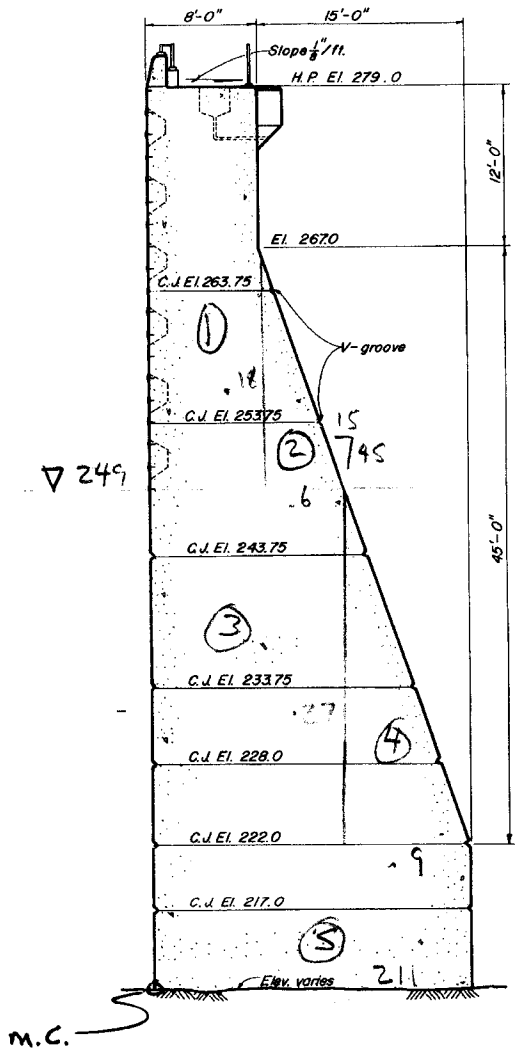
B=	20	Vo=	4506.3	SUM	4506.250	SUM H	1353.000	SUM -M	-486.00	SUM +M 90609.00
H/V=	0.30									SUM -M -486.00
e=	10.00								Mo= 90123.00	
%=	0.01					M/V=	20.00			SUM M 90123.00
FS=	0.00					B/4=	5.00			
MC=	20.00									0.00 0.00

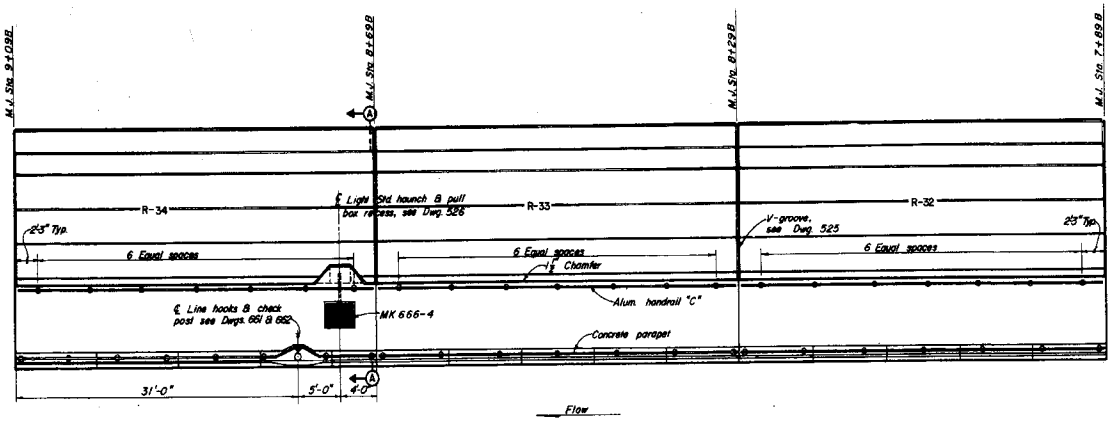
$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = 0.001$$

F. P. = ######### / 0.000

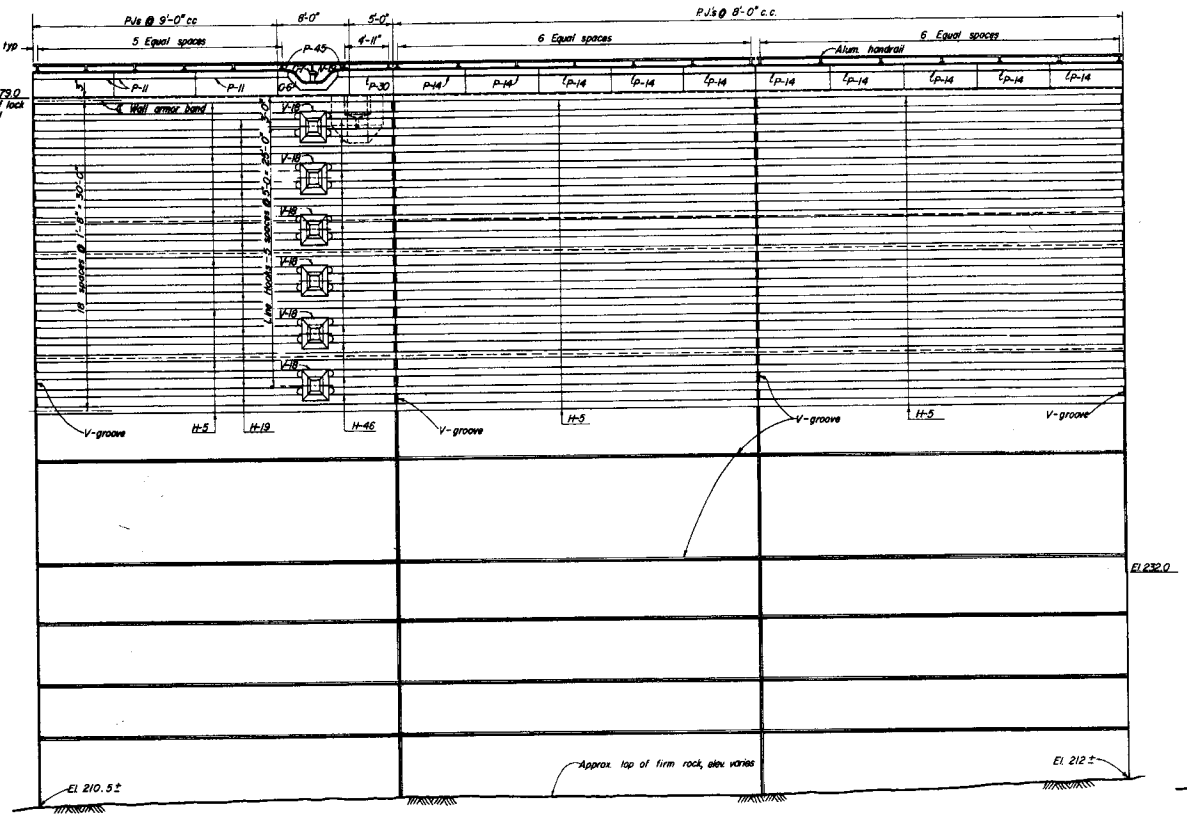
CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT		ARKANSAS L&D 8 LOWER GUIDE WALL R-33
LOADING CONDITION:	FILL LT.- 211 FILL RT.- 211	POOL LT. - •249	POOL RT. - •249
COMPUTED BY: JDC. SEE DWG -62/578	CHECKED BY DPS 11/2/04	DATE 27-Oct-04	

L = 40'

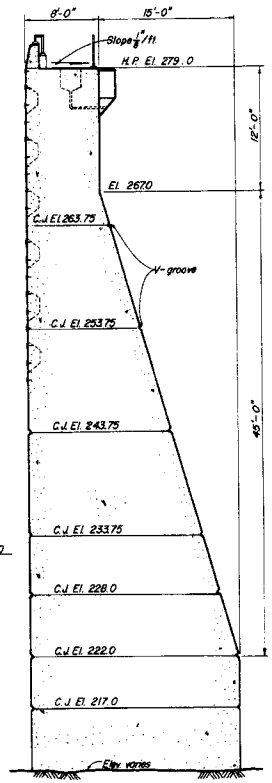




PLAN
SCALE 1/16" = 1'



ELEVATION
SCALE 1/16" = 1'



SECTION AA (A 578)
SCALE 1/16" = 1'


KEY PLAN

NOTES:
1. For general notes see Dwg. 524.
2. For parapet masonry details see Dwg. 558.
3. For handrail details, see Dwg. 663.
4. For wall armor details, see Dwgs. 660, 661 & 662.
5. All concrete this Dwg. except parapet to be paid for under bid item (26).

KEY	DATE	REVISION (INDICATE BY Δ)	CHKD	REC.	APPR

U.S. ARMY ENGINEER DISTRICT, TULSA, CORPS OF ENGINEERS, TULSA, OKLAHOMA
U.S. ARMY ENGINEER DISTRICT, LITTLE ROCK, OFFICE OF THE DISTRICT ENGINEER, LITTLE ROCK, ARKANSAS

DESIGNED: J.W.E.
DRAWN: S.L.S.
CHECKED: M.C.M. Jr.
SUBMITTED: CHIEF, DESIGN BRANCH
RECOMMENDED: CHIEF, ENGRG. DIVISION, TULSA DISTRICT OFFICE
APPROVED: CHIEF, ENGINEERING DIVISION

ARKANSAS RIVER & TRIBUTARIES — ARKANSAS RIVER, ARKANSAS

LOCK AND DAM NO. 8
NAVIGATION LOCK
MASONRY
CONCRETE - MONOLITHS R-32 THRU R-34

DATE: JULY, 1965
SCALE: AS SHOWN | SPEC. NO.
DRAWING NUMBER: 8503-62/578
SHEET 160 OF 287

PREPARED UNDER THE DIRECTION OF CHARLES D. MAYNARD, COL., C.E., DISTRICT ENGINEER

CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT 739	ARKANSAS L&D 8 LOWER GUIDE WALL R-33

LOADING CONDITION: FILL LT.- 211 FILL RT.- 211 POOL LT. - 249 POOL RT. - 249

COMPUTED BY: JDC. SEE DWG -62/578 CHECKED BY DPS 11/2/04 DATE 28-Oct-04

	FORCES			LENG 40	VERTICAL	HORIZONTAL	ARM	MOMENTS -	MOMENTS +
C1	8.00 X 30.00 X	0.15 X	40 1		1440.000		4.00		5760.00
C2	6.00 X 18.00 X	0.15 X	40 0.5		324.000		10.00		3240.00
C3	14.00 X 27.00 X	0.0875 X	40 1		1323.000		7.00		9261.00
C4	9.00 X 27.00 X	0.0875 X	40 0.5		425.250		17.00		7229.25
C5	23.00 X 11.00 X	0.0875 X	40 1		885.500		11.50		10183.25
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
	SUB-TOTAL				4397.750				35673.50
					0.000		0.00		0.00
					0.000		12.33		0.00
					0.000		15.00		0.00
					0.000		16.89		0.00
					0.000		22.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
E1					0.000		0.00		0.00
E2					0.000		0.00		0.00
E3					0.000		0.00		0.00
E4					0.000		0.00		0.00
E5					0.000		0.00		0.00
E6					0.000		0.00		0.00
U1	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U2	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U3	23 X	38 X	0.0625	0	0.000		11.50	0.00	
H1	38 X	38 X	0.0625 X	0.5		> 45.125	12.67		571.58
H2	38 X	38 X	0.0625 X	0.5		< -45.125	12.67	-571.58	
H3	0 X	0 X	0.0625 X	0.5		< 0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5		< 0.000	0.00		0.00
H5	BARGE IMPACT					> 739.000	43.00		31777.00
H6	HORIZONTAL FORCE					> 0	0.00		0.00
H7	HORIZONTAL FORCE					> 0	0		0.00
H8	HORIZONTAL FORCE					> 0	0		0.00

B=	23	Vo=	4397.8	SUM	4397.750	SUM H	739.000	SUM -M	-571.58
H/V=	0.17								
e=	3.84							Mo=	67450.50
%=	99.95					M/V=	15.34		
FS=	0.00					B/4=	5.75		
MC=	15.34								

SUM +M 68022.08
SUM -M -571.58
SUM M 67450.50

22.99 0.00

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = 22.987 \qquad F.P. = \frac{382.621}{0.000}$$

CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT 934	ARKANSAS L&D 8 LOWER GUIDE WALL R-33

LOADING CONDITION: FILL LT.- 211 FILL RT.- 211 POOL LT. - 249 POOL RT. - 249

COMPUTED BY: JDC. SEE DWG -62/578 CHECKED BY DPS 11/2/04 DATE 28-Oct-04

	FORCES	LENG 40	VERTICAL	HORIZONTAL	ARM	- MOMENTS	+
C1	8.00 X 30.00 X 0.15 X 40 1		1440.000		4.00		5760.00
C2	6.00 X 18.00 X 0.15 X 40 0.5		324.000		10.00		3240.00
C3	14.00 X 27.00 X 0.0875 X 40 1		1323.000		7.00		9261.00
C4	9.00 X 27.00 X 0.0875 X 40 0.5		425.250		17.00		7229.25
C5	23.00 X 11.00 X 0.0875 X 40 1		885.500		11.50		10183.25
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
	SUB-TOTAL		4397.750				35673.50
			0.000		0.00		0.00
			0.000		12.33		0.00
			0.000		15.00		0.00
			0.000		16.89		0.00
			0.000		22.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
E1			0.000		0.00		0.00
E2			0.000		0.00		0.00
E3			0.000		0.00		0.00
E4			0.000		0.00		0.00
E5			0.000		0.00		0.00
E6			0.000		0.00		0.00
U1	0.000 X 0 X 0.0625		0.000		0.00	0.00	
U2	0.000 X 0 X 0.0625		0.000		0.00	0.00	
U3	23 X 38 X 0.0625	0	0.000		11.50	0.00	
H1	38 X 38 X 0.0625 X 0.5			> 45.125	12.67		571.58
H2	38 X 38 X 0.0625 X 0.5			< -45.125	12.67	-571.58	
H3	0 X 0 X 0.0625 X 0.5			< 0.000	0.00	0.00	
H4	0 X 0 X 0.0625 X 0.5			< 0.000	0.00		0.00
H5	BARGE IMPACT			> 934.000	43.00		40162.00
H6	HORIZONTAL FORCE			> 0	0.00		0.00
H7	HORIZONTAL FORCE			> 0	0		0.00
H8	HORIZONTAL FORCE			> 0	0		0.00
			SUM 4397.750	SUM H 934.000		SUM -M -571.58	SUM +M 76407.08
							SUM -M -571.58
						Mo= 75835.50	
							SUM M 75835.50

B=	23	Vo=	4397.8		17.27 0.00
H/V=	0.21				
e=	5.74				
%=	75.08			M/V=	17.24
FS=	0.00			B/4=	5.75
MC=	17.24				

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = 17.268 \qquad F.P. = \frac{509.367}{0.000}$$

CORPS OF ENGINEERS, U.S. ARMY — BARGE IMPACT 1130 — ARKANSAS L&D 8 LOWER GUIDE WALL R-33

LOADING CONDITION: FILL LT.- 211 FILL RT.- 211 POOL LT. - 249 POOL RT. - 249

COMPUTED BY: JDC. SEE DWG -62/578 CHECKED BY OBS 11/2/04 DATE 28-Oct-04

	FORCES			LENG	VERTICAL	HORIZONTAL	ARM	MOMENTS -	MOMENTS +
				40					
C1	8.00 X	30.00 X	0.15 X	40 1	1440.000		4.00		5760.00
C2	6.00 X	18.00 X	0.15 X	40 0.5	324.000		10.00		3240.00
C3	14.00 X	27.00 X	0.0875 X	40 1	1323.000		7.00		9261.00
C4	9.00 X	27.00 X	0.0875 X	40 0.5	425.250		17.00		7229.25
C5	23.00 X	11.00 X	0.0875 X	40 1	885.500		11.50		10183.25
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
	SUB-TOTAL				4397.750				35673.50
					0.000		0.00		0.00
					0.000		12.33		0.00
					0.000		15.00		0.00
					0.000		16.89		0.00
					0.000		22.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
E1					0.000		0.00		0.00
E2					0.000		0.00		0.00
E3					0.000		0.00		0.00
E4					0.000		0.00		0.00
E5					0.000		0.00		0.00
E6					0.000		0.00		0.00
U1	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U2	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U3	23 X	38 X	0.0625	0	0.000		11.50	0.00	
H1	38 X	38 X	0.0625 X	0.5		> 45.125	12.67		571.58
H2	38 X	38 X	0.0625 X	0.5		< -45.125	12.67	-571.58	
H3	0 X	0 X	0.0625 X	0.5		< 0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5		< 0.000	0.00		0.00
H5	BARGE IMPACT					> 1130.000	43.00		48590.00
H6	HORIZONTAL FORCE					> 0	0.00		0.00
H7	HORIZONTAL FORCE					> 0	0		0.00
H8	HORIZONTAL FORCE					> 0	0		0.00
					SUM 4397.750	SUM H 1130.000		SUM -M -571.58	SUM +M 84835.08
									SUM -M -571.58
								Mo= 84263.50	
									SUM M 84263.50

B= 23 Vo= 4397.8
H/V= 0.26
e= 7.66
%= 50.08
FS= 0.00
MC= 19.16

M/V= 19.16
B/4= 5.75

11.52 0.00

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = 11.518$$

F. P. $= \frac{763.616}{0.000}$

CORPS OF ENGINEERS, U.S. ARMY — BARGE IMPACT 1522 — ARKANSAS L&D 8 LOWER GUIDE WALL R-33

LOADING CONDITION: FILL LT.- 211 FILL RT.- 211 POOL LT. - 249 POOL RT. - 249

COMPUTED BY: JDC. SEE DWG -62/578 — CHECKED BY DPS 11/2/04 — DATE 28-Oct-04

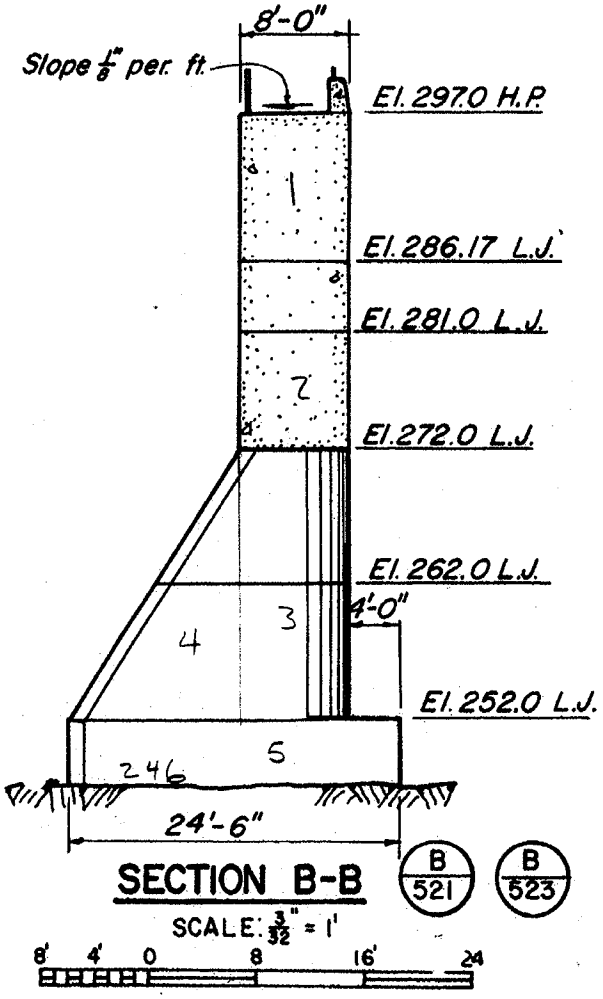
	FORCES			LENG 40	VERTICAL	HORIZONTAL	ARM	- MOMENTS	+
C1	8.00 X	30.00 X	0.15 X	40 1	1440.000		4.00		5760.00
C2	6.00 X	18.00 X	0.15 X	40 0.5	324.000		10.00		3240.00
C3	14.00 X	27.00 X	0.0875 X	40 1	1323.000		7.00		9261.00
C4	9.00 X	27.00 X	0.0875 X	40 0.5	425.250		17.00		7229.25
C5	23.00 X	11.00 X	0.0875 X	40 1	885.500		11.50		10183.25
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
	SUB-TOTAL				4397.750				35673.50
					0.000		0.00		0.00
					0.000		12.33		0.00
					0.000		15.00		0.00
					0.000		16.89		0.00
					0.000		22.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
E1					0.000		0.00		0.00
E2					0.000		0.00		0.00
E3					0.000		0.00		0.00
E4					0.000		0.00		0.00
E5					0.000		0.00		0.00
E6					0.000		0.00		0.00
U1	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U2	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U3	23 X	38 X	0.0625	0	0.000		11.50	0.00	
H1	38 X	38 X	0.0625 X	0.5		> 45.125	12.67		571.58
H2	38 X	38 X	0.0625 X	0.5		< -45.125	12.67	-571.58	
H3	0 X	0 X	0.0625 X	0.5		< 0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5		< 0.000	0.00		0.00
H5	BARGE IMPACT					> 1522.000	43.00		65446.00
H6	HORIZONTAL FORCE					> 0	0.00		0.00
H7	HORIZONTAL FORCE					> 0	0		0.00
H8	HORIZONTAL FORCE					> 0	0		0.00

B=	23	Vo=	4397.8	SUM = 4397.750	SUM H 1522.000	SUM -M -571.58	SUM +M 101691.08
H/V=	0.35						SUM -M -571.58
e=	11.49					Mo= 101119.50	
%=	0.09				M/V= 22.99		SUM M 101119.50
FS=	0.00				B/4= 5.75		
MC=	22.99						0.02 0.00

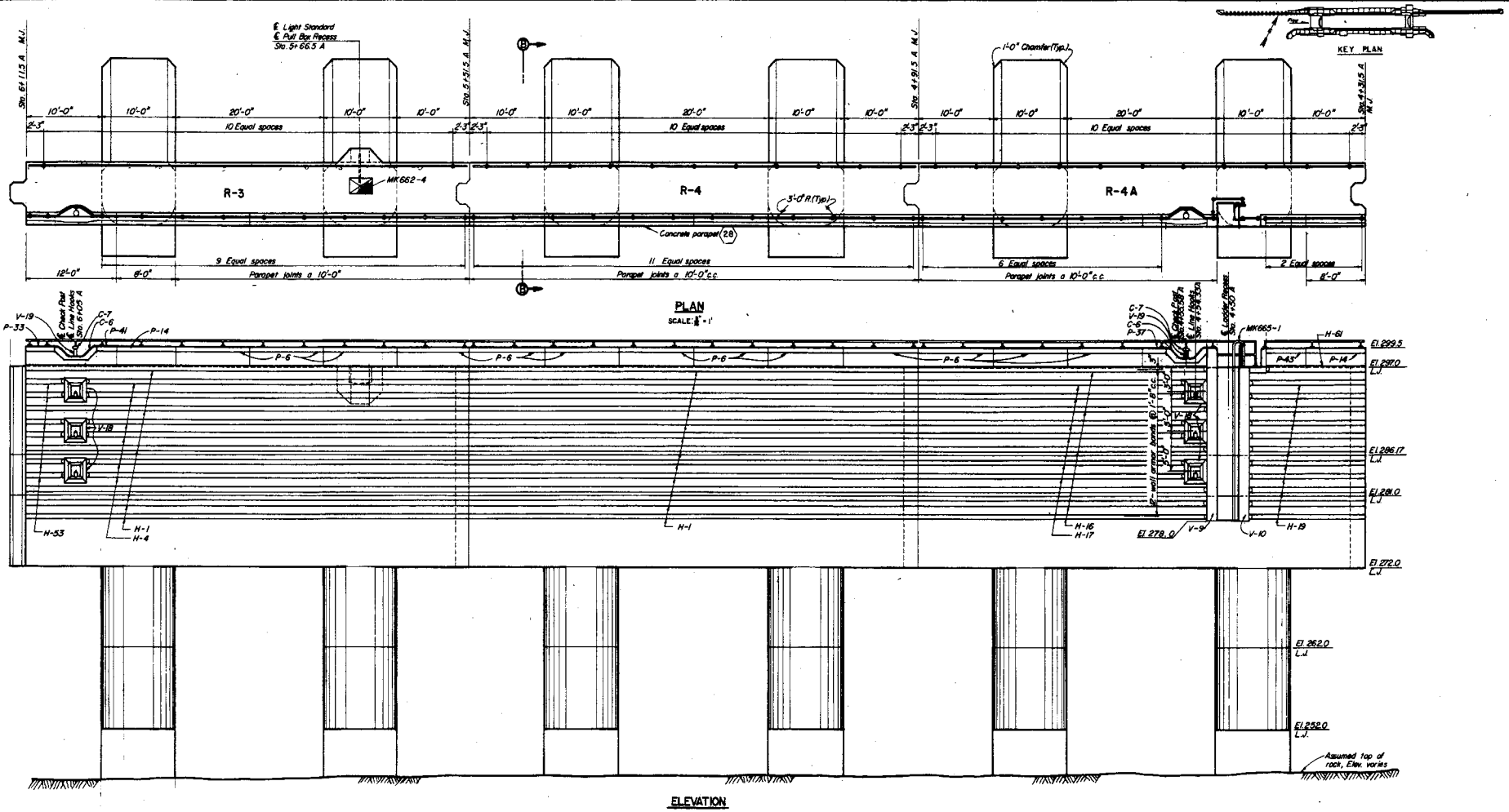
$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = 0.020$$

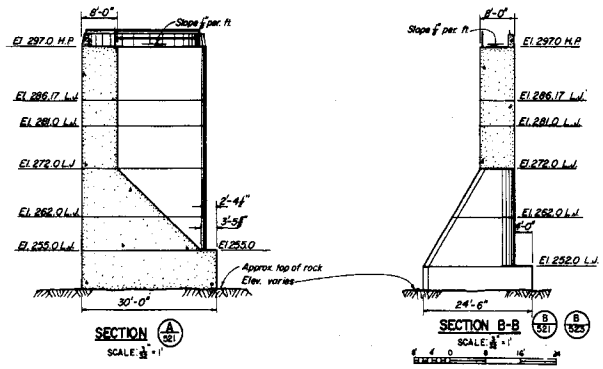
F. P. = ########## / 0.000

CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT			ARKANSAS L&D 9 UPPER GUIDE WALL R-2 FOUNDATION SCALED FROM
LOADING CONDITION:	FILL LT.- 246	FILL RT.- 246	POOL LT. - 287	POOL RT. - 287
COMPUTED BY: JDC.	SEE DWG 522	CHECKED BY DPB 10/28/04	DATE 19-Oct-04	



CORPS OF ENGINEERS — U.S. ARMY





NOTES:

1. For general notes see Dwg. 520.
2. All concrete on this drawing not otherwise noted to be paid for under bid item (27).
3. Pertinent details shown on the following drawings:
   a. Concrete parapet – 571.
   b. Alum. handrailing – 660.
   c. Wall armor – 667 thru 669.
   d. Lift joints – 572.
   e. Line hooks – 669.
   f. Pull box recess – 572.
   g. Const joints – 321.
   h. ladder recess – 570

KEY	DATE	REVISION (INDICATED BY &)	CHKD	REC.	APPR.

U.S. ARMY ENGINEER DISTRICT, TULSA, CORPS OF ENGINEERS, TULSA, OKLAHOMA
U.S. ARMY ENGINEER DISTRICT, LITTLE ROCK, OFFICE OF THE DISTRICT ENGINEERS, LITTLE ROCK, ARKANSAS

DESIGNED: E.L.H.
DRAWN: C.E.W.
CHECKED: A.L.J.
SUBMITTED: [signature]
CHIEF, DESIGN BRANCH
RECOMMENDED: [signature]
CHIEF, ENGRG. DIVISION, TULSA DISTRICT OFFICE

ARKANSAS RIVER & TRIBUTARIES
ARKANSAS RIVER, ARKANSAS

LOCK AND DAM NO. 9
NAVIGATION LOCK
MASONRY
CONCRETE – MONOLITHS R-3,R-4 &R-4A

APPROVED: [signature]
CHIEF, ENGINEERING DIVISION

DATE: AUGUST 1965
SCALE: AS SHOWN
SPEC. NO. 64-38

PREPARED UNDER THE DIRECTION OF FRANK P. BANE, COL., C.E., DISTRICT ENGINEER

DRAWING NUMBER
8504-63/522
SHEET 64 OF 240

CORPS OF ENGINEERS, U.S. ARMY — BARGE IMPACT 334 — ARKANSAS L&D 9 UPPER GUIDE WALL R-2 FOUNDATION SCALED FROM

LOADING CONDITION: — FILL LT.- 246.000 — FILL RT.- 246 — POOL LT. - 287 — POOL RT. - 287

COMPUTED BY: JDC. — SEE DWG 522 — CHECKED BY DPS 10/20/04 — DATE 17-Oct-04

	FORCES				LENG	VERTICAL	HORIZONTAL		ARM	- MOMENTS	+
C1	•8 X	•10 X	•0.15 X	•60 1•		•720.000			~~8.00~~ 16.5		•5760.00
C2	•8 X	•15 X	•0.0875 X	•60 1•		•630.000			~~8.00~~ 16.5		•5040.00
C3	•8 X	•20 X	•0.0875 X	•20 1•		•280.000			~~8.00~~ 16.5		•2240.00
C4	•12.5 X	•20 X	•0.0875 X	•20 0.5		•218.750			~~16.17~~ 16.2		•3536.46
C5	•24.5 X	•6 X	•0.0875 X	•20 1•		•257.250			~~12.25~~ 12.25		•3151.31
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
			SUB-TOTAL			•2106.000					•19727.77
W1						0.000			0.00		0.00
W2						0.000			12.00		0.00
W3						0.000			24.50		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
E1						0.000			0.00		0.00
E2						0.000			0.00		0.00
E3						0.000			0.00		0.00
E4						0.000			0.00		0.00
E5						0.000			0.00		0.00
E6						0.000			0.00		0.00
U1	0.000 X	0 X	0.0625			0.000			0.00	0.00	
U2	0.000 X	15 X	0.0625		0	0.000			8.00	0.00	
U3	24.5 X	41 X	0.0625		0	0.000			12.25	0.00	
H1	•41 X	•41 X	•0.0625 X	•0.5			>	•52.531	•13.67		•717.93
H2	•41 X	•41 X	•0.0625 X	•0.5			<	•-52.531	•13.67	•-717.93	
H3	0 X	0 X	0.0625 X	0.5			<	0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5			<	0.000	0.00		0.00
H5	•BARGE IMPACT						>	-334.000	•44.00		-14696.00
H6	HORIZONTAL FORCE						>	0	0.00		0.00
H7	HORIZONTAL FORCE						>	0	0		0.00
H8	HORIZONTAL FORCE						>	0	0		0.00
						SUM •2106.000	SUM H	-334.000		SUM -M -717.93	SUM +M 35141.70
											SUM -M -717.93
										Mo= 34423.77	
											SUM M 34423.77

B= 24.5 — Vo= 2106 — H/V= 0.16 — e= 4.10 — %= 99.85 — FS= 0.00 — MC= 16.35

M/V= — ~~16.35~~ 8.15 — B/4= 6.13

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = \frac{24.463}{}$$

F. P. = 172.176 / 0.000

24.46 — 0.00

You could Zero these

This one is OK

CORPS OF ENGINEERS, U.S. ARMY — BARGE IMPACT 431 — ARKANSAS L&D 9 UPPER GUIDE WALL R-2 FOUNDATION SCALED FROM

LOADING CONDITION: FILL LT.- 246.000 FILL RT.- 246 POOL LT. - 287 POOL RT. - 287

COMPUTED BY: JDC. SEE DWG 522 — CHECKED BY DPS 10/20/04 — DATE 17-Oct-04

	FORCES			LENG	VERTICAL	HORIZONTAL		ARM	- MOMENTS	+
C1	8 X	10 X	0.15 X	60 1	720.000			8.00		5760.00
C2	8 X	15 X	0.0875 X	60 1	630.000			8.00		5040.00
C3	8 X	20 X	0.0875 X	20 1	280.000			8.00		2240.00
C4	12.5 X	20 X	0.0875 X	20 0.5	218.750			16.17		3536.46
C5	24.5 X	6 X	0.0875 X	20 1	257.250			12.25		3151.31
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
	SUB-TOTAL				2106.000					19727.77
W1					0.000			0.00		0.00
W2					0.000			12.00		0.00
W3					0.000			24.50		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
E1					0.000			0.00		0.00
E2					0.000			0.00		0.00
E3					0.000			0.00		0.00
E4					0.000			0.00		0.00
E5					0.000			0.00		0.00
E6					0.000			0.00		0.00
U1	0.000 X	0 X	0.0625		0.000			0.00	0.00	
U2	0.000 X	15 X	0.0625	0	0.000			8.00	0.00	
U3	24.5 X	41 X	0.0625	0	0.000			12.25	0.00	
H1	41 X	41 X	0.0625 X	0.5		>	52.531	13.67		717.93
H2	41 X	41 X	0.0625 X	0.5		<	-52.531	13.67	-717.93	
H3	0 X	0 X	0.0625 X	0.5		<	0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5		<	0.000	0.00		0.00
H5	BARGE IMPACT					>	431.000	44.00		18964.00
H6	HORIZONTAL FORCE					>	0	0.00		0.00
H7	HORIZONTAL FORCE					>	0	0		0.00
H8	HORIZONTAL FORCE					>	0	0		0.00

B=	24.5	Vo=	2106	SUM	2106.000	SUM H	431.000	SUM -M	-717.93
H/V=	0.20								
e=	6.12							Mo=	38691.77
%=	75.03					M/V=	18.37		
FS=	0.00					B/4=	6.13		
MC=	18.37								

SUM +M 39409.70
SUM -M -717.93
SUM M 38691.77

18.38 0.00

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = 18.384$$

$$F.P. = \frac{229.118}{0.000}$$

CORPS OF ENGINEERS, U.S. ARMY — BARGE IMPACT 528 — ARKANSAS L&D 9 UPPER GUIDE WALL R-2 FOUNDATION SCALED FROM

LOADING CONDITION: FILL LT.- 246.000 FILL RT.- 246 POOL LT. - 287 POOL RT. - 287

COMPUTED BY: JDC. SEE DWG 522 — CHECKED BY DPS 10/20/04 — DATE 17-Oct-04

	FORCES				LENG	VERTICAL	HORIZONTAL	ARM	- MOMENTS	+
C1	8 X	10 X	0.15 X	60	1	720.000		8.00		5760.00
C2	8 X	15 X	0.0875 X	60	1	630.000		8.00		5040.00
C3	8 X	20 X	0.0875 X	20	1	280.000		8.00		2240.00
C4	12.5 X	20 X	0.0875 X	20	0.5	218.750		16.17		3536.46
C5	24.5 X	6 X	0.0875 X	20	1	257.250		12.25		3151.31
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
	SUB-TOTAL					2106.000				19727.77
W1						0.000		0.00		0.00
W2						0.000		12.00		0.00
W3						0.000		24.50		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
E1						0.000		0.00		0.00
E2						0.000		0.00		0.00
E3						0.000		0.00		0.00
E4						0.000		0.00		0.00
E5						0.000		0.00		0.00
E6						0.000		0.00		0.00
U1	0.000 X	0 X	0.0625			0.000		0.00	0.00	
U2	0.000 X	15 X	0.0625		0	0.000		8.00	0.00	
U3	24.5 X	41 X	0.0625		0	0.000		12.25	0.00	
H1	41 X	41 X	0.0625 X	0.5			> 52.531	13.67		717.93
H2	41 X	41 X	0.0625 X	0.5			< -52.531	13.67	-717.93	
H3	0 X	0 X	0.0625 X	0.5			< 0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5			< 0.000	0.00		0.00
H5	BARGE IMPACT						> 528.000	44.00		23232.00
H6	HORIZONTAL FORCE						> 0	0.00		0.00
H7	HORIZONTAL FORCE						> 0	0		0.00
H8	HORIZONTAL FORCE						> 0	0		0.00
						SUM 2106.000	SUM H 528.000		SUM -M -717.93	SUM +M 43677.70
										SUM -M -717.93
									Mo= 42959.77	
										SUM M 42959.77

B=	24.5	Vo=	2106	
H/V=	0.25			
e=	8.15			
%=	50.22		M/V=	20.40
FS=	0.00		B/4=	6.13
MC=	20.40			

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = 12.304$$

$$F.P. = \frac{342.335}{0.000}$$

12.30 0.00

CORPS OF ENGINEERS, U.S. ARMY — BARGE IMPACT 724 — ARKANSAS L&D 9 UPPER GUIDE WALL R-2 FOUNDATION SCALED FROM

LOADING CONDITION: FILL LT.- 246.000 FILL RT.- 246 POOL LT. - 287 POOL RT. - 287

COMPUTED BY: JDC. SEE DWG 522 — CHECKED BY DPS 10/20/04 — DATE 17-Oct-04

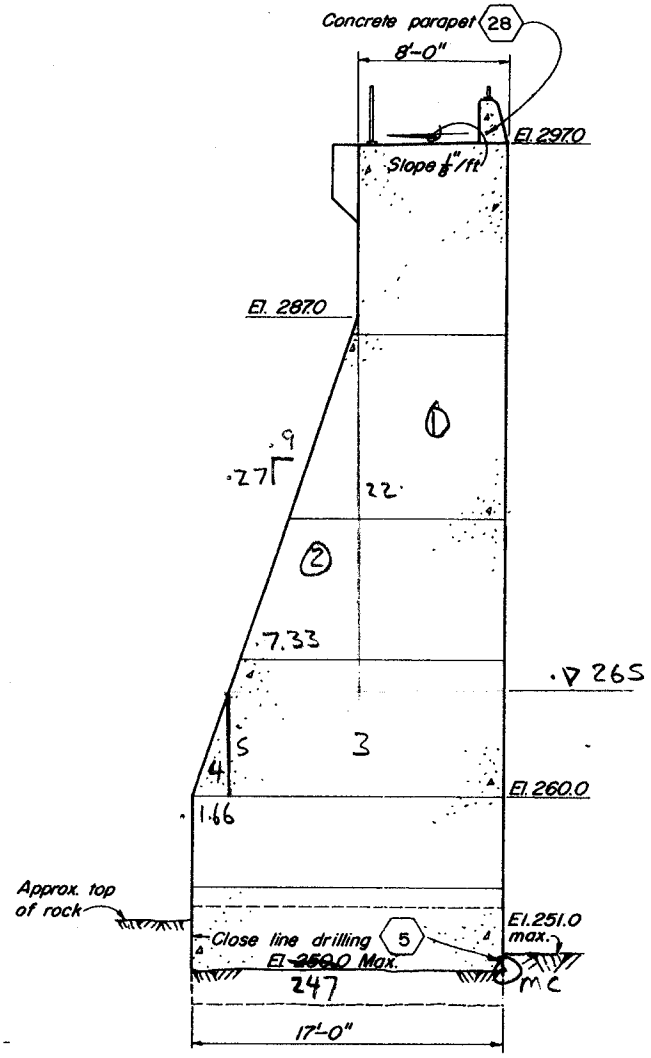
	FORCES				LENG	VERTICAL	HORIZONTAL		ARM	- MOMENTS	+
C1	8 X	10 X	0.15 X	60	1	720.000			8.00		5760.00
C2	8 X	15 X	0.0875 X	60	1	630.000			8.00		5040.00
C3	8 X	20 X	0.0875 X	20	1	280.000			8.00		2240.00
C4	12.5 X	20 X	0.0875 X	20	0.5	218.750			16.17		3536.46
C5	24.5 X	6 X	0.0875 X	20	1	257.250			12.25		3151.31
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
	SUB-TOTAL					2106.000					19727.77
W1						0.000			0.00		0.00
W2						0.000			12.00		0.00
W3						0.000			24.50		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
E1						0.000			0.00		0.00
E2						0.000			0.00		0.00
E3						0.000			0.00		0.00
E4						0.000			0.00		0.00
E5						0.000			0.00		0.00
E6						0.000			0.00		0.00
U1	0.000 X	0 X	0.0625			0.000			0.00	0.00	
U2	0.000 X	15 X	0.0625		0	0.000			8.00	0.00	
U3	24.5 X	41 X	0.0625		0	0.000			12.25	0.00	
H1	41 X	41 X	0.0625 X	0.5			>	52.531	13.67		717.93
H2	41 X	41 X	0.0625 X	0.5			<	-52.531	13.67	-717.93	
H3	0 X	0 X	0.0625 X	0.5			<	0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5			<	0.000	0.00		0.00
H5	BARGE IMPACT						>	724.000	44.00		31856.00
H6	HORIZONTAL FORCE						>	0	0.00		0.00
H7	HORIZONTAL FORCE						>	0	0		0.00
H8	HORIZONTAL FORCE						>	0	0		0.00

B=	24.5	Vo=	2106	SUM	2106.000	SUM H 724.000	SUM -M -717.93
H/V=	0.34						SUM +M 52301.70
e=	12.24						SUM -M -717.93
%=	0.08					M/V= 24.49	Mo= 51583.77
FS=	0.00					B/4= 6.13	SUM M 51583.77
MC=	24.49						0.02 0.00

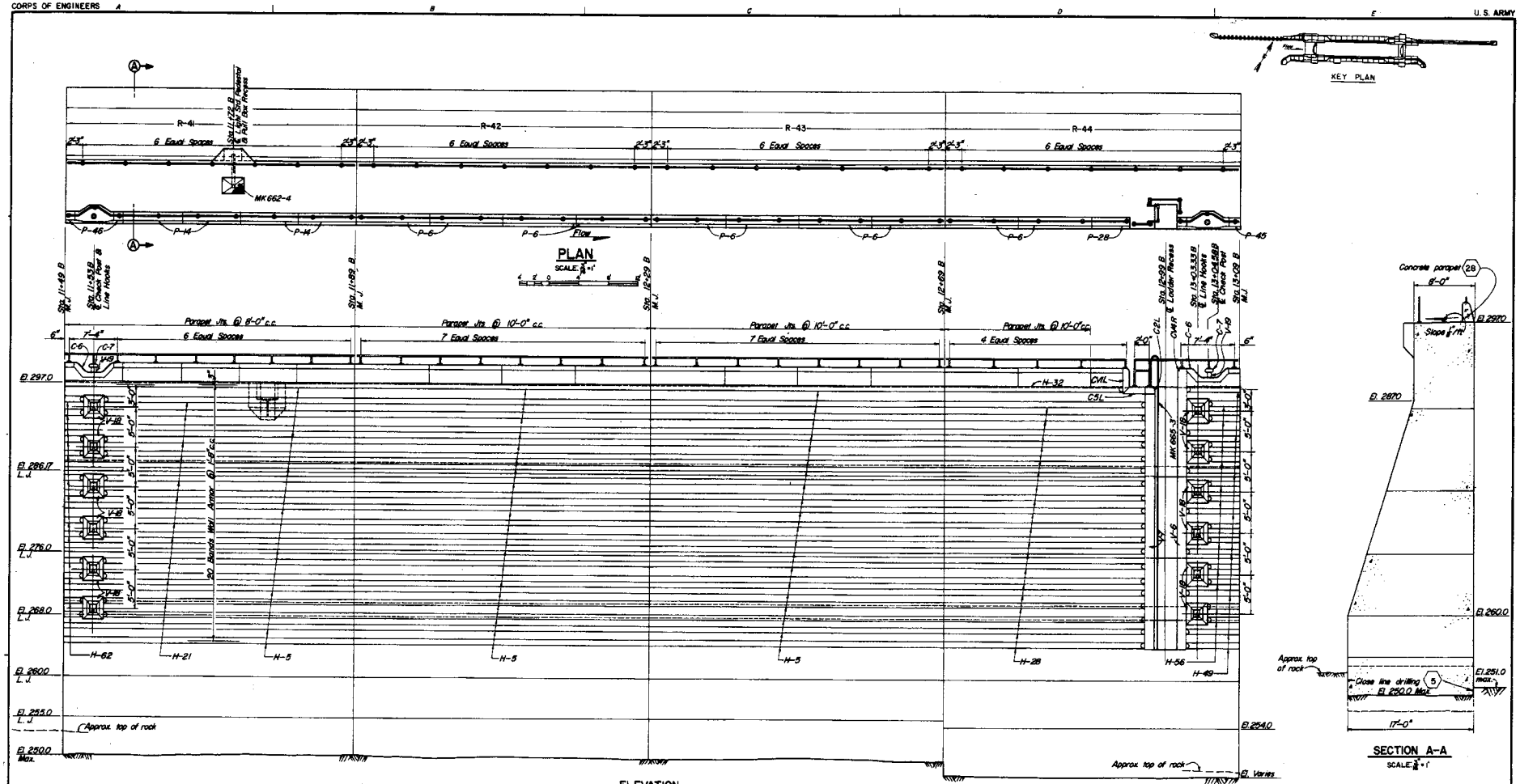
$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = 0.019$$

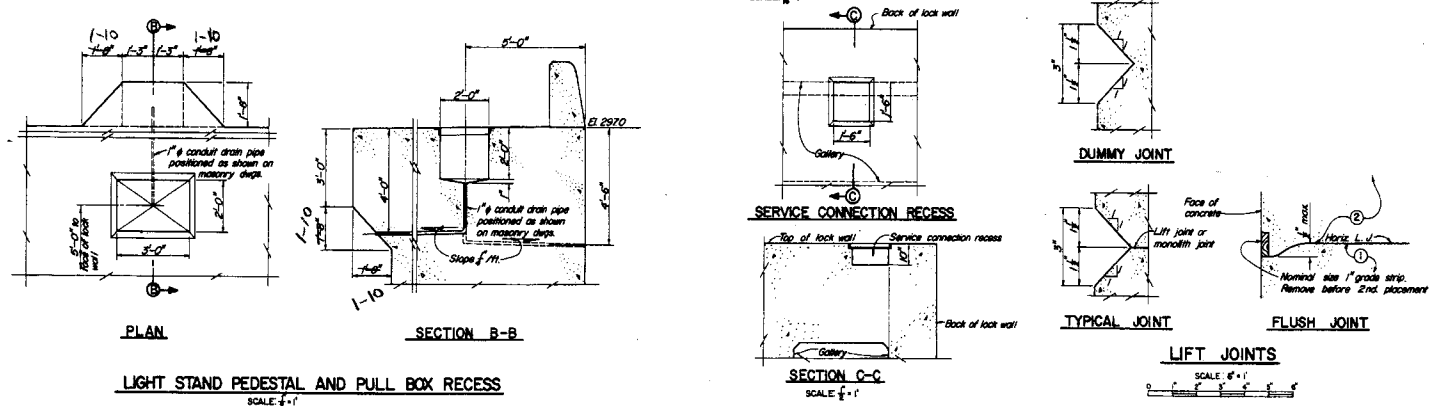
F. P. = ######### / 0.000

CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT		ARKANSAS L&D 9 LOWER GUIDE WALL R-45 - FOND. SCALED FROM D
LOADING CONDITION:	FILL LT.- 247	FILL RT.- 247	POOL LT. - " 265 POOL RT. - " 265
COMPUTED BY: JDC.	SEE DWG -63/573	CHECKED BY	DATE 27-Oct-04



CORPS OF ENGINEERS U. S. ARMY





NOTES:

1. For general notes see Dwg. 520.
2. Pertinent details shown on the following drawings:
   a. Conc. Parapet – 571.
   b. Alum. Handrailing – 660.
   c. Line Hooks – 669.
   d. Check Post – 668.
   e. Ladder Recess – 570.
   f. Wall Armor – 667 thru 669.
3. All concrete on this drawing not otherwise noted to be paid for under Bid Item (28). 27

KEY	DATE	REVISION (INDICATED BY Δ)	CHKD.	REC.	APPR.

U.S. ARMY ENGINEER DISTRICT
TULSA
CORPS OF ENGINEERS
TULSA, OKLAHOMA

U.S. ARMY ENGINEER DISTRICT
LITTLE ROCK
OFFICE OF THE DISTRICT ENGINEER
LITTLE ROCK, ARKANSAS

DESIGNED: T.L.M.
DRAWN: G.L.B.
CHECKED: J.L.J.
SUBMITTED:
CHIEF, DESIGN BRANCH
RECOMMENDED:
CHIEF, ENGRG. DIVISION, TULSA DISTRICT OFFICE

ARKANSAS RIVER & TRIBUTARIES — ARKANSAS RIVER, ARKANSAS

LOCK AND DAM NO. 9
NAVIGATION LOCK
MASONRY
CONCRETE – MONOLITHS R-41 THRU R-44

APPROVED: E. F. Rutt
CHIEF, ENGINEERING DIVISION

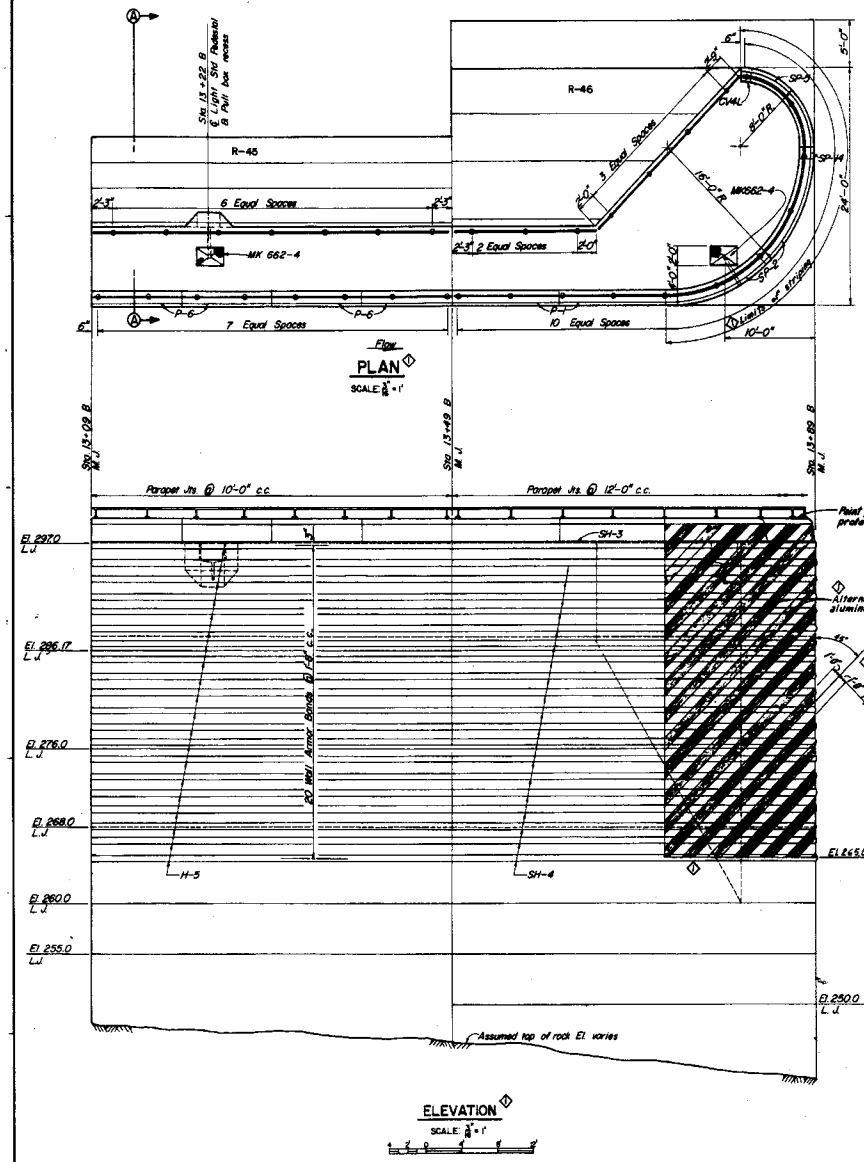
DATE: AUG. 1965
SCALE: AS SHOWN
SPEC. NO. 66-59

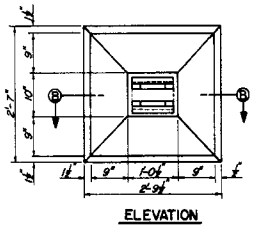
PREPARED UNDER THE DIRECTION OF
FRANK P. BANE, COL., C.E., DISTRICT ENGINEER

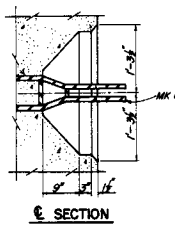
DRAWING NUMBER
850-63/572
SHEET 157 OF 268

CORPS OF ENGINEERS A B C D E U.S. ARMY

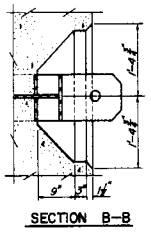


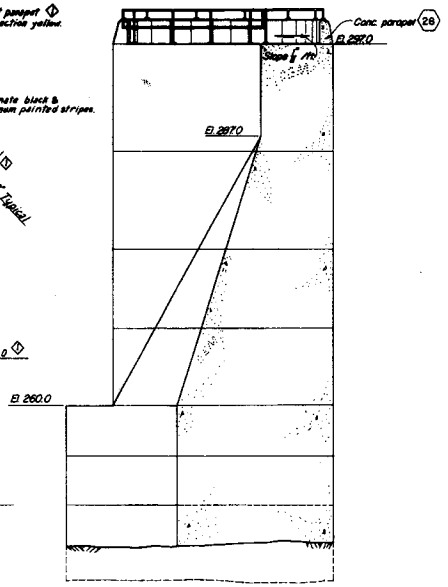






GATE LATCH RECESS
SCALE: 1" = 1'





NOTES:

1. For general notes see Dwg. 520.
2. All concrete on this drawing not otherwise noted to be paid for under Bid Item (27)
3. Pertinent details show on the following drawings:
   a. Conc. Parapet – 571.
   b. Alum. Handrailing – 660.
   c. Pull Box Recess – 572.
   d. Wall Armor – 667 thru 669.
   e. Lift Joints – 572.

KEY	DATE	REVISION (INDICATED BY ◇)	BY
◇	11/2/65	Revised Bid Item in Note 2.	
		Added striping on Plan and Elevation. Amend No. 2	C.E.M.

U.S. ARMY ENGINEER DISTRICT TULSA CORPS OF ENGINEERS TULSA, OKLAHOMA	U.S. ARMY ENGINEER DISTRICT LITTLE ROCK OFFICE OF THE DISTRICT ENGINEER LITTLE ROCK, ARKANSAS
DESIGNED T.L.M. DRAWN C.L.B. CHECKED L.L.J. SUBMITTED: CHIEF, DESIGN BRANCH RECOMMENDED: CHIEF, ENGR. DIVISION, TULSA DISTRICT OFFICE	ARKANSAS RIVER & TRIBUTARIES — ARKANSAS RIVER, ARKANSAS LOCK AND DAM NO. 9 NAVIGATION LOCK MASONRY CONCRETE – MONOLITHS R-45 & R-46
APPROVED: CHIEF, ENGINEERING DIVISION	DATE: AUG. 1965 SCALE AS SHOWN SPEC. NO. 66-39
PREPARED UNDER THE DIRECTION OF FRANK P. GANE, COL., C.E., DISTRICT ENGINEER	DRAWING NUMBER 8504-63/573 SHEET 136 OF 286

THIS DRAWING HAS BEEN REDUCED TO ONE-HALF THE ORIGINAL SCALE

INCL 1, AMEND. NO. 2

CORPS OF ENGINEERS, U.S. ARMY — BARGE IMPACT 644 — ARKANSAS L&D 9 LOWER GUIDE WALL R-45 - FOND. SCALED FROM D

LOADING CONDITION: FILL LT.- 247 FILL RT.- 247 POOL LT. - 265 POOL RT. - 265

COMPUTED BY: JDC. SEE DWG -63/573 — CHECKED BY DRS 4/2/69 — DATE 27-Oct-04

	FORCES			LENG 40	VERTICAL	HORIZONTAL	ARM	MOMENTS -	MOMENTS +
C1	8.00 X 32.00 X	0.15 X		40 1	1536.000		4.00		6144.00
C2	7.33 X 22.00 X	0.15 X		40 0.5	484.000		10.44		5055.11
C3	15.33 X 5.00 X	0.0875 X		40 1	268.333		7.67		2057.22
C4	1.67 X 5.00 X	0.0875 X		40 0.5	14.583		15.89		231.71
C5	17.00 X 13.00 X	0.0875 X		40 1	773.500		8.50		6574.75
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
		SUB-TOTAL			3076.417				20062.80
					0.000		0.00		0.00
					0.000		12.33		0.00
					0.000		15.00		0.00
					0.000		16.89		0.00
					0.000		22.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
E1					0.000		0.00		0.00
E2					0.000		0.00		0.00
E3					0.000		0.00		0.00
E4					0.000		0.00		0.00
E5					0.000		0.00		0.00
E6					0.000		0.00		0.00
U1	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U2	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U3	17 X	18 X	0.0625	0	0.000		8.50	0.00	
H1	18 X	18 X	0.0625 X	0.5		> 10.125	6.00		60.75
H2	18 X	18 X	0.0625 X	0.5		< -10.125	6.00	-60.75	
H3	0 X	0 X	0.0625 X	0.5		< 0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5		< 0.000	0.00		0.00
H5	BARGE IMPACT					> 644.000	23.00		14812.00
H6	HORIZONTAL FORCE					> 0	0.00		0.00
H7	HORIZONTAL FORCE					> 0	0		0.00
H8	HORIZONTAL FORCE					> 0	0		0.00

B=	17	Vo=	3076.4	SUM 3076.417	SUM H 644.000	SUM -M -60.75	SUM +M 34935.55
H/V=	0.21						SUM -M -60.75
e=	2.84					Mo= 34874.80	
%=	99.95				M/V= 11.34		SUM M 34874.80
FS=	0.00				B/4= 4.25		
MC=	11.34						16.99 0.00

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = \frac{16.991}{}$$

F. P. = 362.113 / 0.000

CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT 833	ARKANSAS L&D 9 LOWER GUIDE WALL R-45 - FOND. SCALED FROM D

LOADING CONDITION: FILL LT.- 247 FILL RT.- 247 POOL LT. - 265 POOL RT. - 265

COMPUTED BY: JDC. SEE DWG -63/573 CHECKED BY DPS 11/2/04 DATE 27-Oct-04

	FORCES			LENG 40	VERTICAL	HORIZONTAL	ARM	MOMENTS -	MOMENTS +
C1	8.00 X 32.00 X	0.15 X	40 1		1536.000		4.00		6144.00
C2	7.33 X 22.00 X	0.15 X	40 0.5		484.000		10.44		5055.11
C3	15.33 X 5.00 X	0.0875 X	40 1		268.333		7.67		2057.22
C4	1.67 X 5.00 X	0.0875 X	40 0.5		14.583		15.89		231.71
C5	17.00 X 13.00 X	0.0875 X	40 1		773.500		8.50		6574.75
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
	SUB-TOTAL				3076.417				20062.80
					0.000		0.00		0.00
					0.000		12.33		0.00
					0.000		15.00		0.00
					0.000		16.89		0.00
					0.000		22.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
E1					0.000		0.00		0.00
E2					0.000		0.00		0.00
E3					0.000		0.00		0.00
E4					0.000		0.00		0.00
E5					0.000		0.00		0.00
E6					0.000		0.00		0.00
U1	0.000 X 0 X	0.0625			0.000		0.00	0.00	
U2	0.000 X 0 X	0.0625			0.000		0.00	0.00	
U3	17 X 18 X	0.0625		0	0.000		8.50	0.00	
H1	18 X 18 X	0.0625 X	0.5			> 10.125	6.00		60.75
H2	18 X 18 X	0.0625 X	0.5			< -10.125	6.00	-60.75	
H3	0 X 0 X	0.0625 X	0.5			< 0.000	0.00	0.00	
H4	0 X 0 X	0.0625 X	0.5			< 0.000	0.00		0.00
H5	BARGE IMPACT					> 833.000	23.00		19159.00
H6	HORIZONTAL FORCE					> 0	0.00		0.00
H7	HORIZONTAL FORCE					> 0	0		0.00
H8	HORIZONTAL FORCE					> 0	0		0.00
					SUM 3076.417	SUM H 833.000		SUM -M -60.75	SUM +M 39282.55
									SUM -M -60.75
								Mo= 39221.80	
									SUM M 39221.80

B= 17 Vo= 3076.4
H/V= 0.27
e= 4.25
%= 75.01
FS= 0.00
MC= 12.75

M/V= 12.75
B/4= 4.25

12.75 0.00

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = 12.752$$

$$F.P. = \frac{482.482}{0.000}$$

CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT 1022	ARKANSAS L&D 9 LOWER GUIDE WALL R-45 - FOND. SCALED FROM D

LOADING CONDITION: FILL LT.- 247 FILL RT.- 247 POOL LT. - 265 POOL RT. - 265

COMPUTED BY: JDC. SEE DWG -63/573 CHECKED BY DPS 11/2/04 DATE 27-Oct-04

	FORCES			LENG 40	VERTICAL	HORIZONTAL	ARM	MOMENTS -	MOMENTS +
C1	8.00 X	32.00 X	0.15 X	40 1	1536.000		4.00		6144.00
C2	7.33 X	22.00 X	0.15 X	40 0.5	484.000		10.44		5055.11
C3	15.33 X	5.00 X	0.0875 X	40 1	268.333		7.67		2057.22
C4	1.67 X	5.00 X	0.0875 X	40 0.5	14.583		15.89		231.71
C5	17.00 X	13.00 X	0.0875 X	40 1	773.500		8.50		6574.75
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
		SUB-TOTAL			3076.417				20062.80
					0.000		0.00		0.00
					0.000		12.33		0.00
					0.000		15.00		0.00
					0.000		16.89		0.00
					0.000		22.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
E1					0.000		0.00		0.00
E2					0.000		0.00		0.00
E3					0.000		0.00		0.00
E4					0.000		0.00		0.00
E5					0.000		0.00		0.00
E6					0.000		0.00		0.00
U1	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U2	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U3	17 X	18 X	0.0625	0	0.000		8.50	0.00	
H1	18 X	18 X	0.0625 X	0.5		> 10.125	6.00		60.75
H2	18 X	18 X	0.0625 X	0.5		< -10.125	6.00	-60.75	
H3	0 X	0 X	0.0625 X	0.5		< 0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5		< 0.000	0.00		0.00
H5	BARGE IMPACT					> 1022.000	23.00		23506.00
H6	HORIZONTAL FORCE					> 0	0.00		0.00
H7	HORIZONTAL FORCE					> 0	0		0.00
H8	HORIZONTAL FORCE					> 0	0		0.00

B=	17	Vo=	3076.4	SUM V 3076.417	SUM H 1022.000		SUM -M -60.75	SUM +M 43629.55
H/V=	0.33							SUM -M -60.75
e=	5.66						Mo= 43568.80	
%=	50.08				M/V=	14.16		SUM M 43568.80
FS=	0.00				B/4=	4.25		
MC=	14.16							8.51 0.00

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = \frac{8.513}{}$$

F. P. = 722.721 / 0.000

CORPS OF ENGINEERS, U.S. ARMY | BARGE IMPACT 1401 | ARKANSAS L&D 9 LOWER GUIDE WALL R-45 - FOND. SCALED FROM D

LOADING CONDITION: FILL LT.- 247 FILL RT.- 247 POOL LT. - 265 POOL RT. - 265

COMPUTED BY: JDC. SEE DWG -63/573 CHECKED BY DPS 11/2/04 DATE 27-Oct-04

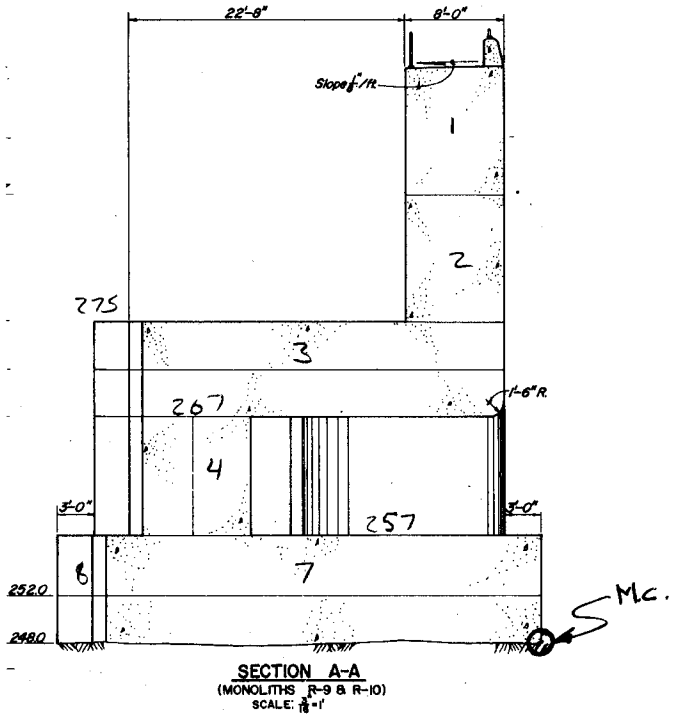
	FORCES			LENG 40	VERTICAL	HORIZONTAL	ARM	- MOMENTS	+
C1	8.00 X 32.00 X	0.15 X	40 1		1536.000		4.00		6144.00
C2	7.33 X 22.00 X	0.15 X	40 0.5		484.000		10.44		5055.11
C3	15.33 X 5.00 X	0.0875 X	40 1		268.333		7.67		2057.22
C4	1.67 X 5.00 X	0.0875 X	40 0.5		14.583		15.89		231.71
C5	17.00 X 13.00 X	0.0875 X	40 1		773.500		8.50		6574.75
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
	SUB-TOTAL				3076.417				20062.80
					0.000		0.00		0.00
					0.000		12.33		0.00
					0.000		15.00		0.00
					0.000		16.89		0.00
					0.000		22.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
E1					0.000		0.00		0.00
E2					0.000		0.00		0.00
E3					0.000		0.00		0.00
E4					0.000		0.00		0.00
E5					0.000		0.00		0.00
E6					0.000		0.00		0.00
U1	0.000 X 0 X	0.0625			0.000		0.00	0.00	
U2	0.000 X 0 X	0.0625			0.000		0.00	0.00	
U3	17 X 18 X	0.0625		0	0.000		8.50	0.00	
H1	18 X 18 X	0.0625 X	0.5			> 10.125	6.00		60.75
H2	18 X 18 X	0.0625 X	0.5			< -10.125	6.00	-60.75	
H3	0 X 0 X	0.0625 X	0.5			< 0.000	0.00	0.00	
H4	0 X 0 X	0.0625 X	0.5			< 0.000	0.00		0.00
H5	BARGE IMPACT					> 1401.000	23.00		32223.00
H6	HORIZONTAL FORCE					> 0	0.00		0.00
H7	HORIZONTAL FORCE					> 0	0		0.00
H8	HORIZONTAL FORCE					> 0	0		0.00

B=	17	Vo=	3076.4	SUM	3076.417	SUM H 1401.000	SUM -M	-60.75	SUM +M 52346.55
H/V=	0.46								SUM -M -60.75
e=	8.50							Mo= 52285.80	
%=	-0.08					M/V=	17.00		SUM M 52285.80
FS=	0.00					B/4=	4.25		
MC=	17.00								0.01 0.00

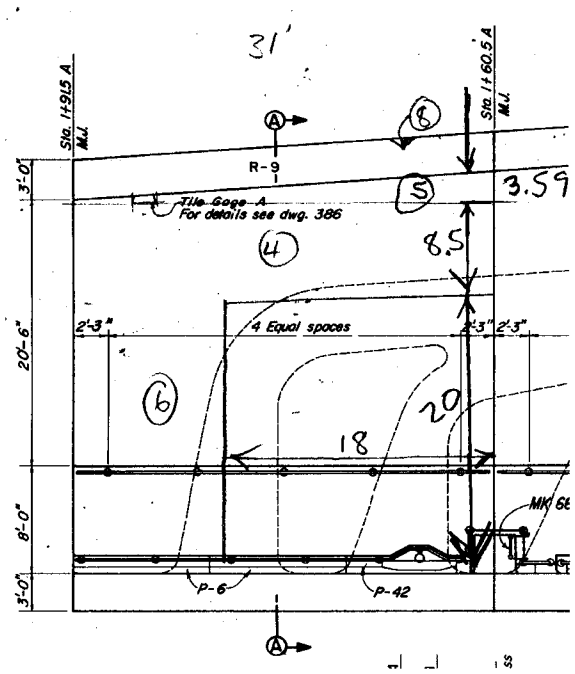
$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = 0.013$$

F. P. = ######### / 0.000

CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT		ARKANSAS L&D 9 R-9	
LOADING CONDITION:	FILL LT.- 246	FILL RT.- 246	POOL LT. - 287	POOL RT. - 287
COMPUTED BY: JDC.	SEE DWG 529	CHECKED BY DPS 10/20/04	DATE 19-Oct-04	

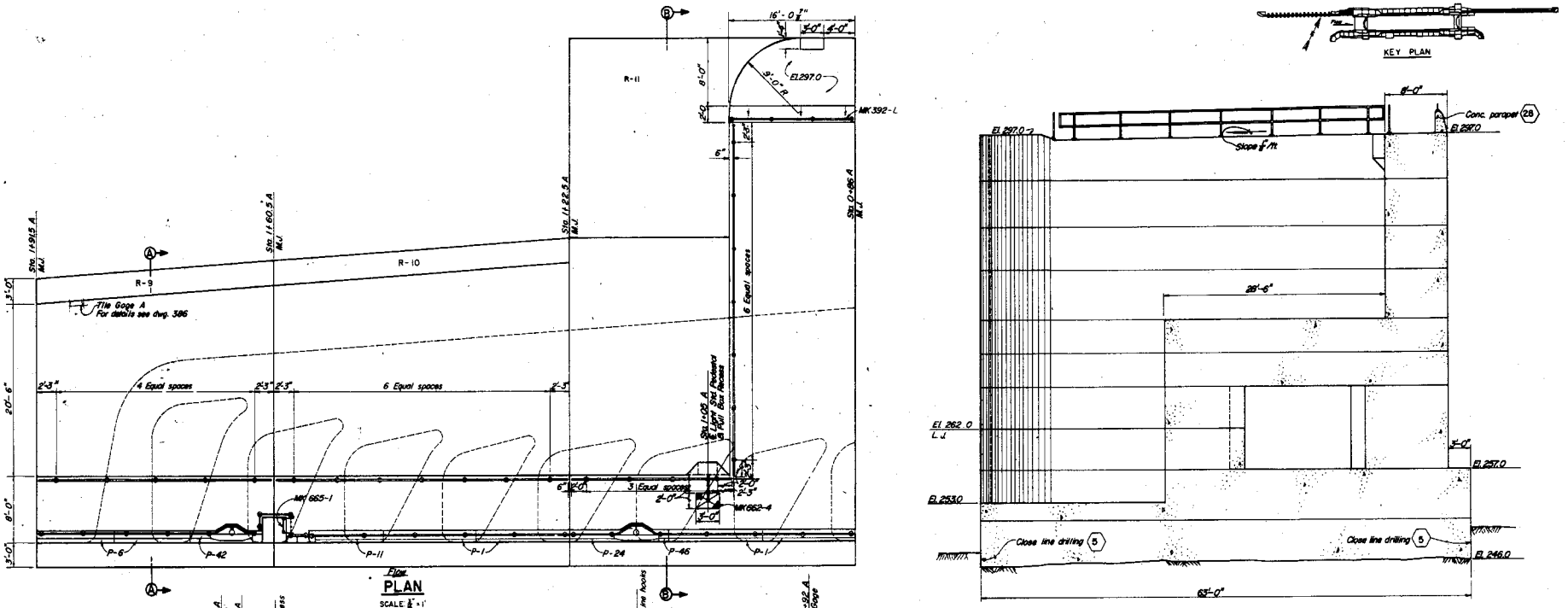


SECTION A-A
(MONOLITHS R-9 & R-10)
SCALE: 1/8"=1'



CORPS OF ENGINEERS

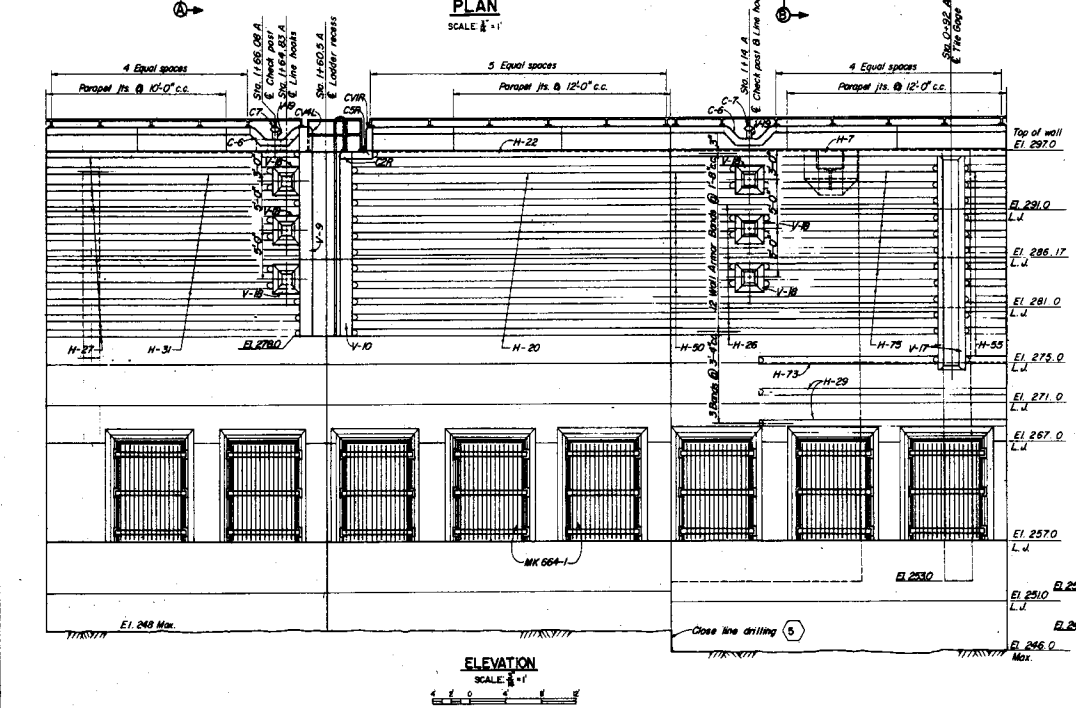
U. S. ARMY



Flow

PLAN

SCALE: 1/8" = 1'



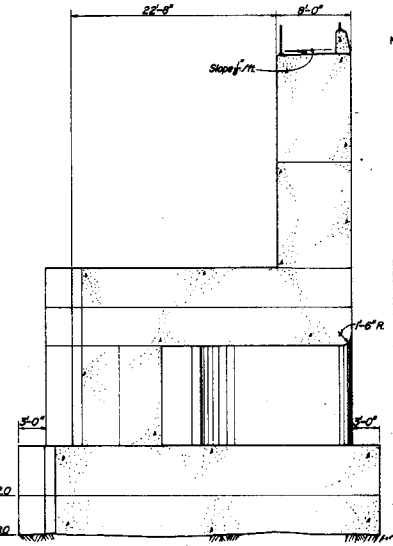
ELEVATION

SCALE: 1/8" = 1'

SECTION B-B

(MONOLITH R-11)

SCALE: 1/8" = 1'



SECTION A-A

(MONOLITHS R-9 & R-10)

SCALE: 1/8" = 1'

NOTES:

1. For general notes see Dwg. 520.
2. Pertinent details shown on the following drawings:
   a. Conc. Parapet – 571.
   b. Alum. Handrailing – 660.
   c. Protection Armor – 667 thru 669.
   d. Line Hooks – 669.
   e. Check Post – 668.
   f. Ladder Recess – 570.
   g. Light Standard Pedestal – 572.
   h. Pull Box Recess – 572.
   i. Inside Manifold – 530.
   j. Tile Gage – 588.
3. All concrete on this drawing not otherwise noted to be paid for under Bid Item (28).

KEY	DATE	REVISION (INDICATED BY Δ)	CHKD.	REC.	APPR.

U.S. ARMY ENGINEER DISTRICT TULSA CORPS OF ENGINEERS TULSA, OKLAHOMA	U.S. ARMY ENGINEER DISTRICT LITTLE ROCK OFFICE OF THE DISTRICT ENGINEER LITTLE ROCK, ARKANSAS
DESIGNED: T.L.N.	ARKANSAS RIVER & TRIBUTARIES — ARKANSAS RIVER, ARKANSAS
DRAWN: C.L.B.	LOCK AND DAM NO. 9
CHECKED: T.L.N.	NAVIGATION LOCK
SUBMITTED: CHIEF, DESIGN BRANCH	MASONRY
RECOMMENDED: CHIEF, ENGRG. DIVISION, TULSA DISTRICT OFFICE	CONCRETE - MONOLITHS R-9 THRU R-11
APPROVED: CHIEF, ENGINEERING DIVISION	DATE: AUG. 1965
PREPARED UNDER THE DIRECTION OF FRANK P. BANE, COL., C.E., DISTRICT ENGINEER	SCALE AS SHOWN — SPEC. NO. 66-29
	DRAWING NUMBER 8504-63/529
	SHEET 94 OF 388

CORPS OF ENGINEERS, U.S. ARMY | BARGE IMPACT 419 | ARKANSAS L&D 9 R-9

LOADING CONDITION: FILL LT.- 246.000 FILL RT.- 246 POOL LT. - 287 POOL RT. - 287

COMPUTED BY: JDC. SEE DWG 529 2.700 CHECKED BY DPS 10/20/04 DATE 19-Oct-04

	FORCES				LENG	VERTICAL	HORIZONTAL		ARM	- MOMENTS	+
C1	8 X	10 X	0.15 X	31 1		372.000			7.00		2604.00
C2	8 X	12 X	0.0875 X	31 1		260.400			7.00		1822.80
C3	28.5 X	8 X	0.0875 X	31 1		618.450			17.25		10668.26
C4	8.5 X	10 X	0.0875 X	31 1		230.563			27.25		6282.83
C5	3.59 X	18 X	0.0875 X	31 0.5		87.641			32.70		2865.56
C6	20 X	10 X	0.0875 X	13 1		227.500			13.00		2957.50
C7	34.5 X	9 X	0.0875 X	31 1		842.231			17.25		14528.49
C8	3.59 X	9 X	0.0875 X	31 0.5		43.820			35.70		1564.24
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
	SUB-TOTAL					2682.605					43293.69
W1						0.000			0.00		0.00
W2						0.000			12.00		0.00
W3						0.000			24.50		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
E1						0.000			0.00		0.00
E2						0.000			0.00		0.00
E3						0.000			0.00		0.00
E4						0.000			0.00		0.00
E5						0.000			0.00		0.00
E6						0.000			0.00		0.00
U1	0.000 X	0 X	0.0625			0.000			0.00	0.00	
U2	0.000 X	15 X	0.0625		0	0.000			8.00	0.00	
U3	34.5 X	41 X	0.0625		0	0.000			17.25	0.00	
H1	41 X	41 X	0.0625 X	0.5			>	52.531	13.67		717.93
H2	41 X	41 X	0.0625 X	0.5			<	-52.531	13.67	-717.93	
H3	0 X	0 X	0.0625 X	0.5			<	0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5			<	0.000	0.00		0.00
H5	BARGE IMPACT						>	419.000	44.00		18436.00
H6	HORIZONTAL FORCE						>	0	0.00		0.00
H7	HORIZONTAL FORCE						>	0	0		0.00
H8	HORIZONTAL FORCE						>	0	0		0.00

B=	34.5	Vo=	2682.6	SUM	2682.605	SUM H	419.000	SUM -M	-717.93	SUM +M	62447.61
H/V=	0.16									SUM -M	-717.93
e=	5.76								Mo= 61729.69		
%=	99.90					M/V=	23.01			SUM M	61729.69
FS=	0.00					B/4=	8.63				
MC=	23.01									34.47	0.00

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = \frac{34.467}{F.P. = \frac{155.664}{0.000}}$$

CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT	593	ARKANSAS L&D 9 R-9

LOADING CONDITION:	FILL LT.-	246.000	FILL RT.-	246	POOL LT. -	287	POOL RT. -	287

COMPUTED BY: JDC.	SEE DWG 529	2.700	CHECKED BY DPS 10/20/04	DATE 19-Oct-04

	FORCES			LENG	VERTICAL	HORIZONTAL	ARM	MOMENTS -	MOMENTS +
C1	8 X	10 X	0.15 X	31 1	372.000		7.00		2604.00
C2	8 X	12 X	0.0875 X	31 1	260.400		7.00		1822.80
C3	28.5 X	8 X	0.0875 X	31 1	618.450		17.25		10668.26
C4	8.5 X	10 X	0.0875 X	31 1	230.563		27.25		6282.83
C5	3.59 X	18 X	0.0875 X	31 0.5	87.641		32.70		2865.56
C6	20 X	10 X	0.0875 X	13 1	227.500		13.00		2957.50
C7	34.5 X	9 X	0.0875 X	31 1	842.231		17.25		14528.49
C8	3.59 X	9 X	0.0875 X	31 0.5	43.820		35.70		1564.24
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
		SUB-TOTAL			2682.605				43293.69
W1					0.000		0.00		0.00
W2					0.000		12.00		0.00
W3					0.000		24.50		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
E1					0.000		0.00		0.00
E2					0.000		0.00		0.00
E3					0.000		0.00		0.00
E4					0.000		0.00		0.00
E5					0.000		0.00		0.00
E6					0.000		0.00		0.00
U1	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U2	0.000 X	15 X	0.0625	0	0.000		8.00	0.00	
U3	34.5 X	41 X	0.0625	0	0.000		17.25	0.00	
H1	41 X	41 X	0.0625 X	0.5		> 52.531	13.67		717.93
H2	41 X	41 X	0.0625 X	0.5		< -52.531	13.67	-717.93	
H3	0 X	0 X	0.0625 X	0.5		< 0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5		< 0.000	0.00		0.00
H5	BARGE IMPACT					> 593.000	44.00		26092.00
H6	HORIZONTAL FORCE					> 0	0.00		0.00
H7	HORIZONTAL FORCE					> 0	0		0.00
H8	HORIZONTAL FORCE					> 0	0		0.00
					SUM 2682.605	SUM H 593.000		SUM -M -717.93	SUM +M 70103.61
									SUM -M -717.93
								Mo= 69385.69	
									SUM M 69385.69

B=	34.5	Vo=	2682.6		25.90 0.00
H/V=	0.22				
e=	8.62				
%=	75.09			M/V=	25.87
FS=	0.00			B/4=	8.63
MC=	25.87				

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = \frac{25.905}{}$$

$$F.P. = \frac{207.112}{0.000}$$

CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT 768	ARKANSAS L&D 9 R-9

LOADING CONDITION: FILL LT.- 246.000 FILL RT.- 246 POOL LT. - 287 POOL RT. - 287

COMPUTED BY: JDC. SEE DWG 529 2.700 CHECKED BY DBS 10/20/04 DATE 19-Oct-04

	FORCES			LENG	VERTICAL	HORIZONTAL	ARM	- MOMENTS	+
C1	8 X	10 X	0.15 X	31 1	372.000		7.00		2604.00
C2	8 X	12 X	0.0875 X	31 1	260.400		7.00		1822.80
C3	28.5 X	8 X	0.0875 X	31 1	618.450		17.25		10668.26
C4	8.5 X	10 X	0.0875 X	31 1	230.563		27.25		6282.83
C5	3.59 X	18 X	0.0875 X	31 0.5	87.641		32.70		2865.56
C6	20 X	10 X	0.0875 X	13 1	227.500		13.00		2957.50
C7	34.5 X	9 X	0.0875 X	31 1	842.231		17.25		14528.49
C8	3.59 X	9 X	0.0875 X	31 0.5	43.820		35.70		1564.24
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
		SUB-TOTAL			2682.605				43293.69
W1					0.000		0.00		0.00
W2					0.000		12.00		0.00
W3					0.000		24.50		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
E1					0.000		0.00		0.00
E2					0.000		0.00		0.00
E3					0.000		0.00		0.00
E4					0.000		0.00		0.00
E5					0.000		0.00		0.00
E6					0.000		0.00		0.00
U1	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U2	0.000 X	15 X	0.0625	0	0.000		8.00	0.00	
U3	34.5 X	41 X	0.0625	0	0.000		17.25	0.00	
H1	41 X	41 X	0.0625 X	0.5		> 52.531	13.67		717.93
H2	41 X	41 X	0.0625 X	0.5		< -52.531	13.67	-717.93	
H3	0 X	0 X	0.0625 X	0.5		< 0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5		< 0.000	0.00		0.00
H5	BARGE IMPACT					> 768.000	44.00		33792.00
H6	HORIZONTAL FORCE					> 0	0.00		0.00
H7	HORIZONTAL FORCE					> 0	0		0.00
H8	HORIZONTAL FORCE					> 0	0		0.00

B=	34.5	Vo=	2682.6	SUM	2682.605	SUM H	768.000	SUM -M	-717.93	SUM +M	77803.61
H/V=	0.29									SUM -M	-717.93
e=	11.49							Mo=	77085.69		
%=	50.13					M/V=	28.74			SUM M	77085.69
FS=	0.00					B/4=	8.63				
MC=	28.74									17.29	0.00

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = 17.294 \qquad F.P. = \frac{310.238}{0.000}$$

CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT 1119	ARKANSAS L&D 9 R-9
LOADING CONDITION:	FILL LT.- 246.000 FILL RT.- 246	POOL LT. - 287 POOL RT. - 287
COMPUTED BY: JDC. SEE DWG 529	2.700 CHECKED BY DPS 10/20/04	DATE 19-Oct-04

	FORCES				LENG	VERTICAL	HORIZONTAL	ARM	- MOMENTS	+
C1	8 X	10 X	0.15 X	31 1		372.000		7.00		2604.00
C2	8 X	12 X	0.0875 X	31 1		260.400		7.00		1822.80
C3	28.5 X	8 X	0.0875 X	31 1		618.450		17.25		10668.26
C4	8.5 X	10 X	0.0875 X	31 1		230.563		27.25		6282.83
C5	3.59 X	18 X	0.0875 X	31 0.5		87.641		32.70		2865.56
C6	20 X	10 X	0.0875 X	13 1		227.500		13.00		2957.50
C7	34.5 X	9 X	0.0875 X	31 1		842.231		17.25		14528.49
C8	3.59 X	9 X	0.0875 X	31 0.5		43.820		35.70		1564.24
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
			SUB-TOTAL			2682.605				43293.69
W1						0.000		0.00		0.00
W2						0.000		12.00		0.00
W3						0.000		24.50		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
E1						0.000		0.00		0.00
E2						0.000		0.00		0.00
E3						0.000		0.00		0.00
E4						0.000		0.00		0.00
E5						0.000		0.00		0.00
E6						0.000		0.00		0.00
U1	0.000 X	0 X	0.0625			0.000		0.00	0.00	
U2	0.000 X	15 X	0.0625		0	0.000		8.00	0.00	
U3	34.5 X	41 X	0.0625		0	0.000		17.25	0.00	
H1	41 X	41 X	0.0625 X	0.5			> 52.531	13.67		717.93
H2	41 X	41 X	0.0625 X	0.5			< -52.531	13.67	-717.93	
H3	0 X	0 X	0.0625 X	0.5			< 0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5			< 0.000	0.00		0.00
H5	BARGE IMPACT						> 1119.000	44.00		49236.00
H6	HORIZONTAL FORCE						> 0	0.00		0.00
H7	HORIZONTAL FORCE						> 0	0		0.00
H8	HORIZONTAL FORCE						> 0	0		0.00
						SUM 2682.605	SUM H 1119.000		SUM -M -717.93	SUM +M 93247.61
										SUM -M -717.93
									Mo= 92529.69	
										SUM M 92529.69
										0.02 0.00

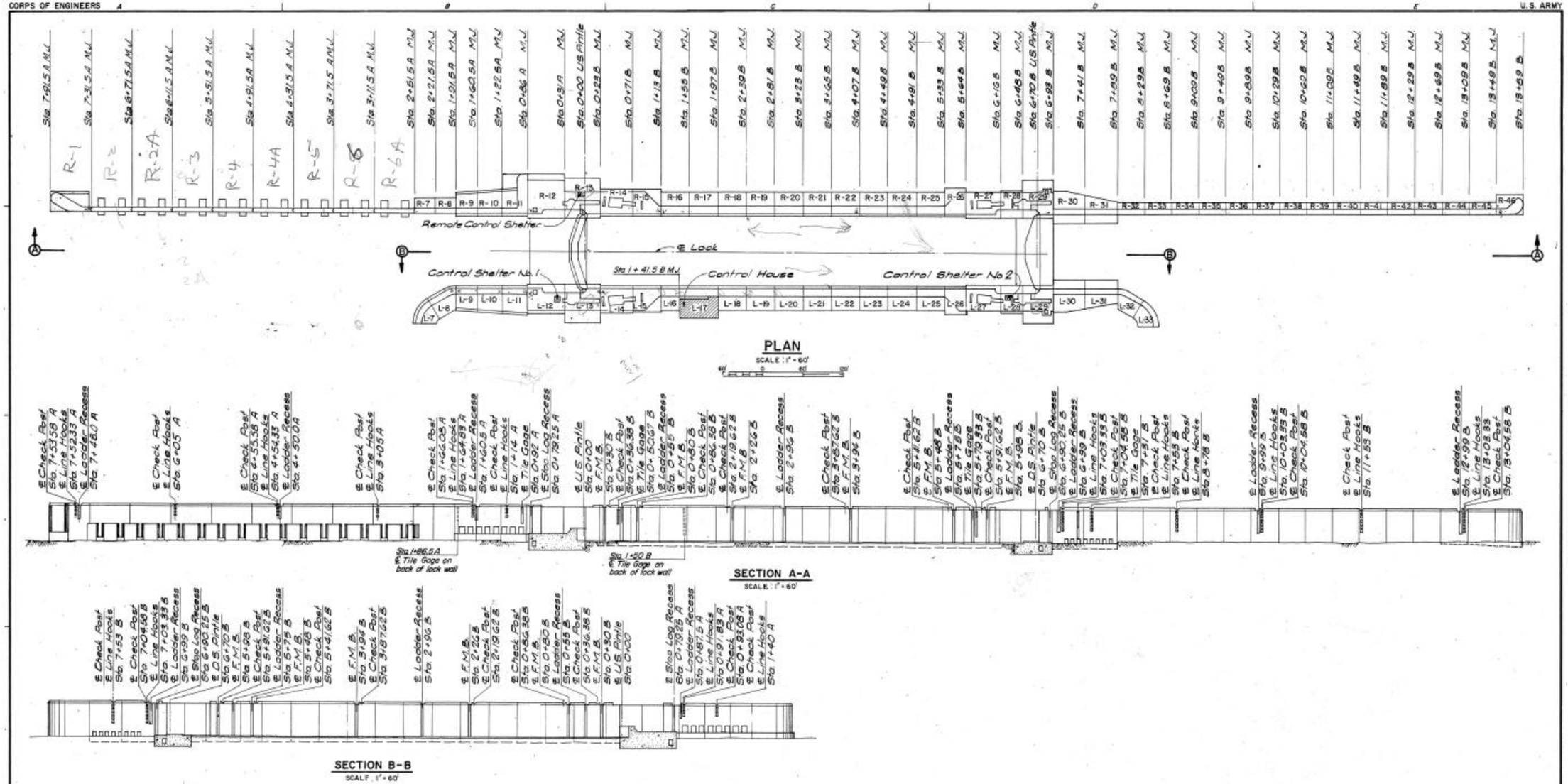
B=	34.5	Vo=	2682.6		
H/V=	0.42				
e=	17.24				
%=	0.07			M/V=	34.49
FS=	0.00			B/4=	8.63
MC=	34.49				

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = 0.023$$

F. P. = ######### / 0.000

CORPS OF ENGINEERS

U.S. ARMY



PLAN

SCALE : 1" = 60'

SECTION A-A

SCALE : 1" = 60'

SECTION B-B

SCALE : 1" = 60'

GENERAL NOTES

GENERAL:

1. Abbreviations:
   a. F.M.B. = Floating Mooring Bitt.
   b. H.P. = High Point
   c. M.J. = Monolith Joint
   d. P.J. = Parapet Joint
   e. L.J. = Lift Joint
2. Payment items indicated thus (86)
3. System of mark numbers for wall armor explained on Dwg 667. For all other mark numbers, the first three digits refer to the drawing showing the detail. Thus, MK-662-1 would be detailed on drawing 8503-63/662.
4. When a section is shown on a drawing other than where it is taken it is identified (A-503), the letter A referencing the section and the number 503 referencing the drawing on which the section is shown.

CONCRETE:

1. Top of all lock walls to slope 1" per ft. back from high point elevation 297.0 at back of parapet.
2. All parapet joints to have a 3/4" clear opening.
3. All exposed and unprotected corners, all monolith joints, and all lift joints shall be chamfered 1/2" except joints in the lock culvert, horizontal joints covered by backfill, joints in bulkhead faces, and monolith joints across top of lock walls.

REINFORCEMENT:

1. All bends of reinforcement and all bar spacers and supports shall be in accordance with the latest issue of "Manual of Standard Practice for Detailing Reinforced Concrete Structures."
2. All splice lengths shall conform to Table I Dwg 524 unless otherwise shown.
3. Splices having different diameter bars shall be lapped in accordance with Table I Dwg. 524 using the diameter of the smaller bar.
4. All embedment shall conform to Table II Dwg 524 unless otherwise shown, also see notes 12 & 13.
5. All reinforcement shall be discontinued at contraction joints.
6. Splices are shown where permissible. Fewer splices may be used at option of the contractor but must be approved by the contracting officer.
7. Reinforcement where necessary to avoid openings, pipes, embedded items and other obstructions shall be field cut, bent or shifted as directed by the contracting officer.
8. Clear distance between layers of reinforcement shall be 7" unless otherwise noted.
9. Unless otherwise noted on the drawings, clearance between reinforcing steel and surface of concrete shall be as follows:
   a. Formed surface - 4"
   b. Walls, beams and girders - 1 1/2"
   c. Slabs - 3"
   d. Unformed surfaces - 6"
10. Ends of reinforcement shall be approximately 3" clear from face of concrete unless otherwise noted.
11. Reinforcing steel will be paid for at contract price item No (34) unless shown otherwise.
12. All embedment shall be measured from face of openings or from intersection of mat reinforcement, which ever is larger.
13. Unless shown otherwise on the Dwg., all embedment around the culvert shall be 30 bar diameters or as shown in Table II, Dwg. 524 which ever is longer.

KEY	DATE	REVISION (INDICATED BY Δ)	CHKD.	REC.	APPR.

U.S. ARMY ENGINEER DISTRICT, TULSA, CORPS OF ENGINEERS, TULSA, OKLAHOMA

U.S. ARMY ENGINEER DISTRICT, LITTLE ROCK, OFFICE OF THE DISTRICT ENGINEER, LITTLE ROCK, ARKANSAS

DESIGNED: T. L. M.
DRAWN: C. E. W.
CHECKED: J. J.
SUBMITTED: CHIEF, DESIGN BRANCH
RECOMMENDED: CHIEF, ENGRG. DIVISION, TULSA DISTRICT OFFICE
APPROVED: E. F. Rutt, CHIEF, ENGINEERING DIVISION

ARKANSAS RIVER & TRIBUTARIES — ARKANSAS RIVER, ARKANSAS

LOCK AND DAM NO. 9
NAVIGATION LOCK
MASONRY
MONOLITH LAYOUT

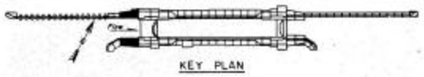
DATE: AUG. 1965
SCALE: AS SHOWN
SPEC. NO. 66-39

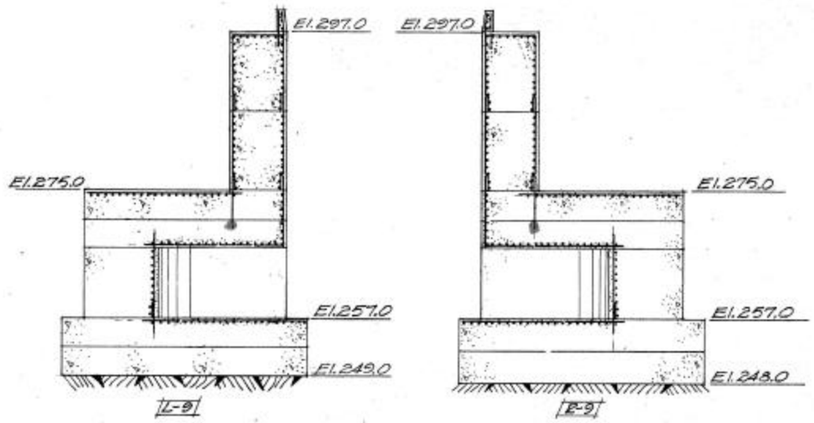
PREPARED UNDER THE DIRECTION OF FRANK P. BANE, COL., C.E., DISTRICT ENGINEER

DRAWING NUMBER 8504-63/520

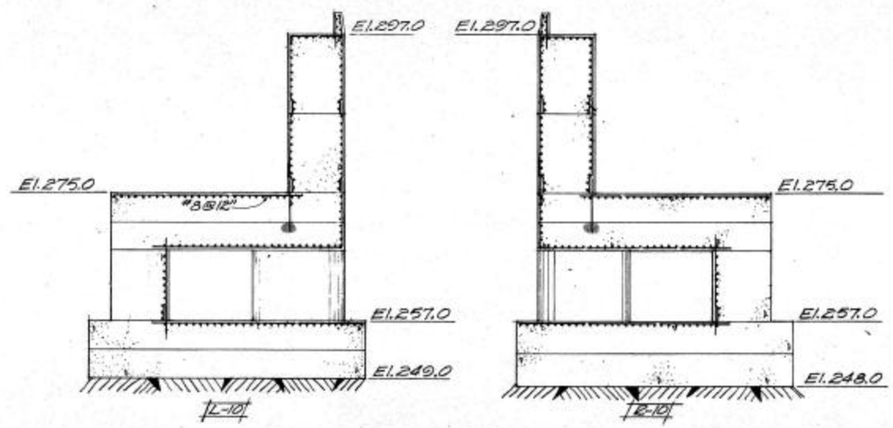
SHEET 66 OF 266

CORPS OF ENGINEERS A B C D E U.S. ARMY

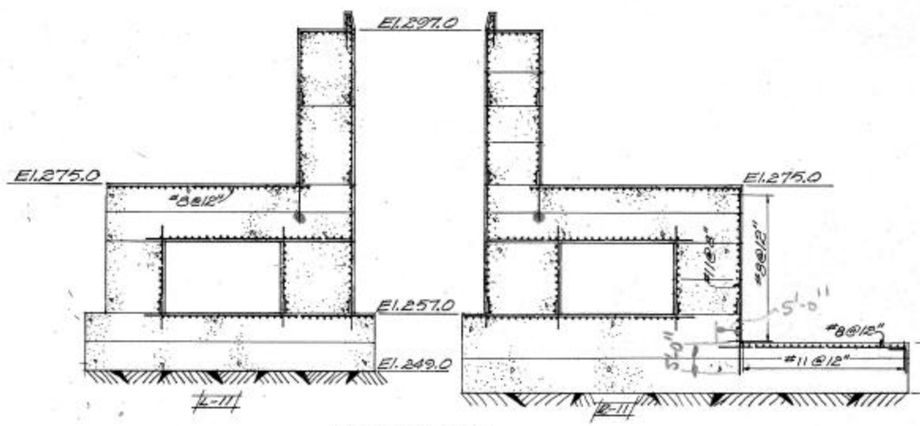




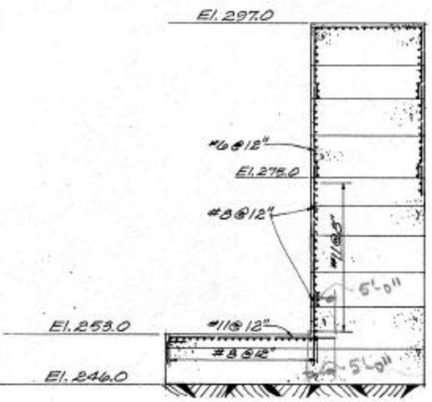
SECTION A/531
Scale: 1/8" = 1'-0"



SECTION B/531
Scale: 1/8" = 1'-0"



SECTION C/531
Scale: 1/8" = 1'-0"



SECTION D/531
Scale: 1/8" = 1'-0"

Notes:
1. All reinforcement shown this dwg. #6@12" o.c. E.W. unless otherwise shown or noted.
2. For General Reinforcing Note see Dwg. 520
3. For Typical Parapet Reinforcement see Dwg. 382

KEY	DATE	REVISION (INDICATED BY Δ)	CHKD.	REC.	APPR.

U.S. ARMY ENGINEER DISTRICT
TULSA
CORPS OF ENGINEERS
TULSA, OKLAHOMA

U.S. ARMY ENGINEER DISTRICT
LITTLE ROCK
OFFICE OF THE DISTRICT ENGINEER
LITTLE ROCK, ARKANSAS

DESIGNED: R.F.M. & W.S.D.
DRAWN: H.P.W.
CHECKED: L.S. R.T.K.
SUBMITTED: H.K. Rossney
CHIEF, DESIGN BRANCH
RECOMMENDED:
CHIEF, ENGRG. DIVISION, TULSA DISTRICT OFFICE

ARKANSAS RIVER & TRIBUTARIES — ARKANSAS RIVER, ARKANSAS

LOCK AND DAM NO. 9
NAVIGATION LOCK
MASONRY
REINFORCEMENT - MONOLITHS
L-9 THRU L-11 & R-9 THRU R-11-DETAILS II

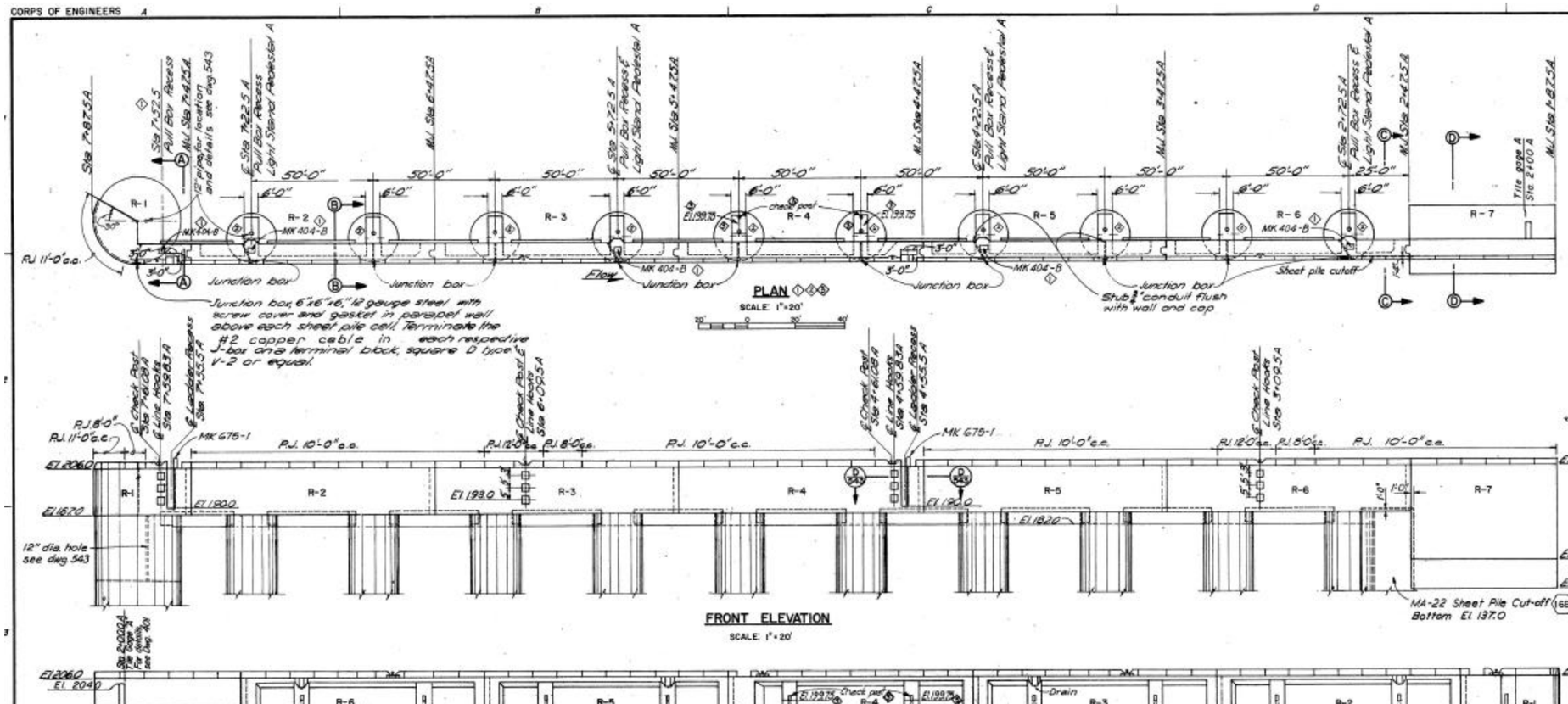
APPROVED: E. F. Rutt
CHIEF, ENGINEERING DIVISION

DATE: AUG. 1965
SCALE: AS SHOWN
SPEC. NO. 66-39

PREPARED UNDER THE DIRECTION OF
FRANK P. BANE, COL., C.E., DISTRICT ENGINEER

DRAWING NUMBER
8504-63/532
SHEET 98 OF 208

CORPS OF ENGINEERS — U.S. ARMY



THIS DRAWING FORMS A PART OF MODIFICATION NO. 24 CONTRACT NO. DA-03-010-ENG-G5-60

NOTE:

1. For general notes see dwg. 540.
2. For handrail locations and details see dwgs. 668, 669 and 670.
3. For wall armor locations and details see dwgs. 660 thru 665.
4. For waterstops see dwg. 577.
5. For concrete parapet details see dwg. 574.
6. For details of conc. beams see dwg. 543.
7. (1) Coal-tar epoxy to be applied to the inside and outside of all sheet piles to be driven in the upstream guide wall cells. Coating to cover these piles in place between Elevations 187.0 and 157.0.

KEY	DATE	REVISION (INDICATED BY ◇)	
(1)	1-3-66	Added check posts on Mono. R-4. Mod. No. 24	BRY
(2)	10-30-64	Change location of 12" pipe, Amend No. 2	RLC
(3)	10-26-64	Chgd pullbox, pay item wall thickness & add note 7, Amend No. 1	RLC

U.S. ARMY ENGINEER DISTRICT TULSA, CORPS OF ENGINEERS, TULSA, OKLAHOMA

U.S. ARMY ENGINEER DISTRICT LITTLE ROCK, OFFICE OF THE DISTRICT ENGINEER, LITTLE ROCK, ARKANSAS

DESIGNED C.E.W.
DRAWN C.L.B.
CHECKED J.L.A.
SUBMITTED: Chief, Design Branch
RECOMMENDED: Chief, Engrg. Division, Tulsa District Office
APPROVED: (LSCC) Chief, Engineering Division

ARKANSAS RIVER & TRIBUTARIES — ARKANSAS RIVER, ARKANSAS

LOCK AND DAM NO. 4
NAVIGATION LOCK

MASONRY
CONCRETE - MONOLITHS R-1 THRU R-7

DATE: JULY 1964
SCALE: AS SHOWN
SPEC. NO. 65-31

PREPARED UNDER THE DIRECTION OF CHARLES D. MAYNARD, COL., C.E., DISTRICT ENGINEER

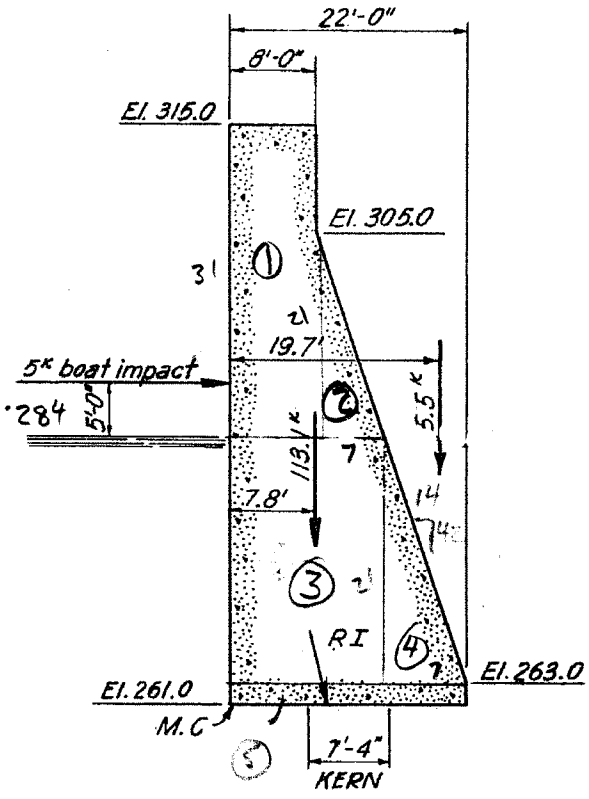
DRAWING NUMBER 8257-55/541

SHEET 181 OF 275

THIS DRAWING HAS BEEN REDUCED TO ONE-HALF THE ORIGINAL SCALE

CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT			ARKANSAS L&D 10 LOWER GUIDE WALL - SECTION FROM DM			
LOADING CONDITION:	FILL LT.-	261	FILL RT.-	261	POOL LT. -	.284	POOL RT. - 284
COMPUTED BY: JDC.	SEE DWG -143/289		CHECKED BY DPS 11/2/04		DATE	28-Oct-04	

.L=42 SEE 143/2640



CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT 959	ARKANSAS L&D 10 LOWER GUIDE WALL - SECTION FROM DM

LOADING CONDITION: FILL LT.- 261 FILL RT.- 261 POOL LT. - 284 POOL RT. - 284

COMPUTED BY: JDC. SEE DWG -143/289 CHECKED BY OPS 11/2/04 DATE 28-Oct-04

	FORCES	LENG 42	VERTICAL	HORIZONTAL	ARM	MOMENTS -	MOMENTS +
C1	8.00 X 31.00 X 0.15 X	42 1	1562.400		4.00		6249.60
C2	7.00 X 21.00 X 0.15 X	42 0.5	463.050		10.33		4784.85
C3	15.00 X 21.00 X 0.0875 X	42 1	1157.625		7.50		8682.19
C4	7.00 X 21.00 X 0.0875 X	42 0.5	270.113		17.33		4681.95
C5	22.00 X 2.00 X 0.0875 X	42 1	161.700		11.00		1778.70
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
	SUB-TOTAL		3614.888				26177.29
			0.000		0.00		0.00
			0.000		12.33		0.00
			0.000		15.00		0.00
			0.000		16.89		0.00
			0.000		22.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
E1			0.000		0.00		0.00
E2			0.000		0.00		0.00
E3			0.000		0.00		0.00
E4			0.000		0.00		0.00
E5			0.000		0.00		0.00
E6			0.000		0.00		0.00
U1	0.000 X 0 X 0.0625		0.000		0.00	0.00	
U2	0.000 X 0 X 0.0625		0.000		0.00	0.00	
U3	22 X 23 X 0.0625	0	0.000		11.00	0.00	
H1	23 X 23 X 0.0625 X	0.5		> 16.531	7.67		126.74
H2	23 X 23 X 0.0625 X	0.5		< -16.531	7.67	-126.74	
H3	0 X 0 X 0.0625 X	0.5		< 0.000	0.00	0.00	
H4	0 X 0 X 0.0625 X	0.5		< 0.000	0.00		0.00
H5	BARGE IMPACT			> 959.000	28.00		26852.00
H6	HORIZONTAL FORCE			> 0	0.00		0.00
H7	HORIZONTAL FORCE			> 0	0		0.00
H8	HORIZONTAL FORCE			> 0	0		0.00

B=	22	Vo= 3614.9	SUM 3614.888	SUM H 959.000		SUM -M -126.74	SUM +M 53156.03
H/V=	0.27						SUM -M -126.74
e=	3.67					Mo= 53029.29	
%=	99.96			M/V=	14.67		SUM M 53029.29
FS=	0.00			B/4=	5.50		
MC=	14.67						21.99 0.00

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = 21.991 \qquad F.P. = \frac{328.762}{0.000}$$

CORPS OF ENGINEERS, U.S. ARMY — BARGE IMPACT 1195 — ARKANSAS L&D 10 LOWER GUIDE WALL - SECTION FROM DM

LOADING CONDITION: FILL LT.- 261 FILL RT.- 261 POOL LT. - 284 POOL RT. - 284

COMPUTED BY: JDC. SEE DWG -143/289 CHECKED BY DATE 28-Oct-04

	FORCES			LENG 42	VERTICAL	HORIZONTAL	ARM	MOMENTS -	MOMENTS +
C1	8.00 X	31.00 X	0.15 X	42 1	1562.400		4.00		6249.60
C2	7.00 X	21.00 X	0.15 X	42 0.5	463.050		10.33		4784.85
C3	15.00 X	21.00 X	0.0875 X	42 1	1157.625		7.50		8682.19
C4	7.00 X	21.00 X	0.0875 X	42 0.5	270.113		17.33		4681.95
C5	22.00 X	2.00 X	0.0875 X	42 1	161.700		11.00		1778.70
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
			SUB-TOTAL		3614.888				26177.29
					0.000		0.00		0.00
					0.000		12.33		0.00
					0.000		15.00		0.00
					0.000		16.89		0.00
					0.000		22.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
E1					0.000		0.00		0.00
E2					0.000		0.00		0.00
E3					0.000		0.00		0.00
E4					0.000		0.00		0.00
E5					0.000		0.00		0.00
E6					0.000		0.00		0.00
U1	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U2	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U3	22 X	23 X	0.0625	0	0.000		11.00	0.00	
H1	23 X	23 X	0.0625 X	0.5		> 16.531	7.67		126.74
H2	23 X	23 X	0.0625 X	0.5		< -16.531	7.67	-126.74	
H3	0 X	0 X	0.0625 X	0.5		< 0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5		< 0.000	0.00		0.00
H5	BARGE IMPACT					> 1195.000	28.00		33460.00
H6	HORIZONTAL FORCE					> 0	0.00		0.00
H7	HORIZONTAL FORCE					> 0	0		0.00
H8	HORIZONTAL FORCE					> 0	0		0.00
					SUM 3614.888	SUM H 1195.000		SUM -M -126.74	SUM +M 59764.03
									SUM -M -126.74
								Mo= 59637.29	
									SUM M 59637.29
									16.51 0.00

B= 22 Vo= 3614.9
H/V= 0.33
e= 5.50
%= 75.03
FS= 0.00
MC= 16.50

M/V= 16.50
B/4= 5.50

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = 16.507$$

$$F.P. = \frac{437.984}{0.000}$$

CORPS OF ENGINEERS, U.S. ARMY — BARGE IMPACT 1432 — ARKANSAS L&D 10 LOWER GUIDE WALL - SECTION FROM DM

LOADING CONDITION: FILL LT.- 261 FILL RT.- 261 POOL LT. - 284 POOL RT. - 284

COMPUTED BY: JDC. SEE DWG -143/289 — CHECKED BY — DATE 28-Oct-04

	FORCES			LENG 42	VERTICAL	HORIZONTAL	ARM	- MOMENTS	+
C1	8.00 X	31.00 X	0.15 X	42 1	1562.400		4.00		6249.60
C2	7.00 X	21.00 X	0.15 X	42 0.5	463.050		10.33		4784.85
C3	15.00 X	21.00 X	0.0875 X	42 1	1157.625		7.50		8682.19
C4	7.00 X	21.00 X	0.0875 X	42 0.5	270.113		17.33		4681.95
C5	22.00 X	2.00 X	0.0875 X	42 1	161.700		11.00		1778.70
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
			SUB-TOTAL		3614.888				26177.29
					0.000		0.00		0.00
					0.000		12.33		0.00
					0.000		15.00		0.00
					0.000		16.89		0.00
					0.000		22.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
E1					0.000		0.00		0.00
E2					0.000		0.00		0.00
E3					0.000		0.00		0.00
E4					0.000		0.00		0.00
E5					0.000		0.00		0.00
E6					0.000		0.00		0.00
U1	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U2	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U3	22 X	23 X	0.0625	0	0.000		11.00	0.00	
H1	23 X	23 X	0.0625 X	0.5		> 16.531	7.67		126.74
H2	23 X	23 X	0.0625 X	0.5		< -16.531	7.67	-126.74	
H3	0 X	0 X	0.0625 X	0.5		< 0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5		< 0.000	0.00		0.00
H5	BARGE IMPACT					> 1432.000	28.00		40096.00
H6	HORIZONTAL FORCE					> 0	0.00		0.00
H7	HORIZONTAL FORCE					> 0	0		0.00
H8	HORIZONTAL FORCE					> 0	0		0.00

B=	22	Vo=	3614.9	SUM	3614.888	SUM H	1432.000	SUM -M	-126.74
H/V=	0.40								
e=	7.33							Mo=	66273.29
%	50.00					M/V=	18.33		
FS=	0.00					B/4=	5.50		
MC=	18.33								

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = \frac{657.270}{0.000}$$

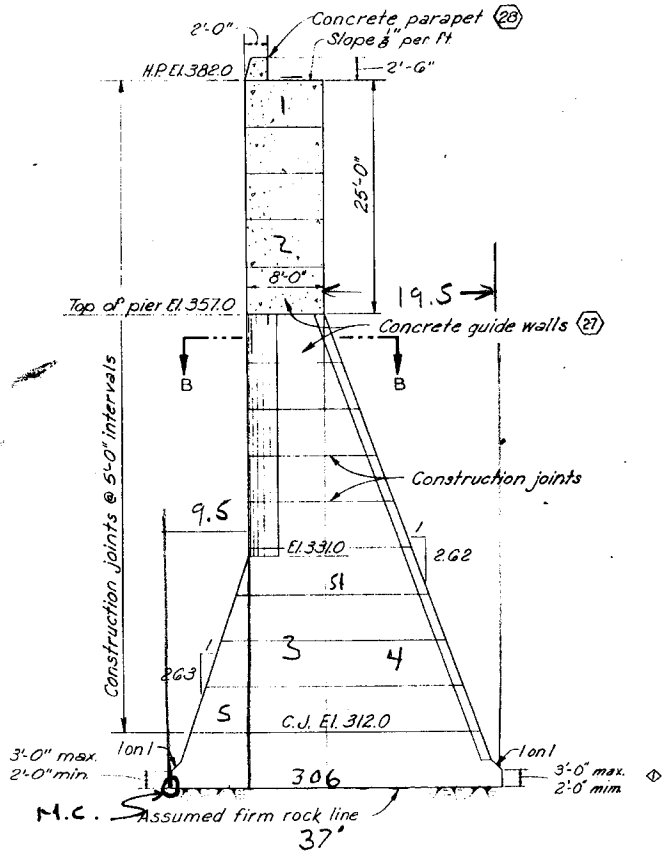
11.000 F. P. =

SUM +M	66400.03
SUM -M	-126.74
SUM M	66273.29
11.00	0.00

CORPS OF ENGINEERS, U.S. ARMY			BARGE IMPACT 1905			ARKANSAS L&D 10 LOWER GUIDE WALL - SECTION FROM DM			
LOADING CONDITION:		FILL LT.- 261	FILL RT.- 261	POOL LT. - 284	POOL RT. - 284				
COMPUTED BY: JDC.	SEE DWG -143/289		CHECKED BY		DATE 28-Oct-04				
FORCES		LENG 42	VERTICAL	HORIZONTAL	ARM	- MOMENTS	+		
C1	8.00 X 31.00 X 0.15 X	42 1	1562.400		4.00		6249.60		
C2	7.00 X 21.00 X 0.15 X	42 0.5	463.050		10.33		4784.85		
C3	15.00 X 21.00 X 0.0875 X	42 1	1157.625		7.50		8682.19		
C4	7.00 X 21.00 X 0.0875 X	42 0.5	270.113		17.33		4681.95		
C5	22.00 X 2.00 X 0.0875 X	42 1	161.700		11.00		1778.70		
			0.000		0.00		0.00		
			0.000		0.00		0.00		
			0.000		0.00		0.00		
			0.000		0.00		0.00		
			0.000		0.00		0.00		
			0.000		0.00		0.00		
			0.000		0.00		0.00		
			0.000		0.00		0.00		
			0.000		0.00		0.00		
			0.000		0.00		0.00		
			0.000		0.00		0.00		
			0.000		0.00		0.00		
	SUB-TOTAL		3614.888				26177.29		
			0.000		0.00		0.00		
			0.000		12.33		0.00		
			0.000		15.00		0.00		
			0.000		16.89		0.00		
			0.000		22.00		0.00		
			0.000		0.00		0.00		
			0.000		0.00		0.00		
			0.000		0.00		0.00		
			0.000		0.00		0.00		
			0.000		0.00		0.00		
			0.000		0.00		0.00		
			0.000		0.00		0.00		
E1			0.000		0.00		0.00		
E2			0.000		0.00		0.00		
E3			0.000		0.00		0.00		
E4			0.000		0.00		0.00		
E5			0.000		0.00		0.00		
E6			0.000		0.00		0.00		
U1	0.000 X 0 X 0.0625		0.000		0.00	0.00			
U2	0.000 X 0 X 0.0625		0.000		0.00	0.00			
U3	22 X 23 X 0.0625	0	0.000		11.00	0.00			
H1	23 X 23 X 0.0625 X	0.5		> 16.531	7.67		126.74		
H2	23 X 23 X 0.0625 X	0.5		< -16.531	7.67	-126.74			
H3	0 X 0 X 0.0625 X	0.5		< 0.000	0.00	0.00			
H4	0 X 0 X 0.0625 X	0.5		< 0.000	0.00		0.00		
H5	BARGE IMPACT			> 1905.000	28.00		53340.00		
H6	HORIZONTAL FORCE			> 0	0.00		0.00		
H7	HORIZONTAL FORCE			> 0	0		0.00		
H8	HORIZONTAL FORCE			> 0	0		0.00		
B= 22	Vo= 3614.9		SUM 3614.888	SUM H 1905.000		SUM -M -126.74	SUM +M 79644.03		
H/V= 0.53							SUM -M -126.74		
e= 11.00						Mo= 79517.29			
%= 0.04				M/V=	22.00		SUM M 79517.29		
FS= 0.00				B/4=	5.50				
MC= 22.00							0.01	0.00	

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = 0.008 \qquad F.P. = \frac{\#\#\#\#\#\#\#\#}{0.000}$$

CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT	ARKANSAS L&D 12 UPPER GUIDE WALL CELL R-8
LOADING CONDITION:	FILL LT.- 306 FILL RT.- 306	POOL LT. - 372 POOL RT. - 372
COMPUTED BY: JDC. SEE DWG 523	CHECKED BY DPS 10/20/04	DATE 19-Oct-04

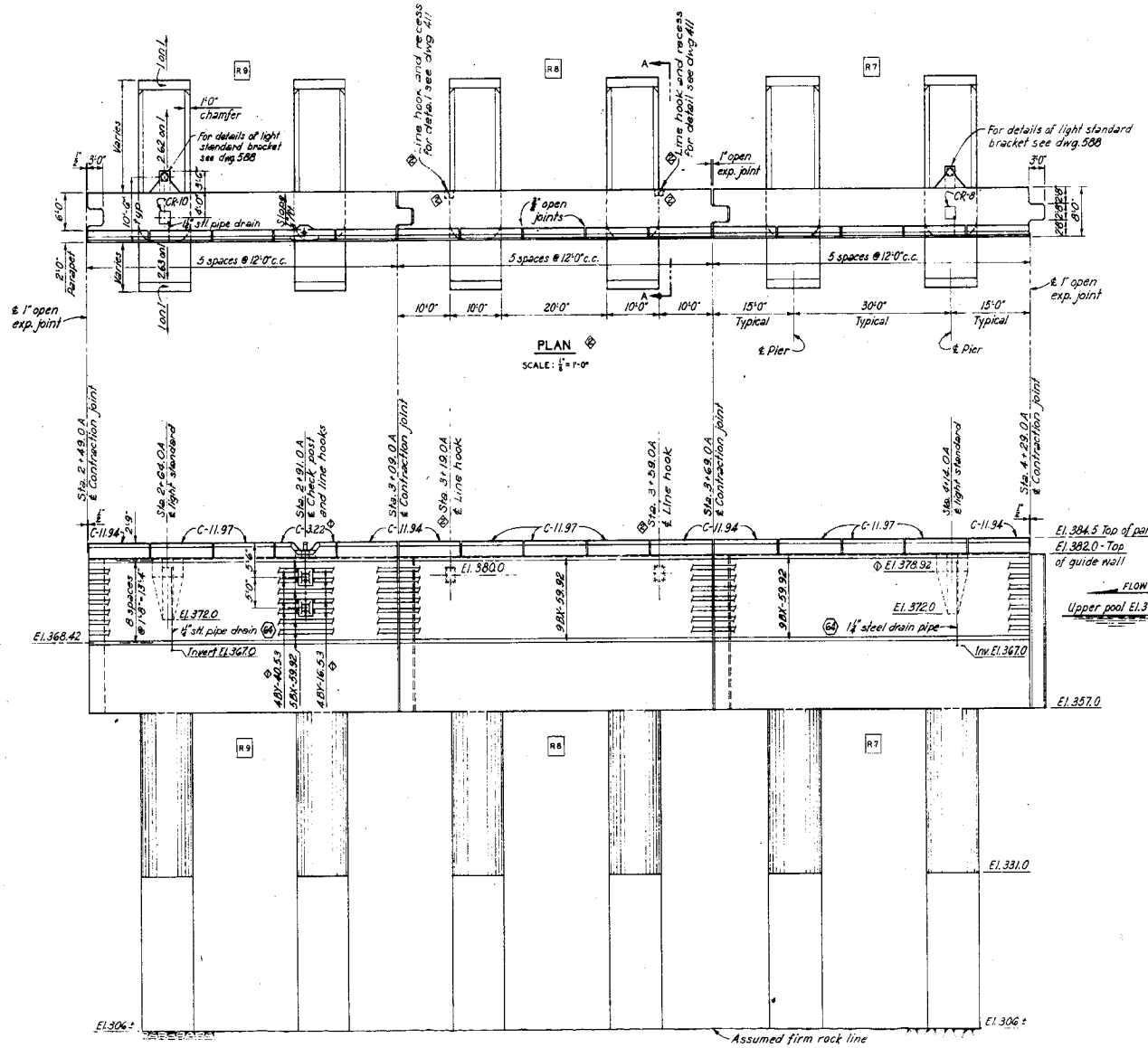


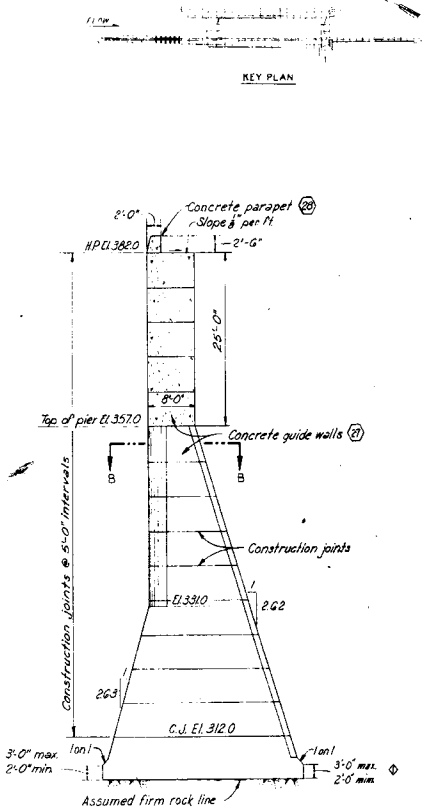
SECTION A-A ◊

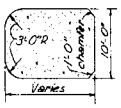
SCALE: 1/8" = 1'-0"

CORPS OF ENGINEERS

U. S. ARMY







NOTES. ℄

1. For general notes see dwgs. 352 and 521.
2. For reinforcement see dwg. 524.
3. All concrete in the guide walls, except in the parapet will be paid for at contract price, Item No. 27.
4. All concrete in the parapets will be paid for at contract price, Item No. 28.
5. All protection armor will be paid for at contract price, Item No. 69.
6. For details of concrete parapet see dwg. 532.
7. For details of concrete recesses see dwg. 588.
8. For details of check post and line hooks see dwg. 659.
9. ℄ For details of riverside line hooks see dwg 411 and 524.

THIS DRAWING HAS BEEN REDUCED TO ONE-HALF THE ORIGINAL SCALE

THIS DRAWING FORMS A PART OF ... CONTRACT NO. DACW55-...-65-141

REVISION	DATE	DESCRIPTION	BY
℄	2-14-66	Added line hooks and note	Mod No 1 JCB
℄	5-7-65	Revised armor markings and sec. A-A,	Amend. No. 1 JDC

U. S. ARMY ENGINEER DISTRICT, LITTLE ROCK
OFFICE OF THE DISTRICT ENGINEER
LITTLE ROCK, ARKANSAS

DESIGNED: JWV
DRAWN: AJJ
CHECKED: JDC
SUBMITTED: Max E. Klein, CHIEF, DESIGN BRANCH
APPROVED: [signature], CHIEF, ENGINEERING DIVISION

ARKANSAS RIVER AND TRIBUTARIES — ARKANSAS RIVER, ARKANSAS

OZARK LOCK AND DAM
NAVIGATION LOCK
MONOLITHS R-7 THRU R-9
PLAN, ELEVATION AND SECTION

JANUARY 1965

SCALE: AS SHOWN — SPEC. NO. 65-98

PREPARED UNDER THE DIRECTION OF CHARLES D. MAYNARD, COL., C.E., DISTRICT ENGINEER

DRAWING NUMBER 8497-58/523

SHEET 97 OF 339

CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT 387	ARKANSAS L&D 12 UPPER GUIDE WALL CELL R-8

LOADING CONDITION: FILL LT.- 306.000 FILL RT.- 306.000 POOL LT. - 372 POOL RT. - 372

COMPUTED BY: JDC. SEE DWG 523 CHECKED BY DPS 10/20/04 DATE 19-Oct-04

	FORCES				LENG 60	VERTICAL	HORIZONTAL		ARM	MOMENTS -	MOMENTS +
C1	8 X	10 X	0.15 X	60	1	720.000			13.50		9720.00
C2	8 X	15 X	0.0875 X	60	1	630.000			13.50		8505.00
C3	8 X	51 X	0.0875	20	1	714.000			13.50		9639.00
C4	19.5 X	51 X	0.0875 X	20	0.5	870.188			24.00		20884.50
C5	9.5 X	25 X	0.0875 X	20	0.5	207.813			6.33		1316.15
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
			SUB-TOTAL			3142.000					50064.65
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
E1						0.000			0.00		0.00
E2						0.000			0.00		0.00
E3						0.000			0.00		0.00
E4						0.000			0.00		0.00
E5						0.000			0.00		0.00
E6						0.000			0.00		0.00
U1	0.000 X	0 X	0.0625			0.000			0.00	0.00	
U2	0.000 X	0 X	0.0625			0.000			0.00	0.00	
U3	37 X	66 X	0.0625			0.000			18.50	0.00	
H1	66 X	66 X	0.0625 X	0.5			>	136.125	22.00		2994.75
H2	66 X	66 X	0.0625 X	0.5			<	-136.125	22.00	-2994.75	
H3	0 X	0 X	0.0625 X	0.5			<	0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5			<	0.000	0.00		0.00
H5	BARGE IMPACT						>	387.000	71.00		27477.00
H6	HORIZONTAL FORCE						>	0	0.00		0.00
H7	HORIZONTAL FORCE						>	0	0		0.00
H8	HORIZONTAL FORCE						>	0	0		0.00

B=	37	Vo=	3142	SUM	3142.000	SUM H	387.000			SUM -M	-2994.75	SUM +M	80536.40
H/V=	0.12											SUM -M	-2994.75
e=	6.18									Mo=	77541.65		
%=	99.90						M/V=	24.68				SUM M	77541.65
FS=	0.00						B/4=	9.25					
MC=	24.68											36.96	0.00

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = 36.963 \qquad F.P. = \frac{170.009}{0.000}$$

You used 3' above pool on others

CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT 522	ARKANSAS L&D 12 UPPER GUIDE WALL CELL R-8

LOADING CONDITION: FILL LT.- 306.000 FILL RT.- 306.000 POOL LT. - 372 POOL RT. - 372

COMPUTED BY: JDC. SEE DWG 523 CHECKED BY DPS 10/20/04 DATE 19-Oct-04

	FORCES				LENG 60	VERTICAL		HORIZONTAL	ARM	- MOMENTS	+
C1	8	X 10	X 0.15	X 60	1	720.000			13.50		9720.00
C2	8	X 15	X 0.0875	X 60	1	630.000			13.50		8505.00
C3	8	X 51	X 0.0875	20	1	714.000			13.50		9639.00
C4	19.5	X 51	X 0.0875	X 20	0.5	870.188			24.00		20884.50
C5	9.5	X 25	X 0.0875	X 20	0.5	207.813			6.33		1316.15
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
			SUB-TOTAL			3142.000					50064.65
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
E1						0.000			0.00		0.00
E2						0.000			0.00		0.00
E3						0.000			0.00		0.00
E4						0.000			0.00		0.00
E5						0.000			0.00		0.00
E6						0.000			0.00		0.00
U1	0.000	X 0	X 0.0625			0.000			0.00	0.00	
U2	0.000	X 0	X 0.0625			0.000			0.00	0.00	
U3	37	X 66	X 0.0625			0.000			18.50	0.00	
H1	66	X 66	X 0.0625	X 0.5			>	136.125	22.00		2994.75
H2	66	X 66	X 0.0625	X 0.5			<	-136.125	22.00	-2994.75	
H3	0	X 0	X 0.0625	X 0.5			<	0.000	0.00	0.00	
H4	0	X 0	X 0.0625	X 0.5			<	0.000	0.00		0.00
H5	BARGE IMPACT						>	522.000	71.00		37062.00
H6	HORIZONTAL FORCE						>	0	0.00		0.00
H7	HORIZONTAL FORCE						>	0	0		0.00
H8	HORIZONTAL FORCE						>	0	0		0.00

B=	37	Vo=	3142	SUM	3142.000	SUM H	522.000	SUM -M	-2994.75	SUM +M	90121.40
H/V=	0.17									SUM -M	-2994.75
e=	9.23							Mo=	87126.65		
%=	75.16					M/V=	27.73			SUM M	87126.65
FS=	0.00					B/4=	9.25				
MC=	27.73									27.81	0.00

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = \frac{27.811}{}$$

F. P. = 225.954 / 0.000

CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT 659	ARKANSAS L&D 12 UPPER GUIDE WALL CELL R-8

LOADING CONDITION: FILL LT.- 306.000 FILL RT.- 306.000 POOL LT. - 372 POOL RT. - 372

COMPUTED BY: JDC. SEE DWG 523 CHECKED BY DPS 10/20/04 DATE 19-Oct-04

	FORCES				LENG 60	VERTICAL	HORIZONTAL	ARM	- MOMENTS	+
C1	8 X	10 X	0.15 X	60	1	720.000		13.50		9720.00
C2	8 X	15 X	0.0875 X	60	1	630.000		13.50		8505.00
C3	8 X	51 X	0.0875	20	1	714.000		13.50		9639.00
C4	19.5 X	51 X	0.0875 X	20	0.5	870.188		24.00		20884.50
C5	9.5 X	25 X	0.0875 X	20	0.5	207.813		6.33		1316.15
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
			SUB-TOTAL			3142.000				50064.65
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
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						0.000		0.00		0.00
						0.000		0.00		0.00
E1						0.000		0.00		0.00
E2						0.000		0.00		0.00
E3						0.000		0.00		0.00
E4						0.000		0.00		0.00
E5						0.000		0.00		0.00
E6						0.000		0.00		0.00
U1	0.000 X	0 X	0.0625			0.000		0.00	0.00	
U2	0.000 X	0 X	0.0625			0.000		0.00	0.00	
U3	37 X	66 X	0.0625			0.000		18.50	0.00	
H1	66 X	66 X	0.0625 X	0.5			> 136.125	22.00		2994.75
H2	66 X	66 X	0.0625 X	0.5			< -136.125	22.00	-2994.75	
H3	0 X	0 X	0.0625 X	0.5			< 0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5			< 0.000	0.00		0.00
H5	BARGE IMPACT						> 659.000	71.00		46789.00
H6	HORIZONTAL FORCE						> 0	0.00		0.00
H7	HORIZONTAL FORCE						> 0	0		0.00
H8	HORIZONTAL FORCE						> 0	0		0.00

B=	37	Vo=	3142	SUM	3142.000	SUM H 659.000	SUM -M	-2994.75	SUM +M	99848.40
H/V=	0.21								SUM -M	-2994.75
e=	12.33							Mo= 96853.65		
%=	50.06					M/V= 30.83			SUM M	96853.65
FS=	0.00					B/4= 9.25				
MC=	30.83								18.52	0.00

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = \frac{18.524}{}$$

F. P. = 339.243 / 0.000

CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT 932	ARKANSAS L&D 12 UPPER GUIDE WALL CELL R-8

LOADING CONDITION: FILL LT.- 306.000 FILL RT.- 306.000 POOL LT. - 372 POOL RT. - 372

COMPUTED BY: JDC. SEE DWG 523 CHECKED BY DPS 10/20/04 DATE 19-Oct-04

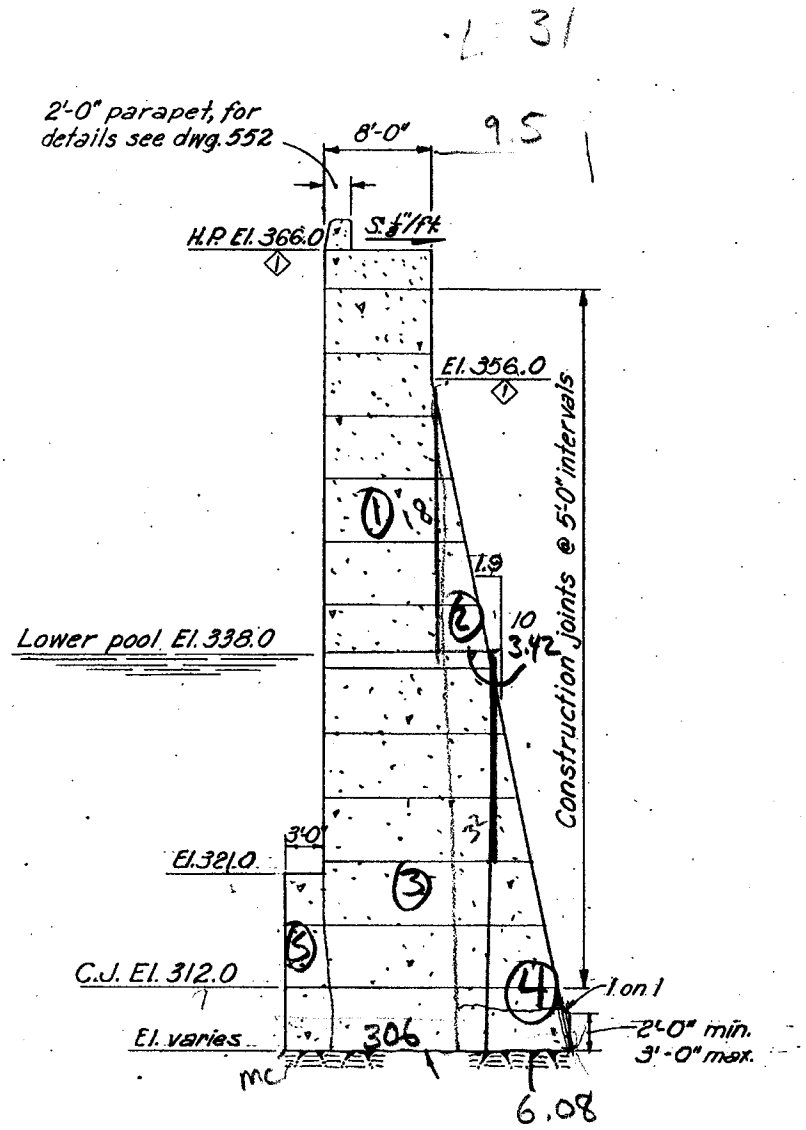
	FORCES				LENG 60	VERTICAL	HORIZONTAL	ARM	- MOMENTS	+
C1	.8 X	.10 X	.0.15 X	.60	.1	.720.000		.13.50		.9720.00
C2	.8 X	.15 X	.0.0875 X	.60	.1	.630.000		.13.50		.8505.00
C3	.8 X	.51 X	.0.0875	.20	.1	.714.000		.13.50		.9639.00
C4	.19.5 X	.51 X	.0.0875 X	.20	.0.5	.870.188		.24.00		.20884.50
C5	.9.5 X	.25 X	.0.0875 X	.20	.0.5	.207.813		.6.33		.1316.15
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
			SUB-TOTAL			.3142.000				50064.65
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
E1						0.000		0.00		0.00
E2						0.000		0.00		0.00
E3						0.000		0.00		0.00
E4						0.000		0.00		0.00
E5						0.000		0.00		0.00
E6						0.000		0.00		0.00
U1	0.000 X	0 X	0.0625			0.000		0.00	0.00	
U2	0.000 X	0 X	0.0625			0.000		0.00	0.00	
U3	37 X	66 X	0.0625			0.000		18.50	0.00	
H1	.66 X	.66 X	.0.0625 X	.0.5			> .136.125	.22.00		.2994.75
H2	.66 X	.66 X	.0.0625 X	.0.5			< .-136.125	.22.00	.-2994.75	
H3	0 X	0 X	0.0625 X	0.5			< 0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5			< 0.000	0.00		0.00
H5	BARGE IMPACT						> 932.000	71.00		66172.00
H6	HORIZONTAL FORCE						> 0	0.00		0.00
H7	HORIZONTAL FORCE						> 0	0		0.00
H8	HORIZONTAL FORCE						> 0	0		0.00

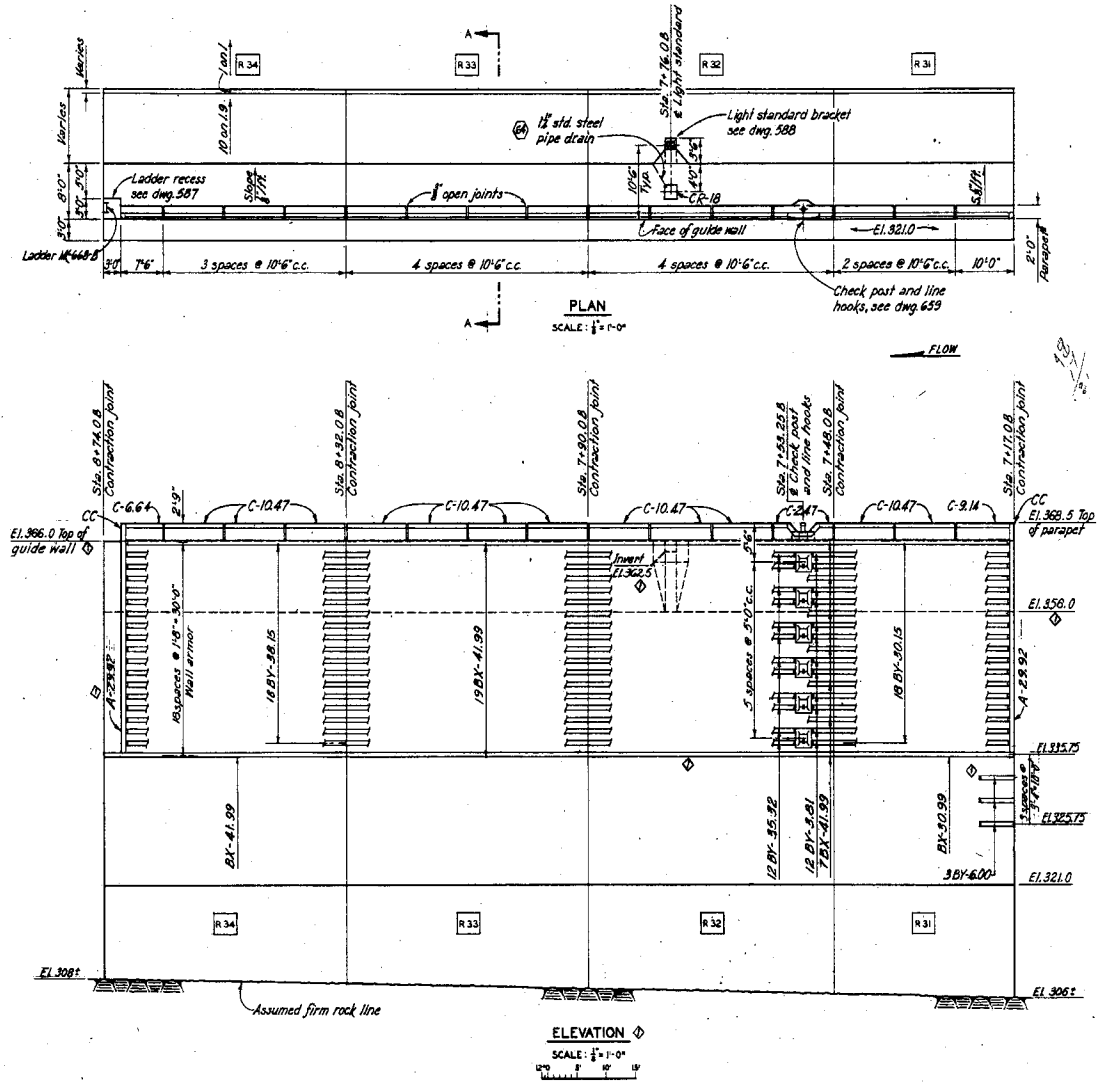
B=	.37	Vo=	3142	SUM	3142.000	SUM H	932.000	SUM -M	-2994.75	SUM +M .119231.40
H/V=	0.30									SUM -M -2994.75
e=	18.49							Mo=	116236.65	
%=	.0.04					M/V=	.36.99			SUM M .116236.65
FS=	0.00					B/4=	9.25			
MC=	36.99									0.02 0.00

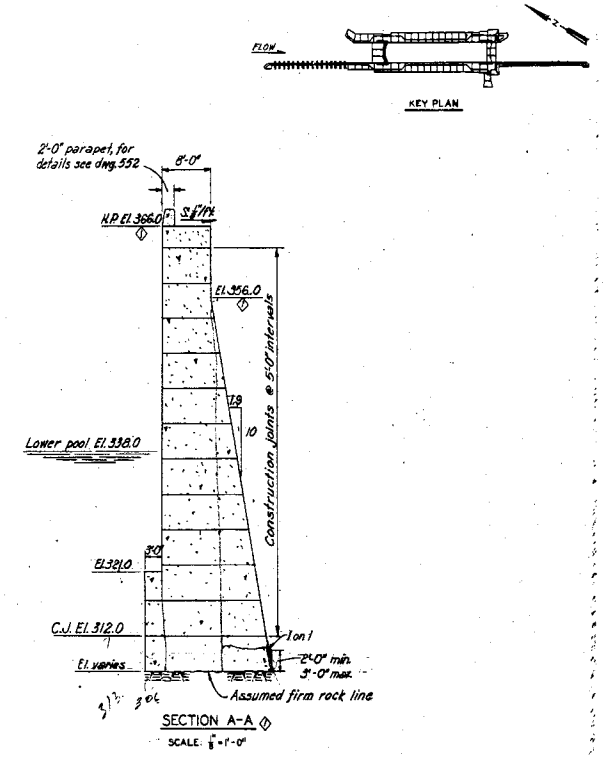
$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = 0.017$$

F. P. = ######### / 0.000

CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT		ARKANSAS L&D 12 LOWER GUIDE WALL R-31
LOADING CONDITION:	FILL LT.- 306	FILL RT.- 306	POOL LT. - 338 POOL RT. - 338
COMPUTED BY: JDC.	SEE DWG -58/571	CHECKED BY	DATE 28-Oct-04







NOTES:

1. For general notes see dwgs. 352 and 521.
2. All concrete in the lock guide walls, except in parapets will be paid for at contract price, Item No. 27.
3. All concrete in parapets will be paid for at contract price, Item No. 28.
4. All protection armor will be paid for at contract price, Item No. 69.

REVISION	DATE	DESCRIPTION	BY
1	4-1-65	Lowered top of guide wall and revised wall armor. Amend. No. 3.	[illegible]

U. S. ARMY ENGINEER DISTRICT, LITTLE ROCK
OFFICE OF THE DISTRICT ENGINEER
LITTLE ROCK, ARKANSAS

ARKANSAS RIVER AND TRIBUTARIES — ARKANSAS RIVER, ARKANSAS

OZARK LOCK AND DAM
NAVIGATION LOCK
MONOLITHS R-31 THRU R-34
PLAN, ELEVATION AND SECTIONS

DESIGNED: JFV
DRAWN: AJJ
CHECKED: RJB
SUBMITTED: Max J. Kline, CHIEF, DESIGN BRANCH
APPROVED: [signature], CHIEF, ENGINEERING DIVISION

JANUARY 1965
SCALE: AS SHOWN
SPEC. NO. 55-95

PREPARED UNDER THE DIRECTION OF CHARLES D. MAYNARD, COL., C.E., DISTRICT ENGINEER

DRAWING NUMBER 8497-58/571
SHEET 142 OF 200

THIS DRAWING HAS BEEN REDUCED TO ONE-HALF THE ORIGINAL SCALE

CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT 347	ARKANSAS L&D 12 LOWER GUIDE WALL R-31
LOADING CONDITION:	FILL LT.- 306 FILL RT.- 306	POOL LT. - 338 POOL RT. - 338
COMPUTED BY: JDC. SEE DWG -58/571	CHECKED BY DBS 11/2/04	DATE 28-Oct-04

	FORCES			LENG 31	VERTICAL	HORIZONTAL	ARM	MOMENTS -	MOMENTS +
C1	8.00 X	28.00 X	0.15 X	31 1	1041.600		7.00		7291.20
C2	3.42 X	18.00 X	0.15 X	31 0.5	143.127		12.14		1737.56
C3	11.42 X	32.00 X	0.0875 X	31 1	991.256		8.71		8633.84
C4	6.08 X	32.00 X	0.0875 X	31 0.5	263.872		16.45		4339.81
C5	3.00 X	15.00 X	0.0875 X	31 1	122.063		1.50		183.09
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
			SUB-TOTAL		2561.918				22185.51
					0.000		0.00		0.00
					0.000		12.33		0.00
					0.000		15.00		0.00
					0.000		16.89		0.00
					0.000		22.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
E1					0.000		0.00		0.00
E2					0.000		0.00		0.00
E3					0.000		0.00		0.00
E4					0.000		0.00		0.00
E5					0.000		0.00		0.00
E6					0.000		0.00		0.00
U1	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U2	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U3	3 X	32 X	0.0625	0	0.000		1.50	0.00	
H1	32 X	32 X	0.0625 X	0.5		> 32.000	10.67		341.33
H2	32 X	32 X	0.0625 X	0.5		< -32.000	10.67	-341.33	
H3	0 X	0 X	0.0625 X	0.5		< 0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5		< 0.000	0.00		0.00
H5	BARGE IMPACT					> 347.000	37.00		12839.00
H6	HORIZONTAL FORCE					> 0	0.00		0.00
H7	HORIZONTAL FORCE					> 0	0		0.00
H8	HORIZONTAL FORCE					> 0	0		0.00

B=	20.50	Vo=	2561.9	SUM	2561.918	SUM H 347.000	SUM -M	-341.33	SUM +M 35365.84
H/V=	0.14								SUM -M -341.33
e=	3.42						Mo=	35024.51	
%=	99.93					M/V= 13.67			SUM M 35024.51
FS=	0.00					B/4= 5.13			
MC=	13.67								20.49 0.00

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = \frac{20.486}{}$$

$$F.P. = \frac{250.109}{0.000}$$

CORPS OF ENGINEERS, U.S. ARMY			BARGE IMPACT	464		ARKANSAS L&D 12 LOWER GUIDE WALL R-31			
LOADING CONDITION:		FILL LT.-	306	FILL RT.-	306	POOL LT. -	338	POOL RT. -	338
COMPUTED BY: JDC.	SEE DWG -58/571			CHECKED BY		DATE	28-Oct-04		

	FORCES			LENG 31	VERTICAL	HORIZONTAL		ARM	MOMENTS -	MOMENTS +
C1	8.00 X	28.00 X	0.15 X	31 1	1041.600			7.00		7291.20
C2	3.42 X	18.00 X	0.15 X	31 0.5	143.127			12.14		1737.56
C3	11.42 X	32.00 X	0.0875 X	31 1	991.256			8.71		8633.84
C4	6.08 X	32.00 X	0.0875 X	31 0.5	263.872			16.45		4339.81
C5	3.00 X	15.00 X	0.0875 X	31 1	122.063			1.50		183.09
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
			SUB-TOTAL		2561.918					22185.51
					0.000			0.00		0.00
					0.000			12.33		0.00
					0.000			15.00		0.00
					0.000			16.89		0.00
					0.000			22.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
E1					0.000			0.00		0.00
E2					0.000			0.00		0.00
E3					0.000			0.00		0.00
E4					0.000			0.00		0.00
E5					0.000			0.00		0.00
E6					0.000			0.00		0.00
U1	0.000 x	0 X	0.0625		0.000			0.00	0.00	
U2	0.000 x	0 X	0.0625		0.000			0.00	0.00	
U3	3 X	32 X	0.0625	0	0.000			1.50	0.00	
H1	32 X	32 X	0.0625 X	0.5		>	32.000	10.67		341.33
H2	32 X	32 X	0.0625 X	0.5		<	-32.000	10.67	-341.33	
H3	0 X	0 X	0.0625 X	0.5		<	0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5		<	0.000	0.00		0.00
H5	BARGE IMPACT					>	464.000	37.00		17168.00
H6	HORIZONTAL FORCE					>	0	0.00		0.00
H7	HORIZONTAL FORCE					>	0	0		0.00
H8	HORIZONTAL FORCE					>	0	0		0.00

B=	20.50	Vo=	2561.9	SUM	2561.918	SUM H	464.000		SUM -M	-341.33
H/V=	0.18									
e=	5.11								Mo=	39353.51
%=	75.21						M/V=	15.36		
FS=	0.00						B/4=	5.13		
MC=	15.36									

$$KmcB = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = 15.417$$

$$F.P. = \frac{332.347}{0.000}$$

SUM +M	39694.84		
SUM -M	-341.33		
SUM M	39353.51		
		15.42	0.00

CORPS OF ENGINEERS, U.S. ARMY — BARGE IMPACT 583 — ARKANSAS L&D 12 LOWER GUIDE WALL R-31

LOADING CONDITION: FILL LT.- 306 FILL RT.- 306 POOL LT. - 338 POOL RT. - 338

COMPUTED BY: JDC. SEE DWG -58/571 — CHECKED BY — DATE 28-Oct-04

	FORCES			LENG 31	VERTICAL	HORIZONTAL	ARM	- MOMENTS	+
C1	8.00 X	28.00 X	0.15 X	31 1	1041.600		7.00		7291.20
C2	3.42 X	18.00 X	0.15 X	31 0.5	143.127		12.14		1737.56
C3	11.42 X	32.00 X	0.0875 X	31 1	991.256		8.71		8633.84
C4	6.08 X	32.00 X	0.0875 X	31 0.5	263.872		16.45		4339.81
C5	3.00 X	15.00 X	0.0875 X	31 1	122.063		1.50		183.09
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
			SUB-TOTAL		2561.918				22185.51
					0.000		0.00		0.00
					0.000		12.33		0.00
					0.000		15.00		0.00
					0.000		16.89		0.00
					0.000		22.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
E1					0.000		0.00		0.00
E2					0.000		0.00		0.00
E3					0.000		0.00		0.00
E4					0.000		0.00		0.00
E5					0.000		0.00		0.00
E6					0.000		0.00		0.00
U1	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U2	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U3	3 X	32 X	0.0625	0	0.000		1.50	0.00	
H1	32 X	32 X	0.0625 X	0.5		> 32.000	10.67		341.33
H2	32 X	32 X	0.0625 X	0.5		< -32.000	10.67	-341.33	
H3	0 X	0 X	0.0625 X	0.5		< 0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5		< 0.000	0.00		0.00
H5	BARGE IMPACT					> 583.000	37.00		21571.00
H6	HORIZONTAL FORCE					> 0	0.00		0.00
H7	HORIZONTAL FORCE					> 0	0		0.00
H8	HORIZONTAL FORCE					> 0	0		0.00

B=	20.50	Vo=	2561.9	SUM	2561.918	SUM H	583.000	SUM -M	-341.33	SUM +M	44097.84
H/V=	0.23									SUM -M	-341.33
e=	6.83							Mo=	43756.51		
%=	50.05					M/V=	17.08			SUM M	43756.51
FS=	0.00					B/4=	5.13				
MC=	17.08									10.26	0.00

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = 10.261 \qquad F.P. = \frac{499.340}{0.000}$$

CORPS OF ENGINEERS, U.S. ARMY — BARGE IMPACT 819 — ARKANSAS L&D 12 LOWER GUIDE WALL R-31

LOADING CONDITION: FILL LT.- 306 FILL RT.- 306 POOL LT. - 338 POOL RT. - 338

COMPUTED BY: JDC. SEE DWG -58/571 — CHECKED BY — DATE 28-Oct-04

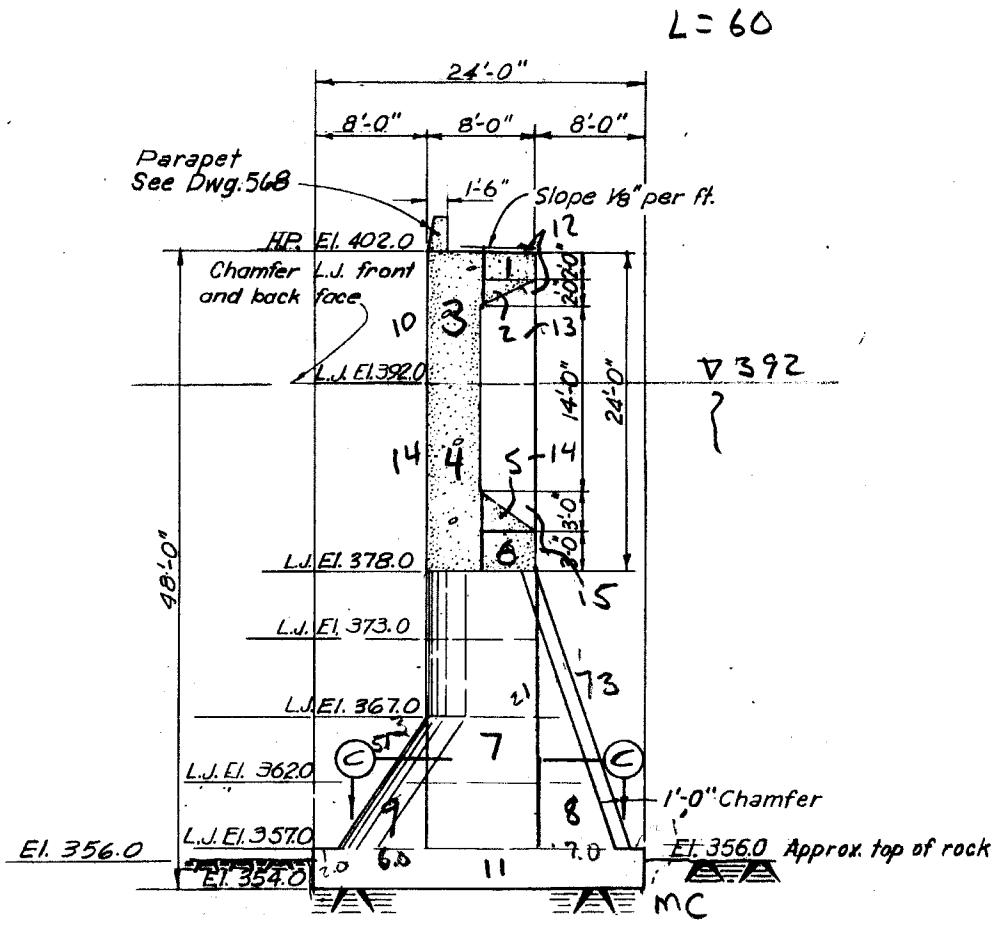
	FORCES			LENG 31	VERTICAL	HORIZONTAL	ARM	- MOMENTS	+
C1	8.00 X	28.00 X	0.15 X	31 1	1041.600		7.00		7291.20
C2	3.42 X	18.00 X	0.15 X	31 0.5	143.127		12.14		1737.56
C3	11.42 X	32.00 X	0.0875 X	31 1	991.256		8.71		8633.84
C4	6.08 X	32.00 X	0.0875 X	31 0.5	263.872		16.45		4339.81
C5	3.00 X	15.00 X	0.0875 X	31 1	122.063		1.50		183.09
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
			SUB-TOTAL		2561.918				22185.51
					0.000		0.00		0.00
					0.000		12.33		0.00
					0.000		15.00		0.00
					0.000		16.89		0.00
					0.000		22.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
E1					0.000		0.00		0.00
E2					0.000		0.00		0.00
E3					0.000		0.00		0.00
E4					0.000		0.00		0.00
E5					0.000		0.00		0.00
E6					0.000		0.00		0.00
U1	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U2	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U3	3 X	32 X	0.0625	0	0.000		1.50	0.00	
H1	32 X	32 X	0.0625 X	0.5		> 32.000	10.67		341.33
H2	32 X	32 X	0.0625 X	0.5		< -32.000	10.67	-341.33	
H3	0 X	0 X	0.0625 X	0.5		< 0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5		< 0.000	0.00		0.00
H5	BARGE IMPACT					> 819.000	37.00		30303.00
H6	HORIZONTAL FORCE					> 0	0.00		0.00
H7	HORIZONTAL FORCE					> 0	0		0.00
H8	HORIZONTAL FORCE					> 0	0		0.00

B=	20.50	Vo=	2561.9	SUM	2561.918	SUM H	819.000	SUM -M	-341.33	SUM +M	52829.84
H/V=	0.32									SUM -M	-341.33
e=	10.24							Mo=	52488.51		
%=	0.18					M/V=	20.49			SUM M	52488.51
FS=	0.00					B/4=	5.13			0.04	0.00
MC=	20.49										

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = 0.036$$

F. P. = ######### / 0.000

CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT	ARKANSAS L&D 13 UPPER GUIDE WALL
LOADING CONDITION: FILL LT.- 354 FILL RT.- 354	POOL LT. - 392 POOL RT. - 392	
COMPUTED BY: JDC. SEE DWG 520	CHECKED BY DPS 11/1/04	DATE 01-Nov-04

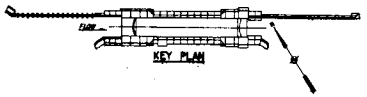


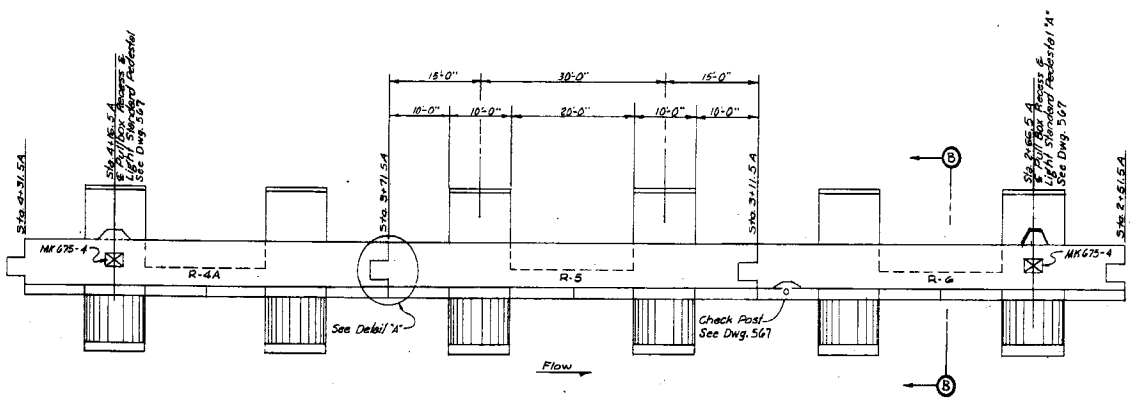
SECTION B-B

SCALE : 1/8 INCH = 1 FOOT

CORPS OF ENGINEERS

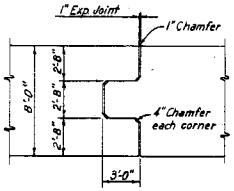
U. S. ARMY





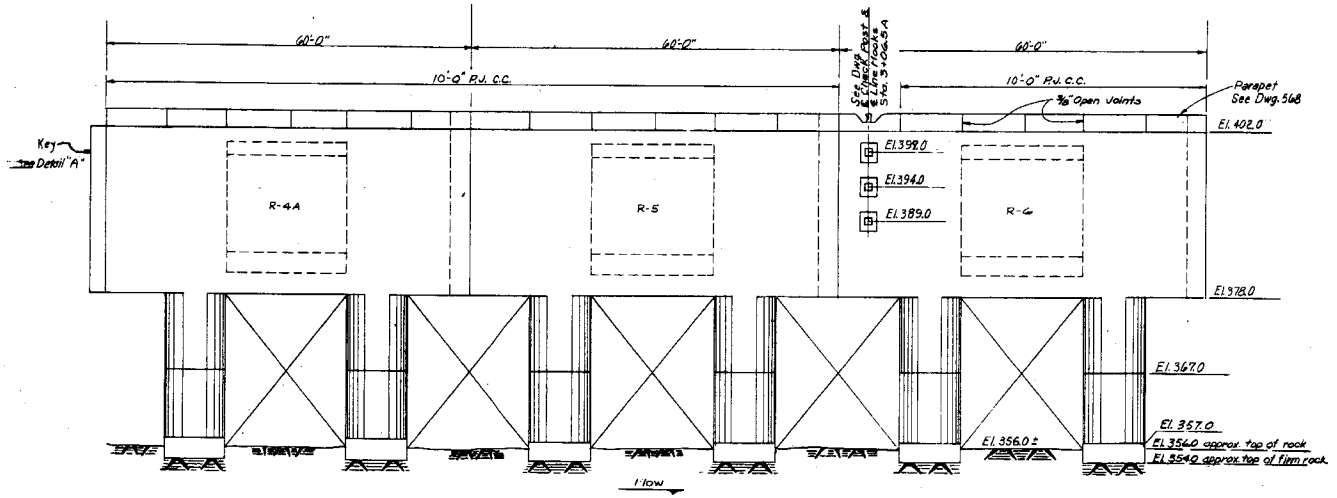
PLAN

SCALE: $\frac{1}{8}$ INCH = 1 FOOT



DETAIL "A"

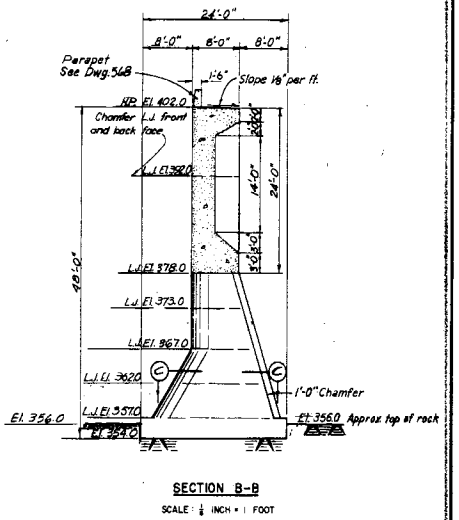
SCALE: $\frac{1}{4}$ INCH = 1 FOOT



ELEVATION

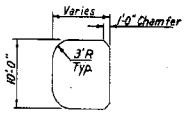
UPSTREAM GUIDE WALL

SCALE: $\frac{1}{8}$ INCH = 1 FOOT



SECTION B-B

SCALE: $\frac{1}{8}$ INCH = 1 FOOT



SECTION C-C

SCALE: $\frac{1}{8}$ INCH = 1 FOOT

Notes:

1. For General Notes see dwg. 514
2. For Concrete Parapet Details see dwg. 568
3. For Wall Armor Location and Details see dwg. 660
4. For Water Stop Details see dwg. 570
5. For Light Standard and Pull Box Details see dwg. 567
6. For Ladder Recess & Check Post Details see Dwg. 567.
7. For Handrail Location and Details see dwg. 670
8. For Reinforcing see dwg. 521
9. All concrete shown on this dwg., except for parapets, will be paid for at contract price, Item No. 27.
10. All concrete in parapets will be paid for at contract price, Item No. 28.
11. For Line Hook Recess dimensions, see Dwg. 568.

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DISTRICT
FORT WORTH
CORPS OF ENGINEERS
FORT WORTH, TEXAS

U.S. ARMY ENGINEER DISTRICT
LITTLE ROCK
OFFICE OF THE DISTRICT ENGINEER
LITTLE ROCK, ARKANSAS

DESIGNED: J.K.
DRAWN: R.E.C.
CHECKED: W.E.V.
SUBMITTED: [signature]
CHIEF, DESIGN BRANCH
RECOMMENDED: [signature]
CHIEF, ENGRG. DIVISION, FORT WORTH DISTRICT OFFICE
APPROVED: [signature]
CHIEF ENGINEERING DIVISION

ARKANSAS RIVER AND TRIBUTARIES ARKANSAS RIVER, ARKANSAS

LOCK AND DAM NO. 13
NAVIGATION LOCK
MASONRY
CONCRETE - MONOLITHS R-4A THRU R-6
PLAN, ELEVATION, SECTION AND DETAIL

DATE: SEPTEMBER 1965
SCALE: AS SHOWN
SPEC. NO. 66-47

PREPARED UNDER THE DIRECTION OF
FRANK P. BAME, COLONEL, C.E. DISTRICT ENGINEER

DRAWING NUMBER
8505-64/520
SHEET 98 OF 200

CORPS OF ENGINEERS, U.S. ARMY — BARGE IMPACT — 160 — ARKANSAS L&D 13 UPPER GUIDE WALL

LOADING CONDITION: — FILL LT.- 354.000 — FILL RT.- 354.000 — POOL LT. - 392 — POOL RT. - 392

COMPUTED BY: JDC. — SEE DWG 520 — CHECKED BY DPS 11/1/04 — DATE 01-Nov-04

	FORCES			LENG	VERTICAL	HORIZONTAL	ARM	MOMENTS -	MOMENTS +	
C1	4 X	2 X	0.15 X	60 1	72.000		10.00		720.00	
C2	4 X	2 X	0.15 X	60 0.5	36.000		10.67		384.00	
C3	4 X	10 X	0.15 X	60 1	360.000		14.00		5040.00	
C4	4 X	14 X	0.0875 X	60 1	294.000		14.00		4116.00	
C5	4 X	3 X	0.0875 X	60 0.5	31.500		10.67		336.00	
C6	4 X	3 X	0.0875 X	60 1	63.000		10.00		630.00	
C7	8 X	21 X	0.0875 X	20 1	294.000		12.00		3528.00	
C8	7 X	21 X	0.0875 X	20 0.5	128.625		5.67		728.88	
C9	6 X	10 X	0.0875 X	20 0.5	52.500		18.00		945.00	
C10	0 X	0 X	0.0875 X	20 1	0.000		0.00		0.00	
C11	24 X	3 X	0.0875 X	20 1	126.000		12.00		1512.00	
C12	4 X	2 X	0.15 X	40 0.5	24.000		9.33		224.00	
C13	4 X	6 X	0.15 X	40 1	144.000		10.00		1440.00	
C14	4 X	8 X	0.0875 X	40 1	112.000		10.00		1120.00	
C15	4 X	7/3 X	0.0875 X	40 0.5	~~28.000~~	21	9.33		~~261.33~~	196
					0.000		0.00		0.00	
					0.000		0.00		0.00	
		SUB-TOTAL			~~1765.625~~	1758.625			~~20985.21~~	20919.88
W1					0.000		0.00		0.00	
W2					0.000		0.00		0.00	
W3					0.000		0.00		0.00	
					0.000		0.00		0.00	
					0.000		0.00		0.00	
					0.000		0.00		0.00	
					0.000		0.00		0.00	
					0.000		0.00		0.00	
					0.000		0.00		0.00	
					0.000		0.00		0.00	
					0.000		0.00		0.00	
					0.000		0.00		0.00	
					0.000		0.00		0.00	
E1					0.000		0.00		0.00	
E2					0.000		0.00		0.00	
E3					0.000		0.00		0.00	
E4					0.000		0.00		0.00	
E5					0.000		0.00		0.00	
E6					0.000		0.00		0.00	
U1	0.000 X	0 X	0.0625		0.000		0.00	0.00		
U2	0.000 X	120 X	0.0625	0	0.000		8.00	0.00		
U3	24 X	38 X	0.0625	0	0.000		12.00	0.00		
H1	38 X	38 X	0.0625 X	0.5		> 45.125	12.67		571.58	
H2	38 X	38 X	0.0625 X	0.5		< -45.125	12.67	-571.58		
H3	0 X	0 X	0.0625 X	0.5		< 0.000	0.00	0.00		
H4	0 X	0 X	0.0625 X	0.5		< 0.000	0.00		0.00	
H5	BARGE IMPACT					> -160.000	43.00		-6880.00	
H6	HORIZONTAL FORCE					> 0	0.00		0.00	
H7	HORIZONTAL FORCE					> 0	0		0.00	
H8	HORIZONTAL FORCE					> 0	0		0.00	

B=	24	Vo=	1765.6	SUM	~~1765.625~~ 1758.625	SUM H	-160.000	SUM -M	-571.58	SUM +M ~~14676.79~~ 19611.46
H/V=	0.09									SUM -M -571.58
e=	-4.01								Mo= ~~14105.21~~ 14039.88	
%=	99.86					M/V=	7.99			SUM M ~~14105.21~~ 14039.88
FS=	0.00					B/4=	6.00			
MC=	7.99									23.97 0.00

$$Kmca = \frac{3 \times Mo - 1.5 \times w \times B \times B}{Vo - W \times B} = \frac{147.342}{23.966} \quad F.P. = \frac{}{0.000}$$

CORPS OF ENGINEERS, U.S. ARMY — BARGE IMPACT — •241 — ARKANSAS L&D 13 UPPER GUIDE WALL

LOADING CONDITION: — FILL LT.- 354.000 — FILL RT.- 354.000 — POOL LT. - • 392 — POOL RT. - 392

COMPUTED BY: JDC. — SEE DWG 520 — CHECKED BY DPS 11/1/04 — DATE 01-Nov-04

	FORCES				LENG	VERTICAL	HORIZONTAL	ARM	- MOMENTS	+
C1	• 4 X	, 2 X	' 0.15 X	, 60	1	• 72.000		• 10.00		720.00
C2	• 4 X	' 2 X	' 0.15 X	• 60	0.5	' 36.000		' 10.67		384.00
C3	• 4 X	'10 X	' 0.15 X	' 60	1	' 360.000		' 14.00		5040.00
C4	' 4 X	'14 X	'0.0875 X	'60	1	' 294.000		'14.00		4116.00
C5	• 4 X	' 3 X	'0.0875 X	, 60	0.5	'31.500		, 10.67		336.00
C6	• 4 X	' 3 X	'0.0875 X	• 60	1	'63.000		• 10.00		630.00
C7	• 8 X	'21 X	,0.0875 X	• 20	1	• 294.000		, 12.00		3528.00
C8	• 7 X	'21 X	'0.0875 X	' 20	0.5	' 128.625		, 5.67		728.88
C9	'6 X	'10 X	'0.0875 X	' 20	0.5	' 52.500		' 18.00		945.00
C10	0 X	0 X	'0.0875 X	20	1	0.000		0.00		0.00
C11	' 24 X	' 3 X	'0.0875 X	, 20	1	'126.000		'12.00		1512.00
C12	, 4 X	'2 X	' 0.15 X	, 40	0.5	'24.000		, 9.33		224.00
C13	• 4 X	• 6 X	, 0.15 X	' 40	1	' 144.000		'10.00		1440.00
C14	' 4 X	, 8 X	'0.0875 X	'40	1	'112.000		'10.00		1120.00
C15	, 4 X	~~4~~ 3 X	'0.0875 X	'40	0.5	~~28.000~~	21	, 9.33		~~261.33~~ 196
						0.000		0.00		0.00
						0.000		0.00		0.00
			SUB-TOTAL			~~1765.625~~	1758.625			~~20885.21~~ 20919.88
W1						0.000		0.00		0.00
W2						0.000		0.00		0.00
W3						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
E1						0.000		0.00		0.00
E2						0.000		0.00		0.00
E3						0.000		0.00		0.00
E4						0.000		0.00		0.00
E5						0.000		0.00		0.00
E6						0.000		0.00		0.00
U1	0.000 X	0 X	0.0625			0.000		0.00	0.00	
U2	0.000 X	120 X	0.0625		0	0.000		8.00	0.00	
U3	24 X	38 X	0.0625		0	0.000		12.00	0.00	
H1	' 38 X	' 38 X	' 0.0625 X	' 0.5			> ' 45.125	, 12.67		, 571.58
H2	, 38 X	' 38 X	' 0.0625 X	• 0.5			< , -45.125	, 12.67	, -571.58	
H3	0 X	0 X	0.0625 X	0.5			< 0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5			< 0.000	0.00		0.00
H5	BARGE IMPACT						> ' -241.000	43.00		, -10363.00
H6	HORIZONTAL FORCE						> 0	0.00		0.00
H7	HORIZONTAL FORCE						> 0	0		0.00
H8	HORIZONTAL FORCE						> 0	0		0.00

B=	' 24	Vo=	1765.6	SUM	~~1765.625~~ 1758.625	SUM H	' -241.000		SUM -M	, -571.58	SUM +M	~~11193.79~~ 11128.46
H/V=	0.14										SUM -M	' -571.58
e=	-5.98									Mo= ~~10622.21~~ 10556.88		
%=	, 75.20						M/V=	, 6.02			SUM M	~~10622.21~~ 10556.88
FS=	0.00						B/4=	6.00				
MC=	6.02										18.05	0.00

$$Kmca = \frac{3 \times Mo - 1.5 \times w \times B \times B}{Vo - W \times B} = \frac{18.048}{}$$

F. P. = 195.655 / 0.000

CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT • 323	ARKANSAS L&D 13 UPPER GUIDE WALL
LOADING CONDITION:	FILL LT.- 354.000 FILL RT.- 354.000	POOL LT. - 392 POOL RT. - 392
COMPUTED BY: JDC. SEE DWG 520	CHECKED BY DPS 11/1/04	DATE 01-Nov-04

	FORCES			LENG	VERTICAL	HORIZONTAL	ARM	MOMENTS -	MOMENTS +	
C1	4 X	2 X	0.15 X	60 1	72.000		10.00		720.00	
C2	4 X	2 X	0.15 X	60 0.5	36.000		10.67		384.00	
C3	4 X	10 X	0.15 X	60 1	360.000		14.00		5040.00	
C4	4 X	14 X	0.0875 X	60 1	294.000		14.00		4116.00	
C5	4 X	3 X	0.0875 X	60 0.5	31.500		10.67		336.00	
C6	4 X	3 X	0.0875 X	60 1	63.000		10.00		630.00	
C7	8 X	21 X	0.0875 X	20 1	294.000		12.00		3528.00	
C8	7 X	21 X	0.0875 X	20 0.5	128.625		5.67		728.88	
C9	6 X	10 X	0.0875 X	20 0.5	52.500		18.00		945.00	
C10	0 X	0 X	0.0875 X	20 1	0.000		0.00		0.00	
C11	24 X	3 X	0.0875 X	20 1	126.000		12.00		1512.00	
C12	4 X	2 X	0.15 X	40 0.5	24.000		9.33		224.00	
C13	4 X	6 X	0.15 X	40 1	144.000		10.00		1440.00	
C14	4 X	8 X	0.0875 X	40 1	112.000		10.00		1120.00	
C15	4 X	1/3 X	0.0875 X	40 0.5	~~28.000~~	21	9.33		~~261.33~~	196
					0.000		0.00		0.00	
					0.000		0.00		0.00	
		SUB-TOTAL			~~1765.625~~	1758.625			~~20985.21~~	20919.88
W1					0.000		0.00		0.00	
W2					0.000		0.00		0.00	
W3					0.000		0.00		0.00	
					0.000		0.00		0.00	
					0.000		0.00		0.00	
					0.000		0.00		0.00	
					0.000		0.00		0.00	
					0.000		0.00		0.00	
					0.000		0.00		0.00	
					0.000		0.00		0.00	
					0.000		0.00		0.00	
					0.000		0.00		0.00	
					0.000		0.00		0.00	
E1					0.000		0.00		0.00	
E2					0.000		0.00		0.00	
E3					0.000		0.00		0.00	
E4					0.000		0.00		0.00	
E5					0.000		0.00		0.00	
E6					0.000		0.00		0.00	
U1	0.000 X	0 X	0.0625		0.000		0.00	0.00		
U2	0.000 X	120 X	0.0625	0	0.000		8.00	0.00		
U3	24 X	38 X	0.0625	0	0.000		12.00	0.00		
H1	38 X	38 X	0.0625 X	0.5		> 45.125	12.67		571.58	
H2	38 X	38 X	0.0625 X	0.5		< -45.125	12.67	-571.58		
H3	0 X	0 X	0.0625 X	0.5		< 0.000	0.00	0.00		
H4	0 X	0 X	0.0625 X	0.5		< 0.000	0.00		0.00	
H5	BARGE IMPACT					> -323.000	43.00		-13889.00	
H6	HORIZONTAL FORCE					> 0	0.00		0.00	
H7	HORIZONTAL FORCE					> 0	0		0.00	
H8	HORIZONTAL FORCE					> 0	0		0.00	

B=	24	Vo=	1765.6	SUM ~~1765.625~~ 1758.625	SUM H	-323.000		SUM -M	-571.58	SUM +M ~~4663.79~~	7602.46
H/V=	0.18									SUM -M -571.58	
e=	-7.98								Mo= ~~7030.21~~		
%=	50.24					M/V=	4.02		7030.88	SUM M ~~7006.21~~	7030.88
FS=	0.00					B/4=	6.00				
MC=	4.02									12.06	0.00

$$Kmca = \frac{3 \times Mo - 1.5 \times w \times B \times B}{Vo - W \times B} = \frac{12.057}{}$$

F. P. = 292.873 / 0.000

CORPS OF ENGINEERS, U.S. ARMY — BARGE IMPACT .488 — ARKANSAS L&D 13 UPPER GUIDE WALL

LOADING CONDITION: — FILL LT.- 354.000 — FILL RT.- 354.000 — POOL LT. - 392 — POOL RT. - 392

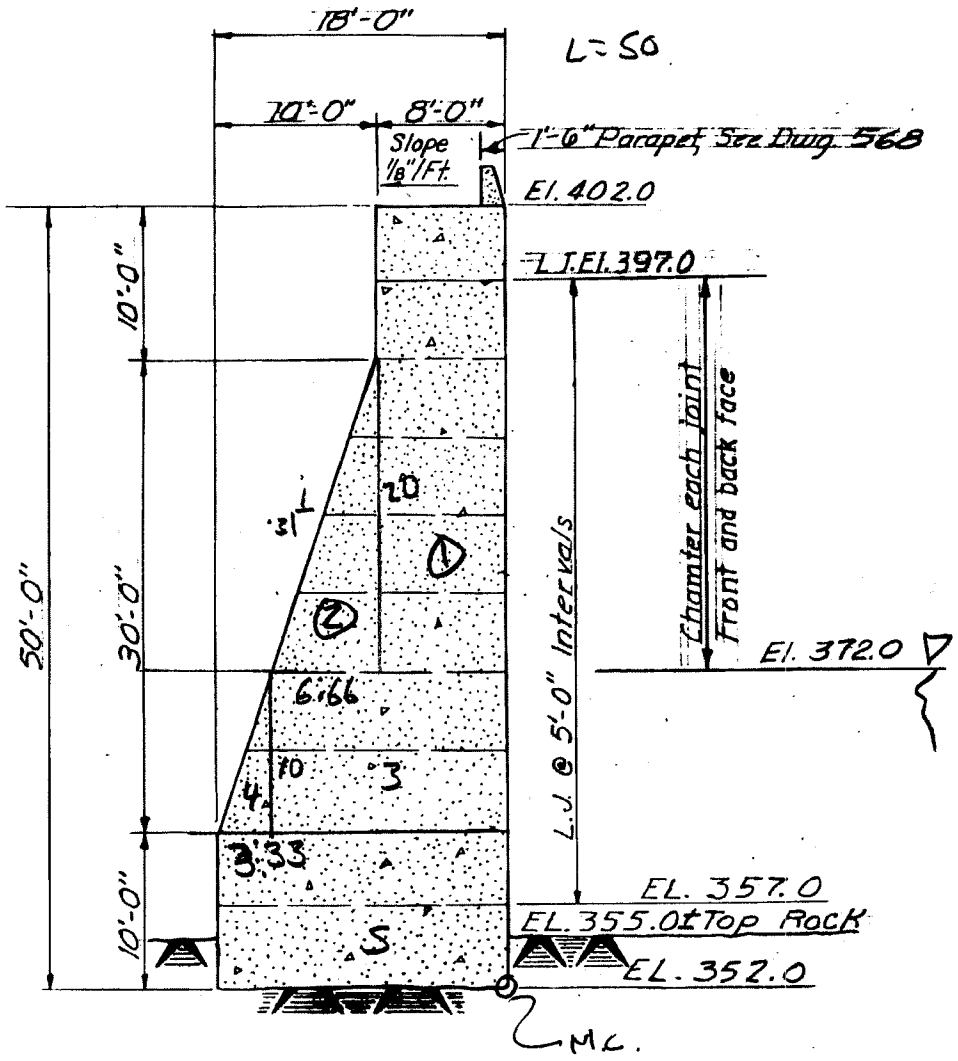
COMPUTED BY: JDC. — SEE DWG 520 — CHECKED BY DPS 11/1/04 — DATE 01-Nov-04

	FORCES			LENG	VERTICAL	HORIZONTAL	ARM	- MOMENTS	+	
C1	4 X	2 X	0.15 X	60 1	72.000		10.00		720.00	
C2	4 X	2 X	0.15 X	60 0.5	36.000		10.67		384.00	
C3	4 X	10 X	0.15 X	60 1	360.000		14.00		5040.00	
C4	4 X	14 X	0.0875 X	60 1	294.000		14.00		4116.00	
C5	4 X	3 X	0.0875 X	60 0.5	31.500		10.67		336.00	
C6	4 X	3 X	0.0875 X	60 1	63.000		10.00		630.00	
C7	8 X	21 X	0.0875 X	20 1	294.000		12.00		3528.00	
C8	7 X	21 X	0.0875 X	20 0.5	128.625		5.67		728.88	
C9	6 X	10 X	0.0875 X	20 0.5	52.500		18.00		945.00	
C10	0 X	0 X	0.0875 X	20 1	0.000		0.00		0.00	
C11	24 X	3 X	0.0875 X	20 1	126.000		12.00		1512.00	
C12	4 X	2 X	0.15 X	40 0.5	24.000		9.33		224.00	
C13	4 X	6 X	0.15 X	40 1	144.000		10.00		1440.00	
C14	4 X	8 X	0.0875 X	40 1	112.000		10.00		1120.00	
C15	4 X	~~3~~ 21 X	0.0875 X	40 0.5	~~28.000~~	21	9.33		~~261.33~~	196
		3			0.000		0.00		0.00	
					0.000		0.00		0.00	
			SUB-TOTAL		~~1765.625~~	1758.625			~~20985.21~~	20919.88
W1					0.000		0.00		0.00	
W2					0.000		0.00		0.00	
W3					0.000		0.00		0.00	
					0.000		0.00		0.00	
					0.000		0.00		0.00	
					0.000		0.00		0.00	
					0.000		0.00		0.00	
					0.000		0.00		0.00	
					0.000		0.00		0.00	
					0.000		0.00		0.00	
					0.000		0.00		0.00	
					0.000		0.00		0.00	
E1					0.000		0.00		0.00	
E2					0.000		0.00		0.00	
E3					0.000		0.00		0.00	
E4					0.000		0.00		0.00	
E5					0.000		0.00		0.00	
E6					0.000		0.00		0.00	
U1	0.000 X	0 X	0.0625		0.000		0.00	0.00		
U2	0.000 X	120 X	0.0625	0	0.000		8.00	0.00		
U3	24 X	38 X	0.0625	0	0.000		12.00	0.00		
H1	38 X	38 X	0.0625 X	0.5		> 45.125	12.67		571.58	
H2	38 X	38 X	0.0625 X	0.5		< -45.125	12.67	-571.58		
H3	0 X	0 X	0.0625 X	0.5		< 0.000	0.00	0.00		
H4	0 X	0 X	0.0625 X	0.5		< 0.000	0.00		0.00	
H5	BARGE IMPACT					> -488.000	43.00		-20984.00	
H6	HORIZONTAL FORCE					> 0	0.00		0.00	
H7	HORIZONTAL FORCE					> 0	0		0.00	
H8	HORIZONTAL FORCE					> 0	0		0.00	

B=	24	Vo=	1765.6	SUM	~~1765.625~~ 1758.625	SUM H	-488.000	SUM -M	-571.58	SUM +M ~~572.79~~ 507.46
H/V=	0.28									SUM -M -571.58
e=	-12.00								Mo= ~~1.21~~ -64.12	
%=	0.01					M/V=	0.00			SUM M ~~1.21~~ -64.12
FS=	0.00					B/4=	6.00			
MC=	0.00									0.00 0.00

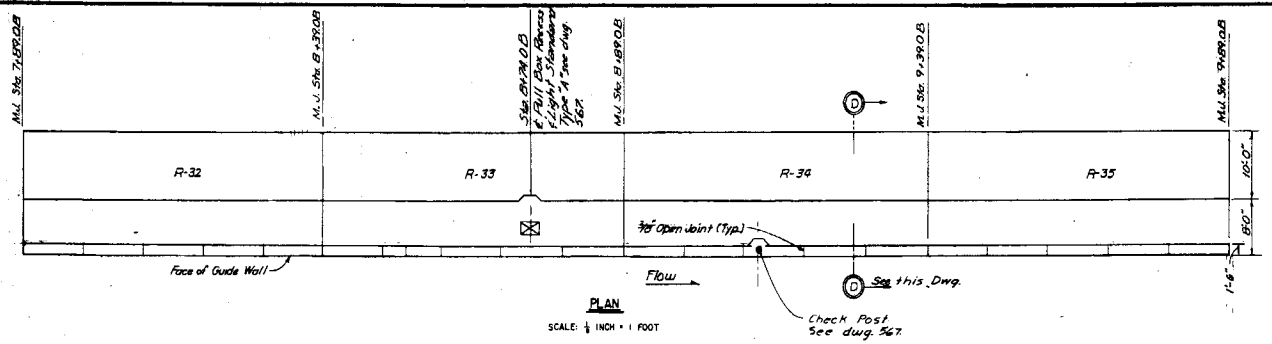
Kmca= (3 X Mo - 1.5 X w X B X B) / (Vo - W x B) = 0.002 — F. P. = ######### / 0.000

CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT		ARKANSAS L&D 13 LOWER GUIDE WALL
LOADING CONDITION:	FILL LT.- 352 FILL RT.- 352	POOL LT. - • 372	POOL RT. - • 372
COMPUTED BY: JDC. SEE DWG -64/556	CHECKED BY DR > 11/1/04	DATE 01-Nov-04	



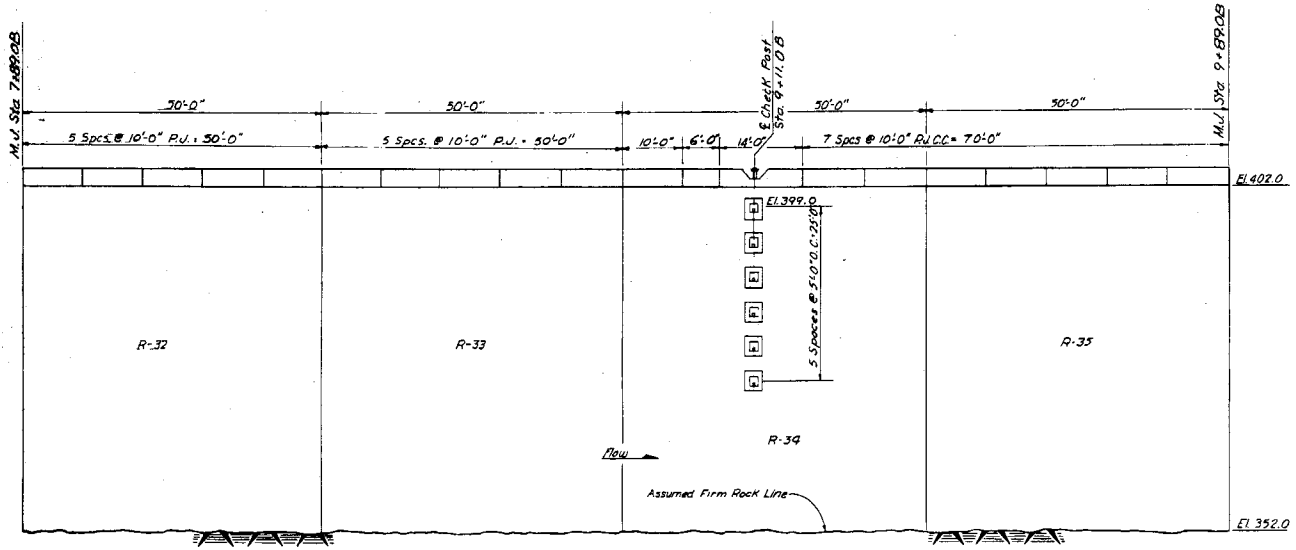
SECTION D-D

SCALE: 1/8 INCH = 1 FOOT



PLAN

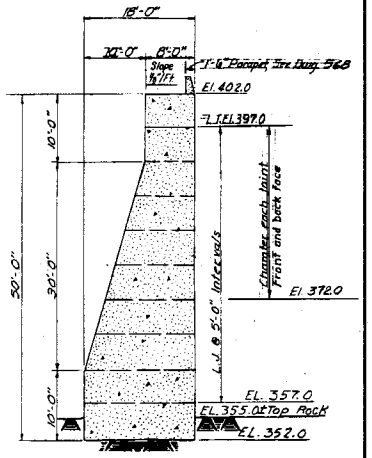
SCALE: ¼ INCH = 1 FOOT



ELEVATION

SCALE: ¼ INCH = 1 FOOT





SECTION D-D

SCALE: ¼ INCH = 1 FOOT

Notes:
1. For General Notes, see Dwg. 516.
2. All concrete in the lock guide walls, except in parapets, will be paid for at contract price, Item No. 27.
3. All concrete in parapets will be paid for at contract price, Item No. 28.
4. For details of Concrete parapet See dwg 568.
5. For wall armor details See dwg. 660.
6. For check post and line hook details See dwg. 567.
7. For Handrail location and details See dwg. 660.
8. For chamfer details see dwg 518.

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DISTRICT
FORT WORTH
CORPS OF ENGINEERS
FORT WORTH, TEXAS

U.S. ARMY ENGINEER DISTRICT
LITTLE ROCK
OFFICE OF THE DISTRICT ENGINEER
LITTLE ROCK, ARKANSAS

DESIGNED: G.E.T.
DRAWN: J.E.G.
CHECKED: C.F.B.
SUBMITTED: CHIEF, DESIGN BRANCH
RECOMMENDED: CHIEF, ENGRG. DIVISION, FORT WORTH DISTRICT OFFICE
APPROVED: CHIEF ENGINEERING DIVISION

ARKANSAS RIVER AND TRIBUTARIES ARKANSAS RIVER, ARKANSAS.

LOCK AND DAM NO. 13
NAVIGATION LOCK
MASONRY
CONCRETE - MONOLITHS R-32 THRU R-35
PLAN, ELEVATION AND SECTION.

DATE: SEPTEMBER 1965.
SCALE: AS SHOWN
SPEC. NO. 66-17

PREPARED UNDER THE DIRECTION OF
FRANK P. BAINE, COLONEL, C.E. DISTRICT ENGINEER

DRAWING NUMBER
8505-64/556
SHEET 131 OF 299

CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT 815	ARKANSAS L&D 13 LOWER GUIDE WALL

LOADING CONDITION: FILL LT.- 352 FILL RT.- 352 POOL LT. - 372 POOL RT. - 372

COMPUTED BY: JDC. SEE DWG -64/556 CHECKED BY DPS 11/1/04 DATE 01-Nov-04

	FORCES				LENG	VERTICAL	HORIZONTAL	ARM	- MOMENTS	+
					50					
C1	8.00 X	30 X	0.15 X	50	1	1800.000		4.00		7200.00
C2	6.67 X	20 X	0.15 X	50	0.5	500.000		10.22		5111.11
C3	14.67 X	10 X	0.0875 X	50	1	641.667		7.33		4705.56
C4	3.33 X	10 X	0.0875 X	50	0.5	72.917		15.78		1150.46
C5	18.00 X	10.00 X	0.0875 X	50	1	787.500		9.00		7087.50
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
			SUB-TOTAL			3802.083				25254.63
						0.000		0.00		0.00
						0.000		12.33		0.00
						0.000		15.00		0.00
						0.000		16.89		0.00
						0.000		22.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
E1						0.000		0.00		0.00
E2						0.000		0.00		0.00
E3						0.000		0.00		0.00
E4						0.000		0.00		0.00
E5						0.000		0.00		0.00
E6						0.000		0.00		0.00
U1	0.000 X	0 X	0.0625			0.000		0.00	0.00	
U2	0.000 X	0 X	0.0625			0.000		0.00	0.00	
U3	18 X	20 X	0.0625		0	0.000		9.00	0.00	
H1	20 X	20 X	0.0625 X	0.5			> 12.500	6.67		83.33
H2	20 X	20 X	0.0625 X	0.5			< -12.500	6.67	-83.33	
H3	0 X	0 X	0.0625 X	0.5			< 0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5			< 0.000	0.00		0.00
H5	BARGE IMPACT						> 815.000	25.00		20375.00
H6	HORIZONTAL FORCE						> 0	0.00		0.00
H7	HORIZONTAL FORCE						> 0	0		0.00
H8	HORIZONTAL FORCE						> 0	0		0.00

B=	18	Vo=	3802.1	SUM	3802.083	SUM H	815.000	SUM -M	-83.33	SUM +M 45712.96
H/V=	0.21									SUM -M -83.33
e=	3.00								Mo= 45629.63	
%=	99.98					M/V=	12.00			SUM M 45629.63
FS=	0.00					B/4=	4.50			
MC=	12.00									18.00 0.00

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = 17.996 \qquad F.P. = \frac{422.539}{0.000}$$

CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT 1042	ARKANSAS L&D 13 LOWER GUIDE WALL

LOADING CONDITION: FILL LT.- 352 FILL RT.- 352 POOL LT. - 372 POOL RT. - 372

COMPUTED BY: JDC. SEE DWG -64/556 CHECKED BY DPS 11/1/04 DATE 01-Nov-04

	FORCES			LENG	VERTICAL	HORIZONTAL	ARM	- MOMENTS	+
				50					
C1	8.00 X	30 X	0.15 X	50 1	1800.000		4.00		7200.00
C2	6.67 X	20 X	0.15 X	50 0.5	500.000		10.22		5111.11
C3	14.67 X	10 X	0.0875 X	50 1	641.667		7.33		4705.56
C4	3.33 X	10 X	0.0875 X	50 0.5	72.917		15.78		1150.46
C5	18.00 X	10.00 X	0.0875 X	50 1	787.500		9.00		7087.50
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
			SUB-TOTAL		3802.083				25254.63
					0.000		0.00		0.00
					0.000		12.33		0.00
					0.000		15.00		0.00
					0.000		16.89		0.00
					0.000		22.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
E1					0.000		0.00		0.00
E2					0.000		0.00		0.00
E3					0.000		0.00		0.00
E4					0.000		0.00		0.00
E5					0.000		0.00		0.00
E6					0.000		0.00		0.00
U1	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U2	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U3	18 X	20 X	0.0625	0	0.000		9.00	0.00	
H1	20 X	20 X	0.0625 X	0.5		> 12.500	6.67		83.33
H2	20 X	20 X	0.0625 X	0.5		< -12.500	6.67	-83.33	
H3	0 X	0 X	0.0625 X	0.5		< 0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5		< 0.000	0.00		0.00
H5	BARGE IMPACT					> 1042.000	25.00		26050.00
H6	HORIZONTAL FORCE					> 0	0.00		0.00
H7	HORIZONTAL FORCE					> 0	0		0.00
H8	HORIZONTAL FORCE					> 0	0		0.00

B=	18	Vo=	3802.1	SUM	3802.083	SUM H 1042.000	SUM -M	-83.33	SUM +M 51387.96
H/V=	0.27								SUM -M -83.33
e=	4.49						Mo=	51304.63	
%=	75.10					M/V= 13.49			SUM M 51304.63
FS=	0.00					B/4= 4.50			
MC=	13.49								13.52 0.00

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = \frac{562.499}{13.519} \qquad F.P. = \frac{}{0.000}$$

CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT 1271	ARKANSAS L&D 13 LOWER GUIDE WALL

LOADING CONDITION: FILL LT.- 352 FILL RT.- 352 POOL LT. - 372 POOL RT. - 372

COMPUTED BY: JDC. SEE DWG -64/556 CHECKED BY DPS 11/1/04 DATE 01-Nov-04

	FORCES			LENG 50	VERTICAL	HORIZONTAL	ARM	- MOMENTS	+
C1	8.00 X	30 X	0.15 X	50 1	1800.000		4.00		7200.00
C2	6.67 X	20 X	0.15 X	50 0.5	500.000		10.22		5111.11
C3	14.67 X	10 X	0.0875 X	50 1	641.667		7.33		4705.56
C4	3.33 X	10 X	0.0875 X	50 0.5	72.917		15.78		1150.46
C5	18.00 X	10.00 X	0.0875 X	50 1	787.500		9.00		7087.50
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
			SUB-TOTAL		3802.083				25254.63
					0.000		0.00		0.00
					0.000		12.33		0.00
					0.000		15.00		0.00
					0.000		16.89		0.00
					0.000		22.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
E1					0.000		0.00		0.00
E2					0.000		0.00		0.00
E3					0.000		0.00		0.00
E4					0.000		0.00		0.00
E5					0.000		0.00		0.00
E6					0.000		0.00		0.00
U1	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U2	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U3	18 X	20 X	0.0625	0	0.000		9.00	0.00	
H1	20 X	20 X	0.0625 X	0.5		> 12.500	6.67		83.33
H2	20 X	20 X	0.0625 X	0.5		< -12.500	6.67	-83.33	
H3	0 X	0 X	0.0625 X	0.5		< 0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5		< 0.000	0.00		0.00
H5	BARGE IMPACT					> 1271.000	25.00		31775.00
H6	HORIZONTAL FORCE					> 0	0.00		0.00
H7	HORIZONTAL FORCE					> 0	0		0.00
H8	HORIZONTAL FORCE					> 0	0		0.00

B=	18	Vo=	3802.1	SUM	3802.083	SUM H	1271.000	SUM -M	-83.33	SUM +M	57112.96
H/V=	0.33									SUM -M	-83.33
e=	6.00							Mo=	57029.63		
%=	50.01					M/V=	15.00			SUM M	57029.63
FS=	0.00					B/4=	4.50				
MC=	15.00									9.00	0.00

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = 9.001 \qquad F.P. = \frac{844.787}{0.000}$$

CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT 1727	ARKANSAS L&D 13 LOWER GUIDE WALL

LOADING CONDITION: FILL LT.- 352 FILL RT.- 352 POOL LT. - 372 POOL RT. - 372

COMPUTED BY: JDC. SEE DWG -64/556 CHECKED BY DPS 11/1/04 DATE 01-Nov-04

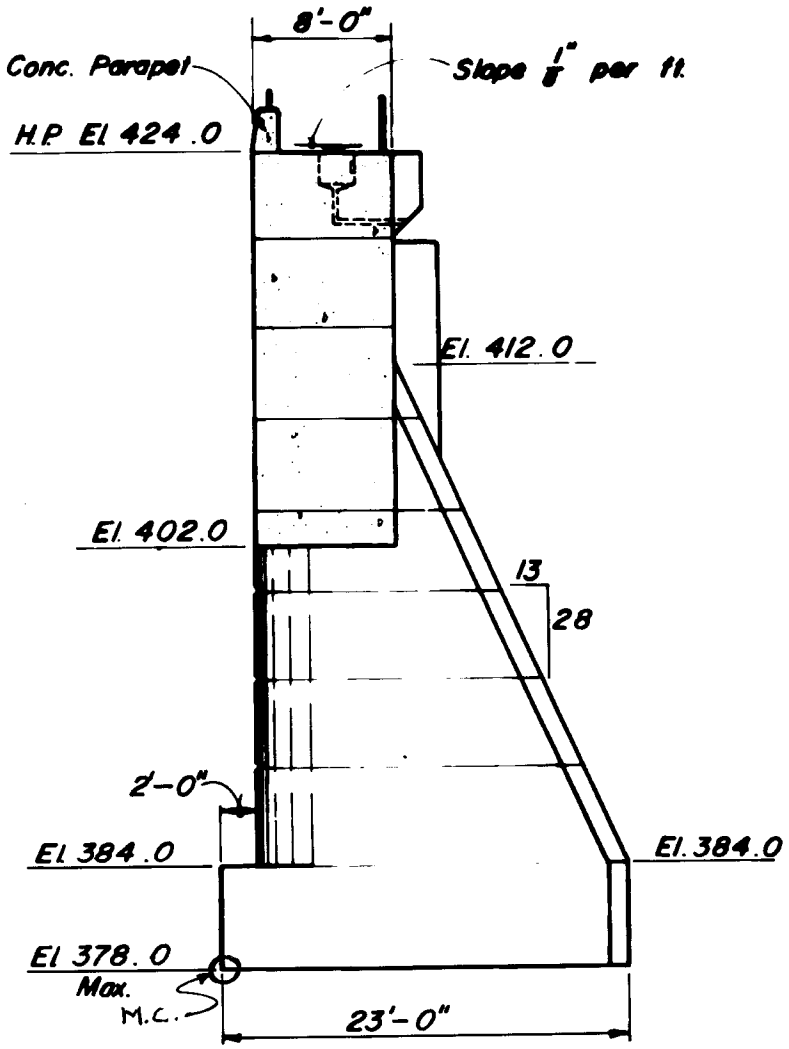
	FORCES			LENG 50	VERTICAL	HORIZONTAL	ARM	- MOMENTS	+
C1	8.00 X	30 X	0.15 X	50 1	1800.000		4.00		7200.00
C2	6.67 X	20 X	0.15 X	50 0.5	500.000		10.22		5111.11
C3	14.67 X	10 X	0.0875 X	50 1	641.667		7.33		4705.56
C4	3.33 X	10 X	0.0875 X	50 0.5	72.917		15.78		1150.46
C5	18.00 X	10.00 X	0.0875 X	50 1	787.500		9.00		7087.50
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
			SUB-TOTAL		3802.083				25254.63
					0.000		0.00		0.00
					0.000		12.33		0.00
					0.000		15.00		0.00
					0.000		16.89		0.00
					0.000		22.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
E1					0.000		0.00		0.00
E2					0.000		0.00		0.00
E3					0.000		0.00		0.00
E4					0.000		0.00		0.00
E5					0.000		0.00		0.00
E6					0.000		0.00		0.00
U1	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U2	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U3	18 X	20 X	0.0625	0	0.000		9.00	0.00	
H1	20 X	20 X	0.0625 X	0.5		> 12.500	6.67		83.33
H2	20 X	20 X	0.0625 X	0.5		< -12.500	6.67	-83.33	
H3	0 X	0 X	0.0625 X	0.5		< 0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5		< 0.000	0.00		0.00
H5	BARGE IMPACT					> 1727.000	25.00		43175.00
H6	HORIZONTAL FORCE					> 0	0.00		0.00
H7	HORIZONTAL FORCE					> 0	0		0.00
H8	HORIZONTAL FORCE					> 0	0		0.00

B=	18	Vo=	3802.1	SUM	3802.083	SUM H 1727.000	SUM -M	-83.33	SUM +M 68512.96
H/V=	0.45								SUM -M -83.33
e=	9.00						Mo=	68429.63	
%=	0.03					M/V= 18.00			SUM M 68429.63
FS=	0.00					B/4= 4.50			
MC=	18.00								0.01 0.00

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = 0.006$$

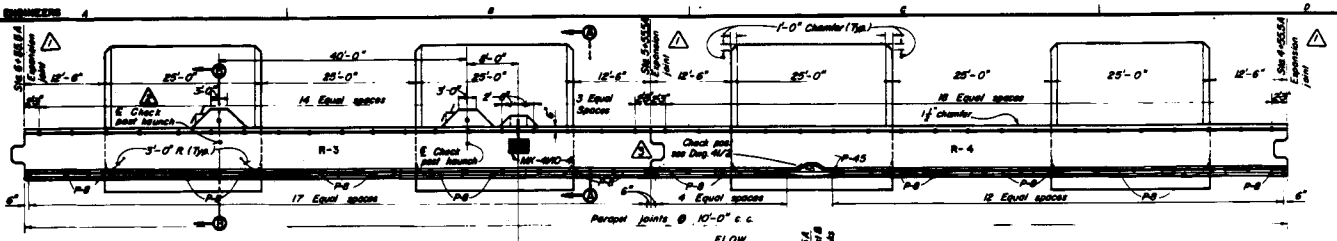
F. P. ######### 0.000

CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT		ARKANSAS L&D 14 UPPER GUIDE WALL R-4	
LOADING CONDITION:	FILL LT.- 378	FILL RT.- 378	POOL LT. - 412	POOL RT. - 412
COMPUTED BY: JDC.	SEE DWG -26/3.3	CHECKED BY DPS 10/20/04	DATE 19-Oct-04	



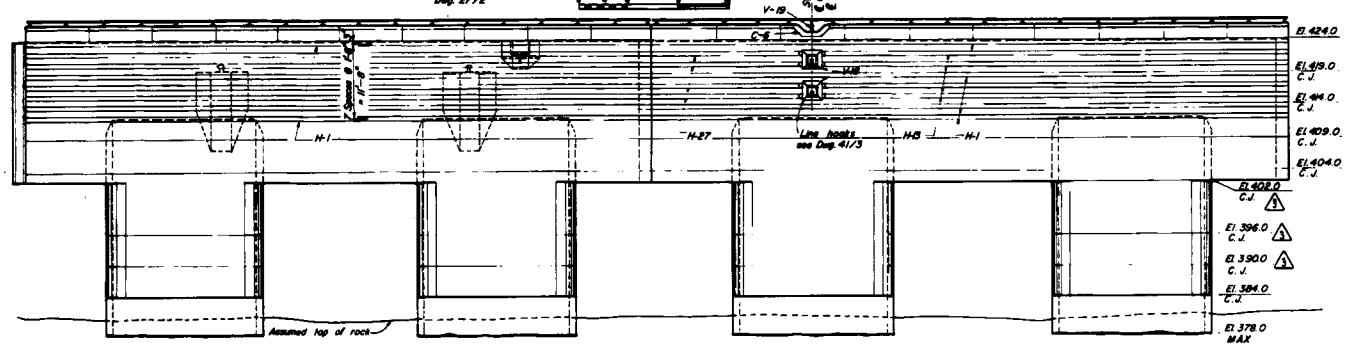
SECTION A-A

SCALE: 1" = 1'



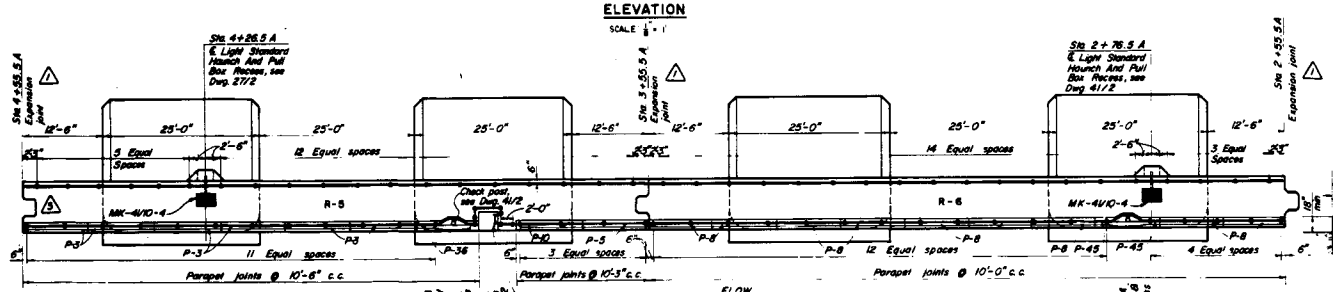
PLAN

SCALE: $\frac{1}{8}$" = 1'



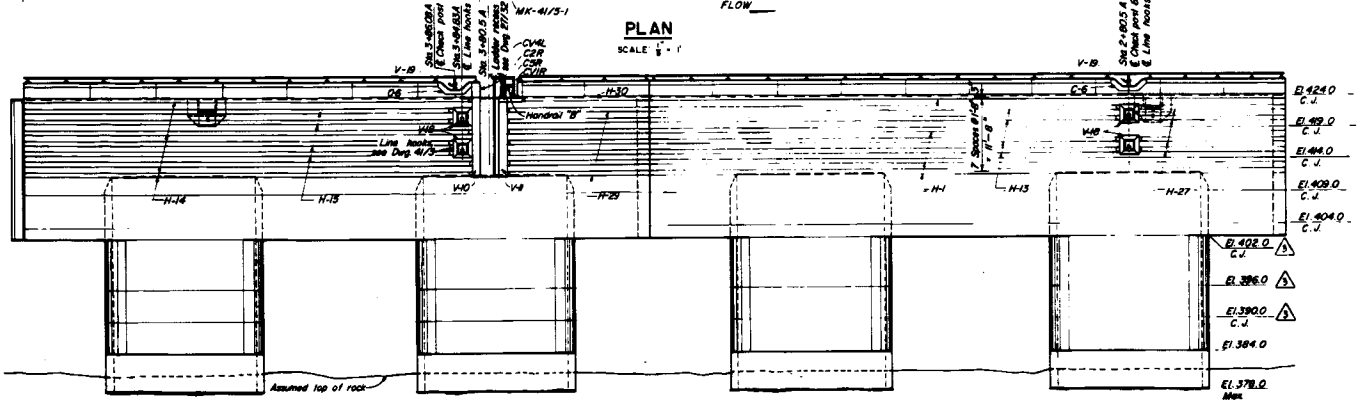
ELEVATION

SCALE $\frac{1}{8}$" = 1'



PLAN

SCALE: $\frac{1}{8}$" = 1'

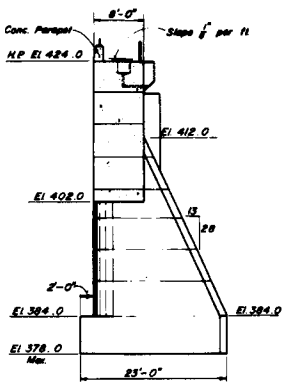


ELEVATION

SCALE $\frac{1}{8}$" = 1'

RECORD (AS BUILT) DRAWING

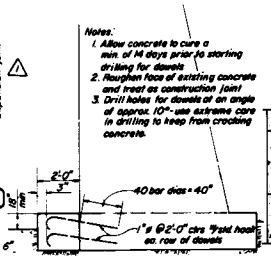




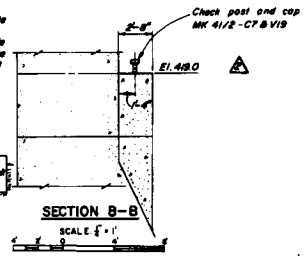
SECTION A-A

SCALE: $\frac{1}{8}$" = 1'

Notes:
1. Allow concrete to cure a min. of 14 days prior to starting drilling for dowels
2. Roughen face of existing concrete and treat as construction joint
3. Drill holes for dowels at an angle of approx. 10°- use extreme care in drilling to keep from cracking concrete.



DS PIER R-5
US PIER R-6
N.S.



SECTION B-B

SCALE $\frac{1}{8}$" = 1'

NOTES.
1. For general notes see Dwg. 26/1.
2. For concrete parapet detail see Dwg. 26/46
3. For wall armor details see Dwg. 41/1.
4. For handrail details see Dwg. 41/4.
5. All concrete on this Dwg. except parapet shall be paid for under bid item no. 35
6. For expansion joint detail see Dwg. 26/2.

KEY	DATE	REVISION (INDICATED BY Δ)	CHKD	REC.	APPD
3	8	Revised as constructed			
2	1-16-67	Check post identified			
1	10/4/66	Clarified details			

U.S. ARMY ENGINEER DISTRICT, TULSA
CORPS OF ENGINEERS
TULSA, OKLAHOMA

ARKANSAS RIVER & TRIBUTARIES — ARKANSAS RIVER, OKLAHOMA

	BY	CHKD
DESIGNED	WRM	J.L.J
DRAWN	S.M.M.	C.P.M.
TRACED		
SUBMITTED BY: Chief, Eng. Design Sec. A		
RECOMMENDED: Chief, Eng. Design Br.		
APPROVED: For the District Engineer		

LOCK AND DAM NO. 14
NAVIGATION LOCK
CONCRETE AND REINFORCEMENT
CONCRETE - MONOLITHS R-3 THRU R-6

DATE: FEB. 1966
SCALE: AS SHOWN
DRAWING NO. 1880-C2-26/3.3
DRAWING NO. DIVERS 34-202-10-1000

CONTRACT NO. 67-C-0005

I-47

CORPS OF ENGINEERS, U.S. ARMY — BARGE IMPACT 743 — ARKANSAS L&D 14 UPPER GUIDE WALL R-4

LOADING CONDITION: — FILL LT.- 378.000 — FILL RT.- 378.000 — POOL LT. - 412 — POOL RT. - 412

COMPUTED BY: JDC. — SEE DWG -26/3.3 — CHECKED BY DPS 10/20/04 — DATE 19-Oct-04

	FORCES				LENG 100	VERTICAL	HORIZONTAL		ARM	- MOMENTS	+
C1	8 X	12 X	0.15 X	100	1	1440.000			6.00		8640.00
C1B	8 X	10 X	0.0875 X	100	1	700.000			6.00		4200.00
C2	8 X	18 X	0.0875 X	50	1	630.000			6.00		3780.00
C3	13 X	28 X	0.0875 X	50	0.5	796.250			14.33		11412.92
C4	23 X	6 X	0.0875 X	50	1	603.750			11.50		6943.13
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
			SUB-TOTAL			4170.000					34976.04
						0.000			0.00		0.00
						0.000			12.33		0.00
						0.000			15.00		0.00
						0.000			16.89		0.00
						0.000			22.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
E1						0.000			0.00		0.00
E2						0.000			0.00		0.00
E3						0.000			0.00		0.00
E4						0.000			0.00		0.00
E5						0.000			0.00		0.00
E6						0.000			0.00		0.00
U1	0.000 X	0 X	0.0625			0.000			0.00	0.00	
U2	0.000 X	0 X	0.0625			0.000			0.00	0.00	
U3	23 X	34 X	0.0625		0	0.000			11.50	0.00	
H1	34 X	34 X	0.0625 X	0.5			>	36.125	11.33		409.42
H2	34 X	34 X	0.0625 X	0.5			<	-36.125	11.33	-409.42	
H3	0 X	0 X	0.0625 X	0.5			<	0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5			<	0.000	0.00		0.00
H5	BARGE IMPACT						>	743.000	39.00		28977.00
H6	HORIZONTAL FORCE						>	0	0.00		0.00
H7	HORIZONTAL FORCE						>	0	0		0.00
H8	HORIZONTAL FORCE						>	0	0		0.00

B=	23	Vo=	4170	SUM	4170.000	SUM H	743.000			SUM -M	-409.42	SUM +M	64362.46
H/V=	0.18											SUM -M	-409.42
e=	3.84									Mo=	63953.04		
%=	99.96						M/V=	15.34				SUM M	63953.04
FS=	0.00						B/4=	5.75					
MC=	15.34											22.99	0.00

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = \frac{22.991}{}$$

F. P. = 362.757 / 0.000

CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT 947	ARKANSAS L&D 14 UPPER GUIDE WALL R-4

LOADING CONDITION: FILL LT.- 378.000 FILL RT.- 378.000 POOL LT. - 412 POOL RT. - 412

COMPUTED BY: JDC. SEE DWG -26/3.3 CHECKED BY DPS 10/20/04 DATE 19-Oct-04

	FORCES			LENG 100	VERTICAL	HORIZONTAL	ARM	- MOMENTS	+
C1	8 X	12 X	0.15 X	100 1	1440.000		6.00		8640.00
CIB	8 X	10 X	0.0875 X	100 1	700.000		6.00		4200.00
C2	8 X	18 X	0.0875 X	50 1	630.000		6.00		3780.00
C3	13 X	28 X	0.0875 X	50 0.5	796.250		14.33		11412.92
C4	23 X	6 X	0.0875 X	50 1	603.750		11.50		6943.13
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
	SUB-TOTAL				4170.000				34976.04
					0.000		0.00		0.00
					0.000		12.33		0.00
					0.000		15.00		0.00
					0.000		16.89		0.00
					0.000		22.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
E1					0.000		0.00		0.00
E2					0.000		0.00		0.00
E3					0.000		0.00		0.00
E4					0.000		0.00		0.00
E5					0.000		0.00		0.00
E6					0.000		0.00		0.00
U1	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U2	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U3	23 X	34 X	0.0625	0	0.000		11.50	0.00	
H1	34 X	34 X	0.0625 X	0.5		> 36.125	11.33		409.42
H2	34 X	34 X	0.0625 X	0.5		< -36.125	11.33	-409.42	
H3	0 X	0 X	0.0625 X	0.5		< 0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5		< 0.000	0.00		0.00
H5	BARGE IMPACT					> 947.000	39.00		36933.00
H6	HORIZONTAL FORCE					> 0	0.00		0.00
H7	HORIZONTAL FORCE					> 0	0		0.00
H8	HORIZONTAL FORCE					> 0	0		0.00

B=	23	Vo=	4170	SUM	4170.000	SUM H 947.000	SUM -M -409.42	SUM +M 72318.46
H/V=	0.23							SUM -M -409.42
e=	5.74						Mo= 71909.04	
%=	75.07					M/V= 17.24		SUM M 71909.04
FS=	0.00					B/4= 5.75		
MC=	17.24							17.27 0.00

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = 17.267 \qquad F.P. = \frac{483.006}{0.000}$$

CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT 1152	ARKANSAS L&D 14 UPPER GUIDE WALL R-4

LOADING CONDITION: FILL LT.- 378.000 FILL RT.- 378.000 POOL LT. - 412 POOL RT. - 412

COMPUTED BY: JDC. SEE DWG -26/3.3 CHECKED BY DPS 11/1/04 DATE 01-Nov-04

	FORCES			LENG 100	VERTICAL	HORIZONTAL	ARM	MOMENTS -	MOMENTS +
C1	8 X	12 X	0.15 X	100 1	1440.000		6.00		8640.00
C1B	8 X	10 X	0.0875 X	100 1	700.000		6.00		4200.00
C2	8 X	18 X	0.0875 X	50 1	630.000		6.00		3780.00
C3	13 X	28 X	0.0875 X	50 0.5	796.250		14.33		11412.92
C4	23 X	6 X	0.0875 X	50 1	603.750		11.50		6943.13
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
			SUB-TOTAL		4170.000				34976.04
					0.000		0.00		0.00
					0.000		12.33		0.00
					0.000		15.00		0.00
					0.000		16.89		0.00
					0.000		22.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
E1					0.000		0.00		0.00
E2					0.000		0.00		0.00
E3					0.000		0.00		0.00
E4					0.000		0.00		0.00
E5					0.000		0.00		0.00
E6					0.000		0.00		0.00
U1	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U2	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U3	23 X	34 X	0.0625	0	0.000		11.50	0.00	
H1	34.000 X	34 X	0.0625 X	0.5		> 36.125	11.33		409.42
H2	34 X	34 X	0.0625 X	0.5		< -36.125	11.33	-409.42	
H3	0 X	0 X	0.0625 X	0.5		< 0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5		< 0.000	0.00		0.00
H5	BARGE IMPACT					> 1152.000	39.00		44928.00
H6	HORIZONTAL FORCE					> 0	0.00		0.00
H7	HORIZONTAL FORCE					> 0	0		0.00
H8	HORIZONTAL FORCE					> 0	0		0.00
					SUM 4170.000	SUM H 1152.000		SUM -M -409.42	SUM +M 80313.46
									SUM -M -409.42
								Mo= 79904.04	
									SUM M 79904.04

B= 23 Vo= 4170
H/V= 0.28
e= 7.66
%= 50.07
FS= 0.00
MC= 19.16

M/V= 19.16
B/4= 5.75

11.52 0.00

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = 11.515$$

F. P. = 724.268 / 0.000

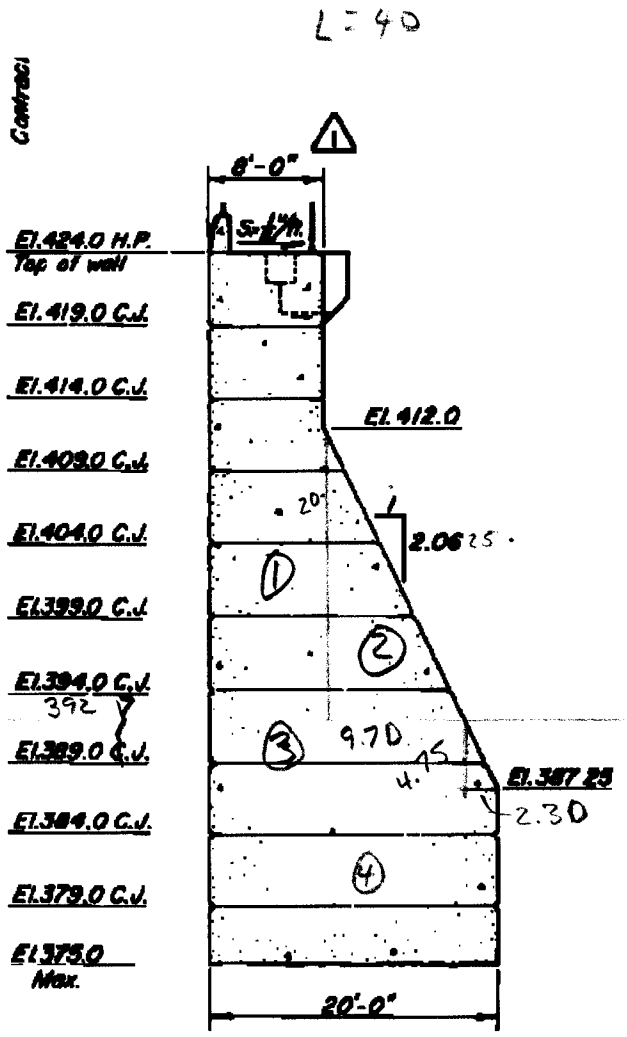
CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT 1562	ARKANSAS L&D 14 UPPER GUIDE WALL R-4
LOADING CONDITION:	FILL LT.- 378.000 FILL RT.- 378.000	POOL LT. - 412 POOL RT. - 412
COMPUTED BY: JDC. SEE DWG -26/3.3	CHECKED BY DPS 11/1/04	DATE 01-Nov-04

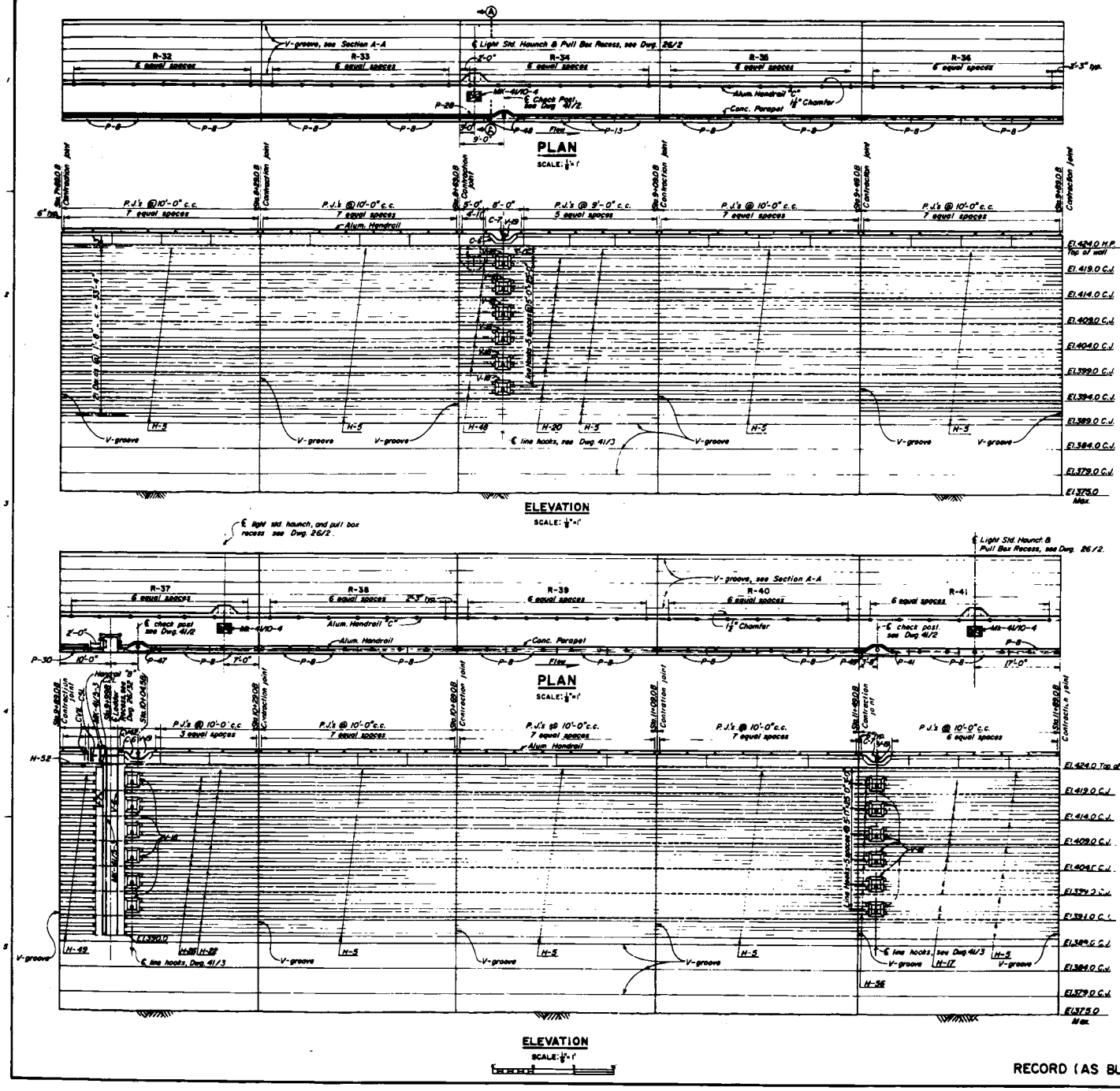
	FORCES				LENG 100	VERTICAL	HORIZONTAL	ARM	- MOMENTS	+
C1	8 X	12 X	0.15 X	100	1	1440.000		6.00		8640.00
CIB	8 X	10 X	0.0875 X	100	1	700.000		6.00		4200.00
C2	8 X	18 X	0.0875 X	50	1	630.000		6.00		3780.00
C3	13 X	28 X	0.0875 X	50	0.5	796.250		14.33		11412.92
C4	23 X	6 X	0.0875 X	50	1	603.750		11.50		6943.13
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
	SUB-TOTAL					4170.000				34976.04
						0.000		0.00		0.00
						0.000		12.33		0.00
						0.000		15.00		0.00
						0.000		16.89		0.00
						0.000		22.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
E1						0.000		0.00		0.00
E2						0.000		0.00		0.00
E3						0.000		0.00		0.00
E4						0.000		0.00		0.00
E5						0.000		0.00		0.00
E6						0.000		0.00		0.00
U1	0.000 X	0 X	0.0625			0.000		0.00	0.00	
U2	0.000 X	0 X	0.0625			0.000		0.00	0.00	
U3	23 X	34 X	0.0625		0	0.000		11.50	0.00	
H1	34.000 X	34 X	0.0625 X	0.5			> 36.125	11.33		409.42
H2	34 X	34 X	0.0625 X	0.5			< -36.125	11.33	-409.42	
H3	0 X	0 X	0.0625 X	0.5			< 0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5			< 0.000	0.00		0.00
H5	BARGE IMPACT						> 1562.000	39.00		60918.00
H6	HORIZONTAL FORCE						> 0	0.00		0.00
H7	HORIZONTAL FORCE						> 0	0		0.00
H8	HORIZONTAL FORCE						> 0	0		0.00

B=	23	Vo=	4170	SUM	4170.000	SUM H 1562.000	SUM -M -409.42	SUM +M 96303.46
H/V=	0.37							SUM -M -409.42
e=	11.50						Mo= 95894.04	
%=	0.05					M/V= 23.00		SUM M 95894.04
FS=	0.00					B/4= 5.75		
MC=	23.00							0.01 0.00

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = 0.011 \qquad F.P. = \frac{\#\#\#\#\#\#\#\#}{0.000}$$

CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT		ARKANSAS L&D 14 LOWER GUIDE WALL
LOADING CONDITION:	FILL LT.- 375	FILL RT.- 375	POOL LT. - , 392 POOL RT. - , 392
COMPUTED BY: JDC.	SEE DWG -26/45.1	CHECKED BY DB 4/2/04	DATE 28-Oct-04





SECTION A-A
SCALE: 1/8"=1'-0"



NOTES:

1. For general notes see Dwg. 26/1
2. For parapet masonry details see Dwg. 26/45
3. For handrail details see Dwg. 41/4
4. For wall armor details see Dwg. 41/1
5. All concrete this Dwg. except parapet to be paid for under bid item (35)
6. For lift joints see Dwg. 26/2

KEY	DATE	REVISION NO. DATED BY	CHKD	BY	APPR
1	6/3/66	Amendment No. 1			

U.S. ARMY ENGINEER DISTRICT, TULSA
CORPS OF ENGINEERS
TULSA, OKLAHOMA

ARKANSAS RIVER & TRIBUTARIES — ARKANSAS RIVER, OKLAHOMA

LOCK AND DAM NO. 14
NAVIGATION LOCK
CONCRETE AND REINFORCEMENT

CONCRETE - MONOLITHS R-32 THRU R-41

DESIGNED — DRAWN — TRACED — SUBMITTED BY — CHIEF, ENGRG. SEC. — RECOMMENDED — CHIEF, DESIGN BRANCH

APPROVED — CHIEF, ENGRG. DIV. FOR THE DISTRICT ENGINEER

DATE: FEB 1966

SCALE AS SHOWN

DRAWING NO. 1880-C2-26/45.1

RECORD (AS BUILT) DRAWING

CONTRACT NO. 67-C-2005

CORPS OF ENGINEERS, U.S. ARMY — BARGE IMPACT 893 — ARKANSAS L&D 14 LOWER GUIDE WALL

LOADING CONDITION: FILL LT.- 375 FILL RT.- 375 POOL LT. - 392 POOL RT. - 392

COMPUTED BY: JDC. SEE DWG -26/45.1 — CHECKED BY DPS 11/2/04 — DATE 28-Oct-04

	FORCES	LENG 40	VERTICAL	HORIZONTAL	ARM	MOMENTS -	MOMENTS +
C1	8.00 X 32.00 X 0.15 X	40 1	1536.000		4.00		6144.00
C2	9.70 X 20.00 X 0.15 X	40 0.5	582.000		11.23		6537.80
C3	17.70 X 4.75 X 0.0875 X	40 1	294.263		8.85		2604.22
C4	2.30 X 4.75 X 0.0875 X	40 0.5	19.119		18.47		353.06
C5	20.00 X 12.25 X 0.0875 X	40 1	857.500		10.00		8575.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
	SUB-TOTAL		3288.881				24214.08
			0.000		0.00		0.00
			0.000		12.33		0.00
			0.000		15.00		0.00
			0.000		16.89		0.00
			0.000		22.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
E1			0.000		0.00		0.00
E2			0.000		0.00		0.00
E3			0.000		0.00		0.00
E4			0.000		0.00		0.00
E5			0.000		0.00		0.00
E6			0.000		0.00		0.00
U1	0.000 X 0 X 0.0625		0.000		0.00	0.00	
U2	0.000 X 0 X 0.0625		0.000		0.00	0.00	
U3	20 X 17 X 0.0625	0	0.000		10.00	0.00	
H1	17 X 17 X 0.0625 X	0.5		> 9.031	5.67		51.18
H2	17 X 17 X 0.0625 X	0.5		< -9.031	5.67	-51.18	
H3	0 X 0 X 0.0625 X	0.5		< 0.000	0.00	0.00	
H4	0 X 0 X 0.0625 X	0.5		< 0.000	0.00		0.00
H5	BARGE IMPACT			> 893.000	22.00		19646.00
H6	HORIZONTAL FORCE			> 0	0.00		0.00
H7	HORIZONTAL FORCE			> 0	0		0.00
H8	HORIZONTAL FORCE			> 0	0		0.00

B=	20	Vo= 3288.9	SUM 3288.881	SUM H 893.000		SUM -M -51.18	SUM +M 43911.26
H/V=	0.27						SUM -M -51.18
e=	3.34					Mo= 43860.08	
%=	99.96			M/V=	13.34		SUM M 43860.08
FS=	0.00			B/4=	5.00		
MC=	13.34						19.99 0.00

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = 19.992 \qquad F.P. = \frac{329.013}{0.000}$$

CORPS OF ENGINEERS, U.S. ARMY — BARGE IMPACT 1390 — ARKANSAS L&D 14 LOWER GUIDE WALL

LOADING CONDITION: FILL LT.- 375 FILL RT.- 375 POOL LT. - 392 POOL RT. - 392

COMPUTED BY: JDC. SEE DWG -26/45.1 — CHECKED BY — DATE 28-Oct-04

	FORCES			LENG 40	VERTICAL	HORIZONTAL	ARM	- MOMENTS	+
C1	8.00 X	32.00 X	0.15 X	40 1	1536.000		4.00		6144.00
C2	9.70 X	20.00 X	0.15 X	40 0.5	582.000		11.23		6537.80
C3	17.70 X	4.75 X	0.0875 X	40 1	294.263		8.85		2604.22
C4	2.30 X	4.75 X	0.0875 X	40 0.5	19.119		18.47		353.06
C5	20.00 X	12.25 X	0.0875 X	40 1	857.500		10.00		8575.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
			SUB-TOTAL		3288.881				24214.08
					0.000		0.00		0.00
					0.000		12.33		0.00
					0.000		15.00		0.00
					0.000		16.89		0.00
					0.000		22.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
E1					0.000		0.00		0.00
E2					0.000		0.00		0.00
E3					0.000		0.00		0.00
E4					0.000		0.00		0.00
E5					0.000		0.00		0.00
E6					0.000		0.00		0.00
U1	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U2	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U3	20 X	17 X	0.0625	0	0.000		10.00	0.00	
H1	17 X	17 X	0.0625 X	0.5		> 9.031	5.67		51.18
H2	17 X	17 X	0.0625 X	0.5		< -9.031	5.67	-51.18	
H3	0 X	0 X	0.0625 X	0.5		< 0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5		< 0.000	0.00		0.00
H5	BARGE IMPACT					> 1390.000	22.00		30580.00
H6	HORIZONTAL FORCE					> 0	0.00		0.00
H7	HORIZONTAL FORCE					> 0	0		0.00
H8	HORIZONTAL FORCE					> 0	0		0.00

B=	20	Vo=	3288.9	SUM	3288.881	SUM H	1390.000	SUM -M	-51.18	SUM +M	54845.26
H/V=	0.42									SUM -M	-51.18
e=	6.66							Mo=	54794.08		
%=	50.09					M/V=	16.66			SUM M	54794.08
FS=	0.00					B/4=	5.00				
MC=	16.66									10.02	0.00

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = 10.019 \qquad F.P. = \frac{656.542}{0.000}$$

CORPS OF ENGINEERS, U.S. ARMY					BARGE IMPACT 1141			ARKANSAS L&D 14 LOWER GUIDE WALL	
LOADING CONDITION:			FILL LT.- 375		FILL RT.- 375			POOL LT. - 392	POOL RT. - 392
COMPUTED BY: JDC.			SEE DWG -26/45.1		CHECKED BY			DATE 28-Oct-04	
	FORCES			LENG 40	VERTICAL	HORIZONTAL	ARM	- MOMENTS	+
C1	8.00 X	32.00 X	0.15 X	40 1	1536.000		4.00		6144.00
C2	9.70 X	20.00 X	0.15 X	40 0.5	582.000		11.23		6537.80
C3	17.70 X	4.75 X	0.0875 X	40 1	294.263		8.85		2604.22
C4	2.30 X	4.75 X	0.0875 X	40 0.5	19.119		18.47		353.06
C5	20.00 X	12.25 X	0.0875 X	40 1	857.500		10.00		8575.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
			SUB-TOTAL		3288.881				24214.08
					0.000		0.00		0.00
					0.000		12.33		0.00
					0.000		15.00		0.00
					0.000		16.89		0.00
					0.000		22.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
E1					0.000		0.00		0.00
E2					0.000		0.00		0.00
E3					0.000		0.00		0.00
E4					0.000		0.00		0.00
E5					0.000		0.00		0.00
E6					0.000		0.00		0.00
U1	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U2	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U3	20 X	17 X	0.0625	0	0.000		10.00	0.00	
H1	17 X	17 X	0.0625 X	0.5		> 9.031	5.67		51.18
H2	17 X	17 X	0.0625 X	0.5		< -9.031	5.67	-51.18	
H3	0 X	0 X	0.0625 X	0.5		< 0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5		< 0.000	0.00		0.00
H5	BARGE IMPACT					> 1141.000	22.00		25102.00
H6	HORIZONTAL FORCE					> 0	0.00		0.00
H7	HORIZONTAL FORCE					> 0	0		0.00
H8	HORIZONTAL FORCE					> 0	0		0.00
B=	20	Vo=	3288.9		SUM 3288.881	SUM H 1141.000		SUM -M -51.18	SUM +M 49367.26
H/V=	0.35								SUM -M -51.18
e=	4.99							Mo= 49316.08	
%=	75.08					M/V=	14.99		SUM M 49316.08
FS=	0.00					B/4=	5.00		
MC=	14.99								15.02 0.00

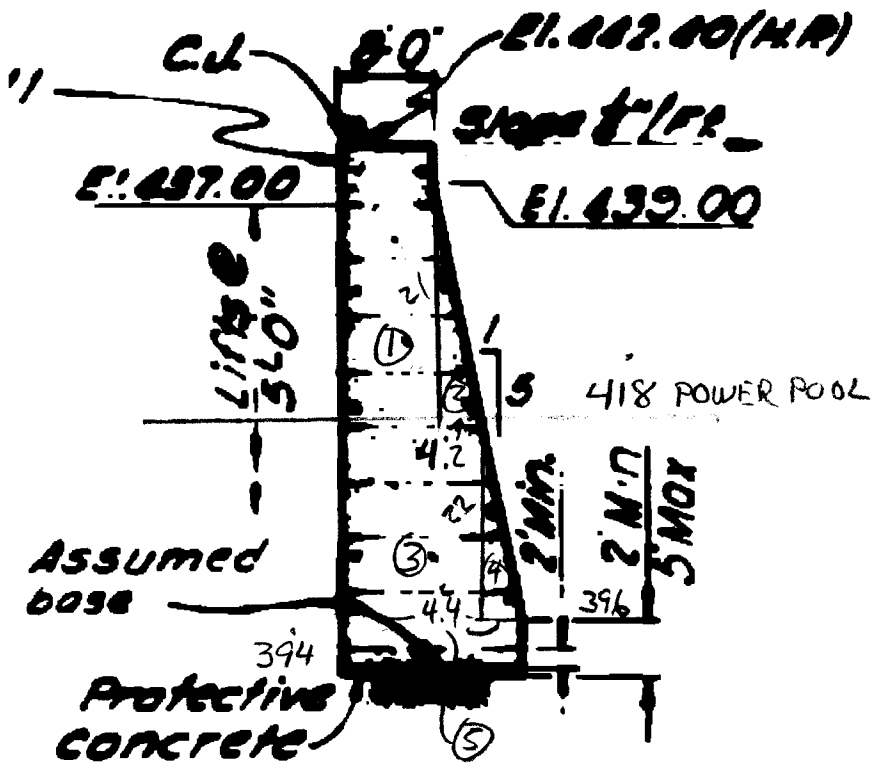
$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = 15.016 \qquad F.P. = \frac{438.061}{0.000}$$

CORPS OF ENGINEERS, U.S. ARMY				BARGE IMPACT 1889			ARKANSAS L&D 14 LOWER GUIDE WALL		
LOADING CONDITION:		FILL LT.- 375		FILL RT.- 375			POOL LT. - 392	POOL RT. - 392	
COMPUTED BY: JDC.		SEE DWG -26/45.1		CHECKED BY			DATE 28-Oct-04		
	FORCES		LENG 40	VERTICAL	HORIZONTAL	ARM	- MOMENTS		+
C1	8.00 X 32.00 X	0.15 X	40 1	1536.000		4.00			6144.00
C2	9.70 X 20.00 X	0.15 X	40 0.5	582.000		11.23			6537.80
C3	17.70 X 4.75 X	0.0875 X	40 1	294.263		8.85			2604.22
C4	2.30 X 4.75 X	0.0875 X	40 0.5	19.119		18.47			353.06
C5	20.00 X 12.25 X	0.0875 X	40 1	857.500		10.00			8575.00
				0.000		0.00			0.00
				0.000		0.00			0.00
				0.000		0.00			0.00
				0.000		0.00			0.00
				0.000		0.00			0.00
				0.000		0.00			0.00
				0.000		0.00			0.00
				0.000		0.00			0.00
				0.000		0.00			0.00
				0.000		0.00			0.00
				0.000		0.00			0.00
				0.000		0.00			0.00
		SUB-TOTAL		3288.881					24214.08
				0.000		0.00			0.00
				0.000		12.33			0.00
				0.000		15.00			0.00
				0.000		16.89			0.00
				0.000		22.00			0.00
				0.000		0.00			0.00
				0.000		0.00			0.00
				0.000		0.00			0.00
				0.000		0.00			0.00
				0.000		0.00			0.00
				0.000		0.00			0.00
				0.000		0.00			0.00
				0.000		0.00			0.00
E1				0.000		0.00			0.00
E2				0.000		0.00			0.00
E3				0.000		0.00			0.00
E4				0.000		0.00			0.00
E5				0.000		0.00			0.00
E6				0.000		0.00			0.00
U1	0.000 X 0 X	0.0625		0.000		0.00	0.00		
U2	0.000 X 0 X	0.0625		0.000		0.00	0.00		
U3	20 X 17 X	0.0625	0	0.000		10.00	0.00		
H1	17 X 17 X	0.0625 X	0.5		> 9.031	5.67			51.18
H2	17 X 17 X	0.0625 X	0.5		< -9.031	5.67	-51.18		
H3	0 X 0 X	0.0625 X	0.5		< 0.000	0.00	0.00		
H4	0 X 0 X	0.0625 X	0.5		< 0.000	0.00			0.00
H5	BARGE IMPACT				> 1889.000	22.00			41558.00
H6	HORIZONTAL FORCE				> 0	0.00			0.00
H7	HORIZONTAL FORCE				> 0	0			0.00
H8	HORIZONTAL FORCE				> 0	0			0.00
B=	20 Vo=	3288.9		SUM 3288.881	SUM H 1889.000		SUM -M -51.18		SUM +M 65823.26
H/V=	0.57								SUM -M -51.18
e=	10.00						Mo= 65772.08		
%=	0.03				M/V=	20.00			SUM M 65772.08
FS=	0.00				B/4=	5.00			
MC=	20.00								0.01 0.00

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = 0.005 \qquad F.P. = \frac{\#\#\#\#\#\#\#\#}{0.000}$$

CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT			ARKANSAS L&D 15 LOWER GUIDE WALL EL SCALED FROM DWG	
LOADING CONDITION:	FILL LT.- 394	FILL RT.- 394	POOL LT. - 418	POOL RT. - 418	
COMPUTED BY: JDC.	SEE DWG -26/4.1	CHECKED BY DPS 11/04	DATE 01-Nov-04		

L=26



SECTION B-B

TYPICAL GUIDE WALL SECTION

SCALE 1" = 20'

CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT 235	ARKANSAS L&D 15 LOWER GUIDE WALL EL SCALED FROM DWG
LOADING CONDITION:	FILL LT.- 394 FILL RT.- 394	POOL LT. - 418 POOL RT. - 418
COMPUTED BY: JDC.	SEE DWG -26/4.1	CHECKED BY DRS 11/1/04 DATE 01-Nov-04

	FORCES	LENG	VERTICAL	HORIZONTAL	ARM	MOMENTS -	MOMENTS +	
C1	8 X ~~19~~ 21.9 X 0.15 X 26	1	~~502.800~~	748.8	4.00		~~2371.20~~	2995.2
C2	4.2 X 21 X 0.15 X 26	0.5	171.990		9.40		1616.71	
C3	12.2 X 22 X 0.0875 X 26	1	610.610		6.10		3724.72	
C4	4.4 X 22 X 0.0875 X 26	0.5	110.110		~~18.47~~ 13.67		~~2142.47~~	1505.2
C5	16.6 X 2 X 0.0875 X 26	1	75.530		8.30		626.90	
			0.000		0.00		0.00	
			0.000		0.00		0.00	
			0.000		0.00		0.00	
			0.000		0.00		0.00	
			0.000		0.00		0.00	
			0.000		0.00		0.00	
			0.000		0.00		0.00	
			0.000		0.00		0.00	
			0.000		0.00		0.00	
			0.000		0.00		0.00	
			0.000		0.00		0.00	
			0.000		0.00		0.00	
	SUB-TOTAL		~~1561.010~~	1717.05			~~10483.00~~	10468.73
			0.000		0.00		0.00	
			0.000		12.33		0.00	
			0.000		15.00		0.00	
			0.000		16.89		0.00	
			0.000		22.00		0.00	
			0.000		0.00		0.00	
			0.000		0.00		0.00	
			0.000		0.00		0.00	
			0.000		0.00		0.00	
			0.000		0.00		0.00	
			0.000		0.00		0.00	
			0.000		0.00		0.00	
E1			0.000		0.00		0.00	
E2			0.000		0.00		0.00	
E3			0.000		0.00		0.00	
E4			0.000		0.00		0.00	
E5			0.000		0.00		0.00	
E6			0.000		0.00		0.00	
U1	0.000 X 0 X 0.0625		0.000		0.00	0.00		
U2	0.000 X 0 X 0.0625		0.000		0.00	0.00		
U3	16.6 X 24 X 0.0625	0	0.000		8.30	0.00		
H1	24 X 24 X 0.0625 X 0.5			> 18.000	8.00		144.00	
H2	24 X 24 X 0.0625 X 0.5			< -18.000	8.00	-144.00		
H3	0 X 0 X 0.0625 X 0.5			< 0.000	0.00	0.00		
H4	0 X 0 X 0.0625 X 0.5			< 0.000	0.00		0.00	
H5	BARGE IMPACT			> 235.000	29.00		6815.00	
H6	HORIZONTAL FORCE			> 0	0.00		0.00	
H7	HORIZONTAL FORCE			> 0	0		0.00	
H8	HORIZONTAL FORCE			> 0	0		0.00	

B=	16.6	Vo=	1561	SUM ~~1561.010~~ 1717.05	SUM H 235.000		SUM -M -144.00	SUM +M 17442.00
H/V=	0.15							SUM -M -144.00
e=	2.78						Mo= 17298.00	
%=	99.74				M/V=	11.08		SUM M 17298.00
FS=	0.00				B/4=	4.15		
MC=	11.08							16.56 0.00

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = \frac{188.568}{16.557} \quad F.P. = \frac{}{0.000}$$

CORPS OF ENGINEERS, U.S. ARMY					BARGE IMPACT 308			ARKANSAS L&D 15 LOWER GUIDE WALL EL SCALED FROM DWG			
LOADING CONDITION:					FILL LT.- 394	FILL RT.- 394		POOL LT. - 418	POOL RT. - 418		
COMPUTED BY: JDC.					SEE DWG -26/4.1	CHECKED BY		DATE 01-Nov-04			
FORCES				LENG 26	VERTICAL	HORIZONTAL	ARM	- MOMENTS		+	
C1	8 X	19 X	0.15 X	26 1	592.800		4.00			2371.20	
C2	4.2 X	21 X	0.15 X	26 0.5	171.990		9.40			1616.71	
C3	12.2 X	22 X	0.0875 X	26 1	610.610		6.10			3724.72	
C4	4.4 X	22 X	0.0875 X	26 0.5	110.110		19.47			2143.47	
C5	16.6 X	2 X	0.0875 X	26 1	75.530		8.30			626.90	
					0.000		0.00			0.00	
					0.000		0.00			0.00	
					0.000		0.00			0.00	
					0.000		0.00			0.00	
					0.000		0.00			0.00	
					0.000		0.00			0.00	
					0.000		0.00			0.00	
					0.000		0.00			0.00	
					0.000		0.00			0.00	
					0.000		0.00			0.00	
					0.000		0.00			0.00	
					0.000		0.00			0.00	
			SUB-TOTAL		1561.040					10483.00	
					0.000		0.00			0.00	
					0.000		12.33			0.00	
					0.000		15.00			0.00	
					0.000		16.89			0.00	
					0.000		22.00			0.00	
					0.000		0.00			0.00	
					0.000		0.00			0.00	
					0.000		0.00			0.00	
					0.000		0.00			0.00	
					0.000		0.00			0.00	
					0.000		0.00			0.00	
					0.000		0.00			0.00	
					0.000		0.00			0.00	
E1					0.000		0.00			0.00	
E2					0.000		0.00			0.00	
E3					0.000		0.00			0.00	
E4					0.000		0.00			0.00	
E5					0.000		0.00			0.00	
E6					0.000		0.00			0.00	
U1	0.000 X	0 X	0.0625		0.000		0.00	0.00			
U2	0.000 X	0 X	0.0625		0.000		0.00	0.00			
U3	16.6 X	24 X	0.0625	0	0.000		8.30	0.00			
H1	24 X	24 X	0.0625 X	0.5		> 18.000	8.00			144.00	
H2	24 X	24 X	0.0625 X	0.5		< -18.000	8.00	-144.00			
H3	0 X	0 X	0.0625 X	0.5		< 0.000	0.00	0.00			
H4	0 X	0 X	0.0625 X	0.5		< 0.000	0.00			0.00	
H5	BARGE IMPACT					> 308.000	29.00			8932.00	
H6	HORIZONTAL FORCE					> 0	0.00			0.00	
H7	HORIZONTAL FORCE					> 0	0			0.00	
H8	HORIZONTAL FORCE					> 0	0			0.00	
B=	16.6	Vo=	1561		SUM 1561.040	SUM H 308.000		SUM -M -144.00		SUM +M	19559.00
H/V=	0.20									SUM -M	-144.00
e=	4.14							Mo= 19415.00			
%=	75.23					M/V=	12.44			SUM M	19415.00
FS=	0.00					B/4=	4.15				
MC=	12.44									12.49	0.00

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = 12.488 \qquad F.P. = \frac{250.000}{0.000}$$

CORPS OF ENGINEERS, U.S. ARMY					BARGE IMPACT 383			ARKANSAS L&D 15 LOWER GUIDE WALL EL SCALED FROM DWG		
LOADING CONDITION:					FILL LT.- 394	FILL RT.- 394		POOL LT. - 418	POOL RT. - 418	
COMPUTED BY: JDC.					SEE DWG -26/4.1	CHECKED BY		DATE 01-Nov-04		
	FORCES			LENG 26	VERTICAL	HORIZONTAL	ARM	- MOMENTS		+
C1	8 X	19 X	0.15 X	26 1	592.800		4.00			2371.20
C2	4.2 X	21 X	0.15 X	26 0.5	171.990		9.40			1616.71
C3	12.2 X	22 X	0.0875 X	26 1	610.610		6.10			3724.72
C4	4.4 X	22 X	0.0875 X	26 0.5	110.110		19.47			2143.47
C5	16.6 X	2 X	0.0875 X	26 1	75.530		8.30			626.90
					0.000		0.00			0.00
					0.000		0.00			0.00
					0.000		0.00			0.00
					0.000		0.00			0.00
					0.000		0.00			0.00
					0.000		0.00			0.00
					0.000		0.00			0.00
					0.000		0.00			0.00
					0.000		0.00			0.00
					0.000		0.00			0.00
					0.000		0.00			0.00
					0.000		0.00			0.00
			SUB-TOTAL		1561.040					10483.00
					0.000		0.00			0.00
					0.000		12.33			0.00
					0.000		15.00			0.00
					0.000		16.89			0.00
					0.000		22.00			0.00
					0.000		0.00			0.00
					0.000		0.00			0.00
					0.000		0.00			0.00
					0.000		0.00			0.00
					0.000		0.00			0.00
					0.000		0.00			0.00
					0.000		0.00			0.00
					0.000		0.00			0.00
E1					0.000		0.00			0.00
E2					0.000		0.00			0.00
E3					0.000		0.00			0.00
E4					0.000		0.00			0.00
E5					0.000		0.00			0.00
E6					0.000		0.00			0.00
U1	0.000 X	0 X	0.0625		0.000		0.00	0.00		
U2	0.000 X	0 X	0.0625		0.000		0.00	0.00		
U3	16.6 X	24 X	0.0625	0	0.000		8.30	0.00		
H1	24 X	24 X	0.0625 X	0.5		> 18.000	8.00			144.00
H2	24 X	24 X	0.0625 X	0.5		< -18.000	8.00	-144.00		
H3	0 X	0 X	0.0625 X	0.5		< 0.000	0.00	0.00		
H4	0 X	0 X	0.0625 X	0.5		< 0.000	0.00			0.00
H5	BARGE IMPACT					> 383.000	29.00			11107.00
H6	HORIZONTAL FORCE					> 0	0.00			0.00
H7	HORIZONTAL FORCE					> 0	0			0.00
H8	HORIZONTAL FORCE					> 0	0			0.00
B=	16.6	Vo=	1561		SUM 1561.040	SUM H 383.000		SUM -M -144.00		SUM +M 21734.00
H/V=	0.25									SUM -M -144.00
e=	5.53							Mo= 21590.00		
%=	50.05					M/V=	13.83			SUM M 21590.00
FS=	0.00					B/4=	4.15			
MC=	13.83									8.31 0.00

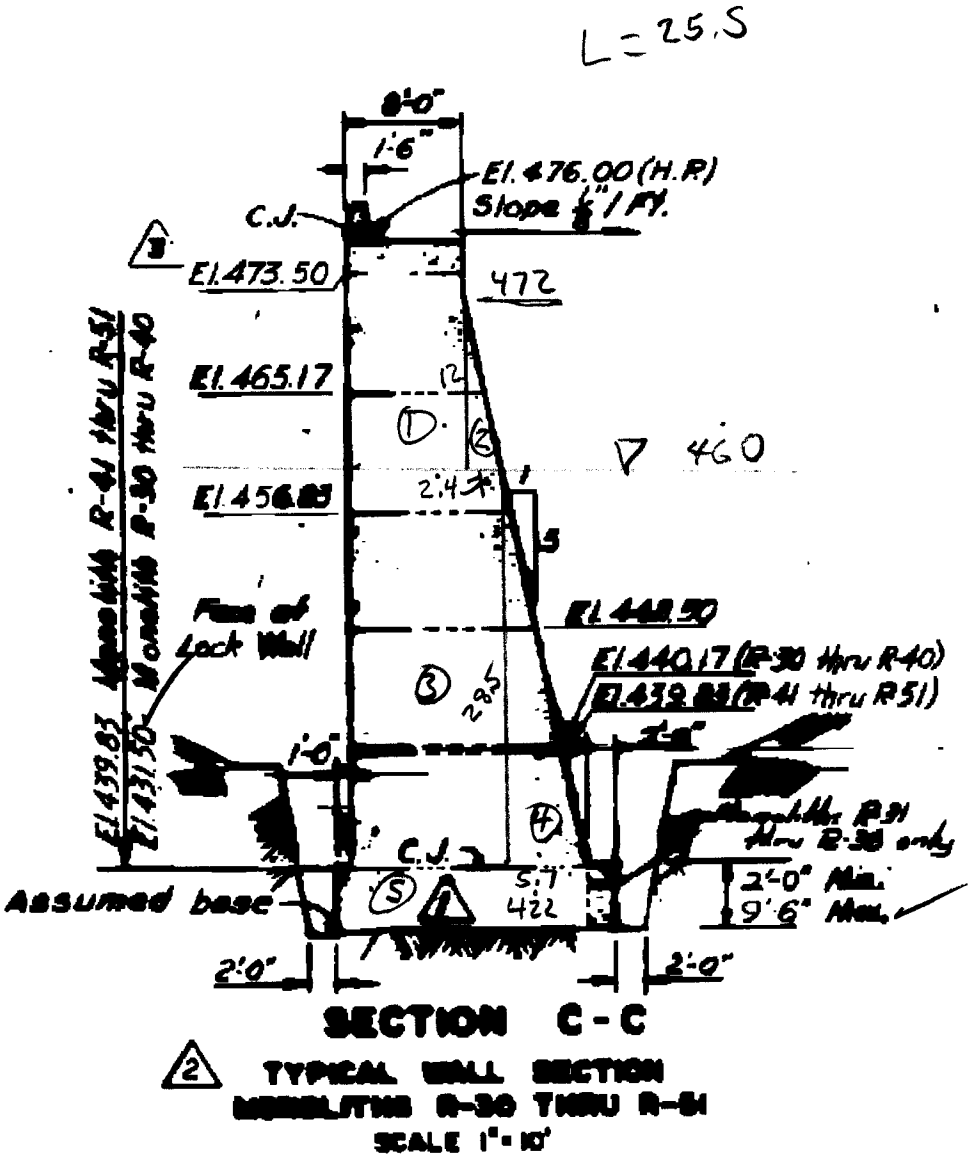
$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = 8.308 \qquad F.P. = \frac{375.773}{0.000}$$

CORPS OF ENGINEERS, U.S. ARMY					BARGE IMPACT 532			ARKANSAS L&D 15 LOWER GUIDE WALL EL SCALED FROM DWG		
LOADING CONDITION:					FILL LT.- 394	FILL RT.- 394		POOL LT. - 418	POOL RT. - 418	
COMPUTED BY: JDC.					SEE DWG -26/4.1	CHECKED BY		DATE 01-Nov-04		
	FORCES			LENG 26	VERTICAL	HORIZONTAL	ARM	- MOMENTS		+
C1	8 X	19 X	0.15 X	26 1	592.800		4.00			2371.20
C2	4.2 X	21 X	0.15 X	26 0.5	171.990		9.40			1616.71
C3	12.2 X	22 X	0.0875 X	26 1	610.610		6.10			3724.72
C4	4.4 X	22 X	0.0875 X	26 0.5	110.110		19.47			2143.47
C5	16.6 X	2 X	0.0875 X	26 1	75.530		8.30			626.90
					0.000		0.00			0.00
					0.000		0.00			0.00
					0.000		0.00			0.00
					0.000		0.00			0.00
					0.000		0.00			0.00
					0.000		0.00			0.00
					0.000		0.00			0.00
					0.000		0.00			0.00
					0.000		0.00			0.00
					0.000		0.00			0.00
					0.000		0.00			0.00
			SUB-TOTAL		1561.040					10483.00
					0.000		0.00			0.00
					0.000		12.33			0.00
					0.000		15.00			0.00
					0.000		16.89			0.00
					0.000		22.00			0.00
					0.000		0.00			0.00
					0.000		0.00			0.00
					0.000		0.00			0.00
					0.000		0.00			0.00
					0.000		0.00			0.00
					0.000		0.00			0.00
					0.000		0.00			0.00
					0.000		0.00			0.00
E1					0.000		0.00			0.00
E2					0.000		0.00			0.00
E3					0.000		0.00			0.00
E4					0.000		0.00			0.00
E5					0.000		0.00			0.00
E6					0.000		0.00			0.00
U1	0.000 X	0 X	0.0625		0.000		0.00	0.00		
U2	0.000 X	0 X	0.0625		0.000		0.00	0.00		
U3	16.6 X	24 X	0.0625	0	0.000		8.30	0.00		
H1	24 X	24 X	0.0625 X	0.5		> 18.000	8.00			144.00
H2	24 X	24 X	0.0625 X	0.5		< -18.000	8.00	-144.00		
H3	0 X	0 X	0.0625 X	0.5		< 0.000	0.00	0.00		
H4	0 X	0 X	0.0625 X	0.5		< 0.000	0.00			0.00
H5	BARGE IMPACT					> 532.000	29.00			15428.00
H6	HORIZONTAL FORCE					> 0	0.00			0.00
H7	HORIZONTAL FORCE					> 0	0			0.00
H8	HORIZONTAL FORCE					> 0	0			0.00
B=	16.6	Vo=	1561		SUM 1561.040	SUM H 532.000		SUM -M -144.00		SUM +M 26055.00
H/V=	0.34									SUM -M -144.00
e=	8.30							Mo= 25911.00		
%=	0.03					M/V=	16.60			SUM M 25911.00
FS=	0.00					B/4=	4.15			
MC=	16.60									0.00 0.00

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = 0.004$$

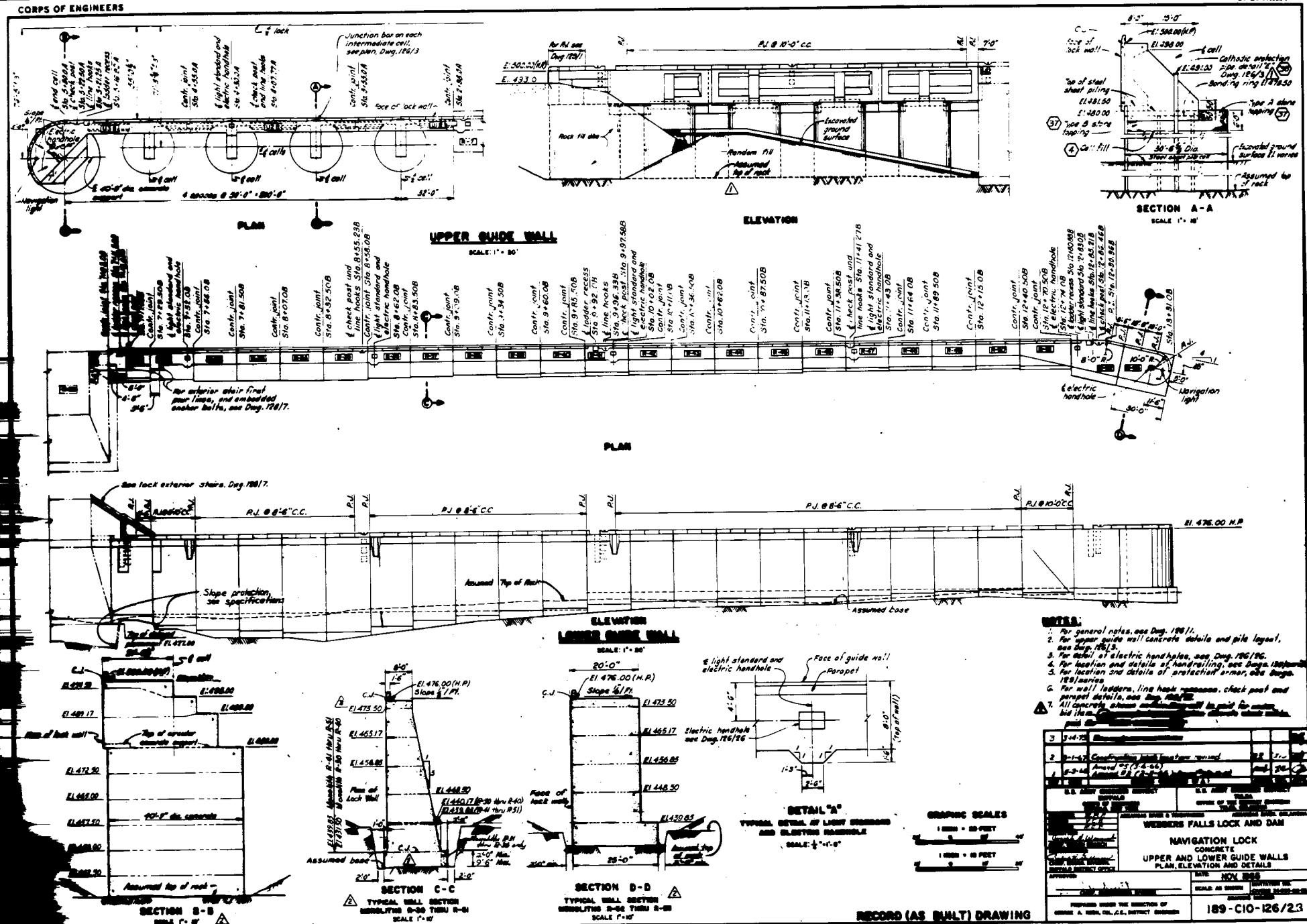
F. P. = ######### / 0.000

CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT			ARKANSAS L&D 16 LOWER GUIDE WALL EL SCALED FROM DWG			
LOADING CONDITION:	FILL LT.-	422	FILL RT.-	422	POOL LT. -	460	POOL RT. - 460
COMPUTED BY: JDC.	SEE DWG -126/2		CHECKED BY	DPS 4/1/64	DATE	01-Nov-04	



SECTION C-C

2 TYPICAL WALL SECTION
MONOLITHS R-30 THRU R-51
SCALE 1" = 10'



NOTES:

1. For general notes, see Dwg. 126/1.
2. For upper guide wall concrete details and pile layout, see Dwg. 126/3.
3. For detail of electric handholes, see Dwg. 126/26.
4. For location and details of handrailing, see Dwgs. 130/series.
5. For location and details of protection armor, see Dwgs. 129/series.
6. For wall ladders, line hook recesses, check post and parapet details, see Dwg. 126/22.
7. All concrete shown [illegible] to paid for under bid item [illegible]

3	3-14-75	[illegible]
2	9-1-67	Construction joint location revised
1	5-3-66	Amend #5 (3-4-66) Amend #2 (2-8-66) [illegible]

U.S. ARMY ENGINEER DISTRICT
TULSA
OFFICE OF THE DISTRICT ENGINEER
TULSA, OKLAHOMA

ARKANSAS RIVER & TRIBUTARIES
ARKANSAS RIVER, OKLAHOMA

WEBBERS FALLS LOCK AND DAM

NAVIGATION LOCK
CONCRETE
UPPER AND LOWER GUIDE WALLS
PLAN, ELEVATION AND DETAILS

DATE: NOV 1966

SCALE: AS SHOWN

PREPARED UNDER THE DIRECTION OF GEORGE A. HIGH, COL., C.E., DISTRICT ENGINEER

189-C10-126/23

RECORD (AS BUILT) DRAWING

CONTRACT NO. 66-346

2-17

CORPS OF ENGINEERS, U.S. ARMY — BARGE IMPACT 220 — ARKANSAS L&D 16 LOWER GUIDE WALL EL SCALED FROM DWG

LOADING CONDITION: FILL LT.- 422 FILL RT.- 422 POOL LT. - 460 POOL RT. - 460

COMPUTED BY: JDC. SEE DWG -126/2 — CHECKED BY DPS 11/1/04 — DATE 01-Nov-04

	FORCES	LENG	VERTICAL	HORIZONTAL	ARM	MOMENTS -	MOMENTS +
		26					
C1	8 X 16 X 0.15 X 25.5 1		489.600		5.00		2448.00
C2	2.4 X 12 X 0.15 X 25.5 0.5		55.080		9.80		539.78
C3	10.4 X 28.5 X 0.0875 X 25.5 1		661.343		6.20		4100.32
C4	5.7 X 28.5 X 0.0875 X 25.5 0.5		181.233		13.30		2410.40
C5	19.1 X 9.50 X 0.0875 X 25.5 1		404.860		9.55		3866.42
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
	SUB-TOTAL		1792.116				13364.93
			0.000		0.00		0.00
			0.000		12.33		0.00
			0.000		15.00		0.00
			0.000		16.89		0.00
			0.000		22.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
E1			0.000		0.00		0.00
E2			0.000		0.00		0.00
E3			0.000		0.00		0.00
E4			0.000		0.00		0.00
E5			0.000		0.00		0.00
E6			0.000		0.00		0.00
U1	0.000 X 0 X 0.0625		0.000		0.00	0.00	
U2	0.000 X 0 X 0.0625		0.000		0.00	0.00	
U3	19.1 X 38 X 0.0625	0	0.000		9.55	0.00	
H1	38 X 38 X 0.0625 X 0.5			> 45.125	12.67		571.58
H2	38 X 38 X 0.0625 X 0.5			< -45.125	12.67	-571.58	
H3	0 X 0 X 0.0625 X 0.5			< 0.000	0.00	0.00	
H4	0 X 0 X 0.0625 X 0.5			< 0.000	0.00		0.00
H5	BARGE IMPACT			> 220.000	43.00		9460.00
H6	HORIZONTAL FORCE			> 0	0.00		0.00
H7	HORIZONTAL FORCE			> 0	0		0.00
H8	HORIZONTAL FORCE			> 0	0		0.00
			SUM 1792.116	SUM H 220.000		SUM -M -571.58	SUM +M 23396.51
							SUM -M -571.58
						Mo= 22824.93	
							SUM M 22824.93

B= 19.1 Vo= 1792.1
H/V= 0.12
e= 3.19
%= 99.95
FS= 0.00
MC= 12.74

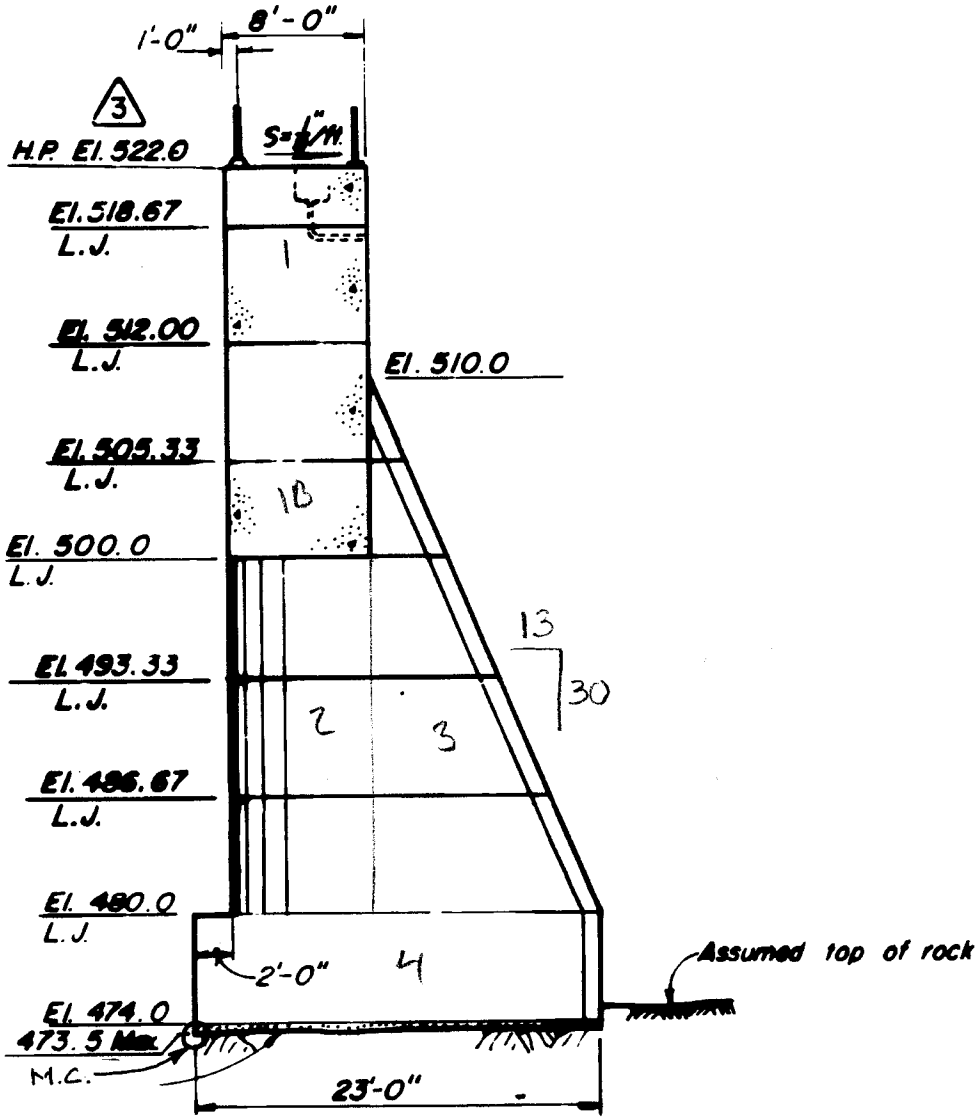
M/V= 12.74
B/4= 4.78

19.09 0.00

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = \frac{187.744}{19.091}$$

F. P. = 0.000

CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT			ARKANSAS L&D 17 UPPER GUIDE WALL R-4			
LOADING CONDITION:	FILL LT.-	474	FILL RT.-	474	POOL LT. -	511	POOL RT. - 511
COMPUTED BY: JDC.	SEE DWG -126/2.4		CHECKED BY DPS 10/27/04		DATE	19-Oct-04	



SECTION B-B (2)

SCALE: 1" = 1'

CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT 286	ARKANSAS L&D 16 LOWER GUIDE WALL EL SCALED FROM DWG
LOADING CONDITION:	FILL LT.- 422 FILL RT.- 422	POOL LT. - 460 POOL RT. - 460
COMPUTED BY: JDC.	SEE DWG -126/2	CHECKED BY DPS 11/1/04 DATE 01-Nov-04

	FORCES			LENG 26	VERTICAL	HORIZONTAL		ARM	- MOMENTS	+
C1	8 X	16 X	0.15 X	25.5 1	489.600			5.00		2448.00
C2	2.4 X	12 X	0.15 X	25.5 0.5	55.080			9.80		539.78
C3	10.4 X	28.5 X	0.0875 X	25.5 1	661.343			6.20		4100.32
C4	5.7 X	28.5 X	0.0875 X	25.5 0.5	181.233			13.30		2410.40
C5	19.1 X	9.50 X	0.0875 X	25.5 1	404.860			9.55		3866.42
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
	SUB-TOTAL				1792.116					13364.93
					0.000			0.00		0.00
					0.000			12.33		0.00
					0.000			15.00		0.00
					0.000			16.89		0.00
					0.000			22.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
E1					0.000			0.00		0.00
E2					0.000			0.00		0.00
E3					0.000			0.00		0.00
E4					0.000			0.00		0.00
E5					0.000			0.00		0.00
E6					0.000			0.00		0.00
U1	0.000 X	0 X	0.0625		0.000			0.00	0.00	
U2	0.000 X	0 X	0.0625		0.000			0.00	0.00	
U3	19.1 X	38 X	0.0625	0	0.000			9.55	0.00	
H1	38 X	38 X	0.0625 X	0.5		>	45.125	12.67		571.58
H2	38 X	38 X	0.0625 X	0.5		<	-45.125	12.67	-571.58	
H3	0 X	0 X	0.0625 X	0.5		<	0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5		<	0.000	0.00		0.00
H5	BARGE IMPACT					>	286.000	43.00		12298.00
H6	HORIZONTAL FORCE					>	0	0.00		0.00
H7	HORIZONTAL FORCE					>	0	0		0.00
H8	HORIZONTAL FORCE					>	0	0		0.00

B=	19.1	Vo=	1792.1	SUM	1792.116	SUM H	286.000	SUM -M	-571.58
H/V=	0.16								
e=	4.77							Mo=	25662.93
%=	75.08					M/V=	14.32		
FS=	0.00					B/4=	4.78		
MC=	14.32								

SUM +M	26234.51
SUM -M	-571.58
SUM M	25662.93
	14.34
	0.00

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = \frac{14.340}{}$$

$$F.P. = \frac{249.941}{0.000}$$

CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT 352	ARKANSAS L&D 16 LOWER GUIDE WALL EL SCALED FROM DWG
LOADING CONDITION:	FILL LT.- 422 FILL RT.- 422	POOL LT. - 460 POOL RT. - 460
COMPUTED BY: JDC. SEE DWG -126/2	CHECKED BY DPS 11/1/04	DATE 01-Nov-04

	FORCES	LENG 26	VERTICAL	HORIZONTAL	ARM	MOMENTS -	MOMENTS +
C1	8 X 16 X 0.15 X 25.5 1		489.600		5.00		2448.00
C2	2.4 X 12 X 0.15 X 25.5	0.5	55.080		9.80		539.78
C3	10.4 X 28.5 X 0.0875 X 25.5 1		661.343		6.20		4100.32
C4	5.7 X 28.5 X 0.0875 X 25.5	0.5	181.233		13.30		2410.40
C5	19.1 X 9.50 X 0.0875 X 25.5 1		404.860		9.55		3866.42
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
	SUB-TOTAL		1792.116				13364.93
			0.000		0.00		0.00
			0.000		12.33		0.00
			0.000		15.00		0.00
			0.000		16.89		0.00
			0.000		22.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
E1			0.000		0.00		0.00
E2			0.000		0.00		0.00
E3			0.000		0.00		0.00
E4			0.000		0.00		0.00
E5			0.000		0.00		0.00
E6			0.000		0.00		0.00
U1	0.000 X 0 X 0.0625		0.000		0.00	0.00	
U2	0.000 X 0 X 0.0625		0.000		0.00	0.00	
U3	19.1 X 38 X 0.0625	0	0.000		9.55	0.00	
H1	38 X 38 X 0.0625 X 0.5			> 45.125	12.67		571.58
H2	38 X 38 X 0.0625 X 0.5			< -45.125	12.67	-571.58	
H3	0 X 0 X 0.0625 X 0.5			< 0.000	0.00	0.00	
H4	0 X 0 X 0.0625 X 0.5			< 0.000	0.00		0.00
H5	BARGE IMPACT			> 352.000	43.00		15136.00
H6	HORIZONTAL FORCE			> 0	0.00		0.00
H7	HORIZONTAL FORCE			> 0	0		0.00
H8	HORIZONTAL FORCE			> 0	0		0.00
			SUM 1792.116	SUM H 352.000		SUM -M -571.58	SUM +M 29072.51
							SUM -M -571.58
						Mo= 28500.93	
							SUM M 28500.93

B=	19.1	Vo=	1792.1		9.59 0.00
H/V=	0.20				
e=	6.35				
%=	50.21			M/V=	15.90
FS=	0.00			B/4=	4.78
MC=	15.90				

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = 9.589$$

$$F.P. = \frac{373.767}{0.000}$$

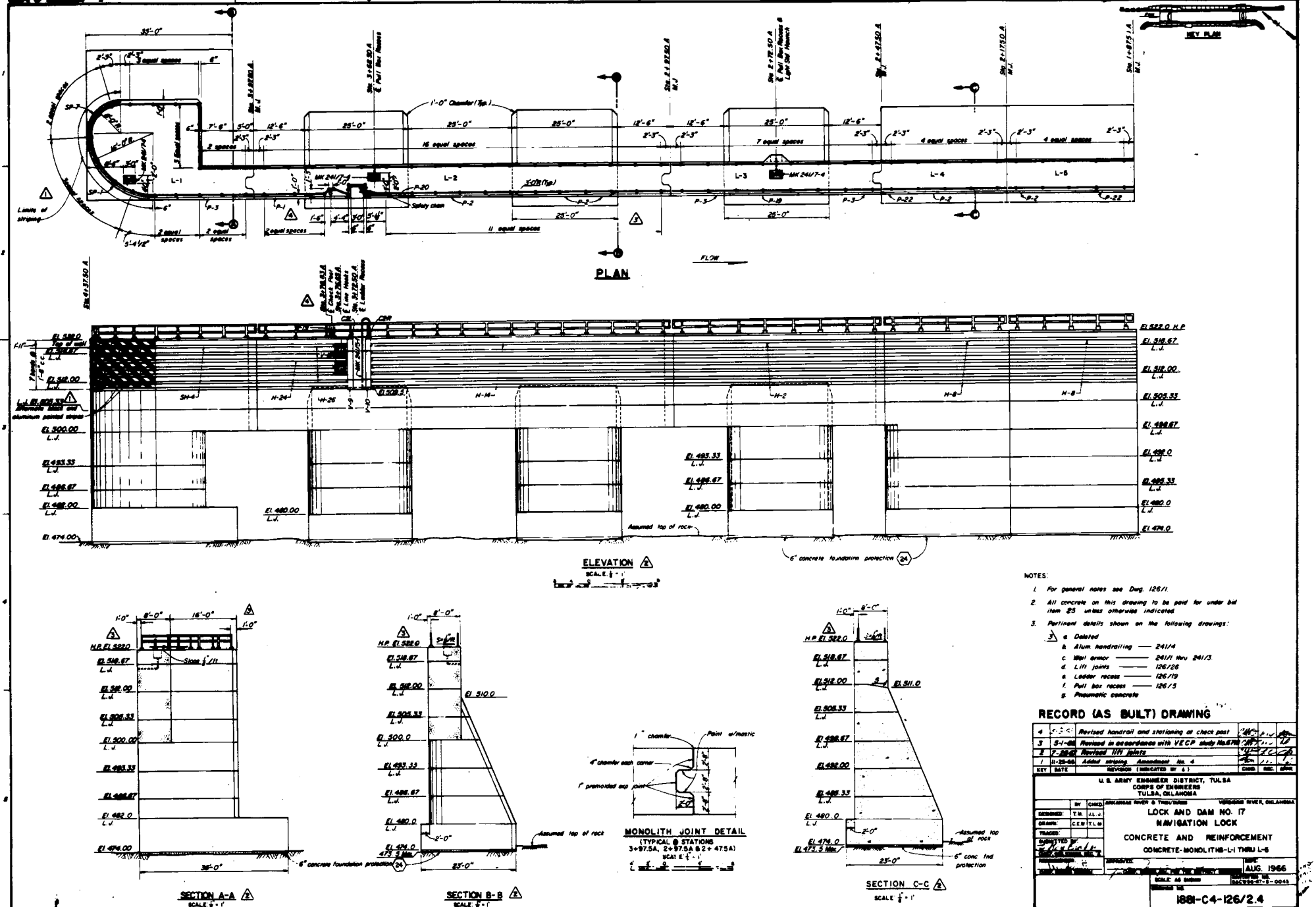
CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT 485	ARKANSAS L&D 16 LOWER GUIDE WALL EL SCALED FROM DWG
LOADING CONDITION:	FILL LT.- 422 FILL RT.- 422	POOL LT. - 460 POOL RT. - 460
COMPUTED BY: JDC.	SEE DWG -126/2	CHECKED BY DBS 12/1/04 DATE 01-Nov-04

	FORCES	LENG 26	VERTICAL	HORIZONTAL	ARM	- MOMENTS	+
C1	8 X 16 X 0.15 X 25.5 1		489.600		5.00		2448.00
C2	2.4 X 12 X 0.15 X 25.5 0.5		55.080		9.80		539.78
C3	10.4 X 28.5 X 0.0875 X 25.5 1		661.343		6.20		4100.32
C4	5.7 X 28.5 X 0.0875 X 25.5 0.5		181.233		13.30		2410.40
C5	19.1 X 9.50 X 0.0875 X 25.5 1		404.860		9.55		3866.42
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
	SUB-TOTAL		1792.116				13364.93
			0.000		0.00		0.00
			0.000		12.33		0.00
			0.000		15.00		0.00
			0.000		16.89		0.00
			0.000		22.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
E1			0.000		0.00		0.00
E2			0.000		0.00		0.00
E3			0.000		0.00		0.00
E4			0.000		0.00		0.00
E5			0.000		0.00		0.00
E6			0.000		0.00		0.00
U1	0.000 X 0 X 0.0625		0.000		0.00	0.00	
U2	0.000 X 0 X 0.0625		0.000		0.00	0.00	
U3	19.1 X 38 X 0.0625	0	0.000		9.55	0.00	
H1	38 X 38 X 0.0625 X 0.5			> 45.125	12.67		571.58
H2	38 X 38 X 0.0625 X 0.5			< -45.125	12.67	-571.58	
H3	0 X 0 X 0.0625 X 0.5			< 0.000	0.00	0.00	
H4	0 X 0 X 0.0625 X 0.5			< 0.000	0.00		0.00
H5	BARGE IMPACT			> 485.000	43.00		20855.00
H6	HORIZONTAL FORCE			> 0	0.00		0.00
H7	HORIZONTAL FORCE			> 0	0		0.00
H8	HORIZONTAL FORCE			> 0	0		0.00
			SUM 1792.116	SUM H 485.000		SUM -M -571.58	SUM +M 34791.51
							SUM -M -571.58
						Mo= 34219.93	
							SUM M 34219.93

B=	19.1	Vo= 1792.1			0.02 0.00
H/V=	0.27				
e=	9.54				
%=	0.08		M/V=	19.09	
FS=	0.00		B/4=	4.78	
MC=	19.09				

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = 0.016$$

F. P. = ######### / 0.000



NOTES:

1. For general notes see Dwg. 126/1.
2. All concrete on this drawing to be paid for under bid item 25 unless otherwise indicated.
3. Pertinent details shown on the following drawings:
   - a. Deleted
   - b. Alum. handrailing — 241/4
   - c. Wall armor — 241/1 thru 241/3.
   - d. Lift joints — 126/26
   - e. Ladder recess — 126/19
   - f. Pull box recess — 126/5
   - g. Pneumatic concrete

RECORD (AS BUILT) DRAWING

KEY	DATE	REVISION (INDICATED BY △)	CHKD.	REC.	APPR.
4	[illegible]	Revised handrail and stationing at check post	[illegible]	[illegible]	[illegible]
3	5-1-66	Revised in accordance with VECP study No.67[illegible]	[illegible]	[illegible]	[illegible]
2	7-28-67	Revised lift joints	[illegible]	[illegible]	[illegible]
1	11-25-66	Added striping. Amendment No. 4	[illegible]	[illegible]	[illegible]

U.S. ARMY ENGINEER DISTRICT, TULSA
CORPS OF ENGINEERS
TULSA, OKLAHOMA

ARKANSAS RIVER & TRIBUTARIES — VERDIGRIS RIVER, OKLAHOMA

LOCK AND DAM NO. 17
NAVIGATION LOCK
CONCRETE AND REINFORCEMENT
CONCRETE-MONOLITHS-L-1 THRU L-6

DESIGNED: T.M. J.L.J.
DRAWN: C.E.W. T.L.M.
TRACED:
SUBMITTED BY:
APPROVED:
DATE: AUG. 1966
SCALE: AS SHOWN
DACW56-67-B-0043
DRAWING NO. 1881-C4-126/2.4

CORPS OF ENGINEERS, U.S. ARMY — BARGE IMPACT 348 — ARKANSAS L&D 17 UPPER GUIDE WALL L-3

LOADING CONDITION: FILL LT.- 474 FILL RT.- 474 POOL LT. - 511 POOL RT. - 511

COMPUTED BY: JDC. SEE DWG -126/2.4 — CHECKED BY DPS 10/27/09 — DATE 25-Oct-04

	FORCES			LENG 100	VERTICAL	HORIZONTAL	ARM	- MOMENTS	+
C1	8 X	11 X	0.15 X	50 1	660.000		6.00		3960.00
C1B	8 X	11 X	0.0875 X	50 1	385.000		6.00		2310.00
C2	8 X	20 X	0.0875 X	25 1	350.000		6.00		2100.00
C3	13 X	30 X	0.0875 X	25 0.5	426.563		14.33		6114.06
C4	23 X	6 X	0.0875 X	25 1	301.875		11.50		3471.56
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
			SUB-TOTAL		2123.438				17955.63
					0.000		0.00		0.00
					0.000		12.33		0.00
					0.000		15.00		0.00
					0.000		16.89		0.00
					0.000		22.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
E1					0.000		0.00		0.00
E2					0.000		0.00		0.00
E3					0.000		0.00		0.00
E4					0.000		0.00		0.00
E5					0.000		0.00		0.00
E6					0.000		0.00		0.00
U1	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U2	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U3	23 X	37 X	0.0625	0	0.000		11.50	0.00	
H1	37 X	37 X	0.0625 X	0.5		> 42.781	12.33		527.64
H2	37 X	37 X	0.0625 X	0.5		< -42.781	12.33	-527.64	
H3	0 X	0 X	0.0625 X	0.5		< 0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5		< 0.000	0.00		0.00
H5	BARGE IMPACT					> 348.000	42.00		14616.00
H6	HORIZONTAL FORCE					> 0	0.00		0.00
H7	HORIZONTAL FORCE					> 0	0		0.00
H8	HORIZONTAL FORCE					> 0	0		0.00

B=	23	Vo=	2123.4	SUM	2123.438	SUM H 348.000	SUM -M -527.64	SUM +M 33099.26
H/V=	0.16							SUM -M -527.64
e=	3.84						Mo= 32571.63	
%=	99.92					M/V= 15.34		SUM M 32571.63
FS=	0.00					B/4= 5.75		
MC=	15.34							22.98 0.00

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = 22.983 \qquad F.P. = \frac{184.786}{0.000}$$

CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT 444	ARKANSAS L&D 17 UPPER GUIDE WALL L-3
LOADING CONDITION:	FILL LT.- 474 FILL RT.- 474	POOL LT. - 511 POOL RT. - 511
COMPUTED BY: JDC. SEE DWG -126/2.4	CHECKED BY DPS 10/27/04	DATE 25-Oct-04

	FORCES				LENG 100	VERTICAL	HORIZONTAL		ARM	- MOMENTS	+
C1	8 X	11 X	0.15 X	50	1	660.000			6.00		3960.00
CIB	8 X	11 X	0.0875 X	50	1	385.000			6.00		2310.00
C2	8 X	20 X	0.0875 X	25	1	350.000			6.00		2100.00
C3	13 X	30 X	0.0875 X	25	0.5	426.563			14.33		6114.06
C4	23 X	6 X	0.0875 X	25	1	301.875			11.50		3471.56
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
			SUB-TOTAL			2123.438					17955.63
						0.000			0.00		0.00
						0.000			12.33		0.00
						0.000			15.00		0.00
						0.000			16.89		0.00
						0.000			22.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
E1						0.000			0.00		0.00
E2						0.000			0.00		0.00
E3						0.000			0.00		0.00
E4						0.000			0.00		0.00
E5						0.000			0.00		0.00
E6						0.000			0.00		0.00
U1	0.000 X	0 X	0.0625			0.000			0.00	0.00	
U2	0.000 X	0 X	0.0625			0.000			0.00	0.00	
U3	23 X	37 X	0.0625		0	0.000			11.50	0.00	
H1	37 X	37 X	0.0625 X	0.5			>	42.781	12.33		527.64
H2	37 X	37 X	0.0625 X	0.5			<	-42.781	12.33	-527.64	
H3	0 X	0 X	0.0625 X	0.5			<	0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5			<	0.000	0.00		0.00
H5	BARGE IMPACT						>	444.000	42.00		18648.00
H6	HORIZONTAL FORCE						>	0	0.00		0.00
H7	HORIZONTAL FORCE						>	0	0		0.00
H8	HORIZONTAL FORCE						>	0	0		0.00

B=	23	Vo=	2123.4	SUM	2123.438	SUM H	444.000	SUM -M -527.64	SUM +M 37131.26
H/V=	0.21								SUM -M -527.64
e=	5.74							Mo= 36603.63	
%=	75.16					M/V=	17.24		SUM M 36603.63
FS=	0.00					B/4=	5.75		
MC=	17.24								17.29 0.00

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = 17.286 \qquad F.P. = \frac{245.679}{0.000}$$

CORPS OF ENGINEERS, U.S. ARMY — BARGE IMPACT 541 — ARKANSAS L&D 17 UPPER GUIDE WALL L-3

LOADING CONDITION: FILL LT.- 474 FILL RT.- 474 POOL LT. - 511 POOL RT. - 511

COMPUTED BY: JDC. SEE DWG -126/2.4 — CHECKED BY DPS 10/27/04 — DATE 25-Oct-04

	FORCES			LENG 100	VERTICAL	HORIZONTAL	ARM	- MOMENTS	+
C1	8 X	11 X	0.15 X	50 1	660.000		6.00		3960.00
C1B	8 X	11 X	0.0875 X	50 1	385.000		6.00		2310.00
C2	8 X	20 X	0.0875 X	25 1	350.000		6.00		2100.00
C3	13 X	30 X	0.0875 X	25 0.5	426.563		14.33		6114.06
C4	23 X	6 X	0.0875 X	25 1	301.875		11.50		3471.56
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
			SUB-TOTAL		2123.438				17955.63
					0.000		0.00		0.00
					0.000		12.33		0.00
					0.000		15.00		0.00
					0.000		16.89		0.00
					0.000		22.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
E1					0.000		0.00		0.00
E2					0.000		0.00		0.00
E3					0.000		0.00		0.00
E4					0.000		0.00		0.00
E5					0.000		0.00		0.00
E6					0.000		0.00		0.00
U1	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U2	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U3	23 X	37 X	0.0625	0	0.000		11.50	0.00	
H1	37 X	37 X	0.0625 X	0.5		> 42.781	12.33		527.64
H2	37 X	37 X	0.0625 X	0.5		< -42.781	12.33	-527.64	
H3	0 X	0 X	0.0625 X	0.5		< 0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5		< 0.000	0.00		0.00
H5	BARGE IMPACT					> 541.000	42.00		22722.00
H6	HORIZONTAL FORCE					> 0	0.00		0.00
H7	HORIZONTAL FORCE					> 0	0		0.00
H8	HORIZONTAL FORCE					> 0	0		0.00
					SUM 2123.438	SUM H 541.000		SUM -M -527.64	SUM +M 41205.26
									SUM -M -527.64
								Mo= 40677.63	
									SUM M 40677.63

B= 23 Vo= 2123.4
H/V= 0.25
e= 7.66
%= 50.13
FS= 0.00
MC= 19.16

M/V= 19.16
B/4= 5.75

11.53 0.00

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = 11.531$$

F. P. = 368.316 / 0.000

CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT 735	ARKANSAS L&D 17 UPPER GUIDE WALL L-3

LOADING CONDITION: FILL LT.- 474 FILL RT.- 474 POOL LT. - 511 POOL RT. - 511

COMPUTED BY: JDC. SEE DWG -126/2.4 CHECKED BY DPS 10/27/04 DATE 25-Oct-04

	FORCES			LENG 100	VERTICAL	HORIZONTAL	ARM	- MOMENTS	+
C1	8 X	11 X	0.15 X	50 1	660.000		6.00		3960.00
C1B	8 X	11 X	0.0875 X	50 1	385.000		6.00		2310.00
C2	8 X	20 X	0.0875 X	25 1	350.000		6.00		2100.00
C3	13 X	30 X	0.0875 X	25 0.5	426.563		14.33		6114.06
C4	23 X	6 X	0.0875 X	25 1	301.875		11.50		3471.56
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
			SUB-TOTAL		2123.438				17955.63
					0.000		0.00		0.00
					0.000		12.33		0.00
					0.000		15.00		0.00
					0.000		16.89		0.00
					0.000		22.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
E1					0.000		0.00		0.00
E2					0.000		0.00		0.00
E3					0.000		0.00		0.00
E4					0.000		0.00		0.00
E5					0.000		0.00		0.00
E6					0.000		0.00		0.00
U1	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U2	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U3	23 X	37 X	0.0625	0	0.000		11.50	0.00	
H1	37 X	37 X	0.0625 X	0.5		> 42.781	12.33		527.64
H2	37 X	37 X	0.0625 X	0.5		< -42.781	12.33	-527.64	
H3	0 X	0 X	0.0625 X	0.5		< 0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5		< 0.000	0.00		0.00
H5	BARGE IMPACT					> 735.000	42.00		30870.00
H6	HORIZONTAL FORCE					> 0	0.00		0.00
H7	HORIZONTAL FORCE					> 0	0		0.00
H8	HORIZONTAL FORCE					> 0	0		0.00

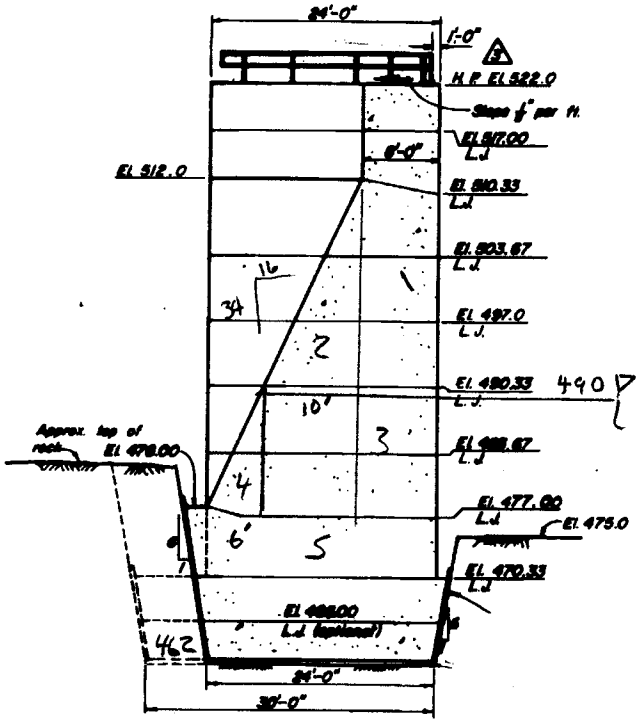
B=	23	Vo=	2123.4	SUM	2123.438	SUM H 735.000	SUM -M	-527.64	SUM +M 49353.26
H/V=	0.35								SUM -M -527.64
e=	11.49							Mo= 48825.63	
%=	0.08					M/V= 22.99			SUM M 48825.63
FS=	0.00					B/4= 5.75			
MC=	22.99								0.02 0.00

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = 0.019$$

F. P. = ######### / 0.000

CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT		ARKANSAS L&D 17 LOWER GUIDE WALL L-33
LOADING CONDITION:	FILL LT.- 474	FILL RT.- 474	POOL LT. - • 490 POOL RT. - 490
COMPUTED BY: JDC.	SEE DWG -126/2.4	CHECKED BY DPS 10/28/04	DATE 25-Oct-04

Note: Since this monolith is keyed into rock overturning is not likely. Passive resistance of rock ignored!



CORPS OF ENGINEERS, U.S. ARMY — BARGE IMPACT 1010 — ARKANSAS L&D 17 LOWER GUIDE WALL L-33

LOADING CONDITION: FILL LT.- 462 FILL RT.- 462 POOL LT. - 490 POOL RT. - 490

COMPUTED BY: JDC. SEE DWG -126/35.4 — CHECKED BY DPS 10/28/04 — DATE 25-Oct-04

	FORCES			LENG 42	VERTICAL	HORIZONTAL	ARM	MOMENTS -	MOMENTS +
C1	8 X	32 X	0.15 X	42 1	1612.800		4.00		6451.20
C2	10 X	22 X	0.15 X	42 0.5	693.000		11.33		7854.00
C3	18 X	13 X	0.0875 X	42 1	859.950		9.00		7739.55
C4	6 X	13 X	0.0875 X	42 0.5	143.325		20.00		2866.50
C5	24 X	15 X	0.0875 X	42 1	1323.000		12.00		15876.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
	SUB-TOTAL				4632.075				40787.25
					0.000		0.00		0.00
					0.000		12.33		0.00
					0.000		15.00		0.00
					0.000		16.89		0.00
					0.000		22.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
E1					0.000		0.00		0.00
E2					0.000		0.00		0.00
E3					0.000		0.00		0.00
E4					0.000		0.00		0.00
E5					0.000		0.00		0.00
E6					0.000		0.00		0.00
U1	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U2	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U3	24 X	28 X	0.0625	0	0.000		12.00	0.00	
H1	28 X	28 X	0.0625 X	0.5		> 24.500	9.33		228.67
H2	28 X	28 X	0.0625 X	0.5		< -24.500	9.33	-228.67	
H3	0 X	0 X	0.0625 X	0.5		< 0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5		< 0.000	0.00		0.00
H5	BARGE IMPACT					> 1010.000	33.00		33330.00
H6	HORIZONTAL FORCE					> 0	0.00		0.00
H7	HORIZONTAL FORCE					> 0	0		0.00
H8	HORIZONTAL FORCE					> 0	0		0.00

B= 24 Vo= 4632.1 — SUM 4632.075 — SUM H 1010.000 — SUM -M -228.67 — SUM +M 74345.92 — SUM -M -228.67

H/V= 0.22

e= 4.00 — Mo= 74117.25

%= 99.99 — M/V= 16.00 — SUM M 74117.25

FS= 0.00 — B/4= 6.00

MC= 16.00 — 24.00 0.00

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = 23.997 \qquad F.P. = \frac{386.048}{0.000}$$

CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT 1290	ARKANSAS L&D 17 LOWER GUIDE WALL L-33
LOADING CONDITION:	FILL LT.- 462 FILL RT.- 462	POOL LT. - 490 POOL RT. - 490
COMPUTED BY: JDC.	SEE DWG -126/35.4	CHECKED BY DPS 10/20/04 DATE 25-Oct-04

	FORCES			LENG 42	VERTICAL	HORIZONTAL	ARM	- MOMENTS	+
C1	8 X	32 X	0.15 X	42 1	1612.800		4.00		6451.20
C2	10 X	22 X	0.15 X	42 0.5	693.000		11.33		7854.00
C3	18 X	13 X	0.0875 X	42 1	859.950		9.00		7739.55
C4	6 X	13 X	0.0875 X	42 0.5	143.325		20.00		2866.50
C5	24 X	15 X	0.0875 X	42 1	1323.000		12.00		15876.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
	SUB-TOTAL				4632.075				40787.25
					0.000		0.00		0.00
					0.000		12.33		0.00
					0.000		15.00		0.00
					0.000		16.89		0.00
					0.000		22.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
E1					0.000		0.00		0.00
E2					0.000		0.00		0.00
E3					0.000		0.00		0.00
E4					0.000		0.00		0.00
E5					0.000		0.00		0.00
E6					0.000		0.00		0.00
U1	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U2	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U3	24 X	28 X	0.0625	0	0.000		12.00	0.00	
H1	28 X	28 X	0.0625 X	0.5		> 24.500	9.33		228.67
H2	28 X	28 X	0.0625 X	0.5		< -24.500	9.33	-228.67	
H3	0 X	0 X	0.0625 X	0.5		< 0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5		< 0.000	0.00		0.00
H5	BARGE IMPACT					> 1290.000	33.00		42570.00
H6	HORIZONTAL FORCE					> 0	0.00		0.00
H7	HORIZONTAL FORCE					> 0	0		0.00
H8	HORIZONTAL FORCE					> 0	0		0.00

B=	24	Vo=	4632.1	SUM 4632.075	SUM H 1290.000		SUM -M -228.67	SUM +M 83585.92
H/V=	0.28							SUM -M -228.67
e=	6.00						Mo= 83357.25	
%=	75.05				M/V=	18.00		SUM M 83357.25
FS=	0.00				B/4=	6.00		
MC=	18.00							18.01 0.00

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = \frac{18.013}{}$$

F. P. = 514.303 / 0.000

CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT 1571	ARKANSAS L&D 17 LOWER GUIDE WALL L-33
LOADING CONDITION:	FILL LT.- 462 FILL RT.- 462	POOL LT. - 490 POOL RT. - 490
COMPUTED BY: JDC.	SEE DWG -126/35.4	CHECKED BY DBS 10/25/04 DATE 25-Oct-04

	FORCES			LENG 42	VERTICAL	HORIZONTAL	ARM	MOMENTS -	MOMENTS +
C1	8 X	32 X	0.15 X	42 1	1612.800		4.00		6451.20
C2	10 X	22 X	0.15 X	42 0.5	693.000		11.33		7854.00
C3	18 X	13 X	0.0875 X	42 1	859.950		9.00		7739.55
C4	6 X	13 X	0.0875 X	42 0.5	143.325		20.00		2866.50
C5	24 X	15 X	0.0875 X	42 1	1323.000		12.00		15876.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
	SUB-TOTAL				4632.075				40787.25
					0.000		0.00		0.00
					0.000		12.33		0.00
					0.000		15.00		0.00
					0.000		16.89		0.00
					0.000		22.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
E1					0.000		0.00		0.00
E2					0.000		0.00		0.00
E3					0.000		0.00		0.00
E4					0.000		0.00		0.00
E5					0.000		0.00		0.00
E6					0.000		0.00		0.00
U1	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U2	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U3	24 X	28 X	0.0625	0	0.000		12.00	0.00	
H1	28 X	28 X	0.0625 X	0.5		> 24.500	9.33		228.67
H2	28 X	28 X	0.0625 X	0.5		< -24.500	9.33	-228.67	
H3	0 X	0 X	0.0625 X	0.5		< 0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5		< 0.000	0.00		0.00
H5	BARGE IMPACT					> 1571.000	33.00		51843.00
H6	HORIZONTAL FORCE					> 0	0.00		0.00
H7	HORIZONTAL FORCE					> 0	0		0.00
H8	HORIZONTAL FORCE					> 0	0		0.00

B=	24	Vo=	4632.1	SUM 4632.075	SUM H 1571.000		SUM -M -228.67	SUM +M 92858.92
H/V=	0.34							SUM -M -228.67
e=	8.00						Mo= 92630.25	
%=	50.03				M/V=	20.00		SUM M 92630.25
FS=	0.00				B/4=	6.00		
MC=	20.00							12.01 0.00

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = \frac{12.007}{}$$

F. P. = 771.544 / 0.000

CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT 2132	ARKANSAS L&D 17 LOWER GUIDE WALL L-33
LOADING CONDITION:	FILL LT.- 462 FILL RT.- 462	POOL LT. - 490 POOL RT. - 490
COMPUTED BY: JDC.	SEE DWG -126/35.4	CHECKED BY DPS 10/28/04 DATE 25-Oct-04

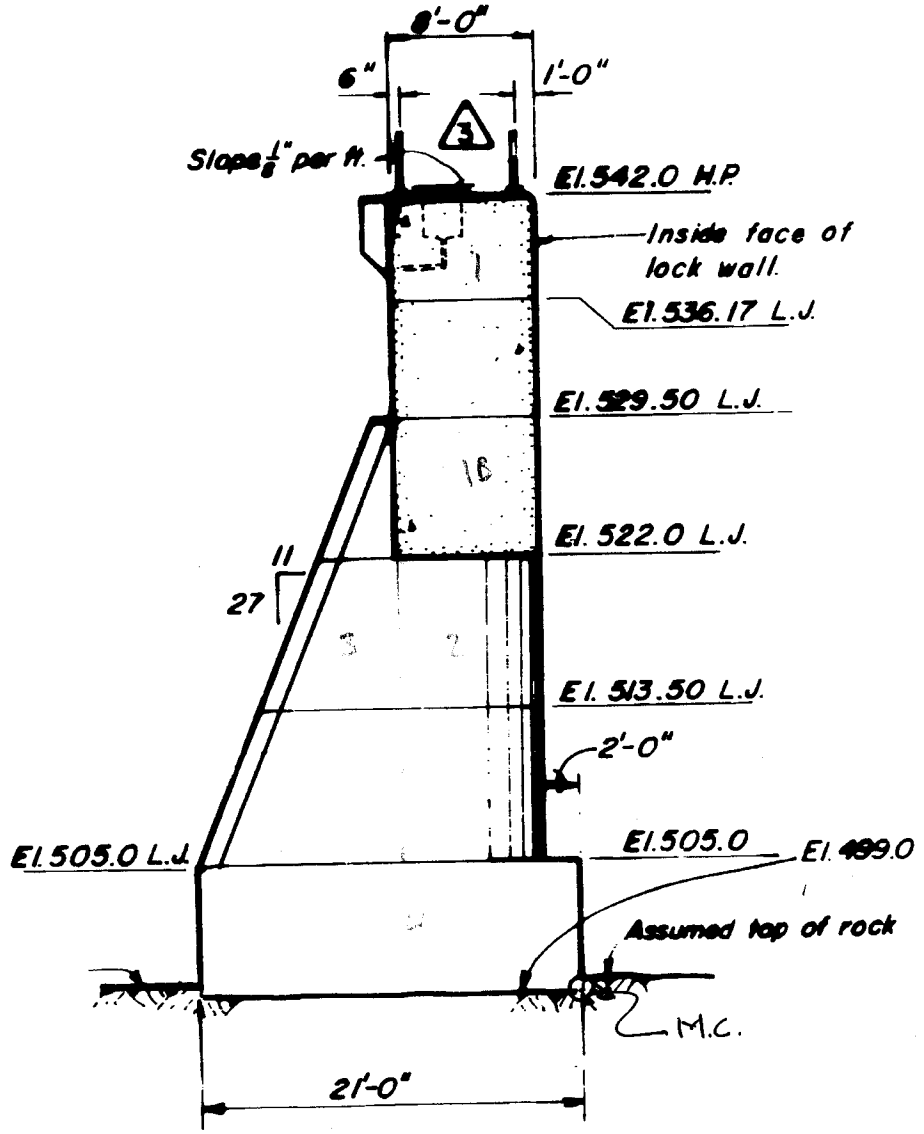
	FORCES			LENG 42	VERTICAL	HORIZONTAL	ARM	- MOMENTS	+
C1	8 X	32 X	0.15 X	42 1	1612.800		4.00		6451.20
C2	10 X	22 X	0.15 X	42 0.5	693.000		11.33		7854.00
C3	18 X	13 X	0.0875 X	42 1	859.950		9.00		7739.55
C4	6 X	13 X	0.0875 X	42 0.5	143.325		20.00		2866.50
C5	24 X	15 X	0.0875 X	42 1	1323.000		12.00		15876.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
	SUB-TOTAL				4632.075				40787.25
					0.000		0.00		0.00
					0.000		12.33		0.00
					0.000		15.00		0.00
					0.000		16.89		0.00
					0.000		22.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
E1					0.000		0.00		0.00
E2					0.000		0.00		0.00
E3					0.000		0.00		0.00
E4					0.000		0.00		0.00
E5					0.000		0.00		0.00
E6					0.000		0.00		0.00
U1	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U2	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U3	24 X	28 X	0.0625	0	0.000		12.00	0.00	
H1	28 X	28 X	0.0625 X	0.5		> 24.500	9.33		228.67
H2	28 X	28 X	0.0625 X	0.5		< -24.500	9.33	-228.67	
H3	0 X	0 X	0.0625 X	0.5		< 0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5		< 0.000	0.00		0.00
H5	BARGE IMPACT					> 2132.000	33.00		70356.00
H6	HORIZONTAL FORCE					> 0	0.00		0.00
H7	HORIZONTAL FORCE					> 0	0		0.00
H8	HORIZONTAL FORCE					> 0	0		0.00

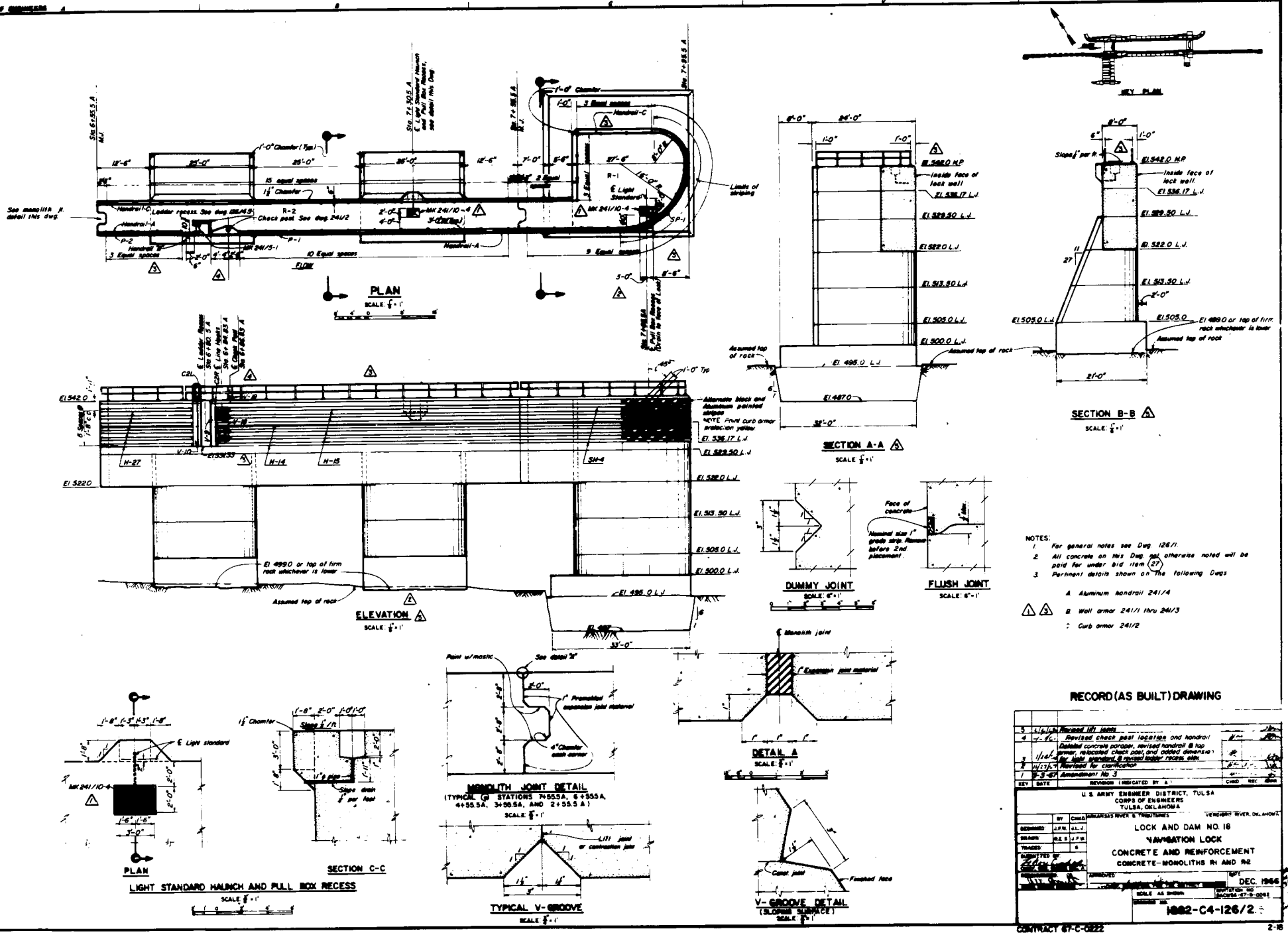
B=	24	Vo=	4632.1	SUM 4632.075	SUM H 2132.000	SUM -M -228.67	SUM +M 111371.92
H/V=	0.46						SUM -M -228.67
e=	11.99					Mo= 111143.25	
%=	0.07				M/V= 23.99		SUM M 111143.25
FS=	0.00				B/4= 6.00		
MC=	23.99						0.02 0.00

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = 0.017 \qquad F.P. = \frac{\#\#\#\#\#\#\#\#}{0.000}$$

532

CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT		ARKANSAS L&D 18 UPPER GUIDE WALL R-4
LOADING CONDITION:	FILL LT.- 499	FILL RT.- 499	POOL LT. - 534 POOL RT. - 534
COMPUTED BY: JDC.	SEE DWG -126/2.5	CHECKED BY DPS 10/28/04	DATE 19-Oct-04





NOTES:

1. For general notes see Dwg. 126/1.
2. All concrete on this Dwg. not otherwise noted will be paid for under bid item (27).
3. Pertinent details shown on the following Dwgs.

A. Aluminum handrail 241/4

B. Wall armor 241/1 thru 241/3

C. Curb armor 241/2

RECORD (AS BUILT) DRAWING

KEY	DATE	REVISION (INDICATED BY A)	CHKD	REC	APPR
5	6/6/66	Revised lift joints			
4	4/6/66	Revised check post location and handrail			
3	11/24/64	Detailed concrete parapet, revised handrail & top armor, relocated check post, and added dimension for light standard & revised ladder recess elev.			
2	11/27/67	Revised for clarification			
1	5-3-67	Amendment No. 3			

U.S. ARMY ENGINEER DISTRICT, TULSA
CORPS OF ENGINEERS
TULSA, OKLAHOMA

ARKANSAS RIVER & TRIBUTARIES — VERDIGRIS RIVER, OKLAHOMA

LOCK AND DAM NO. 18
NAVIGATION LOCK
CONCRETE AND REINFORCEMENT
CONCRETE-MONOLITHS R1 AND R2

DESIGNED: J.F.W. J.L.J.
DRAWN: R.E.S. J.F.W.
TRACED: 6
SUBMITTED BY:
APPROVED:
DATE: DEC. 1966
SCALE AS SHOWN
INVITATION NO. DACW56-67-B-0062
DRAWING NO. 1882-C4-126/2

CONTRACT 67-C-0222

2-18

CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT 582	ARKANSAS L&D 18 UPPER GUIDE WALL R-4
LOADING CONDITION:	FILL LT.- 499 FILL RT.- 499	POOL LT. - 532 POOL RT. - 532
COMPUTED BY: JDC. SEE DWG -126/2.5	CHECKED BY DPS 10/28/04	DATE 25-Oct-04

	FORCES			LENG 100	VERTICAL	HORIZONTAL	ARM	- MOMENTS	+
C1	8 X	10 X	0.15 X	100 1	1200.000		6.00		7200.00
C1B	8 X	10 X	0.0875 X	100 1	700.000		6.00		4200.00
C2	8 X	17 X	0.0875 X	50 1	595.000		6.00		3570.00
C3	11 X	24.5 X	0.0875 X	50 0.5	589.531		13.67		8056.93
C4	21 X	6 X	0.0875 X	50 1	551.250		10.50		5788.13
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
	SUB-TOTAL				3635.781				28815.05
					0.000		0.00		0.00
					0.000		12.33		0.00
					0.000		15.00		0.00
					0.000		16.89		0.00
					0.000		22.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
E1					0.000		0.00		0.00
E2					0.000		0.00		0.00
E3					0.000		0.00		0.00
E4					0.000		0.00		0.00
E5					0.000		0.00		0.00
E6					0.000		0.00		0.00
U1	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U2	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U3	21 X	33 X	0.0625	0	0.000		10.50	0.00	
H1	33 X	33 X	0.0625 X	0.5		> 34.031	11.00		374.34
H2	33 X	33 X	0.0625 X	0.5		< -34.031	11.00	-374.34	
H3	0 X	0 X	0.0625 X	0.5		< 0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5		< 0.000	0.00		0.00
H5	BARGE IMPACT					> 582.000	38.00		22116.00
H6	HORIZONTAL FORCE					> 0	0.00		0.00
H7	HORIZONTAL FORCE					> 0	0		0.00
H8	HORIZONTAL FORCE					> 0	0		0.00

B=	21	Vo=	3635.8	SUM	3635.781	SUM H 582.000	SUM -M	-374.34	SUM +M 51305.40
H/V=	0.16								SUM -M -374.34
e=	3.51							Mo= 50931.05	
%=	99.88					M/V= 14.01			SUM M 50931.05
FS=	0.00					B/4= 5.25			
MC=	14.01								20.98 0.00

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = \frac{346.675}{20.975} \qquad F.P. = \frac{}{0.000}$$

CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT 748	ARKANSAS L&D 18 UPPER GUIDE WALL R-4
LOADING CONDITION:	FILL LT.- 499 FILL RT.- 499	POOL LT. - 532 POOL RT. - 532
COMPUTED BY: JDC. SEE DWG -126/2.5	CHECKED BY DPS 10/28/04	DATE 25-Oct-04

	FORCES			LENG 100	VERTICAL	HORIZONTAL	ARM	- MOMENTS	+
C1	8 X	10 X	0.15 X	100 1	1200.000		6.00		7200.00
C1B	8 X	10 X	0.0875 X	100 1	700.000		6.00		4200.00
C2	8 X	17 X	0.0875 X	50 1	595.000		6.00		3570.00
C3	11 X	24.5 X	0.0875 X	50 0.5	589.531		13.67		8056.93
C4	21 X	6 X	0.0875 X	50 1	551.250		10.50		5788.13
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
	SUB-TOTAL				3635.781				28815.05
					0.000		0.00		0.00
					0.000		12.33		0.00
					0.000		15.00		0.00
					0.000		16.89		0.00
					0.000		22.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
E1					0.000		0.00		0.00
E2					0.000		0.00		0.00
E3					0.000		0.00		0.00
E4					0.000		0.00		0.00
E5					0.000		0.00		0.00
E6					0.000		0.00		0.00
U1	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U2	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U3	21 X	33 X	0.0625	0	0.000		10.50	0.00	
H1	33 X	33 X	0.0625 X	0.5		> 34.031	11.00		374.34
H2	33 X	33 X	0.0625 X	0.5		< -34.031	11.00	-374.34	
H3	0 X	0 X	0.0625 X	0.5		< 0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5		< 0.000	0.00		0.00
H5	BARGE IMPACT					> 748.000	38.00		28424.00
H6	HORIZONTAL FORCE					> 0	0.00		0.00
H7	HORIZONTAL FORCE					> 0	0		0.00
H8	HORIZONTAL FORCE					> 0	0		0.00

B=	21	Vo=	3635.8	SUM	3635.781	SUM H 748.000		SUM -M -374.34	SUM +M 57613.40
H/V=	0.21								SUM -M -374.34
e=	5.24							Mo= 57239.05	
%=	75.10					M/V=	15.74		SUM M 57239.05
FS=	0.00					B/4=	5.25		
MC=	15.74								15.77 0.00

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = \frac{461.095}{15.770} \qquad F.P. = \frac{}{0.000}$$

CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT 916	ARKANSAS L&D 18 UPPER GUIDE WALL R-4
LOADING CONDITION:	FILL LT.- 499 FILL RT.- 499	POOL LT. - 532 POOL RT. - 532
COMPUTED BY: JDC. SEE DWG -126/2.5	CHECKED BY DPS 10/28/04	DATE 25-Oct-04

	FORCES				LENG 100	VERTICAL	HORIZONTAL		ARM	- MOMENTS	+
C1	8 X	10 X	0.15 X	100	1	1200.000			6.00		7200.00
C1B	8 X	10 X	0.0875 X	100	1	700.000			6.00		4200.00
C2	8 X	17 X	0.0875 X	50	1	595.000			6.00		3570.00
C3	11 X	24.5 X	0.0875 X	50	0.5	589.531			13.67		8056.93
C4	21 X	6 X	0.0875 X	50	1	551.250			10.50		5788.13
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
			SUB-TOTAL			3635.781					28815.05
						0.000			0.00		0.00
						0.000			12.33		0.00
						0.000			15.00		0.00
						0.000			16.89		0.00
						0.000			22.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
E1						0.000			0.00		0.00
E2						0.000			0.00		0.00
E3						0.000			0.00		0.00
E4						0.000			0.00		0.00
E5						0.000			0.00		0.00
E6						0.000			0.00		0.00
U1	0.000 X	0 X	0.0625			0.000			0.00	0.00	
U2	0.000 X	0 X	0.0625			0.000			0.00	0.00	
U3	21 X	33 X	0.0625		0	0.000			10.50	0.00	
H1	33 X	33 X	0.0625 X	0.5			>	34.031	11.00		374.34
H2	33 X	33 X	0.0625 X	0.5			<	-34.031	11.00	-374.34	
H3	0 X	0 X	0.0625 X	0.5			<	0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5			<	0.000	0.00		0.00
H5	BARGE IMPACT						>	916.000	38.00		34808.00
H6	HORIZONTAL FORCE						>	0	0.00		0.00
H7	HORIZONTAL FORCE						>	0	0		0.00
H8	HORIZONTAL FORCE						>	0	0		0.00

B=	21	Vo=	3635.8	SUM	3635.781	SUM H 916.000	SUM -M	-374.34	SUM +M	63997.40
H/V=	0.25								SUM -M	-374.34
e=	7.00						Mo=	63623.05		
%=	50.01					M/V= 17.50			SUM M	63623.05
FS=	0.00					B/4= 5.25				
MC=	17.50								10.50	0.00

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = 10.503 \qquad F.P. = \frac{692.360}{0.000}$$

CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT 1250	ARKANSAS L&D 18 UPPER GUIDE WALL R-4
LOADING CONDITION:	FILL LT.- 499 FILL RT.- 499	POOL LT. - 532 POOL RT. - 532
COMPUTED BY: JDC. SEE DWG -126/2.5	CHECKED BY DPS 10/28/04	DATE 25-Oct-04

	FORCES	LENG 100	VERTICAL	HORIZONTAL	ARM	- MOMENTS	+
C1	8 X 10 X 0.15 X 100	1	1200.000		6.00		7200.00
CIB	8 X 10 X 0.0875 X 100	1	700.000		6.00		4200.00
C2	8 X 17 X 0.0875 X 50	1	595.000		6.00		3570.00
C3	11 X 24.5 X 0.0875 X 50	0.5	589.531		13.67		8056.93
C4	21 X 6 X 0.0875 X 50	1	551.250		10.50		5788.13
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
	SUB-TOTAL		3635.781				28815.05
			0.000		0.00		0.00
			0.000		12.33		0.00
			0.000		15.00		0.00
			0.000		16.89		0.00
			0.000		22.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
			0.000		0.00		0.00
E1			0.000		0.00		0.00
E2			0.000		0.00		0.00
E3			0.000		0.00		0.00
E4			0.000		0.00		0.00
E5			0.000		0.00		0.00
E6			0.000		0.00		0.00
U1	0.000 X 0 X 0.0625		0.000		0.00	0.00	
U2	0.000 X 0 X 0.0625		0.000		0.00	0.00	
U3	21 X 33 X 0.0625	0	0.000		10.50	0.00	
H1	33 X 33 X 0.0625 X 0.5			> 34.031	11.00		374.34
H2	33 X 33 X 0.0625 X 0.5			< -34.031	11.00	-374.34	
H3	0 X 0 X 0.0625 X 0.5			< 0.000	0.00	0.00	
H4	0 X 0 X 0.0625 X 0.5			< 0.000	0.00		0.00
H5	BARGE IMPACT			> 1250.000	38.00		47500.00
H6	HORIZONTAL FORCE			> 0	0.00		0.00
H7	HORIZONTAL FORCE			> 0	0		0.00
H8	HORIZONTAL FORCE			> 0	0		0.00

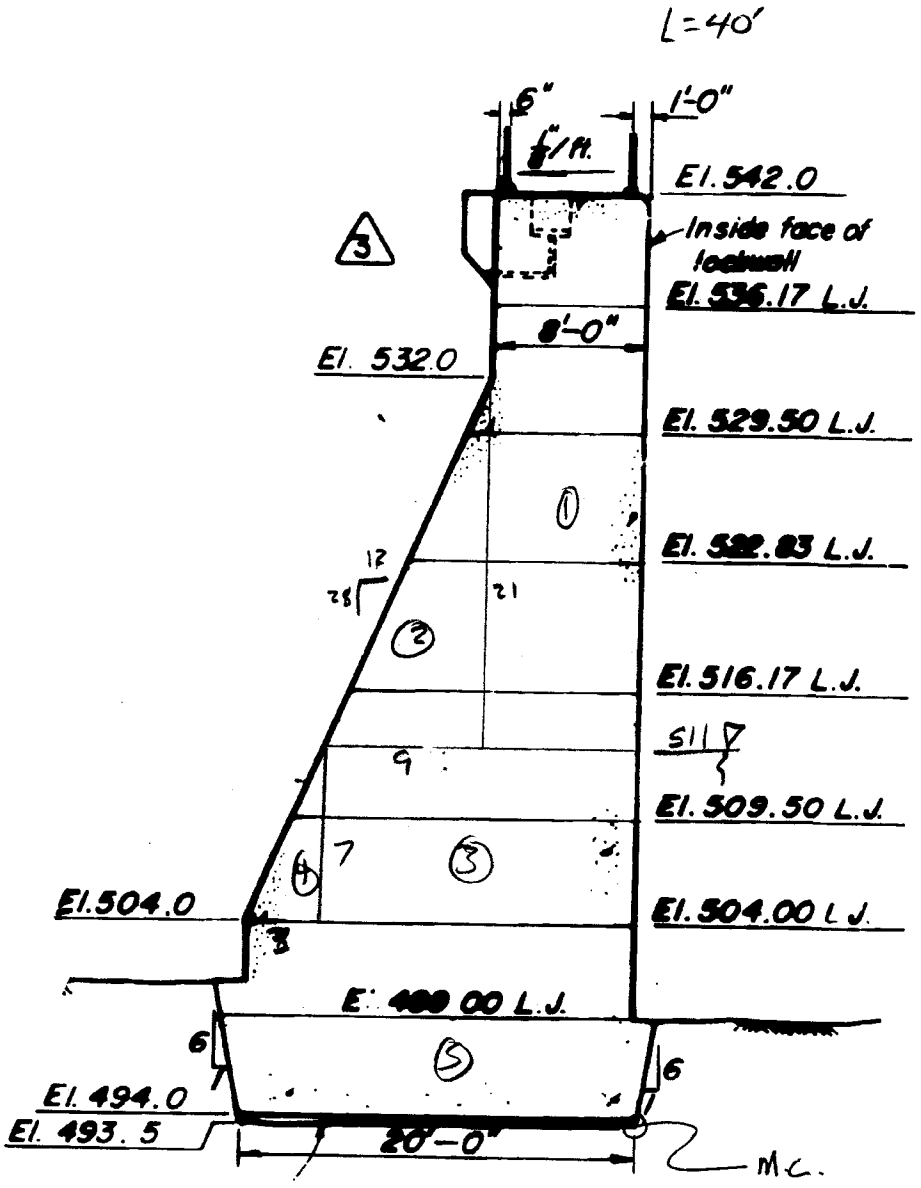
B=	21	Vo= 3635.8	SUM 3635.781	SUM H 1250.000		SUM -M -374.34	SUM +M 76689.40
H/V=	0.34						SUM -M -374.34
e=	10.49					Mo= 76315.05	
%=	0.14			M/V=	20.99		SUM M 76315.05
FS=	0.00			B/4=	5.25		
MC=	20.99						0.03 0.00

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = 0.030$$

F. P. ######## / 0.000

CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT			ARKANSAS L&D 18 LOWER GUIDE WALL L-33			
LOADING CONDITION:	FILL LT.-	494	FILL RT.-	494	POOL LT. -	511	POOL RT. - 511
COMPUTED BY: JDC.	SEE DWG -126/48.4		CHECKED BY		DATE	25-Oct-04	

Note: Since this monolith is keyed into rock, overturning is not as likely



CORPS OF ENGINEERS, U.S. ARMY — BARGE IMPACT 882 — ARKANSAS L&D 18 LOWER GUIDE WALL L-33

LOADING CONDITION: FILL LT.- 494 FILL RT.- 494 POOL LT. - 511 POOL RT. - 511

COMPUTED BY: JDC. SEE DWG -126/48.4 — CHECKED BY DB. 11/1/04 — DATE 31-Oct-04

	FORCES			LENG 40	VERTICAL	HORIZONTAL	ARM	- MOMENTS	+
C1	8 X	31 X	0.15 X	40 1	1488.000		4.00		5952.00
C2	9 X	21 X	0.15 X	40 0.5	567.000		11.00		6237.00
C3	17 X	7 X	0.0875 X	40 1	416.500		8.50		3540.25
C4	3 X	7 X	0.0875 X	40 0.5	36.750		18.00		661.50
C5	20 X	10 X	0.0875 X	40 1	700.000		10.00		7000.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
	SUB-TOTAL				3208.250				23390.75
					0.000		0.00		0.00
					0.000		12.33		0.00
					0.000		15.00		0.00
					0.000		16.89		0.00
					0.000		22.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
					0.000		0.00		0.00
E1					0.000		0.00		0.00
E2					0.000		0.00		0.00
E3					0.000		0.00		0.00
E4					0.000		0.00		0.00
E5					0.000		0.00		0.00
E6					0.000		0.00		0.00
U1	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U2	0.000 X	0 X	0.0625		0.000		0.00	0.00	
U3	20 X	17 X	0.0625	0	0.000		10.00	0.00	
H1	17 X	17 X	0.0625 X	0.5		> 9.031	5.67		51.18
H2	17 X	17 X	0.0625 X	0.5		< -9.031	5.67	-51.18	
H3	0 X	0 X	0.0625 X	0.5		< 0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5		< 0.000	0.00		0.00
H5	BARGE IMPACT					> 882.000	22.00		19404.00
H6	HORIZONTAL FORCE					> 0	0.00		0.00
H7	HORIZONTAL FORCE					> 0	0		0.00
H8	HORIZONTAL FORCE					> 0	0		0.00
					SUM 3208.250	SUM H 882.000		SUM -M -51.18	SUM +M 42845.93
									SUM -M -51.18
								Mo= 42794.75	
									SUM M 42794.75
									19.98 0.00

B= 20 Vo= 3208.3
H/V= 0.27
e= 3.34
%= 99.92
FS= 0.00
MC= 13.34

M/V= 13.34
B/4= 5.00

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = 19.983$$

$$F.P. = \frac{321.096}{0.000}$$

CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT 1124	ARKANSAS L&D 18 LOWER GUIDE WALL L-33
LOADING CONDITION:	FILL LT.- 494 FILL RT.- 494	POOL LT. - 511 POOL RT. - 511
COMPUTED BY: JDC.	SEE DWG -126/48.4	CHECKED BY DRS 11/1/04 DATE 31-Oct-04

	FORCES				LENG 40	VERTICAL	HORIZONTAL	ARM	- MOMENTS	+
C1	8 X	31 X	0.15 X	40 1		1488.000		4.00		5952.00
C2	9 X	21 X	0.15 X	40 0.5		567.000		11.00		6237.00
C3	17 X	7 X	0.0875 X	40 1		416.500		8.50		3540.25
C4	3 X	7 X	0.0875 X	40 0.5		36.750		18.00		661.50
C5	20 X	10 X	0.0875 X	40 1		700.000		10.00		7000.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
	SUB-TOTAL					3208.250				23390.75
						0.000		0.00		0.00
						0.000		12.33		0.00
						0.000		15.00		0.00
						0.000		16.89		0.00
						0.000		22.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
						0.000		0.00		0.00
E1						0.000		0.00		0.00
E2						0.000		0.00		0.00
E3						0.000		0.00		0.00
E4						0.000		0.00		0.00
E5						0.000		0.00		0.00
E6						0.000		0.00		0.00
U1	0.000 X	0 X	0.0625			0.000		0.00	0.00	
U2	0.000 X	0 X	0.0625			0.000		0.00	0.00	
U3	20 X	17 X	0.0625		0	0.000		10.00	0.00	
H1	17 X	17 X	0.0625 X	0.5			> 9.031	5.67		51.18
H2	17 X	17 X	0.0625 X	0.5			< -9.031	5.67	-51.18	
H3	0 X	0 X	0.0625 X	0.5			< 0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5			< 0.000	0.00		0.00
H5	BARGE IMPACT						> 1124.000	22.00		24728.00
H6	HORIZONTAL FORCE						> 0	0.00		0.00
H7	HORIZONTAL FORCE						> 0	0		0.00
H8	HORIZONTAL FORCE						> 0	0		0.00

B=	20	Vo=	3208.3	SUM	3208.250	SUM H 1124.000	SUM -M	-51.18	SUM +M 48169.93
H/V=	0.35								SUM -M -51.18
e=	5.00							Mo= 48118.75	
%=	75.02					M/V= 15.00			SUM M 48118.75
FS=	0.00					B/4= 5.00			
MC=	15.00								15.00 0.00

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = \frac{15.005}{}$$

$$F.P. = \frac{427.633}{0.000}$$

CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT 1367	ARKANSAS L&D 18 LOWER GUIDE WALL L-33
LOADING CONDITION:	FILL LT.- 494 FILL RT.- 494	POOL LT. - 511 POOL RT. - 511
COMPUTED BY: JDC.	SEE DWG -126/48.4	CHECKED BY DPS 11/1/04 DATE 31-Oct-04

	FORCES			LENG	VERTICAL	HORIZONTAL		ARM	MOMENTS -	MOMENTS +
				40						
C1	8 X	31 X	0.15 X	40 1	1488.000			4.00		5952.00
C2	9 X	21 X	0.15 X	40 0.5	567.000			11.00		6237.00
C3	17 X	7 X	0.0875 X	40 1	416.500			8.50		3540.25
C4	3 X	7 X	0.0875 X	40 0.5	36.750			18.00		661.50
C5	20 X	10 X	0.0875 X	40 1	700.000			10.00		7000.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
			SUB-TOTAL		3208.250					23390.75
					0.000			0.00		0.00
					0.000			12.33		0.00
					0.000			15.00		0.00
					0.000			16.89		0.00
					0.000			22.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
					0.000			0.00		0.00
E1					0.000			0.00		0.00
E2					0.000			0.00		0.00
E3					0.000			0.00		0.00
E4					0.000			0.00		0.00
E5					0.000			0.00		0.00
E6					0.000			0.00		0.00
U1	0.000 X	0 X	0.0625		0.000			0.00	0.00	
U2	0.000 X	0 X	0.0625		0.000			0.00	0.00	
U3	20 X	17 X	0.0625	0	0.000			10.00	0.00	
H1	17 X	17 X	0.0625 X	0.5		>	9.031	5.67		51.18
H2	17 X	17 X	0.0625 X	0.5		<	-9.031	5.67	-51.18	
H3	0 X	0 X	0.0625 X	0.5		<	0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5		<	0.000	0.00		0.00
H5	BARGE IMPACT					>	1367.000	22.00		30074.00
H6	HORIZONTAL FORCE					>	0	0.00		0.00
H7	HORIZONTAL FORCE					>	0	0		0.00
H8	HORIZONTAL FORCE					>	0	0		0.00

B=	20	Vo=	3208.3	SUM	3208.250	SUM H	1367.000	SUM -M	-51.18	SUM +M 53515.93
H/V=	0.43									SUM -M -51.18
e=	6.66								Mo= 53464.75	
%=	50.03					M/V=	16.66			SUM M 53464.75
FS=	0.00					B/4=	5.00			
MC=	16.66									10.01 0.00

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo} = \frac{10.006}{}$$

$$F.P. = \frac{641.285}{0.000}$$

CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT 1853	ARKANSAS L&D 18 LOWER GUIDE WALL L-33
LOADING CONDITION:	FILL LT.- 494 FILL RT.- 494	POOL LT. - 511 POOL RT. - 511
COMPUTED BY: JDC.	SEE DWG -126/48.4	CHECKED BY DPS 11/1/04 DATE 31-Oct-04

	FORCES				LENG 40	VERTICAL	HORIZONTAL		ARM	- MOMENTS	+
C1	8 X	31 X	0.15 X	40	1	1488.000			4.00		5952.00
C2	9 X	21 X	0.15 X	40	0.5	567.000			11.00		6237.00
C3	17 X	7 X	0.0875 X	40	1	416.500			8.50		3540.25
C4	3 X	7 X	0.0875 X	40	0.5	36.750			18.00		661.50
C5	20 X	10 X	0.0875 X	40	1	700.000			10.00		7000.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
			SUB-TOTAL			3208.250					23390.75
						0.000			0.00		0.00
						0.000			12.33		0.00
						0.000			15.00		0.00
						0.000			16.89		0.00
						0.000			22.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
						0.000			0.00		0.00
E1						0.000			0.00		0.00
E2						0.000			0.00		0.00
E3						0.000			0.00		0.00
E4						0.000			0.00		0.00
E5						0.000			0.00		0.00
E6						0.000			0.00		0.00
U1	0.000 X	0 X	0.0625			0.000			0.00	0.00	
U2	0.000 X	0 X	0.0625			0.000			0.00	0.00	
U3	20 X	17 X	0.0625		0	0.000			10.00	0.00	
H1	17 X	17 X	0.0625 X	0.5			>	9.031	5.67		51.18
H2	17 X	17 X	0.0625 X	0.5			<	-9.031	5.67	-51.18	
H3	0 X	0 X	0.0625 X	0.5			<	0.000	0.00	0.00	
H4	0 X	0 X	0.0625 X	0.5			<	0.000	0.00		0.00
H5	BARGE IMPACT						>	1853.000	22.00		40766.00
H6	HORIZONTAL FORCE						>	0	0.00		0.00
H7	HORIZONTAL FORCE						>	0	0		0.00
H8	HORIZONTAL FORCE						>	0	0		0.00

B=	20	Vo=	3208.3	SUM	3208.250	SUM H	1853.000	SUM -M -51.18	SUM +M 64207.93
H/V=	0.58								SUM -M -51.18
e=	10.00							Mo= 64156.75	
%=	0.04					M/V=	20.00		SUM M 64156.75
FS=	0.00					B/4=	5.00		0.01 0.00
MC=	20.00								

$$Kmcb = \frac{3 \times (Mo + 0.5 \times W \times B \times B - Vo \times B)}{W \times B - Vo}$$

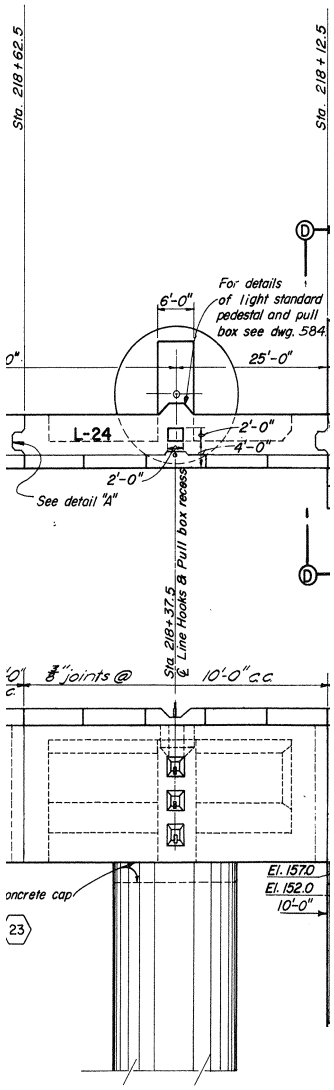
0.008 F. P. = ######## / 0.000

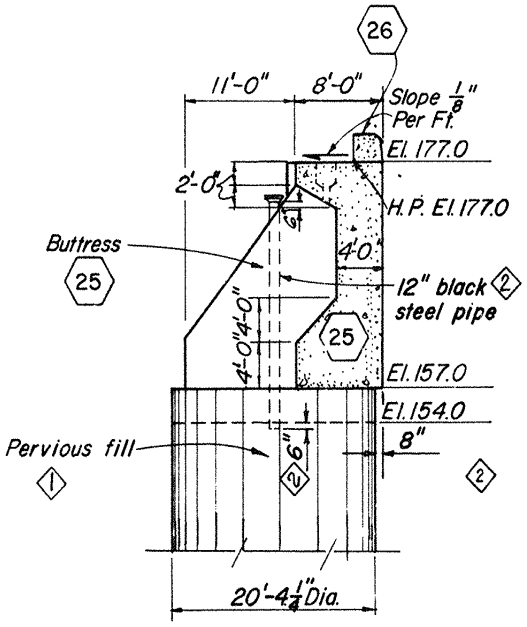
Appendix D
Cost Estimate for Pinning Cells

Arkansas River Lock Dams
Anchor Bolts

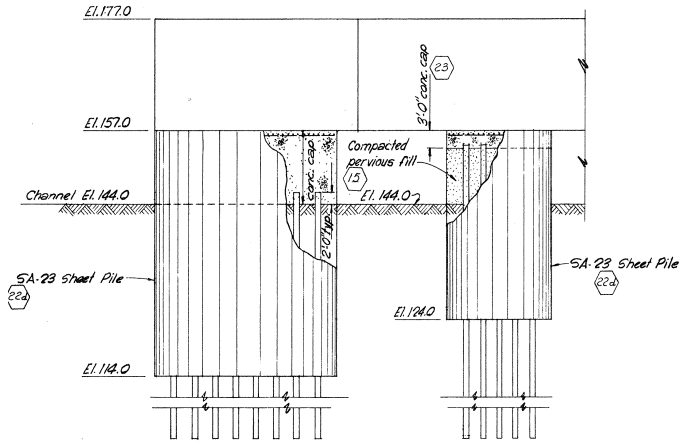
Crew $/hour Development				
			Hourly	**Hourly**
Equipment/Subcontractor	**Quantity**	**UOM**	**Rate**	**Crew Price**
7 - Man Dive Crew	1	ea	$900	$900
Tugboat 150-400 HP	0.2	ea	$26	$5
Flatdeck Barge	1	ea	$8	$8
Small Tools	2	ea	$5	$10
			Equipment Total	**$923**
Labor				
Heavy Equipment Operator	0.2	ea	$35	$7
Laborer	0.4	ea	$25	$10
			Labor Subtotal	**$17**
PT&I (30%)			**Labor Total**	**$22.10**
Crew Total w/o Indirects (30%)	1	ea		**$945.30**
Add Indirect Markups (35%)				**$1,276.16**
Materials			Unit Price	Totals
12" A36 Bolt w/nut&washer	5305	ea	$2.52	$13,368.60
Hilti RE500 injection adhesive anchor	1061	ea	$5	$5,305
1 cartridge will anchor ~ 5 bolts			Subtotal	$18,673.60
Add 4.625% Sales Tax				**$19,537.25**
Add Indirect Markups (35%)				**$26,375.29**
			Material Total	**$26,375.29**
			$/bolt	**$4.97**
Calculate Cost of Bolt Installation				
Number of Projects	8	ea		
Installing Underwater Bolts (Material)	5305	ea	$4.97	**$26,375.29**
Use productivity of 4 bolts/hr/7-man dive crew	1326.25	hrs	$1,276.16	**$1,692,500.57**
Assume a Lump Sum of $20,000/mob/demob	8	ea	$20,000	**$160,000**
			Total	**$1,878,876**
			$/bolt	***$354.17***

CORPS OF ENGINEERS, U.S. ARMY	BARGE IMPACT			ARKANSAS L&D 2 UPPER GUIDE WALL			
LOADING CONDITION:	FILL LT.-	144	FILL RT.- 144	POOL LT. -	162	POOL RT. -	162
COMPUTED BY: JDC.	SEE DWG 53/580 + 602	CHECKED BY		DATE	08-Nov-04		

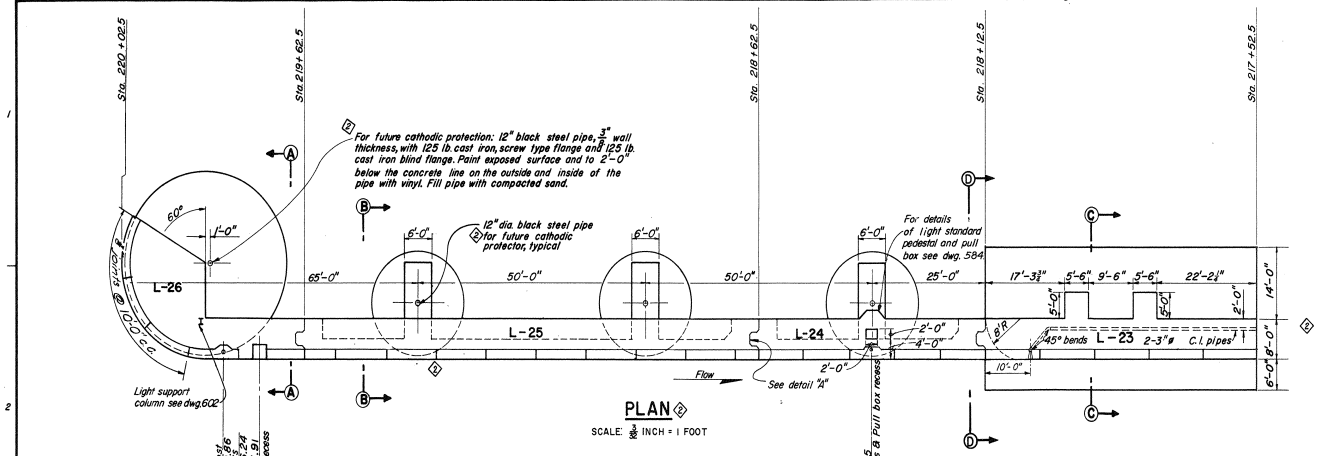


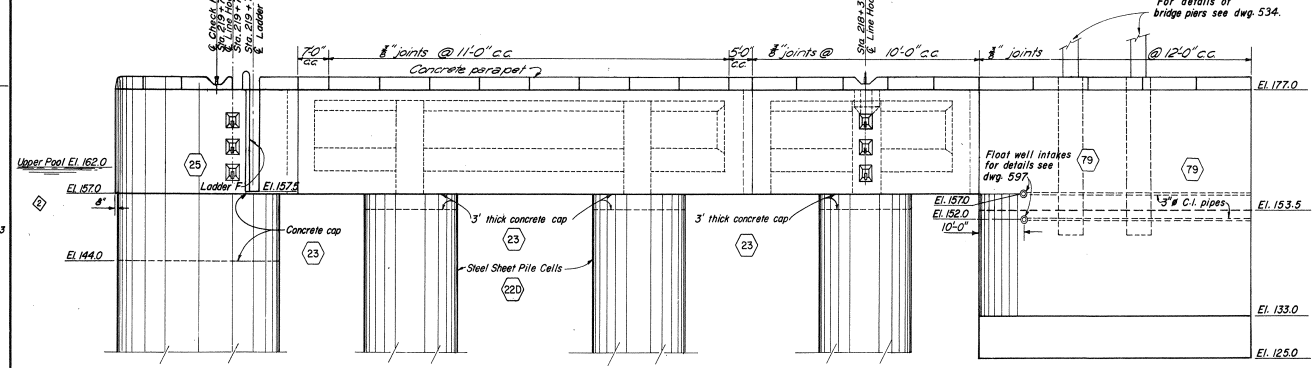


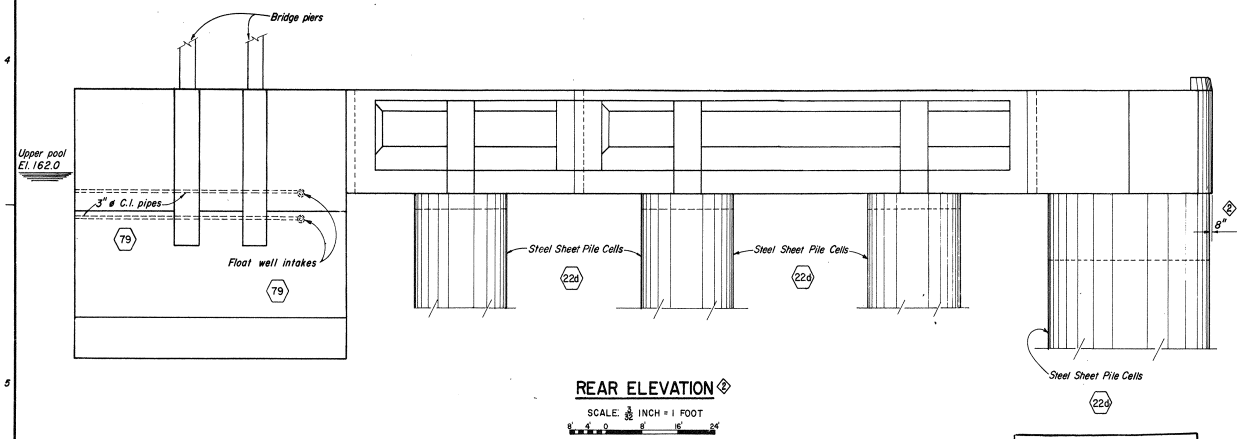
PIN THE SHEETPILING TO THE CAP
Install Hilti RE500 injection adhesive anchor which can be used in underwater applications with ¾" diameter threaded mild steel (A36) anchor. Install two horizontal rings at 6 inches from top and bottom, staggering the anchors.

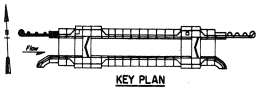


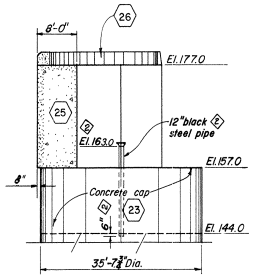
CORPS OF ENGINEERS U.S. ARMY

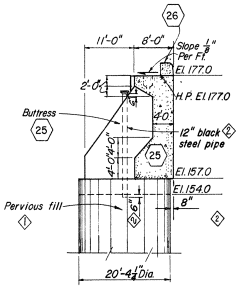


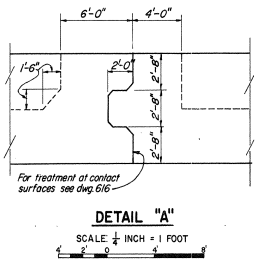


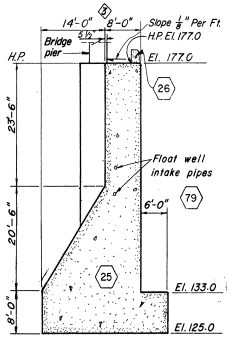


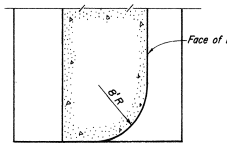






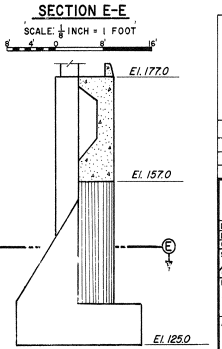






NOTES:

1. For depth of sheet piling, see dwg. 571
2. For general notes see dwg. 571
3. Apply details shown on dwg. 576 for future cathodic protection and extent of epoxy application.
2 4. Coal tar epoxy to be applied to the inside and outside of the sheet piles to be driven in the upstream guide wall cells. Coating to cover these piles in place, between elevations 157.0 and 142.0.



KEY	DATE	REVISION	APPR.
3	7-21-65	Changed location of bridge pier Mod. No. 18	GES
2	12-7-64	Added 8" Ø sleeve, 12" pipe sleeve, note 4 Mod. No. 4	G.H.
1	7-31-64	Sec. B-B, deleted pay item Amend. No. 2	E.E.L.

U.S. ARMY ENGINEER DISTRICT, TULSA, CORPS OF ENGINEERS, TULSA, OKLAHOMA
U.S. ARMY ENGINEER DISTRICT, LITTLE ROCK, OFFICE OF THE DISTRICT ENGINEER, LITTLE ROCK, ARKANSAS

DESIGNED: W.R.M.
DRAWN: C.E.W.
CHECKED: J.L.J.
SUBMITTED: E.E. Pitts
CHIEF, DESIGN BRANCH
RECOMMENDED:
CHIEF, ENGRG. DIVISION, TULSA DISTRICT OFFICE
APPROVED: E.J. Pinch
CHIEF, ENGINEERING DIVISION

ARKANSAS RIVER & TRIBUTARIES
ARKANSAS RIVER, ARKANSAS

LOCK AND DAM NO. 2
NAVIGATION LOCK
MASONRY
MONOLITHS L-23 THRU L-26

DATE: AUG. 1963
SCALE: AS SHOWN SPEC. NO. 65-1
DRAWING NUMBER 8255-53/580
SHEET 64 OF 242

PREPARED UNDER THE DIRECTION OF CHARLES D. MAYNARD, COL., C.E., DISTRICT ENGINEER

CONTRACT NO. 65-26
RECORD DRAWING AS CONSTRUCTED
William G. Vance 7APR67

THIS DRAWING FORMS A PART OF MODIFICATION NO. 18 CONTRACT NO. DA03-060-CIVENG-65-26

THIS DRAWING FORMS A PART OF MODIFICATION NO. 18 CONTRACT NO. DA03-060-CIVENG-65-26

APPENDIX C5.0

COST ESTIMATING APPENDIX FOR ARKANSAS REACHES

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TAB B - MCACES Cost Estimate - 2 Foot Lower (11 Foot) Navigational Channel Reaches 1 - 4
TAB C - MCACES Cost Estimate - 3 Foot Lower (12 Foot) Navigational Channel Reaches 1 - 4
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TAB J – Cost Summary
TAB K – Contingencies To Be Used In The Cost Estimate

APPENDIX C5.0 - ARKANSAS REACHES, FEASIBILITY REPORT FOR THE ARKANSAS RIVER NAVIGATION STUDY, ARKANSAS AND OKLAHOMA

C5.0-1 - GENERAL - The Cost Engineering and Support Section of the Little Rock District Corps of Engineers prepared preliminary cost estimates and the baseline cost estimate for the navigation project for the McClellan-Kerr Arkansas River Navigation System (MKARNS). The tentatively selected alternative contained within this Appendix is for deepening the navigation channel to 12 feet.

The cost estimates for the alternative plans presented in this feasibility study were prepared in accordance with EI 01D010, "Engineering Instructions", dated 1 September 1997. The cost account numbers in the estimate are in accordance with those prescribed in the "Work Breakdown Structure (WBS) for Civil Works Construction Cost Estimates". The price level base was February 2001 and has now been updated to July 2004. The baseline estimate provides for all pertinent elements for a complete project ready for operation. .

C5.0-2 STRUCTURAL SCOPE AND CONSIDERATIONS:

Major work items include hydraulic dredging and construction of riprap bank stabilization structures. In support of the additional dredging in lower reach 1, two additional dredge material disposal areas are required. The construction of the disposal areas include clearing, soil excavation and compaction, riprap slope protection and outlet structures.

Work on the navigation locks and dams is limited to pinning the guide walls of eight structures.

Also, an operation and maintenance (O&M) plan, and all Planning, Engineering and Design and Construction Management costs are included in the cost estimates.

The costs for the baseline estimate are totally based upon quantities provided by Hydrology and Hydraulics Section for the dredging and bank stabilization works and flow training structures (riprap). Geotechnical Civil personnel provided quantities for the dredge material disposal areas. No drawings showing work locations or structure design were provided for estimating purposes.

The estimates are presented in MCACES for DOS, Gold 5.31, using labor rates developed from current Davis-Bacon and Arkansas Department of Labor Wage Determinations and the 2001 National crews, equipment database for Region III containing Arkansas, and an updated 2001 unit price book databases. Abstracted costs in

the estimates are based on 2004 bid opening cost estimates from Indefinite Delivery-Indefinite Quantity maintenance contracts for dredging and bank stabilization for the MKARNS.

Design engineers feel the designs from which quantities were generated are of sufficient detail for a feasibility study level of design and that confidence can be placed on the quantities developed when the assigned contingencies are considered.

All work is assumed to be a part of a large contract (multi-million dollar). It is not assumed for a contractor to go individually to notch a dike or individually dredge a side channel opening.

It is important to note that limited modeling and engineering surveys were completed as part of this study. The lack of this information suggests the necessity of the application of a higher level of contingency for the all items of work.

C5.0-3 DISCUSSION OF COSTS FOR BASELINE ESTIMATES BY ACCOUNT NUMBERS –

The selected plan's cost will be briefly discussed below by feature. The features discussed will include: 01, Lands and Damages; 02, Relocations; 06, Fish and Wildlife Facilities; 09, Channels and Canals; 30, Planning, Engineering and Design, and 31, Construction Management.

Feature 01 - Lands And Damages-

Structural Lands and Damages cost represents all Real Estate costs associated with the construction of the dredged material disposal areas.

Real Estate costs are further documented in the revised REP (Real Estate Plan). .

Feature 02 - Relocations-

Costs in this feature represent those costs associated with Structural Relocations work necessary for the Project. They include cost to remove six 10-inch diameter steel abandoned utility pipelines at approximately navigation mile 62 (Reach 1).

Feature 09 - Channels And Canals-

Costs in this feature represent those costs associated with the Structural Channels and Canals work necessary for this Project.

Feature 09 includes costs associated with channel deepening, construction of new disposal areas, and bank stabilization dikes and jetties. Channel deepening will be accomplished with a hydraulic dredge with floating discharge pipeline. The discharge pipeline conveys the excavated material to a disposal area usually within 3,000 feet. The

cost of dredging was calculated using the Corps of Engineers Dredge Estimating Program (CEDEP).

Feature 30- Planning, Engineering And Design-

Costs for this account represent a compilation of costs from the individual elements of the Little Rock District, which have and will work on deepening the McClellan-Kerr Arkansas River Navigation in the future. Technical indirect and district overhead costs for the respective elements are also a part of these costs.

This study and project are 100 percent federally funded.

Feature 31-Constructon Management –

These construction management (CM) costs represent total costs for the Construction Branch (District and Field Offices) and project management. These costs include the Technical Indirect and District Overhead markups for these respective organizations. The CM amount was determined by taking 7.5 percent of the construction cost.

C5.0-4 DISCUSSION OF CONTINGENCIES

The contingency assigned to the cost estimate was based upon the judgment of the cost engineer with input from each design element. The relative degree of uncertainty of the line items is reflected in the contingencies. Generally the 'level of uncertainties' is high due to the level of design effort used for creating the estimate. Subsurface borings, significant numbers of soundings, detail design for disposal areas and bank stabilization structures, and baseline surveys were unavailable for incorporation. Also, few supply or subcontract quotes were obtained to refine certain cost items. Also, construction quantities could vary substantially in quantity due to unknown conditions or limited design generally carries a higher contingency.

01 - Lands and Damages - Real Estate determined the land values using local knowledge of structure/land costs and by completing a visual inspection of each property. RE recommended using a 20% contingency on structure/land values that were assigned. Property appraisals will be further detailed prior to implementation for a final comparison of options and recommendation. Relocation assistance is an allocated amount based on the size of the family being affected. Real Estate has reliable historical information on administrative costs used for land acquisitions.

02 - Relocations - The cost for demolition of the pipeline including removal of debris was based on the cost estimator's judgment. No drawings or survey data were provided. The estimator scaled the length of the pipeline from existing navigation charts. The estimator assumed a depth and width of the trench and computed an excavation quantity. It was also assumed that most of the work would be done from a barge. Also, used to generate demolition cost were 2003 labor rates and updated 2001 equipment cost database.

Equipment utilized was assumed to be 2 barges, an excavator, dragline, and river workboat for locating the floating plant. Therefore with the limited information, a 20 percent contingency was thought to be appropriate.

09 – Channels and Canals –

Hydrology and Hydraulics Section furnished dredging and bank stabilization quantities for the various alternatives. The dredging quantities were based on an April 2003 hydrographic survey of the river conducted by Little Rock District Corps of Engineers river survey crew. Since survey data was gathered for this work, a contingency or 15 % was deemed appropriate.

The bank stabilization work was assumed to be composed of riprap only. This approach is a standard design for Corps work. Quantities certainly will vary; nonetheless, a 25% contingency was used. Construction should be routine for Corps work in and around navigable waters.

12 - Ports and Harbors. Port operators furnished this information to Operations personnel. It was unknown the extant of survey data that was used to compute the quantities. The contingency applied to this cost item was 20%.

30 - Planning, Engineering, and Design (PED). The contingency used for the various components of PED is 20%. The reasoning for this level of contingency is that PDT members have indicated that a significant amount of modeling and design is needed to produce designs that meet current design criteria.

31 - Supervision and Administration (S&A). The contingency for S&A costs is 20%. This would include Construction LCPM. The cost estimator chose to use this level of contingency due to the unknowns about the designs.

C5.0-5 - ESCALATION

Escalation is based on the construction duration and EC 11-2-187, 31 March 2004. The construction period was assumed to be 4 years and was set by the project manager. This assumption was based on the premise that budget constraints would limit funding in any one fiscal year. The construction start of the project was assumed to be late fiscal year 2005 with a mid-point of construction of January 2008.

ARKANSAS RIVER NAVIGATION STUDY,
ARKANSAS AND OKLAHOMA
FEASIBILITY STUDY

TAB A

- MCACES Cost Estimate -

One-Foot Lower (10 Foot) Navigational Channel Reaches 1- 4

Feasibility Cost Es - 1 FT Lower Alternative - Lower the MKARNS Navigation Channel Bottom 1 Foot (10 ft Navigation Channel)

Designed By: Design Branch
Estimated By: Cost Engineering & Support Sectn

Prepared By: George Losak

Preparation Date: 07/18/05
Effective Date of Pricing: 01/01/08
Est Construction Time: 1000 Days

Sales Tax: 7.00%

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M C A C E S G O L D E D I T I O N
Composer GOLD Software Copyright (c) 1985-2000
by Building Systems Design, Inc.
Release 5.31

This project is to increase the depth of the navigation channel in Arkansas for the McClellan-Kerr Arkansas River Navigation System (MKARNS) from 9 feet to 10 feet. There are 12 navigation locks and dams in the MKARNS in Arkansas. Tulsa District is developing the modification costs for the Oklahoma segment of the MKARNS.

This cost estimate quantifies the cost to lower the bottom of th MKARNS navigation channel 1 foot.

Features requiring modification include additional dredging in certain locations, construction of additional dredge disposal areas in Reach 1, removal of abandoned pipelines, and construction of bank stabilization structures at selected locations.

Many of the costs contained herein are based upon the designers experience. No detailed engineering surveys, drawings nor quantities were developed for these cost estimates.

ASSUMPTIONS:

1. Work is assumed to require 4 years with several contractors working concurrently. Assumed start date October 2006. Mid-point of construction is January 2008.

2. Dredging for ports and harbors is based on professional judgement that there would be some dredging involved. This dredging is accomplished in conjunction with the Corps of Engineers contract for economic efficiency.

3. Dredged material from harbors and ports is to be disposed of in nearby disposal sites.

EXCLUSIONS:

INCLUSIONS:

1. Escalation computed to be 5.1 percent per EC 11-2-187, 31 Mar 04.

2. Contingency is 15% for dredging (recent survey), 25% for dike and jetty construction and 20 percent for other feature because of limited information.

3. Prime contractor profit of 7.58 percent.

4. Sales tax of 7 percent.

5. Supervision and administration cost for construction contracts of 7.5 percent was furnished by Construction Branch personnel.

REASON FOR REVISION.

18 July 2005. Environmental and cultural resource costs were revised based on new costs from the Environmental Specialist.

SUMMARY REPORTS SUMMARY PAGE

PROJECT OWNER SUMMARY - 1st Levl.....1
PROJECT OWNER SUMMARY - Assembly.....2
2ND VIEW SUMMARY.....21

No Detailed Estimate...

No Backup Reports...

* * * END TABLE OF CONTENTS * * *

		QUANTITY	UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
01	Lands and Damages	1.00	JOB	923,200	0	184,560	0	1,107,760	1107760
02	Relocations	1.00	EA	1,168,276	59,582	245,572	0	1,473,430	1473430
05	Locks	1.00	EA	2,076,974	105,926	545,725	0	2,728,624	2728624
06	Fish and Wildlife Facilities	1.00	JOB	11,065,399	564,335	2,473,053	0	14,102,787	14102787
09	Channels and Canals	1.00	EA	23,804,632	1,214,036	5,656,778	0	30,675,447	30675447
12	Navigation, Ports & Harbors (NF)	1.00	EA	17,568	896	3,693	0	22,157	22157.22
18	Cultural Resource Preservation	1.00	JOB	200,000	10,200	42,040	0	252,240	252240.00
30	Planning, Engineering & Design	1.00	JOB	4,758,767	242,697	1,000,293	0	6,001,757	6001757
31	Construction Management	1.00	JOB	2,482,429	126,604	521,807	0	3,130,839	3130839
TOTAL	Feasibility Cost Es - 1 FT Lower	1.00	EA	46,497,245	2,324,276	10,673,520	0	59,495,041	59495041

	QUANTITY	UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
01 Lands and Damages								
01.23 Construction Documents								
01.23.03 Real Estate Analysis Documents								
01.23.03.01 Reach 1 (NM 0.0 to NM 75.2)								
01.23.03.01.02 Real Estate Acquisition Document								
01.23.03.01.02.01 Acquistions	1.00	JOB	44,000	0	8,800	0	52,800	52800.00
01.23.03.01.02.02 Surveys	1.00	JOB	100,000	0	20,000	0	120,000	120000.00
01.23.03.01.02.03 Title Contract	1.00	JOB	6,000	0	1,200	0	7,200	7200.00
TOTAL Real Estate Acquisition Document	1.00	JOB	150,000	0	30,000	0	180,000	180000.00
01.23.03.01.03 Real Estate Condemntn Documents								
01.23.03.01.03.01 Condemnations by Corps of Engrs	1.00	JOB	8,000	0	1,600	0	9,600	9600.00
TOTAL Real Estate Condemntn Documents	1.00	JOB	8,000	0	1,600	0	9,600	9600.00
01.23.03.01.05 Real Estate Appraisal Documents								
01.23.03.01.05.01 Appraisal Contracts	1.00	JOB	6,000	0	1,200	0	7,200	7200.00
01.23.03.01.05.02 Review of Appraisal Reports	1.00	JOB	2,400	0	480	0	2,880	2880.00
TOTAL Real Estate Appraisal Documents	1.00	JOB	8,400	0	1,680	0	10,080	10080.00
01.23.03.01.06 Real Estate PL 94-646 Asst. Docs								
01.23.03.01.06.01 PL 91-646 Assistance	1.00	JOB	800	0	160	0	960	960.00
TOTAL Real Estate PL 94-646 Asst. Docs	1.00	JOB	800	0	160	0	960	960.00
01.23.03.01.15 Real Estate Payment Documents								
01.23.03.01.15.01 Payments (Land & Improvements)	1.00	JOB	750,600	0	150,120	0	900,720	900720.00
01.23.03.01.15.03 Payments (PL 91-646 Asst.)	1.00	JOB	5,000	0	1,000	0	6,000	6000.00
01.23.03.01.15.04 Review	1.00	JOB	400	0	0	0	400	400.00
TOTAL Real Estate Payment Documents	1.00	JOB	756,000	0	151,120	0	907,120	907120.00
TOTAL Reach 1 (NM 0.0 to NM 75.2)	1.00	EA	923,200	0	184,560	0	1,107,760	1107760

	QUANTITY UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
01.23.03.02 Reach 2 (NM 75.5 to NM 119.5)							
01.23.03.02.15 Real Estate Land Payments							
01.23.03 Reach 3 (NM 119.5 to NM 220.3)							
01.23.03.03.15 Real Estate Land Payments							
01.23.03.04 Reach 4 (NM 220.3 to NM 307.7)							
01.23.03.04.15 Real Estate Land Payments							
TOTAL Real Estate Analysis Documents	1.00 JOB	923,200	0	184,560	0	1,107,760	1107760
TOTAL Construction Documents	1.00 JOB	923,200	0	184,560	0	1,107,760	1107760
TOTAL Lands and Damages	1.00 JOB	923,200	0	184,560	0	1,107,760	1107760
02 Relocations							
02.01 Roads							
02.01.01 Roads							
02.01.01.04 Reach 4 (NM 220.3 to NM 307.7)							
02.02 Railroads							
02.02.07 Bridges							
02.02.07.04 Reach 4 (NM 220.3 to NM 307.7)							
02.03 Utilities							
02.03.01 Pipelines							
02.03.01.01 Reach 1 (NM 0.0 to NM 75.2)							
02.03.01.01.51 Demo Pipeline TX East #64-1 (6)	2200.00 FT	1,168,276	59,582	245,572	0	1,473,430	669.74
TOTAL Reach 1 (NM 0.0 to NM 75.2)	1.00 EA	1,168,276	59,582	245,572	0	1,473,430	1473430
02.03.01.04 Reach 4 (NM 220.3 to NM 307.7)							
TOTAL Pipelines	1.00 EA	1,168,276	59,582	245,572	0	1,473,430	1473430
02.03.02 Electric Lines							
02.03.02.04 Reach 4 (NM 220.3 to NM 307.7)							
TOTAL Utilities	1.00 EA	1,168,276	59,582	245,572	0	1,473,430	1473430
TOTAL Relocations	1.00 EA	1,168,276	59,582	245,572	0	1,473,430	1473430

	QUANTITY	UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
05 Locks								
05.62 Approach Walls, Upper & Lower								
05.62.05 Metals								
05.62.05.01 Reach 1 (NM 0.0 to NM 75.2)								
05.62.05.01.10 Pinning Guidewalls	1.00	JOB	1,384,649	70,617	363,817	0	1,819,083	1819083
TOTAL Reach 1 (NM 0.0 to NM 75.2)	1.00	JOB	1,384,649	70,617	363,817	0	1,819,083	1819083
05.62.05.02 Reach 2 (NM 75.5 to NM 119.5)								
05.62.05.02.10 Pinning Guidewalls	1.00	JOB	346,162	17,654	90,954	0	454,771	454770.74
TOTAL Reach 2 (NM 75.5 to NM 119.5)	1.00	EA	346,162	17,654	90,954	0	454,771	454770.74
05.62.05.03 Reach 3 (NM 119.5 to NM 220.3)								
05.62.05.03.10 Pinning Guidewalls	1.00	JOB	346,162	17,654	90,954	0	454,771	454770.74
TOTAL Reach 3 (NM 119.5 to NM 220.3)	1.00	EA	346,162	17,654	90,954	0	454,771	454770.74
05.62.05.04 Reach 4 (NM 220.3 to NM 307.7)								
05.62.05.04.10 Pinning Guidewalls								
TOTAL Metals			2,076,974	105,926	545,725	0	2,728,624	
TOTAL Approach Walls, Upper & Lower			2,076,974	105,926	545,725	0	2,728,624	
TOTAL Locks	1.00	EA	2,076,974	105,926	545,725	0	2,728,624	2728624
06 Fish and Wildlife Facilities								
06.03 F & W Faclts & Sancturies Mitign								
06.03.73 Habitat & Feeding Facilities								
06.03.73.01 Reach 1 (NM 0.0 to NM 75.2)								
06.03.73.01.11 Tern Island from Dredge Material								
06.03.73.01.11.01 Dredge Material for Island	400000.00	CY	62,000	3,162	13,032	0	78,194	0.20
06.03.73.01.11.06 Turbidity Barrier	3000.00	FT	41,975	2,141	8,823	0	52,939	17.65

		QUANTITY	UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
06.03.73.01.11.11	Turbidity Barrier	21000.00	FT	48,614	2,479	10,219	0	61,312	2.92
TOTAL	Tern Island from Dredge Material	5600.00	SF	152,589	7,782	32,074	0	192,445	34.37
06.03.73.01.12	Notch Dikes								
06.03.73.01.12.01	Dike Notching	46.00	EA	26,505	1,352	5,571	0	33,427	726.68
TOTAL	Notch Dikes	46.00	EA	26,505	1,352	5,571	0	33,427	726.68
06.03.73.01.13	Dredge Coal Pile Entrance Channl								
06.03.73.01.13. 1	Excavate, Load & Barge	74074.00	CY	63,709	3,249	13,392	0	80,349	1.08
06.03.73.01.13. 2	Unload in Disposal Area	88888.80	CY	76,450	3,899	16,070	0	96,419	1.08
06.03.73.01.13. 3	Mobilization	1.00	JOB	8,945	456	1,880	0	11,281	11281.05
06.03.73.01.13. 4	Demobilization	1.00	JOB	4,547	232	956	0	5,735	5734.61
TOTAL	Dredge Coal Pile Entrance Channl	74074.00	CY	153,650	7,836	32,297	0	193,784	2.62
06.03.73.01.14	Dredge Side Channels @ 44.6 (2)								
06.03.73.01.14. 1	Excavate, Load & Barge	92593.00	CY	79,636	4,061	16,740	0	100,437	1.08
06.03.73.01.14. 2	Unload in Disposal Area	111111.60	CY	95,563	4,874	20,087	0	120,525	1.08
06.03.73.01.14. 3	Mobilization	1.00	JOB	8,945	456	1,880	0	11,281	11281.05
06.03.73.01.14. 4	Demobilization	1.00	JOB	4,547	232	956	0	5,735	5734.61
TOTAL	Dredge Side Channels @ 44.6 (2)	92593.00	CY	188,691	9,623	39,663	0	237,977	2.57
06.03.73.01.15	Dredge Side Channel @ 70.6 R								
06.03.73.01.15. 1	Excavate, Load & Barge	33333.00	CY	28,669	1,462	6,026	0	36,157	1.08
06.03.73.01.15. 2	Unload in Disposal Area	39999.60	CY	34,402	1,755	7,231	0	43,388	1.08
06.03.73.01.15. 3	Mobilization	1.00	JOB	4,472	228	940	0	5,641	5640.52
06.03.73.01.15. 4	Demobilization	1.00	JOB	2,273	116	478	0	2,867	2867.30
TOTAL	Dredge Side Channel @ 70.6 R	33333.00	CY	69,817	3,561	14,675	0	88,053	2.64
06.03.73.01.16	Env Sustainability @ 71.3L								
06.03.73.01.16. 1	Excavate, Load & Barge	118518.00	CY	101,933	5,199	21,426	0	128,558	1.08
06.03.73.01.16. 2	Unload in Disposal Area	142221.60	CY	122,320	6,238	25,712	0	154,270	1.08
06.03.73.01.16. 3	Mobilization	1.00	JOB	8,945	456	1,880	0	11,281	11281.05
06.03.73.01.16. 4	Demobilization	1.00	JOB	4,547	232	956	0	5,735	5734.61
TOTAL	Env Sustainability @ 71.3L	118518.00	CY	237,745	12,125	49,974	0	299,844	2.53

		QUANTITY	UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
06.03.73.01.17	Dredge Side Channels @ 32.2								
06.03.73.01.17. 1	Excavate, Load & Barge	9259.00	CY	7,963	406	1,674	0	10,043	1.08
06.03.73.01.17. 2	Unload in Disposal Area	11110.80	CY	9,556	487	2,009	0	12,052	1.08
06.03.73.01.17. 3	Mobilization	1.00	JOB	8,945	456	1,880	0	11,281	11281.05
06.03.73.01.17. 4	Demobilization	1.00	JOB	4,547	232	956	0	5,735	5734.61
	TOTAL Dredge Side Channels @ 32.2	9259.00	CY	31,011	1,582	6,519	0	39,111	4.22
06.03.73.01.18	Dredge Side Channels @ 50.9L								
06.03.73.01.18. 1	Excavate, Load & Barge	18518.00	CY	15,927	812	3,348	0	20,087	1.08
06.03.73.01.18. 2	Unload in Disposal Area	22221.60	CY	19,112	975	4,017	0	24,104	1.08
06.03.73.01.18. 3	Mobilization	1.00	JOB	8,945	456	1,880	0	11,281	11281.05
06.03.73.01.18. 4	Demobilization	1.00	JOB	4,547	232	956	0	5,735	5734.61
	TOTAL Dredge Side Channels @ 50.9L	18518.00	CY	48,530	2,475	10,201	0	61,207	3.31
06.03.73.01.21	5' Dia Gated Culvert @ 15.3 R								
06.03.73.01.21. 1	Excavate, Load & Barge	10000.00	CY	8,601	439	1,808	0	10,847	1.08
06.03.73.01.21. 2	Unload in Disposal Area	12000.00	CY	10,321	526	2,169	0	13,017	1.08
06.03.73.01.21. 3	Mobilization	1.00	JOB	13,154	671	2,765	0	16,590	16589.77
06.03.73.01.21. 4	Demobilization	1.00	JOB	6,889	351	1,448	0	8,689	8688.79
06.03.73.01.21.11	Install 5' Dia Culvert	250.00	JOB	54,519	2,780	11,460	0	68,759	275.04
06.03.73.01.21.12	Backfill	10000.00	CY	63,456	3,236	13,338	0	80,030	8.00
06.03.73.01.21.13	Riprap Slope Protection	300.00	TON	7,162	365	1,506	0	9,033	30.11
06.03.73.01.21.14	Site Dewatering	1008.00	HR	118,676	6,052	24,946	0	149,674	148.49
	TOTAL 5' Dia Gated Culvert @ 15.3 R	250.00	LF	282,777	14,422	59,440	0	356,639	1426.56
06.03.73.01.25	Silt Curtains								
06.03.73.01.25.06	Turbidity Barrier	2400.00	FT	33,580	1,713	7,059	0	42,351	17.65
	TOTAL Silt Curtains	1.00	JOB	33,580	1,713	7,059	0	42,351	42351.18
06.03.73.01.50	Long Term Management Features								
06.03.73.01.50.06	Bathymetry (LTM)	1.00	JOB	66,700	3,402	14,020	0	84,122	84122.04
06.03.73.01.50.07	Substrate Sampling (LTM)	1.00	JOB	20,000	1,020	4,204	0	25,224	25224.00
06.03.73.01.50.08	LIDAAR/GIS (LTM)	1.00	JOB	50,000	2,550	10,510	0	63,060	63060.00
06.03.73.01.50.09	Backwater Reevaluations (LTM)	1.00	JOB	26,700	1,362	5,612	0	33,674	33674.04
06.03.73.01.50.10	Diversity & Pres @ Trib Mout LTM	1.00	JOB	26,700	1,362	5,612	0	33,674	33674.04
06.03.73.01.50.13	Fish Sampling (LTM)	1.00	JOB	100,000	5,100	21,020	0	126,120	126120.00
06.03.73.01.50.15	Water Quality Monitoring (LTM)	1.00	JOB	100,000	5,100	21,020	0	126,120	126120.00
06.03.73.01.50.16	Mussel Bed Monitoring (LTM)	1.00	JOB	615,000	31,365	129,273	0	775,638	775638.00

		QUANTITY	UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
06.03.73.01.50.91	LM Boat Ramp - Concrete	5600.00	SF	53,966	2,752	11,344	0	68,062	12.15
06.03.73.01.50.92	LM Boat Ramp - Clearing	1.00	AC	2,854	146	600	0	3,599	3599.24
06.03.73.01.50.93	LM Boat Ramp - Aggregate Base	184.80	SY	4,303	219	905	0	5,428	29.37
	TOTAL Long Term Management Features	1.00	EA	1,066,223	54,377	224,120	0	1,344,721	1344721
06.03.73.01.51	Adaptive Management Features								
06.03.73.01.51.01	Backwaters & Trib Mouths Misc AM	1.00	JOB	166,700	8,502	35,040	0	210,242	210242.04
06.03.73.01.51.03	Dike Field Mods (AM)	1.00	JOB	100,000	5,100	21,020	0	126,120	126120.00
06.03.73.01.51.04	Mussel Bed Recolonization (AM)	1.00	JOB	100,000	5,100	21,020	0	126,120	126120.00
	TOTAL Adaptive Management Features	1.00	EA	366,700	18,702	77,080	0	462,482	462482.04
06.03.73.01.60	Mussel Mitigation NM 10.5-19.0								
06.03.73.01.60.01	Survey for Potential Relo Site	1.00	JOB	40,000	2,040	8,408	0	50,448	50448.00
06.03.73.01.60.02	Survey Mussel Beds for Density	1.00	JOB	20,000	1,020	4,204	0	25,224	25224.00
06.03.73.01.60.03	Relocate Unionids	1.00	JOB	200,000	10,200	42,040	0	252,240	252240.00
06.03.73.01.60.04	Relocate 30,000 Additional Mussl	1.00	JOB	140,000	7,140	29,428	0	176,568	176568.00
06.03.73.01.60.06	Return Mussels to AP Canal	1.00	JOB	151,065	7,704	31,754	0	190,523	190523.18
06.03.73.01.60.07	Monitor Relo'd Unionids in Canal	1.00	JOB	115,250	5,878	24,226	0	145,353	145353.30
06.03.73.01.60.08	Propagate and release 3Mil Union	1.00	JOB	429,499	21,904	90,281	0	541,684	541684.14
	TOTAL Mussel Mitigation NM 10.5-19.0	1.00	JOB	1,095,814	55,887	230,340	0	1,382,041	1382041
06.03.73.01.65	Mussel Mitigation NM 19.0-75.2								
06.03.73.01.65.10	NM 48.5 Survey Unionid Distrib.	1.00	JOB	5,000	255	1,051	0	6,306	6306.00
	TOTAL Mussel Mitigation NM 19.0-75.2	1.00	JOB	5,000	255	1,051	0	6,306	6306.00
06.03.73.01.70	Endangered Species Surveys								
	TOTAL Reach 1 (NM 0.0 to NM 75.2)	1.00	EA	3,758,633	191,690	790,065	0	4,740,388	4740388
06.03.73.02	Reach 2 (NM 75.5 to NM 119.5)								
06.03.73.02.11	Tern Island from Dredge Material								
06.03.73.02.11.01	Dredge Material for Island	200000.00	CY	31,000	1,581	6,516	0	39,097	0.20
06.03.73.02.11.06	Turbidity Barrier	3000.00	FT	41,975	2,141	8,823	0	52,939	17.65
	TOTAL Tern Island from Dredge Material	5600.00	SF	72,975	3,722	15,339	0	92,036	16.44
06.03.73.02.12	Notch Dikes								

		QUANTITY	UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
06.03.73.02.12.01	Dike Notching	47.00	EA	27,081	1,381	5,692	0	34,154	726.68
TOTAL	Notch Dikes	47.00	EA	27,081	1,381	5,692	0	34,154	726.68
06.03.73.02.21	Dredge Side Channel @ 75.3L								
06.03.73.02.21. 1	Excavate, Load & Barge	5556.00	CY	4,779	244	1,004	0	6,027	1.08
06.03.73.02.21. 2	Unload in Disposal Area	6667.20	CY	5,734	292	1,205	0	7,232	1.08
06.03.73.02.21. 3	Mobilization	1.00	JOB	1,789	91	376	0	2,256	2256.21
06.03.73.02.21. 4	Demobilization	1.00	JOB	909	46	191	0	1,147	1146.92
TOTAL	Dredge Side Channel @ 75.3L	5556.00	CY	13,211	674	2,777	0	16,662	3.00
06.03.73.02.22	Dredge Side Channel @ 78.7L								
06.03.73.02.22. 1	Excavate, Load & Barge	5556.00	CY	4,779	244	1,004	0	6,027	1.08
06.03.73.02.22. 2	Unload in Disposal Area	6667.20	CY	5,734	292	1,205	0	7,232	1.08
06.03.73.02.22. 3	Mobilization	1.00	JOB	8,945	456	1,880	0	11,281	11281.05
06.03.73.02.22. 4	Demobilization	1.00	JOB	4,547	232	956	0	5,735	5734.61
TOTAL	Dredge Side Channel @ 78.7L	5556.00	CY	24,004	1,224	5,046	0	30,274	5.45
06.03.73.02.23	Dredge Side Channel @ 82.6L								
06.03.73.02.23. 1	Excavate, Load & Barge	5556.00	CY	4,779	244	1,004	0	6,027	1.08
06.03.73.02.23. 2	Unload in Disposal Area	6667.20	CY	5,734	292	1,205	0	7,232	1.08
06.03.73.02.23. 3	Mobilization	1.00	JOB	1,789	91	376	0	2,256	2256.21
06.03.73.02.23. 4	Demobilization	1.00	JOB	909	46	191	0	1,147	1146.92
TOTAL	Dredge Side Channel @ 82.6L	5556.00	CY	13,211	674	2,777	0	16,662	3.00
06.03.73.02.24	Dredge Side Channel @ 92.6L								
06.03.73.02.24. 1	Excavate, Load & Barge	3333.00	CY	2,867	146	603	0	3,615	1.08
06.03.73.02.24. 2	Unload in Disposal Area	3999.60	CY	3,440	175	723	0	4,338	1.08
06.03.73.02.24. 3	Mobilization	1.00	JOB	4,472	228	940	0	5,641	5640.52
06.03.73.02.24. 4	Demobilization	1.00	JOB	2,273	116	478	0	2,867	2867.30
TOTAL	Dredge Side Channel @ 92.6L	3333.00	CY	13,052	666	2,744	0	16,462	4.94
06.03.73.02.26	Silt Curtains								
06.03.73.02.26.06	Turbidity Barrier	2400.00	FT	33,580	1,713	7,059	0	42,351	17.65
TOTAL	Silt Curtains	2400.00	FT	33,580	1,713	7,059	0	42,351	17.65

		QUANTITY	UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
06.03.73.02.27	Dredge Side Channel @ 88.2R								
06.03.73.02.27. 1	Excavate, Load & Barge	37037.00	CY	31,854	1,625	6,696	0	40,175	1.08
06.03.73.02.27. 2	Unload in Disposal Area	44444.40	CY	38,225	1,949	8,035	0	48,210	1.08
06.03.73.02.27. 3	Mobilization	1.00	JOB	4,472	228	940	0	5,641	5640.52
06.03.73.02.27. 4	Demobilization	1.00	JOB	2,273	116	478	0	2,867	2867.30
	TOTAL Dredge Side Channel @ 88.2R	37037.00	CY	76,825	3,918	16,149	0	96,892	2.62
06.03.73.02.51	Long Term Management Features								
06.03.73.02.51.06	Bathymetry (LTM)	1.00	JOB	66,700	3,402	14,020	0	84,122	84122.04
06.03.73.02.51.07	Substrate Sampling (LTM)	1.00	JOB	20,000	1,020	4,204	0	25,224	25224.00
06.03.73.02.51.08	LIDAAR/GIS (LTM)	1.00	JOB	50,000	2,550	10,510	0	63,060	63060.00
06.03.73.02.51.09	Backwater Reevaluations (LTM)	1.00	JOB	26,700	1,362	5,612	0	33,674	33674.04
06.03.73.02.51.10	Diversity & Pres @ Trib Mout LTM	1.00	JOB	26,700	1,362	5,612	0	33,674	33674.04
06.03.73.02.51.13	Fish Sampling (LTM)	1.00	JOB	100,000	5,100	21,020	0	126,120	126120.00
06.03.73.02.51.15	Water Quality Monitoring (LTM)	1.00	JOB	100,000	5,100	21,020	0	126,120	126120.00
06.03.73.02.51.91	89.5R Boat Ramp - Concrete	5600.00	SF	53,966	2,752	11,344	0	68,062	12.15
06.03.73.02.51.92	89.5R Boat Ramp - Clearing	1.00	AC	2,854	146	600	0	3,599	3599.24
06.03.73.02.51.93	89.5R Boat Ramp - Aggregate Base	184.80	SY	4,303	219	905	0	5,428	29.37
	TOTAL Long Term Management Features	1.00	EA	451,223	23,012	94,847	0	569,083	569082.51
06.03.73.02.52	Adaptive Management Features								
06.03.73.02.52.01	Backwaters & Trib Mouths Misc AM	1.00	JOB	166,700	8,502	35,040	0	210,242	210242.04
06.03.73.02.52.03	Dike Field Mods (AM)	1.00	JOB	100,000	5,100	21,020	0	126,120	126120.00
06.03.73.02.52.04	Mussel Bed Recolonization (AM)	1.00	JOB	100,000	5,100	21,020	0	126,120	126120.00
	TOTAL Adaptive Management Features	1.00	EA	366,700	18,702	77,080	0	462,482	462482.04
06.03.73.02.63	Env Sustainability @ 110.4L								
06.03.73.02.63. 1	Excavate, Load & Barge	12000.00	CY	10,321	526	2,169	0	13,017	1.08
06.03.73.02.63. 2	Unload in Disposal Area	14400.00	CY	12,385	632	2,603	0	15,620	1.08
06.03.73.02.63. 3	Mobilization	1.00	JOB	13,154	671	2,765	0	16,590	16589.77
06.03.73.02.63. 4	Demobilization	1.00	JOB	6,889	351	1,448	0	8,689	8688.79
06.03.73.02.63.11	Install 8' Dia Culvert	300.00	JOB	140,575	7,169	29,549	0	177,294	590.98
06.03.73.02.63.12	Backfill	10000.00	CY	63,456	3,236	13,338	0	80,030	8.00
06.03.73.02.63.13	Riprap Slope Protection	300.00	TON	7,162	365	1,506	0	9,033	30.11
	TOTAL Env Sustainability @ 110.4L	300.00	LF	253,943	12,951	53,379	0	320,272	1067.57
06.03.73.02.64	8' Dia Gated Culvert @ 110.4R								
06.03.73.02.64. 1	Excavate, Load & Barge	2400.00	CY	2,064	105	434	0	2,603	1.08

		QUANTITY	UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
06.03.73.02.64. 2	Unload in Disposal Area	2880.00	CY	2,477	126	521	0	3,124	1.08
06.03.73.02.64. 3	Mobilization	1.00	JOB	13,154	671	2,765	0	16,590	16589.77
06.03.73.02.64. 4	Demobilization	1.00	JOB	6,889	351	1,448	0	8,689	8688.79
06.03.73.02.64.11	Install 8' Dia Culvert	60.00	FT	38,313	1,954	8,053	0	48,321	805.34
06.03.73.02.64.12	Backfill	2400.00	CY	59,119	3,015	12,427	0	74,561	31.07
06.03.73.02.64.13	Riprap Slope Protection	100.00	TON	2,387	122	502	0	3,011	30.11
	TOTAL 8' Dia Gated Culvert @ 110.4R	60.00	LF	124,404	6,345	26,150	0	156,898	2614.97
06.03.73.02.80	Bank Stab @ 91.5 - CG	64059.00	TON	784,723	40,021	206,186	0	1,030,930	16.09
	TOTAL Reach 2 (NM 75.5 to NM 119.5)	1.00	EA	2,254,933	115,002	515,224	0	2,885,158	2885158
06.03.73.03	Reach 3 (NM 119.5 to NM 220.3)								
06.03.73.03.11	Tern Island from Dredge Material								
06.03.73.03.11.01	Dredge Material for Island	200000.00	CY	31,000	1,581	6,516	0	39,097	0.20
06.03.73.03.11.06	Turbidity Barrier	3000.00	FT	41,975	2,141	8,823	0	52,939	17.65
	TOTAL Tern Island from Dredge Material	5600.00	SF	72,975	3,722	15,339	0	92,036	16.44
06.03.73.03.12	Notch Dikes								
06.03.73.03.12.01	Dike Notching	64.00	EA	36,876	1,881	7,751	0	46,508	726.68
	TOTAL Notch Dikes	64.00	EA	36,876	1,881	7,751	0	46,508	726.68
06.03.73.03.15	Elevated Shore Line @Sweeden Isl								
06.03.73.03.15.01	Dredge Material for Island	200000.00	CY	31,000	1,581	6,516	0	39,097	0.20
06.03.73.03.15.06	Turbidity Barrier	3000.00	FT	41,975	2,141	8,823	0	52,939	17.65
	TOTAL Elevated Shore Line @Sweeden Isl	5600.00	SF	72,975	3,722	15,339	0	92,036	16.44
06.03.73.03.22	Dredge Side Channel @ 164.5L								
06.03.73.03.22. 1	Excavate, Load & Barge	18519.00	CY	15,928	812	3,348	0	20,088	1.08
06.03.73.03.22. 2	Unload in Disposal Area	22222.80	CY	19,113	975	4,018	0	24,105	1.08
06.03.73.03.22. 3	Mobilization	1.00	JOB	1,789	91	376	0	2,256	2256.21
06.03.73.03.22. 4	Demobilization	1.00	JOB	909	46	191	0	1,147	1146.92
	TOTAL Dredge Side Channel @ 164.5L	18519.00	CY	37,739	1,925	7,933	0	47,596	2.57
06.03.73.03.23	Dredge Side Channel @ 132.2L								

		QUANTITY	UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
06.03.73.03.23. 1	Excavate, Load & Barge	37037.00	CY	31,854	1,625	6,696	0	40,175	1.08
06.03.73.03.23. 2	Unload in Disposal Area	44444.40	CY	38,225	1,949	8,035	0	48,210	1.08
06.03.73.03.23. 3	Mobilization	1.00	JOB	1,789	91	376	0	2,256	2256.21
06.03.73.03.23. 4	Demobilization	1.00	JOB	909	46	191	0	1,147	1146.92
	TOTAL Dredge Side Channel @ 132.2L	37037.00	CY	72,778	3,712	15,298	0	91,787	2.48
06.03.73.03.25	Silt Curtains								
06.03.73.03.25.06	Turbidity Barrier	1200.00	FT	16,790	856	3,529	0	21,176	17.65
	TOTAL Silt Curtains	1.00	JOB	16,790	856	3,529	0	21,176	21175.59
06.03.73.03.51	Long Term Management Features								
06.03.73.03.51.06	Bathymetry (LTM)	1.00	JOB	66,700	3,402	14,020	0	84,122	84122.04
06.03.73.03.51.07	Substrate Sampling (LTM)	1.00	JOB	20,000	1,020	4,204	0	25,224	25224.00
06.03.73.03.51.08	LIDAAR/GIS (LTM)	1.00	JOB	50,000	2,550	10,510	0	63,060	63060.00
06.03.73.03.51.09	Backwater Reevaluations (LTM)	1.00	JOB	26,700	1,362	5,612	0	33,674	33674.04
06.03.73.03.51.10	Diversity & Pres @ Trib Mout LTM	1.00	JOB	26,700	1,362	5,612	0	33,674	33674.04
06.03.73.03.51.11	Gravel Modl Sus. Substrates LTM	1.00	JOB	30,000	1,530	6,306	0	37,836	37836.00
06.03.73.03.51.12	Gravel Monitring Hab Qual LTM	1.00	JOB	97,500	4,972	20,495	0	122,967	122967.00
06.03.73.03.51.13	Fish Sampling (LTM)	1.00	JOB	100,000	5,100	21,020	0	126,120	126120.00
06.03.73.03.51.15	Water Quality Monitoring (LTM)	1.00	JOB	100,000	5,100	21,020	0	126,120	126120.00
06.03.73.03.51.16	Mussel Bed Monitoring (LTM)	1.00	JOB	250,000	12,750	52,550	0	315,300	315300.00
	TOTAL Long Term Management Features	1.00	EA	767,600	39,148	161,350	0	968,097	968097.12
06.03.73.03.52	Adaptive Management Features								
06.03.73.03.52.01	Backwaters & Trib Mouths Misc AM	1.00	JOB	166,700	8,502	35,040	0	210,242	210242.04
06.03.73.03.52.02	Gravel Bar Monitoring AM	1.00	JOB	125,000	6,375	26,275	0	157,650	157650.00
06.03.73.03.52.03	Dike Field Mods (AM)	1.00	JOB	100,000	5,100	21,020	0	126,120	126120.00
06.03.73.03.52.04	Mussel Bed Recolonization (AM)	1.00	JOB	100,000	5,100	21,020	0	126,120	126120.00
	TOTAL Adaptive Management Features	1.00	EA	491,700	25,077	103,355	0	620,132	620132.04
06.03.73.03.80	Bank Stab 143,7-144,2L - CG	85350.00	TON	1,045,538	53,322	274,715	0	1,373,575	16.09
06.03.73.03.81	Bank Stab 163.6-165.3L - CG	79110.00	TON	969,098	49,424	254,630	0	1,273,152	16.09
	TOTAL Reach 3 (NM 119.5 to NM 220.3)	1.00	EA	3,584,068	182,787	859,240	0	4,626,095	4626095
06.03.73.04	Reach 4 (NM 220.3 to NM 307.7)								
06.03.73.04.11	Tern Islnds from Dredge Material								
06.03.73.04.11.01	Dredge Material for Island	200000.00	CY	31,000	1,581	6,516	0	39,097	0.20

		QUANTITY	UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
06.03.73.04.11.06	Turbidity Barrier	3000.00	FT	4,609	235	969	0	5,813	1.94
06.03.73.04.11.11	Turbidity Barrier	3000.00	FT	6,945	354	1,460	0	8,759	2.92
	TOTAL Tern Islnds from Dredge Material	5600.00	SF	42,554	2,170	8,945	0	53,669	9.58
06.03.73.04.12	Notch Dikes								
06.03.73.04.12.01	Dike Notching	39.00	EA	22,471	1,146	4,723	0	28,341	726.68
	TOTAL Notch Dikes	39.00	EA	22,471	1,146	4,723	0	28,341	726.68
06.03.73.04.21	Dredge Side Channel @ 276.0R								
06.03.73.04.21. 1	Excavate, Load & Barge	37037.00	CY	31,854	1,625	6,696	0	40,175	1.08
06.03.73.04.21. 2	Unload in Disposal Area	44444.40	CY	38,225	1,949	8,035	0	48,210	1.08
06.03.73.04.21. 3	Mobilization	1.00	JOB	1,789	91	376	0	2,256	2256.21
06.03.73.04.21. 4	Demobilization	1.00	JOB	909	46	191	0	1,147	1146.92
	TOTAL Dredge Side Channel @ 276.0R	37037.00	CY	72,778	3,712	15,298	0	91,787	2.48
06.03.73.04.25	Silt Curtains								
06.03.73.04.25.06	Turbidity Barrier	400.00	FT	5,597	285	1,176	0	7,059	17.65
	TOTAL Silt Curtains	1.00	JOB	5,597	285	1,176	0	7,059	7058.52
06.03.73.04.51	Long Term Management Features								
06.03.73.04.51.06	Bathymetry (LTM)	1.00	JOB	66,700	3,402	14,020	0	84,122	84122.04
06.03.73.04.51.07	Substrate Sampling (LTM)	1.00	JOB	20,000	1,020	4,204	0	25,224	25224.00
06.03.73.04.51.08	LIDAAR/GIS (LTM)	1.00	JOB	50,000	2,550	10,510	0	63,060	63060.00
06.03.73.04.51.09	Backwater Reevaluations (LTM)	1.00	JOB	26,700	1,362	5,612	0	33,674	33674.04
06.03.73.04.51.10	Diversity & Pres @ Trib Mout LTM	1.00	JOB	26,700	1,362	5,612	0	33,674	33674.04
06.03.73.04.51.11	Gravel Modl Sus. Substrates LTM	1.00	JOB	30,000	1,530	6,306	0	37,836	37836.00
06.03.73.04.51.12	Gravel Monitring Hab Qual LTM	1.00	JOB	97,500	4,972	20,495	0	122,967	122967.00
06.03.73.04.51.13	Fish Sampling (LTM)	1.00	JOB	100,000	5,100	21,020	0	126,120	126120.00
06.03.73.04.51.15	Water Quality Monitoring (LTM)	1.00	JOB	100,000	5,100	21,020	0	126,120	126120.00
06.03.73.04.51.91	272.0R Boat Ramp - Concrete	5600.00	SF	53,966	2,752	11,344	0	68,062	12.15
06.03.73.04.51.92	272.0 R Boat Ramp - Clearing	1.00	AC	2,854	146	600	0	3,599	3599.24
06.03.73.04.51.93	272R Boat Ramp - Aggregate Base	184.80	SY	4,303	219	905	0	5,428	29.37
	TOTAL Long Term Management Features	1.00	EA	578,723	29,515	121,648	0	729,886	729885.51
06.03.73.04.52	Adaptive Management Features								
06.03.73.04.52.01	Backwaters & Trib Mouths Misc AM	1.00	JOB	166,700	8,502	35,040	0	210,242	210242.04

		QUANTITY	UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
06.03.73.04.52.02	Gravel Bar Monitoring AM	1.00	JOB	125,000	6,375	26,275	0	157,650	157650.00
06.03.73.04.52.03	Dike Field Mods (AM)	1.00	JOB	100,000	5,100	21,020	0	126,120	126120.00
06.03.73.04.52.04	Mussel Bed Recolonization (AM)	1.00	JOB	100,000	5,100	21,020	0	126,120	126120.00
	TOTAL Adaptive Management Features	1.00	EA	491,700	25,077	103,355	0	620,132	620132.04
06.03.73.04.63	8' Dia Gated Culvert @ 243.9L								
06.03.73.04.63. 1	Excavate, Load & Barge	12000.00	CY	10,321	526	2,169	0	13,017	1.08
06.03.73.04.63. 2	Unload in Disposal Area	14400.00	CY	12,385	632	2,603	0	15,620	1.08
06.03.73.04.63. 3	Mobilization	1.00	JOB	13,154	671	2,765	0	16,590	16589.77
06.03.73.04.63. 4	Demobilization	1.00	JOB	6,889	351	1,448	0	8,689	8688.79
06.03.73.04.63.11	Install 8' Dia Culvert	300.00	JOB	140,575	7,169	29,549	0	177,294	590.98
06.03.73.04.63.12	Backfill	10000.00	CY	63,456	3,236	13,338	0	80,030	8.00
06.03.73.04.63.13	Riprap Slope Protection	300.00	TON	7,162	365	1,506	0	9,033	30.11
	TOTAL 8' Dia Gated Culvert @ 243.9L	300.00	LF	253,943	12,951	53,379	0	320,272	1067.57
	TOTAL Reach 4 (NM 220.3 to NM 307.7)	1.00	EA	1,467,766	74,856	308,524	0	1,851,146	1851146
	TOTAL Habitat & Feeding Facilities	1.00	JOB	11,065,399	564,335	2,473,053	0	14,102,787	14102787
	TOTAL F & W Faclts & Sancturies Mitign	1.00	JOB	11,065,399	564,335	2,473,053	0	14,102,787	14102787
	TOTAL Fish and Wildlife Facilities	1.00	JOB	11,065,399	564,335	2,473,053	0	14,102,787	14102787
09	Channels and Canals								
09.01	Channels								
09.01.16	Pipeline Dredging								
09.01.16.01	Reach 1 (NM 0.0 to NM 75.2)	790615.00	CY	1,225,453	62,498	193,193	0	1,481,144	1.87
09.01.16.02	Reach 2 (NM 75.2 to NM 119.5)	98929.00	CY	153,340	7,820	24,174	0	185,334	1.87
09.01.16.03	Reach 3 (NM 119.5 to NM 220.3)	196478.00	CY	304,541	15,532	48,011	0	368,083	1.87
09.01.16.04	Reach 4 (NM 220.3 to NM 308.7)	378400.00	CY	586,520	29,913	92,465	0	708,897	1.87
	TOTAL Pipeline Dredging	1.00	EA	2,269,854	115,763	357,842	0	2,743,459	2743459
09.01.20	Disposal Areas								
09.01.20.01	Reach 1 (NM 0.0 to NM 75.2)								
09.01.20.01.01	Preparatory Work Area 1								
09.01.20.01.01.01	Clearing and Grubbing	100.00	ACR	211,300	10,776	44,415	0	266,492	2664.92
09.01.20.01.01.02	Strip Topsoil	161333.00	CY	65,794	3,356	13,830	0	82,980	0.51

		QUANTITY	UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
	TOTAL Preparatory Work Area 1	100.00	ACR	277,094	14,132	58,245	0	349,471	3494.71
09.01.20.01.02	Site Work - Area 1								
09.01.20.01.02.02	Dike Construction-Embankment	363902.00	CY	1,759,110	89,715	369,765	0	2,218,590	6.10
09.01.20.01.02.03	Dike Construction-Slope Stabilzt	1.00	CY	48,396	2,468	10,173	0	61,038	61037.55
09.01.20.01.02.04	Dike Construction-Control Str.	1.00	EA	42,175	2,151	8,865	0	53,191	53191.19
09.01.20.01.02.05	Dike Construction-Turfing	21.00	ACR	30,652	1,563	6,443	0	38,658	1840.87
	TOTAL Site Work - Area 1	1.00	EA	1,880,334	95,897	395,246	0	2,371,477	2371477
09.01.20.01.03	Preparatory Work Area 2								
09.01.20.01.03.01	Clearing and Grubbing	267.00	ACR	564,171	28,773	118,589	0	711,533	2664.92
09.01.20.01.03.02	Strip Topsoil	430760.00	CY	175,671	8,959	36,926	0	221,556	0.51
	TOTAL Preparatory Work Area 2	267.00	ACR	739,842	37,732	155,515	0	933,089	3494.71
09.01.20.01.04	Site Work - Area 2								
09.01.20.01.04.02	Dike Construction-Embankment	514624.00	CY	2,641,616	134,722	555,268	0	3,331,606	6.47
09.01.20.01.04.03	Dike Construction-Slope Stabilzt	1.00	JOB	67,798	3,458	14,251	0	85,507	85506.86
09.01.20.01.04.04	Dike Construction-Control Str.	1.00	EA	67,996	3,468	14,293	0	85,757	85757.10
09.01.20.01.04.05	Dike Construction-Turfing	29.00	ACR	42,329	2,159	8,898	0	53,385	1840.87
	TOTAL Site Work - Area 2	1.00	EA	2,819,740	143,807	592,709	0	3,556,256	3556256
09.01.20.01.06	Area 2 - Associated Items								
09.01.20.01.06.01	Pump Station 13,000 gpm	1.00	EA	731,079	37,285	153,673	0	922,037	922037.03
09.01.20.01.06.02	Pump Station Suction Piping	1.00	EA	97,186	4,956	20,428	0	122,571	122570.67
09.01.20.01.06.04	Pump Station Disch Piping-24"	550.00	LF	127,136	6,484	26,724	0	160,344	291.53
09.01.20.01.06.05	Disch Piping-24" Trenching	550.00	LF	15,250	778	3,206	0	19,233	34.97
09.01.20.01.06.10	Pump Station Electrical Controls	1.00	EA	74,026	3,775	15,560	0	93,362	93361.79
09.01.20.01.06.20	Pump Station Elect OH Line	5280.00	LF	60,026	3,061	12,617	0	75,705	14.34
09.01.20.01.06.25	Pump Station Elect Transformer	300.00	KVA	14,217	725	2,988	0	17,930	59.77
09.01.20.01.06.30	Pump Station Concrete Platform	1.00	EA	1,885	96	396	0	2,377	2377.31
	TOTAL Area 2 - Associated Items	1.00	EA	1,120,804	57,161	235,593	0	1,413,558	1413558
	TOTAL Reach 1 (NM 0.0 to NM 75.2)	1.00	EA	6,837,814	348,728	1,437,308	0	8,623,850	8623850
09.01.20.04	Reach 4 (NM 220.3 to NM 307.7)								
	TOTAL Disposal Areas	1.00	EA	6,837,814	348,728	1,437,308	0	8,623,850	8623850

	QUANTITY	UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
09.01.30 Bank Stablztion, Dikes & Jetties								
09.01.30.01 Reach 1 (NM 0.0 to NM 75.2)								
09.01.30.01.01 Bank Stabilization Measures - CG	466613.00	TON	5,716,009	291,516	1,501,881	0	7,509,407	16.09
TOTAL Reach 1 (NM 0.0 to NM 75.2)	466613.00	TON	5,716,009	291,516	1,501,881	0	7,509,407	16.09
09.01.30.02 Reach 2 (NM 75.5 to NM 119.5)								
09.01.30.02.01 Bank Stabilization Measures- CG	222667.00	TON	2,727,671	139,111	716,695	0	3,583,477	16.09
TOTAL Reach 2 (NM 75.5 to NM 119.5)	222667.00	TON	2,727,671	139,111	716,695	0	3,583,477	16.09
09.01.30.03 Reach 3 (NM 119.5 to NM 220.3)								
09.01.30.03.01 Bank Stabilization Measures -CG	124763.00	TON	1,653,110	84,309	434,355	0	2,171,773	17.41
TOTAL Reach 3 (NM 119.5 to NM 220.3)	124763.00	TON	1,653,110	84,309	434,355	0	2,171,773	17.41
09.01.30.04 Reach 4 (NM 220.3 to NM 307.7)								
09.01.30.04.01 Bank Stabilization Measures- CG	347183.00	TON	4,600,175	234,609	1,208,696	0	6,043,480	17.41
TOTAL Reach 4 (NM 220.3 to NM 307.7)	347183.00	TON	4,600,175	234,609	1,208,696	0	6,043,480	17.41
TOTAL Bank Stablztion, Dikes & Jetties	1.00	JOB	14,696,965	749,545	3,861,627	0	19,308,137	19308137
TOTAL Channels	1.00	EA	23,804,632	1,214,036	5,656,778	0	30,675,447	30675447
TOTAL Channels and Canals	1.00	EA	23,804,632	1,214,036	5,656,778	0	30,675,447	30675447
12 Navigation, Ports & Harbors (NF)								
12.01 Ports								
12.01.15 Mechanical Dredging								
12.01.15.02 Reach 2 (NM 75.2 to NM 119.5)								
TOTAL Reach 2 (NM 75.2 to NM 119.5)								
12.01.15.03 Reach 3 (NM 119.5 to NM 220.3)								
12.01.15.03.10 Dredged Fill								

		QUANTITY	UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
12.01.15.03.10. 1	Excavate, Load & Barge	2370.00	CY	2,038	104	428	0	2,571	1.08
12.01.15.03.10. 2	Unload in Disposal Area	2370.00	CY	2,038	104	428	0	2,571	1.08
12.01.15.03.10. 3	Mobilization	1.00	JOB	8,945	456	1,880	0	11,281	11281.05
12.01.15.03.10. 4	Demobilization	1.00	JOB	4,547	232	956	0	5,735	5734.61
	TOTAL Dredged Fill	2370.00	CY	17,568	896	3,693	0	22,157	9.35
	TOTAL Reach 3 (NM 119.5 to NM 220.3)	2370.00	CY	17,568	896	3,693	0	22,157	9.35
12.01.15.04	Reach 4 (NM 220.3 to NM 308.7)								
	TOTAL Mechanical Dredging	1.00	JOB	17,568	896	3,693	0	22,157	22157.22
12.01.16	Pipeline Dredging								
12.01.16.04	Reach 4 (NM 220.3 to NM 308.7)								
	TOTAL Ports	1.00	EA	17,568	896	3,693	0	22,157	22157.22
12.02	Harbors								
12.02.16	Pipeline Dredging								
12.02.16.04	Reach 4 (NM 220.3 to NM 308.7)								
	TOTAL Navigation, Ports & Harbors (NF)	1.00	EA	17,568	896	3,693	0	22,157	22157.22
18	Cultural Resource Preservation								
18.00	Cultural Resource Preservation								
18.00.86	Identification, Data Analysis								
18.00.86.01	Reach 1 (NM 0 - 75.2)								
18.00.86.01.55	Cultural/Archaelogical Surveys								
18.00.86.01.55.01	Cultural/Archaelogical Surveys	1.00	JOB	150,000	7,650	31,530	0	189,180	189180.00
	TOTAL Cultural/Archaelogical Surveys	1.00	JOB	150,000	7,650	31,530	0	189,180	189180.00
	TOTAL Reach 1 (NM 0 - 75.2)	1.00	JOB	150,000	7,650	31,530	0	189,180	189180.00
18.00.86.02	Reach 2 (NM 75.2 - 119.5)								
18.00.86.02.55	Cultural/Archaelogical Surveys								

	QUANTITY	UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
18.00.86.02.55.01 Cultural/Archaelogical Surveys	1.00	JOB	50,000	2,550	10,510	0	63,060	63060.00
TOTAL Cultural/Archaelogical Surveys	1.00	JOB	50,000	2,550	10,510	0	63,060	63060.00
TOTAL Reach 2 (NM 75.2 - 119.5)	1.00	JOB	50,000	2,550	10,510	0	63,060	63060.00
18.00.86.03 Reach 3 (NM 119.5 - 220.3)								
18.00.86.03.55 Cultural/Archaelogical Surveys								
18.00.86.04 Reach 3 (NM 220.3 - 308.7)								
18.00.86.04.55 Cultural/Archaelogical Surveys								
TOTAL Identification, Data Analysis	1.00	JOB	200,000	10,200	42,040	0	252,240	252240.00
TOTAL Cultural Resource Preservation	1.00	JOB	200,000	10,200	42,040	0	252,240	252240.00
TOTAL Cultural Resource Preservation	1.00	JOB	200,000	10,200	42,040	0	252,240	252240.00
30 Planning, Engineering & Design								
30.20 Project Design Memorandum								
30.20.01 PED								
30.20.01.01 Reach 1 (NM 0.0 to NM 75.2)								
30.20.01.01.01 Surveys&Mapp'g Except Real Estat								
30.20.01.01.01.02 Other Design Costs - Surveys	1.00	JOB	86,000	4,386	18,077	0	108,463	108463.20
TOTAL Surveys&Mapp'g Except Real Estat	1.00	EA	86,000	4,386	18,077	0	108,463	108463.20
30.20.01.01.03 Hydrology and Hydraulic Studies								
30.20.01.01.03.01 H&H - Verify Structure Design			153,750	7,841	32,318	0	193,910	
30.20.01.01.03.02 H&H - Sedimentation Modeling			58,333	2,975	12,262	0	73,570	
30.20.01.01.03.04 Nav Conditions Physical Model			500,000	25,500	105,100	0	630,600	
30.20.01.01.03.05 Lock Structure/Barge Collision			21,000	1,071	4,414	0	26,485	
30.20.01.01.03.06 SWL H&H Support of Studies			73,750	3,761	15,502	0	93,014	
TOTAL Hydrology and Hydraulic Studies	1.00	EA	806,833	41,148	169,596	0	1,017,578	1017578
30.20.01.01.07 PED	1.00	JOB	1,230,000	62,730	258,546	0	1,551,276	1551276
TOTAL Reach 1 (NM 0.0 to NM 75.2)	1.00	EA	2,122,833	108,264	446,219	0	2,677,317	2677317

	QUANTITY	UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
30.20.01.02 Reach 2 (NM 75.5 to 119.5)								
30.20.01.02.02 Survey Cost								
30.20.01.02.02.01 Survey Cost	1.00	EA	35,000	1,785	7,357	0	44,142	44142.00
TOTAL Survey Cost	1.00	EA	35,000	1,785	7,357	0	44,142	44142.00
30.20.01.02.03 Hydrology and Hydraulic Studies								
30.20.01.02.03.01 H&H - Verify Structure Design			311,250	15,874	65,425	0	392,549	
30.20.01.02.03.02 H&H - Sedimentation Modeling			58,333	2,975	12,262	0	73,570	
30.20.01.02.03.05 Lock Structure/Barge Collision			21,000	1,071	4,414	0	26,485	
30.20.01.02.03.06 SWL H&H Support of Studies			73,750	3,761	15,502	0	93,014	
TOTAL Hydrology and Hydraulic Studies	1.00	EA	464,333	23,681	97,603	0	585,617	585616.78
30.20.01.02.07 PED	1.00	JOB	336,150	17,144	70,659	0	423,952	423952.38
TOTAL Reach 2 (NM 75.5 to 119.5)	1.00	EA	835,483	42,610	175,619	0	1,053,711	1053711
30.20.01.03 Reach 3 (NM 119.5 to NM 220.3)								
30.20.01.03.02 Survey Cost								
30.20.01.03.02.01 Survey Cost	1.00	EA	65,000	3,315	13,663	0	81,978	81978.00
TOTAL Survey Cost	1.00	EA	65,000	3,315	13,663	0	81,978	81978.00
30.20.01.03.03 Hydrology and Hydraulic Studies								
30.20.01.03.03.01 H&H - Verify Structure Design			323,000	16,473	67,895	0	407,368	
30.20.01.03.03.02 H&H - Sedimentation Modeling			133,333	6,800	28,027	0	168,160	
30.20.01.03.03.05 Lock Structure/Barge Collision			21,000	1,071	4,414	0	26,485	
30.20.01.03.03.06 SWL H&H Support of Studies			73,750	3,761	15,502	0	93,014	
TOTAL Hydrology and Hydraulic Studies	1.00	EA	551,083	28,105	115,838	0	695,026	695025.88
30.20.01.03.07 PED	1.00	JOB	353,623	18,035	74,332	0	445,989	445989.33
TOTAL Reach 3 (NM 119.5 to NM 220.3)	1.00	EA	969,706	49,455	203,832	0	1,222,993	1222993
30.20.01.04 Reach 4 (NM 220.3 to NM 308.7)								
30.20.01.04.02 Survey Cost								

	QUANTITY	UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
30.20.01.04.02.01 Survey Cost	1.00	EA	35,000	1,785	7,357	0	44,142	44142.00
TOTAL Survey Cost	1.00	EA	35,000	1,785	7,357	0	44,142	44142.00
30.20.01.04.03 Hydrology and Hydraulic Studies								
30.20.01.04.03.01 H&H - Verify Structure Design			165,500	8,440	34,788	0	208,729	
30.20.01.04.03.02 H&H - Sedimentation Modeling			58,333	2,975	12,262	0	73,570	
30.20.01.04.03.03 H&H - Lock Operation Proced. Mod			82,000	4,182	17,236	0	103,418	
30.20.01.04.03.05 Lock Structure/Barge Collision			21,000	1,071	4,414	0	26,485	
30.20.01.04.03.06 SWL H&H Support of Studies			73,750	3,761	15,502	0	93,014	
TOTAL Hydrology and Hydraulic Studies	1.00	EA	400,583	20,430	84,203	0	505,215	505215.28
30.20.01.04.07 PED	1.00	JOB	395,162	20,153	83,063	0	498,378	498378.31
TOTAL Reach 4 (NM 220.3 to NM 308.7)	1.00	EA	830,745	42,368	174,623	0	1,047,736	1047736
TOTAL PED	1.00	JOB	4,758,767	242,697	1,000,293	0	6,001,757	6001757
TOTAL Project Design Memorandum	1.00	JOB	4,758,767	242,697	1,000,293	0	6,001,757	6001757
TOTAL Planning, Engineering & Design	1.00	JOB	4,758,767	242,697	1,000,293	0	6,001,757	6001757
31 Construction Management								
31.23 Construction Contracts								
31.23.11 Supervision and Administration								
31.23.11.01 Reach 1 (NM 0.0 to NM 75.2)								
31.23.11.01.01 Prjt Office Supervn and Adminstn	1.00	JOB	1,320,000	67,320	277,464	0	1,664,784	1664784
TOTAL Reach 1 (NM 0.0 to NM 75.2)			1,320,000	67,320	277,464	0	1,664,784	
31.23.11.02 Reach 2 (NM 75.5 to NM 119.5)								
31.23.11.02.01 Prjt Office Supervn and Adminstn	1.00	JOB	360,160	18,368	75,706	0	454,234	454233.79
TOTAL Reach 2 (NM 75.5 to NM 119.5)			360,160	18,368	75,706	0	454,234	
31.23.11.03 Reach 3 (NM 119.5 to NM 220.3)								
31.23.11.03.01 Prjt Office Supervn and Adminstn	1.00	JOB	378,882	19,323	79,641	0	477,846	477845.98
TOTAL Reach 3 (NM 119.5 to NM 220.3)			378,882	19,323	79,641	0	477,846	

		QUANTITY	UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
31.23.11.04	Reach 4 (NM 220.3 to NM 308.7)								
31.23.11.04.01	Prjt Office Supervn and Adminstn	1.00	JOB	423,387	21,593	88,996	0	533,976	533975.68
	TOTAL Reach 4 (NM 220.3 to NM 308.7)			423,387	21,593	88,996	0	533,976	
	TOTAL Supervision and Administration	1.00	JOB	2,482,429	126,604	521,807	0	3,130,839	3130839
	TOTAL Construction Contracts	1.00	JOB	2,482,429	126,604	521,807	0	3,130,839	3130839
	TOTAL Construction Management	1.00	JOB	2,482,429	126,604	521,807	0	3,130,839	3130839
	TOTAL Feasibility Cost Es - 1 FT Lower	1.00	EA	46,497,245	2,324,276	10,673,520	0	59,495,041	59495041

	QUANTITY	UOM	CONTRACT	CONTINGN	Constnt$	PROJECT
01 Reach 1 (NM 0.0 to NM 75.2)						
01. 01 Lands and Damages						
01. 01.23 Construction Documents						
01. 01.23.03 Real Estate Analysis Documents						
01. 01.23.03.02 Real Estate Acquisition Document	1.00	JOB	150,000	30,000	180,000	180,000
01. 01.23.03.03 Real Estate Condemntn Documents	1.00	JOB	8,000	1,600	9,600	9,600
01. 01.23.03.05 Real Estate Appraisal Documents	1.00	JOB	8,400	1,680	10,080	10,080
01. 01.23.03.06 Real Estate PL 94-646 Asst. Docs	1.00	JOB	800	160	960	960
01. 01.23.03.15 Real Estate Payment Documents	1.00	JOB	756,000	151,120	907,120	907,120
01. 01.23.03 Real Estate Analysis Documents	1.00	JOB	923,200	184,560	1,107,760	1,107,760
01. 01.23 Construction Documents	1.00	JOB	923,200	184,560	1,107,760	1,107,760
01. 01 Lands and Damages	1.00	JOB	923,200	184,560	1,107,760	1,107,760
01. 02 Relocations						
01. 02.01 Roads						
01. 02.01.01 Roads						
01. 02.01.01.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
01. 02.01.01 Roads	1.00	EA	0	0	0	0
01. 02.01 Roads	1.00	EA	0	0	0	0
01. 02.02 Railroads						
01. 02.02.07 Bridges						
01. 02.02.07.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
01. 02.02.07 Bridges	1.00	EA	0	0	0	0
01. 02.02 Railroads	1.00	EA	0	0	0	0
01. 02.03 Utilities						
01. 02.03.01 Pipelines						
01. 02.03.01.51 Demo Pipeline TX East #64-1 (6)	2200.00	FT	1,168,276	245,572	1,413,847	1,473,430
01. 02.03.01 Pipelines	1.00	EA	1,168,276	245,572	1,413,847	1,473,430
01. 02.03.02 Electric Lines						
01. 02.03.02.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
01. 02.03.02 Electric Lines	1.00	EA	0	0	0	0
01. 02.03 Utilities	1.00	EA	1,168,276	245,572	1,413,847	1,473,430

	QUANTITY	UOM	CONTRACT	CONTINGN	Constnt$	PROJECT
01. 02 Relocations	1.00	EA	1,168,276	245,572	1,413,847	1,473,430
01. 05 Locks						
01. 05.62 Approach Walls, Upper & Lower						
01. 05.62.05 Metals						
01. 05.62.05.10 Pinning Guidewalls	1.00	JOB	1,384,649	363,817	1,748,466	1,819,083
01. 05.62.05 Metals	1.00	LS	1,384,649	363,817	1,748,466	1,819,083
01. 05.62 Approach Walls, Upper & Lower	1.00	LS	1,384,649	363,817	1,748,466	1,819,083
01. 05 Locks	1.00	EA	1,384,649	363,817	1,748,466	1,819,083
01. 06 Fish and Wildlife Facilities						
01. 06.03 F & W Faclts & Sancturies Mitign						
01. 06.03.73 Habitat & Feeding Facilities						
01. 06.03.73.10 Boat Ramp at Lower Merrisach	5600.00	SF	0	0	0	0
01. 06.03.73.11 Tern Island from Dredge Material	5600.00	SF	152,589	32,074	184,663	192,445
01. 06.03.73.12 Notch Dikes	46.00	EA	26,505	5,571	32,076	33,427
01. 06.03.73.13 Dredge Coal Pile Entrance Channl	74074.00	CY	153,650	32,297	185,948	193,784
01. 06.03.73.14 Dredge Side Channels @ 44.6 (2)	92593.00	CY	188,691	39,663	228,354	237,977
01. 06.03.73.15 Dredge Side Channel @ 70.6 R	33333.00	CY	69,817	14,675	84,492	88,053
01. 06.03.73.16 Dredge Side Channel @ 71.3L	118518.00	CY	237,745	49,974	287,719	299,844
01. 06.03.73.17 Dredge Side Channels @ 32.2	9259.00	CY	31,011	6,519	37,530	39,111
01. 06.03.73.18 Dredge Side Channels @ 50.9L	18518.00	CY	48,530	10,201	58,732	61,207
01. 06.03.73.21 5' Dia Gated Culvert @ 15.3 R	250.00	LF	282,777	59,440	342,217	356,639
01. 06.03.73.25 Silt Curtains	1.00	JOB	33,580	7,059	40,639	42,351
01. 06.03.73.50 Long Term Management Features	1.00	EA	1,066,223	224,120	1,290,343	1,344,721
01. 06.03.73.51 Adaptive Management Features	1.00	EA	366,700	77,080	443,780	462,482
01. 06.03.73.60 Mussel Mitigation NM 10.5-19.0	1.00	JOB	1,095,814	230,340	1,326,154	1,382,041
01. 06.03.73.65 Mussel Mitigation NM 19.0-75.2	1.00	JOB	5,000	1,051	6,051	6,306
01. 06.03.73.70 Endangered Species Surveys	1.00	JOB	0	0	0	0
01. 06.03.73 Habitat & Feeding Facilities	1.00	JOB	3,758,633	790,065	4,548,697	4,740,388
01. 06.03 F & W Faclts & Sancturies Mitign	1.00	JOB	3,758,633	790,065	4,548,697	4,740,388
01. 06 Fish and Wildlife Facilities	1.00	JOB	3,758,633	790,065	4,548,697	4,740,388
01. 09 Channels and Canals						
01. 09.01 Channels						
01. 09.01.16 Pipeline Dredging						
01. 09.01.16.00 <<< Not Identified >>>	1.00	EA	1,225,453	193,193	1,418,646	1,481,144
01. 09.01.16 Pipeline Dredging	1.00	EA	1,225,453	193,193	1,418,646	1,481,144

	QUANTITY	UOM	CONTRACT	CONTINGN	Constnt$	PROJECT
01. 09.01.20 Disposal Areas						
01. 09.01.20.01 Preparatory Work Area 1	100.00	ACR	277,094	58,245	335,339	349,471
01. 09.01.20.02 Site Work - Area 1	1.00	EA	1,880,334	395,246	2,275,580	2,371,477
01. 09.01.20.03 Preparatory Work Area 2	267.00	ACR	739,842	155,515	895,357	933,089
01. 09.01.20.04 Site Work - Area 2	1.00	EA	2,819,740	592,709	3,412,449	3,556,256
01. 09.01.20.06 Area 2 - Associated Items	1.00	EA	1,120,804	235,593	1,356,397	1,413,558
01. 09.01.20 Disposal Areas	1.00	EA	6,837,814	1,437,308	8,275,122	8,623,850
01. 09.01.30 Bank Stablztion, Dikes & Jetties						
01. 09.01.30.01 Bank Stabilization Measures - CG	466613.00	TON	5,716,009	1,501,881	7,217,891	7,509,407
01. 09.01.30 Bank Stablztion, Dikes & Jetties	1.00	JOB	5,716,009	1,501,881	7,217,891	7,509,407
01. 09.01 Channels	1.00	EA	13,779,276	3,132,383	16,911,659	17,614,402
01. 09 Channels and Canals	1.00	EA	13,779,276	3,132,383	16,911,659	17,614,402
01. 12 Navigation, Ports & Harbors (NF)						
01. 12.01 Ports						
01. 12.01.15 Mechanical Dredging						
01. 12.01.15.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
01. 12.01.15 Mechanical Dredging	1.00	JOB	0	0	0	0
01. 12.01.16 Pipeline Dredging						
01. 12.01.16.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
01. 12.01.16 Pipeline Dredging	1.00	EA	0	0	0	0
01. 12.01 Ports	1.00	EA	0	0	0	0
01. 12.02 Harbors						
01. 12.02.16 Pipeline Dredging						
01. 12.02.16.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
01. 12.02.16 Pipeline Dredging	1.00	EA	0	0	0	0
01. 12.02 Harbors	1.00	EA	0	0	0	0
01. 12 Navigation, Ports & Harbors (NF)	1.00	EA	0	0	0	0
01. 18 Cultural Resource Preservation						
01. 18.00 Cultural Resource Preservation						
01. 18.00.86 Identification, Data Analysis						

	QUANTITY	UOM	CONTRACT	CONTINGN	Constnt$	PROJECT
01. 18.00.86.55 Cultural/Archaelogical Surveys	1.00	JOB	150,000	31,530	181,530	189,180
01. 18.00.86 Identification, Data Analysis	1.00	JOB	150,000	31,530	181,530	189,180
01. 18.00 Cultural Resource Preservation	1.00	JOB	150,000	31,530	181,530	189,180
01. 18 Cultural Resource Preservation	1.00	JOB	150,000	31,530	181,530	189,180
01. 30 Planning, Engineering & Design						
01. 30.20 Project Design Memorandum						
01. 30.20.01 PED						
01. 30.20.01.01 Surveys&Mapp'g Except Real Estat	1.00	EA	86,000	18,077	104,077	108,463
01. 30.20.01.03 Hydrology and Hydraulic Studies	1.00	EA	806,833	169,596	976,429	1,017,578
01. 30.20.01.07 PED	1.00	JOB	1,230,000	258,546	1,488,546	1,551,276
01. 30.20.01 PED	1.00	JOB	2,122,833	446,219	2,569,052	2,677,317
01. 30.20 Project Design Memorandum	1.00	JOB	2,122,833	446,219	2,569,052	2,677,317
01. 30 Planning, Engineering & Design	1.00	JOB	2,122,833	446,219	2,569,052	2,677,317
01. 31 Construction Management						
01. 31.23 Construction Contracts						
01. 31.23.11 Supervision and Administration						
01. 31.23.11.01 Prjt Office Supervn and Adminstn	1.00	JOB	1,320,000	277,464	1,597,464	1,664,784
01. 31.23.11 Supervision and Administration	1.00	JOB	1,320,000	277,464	1,597,464	1,664,784
01. 31.23 Construction Contracts	1.00	JOB	1,320,000	277,464	1,597,464	1,664,784
01. 31 Construction Management	1.00	JOB	1,320,000	277,464	1,597,464	1,664,784
01 Reach 1 (NM 0.0 to NM 75.2)	1.00	EA	24,606,867	5,471,609	30,078,476	31,286,343
02 Reach 2 (NM 75.5 to NM 119.5)						
02. 01 Lands and Damages						
02. 01.23 Construction Documents						
02. 01.23.03 Real Estate Analysis Documents						
02. 01.23.03.02 Real Estate Acquisition Document	1.00	JOB	0	0	0	0
02. 01.23.03.05 Real Estate Appraisal Documents	1.00	JOB	0	0	0	0
02. 01.23.03.15 Real Estate Land Payments	1.00	JOB	0	0	0	0
02. 01.23.03 Real Estate Analysis Documents	1.00	JOB	0	0	0	0

	QUANTITY	UOM	CONTRACT	CONTINGN	Constnt$	PROJECT
02. 01.23 Construction Documents	1.00	JOB	0	0	0	0
02. 01 Lands and Damages	1.00	JOB	0	0	0	0
02. 02 Relocations						
02. 02.01 Roads						
02. 02.01.01 Roads						
02. 02.01.01.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
02. 02.01.01 Roads	1.00	EA	0	0	0	0
02. 02.01 Roads	1.00	EA	0	0	0	0
02. 02.02 Railroads						
02. 02.02.07 Bridges						
02. 02.02.07.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
02. 02.02.07 Bridges	1.00	EA	0	0	0	0
02. 02.02 Railroads	1.00	EA	0	0	0	0
02. 02.03 Utilities						
02. 02.03.01 Pipelines						
02. 02.03.01.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
02. 02.03.01 Pipelines	1.00	EA	0	0	0	0
02. 02.03.02 Electric Lines						
02. 02.03.02.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
02. 02.03.02 Electric Lines	1.00	EA	0	0	0	0
02. 02.03 Utilities	1.00	EA	0	0	0	0
02. 02 Relocations	1.00	EA	0	0	0	0
02. 05 Locks						
02. 05.62 Approach Walls, Upper & Lower						
02. 05.62.05 Metals						
02. 05.62.05.10 Pinning Guidewalls	1.00	JOB	346,162	90,954	437,116	454,771
02. 05.62.05 Metals	1.00	LS	346,162	90,954	437,116	454,771
02. 05.62 Approach Walls, Upper & Lower	1.00	LS	346,162	90,954	437,116	454,771

	QUANTITY	UOM	CONTRACT	CONTINGN	Constnt$	PROJECT
02. 05 Locks	1.00	EA	346,162	90,954	437,116	454,771
02. 06 Fish and Wildlife Facilities						
02. 06.03 F & W Faclts & Sancturies Mitign						
02. 06.03.73 Habitat & Feeding Facilities						
02. 06.03.73.10 Boat Ramp at NM 85.9	5600.00	SF	0	0	0	0
02. 06.03.73.11 Tern Island from Dredge Material	5600.00	SF	72,975	15,339	88,314	92,036
02. 06.03.73.12 Notch Dikes	47.00	EA	27,081	5,692	32,773	34,154
02. 06.03.73.21 Dredge Side Channel @ 75.3L	5556.00	CY	13,211	2,777	15,988	16,662
02. 06.03.73.22 Dredge Side Channel @ 78.7L	5556.00	CY	24,004	5,046	29,050	30,274
02. 06.03.73.23 Dredge Side Channel @ 82.6L	5556.00	CY	13,211	2,777	15,988	16,662
02. 06.03.73.24 Dredge Side Channel @ 92.6L	3333.00	CY	13,052	2,744	15,796	16,462
02. 06.03.73.25 Dredge Side Channel @ 116.2R	37037.00	CY	0	0	0	0
02. 06.03.73.26 Silt Curtains	2400.00	FT	33,580	7,059	40,639	42,351
02. 06.03.73.27 Dredge Side Channel @ 88.2R	37037.00	CY	76,825	16,149	92,974	96,892
02. 06.03.73.51 Long Term Management Features	1.00	EA	451,223	94,847	546,070	569,083
02. 06.03.73.52 Adaptive Management Features	1.00	EA	366,700	77,080	443,780	462,482
02. 06.03.73.63 8' Dia Gated Culvert @ 110.4L	300.00	LF	253,943	53,379	307,321	320,272
02. 06.03.73.64 8' Dia Gated Culvert @ 110.4R	60.00	LF	124,404	26,150	150,554	156,898
02. 06.03.73.80 Bank Stab @ 91.5 - CG	64059.00	TON	784,723	206,186	990,909	1,030,930
02. 06.03.73 Habitat & Feeding Facilities	1.00	JOB	2,254,933	515,224	2,770,157	2,885,158
02. 06.03 F & W Faclts & Sancturies Mitign	1.00	JOB	2,254,933	515,224	2,770,157	2,885,158
02. 06 Fish and Wildlife Facilities	1.00	JOB	2,254,933	515,224	2,770,157	2,885,158
02. 09 Channels and Canals						
02. 09.01 Channels						
02. 09.01.16 Pipeline Dredging						
02. 09.01.16.00 <<< Not Identified >>>	1.00	EA	153,340	24,174	177,514	185,334
02. 09.01.16 Pipeline Dredging	1.00	EA	153,340	24,174	177,514	185,334
02. 09.01.20 Disposal Areas						
02. 09.01.20.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
02. 09.01.20 Disposal Areas	1.00	EA	0	0	0	0
02. 09.01.30 Bank Stablztion, Dikes & Jetties						
02. 09.01.30.01 Bank Stabilization Measures- CG	222667.00	TON	2,727,671	716,695	3,444,366	3,583,477
02. 09.01.30 Bank Stablztion, Dikes & Jetties	1.00	JOB	2,727,671	716,695	3,444,366	3,583,477
02. 09.01 Channels	1.00	EA	2,881,011	740,870	3,621,880	3,768,812

	QUANTITY	UOM	CONTRACT	CONTINGN	Constnt$	PROJECT
02. 09 Channels and Canals	1.00	EA	2,881,011	740,870	3,621,880	3,768,812
02. 12 Navigation, Ports & Harbors (NF)						
02. 12.01 Ports						
02. 12.01.15 Mechanical Dredging						
02. 12.01.15.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
02. 12.01.15 Mechanical Dredging	1.00	JOB	0	0	0	0
02. 12.01.16 Pipeline Dredging						
02. 12.01.16.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
02. 12.01.16 Pipeline Dredging	1.00	EA	0	0	0	0
02. 12.01 Ports	1.00	EA	0	0	0	0
02. 12.02 Harbors						
02. 12.02.16 Pipeline Dredging						
02. 12.02.16.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
02. 12.02.16 Pipeline Dredging	1.00	EA	0	0	0	0
02. 12.02 Harbors	1.00	EA	0	0	0	0
02. 12 Navigation, Ports & Harbors (NF)	1.00	EA	0	0	0	0
02. 18 Cultural Resource Preservation						
02. 18.00 Cultural Resource Preservation						
02. 18.00.86 Identification, Data Analysis						
02. 18.00.86.55 Cultural/Archaelogical Surveys	1.00	JOB	50,000	10,510	60,510	63,060
02. 18.00.86 Identification, Data Analysis	1.00	JOB	50,000	10,510	60,510	63,060
02. 18.00 Cultural Resource Preservation	1.00	JOB	50,000	10,510	60,510	63,060
02. 18 Cultural Resource Preservation	1.00	JOB	50,000	10,510	60,510	63,060
02. 30 Planning, Engineering & Design						
02. 30.20 Project Design Memorandum						
02. 30.20.01 PED						
02. 30.20.01.02 Survey Cost	1.00	EA	35,000	7,357	42,357	44,142
02. 30.20.01.03 Hydrology and Hydraulic Studies	1.00	EA	464,333	97,603	561,936	585,617
02. 30.20.01.07 PED	1.00	JOB	336,150	70,659	406,809	423,952
02. 30.20.01 PED	1.00	JOB	835,483	175,619	1,011,102	1,053,711

	QUANTITY	UOM	CONTRACT	CONTINGN	Constnt$	PROJECT
02. 30.20 Project Design Memorandum	1.00	JOB	835,483	175,619	1,011,102	1,053,711
02. 30 Planning, Engineering & Design	1.00	JOB	835,483	175,619	1,011,102	1,053,711
02. 31 Construction Management						
02. 31.23 Construction Contracts						
02. 31.23.11 Supervision and Administration						
02. 31.23.11.01 Prjt Office Supervn and Adminstn	1.00	JOB	360,160	75,706	435,866	454,234
02. 31.23.11 Supervision and Administration	1.00	JOB	360,160	75,706	435,866	454,234
02. 31.23 Construction Contracts	1.00	JOB	360,160	75,706	435,866	454,234
02. 31 Construction Management	1.00	JOB	360,160	75,706	435,866	454,234
02 Reach 2 (NM 75.5 to NM 119.5)	1.00	EA	6,727,749	1,608,882	8,336,630	8,679,746
03 Reach 3 (NM 119.5 to NM 220.3)						
03. 01 Lands and Damages						
03. 01.23 Construction Documents						
03. 01.23.03 Real Estate Analysis Documents						
03. 01.23.03.02 Real Estate Acquisition Document	1.00	JOB	0	0	0	0
03. 01.23.03.05 Real Estate Appraisal Documents	1.00	JOB	0	0	0	0
03. 01.23.03.15 Real Estate Land Payments	1.00	JOB	0	0	0	0
03. 01.23.03 Real Estate Analysis Documents	1.00	JOB	0	0	0	0
03. 01.23 Construction Documents	1.00	JOB	0	0	0	0
03. 01 Lands and Damages	1.00	JOB	0	0	0	0
03. 02 Relocations						
03. 02.01 Roads						
03. 02.01.01 Roads						
03. 02.01.01.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
03. 02.01.01 Roads	1.00	EA	0	0	0	0
03. 02.01 Roads	1.00	EA	0	0	0	0
03. 02.02 Railroads						
03. 02.02.07 Bridges						

	QUANTITY	UOM	CONTRACT	CONTINGN	Constnt$	PROJECT
03. 02.02.07.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
03. 02.02.07 Bridges	1.00	EA	0	0	0	0
03. 02.02 Railroads	1.00	EA	0	0	0	0
03. 02.03 Utilities						
03. 02.03.01 Pipelines						
03. 02.03.01.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
03. 02.03.01 Pipelines	1.00	EA	0	0	0	0
03. 02.03.02 Electric Lines						
03. 02.03.02.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
03. 02.03.02 Electric Lines	1.00	EA	0	0	0	0
03. 02.03 Utilities	1.00	EA	0	0	0	0
03. 02 Relocations	1.00	EA	0	0	0	0
03. 05 Locks						
03. 05.62 Approach Walls, Upper & Lower						
03. 05.62.05 Metals						
03. 05.62.05.10 Pinning Guidewalls	1.00	JOB	346,162	90,954	437,116	454,771
03. 05.62.05 Metals	1.00	LS	346,162	90,954	437,116	454,771
03. 05.62 Approach Walls, Upper & Lower	1.00	LS	346,162	90,954	437,116	454,771
03. 05 Locks	1.00	EA	346,162	90,954	437,116	454,771
03. 06 Fish and Wildlife Facilities						
03. 06.03 F & W Faclts & Sancturies Mitign						
03. 06.03.73 Habitat & Feeding Facilities						
03. 06.03.73.11 Tern Island from Dredge Material	5600.00	SF	72,975	15,339	88,314	92,036
03. 06.03.73.12 Notch Dikes	64.00	EA	36,876	7,751	44,627	46,508
03. 06.03.73.15 Elevated Shore Line @Sweetin Isl	5600.00	SF	72,975	15,339	88,314	92,036
03. 06.03.73.21 Dredge Side Channel @ 131.0L	222222.00	CY	0	0	0	0
03. 06.03.73.22 Dredge Side Channel @ 164.5L	18519.00	CY	37,739	7,933	45,672	47,596
03. 06.03.73.23 Dredge Side Channel @ 132.2L	37037.00	CY	72,778	15,298	88,076	91,787
03. 06.03.73.25 Silt Curtains	1.00	JOB	16,790	3,529	20,319	21,176
03. 06.03.73.51 Long Term Management Features	1.00	EA	767,600	161,350	928,950	968,097
03. 06.03.73.52 Adaptive Management Features	1.00	EA	491,700	103,355	595,055	620,132
03. 06.03.73.70 Mussel Mitigation NM 119.3-220.3	1.00	JOB	0	0	0	0

	QUANTITY	UOM	CONTRACT	CONTINGN	Constnt$	PROJECT
03. 06.03.73.80 Bank Stab 143,7-144,2L - CG	85350.00	TON	1,045,538	274,715	1,320,252	1,373,575
03. 06.03.73.81 Bank Stab 163.6-165.3L - CG	79110.00	TON	969,098	254,630	1,223,728	1,273,152
03. 06.03.73 Habitat & Feeding Facilities	1.00	JOB	3,584,068	859,240	4,443,308	4,626,095
03. 06.03 F & W Faclts & Sancturies Mitign	1.00	JOB	3,584,068	859,240	4,443,308	4,626,095
03. 06 Fish and Wildlife Facilities	1.00	JOB	3,584,068	859,240	4,443,308	4,626,095
03. 09 Channels and Canals						
03. 09.01 Channels						
03. 09.01.16 Pipeline Dredging						
03. 09.01.16.00 <<< Not Identified >>>	1.00	EA	304,541	48,011	352,552	368,083
03. 09.01.16 Pipeline Dredging	1.00	EA	304,541	48,011	352,552	368,083
03. 09.01.20 Disposal Areas						
03. 09.01.20.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
03. 09.01.20 Disposal Areas	1.00	EA	0	0	0	0
03. 09.01.30 Bank Stablztion, Dikes & Jetties						
03. 09.01.30.01 Bank Stabilization Measures -CG	124763.00	TON	1,653,110	434,355	2,087,464	2,171,773
03. 09.01.30 Bank Stablztion, Dikes & Jetties	1.00	JOB	1,653,110	434,355	2,087,464	2,171,773
03. 09.01 Channels	1.00	EA	1,957,651	482,365	2,440,016	2,539,856
03. 09 Channels and Canals	1.00	EA	1,957,651	482,365	2,440,016	2,539,856
03. 12 Navigation, Ports & Harbors (NF)						
03. 12.01 Ports						
03. 12.01.15 Mechanical Dredging						
03. 12.01.15.10 Dredged Fill	2370.00	CY	17,568	3,693	21,261	22,157
03. 12.01.15 Mechanical Dredging	1.00	JOB	17,568	3,693	21,261	22,157
03. 12.01.16 Pipeline Dredging						
03. 12.01.16.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
03. 12.01.16 Pipeline Dredging	1.00	EA	0	0	0	0
03. 12.01 Ports	1.00	EA	17,568	3,693	21,261	22,157
03. 12.02 Harbors						

	QUANTITY	UOM	CONTRACT	CONTINGN	Constnt$	PROJECT
03. 12.02.16 Pipeline Dredging						
03. 12.02.16.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
03. 12.02.16 Pipeline Dredging	1.00	EA	0	0	0	0
03. 12.02 Harbors	1.00	EA	0	0	0	0
03. 12 Navigation, Ports & Harbors (NF)	1.00	EA	17,568	3,693	21,261	22,157
03. 18 Cultural Resource Preservation						
03. 18.00 Cultural Resource Preservation						
03. 18.00.86 Identification, Data Analysis						
03. 18.00.86.55 Cultural/Archaelogical Surveys	1.00	JOB	0	0	0	0
03. 18.00.86 Identification, Data Analysis	1.00	JOB	0	0	0	0
03. 18.00 Cultural Resource Preservation	1.00	JOB	0	0	0	0
03. 18 Cultural Resource Preservation	1.00	JOB	0	0	0	0
03. 30 Planning, Engineering & Design						
03. 30.20 Project Design Memorandum						
03. 30.20.01 PED						
03. 30.20.01.02 Survey Cost	1.00	EA	65,000	13,663	78,663	81,978
03. 30.20.01.03 Hydrology and Hydraulic Studies	1.00	EA	551,083	115,838	666,921	695,026
03. 30.20.01.07 PED	1.00	JOB	353,623	74,332	427,955	445,989
03. 30.20.01 PED	1.00	JOB	969,706	203,832	1,173,538	1,222,993
03. 30.20 Project Design Memorandum	1.00	JOB	969,706	203,832	1,173,538	1,222,993
03. 30 Planning, Engineering & Design	1.00	JOB	969,706	203,832	1,173,538	1,222,993
03. 31 Construction Management						
03. 31.23 Construction Contracts						
03. 31.23.11 Supervision and Administration						
03. 31.23.11.01 Prjt Office Supervn and Adminstn	1.00	JOB	378,882	79,641	458,523	477,846
03. 31.23.11 Supervision and Administration	1.00	JOB	378,882	79,641	458,523	477,846
03. 31.23 Construction Contracts	1.00	JOB	378,882	79,641	458,523	477,846
03. 31 Construction Management	1.00	JOB	378,882	79,641	458,523	477,846

	QUANTITY	UOM	CONTRACT	CONTINGN	Constnt$	PROJECT
03 Reach 3 (NM 119.5 to NM 220.3)	1.00	EA	7,254,037	1,719,726	8,973,763	9,343,719
04 Reach 4 (NM 220.3 to NM 307.7)						
04. 01 Lands and Damages						
04. 01.23 Construction Documents						
04. 01.23.03 Real Estate Analysis Documents						
04. 01.23.03.02 Real Estate Acquisition Document	1.00	JOB	0	0	0	0
04. 01.23.03.05 Real Estate Appraisal Documents	1.00	JOB	0	0	0	0
04. 01.23.03.15 Real Estate Land Payments	1.00	JOB	0	0	0	0
04. 01.23.03 Real Estate Analysis Documents	1.00	JOB	0	0	0	0
04. 01.23 Construction Documents	1.00	JOB	0	0	0	0
04. 01 Lands and Damages	1.00	JOB	0	0	0	0
04. 02 Relocations						
04. 02.01 Roads						
04. 02.01.01 Roads						
04. 02.01.01.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
04. 02.01.01 Roads	1.00	EA	0	0	0	0
04. 02.01 Roads	1.00	EA	0	0	0	0
04. 02.02 Railroads						
04. 02.02.07 Bridges						
04. 02.02.07.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
04. 02.02.07 Bridges	1.00	EA	0	0	0	0
04. 02.02 Railroads	1.00	EA	0	0	0	0
04. 02.03 Utilities						
04. 02.03.01 Pipelines						
04. 02.03.01.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
04. 02.03.01 Pipelines	1.00	EA	0	0	0	0
04. 02.03.02 Electric Lines						
04. 02.03.02.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
04. 02.03.02 Electric Lines	1.00	EA	0	0	0	0
04. 02.03 Utilities	1.00	EA	0	0	0	0

	QUANTITY	UOM	CONTRACT	CONTINGN	Constnt$	PROJECT
04. 02 Relocations	1.00	EA	0	0	0	0
04. 05 Locks						
04. 05.62 Approach Walls, Upper & Lower						
04. 05.62.05 Metals						
04. 05.62.05.10 Pinning Guidewalls	1.00	JOB	0	0	0	0
04. 05.62.05 Metals	1.00	LS	0	0	0	0
04. 05.62 Approach Walls, Upper & Lower	1.00	LS	0	0	0	0
04. 05 Locks	1.00	EA	0	0	0	0
04. 06 Fish and Wildlife Facilities						
04. 06.03 F & W Faclts & Sancturies Mitign						
04. 06.03.73 Habitat & Feeding Facilities						
04. 06.03.73.10 Boat Ramp at NM 272.0L	5600.00	SF	0	0	0	0
04. 06.03.73.11 Tern Islnds from Dredge Material	5600.00	SF	42,554	8,945	51,499	53,669
04. 06.03.73.12 Notch Dikes	39.00	EA	22,471	4,723	27,195	28,341
04. 06.03.73.21 Dredge Side Channel @ 276.0R	37037.00	CY	72,778	15,298	88,076	91,787
04. 06.03.73.25 Silt Curtains	1.00	JOB	5,597	1,176	6,773	7,059
04. 06.03.73.51 Long Term Management Features	1.00	EA	578,723	121,648	700,371	729,886
04. 06.03.73.52 Adaptive Management Features	1.00	EA	491,700	103,355	595,055	620,132
04. 06.03.73.63 8' Dia Gated Culvert @ 243.9L	300.00	LF	253,943	53,379	307,321	320,272
04. 06.03.73 Habitat & Feeding Facilities	1.00	JOB	1,467,766	308,524	1,776,290	1,851,146
04. 06.03 F & W Faclts & Sancturies Mitign	1.00	JOB	1,467,766	308,524	1,776,290	1,851,146
04. 06 Fish and Wildlife Facilities	1.00	JOB	1,467,766	308,524	1,776,290	1,851,146
04. 09 Channels and Canals						
04. 09.01 Channels						
04. 09.01.16 Pipeline Dredging						
04. 09.01.16.00 <<< Not Identified >>>	1.00	EA	586,520	92,465	678,985	708,897
04. 09.01.16 Pipeline Dredging	1.00	EA	586,520	92,465	678,985	708,897
04. 09.01.20 Disposal Areas						
04. 09.01.20.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
04. 09.01.20 Disposal Areas	1.00	EA	0	0	0	0
04. 09.01.30 Bank Stablztion, Dikes & Jetties						
04. 09.01.30.01 Bank Stabilization Measures- CG	347183.00	TON	4,600,175	1,208,696	5,808,871	6,043,480

	QUANTITY	UOM	CONTRACT	CONTINGN	Constnt$	PROJECT
04. 09.01.30 Bank Stablztion, Dikes & Jetties	1.00	JOB	4,600,175	1,208,696	5,808,871	6,043,480
04. 09.01 Channels	1.00	EA	5,186,695	1,301,161	6,487,856	6,752,377
04. 09 Channels and Canals	1.00	EA	5,186,695	1,301,161	6,487,856	6,752,377
04. 12 Navigation, Ports & Harbors (NF)						
04. 12.01 Ports						
04. 12.01.15 Mechanical Dredging						
04. 12.01.15.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
04. 12.01.15 Mechanical Dredging	1.00	JOB	0	0	0	0
04. 12.01.16 Pipeline Dredging						
04. 12.01.16.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
04. 12.01.16 Pipeline Dredging	1.00	EA	0	0	0	0
04. 12.01 Ports	1.00	EA	0	0	0	0
04. 12.02 Harbors						
04. 12.02.16 Pipeline Dredging						
04. 12.02.16.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
04. 12.02.16 Pipeline Dredging	1.00	EA	0	0	0	0
04. 12.02 Harbors	1.00	EA	0	0	0	0
04. 12 Navigation, Ports & Harbors (NF)	1.00	EA	0	0	0	0
04. 18 Cultural Resource Preservation						
04. 18.00 Cultural Resource Preservation						
04. 18.00.86 Identification, Data Analysis						
04. 18.00.86.55 Cultural/Archaelogical Surveys	1.00	JOB	0	0	0	0
04. 18.00.86 Identification, Data Analysis	1.00	JOB	0	0	0	0
04. 18.00 Cultural Resource Preservation	1.00	JOB	0	0	0	0
04. 18 Cultural Resource Preservation	1.00	JOB	0	0	0	0
04. 30 Planning, Engineering & Design						

	QUANTITY	UOM	CONTRACT	CONTINGN	Constnt$	PROJECT
04. 30.20 Project Design Memorandum						
04. 30.20.01 PED						
04. 30.20.01.02 Survey Cost	1.00	EA	35,000	7,357	42,357	44,142
04. 30.20.01.03 Hydrology and Hydraulic Studies	1.00	EA	400,583	84,203	484,786	505,215
04. 30.20.01.07 PED	1.00	JOB	395,162	83,063	478,225	498,378
04. 30.20.01 PED	1.00	JOB	830,745	174,623	1,005,368	1,047,736
04. 30.20 Project Design Memorandum	1.00	JOB	830,745	174,623	1,005,368	1,047,736
04. 30 Planning, Engineering & Design	1.00	JOB	830,745	174,623	1,005,368	1,047,736
04. 31 Construction Management						
04. 31.23 Construction Contracts						
04. 31.23.11 Supervision and Administration						
04. 31.23.11.01 Prjt Office Supervn and Adminstn	1.00	JOB	423,387	88,996	512,383	533,976
04. 31.23.11 Supervision and Administration	1.00	JOB	423,387	88,996	512,383	533,976
04. 31.23 Construction Contracts	1.00	JOB	423,387	88,996	512,383	533,976
04. 31 Construction Management	1.00	JOB	423,387	88,996	512,383	533,976
04 Reach 4 (NM 220.3 to NM 307.7)	1.00	EA	7,908,592	1,873,304	9,781,896	10,185,234
Feasibility Cost Es - 1 FT Lower	1.00	EA	46,497,245	10,673,520	57,170,765	59,495,041

ARKANSAS RIVER NAVIGATION STUDY,
ARKANSAS AND OKLAHOMA
FEASIBILITY STUDY

TAB B

- MCACES Cost Estimate -

Two-Foot Lower (11 Foot) Navigational Channel Reaches 1- 4

Feasiblty Cost Es - 2 FT Lower
Alternative - Lower the MKARNS
Navigation Channel Bottom 2
Feet (11 Foot Navigation
Channel)

Designed By: Design Branch
Estimated By: Cost Engineering & Support Sectn

Prepared By: George Losak

Preparation Date: 07/18/05
Effective Date of Pricing: 01/01/08
Est Construction Time: 1000 Days

Sales Tax: 7.00%

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M C A C E S G O L D E D I T I O N
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Release 5.31

This project is to increase the depth of the navigation channel in Arkansas for the McClellan-Kerr Arkansas River Navigation System (MKARNS) from 9 feet to 12 feet. There are 12 navigation locks and dams in the MKARNS in Arkansas. Tulsa District is developing the modification costs for the Oklahoma segment of the MKARNS.

This cost estimate quantifies the construction cost to lower the bottom of the navigation channel 2 feet.

Work required to obtain the additonal navigation channel depth are additional dredging in certain locations, 2 additional dredge disposal areas, bank stabilization measures (riprap), and removal of an abandoned pipeline.

Many of the costs contained herein are based upon the designers experience. No detail surveys, drawings nor quantities were developed for these cost estimates.

ASSUMPTIONS:

1. Work is assumed to require 4 years with several contractors working concurrently. Assumed start date October 2006. Mid-point of construction is January 2008.

2. Dredging for ports and harbors is based on professional judgement that there would be some dredging involved. This dredging is accomplished in conjuction with the Corps of Engineers contract for economic efficiency.

EXCLUSIONS:

INCLUSIONS:

1. Escalation is computed to be 5.1 percent by EC 11-2-187, 31 Mar 04.

2. Contingency 15% for dredging (more recent survey), 25% for dike and jetty construction and 20 percent for other items because of limited information.

3. Prime contractor profit of 7.58 percent.

4. Sales tax of 7 percent.

5. Supervision and administration cost for construction contracts of 7.5 percent was furnished by Construction Branch personnel.

SUMMARY REPORTS SUMMARY PAGE

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No Detailed Estimate...

No Backup Reports...

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		QUANTITY	UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
01	Lands and Damages	1.00	JOB	923,200	0	184,560	0	1,107,760	1107760
02	Relocations	1.00	EA	1,168,276	59,582	245,572	0	1,473,430	1473430
05	Locks	1.00	JOB	2,076,974	105,926	545,725	0	2,728,624	2728624
06	Fish and Wildlife Facilities	1.00	JOB	11,065,399	564,335	2,473,053	0	14,102,787	14102787
09	Channels and Canals	1.00	EA	28,880,650	1,472,913	6,858,000	0	37,211,563	37211563
12	Navigation, Ports & Harbors (NF)	1.00	EA	69,683	3,554	14,647	0	87,885	87884.76
18	Cultural Resource Preservation	1.00	JOB	200,000	10,200	42,040	0	252,240	252240.00
30	Planning, Engineering & Design	1.00	JOB	4,933,837	251,626	1,037,093	0	6,222,555	6222555
31	Construction Management	1.00	JOB	2,863,934	146,061	601,999	0	3,611,994	3611994
TOTAL	Feasiblty Cost Es - 2 FT Lower	1.00	EA	52,181,953	2,614,196	12,002,688	0	66,798,837	66798837

	QUANTITY	UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
01 Lands and Damages								
01.23 Construction Documents								
01.23.03 Real Estate Analysis Documents								
01.23.03.01 Reach 1 (NM 0.0 to NM 75.2)								
01.23.03.01.02 Real Estate Acquisition Document								
01.23.03.01.02.01 Acquistions	1.00	JOB	44,000	0	8,800	0	52,800	52800.00
01.23.03.01.02.02 Surveys	1.00	JOB	100,000	0	20,000	0	120,000	120000.00
01.23.03.01.02.03 Title Contract	1.00	JOB	6,000	0	1,200	0	7,200	7200.00
TOTAL Real Estate Acquisition Document	1.00	JOB	150,000	0	30,000	0	180,000	180000.00
01.23.03.01.03 Real Estate Condemntn Documents								
01.23.03.01.03.01 Condemnations by Corps of Engrs	1.00	JOB	8,000	0	1,600	0	9,600	9600.00
TOTAL Real Estate Condemntn Documents	1.00	JOB	8,000	0	1,600	0	9,600	9600.00
01.23.03.01.05 Real Estate Appraisal Documents								
01.23.03.01.05.01 Appraisal Contracts	1.00	JOB	6,000	0	1,200	0	7,200	7200.00
01.23.03.01.05.02 Review of Appraisal Reports	1.00	JOB	2,400	0	480	0	2,880	2880.00
TOTAL Real Estate Appraisal Documents	1.00	JOB	8,400	0	1,680	0	10,080	10080.00
01.23.03.01.06 Real Estate PL 94-646 Asst. Docs								
01.23.03.01.06.01 PL 91-646 Assistance	1.00	JOB	800	0	160	0	960	960.00
TOTAL Real Estate PL 94-646 Asst. Docs	1.00	JOB	800	0	160	0	960	960.00
01.23.03.01.15 Real Estate Payment Documents								
01.23.03.01.15.01 Payments (Land & Improvements)	1.00	JOB	750,600	0	150,120	0	900,720	900720.00
01.23.03.01.15.03 Payments (PL 91-646 Asst.)	1.00	JOB	5,000	0	1,000	0	6,000	6000.00
01.23.03.01.15.04 Review	1.00	JOB	400	0	0	0	400	400.00
TOTAL Real Estate Payment Documents	1.00	JOB	756,000	0	151,120	0	907,120	907120.00
TOTAL Reach 1 (NM 0.0 to NM 75.2)	1.00	EA	923,200	0	184,560	0	1,107,760	1107760

	QUANTITY UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
01.23.03.02 Reach 2 (NM 75.5 to NM 119.5)							
01.23.03.02.15 Real Estate Land Payments							
01.23.03.03 Reach 3 (NM 119.5 to NM 220.3)							
01.23.03.03.15 Real Estate Land Payments							
01.23.03.04 Reach 4 (NM 220.3 to NM 307.7)							
01.23.03.04.15 Real Estate Land Payments							
TOTAL Real Estate Analysis Documents	1.00 JOB	923,200	0	184,560	0	1,107,760	1107760
TOTAL Construction Documents	1.00 JOB	923,200	0	184,560	0	1,107,760	1107760
TOTAL Lands and Damages	1.00 JOB	923,200	0	184,560	0	1,107,760	1107760
02 Relocations							
02.01 Roads							
02.01.01 Roads							
02.01.01.04 Reach 4 (NM 220.3 to NM 308.7)							
02.02 Railroads							
02.02.07 Bridges							
02.02.07.04 Reach 4 (NM 220.3 to NM 308.7)							
02.03 Utilities							
02.03.01 Pipelines							
02.03.01.01 Reach 1 (NM 0.0 to NM 75.2)							
02.03.01.01.51 Demo Pipeline TX East #64-1 (6)	2200.00 FT	1,168,276	59,582	245,572	0	1,473,430	669.74
TOTAL Reach 1 (NM 0.0 to NM 75.2)	1.00 EA	1,168,276	59,582	245,572	0	1,473,430	1473430
02.03.01.04 Reach 4 (NM 220.3 to NM 308.7)							
TOTAL Pipelines	1.00 EA	1,168,276	59,582	245,572	0	1,473,430	1473430
02.03.02 Electric Lines							
02.03.02.04 Reach 4 (NM 220.3 to NM 308.7)							
TOTAL Utilities	1.00 EA	1,168,276	59,582	245,572	0	1,473,430	1473430
TOTAL Relocations	1.00 EA	1,168,276	59,582	245,572	0	1,473,430	1473430

	QUANTITY UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
05 Locks							
05.62 Approach Walls, Upper & Lower							
05.62.05 Metals							
05.62.05.01 Reach 1 (NM 0.0 to NM 75.2)							
05.62.05.01.10 Pinning Guidewalls	1.00 JOB	1,384,649	70,617	363,817	0	1,819,083	1819083
TOTAL Reach 1 (NM 0.0 to NM 75.2)	1.00 JOB	1,384,649	70,617	363,817	0	1,819,083	1819083
05.62.05.02 Reach 2 (NM 75.5 to NM 119.5)							
05.62.05.02.10 Pinning Guidewalls	1.00 JOB	346,162	17,654	90,954	0	454,771	454770.74
TOTAL Reach 2 (NM 75.5 to NM 119.5)	1.00 EA	346,162	17,654	90,954	0	454,771	454770.74
05.62.05.03 Reach 3 (NM 119.5 to NM 220.3)							
05.62.05.03.10 Pinning Guidewalls	1.00 JOB	346,162	17,654	90,954	0	454,771	454770.74
TOTAL Reach 3 (NM 119.5 to NM 220.3)	1.00 EA	346,162	17,654	90,954	0	454,771	454770.74
05.62.05.04 Reach 4 (NM 220.3 to NM 307.7)							
05.62.05.04.10 Pinning Guidewalls							
TOTAL Metals		2,076,974	105,926	545,725	0	2,728,624	
TOTAL Approach Walls, Upper & Lower		2,076,974	105,926	545,725	0	2,728,624	
TOTAL Locks	1.00 JOB	2,076,974	105,926	545,725	0	2,728,624	2728624
06 Fish and Wildlife Facilities							
06.03 F & W Faclts & Sancturies Mitign							
06.03.73 Habitat & Feeding Facilities							
06.03.73.01 Reach 1 (NM 0.0 to NM 75.2)							
06.03.73.01.11 Tern Island from Dredge Material							
06.03.73.01.11.01 Dredge Material for Island	400000.00 CY	62,000	3,162	13,032	0	78,194	0.20
06.03.73.01.11.06 Turbidity Barrier	3000.00 FT	41,975	2,141	8,823	0	52,939	17.65

		QUANTITY	UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
06.03.73.01.11.11	Turbidity Barrier	21000.00	FT	48,614	2,479	10,219	0	61,312	2.92
TOTAL	Tern Island from Dredge Material	5600.00	SF	152,589	7,782	32,074	0	192,445	34.37
06.03.73.01.12	Notch Dikes								
06.03.73.01.12.01	Dike Notching	46.00	EA	26,505	1,352	5,571	0	33,427	726.68
TOTAL	Notch Dikes	46.00	EA	26,505	1,352	5,571	0	33,427	726.68
06.03.73.01.13	Dredge Coal Pile Entrance Channl								
06.03.73.01.13. 1	Excavate, Load & Barge	74074.00	CY	63,709	3,249	13,392	0	80,349	1.08
06.03.73.01.13. 2	Unload in Disposal Area	88888.80	CY	76,450	3,899	16,070	0	96,419	1.08
06.03.73.01.13. 3	Mobilization	1.00	JOB	8,945	456	1,880	0	11,281	11281.05
06.03.73.01.13. 4	Demobilization	1.00	JOB	4,547	232	956	0	5,735	5734.61
TOTAL	Dredge Coal Pile Entrance Channl	74074.00	CY	153,650	7,836	32,297	0	193,784	2.62
06.03.73.01.14	Dredge Side Channels @ 44.6 (2)								
06.03.73.01.14. 1	Excavate, Load & Barge	92593.00	CY	79,636	4,061	16,740	0	100,437	1.08
06.03.73.01.14. 2	Unload in Disposal Area	111111.60	CY	95,563	4,874	20,087	0	120,525	1.08
06.03.73.01.14. 3	Mobilization	1.00	JOB	8,945	456	1,880	0	11,281	11281.05
06.03.73.01.14. 4	Demobilization	1.00	JOB	4,547	232	956	0	5,735	5734.61
TOTAL	Dredge Side Channels @ 44.6 (2)	92593.00	CY	188,691	9,623	39,663	0	237,977	2.57
06.03.73.01.15	Dredge Side Channel @ 70.6 R								
06.03.73.01.15. 1	Excavate, Load & Barge	33333.00	CY	28,669	1,462	6,026	0	36,157	1.08
06.03.73.01.15. 2	Unload in Disposal Area	39999.60	CY	34,402	1,755	7,231	0	43,388	1.08
06.03.73.01.15. 3	Mobilization	1.00	JOB	4,472	228	940	0	5,641	5640.52
06.03.73.01.15. 4	Demobilization	1.00	JOB	2,273	116	478	0	2,867	2867.30
TOTAL	Dredge Side Channel @ 70.6 R	33333.00	CY	69,817	3,561	14,675	0	88,053	2.64
06.03.73.01.16	Env. Sustainability @ 71.3L								
06.03.73.01.16. 1	Excavate, Load & Barge	118518.00	CY	101,933	5,199	21,426	0	128,558	1.08
06.03.73.01.16. 2	Unload in Disposal Area	142221.60	CY	122,320	6,238	25,712	0	154,270	1.08
06.03.73.01.16. 3	Mobilization	1.00	JOB	8,945	456	1,880	0	11,281	11281.05
06.03.73.01.16. 4	Demobilization	1.00	JOB	4,547	232	956	0	5,735	5734.61
TOTAL	Env. Sustainability @ 71.3L	118518.00	CY	237,745	12,125	49,974	0	299,844	2.53

		QUANTITY	UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
06.03.73.01.17	Dredge Side Channels @ 32.2								
06.03.73.01.17. 1	Excavate, Load & Barge	9259.00	CY	7,963	406	1,674	0	10,043	1.08
06.03.73.01.17. 2	Unload in Disposal Area	11110.80	CY	9,556	487	2,009	0	12,052	1.08
06.03.73.01.17. 3	Mobilization	1.00	JOB	8,945	456	1,880	0	11,281	11281.05
06.03.73.01.17. 4	Demobilization	1.00	JOB	4,547	232	956	0	5,735	5734.61
	TOTAL Dredge Side Channels @ 32.2	9259.00	CY	31,011	1,582	6,519	0	39,111	4.22
06.03.73.01.18	Dredge Side Channels @ 50.9L								
06.03.73.01.18. 1	Excavate, Load & Barge	18518.00	CY	15,927	812	3,348	0	20,087	1.08
06.03.73.01.18. 2	Unload in Disposal Area	22221.60	CY	19,112	975	4,017	0	24,104	1.08
06.03.73.01.18. 3	Mobilization	1.00	JOB	8,945	456	1,880	0	11,281	11281.05
06.03.73.01.18. 4	Demobilization	1.00	JOB	4,547	232	956	0	5,735	5734.61
	TOTAL Dredge Side Channels @ 50.9L	18518.00	CY	48,530	2,475	10,201	0	61,207	3.31
06.03.73.01.21	5' Dia Gated Culvert @ 15.3 R								
06.03.73.01.21. 1	Excavate, Load & Barge	10000.00	CY	8,601	439	1,808	0	10,847	1.08
06.03.73.01.21. 2	Unload in Disposal Area	12000.00	CY	10,321	526	2,169	0	13,017	1.08
06.03.73.01.21. 3	Mobilization	1.00	JOB	13,154	671	2,765	0	16,590	16589.77
06.03.73.01.21. 4	Demobilization	1.00	JOB	6,889	351	1,448	0	8,689	8688.79
06.03.73.01.21.11	Install 5' Dia Culvert	250.00	JOB	54,519	2,780	11,460	0	68,759	275.04
06.03.73.01.21.12	Backfill	10000.00	CY	63,456	3,236	13,338	0	80,030	8.00
06.03.73.01.21.13	Riprap Slope Protection	300.00	TON	7,162	365	1,506	0	9,033	30.11
06.03.73.01.21.14	Site Dewatering	1008.00	HR	118,676	6,052	24,946	0	149,674	148.49
	TOTAL 5' Dia Gated Culvert @ 15.3 R	250.00	LF	282,777	14,422	59,440	0	356,639	1426.56
06.03.73.01.25	Silt Curtains								
06.03.73.01.25.06	Turbidity Barrier	2400.00	FT	33,580	1,713	7,059	0	42,351	17.65
	TOTAL Silt Curtains	1.00	JOB	33,580	1,713	7,059	0	42,351	42351.18
06.03.73.01.50	Long Term Management Features								
06.03.73.01.50.06	Bathymetry (LTM)	1.00	JOB	66,700	3,402	14,020	0	84,122	84122.04
06.03.73.01.50.07	Substrate Sampling (LTM)	1.00	JOB	20,000	1,020	4,204	0	25,224	25224.00
06.03.73.01.50.08	LIDAAR/GIS (LTM)	1.00	JOB	50,000	2,550	10,510	0	63,060	63060.00
06.03.73.01.50.09	Backwater Reevaluations (LTM)	1.00	JOB	26,700	1,362	5,612	0	33,674	33674.04
06.03.73.01.50.10	Diversity & Pres @ Trib Mout LTM	1.00	JOB	26,700	1,362	5,612	0	33,674	33674.04
06.03.73.01.50.13	Fish Sampling (LTM)	1.00	JOB	100,000	5,100	21,020	0	126,120	126120.00
06.03.73.01.50.15	Water Quality Monitoring (LTM)	1.00	JOB	100,000	5,100	21,020	0	126,120	126120.00
06.03.73.01.50.16	Mussel Bed Monitoring (LTM)	1.00	JOB	615,000	31,365	129,273	0	775,638	775638.00

		QUANTITY	UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
06.03.73.01.50.91	LM Boat Ramp - Concrete	5600.00	SF	53,966	2,752	11,344	0	68,062	12.15
06.03.73.01.50.92	LM Boat Ramp - Clearing	1.00	AC	2,854	146	600	0	3,599	3599.24
06.03.73.01.50.93	LM Boat Ramp - Aggregate Base	184.80	SY	4,303	219	905	0	5,428	29.37
	TOTAL Long Term Management Features	1.00	EA	1,066,223	54,377	224,120	0	1,344,721	1344721
06.03.73.01.51	Adaptive Management Features								
06.03.73.01.51.01	Backwaters & Trib Mouths Misc AM	1.00	JOB	166,700	8,502	35,040	0	210,242	210242.04
06.03.73.01.51.03	Dike Field Mods (AM)	1.00	JOB	100,000	5,100	21,020	0	126,120	126120.00
06.03.73.01.51.04	Mussel Bed Recolonization (AM)	1.00	JOB	100,000	5,100	21,020	0	126,120	126120.00
	TOTAL Adaptive Management Features	1.00	EA	366,700	18,702	77,080	0	462,482	462482.04
06.03.73.01.60	Mussel Mitigation NM 10.5-19.0								
06.03.73.01.60.01	Survey for Potential Relo Site	1.00	JOB	40,000	2,040	8,408	0	50,448	50448.00
06.03.73.01.60.02	Survey Mussel Beds for Density	1.00	JOB	20,000	1,020	4,204	0	25,224	25224.00
06.03.73.01.60.03	Relocate Unionids	1.00	JOB	200,000	10,200	42,040	0	252,240	252240.00
06.03.73.01.60.04	Relocate 30,000 Additional Mussl	1.00	JOB	140,000	7,140	29,428	0	176,568	176568.00
06.03.73.01.60.06	Return Mussels to AP Canal	1.00	JOB	151,065	7,704	31,754	0	190,523	190523.18
06.03.73.01.60.07	Monitor Relo'd Unionids in Canal	1.00	JOB	115,250	5,878	24,226	0	145,353	145353.30
06.03.73.01.60.08	Propagate and release 3Mil Union	1.00	JOB	429,499	21,904	90,281	0	541,684	541684.14
	TOTAL Mussel Mitigation NM 10.5-19.0	1.00	JOB	1,095,814	55,887	230,340	0	1,382,041	1382041
06.03.73.01.65	Mussel Mitigation NM 19.0-75.2								
06.03.73.01.65.10	NM 48.5 Survey Unionid Distrib.	1.00	JOB	5,000	255	1,051	0	6,306	6306.00
	TOTAL Mussel Mitigation NM 19.0-75.2	1.00	JOB	5,000	255	1,051	0	6,306	6306.00
06.03.73.01.70	Endangered Species Surveys								
	TOTAL Reach 1 (NM 0.0 to NM 75.2)	1.00	EA	3,758,633	191,690	790,065	0	4,740,388	4740388
06.03.73.02	Reach 2 (NM 75.5 to NM 119.5)								
06.03.73.02.11	Tern Island from Dredge Material								
06.03.73.02.11.01	Dredge Material for Island	200000.00	CY	31,000	1,581	6,516	0	39,097	0.20
06.03.73.02.11.06	Turbidity Barrier	3000.00	FT	41,975	2,141	8,823	0	52,939	17.65
	TOTAL Tern Island from Dredge Material	5600.00	SF	72,975	3,722	15,339	0	92,036	16.44
06.03.73.02.12	Notch Dikes								

		QUANTITY	UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
06.03.73.02.12.01	Dike Notching	47.00	EA	27,081	1,381	5,692	0	34,154	726.68
TOTAL	Notch Dikes	47.00	EA	27,081	1,381	5,692	0	34,154	726.68
06.03.73.02.21	Dredge Side Channel @ 75.3L								
06.03.73.02.21. 1	Excavate, Load & Barge	5556.00	CY	4,779	244	1,004	0	6,027	1.08
06.03.73.02.21. 2	Unload in Disposal Area	6667.20	CY	5,734	292	1,205	0	7,232	1.08
06.03.73.02.21. 3	Mobilization	1.00	JOB	1,789	91	376	0	2,256	2256.21
06.03.73.02.21. 4	Demobilization	1.00	JOB	909	46	191	0	1,147	1146.92
TOTAL	Dredge Side Channel @ 75.3L	5556.00	CY	13,211	674	2,777	0	16,662	3.00
06.03.73.02.22	Dredge Side Channel @ 78.7L								
06.03.73.02.22. 1	Excavate, Load & Barge	5556.00	CY	4,779	244	1,004	0	6,027	1.08
06.03.73.02.22. 2	Unload in Disposal Area	6667.20	CY	5,734	292	1,205	0	7,232	1.08
06.03.73.02.22. 3	Mobilization	1.00	JOB	8,945	456	1,880	0	11,281	11281.05
06.03.73.02.22. 4	Demobilization	1.00	JOB	4,547	232	956	0	5,735	5734.61
TOTAL	Dredge Side Channel @ 78.7L	5556.00	CY	24,004	1,224	5,046	0	30,274	5.45
06.03.73.02.23	Dredge Side Channel @ 82.6L								
06.03.73.02.23. 1	Excavate, Load & Barge	5556.00	CY	4,779	244	1,004	0	6,027	1.08
06.03.73.02.23. 2	Unload in Disposal Area	6667.20	CY	5,734	292	1,205	0	7,232	1.08
06.03.73.02.23. 3	Mobilization	1.00	JOB	1,789	91	376	0	2,256	2256.21
06.03.73.02.23. 4	Demobilization	1.00	JOB	909	46	191	0	1,147	1146.92
TOTAL	Dredge Side Channel @ 82.6L	5556.00	CY	13,211	674	2,777	0	16,662	3.00
06.03.73.02.24	Dredge Side Channel @ 92.6L								
06.03.73.02.24. 1	Excavate, Load & Barge	3333.00	CY	2,867	146	603	0	3,615	1.08
06.03.73.02.24. 2	Unload in Disposal Area	3999.60	CY	3,440	175	723	0	4,338	1.08
06.03.73.02.24. 3	Mobilization	1.00	JOB	4,472	228	940	0	5,641	5640.52
06.03.73.02.24. 4	Demobilization	1.00	JOB	2,273	116	478	0	2,867	2867.30
TOTAL	Dredge Side Channel @ 92.6L	3333.00	CY	13,052	666	2,744	0	16,462	4.94
06.03.73.02.26	Silt Curtains								
06.03.73.02.26.06	Turbidity Barrier	2400.00	FT	33,580	1,713	7,059	0	42,351	17.65
TOTAL	Silt Curtains	2400.00	FT	33,580	1,713	7,059	0	42,351	17.65

		QUANTITY	UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
06.03.73.02.27	Dredge Side Channel @ 88.2R								
06.03.73.02.27. 1	Excavate, Load & Barge	37037.00	CY	31,854	1,625	6,696	0	40,175	1.08
06.03.73.02.27. 2	Unload in Disposal Area	44444.40	CY	38,225	1,949	8,035	0	48,210	1.08
06.03.73.02.27. 3	Mobilization	1.00	JOB	4,472	228	940	0	5,641	5640.52
06.03.73.02.27. 4	Demobilization	1.00	JOB	2,273	116	478	0	2,867	2867.30
	TOTAL Dredge Side Channel @ 88.2R	37037.00	CY	76,825	3,918	16,149	0	96,892	2.62
06.03.73.02.51	Long Term Management Features								
06.03.73.02.51.06	Bathymetry (LTM)	1.00	JOB	66,700	3,402	14,020	0	84,122	84122.04
06.03.73.02.51.07	Substrate Sampling (LTM)	1.00	JOB	20,000	1,020	4,204	0	25,224	25224.00
06.03.73.02.51.08	LIDAAR/GIS (LTM)	1.00	JOB	50,000	2,550	10,510	0	63,060	63060.00
06.03.73.02.51.09	Backwater Reevaluations (LTM)	1.00	JOB	26,700	1,362	5,612	0	33,674	33674.04
06.03.73.02.51.10	Diversity & Pres @ Trib Mout LTM	1.00	JOB	26,700	1,362	5,612	0	33,674	33674.04
06.03.73.02.51.13	Fish Sampling (LTM)	1.00	JOB	100,000	5,100	21,020	0	126,120	126120.00
06.03.73.02.51.15	Water Quality Monitoring (LTM)	1.00	JOB	100,000	5,100	21,020	0	126,120	126120.00
06.03.73.02.51.91	85.9 Boat Ramp - Concrete	5600.00	SF	53,966	2,752	11,344	0	68,062	12.15
06.03.73.02.51.92	85.9 Boat Ramp - Clearing	1.00	AC	2,854	146	600	0	3,599	3599.24
06.03.73.02.51.93	85.9 Boat Ramp - Aggregate Base	184.80	SY	4,303	219	905	0	5,428	29.37
	TOTAL Long Term Management Features	1.00	EA	451,223	23,012	94,847	0	569,083	569082.51
06.03.73.02.52	Adaptive Management Features								
06.03.73.02.52.01	Backwaters & Trib Mouths Misc AM	1.00	JOB	166,700	8,502	35,040	0	210,242	210242.04
06.03.73.02.52.03	Dike Field Mods (AM)	1.00	JOB	100,000	5,100	21,020	0	126,120	126120.00
06.03.73.02.52.04	Mussel Bed Recolonization (AM)	1.00	JOB	100,000	5,100	21,020	0	126,120	126120.00
	TOTAL Adaptive Management Features	1.00	EA	366,700	18,702	77,080	0	462,482	462482.04
06.03.73.02.63	Env Sustainablity @ 110.4L								
06.03.73.02.63. 1	Excavate, Load & Barge	12000.00	CY	10,321	526	2,169	0	13,017	1.08
06.03.73.02.63. 2	Unload in Disposal Area	14400.00	CY	12,385	632	2,603	0	15,620	1.08
06.03.73.02.63. 3	Mobilization	1.00	JOB	13,154	671	2,765	0	16,590	16589.77
06.03.73.02.63. 4	Demobilization	1.00	JOB	6,889	351	1,448	0	8,689	8688.79
06.03.73.02.63.11	Install 8' Dia Culvert	300.00	JOB	140,575	7,169	29,549	0	177,294	590.98
06.03.73.02.63.12	Backfill	10000.00	CY	63,456	3,236	13,338	0	80,030	8.00
06.03.73.02.63.13	Riprap Slope Protection	300.00	TON	7,162	365	1,506	0	9,033	30.11
	TOTAL Env Sustainablity @ 110.4L	300.00	LF	253,943	12,951	53,379	0	320,272	1067.57
06.03.73.02.64	8' Dia Gated Culvert @ 110.4R								
06.03.73.02.64. 1	Excavate, Load & Barge	2400.00	CY	2,064	105	434	0	2,603	1.08

		QUANTITY	UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
06.03.73.02.64. 2	Unload in Disposal Area	2880.00	CY	2,477	126	521	0	3,124	1.08
06.03.73.02.64. 3	Mobilization	1.00	JOB	13,154	671	2,765	0	16,590	16589.77
06.03.73.02.64. 4	Demobilization	1.00	JOB	6,889	351	1,448	0	8,689	8688.79
06.03.73.02.64.11	Install 8' Dia Culvert	60.00	FT	38,313	1,954	8,053	0	48,321	805.34
06.03.73.02.64.12	Backfill	2400.00	CY	59,119	3,015	12,427	0	74,561	31.07
06.03.73.02.64.13	Riprap Slope Protection	100.00	TON	2,387	122	502	0	3,011	30.11
	TOTAL 8' Dia Gated Culvert @ 110.4R	60.00	LF	124,404	6,345	26,150	0	156,898	2614.97
06.03.73.02.80	Bank Stab @ 91.5 - CG	64059.00	TON	784,723	40,021	206,186	0	1,030,930	16.09
	TOTAL Reach 2 (NM 75.5 to NM 119.5)	1.00	EA	2,254,933	115,002	515,224	0	2,885,158	2885158
06.03.73.03	Reach 3 (NM 119.5 to NM 220.3)								
06.03.73.03.11	Tern Island from Dredge Material								
06.03.73.03.11.01	Dredge Material for Island	200000.00	CY	31,000	1,581	6,516	0	39,097	0.20
06.03.73.03.11.06	Turbidity Barrier	3000.00	FT	41,975	2,141	8,823	0	52,939	17.65
	TOTAL Tern Island from Dredge Material	5600.00	SF	72,975	3,722	15,339	0	92,036	16.44
06.03.73.03.12	Notch Dikes								
06.03.73.03.12.01	Dike Notching	64.00	EA	36,876	1,881	7,751	0	46,508	726.68
	TOTAL Notch Dikes	64.00	EA	36,876	1,881	7,751	0	46,508	726.68
06.03.73.03.15	Elevated Shore Line @Sweeden Isl								
06.03.73.03.15.01	Dredge Material for Island	200000.00	CY	31,000	1,581	6,516	0	39,097	0.20
06.03.73.03.15.06	Turbidity Barrier	3000.00	FT	41,975	2,141	8,823	0	52,939	17.65
	TOTAL Elevated Shore Line @Sweeden Isl	5600.00	SF	72,975	3,722	15,339	0	92,036	16.44
06.03.73.03.22	Dredge Side Channel @ 164.5L								
06.03.73.03.22. 1	Excavate, Load & Barge	18519.00	CY	15,928	812	3,348	0	20,088	1.08
06.03.73.03.22. 2	Unload in Disposal Area	22222.80	CY	19,113	975	4,018	0	24,105	1.08
06.03.73.03.22. 3	Mobilization	1.00	JOB	1,789	91	376	0	2,256	2256.21
06.03.73.03.22. 4	Demobilization	1.00	JOB	909	46	191	0	1,147	1146.92
	TOTAL Dredge Side Channel @ 164.5L	18519.00	CY	37,739	1,925	7,933	0	47,596	2.57
06.03.73.03.23	Dredge Side Channel @ 132.2L								

		QUANTITY	UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
06.03.73.03.23. 1	Excavate, Load & Barge	37037.00	CY	31,854	1,625	6,696	0	40,175	1.08
06.03.73.03.23. 2	Unload in Disposal Area	44444.40	CY	38,225	1,949	8,035	0	48,210	1.08
06.03.73.03.23. 3	Mobilization	1.00	JOB	1,789	91	376	0	2,256	2256.21
06.03.73.03.23. 4	Demobilization	1.00	JOB	909	46	191	0	1,147	1146.92
	TOTAL Dredge Side Channel @ 132.2L	37037.00	CY	72,778	3,712	15,298	0	91,787	2.48
06.03.73.03.25	Silt Curtains								
06.03.73.03.25.06	Turbidity Barrier	1200.00	FT	16,790	856	3,529	0	21,176	17.65
	TOTAL Silt Curtains	1.00	JOB	16,790	856	3,529	0	21,176	21175.59
06.03.73.03.51	Long Term Management Features								
06.03.73.03.51.06	Bathymetry (LTM)	1.00	JOB	66,700	3,402	14,020	0	84,122	84122.04
06.03.73.03.51.07	Substrate Sampling (LTM)	1.00	JOB	20,000	1,020	4,204	0	25,224	25224.00
06.03.73.03.51.08	LIDAAR/GIS (LTM)	1.00	JOB	50,000	2,550	10,510	0	63,060	63060.00
06.03.73.03.51.09	Backwater Reevaluations (LTM)	1.00	JOB	26,700	1,362	5,612	0	33,674	33674.04
06.03.73.03.51.10	Diversity & Pres @ Trib Mout LTM	1.00	JOB	26,700	1,362	5,612	0	33,674	33674.04
06.03.73.03.51.11	Gravel Modl Sus. Substrates LTM	1.00	JOB	30,000	1,530	6,306	0	37,836	37836.00
06.03.73.03.51.12	Gravel Monitring Hab Qual LTM	1.00	JOB	97,500	4,973	20,495	0	122,967	122967.00
06.03.73.03.51.13	Fish Sampling (LTM)	1.00	JOB	100,000	5,100	21,020	0	126,120	126120.00
06.03.73.03.51.15	Water Quality Monitoring (LTM)	1.00	JOB	100,000	5,100	21,020	0	126,120	126120.00
06.03.73.03.51.16	Mussel Bed Monitoring (LTM)	1.00	JOB	250,000	12,750	52,550	0	315,300	315300.00
	TOTAL Long Term Management Features	1.00	EA	767,600	39,148	161,350	0	968,097	968097.12
06.03.73.03.52	Adaptive Management Features								
06.03.73.03.52.01	Backwaters & Trib Mouths Misc AM	1.00	JOB	166,700	8,502	35,040	0	210,242	210242.04
06.03.73.03.52.02	Gravel Bar Monitoring AM	1.00	JOB	125,000	6,375	26,275	0	157,650	157650.00
06.03.73.03.52.03	Dike Field Mods (AM)	1.00	JOB	100,000	5,100	21,020	0	126,120	126120.00
06.03.73.03.52.04	Mussel Bed Recolonization (AM)	1.00	JOB	100,000	5,100	21,020	0	126,120	126120.00
	TOTAL Adaptive Management Features	1.00	EA	491,700	25,077	103,355	0	620,132	620132.04
06.03.73.03.80	Bank Stab 143,7-144,2L - CG	85350.00	TON	1,045,538	53,322	274,715	0	1,373,575	16.09
06.03.73.03.81	Bank Stab 163.6-165.3L - CG	79110.00	TON	969,098	49,424	254,630	0	1,273,152	16.09
	TOTAL Reach 3 (NM 119.5 to NM 220.3)	1.00	EA	3,584,068	182,787	859,240	0	4,626,095	4626095
06.03.73.04	Reach 4 (NM 220.3 to NM 307.7)								
06.03.73.04.11	Tern Islnds from Dredge Material								
06.03.73.04.11.01	Dredge Material for Island	200000.00	CY	31,000	1,581	6,516	0	39,097	0.20

		QUANTITY	UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
06.03.73.04.11.06	Turbidity Barrier	3000.00	FT	4,609	235	969	0	5,813	1.94
06.03.73.04.11.11	Turbidity Barrier	3000.00	FT	6,945	354	1,460	0	8,759	2.92
	TOTAL Tern Islnds from Dredge Material	5600.00	SF	42,554	2,170	8,945	0	53,669	9.58
06.03.73.04.12	Notch Dikes								
06.03.73.04.12.01	Dike Notching	39.00	EA	22,471	1,146	4,723	0	28,341	726.68
	TOTAL Notch Dikes	39.00	EA	22,471	1,146	4,723	0	28,341	726.68
06.03.73.04.21	Dredge Side Channel @ 276.0R								
06.03.73.04.21. 1	Excavate, Load & Barge	37037.00	CY	31,854	1,625	6,696	0	40,175	1.08
06.03.73.04.21. 2	Unload in Disposal Area	44444.40	CY	38,225	1,949	8,035	0	48,210	1.08
06.03.73.04.21. 3	Mobilization	1.00	JOB	1,789	91	376	0	2,256	2256.21
06.03.73.04.21. 4	Demobilization	1.00	JOB	909	46	191	0	1,147	1146.92
	TOTAL Dredge Side Channel @ 276.0R	37037.00	CY	72,778	3,712	15,298	0	91,787	2.48
06.03.73.04.25	Silt Curtains								
06.03.73.04.25.06	Turbidity Barrier	400.00	FT	5,597	285	1,176	0	7,059	17.65
	TOTAL Silt Curtains	1.00	JOB	5,597	285	1,176	0	7,059	7058.52
06.03.73.04.51	Long Term Management Features								
06.03.73.04.51.06	Bathymetry (LTM)	1.00	JOB	66,700	3,402	14,020	0	84,122	84122.04
06.03.73.04.51.07	Substrate Sampling (LTM)	1.00	JOB	20,000	1,020	4,204	0	25,224	25224.00
06.03.73.04.51.08	LIDAAR/GIS (LTM)	1.00	JOB	50,000	2,550	10,510	0	63,060	63060.00
06.03.73.04.51.09	Backwater Reevaluations (LTM)	1.00	JOB	26,700	1,362	5,612	0	33,674	33674.04
06.03.73.04.51.10	Diversity & Pres @ Trib Mout LTM	1.00	JOB	26,700	1,362	5,612	0	33,674	33674.04
06.03.73.04.51.11	Gravel Modl Sus. Substrates LTM	1.00	JOB	30,000	1,530	6,306	0	37,836	37836.00
06.03.73.04.51.12	Gravel Monitring Hab Qual LTM	1.00	JOB	97,500	4,973	20,495	0	122,967	122967.00
06.03.73.04.51.13	Fish Sampling (LTM)	1.00	JOB	100,000	5,100	21,020	0	126,120	126120.00
06.03.73.04.51.15	Water Quality Monitoring (LTM)	1.00	JOB	100,000	5,100	21,020	0	126,120	126120.00
06.03.73.04.51.91	272R Boat Ramp - Concrete	5600.00	SF	53,966	2,752	11,344	0	68,062	12.15
06.03.73.04.51.92	272L Boat Ramp - Clearing	1.00	AC	2,854	146	600	0	3,599	3599.24
06.03.73.04.51.93	272L Boat Ramp - Aggregate Base	184.80	SY	4,303	219	905	0	5,428	29.37
	TOTAL Long Term Management Features	1.00	EA	578,723	29,515	121,648	0	729,886	729885.51
06.03.73.04.52	Adaptive Management Features								
06.03.73.04.52.01	Backwaters & Trib Mouths Misc AM	1.00	JOB	166,700	8,502	35,040	0	210,242	210242.04

		QUANTITY	UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
06.03.73.04.52.02	Gravel Bar Monitoring AM	1.00	JOB	125,000	6,375	26,275	0	157,650	157650.00
06.03.73.04.52.03	Dike Field Mods (AM)	1.00	JOB	100,000	5,100	21,020	0	126,120	126120.00
06.03.73.04.52.04	Mussel Bed Recolonization (AM)	1.00	JOB	100,000	5,100	21,020	0	126,120	126120.00
	TOTAL Adaptive Management Features	1.00	EA	491,700	25,077	103,355	0	620,132	620132.04
06.03.73.04.63	8' Dia Gated Culvert @ 243.9L								
06.03.73.04.63. 1	Excavate, Load & Barge	12000.00	CY	10,321	526	2,169	0	13,017	1.08
06.03.73.04.63. 2	Unload in Disposal Area	14400.00	CY	12,385	632	2,603	0	15,620	1.08
06.03.73.04.63. 3	Mobilization	1.00	JOB	13,154	671	2,765	0	16,590	16589.77
06.03.73.04.63. 4	Demobilization	1.00	JOB	6,889	351	1,448	0	8,689	8688.79
06.03.73.04.63.11	Install 8' Dia Culvert	300.00	JOB	140,575	7,169	29,549	0	177,294	590.98
06.03.73.04.63.12	Backfill	10000.00	CY	63,456	3,236	13,338	0	80,030	8.00
06.03.73.04.63.13	Riprap Slope Protection	300.00	TON	7,162	365	1,506	0	9,033	30.11
	TOTAL 8' Dia Gated Culvert @ 243.9L	300.00	LF	253,943	12,951	53,379	0	320,272	1067.57
	TOTAL Reach 4 (NM 220.3 to NM 307.7)	1.00	EA	1,467,766	74,856	308,524	0	1,851,146	1851146
	TOTAL Habitat & Feeding Facilities	1.00	JOB	11,065,399	564,335	2,473,053	0	14,102,787	14102787
	TOTAL F & W Faclts & Sancturies Mitign	1.00	JOB	11,065,399	564,335	2,473,053	0	14,102,787	14102787
	TOTAL Fish and Wildlife Facilities	1.00	JOB	11,065,399	564,335	2,473,053	0	14,102,787	14102787
09	Channels and Canals								
09.01	Channels								
09.01.16	Pipeline Dredging								
09.01.16.01	Reach 1 (NM 0.0 to NM 75.2)	1020450	CY	1,581,698	80,667	249,355	0	1,911,719	1.87
09.01.16.02	Reach 2 (NM 75.2 to NM 119.5)	225517.00	CY	349,551	17,827	55,107	0	422,485	1.87
09.01.16.03	Reach 3 (NM 119.5 to NM 220.3)	426827.00	CY	661,582	33,741	104,298	0	799,621	1.87
09.01.16.04	Reach 4 (NM 220.3 to NM 308.7)	605000.00	CY	937,750	47,825	147,836	0	1,133,412	1.87
	TOTAL Pipeline Dredging	1.00	EA	3,530,581	180,060	556,596	0	4,267,236	4267236
09.01.20	Disposal Areas								
09.01.20.01	Reach 1 (NM 0.0 to NM 75.2)								
09.01.20.01.01	Preparatory Work Area 1								
09.01.20.01.01.01	Clearing and Grubbing	100.00	ACR	211,300	10,776	44,415	0	266,492	2664.92
09.01.20.01.01.02	Strip Topsoil	161333.00	CY	65,794	3,356	13,830	0	82,980	0.51

		QUANTITY	UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
	TOTAL Preparatory Work Area 1	100.00	ACR	277,094	14,132	58,245	0	349,471	3494.71
09.01.20.01.02	Site Work - Area 1								
09.01.20.01.02.02	Dike Construction-Embankment	363902.00	CY	1,759,110	89,715	369,765	0	2,218,590	6.10
09.01.20.01.02.03	Dike Construction-Slope Stabilzt	1.00	CY	48,396	2,468	10,173	0	61,038	61037.55
09.01.20.01.02.04	Dike Construction-Control Str.	1.00	EA	42,175	2,151	8,865	0	53,191	53191.19
09.01.20.01.02.05	Dike Construction-Turfing	21.00	ACR	30,652	1,563	6,443	0	38,658	1840.87
	TOTAL Site Work - Area 1	1.00	EA	1,880,334	95,897	395,246	0	2,371,477	2371477
09.01.20.01.03	Preparatory Work Area 2								
09.01.20.01.03.01	Clearing and Grubbing	267.00	ACR	564,171	28,773	118,589	0	711,533	2664.92
09.01.20.01.03.02	Strip Topsoil	430760.00	CY	175,671	8,959	36,926	0	221,556	0.51
	TOTAL Preparatory Work Area 2	267.00	ACR	739,842	37,732	155,515	0	933,089	3494.71
09.01.20.01.04	Site Work - Area 2								
09.01.20.01.04.02	Dike Construction-Embankment	514624.00	CY	2,641,616	134,722	555,268	0	3,331,606	6.47
09.01.20.01.04.03	Dike Construction-Slope Stabilzt	1.00	JOB	67,798	3,458	14,251	0	85,507	85506.86
09.01.20.01.04.04	Dike Construction-Control Str.	1.00	EA	67,996	3,468	14,293	0	85,757	85757.10
09.01.20.01.04.05	Dike Construction-Turfing	29.00	ACR	42,329	2,159	8,898	0	53,385	1840.87
	TOTAL Site Work - Area 2	1.00	EA	2,819,740	143,807	592,709	0	3,556,256	3556256
09.01.20.01.06	Area 2 - Associated Items								
09.01.20.01.06.01	Pump Station 13,000 gpm	1.00	EA	731,079	37,285	153,673	0	922,037	922037.03
09.01.20.01.06.02	Pump Station Suction Piping	1.00	EA	97,186	4,956	20,428	0	122,571	122570.67
09.01.20.01.06.04	Pump Station Disch Piping-24"	550.00	LF	127,136	6,484	26,724	0	160,344	291.53
09.01.20.01.06.05	Disch Piping-24" Trenching	550.00	LF	15,250	778	3,206	0	19,233	34.97
09.01.20.01.06.10	Pump Station Electrical Controls	1.00	EA	74,026	3,775	15,560	0	93,362	93361.79
09.01.20.01.06.20	Pump Station Elect OH Line	5280.00	LF	60,026	3,061	12,617	0	75,705	14.34
09.01.20.01.06.25	Pump Station Elect Transformer	300.00	KVA	14,217	725	2,988	0	17,930	59.77
09.01.20.01.06.30	Pump Station Concrete Platform	1.00	EA	1,885	96	396	0	2,377	2377.31
	TOTAL Area 2 - Associated Items	1.00	EA	1,120,804	57,161	235,593	0	1,413,558	1413558
	TOTAL Reach 1 (NM 0.0 to NM 75.2)	1.00	EA	6,837,814	348,728	1,437,308	0	8,623,850	8623850
09.01.20.04	Reach 4 (NM 220.3 to NM 307.7)								
	TOTAL Disposal Areas	1.00	EA	6,837,814	348,728	1,437,308	0	8,623,850	8623850

	QUANTITY	UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
09.01.30 Bank Stablztion, Dikes & Jetties								
09.01.30.01 Reach 1 (NM 0.0 to NM 75.2)								
09.01.30.01.01 Bank Stabilization Measures - CG	501964.00	TON	6,149,059	313,602	1,615,665	0	8,078,326	16.09
TOTAL Reach 1 (NM 0.0 to NM 75.2)	501964.00	TON	6,149,059	313,602	1,615,665	0	8,078,326	16.09
09.01.30.02 Reach 2 (NM 75.2 to NM 119.5)								
09.01.30.02.01 Bank Stabilization Measures- CG	252380.00	TON	3,091,655	157,674	812,332	0	4,061,662	16.09
TOTAL Reach 2 (NM 75.2 to NM 119.5)	252380.00	TON	3,091,655	157,674	812,332	0	4,061,662	16.09
09.01.30.03 Reach 3 (NM 119.5 to NM 220.3)								
09.01.30.03.01 Bank Stabilization Measures - CG	314599.00	TON	4,168,437	212,590	1,095,257	0	5,476,284	17.41
TOTAL Reach 3 (NM 119.5 to NM 220.3)	314599.00	TON	4,168,437	212,590	1,095,257	0	5,476,284	17.41
09.01.30.04 Reach 4 (NM 220.3 to NM 308.7)								
09.01.30.04.01 Bank Stabilization Measures-CG	385140.00	TON	5,103,105	260,258	1,340,841	0	6,704,204	17.41
TOTAL Reach 4 (NM 220.3 to NM 308.7)	385140.00	TON	5,103,105	260,258	1,340,841	0	6,704,204	17.41
TOTAL Bank Stablztion, Dikes & Jetties	1.00	JOB	18,512,256	944,125	4,864,095	0	24,320,476	24320476
TOTAL Channels	1.00	EA	28,880,650	1,472,913	6,858,000	0	37,211,563	37211563
TOTAL Channels and Canals	1.00	EA	28,880,650	1,472,913	6,858,000	0	37,211,563	37211563
12 Navigation, Ports & Harbors (NF)								
12.01 Ports								
12.01.15 Mechanical Dredging								
12.01.15.01 Reach 1 (NM 0.0 to NM 75.2)								
12.01.15.01.10 Mechanical Dredging								
12.01.15.01.10. 1 Excavate, Load & Barge	842.00	CY	724	37	152	0	913	1.08
12.01.15.01.10. 2 Unload in Disposal Area	842.00	CY	724	37	152	0	913	1.08
12.01.15.01.10. 3 Mobilization	1.00	JOB	8,945	456	1,880	0	11,281	11281.05
12.01.15.01.10. 4 Demobilization	1.00	JOB	4,547	232	956	0	5,735	5734.61

		QUANTITY	UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
	TOTAL Mechanical Dredging	842.00	CY	14,940	762	3,140	0	18,842	22.38
	TOTAL Reach 1 (NM 0.0 to NM 75.2)			14,940	762	3,140	0	18,842	
12.01.15.02	Reach 2 (NM 75.2 to NM 119.5)								
12.01.15.02.10	Mechanical Dredging								
12.01.15.02.10. 1	Excavate, Load & Barge	1777.00	CY	1,528	78	321	0	1,928	1.08
12.01.15.02.10. 2	Unload in Disposal Area	1777.00	CY	1,528	78	321	0	1,928	1.08
12.01.15.02.10. 3	Mobilization	1.00	JOB	8,945	456	1,880	0	11,281	11281.05
12.01.15.02.10. 4	Demobilization	1.00	JOB	4,547	232	956	0	5,735	5734.61
	TOTAL Mechanical Dredging	1777.00	CY	16,548	844	3,478	0	20,871	11.74
	TOTAL Reach 2 (NM 75.2 to NM 119.5)			16,548	844	3,478	0	20,871	
12.01.15.03	Reach 3 (NM 119.5 to NM 220.3)								
12.01.15.03.10	Mechanical Dredging								
12.01.15.03.10. 1	Excavate, Load & Barge	4740.00	CY	4,077	208	857	0	5,142	1.08
12.01.15.03.10. 2	Unload in Disposal Area	4740.00	CY	4,077	208	857	0	5,142	1.08
12.01.15.03.10. 3	Mobilization	1.00	JOB	8,945	456	1,880	0	11,281	11281.05
12.01.15.03.10. 4	Demobilization	1.00	JOB	4,547	232	956	0	5,735	5734.61
	TOTAL Mechanical Dredging	4740.00	CY	21,645	1,104	4,550	0	27,299	5.76
	TOTAL Reach 3 (NM 119.5 to NM 220.3)	2370.00	CY	21,645	1,104	4,550	0	27,299	11.52
12.01.15.04	Reach 4 (NM 220.3 to NM 308.7)								
12.01.15.04.10	Mechanical Dredging								
12.01.15.04.10. 1	Excavate, Load & Barge	1778.00	CY	1,529	78	321	0	1,929	1.08
12.01.15.04.10. 2	Unload in Disposal Area	1778.00	CY	1,529	78	321	0	1,929	1.08
12.01.15.04.10. 3	Mobilization	1.00	JOB	8,945	456	1,880	0	11,281	11281.05
12.01.15.04.10. 4	Demobilization	1.00	JOB	4,547	232	956	0	5,735	5734.61
	TOTAL Mechanical Dredging	1778.00	CY	16,550	844	3,479	0	20,873	11.74
	TOTAL Reach 4 (NM 220.3 to NM 308.7)			16,550	844	3,479	0	20,873	
	TOTAL Mechanical Dredging	1.00	JOB	69,683	3,554	14,647	0	87,885	87884.76
12.01.16	Pipeline Dredging								

	QUANTITY	UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
12.01.16.04 Reach 4 (NM 220.3 to NM 308.7)								
TOTAL Ports	1.00	EA	69,683	3,554	14,647	0	87,885	87884.76
12.02 Harbors								
12.02.16 Pipeline Dredging								
12.02.16.04 Reach 4 (NM 220.3 to NM 308.7)								
TOTAL Navigation, Ports & Harbors (NF)	1.00	EA	69,683	3,554	14,647	0	87,885	87884.76
18 Cultural Resource Preservation								
18.00 Cultural Resource Preservation								
18.00.86 Identification, Data Analysis								
18.00.86.01 Reach 1 (NM 0 - 75.2)								
18.00.86.01.55 Cultural/Archaelogical Surveys								
18.00.86.01.55.01 Cultural/Archaelogical Surveys	1.00	JOB	150,000	7,650	31,530	0	189,180	189180.00
TOTAL Cultural/Archaelogical Surveys	1.00	JOB	150,000	7,650	31,530	0	189,180	189180.00
TOTAL Reach 1 (NM 0 - 75.2)	1.00	JOB	150,000	7,650	31,530	0	189,180	189180.00
18.00.86.02 Reach 2 (NM 75.2 - 119.5)								
18.00.86.02.55 Cultural/Archaelogical Surveys								
18.00.86.02.55.01 Cultural/Archaelogical Surveys	1.00	JOB	50,000	2,550	10,510	0	63,060	63060.00
TOTAL Cultural/Archaelogical Surveys	1.00	JOB	50,000	2,550	10,510	0	63,060	63060.00
TOTAL Reach 2 (NM 75.2 - 119.5)	1.00	JOB	50,000	2,550	10,510	0	63,060	63060.00
18.00.86.03 Reach 3 (NM 119.5 - 220.3)								
18.00.86.03.55 Cultural/Archaelogical Surveys								
18.00.86.04 Reach 3 (NM 220.3 - 308.7)								
18.00.86.04.55 Cultural/Archaelogical Surveys								
TOTAL Identification, Data Analysis	1.00	JOB	200,000	10,200	42,040	0	252,240	252240.00

	QUANTITY	UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
TOTAL Cultural Resource Preservation	1.00	JOB	200,000	10,200	42,040	0	252,240	252240.00
TOTAL Cultural Resource Preservation	1.00	JOB	200,000	10,200	42,040	0	252,240	252240.00
30 Planning, Engineering & Design								
30.20 Project Design Memorandum								
30.20.01 PED								
30.20.01.01 Reach 1 (NM 0.0 to NM 75.2)								
30.20.01.01.01 Surveys&Mapp'g Except Real Estat								
30.20.01.01.01.02 Other Design Costs - Surveys	1.00	JOB	36,000	1,836	7,567	0	45,403	45403.20
TOTAL Surveys&Mapp'g Except Real Estat	1.00	EA	36,000	1,836	7,567	0	45,403	45403.20
30.20.01.01.03 Hydrology and Hydraulic Studies								
30.20.01.01.03.01 H&H - Verify Structure Design			153,750	7,841	32,318	0	193,910	
30.20.01.01.03.02 H&H - Sedimentation Modeling			58,333	2,975	12,262	0	73,570	
30.20.01.01.03.04 Nav Conditions Physical Model			500,000	25,500	105,100	0	630,600	
30.20.01.01.03.05 Lock Structure/Barge Collision			21,000	1,071	4,414	0	26,485	
30.20.01.01.03.06 SWL H&H Support of Studies			73,750	3,761	15,502	0	93,014	
TOTAL Hydrology and Hydraulic Studies	1.00	EA	806,833	41,148	169,596	0	1,017,578	1017578
30.20.01.01.07 PED	1.00	JOB	1,290,000	65,790	271,158	0	1,626,948	1626948
TOTAL Reach 1 (NM 0.0 to NM 75.2)	1.00	EA	2,132,833	108,774	448,321	0	2,689,929	2689929
30.20.01.02 Reach 2 (NM 75.5 to 119.5)								
30.20.01.02.03 Hydrology and Hydraulic Studies								
30.20.01.02.03.01 H&H - Verify Structure Design			311,250	15,874	65,425	0	392,549	
30.20.01.02.03.02 H&H - Sedimentation Modeling			58,333	2,975	12,262	0	73,570	
30.20.01.02.03.05 Lock Structure/Barge Collision			21,000	1,071	4,414	0	26,485	
30.20.01.02.03.06 SWL H&H Support of Studies			73,750	3,761	15,502	0	93,014	
TOTAL Hydrology and Hydraulic Studies	1.00	EA	464,333	23,681	97,603	0	585,617	585616.78
30.20.01.02.07 PED	1.00	JOB	375,363	19,144	78,901	0	473,408	473407.82
TOTAL Reach 2 (NM 75.5 to 119.5)	1.00	EA	839,696	42,824	176,504	0	1,059,025	1059025

	QUANTITY	UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
30.20.01.03 Reach 3 (NM 119.5 to NM 220.3)								
30.20.01.03.03 Hydrology and Hydraulic Studies								
30.20.01.03.03.01 H&H - Verify Structure Design			323,000	16,473	67,895	0	407,368	
30.20.01.03.03.02 H&H - Sedimentation Modeling			133,333	6,800	28,027	0	168,160	
30.20.01.03.03.05 Lock Structure/Barge Collision			21,000	1,071	4,414	0	26,485	
30.20.01.03.03.06 SWL H&H Support of Studies			73,750	3,761	15,502	0	93,014	
TOTAL Hydrology and Hydraulic Studies	1.00	EA	551,083	28,105	115,838	0	695,026	695025.88
30.20.01.03.07 PED	1.00	JOB	554,689	28,289	116,596	0	699,574	699573.77
TOTAL Reach 3 (NM 119.5 to NM 220.3)	1.00	EA	1,105,772	56,394	232,433	0	1,394,600	1394600
30.20.01.04 Reach 4 (NM 220.3 to NM 307.7)								
30.20.01.04.03 Hydrology and Hydraulic Studies								
30.20.01.04.03.01 H&H - Verify Structure Design			165,500	8,440	34,788	0	208,729	
30.20.01.04.03.02 H&H - Sedimentation Modeling			58,333	2,975	12,262	0	73,570	
30.20.01.04.03.03 H&H - Lock Operation Proced. Mod			82,000	4,182	17,236	0	103,418	
30.20.01.04.03.05 Lock Structure/Barge Collision			21,000	1,071	4,414	0	26,485	
30.20.01.04.03.06 SWL H&H Support of Studies			73,750	3,761	15,502	0	93,014	
TOTAL Hydrology and Hydraulic Studies	1.00	EA	400,583	20,430	84,203	0	505,215	505215.28
30.20.01.04.07 PED	1.00	JOB	454,953	23,203	95,631	0	573,787	573786.72
TOTAL Reach 4 (NM 220.3 to NM 307.7)	1.00	EA	855,536	43,632	179,834	0	1,079,002	1079002
TOTAL PED	1.00	JOB	4,933,837	251,626	1,037,093	0	6,222,555	6222555
TOTAL Project Design Memorandum	1.00	JOB	4,933,837	251,626	1,037,093	0	6,222,555	6222555
TOTAL Planning, Engineering & Design	1.00	JOB	4,933,837	251,626	1,037,093	0	6,222,555	6222555
31 Construction Management								
31.23 Construction Contracts								
31.23.11 Supervision and Administration								
31.23.11.01 Reach 1 (NM 0.0 to NM 75.2)								
31.23.11.01.01 Prjt Office Supervn and Adminstn			1,380,000	70,380	290,076	0	1,740,456	
TOTAL Reach 1 (NM 0.0 to NM 75.2)	1.00	EA	1,380,000	70,380	290,076	0	1,740,456	1740456

		QUANTITY	UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
31.23.11.02	Reach 2 (NM 75.5 to NM 119.5)								
31.23.11.02.01	Prjt Office Supervn and Adminstn			402,175	20,511	84,537	0	507,223	
	TOTAL Reach 2 (NM 75.5 to NM 119.5)	1.00	EA	402,175	20,511	84,537	0	507,223	507223.11
31.23.11.03	Reach 3 (NM 119.5 to NM 220.3)								
31.23.11.03.01	Prjt Office Supervn and Adminstn			594,310	30,310	124,924	0	749,544	
	TOTAL Reach 3 (NM 119.5 to NM 220.3)	1.00	EA	594,310	30,310	124,924	0	749,544	749543.77
31.23.11.04	Reach 4 (NM 220.3 to NM 307.7)								
31.23.11.04.01	Prjt Office Supervn and Adminstn			487,449	24,860	102,462	0	614,771	
	TOTAL Reach 4 (NM 220.3 to NM 307.7)	1.00	EA	487,449	24,860	102,462	0	614,771	614770.68
	TOTAL Supervision and Administration			2,863,934	146,061	601,999	0	3,611,994	
	TOTAL Construction Contracts			2,863,934	146,061	601,999	0	3,611,994	
	TOTAL Construction Management	1.00	JOB	2,863,934	146,061	601,999	0	3,611,994	3611994
	TOTAL Feasiblty Cost Es - 2 FT Lower	1.00	EA	52,181,953	2,614,196	12,002,688	0	66,798,837	66798837

	QUANTITY	UOM	CONTRACT	CONTINGN	CONSTNT$	PROJECT
01 Reach 1 (NM 0.0 to NM 75.2)						
01. 01 Lands and Damages						
01. 01.23 Construction Documents						
01. 01.23.03 Real Estate Analysis Documents						
01. 01.23.03.02 Real Estate Acquisition Document	1.00	JOB	150,000	30,000	180,000	180,000
01. 01.23.03.03 Real Estate Condemntn Documents	1.00	JOB	8,000	1,600	9,600	9,600
01. 01.23.03.05 Real Estate Appraisal Documents	1.00	JOB	8,400	1,680	10,080	10,080
01. 01.23.03.06 Real Estate PL 94-646 Asst. Docs	1.00	JOB	800	160	960	960
01. 01.23.03.15 Real Estate Payment Documents	1.00	JOB	756,000	151,120	907,120	907,120
01. 01.23.03 Real Estate Analysis Documents	1.00	JOB	923,200	184,560	1,107,760	1,107,760
01. 01.23 Construction Documents	1.00	JOB	923,200	184,560	1,107,760	1,107,760
01. 01 Lands and Damages	1.00	JOB	923,200	184,560	1,107,760	1,107,760
01. 02 Relocations						
01. 02.01 Roads						
01. 02.01.01 Roads						
01. 02.01.01.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
01. 02.01.01 Roads	1.00	EA	0	0	0	0
01. 02.01 Roads	1.00	EA	0	0	0	0
01. 02.02 Railroads						
01. 02.02.07 Bridges						
01. 02.02.07.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
01. 02.02.07 Bridges	1.00	EA	0	0	0	0
01. 02.02 Railroads	1.00	EA	0	0	0	0
01. 02.03 Utilities						
01. 02.03.01 Pipelines						
01. 02.03.01.51 Demo Pipeline TX East #64-1 (6)	2200.00	FT	1,168,276	245,572	1,413,847	1,473,430
01. 02.03.01 Pipelines	1.00	EA	1,168,276	245,572	1,413,847	1,473,430
01. 02.03.02 Electric Lines						
01. 02.03.02.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
01. 02.03.02 Electric Lines	1.00	EA	0	0	0	0
01. 02.03 Utilities	1.00	EA	1,168,276	245,572	1,413,847	1,473,430

	QUANTITY	UOM	CONTRACT	CONTINGN	CONSTNT$	PROJECT
01. 02 Relocations	1.00	EA	1,168,276	245,572	1,413,847	1,473,430
01. 05 Locks						
01. 05.62 Approach Walls, Upper & Lower						
01. 05.62.05 Metals						
01. 05.62.05.10 Pinning Guidewalls	1.00	JOB	1,384,649	363,817	1,748,466	1,819,083
01. 05.62.05 Metals	1.00	LS	1,384,649	363,817	1,748,466	1,819,083
01. 05.62 Approach Walls, Upper & Lower	1.00	LS	1,384,649	363,817	1,748,466	1,819,083
01. 05 Locks	1.00	JOB	1,384,649	363,817	1,748,466	1,819,083
01. 06 Fish and Wildlife Facilities						
01. 06.03 F & W Faclts & Sancturies Mitign						
01. 06.03.73 Habitat & Feeding Facilities						
01. 06.03.73.10 Boat Ramp at Lower Merrisach	5600.00	SF	0	0	0	0
01. 06.03.73.11 Tern Island from Dredge Material	5600.00	SF	152,589	32,074	184,663	192,445
01. 06.03.73.12 Notch Dikes	46.00	EA	26,505	5,571	32,076	33,427
01. 06.03.73.13 Dredge Coal Pile Entrance Channl	74074.00	CY	153,650	32,297	185,948	193,784
01. 06.03.73.14 Dredge Side Channels @ 44.6 (2)	92593.00	CY	188,691	39,663	228,354	237,977
01. 06.03.73.15 Dredge Side Channel @ 70.6 R	33333.00	CY	69,817	14,675	84,492	88,053
01. 06.03.73.16 Dredge Side Channel @ 71.3L	118518.00	CY	237,745	49,974	287,719	299,844
01. 06.03.73.17 Dredge Side Channels @ 32.2	9259.00	CY	31,011	6,519	37,530	39,111
01. 06.03.73.18 Dredge Side Channels @ 50.9L	18518.00	CY	48,530	10,201	58,732	61,207
01. 06.03.73.21 5' Dia Gated Culvert @ 15.3 R	250.00	LF	282,777	59,440	342,217	356,639
01. 06.03.73.25 Silt Curtains	1.00	JOB	33,580	7,059	40,639	42,351
01. 06.03.73.50 Long Term Management Features	1.00	EA	1,066,223	224,120	1,290,343	1,344,721
01. 06.03.73.51 Adaptive Management Features	1.00	EA	366,700	77,080	443,780	462,482
01. 06.03.73.60 Mussel Mitigation NM 10.5-19.0	1.00	JOB	1,095,814	230,340	1,326,154	1,382,041
01. 06.03.73.65 Mussel Mitigation NM 19.0-75.2	1.00	JOB	5,000	1,051	6,051	6,306
01. 06.03.73.70 Endangered Species Surveys	1.00	JOB	0	0	0	0
01. 06.03.73 Habitat & Feeding Facilities	1.00	JOB	3,758,633	790,065	4,548,697	4,740,388
01. 06.03 F & W Faclts & Sancturies Mitign	1.00	JOB	3,758,633	790,065	4,548,697	4,740,388
01. 06 Fish and Wildlife Facilities	1.00	JOB	3,758,633	790,065	4,548,697	4,740,388
01. 09 Channels and Canals						
01. 09.01 Channels						
01. 09.01.16 Pipeline Dredging						
01. 09.01.16.00 <<< Not Identified >>>	1.00	EA	1,581,698	249,355	1,831,052	1,911,719
01. 09.01.16 Pipeline Dredging	1.00	EA	1,581,698	249,355	1,831,052	1,911,719

	QUANTITY	UOM	CONTRACT	CONTINGN	CONSTNT$	PROJECT
01. 09.01.20 Disposal Areas						
01. 09.01.20.01 Preparatory Work Area 1	100.00	ACR	277,094	58,245	335,339	349,471
01. 09.01.20.02 Site Work - Area 1	1.00	EA	1,880,334	395,246	2,275,580	2,371,477
01. 09.01.20.03 Preparatory Work Area 2	267.00	ACR	739,842	155,515	895,357	933,089
01. 09.01.20.04 Site Work - Area 2	1.00	EA	2,819,740	592,709	3,412,449	3,556,256
01. 09.01.20.06 Area 2 - Associated Items	1.00	EA	1,120,804	235,593	1,356,397	1,413,558
01. 09.01.20 Disposal Areas	1.00	EA	6,837,814	1,437,308	8,275,122	8,623,850
01. 09.01.30 Bank Stablztion, Dikes & Jetties						
01. 09.01.30.01 Bank Stabilization Measures - CG	501964.00	TON	6,149,059	1,615,665	7,764,724	8,078,326
01. 09.01.30 Bank Stablztion, Dikes & Jetties	1.00	JOB	6,149,059	1,615,665	7,764,724	8,078,326
01. 09.01 Channels	1.00	EA	14,568,570	3,302,328	17,870,898	18,613,895
01. 09 Channels and Canals	1.00	EA	14,568,570	3,302,328	17,870,898	18,613,895
01. 12 Navigation, Ports & Harbors (NF)						
01. 12.01 Ports						
01. 12.01.15 Mechanical Dredging						
01. 12.01.15.10 Mechanical Dredging	842.00	CY	14,940	3,140	18,080	18,842
01. 12.01.15 Mechanical Dredging	1.00	JOB	14,940	3,140	18,080	18,842
01. 12.01.16 Pipeline Dredging						
01. 12.01.16.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
01. 12.01.16 Pipeline Dredging	1.00	EA	0	0	0	0
01. 12.01 Ports	1.00	EA	14,940	3,140	18,080	18,842
01. 12.02 Harbors						
01. 12.02.16 Pipeline Dredging						
01. 12.02.16.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
01. 12.02.16 Pipeline Dredging	1.00	EA	0	0	0	0
01. 12.02 Harbors	1.00	EA	0	0	0	0
01. 12 Navigation, Ports & Harbors (NF)	1.00	EA	14,940	3,140	18,080	18,842
01. 18 Cultural Resource Preservation						
01. 18.00 Cultural Resource Preservation						
01. 18.00.86 Identification, Data Analysis						

	QUANTITY	UOM	CONTRACT	CONTINGN	CONSTNT$	PROJECT
01. 18.00.86.55 Cultural/Archaelogical Surveys	1.00	JOB	150,000	31,530	181,530	189,180
01. 18.00.86 Identification, Data Analysis	1.00	JOB	150,000	31,530	181,530	189,180
01. 18.00 Cultural Resource Preservation	1.00	JOB	150,000	31,530	181,530	189,180
01. 18 Cultural Resource Preservation	1.00	JOB	150,000	31,530	181,530	189,180
01. 30 Planning, Engineering & Design						
01. 30.20 Project Design Memorandum						
01. 30.20.01 PED						
01. 30.20.01.01 Surveys&Mapp'g Except Real Estat	1.00	EA	36,000	7,567	43,567	45,403
01. 30.20.01.03 Hydrology and Hydraulic Studies	1.00	EA	806,833	169,596	976,429	1,017,578
01. 30.20.01.07 PED	1.00	JOB	1,290,000	271,158	1,561,158	1,626,948
01. 30.20.01 PED	1.00	JOB	2,132,833	448,321	2,581,154	2,689,929
01. 30.20 Project Design Memorandum	1.00	JOB	2,132,833	448,321	2,581,154	2,689,929
01. 30 Planning, Engineering & Design	1.00	JOB	2,132,833	448,321	2,581,154	2,689,929
01. 31 Construction Management						
01. 31.23 Construction Contracts						
01. 31.23.11 Supervision and Administration						
01. 31.23.11.01 Prjt Office Supervn and Adminstn	1.00	LS	1,380,000	290,076	1,670,076	1,740,456
01. 31.23.11 Supervision and Administration	1.00	EA	1,380,000	290,076	1,670,076	1,740,456
01. 31.23 Construction Contracts	1.00	EA	1,380,000	290,076	1,670,076	1,740,456
01. 31 Construction Management	1.00	JOB	1,380,000	290,076	1,670,076	1,740,456
01 Reach 1 (NM 0.0 to NM 75.2)	1.00	EA	25,481,101	5,659,409	31,140,510	32,392,963
02 Reach 2 (NM 75.5 to NM 119.5)						
02. 01 Lands and Damages						
02. 01.23 Construction Documents						
02. 01.23.03 Real Estate Analysis Documents						
02. 01.23.03.02 Real Estate Acquisition Document	1.00	JOB	0	0	0	0
02. 01.23.03.05 Real Estate Appraisal Documents	1.00	JOB	0	0	0	0
02. 01.23.03.15 Real Estate Land Payments	1.00	JOB	0	0	0	0
02. 01.23.03 Real Estate Analysis Documents	1.00	JOB	0	0	0	0

	QUANTITY	UOM	CONTRACT	CONTINGN	CONSTNT$	PROJECT
02. 01.23 Construction Documents	1.00	JOB	0	0	0	0
02. 01 Lands and Damages	1.00	JOB	0	0	0	0
02. 02 Relocations						
02. 02.01 Roads						
02. 02.01.01 Roads						
02. 02.01.01.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
02. 02.01.01 Roads	1.00	EA	0	0	0	0
02. 02.01 Roads	1.00	EA	0	0	0	0
02. 02.02 Railroads						
02. 02.02.07 Bridges						
02. 02.02.07.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
02. 02.02.07 Bridges	1.00	EA	0	0	0	0
02. 02.02 Railroads	1.00	EA	0	0	0	0
02. 02.03 Utilities						
02. 02.03.01 Pipelines						
02. 02.03.01.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
02. 02.03.01 Pipelines	1.00	EA	0	0	0	0
02. 02.03.02 Electric Lines						
02. 02.03.02.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
02. 02.03.02 Electric Lines	1.00	EA	0	0	0	0
02. 02.03 Utilities	1.00	EA	0	0	0	0
02. 02 Relocations	1.00	EA	0	0	0	0
02. 05 Locks						
02. 05.62 Approach Walls, Upper & Lower						
02. 05.62.05 Metals						
02. 05.62.05.10 Pinning Guidewalls	1.00	JOB	346,162	90,954	437,116	454,771
02. 05.62.05 Metals	1.00	LS	346,162	90,954	437,116	454,771
02. 05.62 Approach Walls, Upper & Lower	1.00	LS	346,162	90,954	437,116	454,771

	QUANTITY	UOM	CONTRACT	CONTINGN	CONSTNT$	PROJECT
02. 05 Locks	1.00	JOB	346,162	90,954	437,116	454,771
02. 06 Fish and Wildlife Facilities						
02. 06.03 F & W Faclts & Sancturies Mitign						
02. 06.03.73 Habitat & Feeding Facilities						
02. 06.03.73.10 Boat Ramp at NM 85.9	5600.00	SF	0	0	0	0
02. 06.03.73.11 Tern Island from Dredge Material	5600.00	SF	72,975	15,339	88,314	92,036
02. 06.03.73.12 Notch Dikes	47.00	EA	27,081	5,692	32,773	34,154
02. 06.03.73.21 Dredge Side Channel @ 75.3L	5556.00	CY	13,211	2,777	15,988	16,662
02. 06.03.73.22 Dredge Side Channel @ 78.7L	5556.00	CY	24,004	5,046	29,050	30,274
02. 06.03.73.23 Dredge Side Channel @ 82.6L	5556.00	CY	13,211	2,777	15,988	16,662
02. 06.03.73.24 Dredge Side Channel @ 92.6L	3333.00	CY	13,052	2,744	15,796	16,462
02. 06.03.73.25 Dredge Side Channel @ 116.2R	37037.00	CY	0	0	0	0
02. 06.03.73.26 Silt Curtains	2400.00	FT	33,580	7,059	40,639	42,351
02. 06.03.73.27 Dredge Side Channel @ 88.2R	37037.00	CY	76,825	16,149	92,974	96,892
02. 06.03.73.51 Long Term Management Features	1.00	EA	451,223	94,847	546,070	569,083
02. 06.03.73.52 Adaptive Management Features	1.00	EA	366,700	77,080	443,780	462,482
02. 06.03.73.63 8' Dia Gated Culvert @ 110.4L	300.00	LF	253,943	53,379	307,321	320,272
02. 06.03.73.64 8' Dia Gated Culvert @ 110.4R	60.00	LF	124,404	26,150	150,554	156,898
02. 06.03.73.80 Bank Stab @ 91.5 - CG	64059.00	TON	784,723	206,186	990,909	1,030,930
02. 06.03.73 Habitat & Feeding Facilities	1.00	JOB	2,254,933	515,224	2,770,157	2,885,158
02. 06.03 F & W Faclts & Sancturies Mitign	1.00	JOB	2,254,933	515,224	2,770,157	2,885,158
02. 06 Fish and Wildlife Facilities	1.00	JOB	2,254,933	515,224	2,770,157	2,885,158
02. 09 Channels and Canals						
02. 09.01 Channels						
02. 09.01.16 Pipeline Dredging						
02. 09.01.16.00 <<< Not Identified >>>	1.00	EA	349,551	55,107	404,658	422,485
02. 09.01.16 Pipeline Dredging	1.00	EA	349,551	55,107	404,658	422,485
02. 09.01.20 Disposal Areas						
02. 09.01.20.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
02. 09.01.20 Disposal Areas	1.00	EA	0	0	0	0
02. 09.01.30 Bank Stablztion, Dikes & Jetties						
02. 09.01.30.01 Bank Stabilization Measures- CG	252380.00	TON	3,091,655	812,332	3,903,987	4,061,662
02. 09.01.30 Bank Stablztion, Dikes & Jetties	1.00	JOB	3,091,655	812,332	3,903,987	4,061,662
02. 09.01 Channels	1.00	EA	3,441,206	867,439	4,308,645	4,484,147

	QUANTITY	UOM	CONTRACT	CONTINGN	CONSTNT$	PROJECT
02. 09 Channels and Canals	1.00	EA	3,441,206	867,439	4,308,645	4,484,147
02. 12 Navigation, Ports & Harbors (NF)						
02. 12.01 Ports						
02. 12.01.15 Mechanical Dredging						
02. 12.01.15.10 Mechanical Dredging	1777.00	CY	16,548	3,478	20,027	20,871
02. 12.01.15 Mechanical Dredging	1.00	JOB	16,548	3,478	20,027	20,871
02. 12.01.16 Pipeline Dredging						
02. 12.01.16.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
02. 12.01.16 Pipeline Dredging	1.00	EA	0	0	0	0
02. 12.01 Ports	1.00	EA	16,548	3,478	20,027	20,871
02. 12.02 Harbors						
02. 12.02.16 Pipeline Dredging						
02. 12.02.16.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
02. 12.02.16 Pipeline Dredging	1.00	EA	0	0	0	0
02. 12.02 Harbors	1.00	EA	0	0	0	0
02. 12 Navigation, Ports & Harbors (NF)	1.00	EA	16,548	3,478	20,027	20,871
02. 18 Cultural Resource Preservation						
02. 18.00 Cultural Resource Preservation						
02. 18.00.86 Identification, Data Analysis						
02. 18.00.86.55 Cultural/Archaelogical Surveys	1.00	JOB	50,000	10,510	60,510	63,060
02. 18.00.86 Identification, Data Analysis	1.00	JOB	50,000	10,510	60,510	63,060
02. 18.00 Cultural Resource Preservation	1.00	JOB	50,000	10,510	60,510	63,060
02. 18 Cultural Resource Preservation	1.00	JOB	50,000	10,510	60,510	63,060
02. 30 Planning, Engineering & Design						
02. 30.20 Project Design Memorandum						
02. 30.20.01 PED						
02. 30.20.01.03 Hydrology and Hydraulic Studies	1.00	EA	464,333	97,603	561,936	585,617
02. 30.20.01.07 PED	1.00	JOB	375,363	78,901	454,264	473,408
02. 30.20.01 PED	1.00	JOB	839,696	176,504	1,016,200	1,059,025

	QUANTITY	UOM	CONTRACT	CONTINGN	CONSTNT$	PROJECT
02. 30.20 Project Design Memorandum	1.00	JOB	839,696	176,504	1,016,200	1,059,025
02. 30 Planning, Engineering & Design	1.00	JOB	839,696	176,504	1,016,200	1,059,025
02. 31 Construction Management						
02. 31.23 Construction Contracts						
02. 31.23.11 Supervision and Administration						
02. 31.23.11.01 Prjt Office Supervn and Adminstn	1.00	LS	402,175	84,537	486,712	507,223
02. 31.23.11 Supervision and Administration	1.00	EA	402,175	84,537	486,712	507,223
02. 31.23 Construction Contracts	1.00	EA	402,175	84,537	486,712	507,223
02. 31 Construction Management	1.00	JOB	402,175	84,537	486,712	507,223
02 Reach 2 (NM 75.5 to NM 119.5)	1.00	EA	7,350,720	1,748,647	9,099,367	9,474,254
03 Reach 3 (NM 119.5 to NM 220.3)						
03. 01 Lands and Damages						
03. 01.23 Construction Documents						
03. 01.23.03 Real Estate Analysis Documents						
03. 01.23.03.02 Real Estate Acquisition Document	1.00	JOB	0	0	0	0
03. 01.23.03.05 Real Estate Appraisal Documents	1.00	JOB	0	0	0	0
03. 01.23.03.15 Real Estate Land Payments	1.00	JOB	0	0	0	0
03. 01.23.03 Real Estate Analysis Documents	1.00	JOB	0	0	0	0
03. 01.23 Construction Documents	1.00	JOB	0	0	0	0
03. 01 Lands and Damages	1.00	JOB	0	0	0	0
03. 02 Relocations						
03. 02.01 Roads						
03. 02.01.01 Roads						
03. 02.01.01.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
03. 02.01.01 Roads	1.00	EA	0	0	0	0
03. 02.01 Roads	1.00	EA	0	0	0	0
03. 02.02 Railroads						
03. 02.02.07 Bridges						

	QUANTITY	UOM	CONTRACT	CONTINGN	CONSTNT$	PROJECT
03. 02.02.07.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
03. 02.02.07 Bridges	1.00	EA	0	0	0	0
03. 02.02 Railroads	1.00	EA	0	0	0	0
03. 02.03 Utilities						
03. 02.03.01 Pipelines						
03. 02.03.01.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
03. 02.03.01 Pipelines	1.00	EA	0	0	0	0
03. 02.03.02 Electric Lines						
03. 02.03.02.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
03. 02.03.02 Electric Lines	1.00	EA	0	0	0	0
03. 02.03 Utilities	1.00	EA	0	0	0	0
03. 02 Relocations	1.00	EA	0	0	0	0
03. 05 Locks						
03. 05.62 Approach Walls, Upper & Lower						
03. 05.62.05 Metals						
03. 05.62.05.10 Pinning Guidewalls	1.00	JOB	346,162	90,954	437,116	454,771
03. 05.62.05 Metals	1.00	LS	346,162	90,954	437,116	454,771
03. 05.62 Approach Walls, Upper & Lower	1.00	LS	346,162	90,954	437,116	454,771
03. 05 Locks	1.00	JOB	346,162	90,954	437,116	454,771
03. 06 Fish and Wildlife Facilities						
03. 06.03 F & W Faclts & Sancturies Mitign						
03. 06.03.73 Habitat & Feeding Facilities						
03. 06.03.73.11 Tern Island from Dredge Material	5600.00	SF	72,975	15,339	88,314	92,036
03. 06.03.73.12 Notch Dikes	64.00	EA	36,876	7,751	44,627	46,508
03. 06.03.73.15 Elevated Shore Line @Sweetin Isl	5600.00	SF	72,975	15,339	88,314	92,036
03. 06.03.73.21 Dredge Side Channel @ 131.0L	222222.00	CY	0	0	0	0
03. 06.03.73.22 Dredge Side Channel @ 164.5L	18519.00	CY	37,739	7,933	45,672	47,596
03. 06.03.73.23 Dredge Side Channel @ 132.2L	37037.00	CY	72,778	15,298	88,076	91,787
03. 06.03.73.25 Silt Curtains	1.00	JOB	16,790	3,529	20,319	21,176
03. 06.03.73.51 Long Term Management Features	1.00	EA	767,600	161,350	928,950	968,097
03. 06.03.73.52 Adaptive Management Features	1.00	EA	491,700	103,355	595,055	620,132
03. 06.03.73.70 Mussel Mitigation NM 119.3-220.3	1.00	JOB	0	0	0	0

	QUANTITY	UOM	CONTRACT	CONTINGN	CONSTNT$	PROJECT
03. 06.03.73.80 Bank Stab 143,7-144,2L - CG	85350.00	TON	1,045,538	274,715	1,320,252	1,373,575
03. 06.03.73.81 Bank Stab 163.6-165.3L - CG	79110.00	TON	969,098	254,630	1,223,728	1,273,152
03. 06.03.73 Habitat & Feeding Facilities	1.00	JOB	3,584,068	859,240	4,443,308	4,626,095
03. 06.03 F & W Faclts & Sancturies Mitign	1.00	JOB	3,584,068	859,240	4,443,308	4,626,095
03. 06 Fish and Wildlife Facilities	1.00	JOB	3,584,068	859,240	4,443,308	4,626,095
03. 09 Channels and Canals						
03. 09.01 Channels						
03. 09.01.16 Pipeline Dredging						
03. 09.01.16.00 <<< Not Identified >>>	1.00	EA	661,582	104,298	765,880	799,621
03. 09.01.16 Pipeline Dredging	1.00	EA	661,582	104,298	765,880	799,621
03. 09.01.20 Disposal Areas						
03. 09.01.20.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
03. 09.01.20 Disposal Areas	1.00	EA	0	0	0	0
03. 09.01.30 Bank Stablztion, Dikes & Jetties						
03. 09.01.30.01 Bank Stabilization Measures - CG	314599.00	TON	4,168,437	1,095,257	5,263,694	5,476,284
03. 09.01.30 Bank Stablztion, Dikes & Jetties	1.00	JOB	4,168,437	1,095,257	5,263,694	5,476,284
03. 09.01 Channels	1.00	EA	4,830,019	1,199,555	6,029,574	6,275,905
03. 09 Channels and Canals	1.00	EA	4,830,019	1,199,555	6,029,574	6,275,905
03. 12 Navigation, Ports & Harbors (NF)						
03. 12.01 Ports						
03. 12.01.15 Mechanical Dredging						
03. 12.01.15.10 Mechanical Dredging	4740.00	CY	21,645	4,550	26,195	27,299
03. 12.01.15 Mechanical Dredging	1.00	JOB	21,645	4,550	26,195	27,299
03. 12.01.16 Pipeline Dredging						
03. 12.01.16.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
03. 12.01.16 Pipeline Dredging	1.00	EA	0	0	0	0
03. 12.01 Ports	1.00	EA	21,645	4,550	26,195	27,299
03. 12.02 Harbors						

	QUANTITY	UOM	CONTRACT	CONTINGN	CONSTNT$	PROJECT
03. 12.02.16 Pipeline Dredging						
03. 12.02.16.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
03. 12.02.16 Pipeline Dredging	1.00	EA	0	0	0	0
03. 12.02 Harbors	1.00	EA	0	0	0	0
03. 12 Navigation, Ports & Harbors (NF)	1.00	EA	21,645	4,550	26,195	27,299
03. 18 Cultural Resource Preservation						
03. 18.00 Cultural Resource Preservation						
03. 18.00.86 Identification, Data Analysis						
03. 18.00.86.55 Cultural/Archaelogical Surveys	1.00	JOB	0	0	0	0
03. 18.00.86 Identification, Data Analysis	1.00	JOB	0	0	0	0
03. 18.00 Cultural Resource Preservation	1.00	JOB	0	0	0	0
03. 18 Cultural Resource Preservation	1.00	JOB	0	0	0	0
03. 30 Planning, Engineering & Design						
03. 30.20 Project Design Memorandum						
03. 30.20.01 PED						
03. 30.20.01.03 Hydrology and Hydraulic Studies	1.00	EA	551,083	115,838	666,921	695,026
03. 30.20.01.07 PED	1.00	JOB	554,689	116,596	671,285	699,574
03. 30.20.01 PED	1.00	JOB	1,105,772	232,433	1,338,205	1,394,600
03. 30.20 Project Design Memorandum	1.00	JOB	1,105,772	232,433	1,338,205	1,394,600
03. 30 Planning, Engineering & Design	1.00	JOB	1,105,772	232,433	1,338,205	1,394,600
03. 31 Construction Management						
03. 31.23 Construction Contracts						
03. 31.23.11 Supervision and Administration						
03. 31.23.11.01 Prjt Office Supervn and Adminstn	1.00	LS	594,310	124,924	719,234	749,544
03. 31.23.11 Supervision and Administration	1.00	EA	594,310	124,924	719,234	749,544
03. 31.23 Construction Contracts	1.00	EA	594,310	124,924	719,234	749,544
03. 31 Construction Management	1.00	JOB	594,310	124,924	719,234	749,544

	QUANTITY	UOM	CONTRACT	CONTINGN	CONSTNT$	PROJECT
03 Reach 3 (NM 119.5 to NM 220.3)	1.00	EA	10,481,976	2,511,656	12,993,632	13,528,213
04 Reach 4 (NM 220.3 to NM 307.7)						
04. 01 Lands and Damages						
04. 01.23 Construction Documents						
04. 01.23.03 Real Estate Analysis Documents						
04. 01.23.03.02 Real Estate Acquisition Document	1.00	JOB	0	0	0	0
04. 01.23.03.05 Real Estate Appraisal Documents	1.00	JOB	0	0	0	0
04. 01.23.03.15 Real Estate Land Payments	1.00	JOB	0	0	0	0
04. 01.23.03 Real Estate Analysis Documents	1.00	JOB	0	0	0	0
04. 01.23 Construction Documents	1.00	JOB	0	0	0	0
04. 01 Lands and Damages	1.00	JOB	0	0	0	0
04. 02 Relocations						
04. 02.01 Roads						
04. 02.01.01 Roads						
04. 02.01.01.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
04. 02.01.01 Roads	1.00	EA	0	0	0	0
04. 02.01 Roads	1.00	EA	0	0	0	0
04. 02.02 Railroads						
04. 02.02.07 Bridges						
04. 02.02.07.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
04. 02.02.07 Bridges	1.00	EA	0	0	0	0
04. 02.02 Railroads	1.00	EA	0	0	0	0
04. 02.03 Utilities						
04. 02.03.01 Pipelines						
04. 02.03.01.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
04. 02.03.01 Pipelines	1.00	EA	0	0	0	0
04. 02.03.02 Electric Lines						
04. 02.03.02.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
04. 02.03.02 Electric Lines	1.00	EA	0	0	0	0
04. 02.03 Utilities	1.00	EA	0	0	0	0

	QUANTITY	UOM	CONTRACT	CONTINGN	CONSTNT$	PROJECT
04. 02 Relocations	1.00	EA	0	0	0	0
04. 05 Locks						
04. 05.62 Approach Walls, Upper & Lower						
04. 05.62.05 Metals						
04. 05.62.05.10 Pinning Guidewalls	1.00	JOB	0	0	0	0
04. 05.62.05 Metals	1.00	LS	0	0	0	0
04. 05.62 Approach Walls, Upper & Lower	1.00	LS	0	0	0	0
04. 05 Locks	1.00	JOB	0	0	0	0
04. 06 Fish and Wildlife Facilities						
04. 06.03 F & W Faclts & Sancturies Mitign						
04. 06.03.73 Habitat & Feeding Facilities						
04. 06.03.73.10 Boat Ramp at NM 272.0L	5600.00	SF	0	0	0	0
04. 06.03.73.11 Tern Islnds from Dredge Material	5600.00	SF	42,554	8,945	51,499	53,669
04. 06.03.73.12 Notch Dikes	39.00	EA	22,471	4,723	27,195	28,341
04. 06.03.73.21 Dredge Side Channel @ 276.0R	37037.00	CY	72,778	15,298	88,076	91,787
04. 06.03.73.25 Silt Curtains	1.00	JOB	5,597	1,176	6,773	7,059
04. 06.03.73.51 Long Term Management Features	1.00	EA	578,723	121,648	700,371	729,886
04. 06.03.73.52 Adaptive Management Features	1.00	EA	491,700	103,355	595,055	620,132
04. 06.03.73.63 8' Dia Gated Culvert @ 243.9L	300.00	LF	253,943	53,379	307,321	320,272
04. 06.03.73 Habitat & Feeding Facilities	1.00	JOB	1,467,766	308,524	1,776,290	1,851,146
04. 06.03 F & W Faclts & Sancturies Mitign	1.00	JOB	1,467,766	308,524	1,776,290	1,851,146
04. 06 Fish and Wildlife Facilities	1.00	JOB	1,467,766	308,524	1,776,290	1,851,146
04. 09 Channels and Canals						
04. 09.01 Channels						
04. 09.01.16 Pipeline Dredging						
04. 09.01.16.00 <<< Not Identified >>>	1.00	EA	937,750	147,836	1,085,586	1,133,412
04. 09.01.16 Pipeline Dredging	1.00	EA	937,750	147,836	1,085,586	1,133,412
04. 09.01.20 Disposal Areas						
04. 09.01.20.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
04. 09.01.20 Disposal Areas	1.00	EA	0	0	0	0
04. 09.01.30 Bank Stablztion, Dikes & Jetties						
04. 09.01.30.01 Bank Stabilization Measures-CG	385140.00	TON	5,103,105	1,340,841	6,443,946	6,704,204

	QUANTITY	UOM	CONTRACT	CONTINGN	CONSTNT$	PROJECT
04. 09.01.30 Bank Stablztion, Dikes & Jetties	1.00	JOB	5,103,105	1,340,841	6,443,946	6,704,204
04. 09.01 Channels	1.00	EA	6,040,855	1,488,677	7,529,532	7,837,616
04. 09 Channels and Canals	1.00	EA	6,040,855	1,488,677	7,529,532	7,837,616
04. 12 Navigation, Ports & Harbors (NF)						
04. 12.01 Ports						
04. 12.01.15 Mechanical Dredging						
04. 12.01.15.10 Mechanical Dredging	1778.00	CY	16,550	3,479	20,029	20,873
04. 12.01.15 Mechanical Dredging	1.00	JOB	16,550	3,479	20,029	20,873
04. 12.01.16 Pipeline Dredging						
04. 12.01.16.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
04. 12.01.16 Pipeline Dredging	1.00	EA	0	0	0	0
04. 12.01 Ports	1.00	EA	16,550	3,479	20,029	20,873
04. 12.02 Harbors						
04. 12.02.16 Pipeline Dredging						
04. 12.02.16.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
04. 12.02.16 Pipeline Dredging	1.00	EA	0	0	0	0
04. 12.02 Harbors	1.00	EA	0	0	0	0
04. 12 Navigation, Ports & Harbors (NF)	1.00	EA	16,550	3,479	20,029	20,873
04. 18 Cultural Resource Preservation						
04. 18.00 Cultural Resource Preservation						
04. 18.00.86 Identification, Data Analysis						
04. 18.00.86.55 Cultural/Archaelogical Surveys	1.00	JOB	0	0	0	0
04. 18.00.86 Identification, Data Analysis	1.00	JOB	0	0	0	0
04. 18.00 Cultural Resource Preservation	1.00	JOB	0	0	0	0
04. 18 Cultural Resource Preservation	1.00	JOB	0	0	0	0
04. 30 Planning, Engineering & Design						

	QUANTITY	UOM	CONTRACT	CONTINGN	CONSTNT$	PROJECT
04. 30.20 Project Design Memorandum						
04. 30.20.01 PED						
04. 30.20.01.03 Hydrology and Hydraulic Studies	1.00	EA	400,583	84,203	484,786	505,215
04. 30.20.01.07 PED	1.00	JOB	454,953	95,631	550,584	573,787
04. 30.20.01 PED	1.00	JOB	855,536	179,834	1,035,370	1,079,002
04. 30.20 Project Design Memorandum	1.00	JOB	855,536	179,834	1,035,370	1,079,002
04. 30 Planning, Engineering & Design	1.00	JOB	855,536	179,834	1,035,370	1,079,002
04. 31 Construction Management						
04. 31.23 Construction Contracts						
04. 31.23.11 Supervision and Administration						
04. 31.23.11.01 Prjt Office Supervn and Adminstn	1.00	LS	487,449	102,462	589,911	614,771
04. 31.23.11 Supervision and Administration	1.00	EA	487,449	102,462	589,911	614,771
04. 31.23 Construction Contracts	1.00	EA	487,449	102,462	589,911	614,771
04. 31 Construction Management	1.00	JOB	487,449	102,462	589,911	614,771
04 Reach 4 (NM 220.3 to NM 307.7)	1.00	EA	8,868,156	2,082,976	10,951,131	11,403,407
Feasiblty Cost Es - 2 FT Lower	1.00	EA	52,181,953	12,002,688	64,184,641	66,798,837

ARKANSAS RIVER NAVIGATION STUDY,
ARKANSAS AND OKLAHOMA
FEASIBILITY STUDY

TAB C

- MCACES Cost Estimate -

Three-Foot Lower (12 Foot) Navigational Channel Reaches 1- 4

Feasibility Cost Es - 3 FT Lower
Alternative - Lower the MKARNS
Channel Bottom 3 Feet (12 foot Navigation Channel)

Designed By: Design Branch
Estimated By: Cost Engineering & Support Sectn

Prepared By: George Losak

Preparation Date: 07/18/05
Effective Date of Pricing: 01/01/08
Est Construction Time: 1000 Days

Sales Tax: 7.00%

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M C A C E S G O L D E D I T I O N
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Release 5.31

This project is to increase the depth of the navigation channel in Arkansas for the McClellan-Kerr Arkansas River Navigation System (MKARNS) from 9 feet to 12 feet. There are 12 navigation locks and dams in the MKARNS in Arkansas. Tulsa District is developing the modification costs for the Oklahoma segment of the MKARNS.

This cost estimate quantifies the construction cost to lower the bottom of the navigation channel 3 feet.

Features requiring modification include additional dredging in certain locations, removal of abandoned pipelines, construction of dredged material disposal areas near the Arkansas Post Canal, and construction of bank stabilization measures.

Many of the costs contained herein are based upon the designers experience. No detail surveys, drawings nor quantities were developed for these cost estimates.

ASSUMPTIONS:

1. Work is assumed to require 4 years with several contractors working concurrently. Assumed start date October 2006. Mid-point of construction is January 2008.

2. Dredging for ports and harbors is based on professional judgement that there would be some dredging involved. This dredging is accomplished in conjunction with the Corps of Engineers contract for economic efficiency.

EXCLUSIONS:

INCLUSIONS:

1. Escalation computed from indices in the 31 Mar 04 EC 11-2-187.

2. Contingency 15% for dredging, 25% for guidewall pinning and dikes and jetties and 20 % for other items because of the lack of information.

3. Prime contractor profit of 7.58 percent.

4. Sales tax of 7 percent.

5. Supervision and administration cost for construction contracts of 7.5 percent was furnished by Construction Branch personnel.

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No Detailed Estimate...

No Backup Reports...

* * * END TABLE OF CONTENTS * * *

		QUANTITY	UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
01	Lands and Damages	1.00	JOB	923,200	0	184,560	0	1,107,760	1107760
02	Relocations	1.00	EA	1,168,276	59,582	245,572	0	1,473,430	1473430
05	Locks	1.00	EA	2,076,974	105,926	545,725	0	2,728,624	2728624
06	Fish and Wildlife Facilities	1.00	JOB	11,065,399	564,335	2,473,053	0	14,102,787	14102787
09	Channels and Canals	1.00	EA	39,335,694	2,006,120	9,277,334	0	50,619,149	50619149
12	Navigation, Ports & Harbors (NF)	1.00	EA	81,322	4,147	17,094	0	102,563	102563.08
18	Cultural Resource Preservation	1.00	JOB	200,000	10,200	42,040	0	252,240	252240.00
30	Planning, Engineering & Design	1.00	JOB	6,206,922	316,553	1,304,695	0	7,828,171	7828171
31	Construction Management	1.00	JOB	3,646,359	185,964	766,465	0	4,598,788	4598788
TOTAL	Feasibility Cost Es - 3 FT Lower	1.00	EA	64,704,146	3,252,828	14,856,538	0	82,813,511	82813511

	QUANTITY	UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
01 Lands and Damages								
01.23 Construction Documents								
01.23.03 Real Estate Analysis Documents								
01.23.03.01 Reach 1 (NM 0.0 to NM 75.2)								
01.23.03.01.02 Real Estate Acquisition Document								
01.23.03.01.02.01 Acquistions	1.00	JOB	44,000	0	8,800	0	52,800	52800.00
01.23.03.01.02.02 Surveys	1.00	JOB	100,000	0	20,000	0	120,000	120000.00
01.23.03.01.02.03 Title Contract	1.00	JOB	6,000	0	1,200	0	7,200	7200.00
TOTAL Real Estate Acquisition Document	1.00	JOB	150,000	0	30,000	0	180,000	180000.00
01.23.03.01.03 Real Estate Condemntn Documents								
01.23.03.01.03.01 Condemnations by Corps of Engrs	1.00	JOB	8,000	0	1,600	0	9,600	9600.00
TOTAL Real Estate Condemntn Documents	1.00	JOB	8,000	0	1,600	0	9,600	9600.00
01.23.03.01.05 Real Estate Appraisal Documents								
01.23.03.01.05.01 Appraisal Contracts	1.00	JOB	6,000	0	1,200	0	7,200	7200.00
01.23.03.01.05.02 Review of Appraisal Reports	1.00	JOB	2,400	0	480	0	2,880	2880.00
TOTAL Real Estate Appraisal Documents	1.00	JOB	8,400	0	1,680	0	10,080	10080.00
01.23.03.01.06 Real Estate PL 94-646 Asst. Docs								
01.23.03.01.06.01 PL 91-646 Assistance	1.00	JOB	800	0	160	0	960	960.00
TOTAL Real Estate PL 94-646 Asst. Docs	1.00	JOB	800	0	160	0	960	960.00
01.23.03.01.15 Real Estate Payment Documents								
01.23.03.01.15.01 Payments (Land & Improvements)	1.00	JOB	750,600	0	150,120	0	900,720	900720.00
01.23.03.01.15.03 Payments (PL 91-646 Asst.)	1.00	JOB	5,000	0	1,000	0	6,000	6000.00
01.23.03.01.15.04 Review	1.00	JOB	400	0	0	0	400	400.00
TOTAL Real Estate Payment Documents	1.00	JOB	756,000	0	151,120	0	907,120	907120.00
TOTAL Reach 1 (NM 0.0 to NM 75.2)	1.00	EA	923,200	0	184,560	0	1,107,760	1107760

	QUANTITY	UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
01.23.03.02 Reach 2 (NM 75.5 to NM 119.5)								
01.23.03.02.15 Real Estate Land Payments								
01.23.03.03 Reach 3 (NM 119.5 to NM 220.3)								
01.23.03.03.15 Real Estate Land Payments								
01.23.03.04 Reach 4 (NM 220.3 to NM 307.7)								
01.23.03.04.15 Real Estate Land Payments								
TOTAL Real Estate Analysis Documents	1.00	JOB	923,200	0	184,560	0	1,107,760	1107760
TOTAL Construction Documents	1.00	JOB	923,200	0	184,560	0	1,107,760	1107760
TOTAL Lands and Damages	1.00	JOB	923,200	0	184,560	0	1,107,760	1107760
02 Relocations								
02.01 Roads								
02.01.01 Roads								
02.01.01.01 Reach 1 (NM 0.0 to NM 75.2)								
02.01.01.01.10 Roads								
02.01.01.02 Reach 2 (NM 75.2 to NM 119.5)								
02.01.01.02.10 Roads								
02.01.01.03 Reach 3 (NM 119.5 to NM 220.3)								
02.01.01.03.10 Roads								
02.01.01.04 Reach 4 (NM 220.3 to NM 308.7)								
02.01.01.04.10 Roads								
02.02 Railroads								
02.02.07 Bridges								
02.02.07.01 Reach 1 (NM 0.0 to NM 75.2)								
02.02.07.01.01 Railroads								
02.02.07.02 Reach 2 (NM 75.2 to NM 119.5)								
02.02.07.02.01 Railroads								
02.02.07.03 Reach 3 (NM 119.5 to NM 220.3)								
02.02.07.03.01 Railroads								
02.02.07.04 Reach 4 (NM 220.3 to NM 308.7)								
02.02.07.04.01 Railroads								

	QUANTITY UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
02.03 Utilities							
02.03.01 Pipelines							
02.03.01.01 Reach 1 (NM 0.0 to NM 75.2)							
02.03.01.01.51 Demo Pipeline TX East #64-1 (6)	2200.00 FT	1,168,276	59,582	245,572	0	1,473,430	669.74
TOTAL Reach 1 (NM 0.0 to NM 75.2)	1.00 EA	1,168,276	59,582	245,572	0	1,473,430	1473430
02.03.01.02 Reach 2 (NM 75.2 to NM 119.5)							
02.03.01.02.51 Relocations							
02.03.01.03 Reach 3 (NM 119.5 to NM 220.3)							
02.03.01.03.51 Relocations							
02.03.01.04 Reach 4 (NM 220.3 to NM 308.7)							
02.03.01.04.51 Relocations							
TOTAL Pipelines	1.00 EA	1,168,276	59,582	245,572	0	1,473,430	1473430
02.03.02 Electric Lines							
02.03.02.01 Reach 1 (NM 0.0 to NM 75.2)							
02.03.02.01.01 Electric							
02.03.02.02 Reach 2 (NM 75.2 to NM 119.5)							
02.03.02.02.01 Electric							
02.03.02.03 Reach 3 (NM 119.5 to NM 220.3)							
02.03.02.03.01 Electric							
02.03.02.04 Reach 4 (NM 220.3 to NM 308.7)							
02.03.02.04.01 Electric							
TOTAL Utilities	1.00 EA	1,168,276	59,582	245,572	0	1,473,430	1473430
TOTAL Relocations	1.00 EA	1,168,276	59,582	245,572	0	1,473,430	1473430
05 Locks							
05.62 Approach Walls, Upper & Lower							
05.62.05 Metals							
05.62.05.01 Reach 1 (NM 0.0 to NM 75.2)							

	QUANTITY	UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
05.62.05.01.10 Pinning Guidewalls	1.00	JOB	1,384,649	70,617	363,817	0	1,819,083	1819083
TOTAL Reach 1 (NM 0.0 to NM 75.2)	1.00	JOB	1,384,649	70,617	363,817	0	1,819,083	1819083
05.62.05.02 Reach 2 (NM 75.5 to NM 119.5)								
05.62.05.02.10 Pinning Guidewalls	1.00	JOB	346,162	17,654	90,954	0	454,771	454770.74
TOTAL Reach 2 (NM 75.5 to NM 119.5)	1.00	EA	346,162	17,654	90,954	0	454,771	454770.74
05.62.05.03 Reach 3 (NM 119.5 to NM 220.3)								
05.62.05.03.10 Pinning Guidewalls	1.00	JOB	346,162	17,654	90,954	0	454,771	454770.74
TOTAL Reach 3 (NM 119.5 to NM 220.3)	1.00	EA	346,162	17,654	90,954	0	454,771	454770.74
05.62.05.04 Reach 4 (NM 220.3 to NM 307.7)								
05.62.05.04.10 Pinning Guidewalls								
TOTAL Metals			2,076,974	105,926	545,725	0	2,728,624	
TOTAL Approach Walls, Upper & Lower			2,076,974	105,926	545,725	0	2,728,624	
TOTAL Locks	1.00	EA	2,076,974	105,926	545,725	0	2,728,624	2728624
06 Fish and Wildlife Facilities								
06.03 F & W Faclts & Sancturies Mitign								
06.03.73 Habitat & Feeding Facilities								
06.03.73.01 Reach 1 (NM 0.0 to NM 75.2)								
06.03.73.01.10 Boat Ramp at Lower Merrisach								
06.03.73.01.11 Tern Island from Dredge Material								
06.03.73.01.11.01 Dredge Material for Island	400000.00	CY	62,000	3,162	13,032	0	78,194	0.20
06.03.73.01.11.06 Turbidity Barrier	3000.00	FT	41,975	2,141	8,823	0	52,939	17.65
06.03.73.01.11.11 Turbidity Barrier	21000.00	FT	48,614	2,479	10,219	0	61,312	2.92
TOTAL Tern Island from Dredge Material	5600.00	SF	152,589	7,782	32,074	0	192,445	34.37
06.03.73.01.12 Notch Dikes								

		QUANTITY	UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
06.03.73.01.12.01	Dike Notching	46.00	EA	26,505	1,352	5,571	0	33,427	726.68
TOTAL	Notch Dikes	46.00	EA	26,505	1,352	5,571	0	33,427	726.68
06.03.73.01.13	Dredge Coal Pile Entrance Channl								
06.03.73.01.13. 1	Excavate, Load & Barge	74074.00	CY	63,709	3,249	13,392	0	80,349	1.08
06.03.73.01.13. 2	Unload in Disposal Area	88888.80	CY	76,450	3,899	16,070	0	96,419	1.08
06.03.73.01.13. 3	Mobilization	1.00	JOB	8,945	456	1,880	0	11,281	11281.05
06.03.73.01.13. 4	Demobilization	1.00	JOB	4,547	232	956	0	5,735	5734.61
TOTAL	Dredge Coal Pile Entrance Channl	74074.00	CY	153,650	7,836	32,297	0	193,784	2.62
06.03.73.01.14	Dredge Side Channels @ 44.6 (2)								
06.03.73.01.14. 1	Excavate, Load & Barge	92593.00	CY	79,636	4,061	16,740	0	100,437	1.08
06.03.73.01.14. 2	Unload in Disposal Area	111111.60	CY	95,563	4,874	20,087	0	120,525	1.08
06.03.73.01.14. 3	Mobilization	1.00	JOB	8,945	456	1,880	0	11,281	11281.05
06.03.73.01.14. 4	Demobilization	1.00	JOB	4,547	232	956	0	5,735	5734.61
TOTAL	Dredge Side Channels @ 44.6 (2)	92593.00	CY	188,691	9,623	39,663	0	237,977	2.57
06.03.73.01.15	Dredge Side Channel @ 70.6 R								
06.03.73.01.15. 1	Excavate, Load & Barge	33333.00	CY	28,669	1,462	6,026	0	36,157	1.08
06.03.73.01.15. 2	Unload in Disposal Area	39999.60	CY	34,402	1,755	7,231	0	43,388	1.08
06.03.73.01.15. 3	Mobilization	1.00	JOB	4,472	228	940	0	5,641	5640.52
06.03.73.01.15. 4	Demobilization	1.00	JOB	2,273	116	478	0	2,867	2867.30
TOTAL	Dredge Side Channel @ 70.6 R	33333.00	CY	69,817	3,561	14,675	0	88,053	2.64
06.03.73.01.16	Env Sustainability @ 71.3L								
06.03.73.01.16. 1	Excavate, Load & Barge	118518.00	CY	101,933	5,199	21,426	0	128,558	1.08
06.03.73.01.16. 2	Unload in Disposal Area	142221.60	CY	122,320	6,238	25,712	0	154,270	1.08
06.03.73.01.16. 3	Mobilization	1.00	JOB	8,945	456	1,880	0	11,281	11281.05
06.03.73.01.16. 4	Demobilization	1.00	JOB	4,547	232	956	0	5,735	5734.61
TOTAL	Env Sustainability @ 71.3L	118518.00	CY	237,745	12,125	49,974	0	299,844	2.53
06.03.73.01.17	Dredge Side Channels @ 32.2								
06.03.73.01.17. 1	Excavate, Load & Barge	9259.00	CY	7,963	406	1,674	0	10,043	1.08
06.03.73.01.17. 2	Unload in Disposal Area	11110.80	CY	9,556	487	2,009	0	12,052	1.08
06.03.73.01.17. 3	Mobilization	1.00	JOB	8,945	456	1,880	0	11,281	11281.05

		QUANTITY	UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
06.03.73.01.17. 4	Demobilization	1.00	JOB	4,547	232	956	0	5,735	5734.61
TOTAL	Dredge Side Channels @ 32.2	9259.00	CY	31,011	1,582	6,519	0	39,111	4.22
06.03.73.01.18	Dredge Side Channels @ 50.9L								
06.03.73.01.18. 1	Excavate, Load & Barge	18518.00	CY	15,927	812	3,348	0	20,087	1.08
06.03.73.01.18. 2	Unload in Disposal Area	22221.60	CY	19,112	975	4,017	0	24,104	1.08
06.03.73.01.18. 3	Mobilization	1.00	JOB	8,945	456	1,880	0	11,281	11281.05
06.03.73.01.18. 4	Demobilization	1.00	JOB	4,547	232	956	0	5,735	5734.61
TOTAL	Dredge Side Channels @ 50.9L	18518.00	CY	48,530	2,475	10,201	0	61,207	3.31
06.03.73.01.21	5' Dia Gated Culvert @ 15.3 R								
06.03.73.01.21. 1	Excavate, Load & Barge	10000.00	CY	8,601	439	1,808	0	10,847	1.08
06.03.73.01.21. 2	Unload in Disposal Area	12000.00	CY	10,321	526	2,169	0	13,017	1.08
06.03.73.01.21. 3	Mobilization	1.00	JOB	13,154	671	2,765	0	16,590	16589.77
06.03.73.01.21. 4	Demobilization	1.00	JOB	6,889	351	1,448	0	8,689	8688.79
06.03.73.01.21.11	Install 5' Dia Culvert	250.00	JOB	54,519	2,780	11,460	0	68,759	275.04
06.03.73.01.21.12	Backfill	10000.00	CY	63,456	3,236	13,338	0	80,030	8.00
06.03.73.01.21.13	Riprap Slope Protection	300.00	TON	7,162	365	1,506	0	9,033	30.11
06.03.73.01.21.14	Site Dewatering	1008.00	HR	118,676	6,052	24,946	0	149,674	148.49
TOTAL	5' Dia Gated Culvert @ 15.3 R	250.00	LF	282,777	14,422	59,440	0	356,639	1426.56
06.03.73.01.25	Silt Curtains								
06.03.73.01.25.06	Turbidity Barrier	2400.00	FT	33,580	1,713	7,059	0	42,351	17.65
TOTAL	Silt Curtains	1.00	JOB	33,580	1,713	7,059	0	42,351	42351.18
06.03.73.01.50	Long Term Management Features								
06.03.73.01.50.06	Bathymetry (LTM)	1.00	JOB	66,700	3,402	14,020	0	84,122	84122.04
06.03.73.01.50.07	Substrate Sampling (LTM)	1.00	JOB	20,000	1,020	4,204	0	25,224	25224.00
06.03.73.01.50.08	LIDAAR/GIS (LTM)	1.00	JOB	50,000	2,550	10,510	0	63,060	63060.00
06.03.73.01.50.09	Backwater Reevaluations (LTM)	1.00	JOB	26,700	1,362	5,612	0	33,674	33674.04
06.03.73.01.50.10	Diversity & Pres @ Trib Mout LTM	1.00	JOB	26,700	1,362	5,612	0	33,674	33674.04
06.03.73.01.50.13	Fish Sampling (LTM)	1.00	JOB	100,000	5,100	21,020	0	126,120	126120.00
06.03.73.01.50.15	Water Quality Monitoring (LTM)	1.00	JOB	100,000	5,100	21,020	0	126,120	126120.00
06.03.73.01.50.16	Mussel Bed Monitoring (LTM)	1.00	JOB	615,000	31,365	129,273	0	775,638	775638.00
06.03.73.01.50.91	LM Boat Ramp - Concrete	5600.00	SF	53,966	2,752	11,344	0	68,062	12.15
06.03.73.01.50.92	LM Boat Ramp - Clearing	1.00	AC	2,854	146	600	0	3,599	3599.24
06.03.73.01.50.93	LM Boat Ramp - Aggregate Base	184.80	SY	4,303	219	905	0	5,428	29.37
TOTAL	Long Term Management Features	1.00	EA	1,066,223	54,377	224,120	0	1,344,721	1344721

	QUANTITY	UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
06.03.73.01.51 Adaptive Management Features								
06.03.73.01.51.01 Backwaters & Trib Mouths Misc AM	1.00	JOB	166,700	8,502	35,040	0	210,242	210242.04
06.03.73.01.51.03 Dike Field Mods (AM)	1.00	JOB	100,000	5,100	21,020	0	126,120	126120.00
06.03.73.01.51.04 Mussel Bed Recolonization (AM)	1.00	JOB	100,000	5,100	21,020	0	126,120	126120.00
TOTAL Adaptive Management Features	1.00	EA	366,700	18,702	77,080	0	462,482	462482.04
06.03.73.01.60 Mussel Mitigation NM 10.5-19.0								
06.03.73.01.60.01 Survey for Potential Relo Site	1.00	JOB	40,000	2,040	8,408	0	50,448	50448.00
06.03.73.01.60.02 Survey Mussel Beds for Density	1.00	JOB	20,000	1,020	4,204	0	25,224	25224.00
06.03.73.01.60.03 Relocate Unionids	1.00	JOB	200,000	10,200	42,040	0	252,240	252240.00
06.03.73.01.60.04 Relocate 30,000 Additional Mussl	1.00	JOB	140,000	7,140	29,428	0	176,568	176568.00
06.03.73.01.60.06 Return Mussels to AP Canal	1.00	JOB	151,065	7,704	31,754	0	190,523	190523.18
06.03.73.01.60.07 Monitor Relo'd Unionids in Canal	1.00	JOB	115,250	5,878	24,226	0	145,353	145353.30
06.03.73.01.60.08 Propagate and release 3Mil Union	1.00	JOB	429,499	21,904	90,281	0	541,684	541684.14
TOTAL Mussel Mitigation NM 10.5-19.0	1.00	JOB	1,095,814	55,887	230,340	0	1,382,041	1382041
06.03.73.01.65 Mussel Mitigation NM 19.0-75.2								
06.03.73.01.65.10 NM 48.5 Survey Unionid Distrib.	1.00	JOB	5,000	255	1,051	0	6,306	6306.00
TOTAL Mussel Mitigation NM 19.0-75.2	1.00	JOB	5,000	255	1,051	0	6,306	6306.00
06.03.73.01.70 Endangered Species Surveys								
TOTAL Reach 1 (NM 0.0 to NM 75.2)	1.00	EA	3,758,633	191,690	790,065	0	4,740,388	4740388
06.03.73.02 Reach 2 (NM 75.5 to NM 119.5)								
06.03.73.02.11 Tern Island from Dredge Material								
06.03.73.02.11.01 Dredge Material for Island	200000.00	CY	31,000	1,581	6,516	0	39,097	0.20
06.03.73.02.11.06 Turbidity Barrier	3000.00	FT	41,975	2,141	8,823	0	52,939	17.65
TOTAL Tern Island from Dredge Material	5600.00	SF	72,975	3,722	15,339	0	92,036	16.44
06.03.73.02.12 Notch Dikes								
06.03.73.02.12.01 Dike Notching	47.00	EA	27,081	1,381	5,692	0	34,154	726.68
TOTAL Notch Dikes	47.00	EA	27,081	1,381	5,692	0	34,154	726.68
06.03.73.02.21 Dredge Side Channel @ 75.3L								

		QUANTITY	UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
06.03.73.02.21. 1	Excavate, Load & Barge	5556.00	CY	4,779	244	1,004	0	6,027	1.08
06.03.73.02.21. 2	Unload in Disposal Area	6667.20	CY	5,734	292	1,205	0	7,232	1.08
06.03.73.02.21. 3	Mobilization	1.00	JOB	1,789	91	376	0	2,256	2256.21
06.03.73.02.21. 4	Demobilization	1.00	JOB	909	46	191	0	1,147	1146.92
	TOTAL Dredge Side Channel @ 75.3L	5556.00	CY	13,211	674	2,777	0	16,662	3.00
06.03.73.02.22	Dredge Side Channel @ 78.7L								
06.03.73.02.22. 1	Excavate, Load & Barge	5556.00	CY	4,779	244	1,004	0	6,027	1.08
06.03.73.02.22. 2	Unload in Disposal Area	6667.20	CY	5,734	292	1,205	0	7,232	1.08
06.03.73.02.22. 3	Mobilization	1.00	JOB	8,945	456	1,880	0	11,281	11281.05
06.03.73.02.22. 4	Demobilization	1.00	JOB	4,547	232	956	0	5,735	5734.61
	TOTAL Dredge Side Channel @ 78.7L	5556.00	CY	24,004	1,224	5,046	0	30,274	5.45
06.03.73.02.23	Dredge Side Channel @ 82.6L								
06.03.73.02.23. 1	Excavate, Load & Barge	5556.00	CY	4,779	244	1,004	0	6,027	1.08
06.03.73.02.23. 2	Unload in Disposal Area	6667.20	CY	5,734	292	1,205	0	7,232	1.08
06.03.73.02.23. 3	Mobilization	1.00	JOB	1,789	91	376	0	2,256	2256.21
06.03.73.02.23. 4	Demobilization	1.00	JOB	909	46	191	0	1,147	1146.92
	TOTAL Dredge Side Channel @ 82.6L	5556.00	CY	13,211	674	2,777	0	16,662	3.00
06.03.73.02.24	Dredge Side Channel @ 92.6L								
06.03.73.02.24. 1	Excavate, Load & Barge	3333.00	CY	2,867	146	603	0	3,615	1.08
06.03.73.02.24. 2	Unload in Disposal Area	3999.60	CY	3,440	175	723	0	4,338	1.08
06.03.73.02.24. 3	Mobilization	1.00	JOB	4,472	228	940	0	5,641	5640.52
06.03.73.02.24. 4	Demobilization	1.00	JOB	2,273	116	478	0	2,867	2867.30
	TOTAL Dredge Side Channel @ 92.6L	3333.00	CY	13,052	666	2,744	0	16,462	4.94
06.03.73.02.26	Silt Curtains								
06.03.73.02.26.06	Turbidity Barrier	2400.00	FT	33,580	1,713	7,059	0	42,351	17.65
	TOTAL Silt Curtains	2400.00	FT	33,580	1,713	7,059	0	42,351	17.65
06.03.73.02.27	Dredge Side Channel @ 88.2R								
06.03.73.02.27. 1	Excavate, Load & Barge	37037.00	CY	31,854	1,625	6,696	0	40,175	1.08
06.03.73.02.27. 2	Unload in Disposal Area	44444.40	CY	38,225	1,949	8,035	0	48,210	1.08
06.03.73.02.27. 3	Mobilization	1.00	JOB	4,472	228	940	0	5,641	5640.52

		QUANTITY	UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
06.03.73.02.27. 4	Demobilization	1.00	JOB	2,273	116	478	0	2,867	2867.30
TOTAL	Dredge Side Channel @ 88.2R	37037.00	CY	76,825	3,918	16,149	0	96,892	2.62
06.03.73.02.51	Long Term Management Features								
06.03.73.02.51.06	Bathymetry (LTM)	1.00	JOB	66,700	3,402	14,020	0	84,122	84122.04
06.03.73.02.51.07	Substrate Sampling (LTM)	1.00	JOB	20,000	1,020	4,204	0	25,224	25224.00
06.03.73.02.51.08	LIDAAR/GIS (LTM)	1.00	JOB	50,000	2,550	10,510	0	63,060	63060.00
06.03.73.02.51.09	Backwater Reevaluations (LTM)	1.00	JOB	26,700	1,362	5,612	0	33,674	33674.04
06.03.73.02.51.10	Diversity & Pres @ Trib Mout LTM	1.00	JOB	26,700	1,362	5,612	0	33,674	33674.04
06.03.73.02.51.13	Fish Sampling (LTM)	1.00	JOB	100,000	5,100	21,020	0	126,120	126120.00
06.03.73.02.51.15	Water Quality Monitoring (LTM)	1.00	JOB	100,000	5,100	21,020	0	126,120	126120.00
06.03.73.02.51.91	85.9 Boat Ramp - Concrete	5600.00	SF	53,966	2,752	11,344	0	68,062	12.15
06.03.73.02.51.92	85.9 Boat Ramp - Clearing	1.00	AC	2,854	146	600	0	3,599	3599.24
06.03.73.02.51.93	85.9 Boat Ramp - Aggregate Base	184.80	SY	4,303	219	905	0	5,428	29.37
TOTAL	Long Term Management Features	1.00	EA	451,223	23,012	94,847	0	569,083	569082.51
06.03.73.02.52	Adaptive Management Features								
06.03.73.02.52.01	Backwaters & Trib Mouths Misc AM	1.00	JOB	166,700	8,502	35,040	0	210,242	210242.04
06.03.73.02.52.03	Dike Field Mods (AM)	1.00	JOB	100,000	5,100	21,020	0	126,120	126120.00
06.03.73.02.52.04	Mussel Bed Recolonization (AM)	1.00	JOB	100,000	5,100	21,020	0	126,120	126120.00
TOTAL	Adaptive Management Features	1.00	EA	366,700	18,702	77,080	0	462,482	462482.04
06.03.73.02.63	Env Sustainability @ 110.4L								
06.03.73.02.63. 1	Excavate, Load & Barge	12000.00	CY	10,321	526	2,169	0	13,017	1.08
06.03.73.02.63. 2	Unload in Disposal Area	14400.00	CY	12,385	632	2,603	0	15,620	1.08
06.03.73.02.63. 3	Mobilization	1.00	JOB	13,154	671	2,765	0	16,590	16589.77
06.03.73.02.63. 4	Demobilization	1.00	JOB	6,889	351	1,448	0	8,689	8688.79
06.03.73.02.63.11	Install 8' Dia Culvert	300.00	JOB	140,575	7,169	29,549	0	177,294	590.98
06.03.73.02.63.12	Backfill	10000.00	CY	63,456	3,236	13,338	0	80,030	8.00
06.03.73.02.63.13	Riprap Slope Protection	300.00	TON	7,162	365	1,506	0	9,033	30.11
TOTAL	Env Sustainability @ 110.4L	300.00	LF	253,943	12,951	53,379	0	320,272	1067.57
06.03.73.02.64	8' Dia Gated Culvert @ 110.4R								
06.03.73.02.64. 1	Excavate, Load & Barge	2400.00	CY	2,064	105	434	0	2,603	1.08
06.03.73.02.64. 2	Unload in Disposal Area	2880.00	CY	2,477	126	521	0	3,124	1.08
06.03.73.02.64. 3	Mobilization	1.00	JOB	13,154	671	2,765	0	16,590	16589.77
06.03.73.02.64. 4	Demobilization	1.00	JOB	6,889	351	1,448	0	8,689	8688.79
06.03.73.02.64.11	Install 8' Dia Culvert	60.00	FT	38,313	1,954	8,053	0	48,321	805.34
06.03.73.02.64.12	Backfill	2400.00	CY	59,119	3,015	12,427	0	74,561	31.07

		QUANTITY	UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
06.03.73.02.64.13	Riprap Slope Protection	100.00	TON	2,387	122	502	0	3,011	30.11
	TOTAL 8' Dia Gated Culvert @ 110.4R	60.00	LF	124,404	6,345	26,150	0	156,898	2614.97
06.03.73.02.80	Bank Stab @ 91.5 - CG	64059.00	TON	784,723	40,021	206,186	0	1,030,930	16.09
	TOTAL Reach 2 (NM 75.5 to NM 119.5)	1.00	EA	2,254,933	115,002	515,224	0	2,885,158	2885158
06.03.73.03	Reach 3 (NM 119.5 to NM 220.3)								
06.03.73.03.11	Tern Island from Dredge Material								
06.03.73.03.11.01	Dredge Material for Island	200000.00	CY	31,000	1,581	6,516	0	39,097	0.20
06.03.73.03.11.06	Turbidity Barrier	3000.00	FT	41,975	2,141	8,823	0	52,939	17.65
	TOTAL Tern Island from Dredge Material	5600.00	SF	72,975	3,722	15,339	0	92,036	16.44
06.03.73.03.12	Notch Dikes								
06.03.73.03.12.01	Dike Notching	64.00	EA	36,876	1,881	7,751	0	46,508	726.68
	TOTAL Notch Dikes	64.00	EA	36,876	1,881	7,751	0	46,508	726.68
06.03.73.03.15	Elevated Shore Line @Sweetin Isl								
06.03.73.03.15.01	Dredge Material for Island	200000.00	CY	31,000	1,581	6,516	0	39,097	0.20
06.03.73.03.15.06	Turbidity Barrier	3000.00	FT	41,975	2,141	8,823	0	52,939	17.65
	TOTAL Elevated Shore Line @Sweetin Isl	5600.00	SF	72,975	3,722	15,339	0	92,036	16.44
06.03.73.03.22	Dredge Side Channel @ 164.5L								
06.03.73.03.22. 1	Excavate, Load & Barge	18519.00	CY	15,928	812	3,348	0	20,088	1.08
06.03.73.03.22. 2	Unload in Disposal Area	22222.80	CY	19,113	975	4,018	0	24,105	1.08
06.03.73.03.22. 3	Mobilization	1.00	JOB	1,789	91	376	0	2,256	2256.21
06.03.73.03.22. 4	Demobilization	1.00	JOB	909	46	191	0	1,147	1146.92
	TOTAL Dredge Side Channel @ 164.5L	18519.00	CY	37,739	1,925	7,933	0	47,596	2.57
06.03.73.03.23	Dredge Side Channel @ 132.2L								
06.03.73.03.23. 1	Excavate, Load & Barge	37037.00	CY	31,854	1,625	6,696	0	40,175	1.08
06.03.73.03.23. 2	Unload in Disposal Area	44444.40	CY	38,225	1,949	8,035	0	48,210	1.08
06.03.73.03.23. 3	Mobilization	1.00	JOB	1,789	91	376	0	2,256	2256.21
06.03.73.03.23. 4	Demobilization	1.00	JOB	909	46	191	0	1,147	1146.92

		QUANTITY	UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
	TOTAL Dredge Side Channel @ 132.2L	37037.00	CY	72,778	3,712	15,298	0	91,787	2.48
06.03.73.03.25	Silt Curtains								
06.03.73.03.25.06	Turbidity Barrier	1200.00	FT	16,790	856	3,529	0	21,176	17.65
	TOTAL Silt Curtains	1.00	JOB	16,790	856	3,529	0	21,176	21175.59
06.03.73.03.51	Long Term Management Features								
06.03.73.03.51.06	Bathymetry (LTM)	1.00	JOB	66,700	3,402	14,020	0	84,122	84122.04
06.03.73.03.51.07	Substrate Sampling (LTM)	1.00	JOB	20,000	1,020	4,204	0	25,224	25224.00
06.03.73.03.51.08	LIDAAR/GIS (LTM)	1.00	JOB	50,000	2,550	10,510	0	63,060	63060.00
06.03.73.03.51.09	Backwater Reevaluations (LTM)	1.00	JOB	26,700	1,362	5,612	0	33,674	33674.04
06.03.73.03.51.10	Diversity & Pres @ Trib Mout LTM	1.00	JOB	26,700	1,362	5,612	0	33,674	33674.04
06.03.73.03.51.11	Gravel Modl Sus. Substrates LTM	1.00	JOB	30,000	1,530	6,306	0	37,836	37836.00
06.03.73.03.51.12	Gravel Monitring Hab Qual LTM	1.00	JOB	97,500	4,973	20,495	0	122,967	122967.00
06.03.73.03.51.13	Fish Sampling (LTM)	1.00	JOB	100,000	5,100	21,020	0	126,120	126120.00
06.03.73.03.51.15	Water Quality Monitoring (LTM)	1.00	JOB	100,000	5,100	21,020	0	126,120	126120.00
06.03.73.03.51.16	Mussel Bed Monitoring (LTM)	1.00	JOB	250,000	12,750	52,550	0	315,300	315300.00
	TOTAL Long Term Management Features	1.00	EA	767,600	39,148	161,350	0	968,097	968097.12
06.03.73.03.52	Adaptive Management Features								
06.03.73.03.52.01	Backwaters & Trib Mouths Misc AM	1.00	JOB	166,700	8,502	35,040	0	210,242	210242.04
06.03.73.03.52.02	Gravel Bar Monitoring AM	1.00	JOB	125,000	6,375	26,275	0	157,650	157650.00
06.03.73.03.52.03	Dike Field Mods (AM)	1.00	JOB	100,000	5,100	21,020	0	126,120	126120.00
06.03.73.03.52.04	Mussel Bed Recolonization (AM)	1.00	JOB	100,000	5,100	21,020	0	126,120	126120.00
	TOTAL Adaptive Management Features	1.00	EA	491,700	25,077	103,355	0	620,132	620132.04
06.03.73.03.80	Bank Stab 143,7-144,2L - CG	85350.00	TON	1,045,538	53,322	274,715	0	1,373,575	16.09
06.03.73.03.81	Bank Stab 163.6-165.3L - CG	79110.00	TON	969,098	49,424	254,630	0	1,273,152	16.09
	TOTAL Reach 3 (NM 119.5 to NM 220.3)	1.00	EA	3,584,068	182,787	859,240	0	4,626,095	4626095
06.03.73.04	Reach 4 (NM 220.3 to NM 307.7)								
06.03.73.04.10	Boat Ramp at NM 272.0L								
06.03.73.04.11	Tern Islnds from Dredge Material								
06.03.73.04.11.01	Dredge Material for Island	200000.00	CY	31,000	1,581	6,516	0	39,097	0.20
06.03.73.04.11.06	Turbidity Barrier	3000.00	FT	4,609	235	969	0	5,813	1.94

		QUANTITY	UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
06.03.73.04.11.11	Turbidity Barrier	3000.00	FT	6,945	354	1,460	0	8,759	2.92
TOTAL	Tern Islnds from Dredge Material	5600.00	SF	42,554	2,170	8,945	0	53,669	9.58
06.03.73.04.12	Notch Dikes								
06.03.73.04.12.01	Dike Notching	39.00	EA	22,471	1,146	4,723	0	28,341	726.68
TOTAL	Notch Dikes	39.00	EA	22,471	1,146	4,723	0	28,341	726.68
06.03.73.04.21	Dredge Side Channel @ 276.0R								
06.03.73.04.21. 1	Excavate, Load & Barge	37037.00	CY	31,854	1,625	6,696	0	40,175	1.08
06.03.73.04.21. 2	Unload in Disposal Area	44444.40	CY	38,225	1,949	8,035	0	48,210	1.08
06.03.73.04.21. 3	Mobilization	1.00	JOB	1,789	91	376	0	2,256	2256.21
06.03.73.04.21. 4	Demobilization	1.00	JOB	909	46	191	0	1,147	1146.92
TOTAL	Dredge Side Channel @ 276.0R	37037.00	CY	72,778	3,712	15,298	0	91,787	2.48
06.03.73.04.25	Silt Curtains								
06.03.73.04.25.06	Turbidity Barrier	400.00	FT	5,597	285	1,176	0	7,059	17.65
TOTAL	Silt Curtains	1.00	JOB	5,597	285	1,176	0	7,059	7058.52
06.03.73.04.51	Long Term Management Features								
06.03.73.04.51.06	Bathymetry (LTM)	1.00	JOB	66,700	3,402	14,020	0	84,122	84122.04
06.03.73.04.51.07	Substrate Sampling (LTM)	1.00	JOB	20,000	1,020	4,204	0	25,224	25224.00
06.03.73.04.51.08	LIDAAR/GIS (LTM)	1.00	JOB	50,000	2,550	10,510	0	63,060	63060.00
06.03.73.04.51.09	Backwater Reevaluations (LTM)	1.00	JOB	26,700	1,362	5,612	0	33,674	33674.04
06.03.73.04.51.10	Diversity & Pres @ Trib Mout LTM	1.00	JOB	26,700	1,362	5,612	0	33,674	33674.04
06.03.73.04.51.11	Gravel Modl Sus. Substrates LTM	1.00	JOB	30,000	1,530	6,306	0	37,836	37836.00
06.03.73.04.51.12	Gravel Monitring Hab Qual LTM	1.00	JOB	97,500	4,973	20,495	0	122,967	122967.00
06.03.73.04.51.13	Fish Sampling (LTM)	1.00	JOB	100,000	5,100	21,020	0	126,120	126120.00
06.03.73.04.51.15	Water Quality Monitoring (LTM)	1.00	JOB	100,000	5,100	21,020	0	126,120	126120.00
06.03.73.04.51.91	272L Boat Ramp - Concrete	5600.00	SF	53,966	2,752	11,344	0	68,062	12.15
06.03.73.04.51.92	272L Boat Ramp - Clearing	1.00	AC	2,854	146	600	0	3,599	3599.24
06.03.73.04.51.93	272L Ramp - Aggregate Base	184.80	SY	4,303	219	905	0	5,428	29.37
TOTAL	Long Term Management Features	1.00	EA	578,723	29,515	121,648	0	729,886	729885.51
06.03.73.04.52	Adaptive Management Features								
06.03.73.04.52.01	Backwaters & Trib Mouths Misc AM	1.00	JOB	166,700	8,502	35,040	0	210,242	210242.04
06.03.73.04.52.02	Gravel Bar Monitoring AM	1.00	JOB	125,000	6,375	26,275	0	157,650	157650.00

		QUANTITY	UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
06.03.73.04.52.03	Dike Field Mods (AM)	1.00	JOB	100,000	5,100	21,020	0	126,120	126120.00
06.03.73.04.52.04	Mussel Bed Recolonization (AM)	1.00	JOB	100,000	5,100	21,020	0	126,120	126120.00
TOTAL	Adaptive Management Features	1.00	EA	491,700	25,077	103,355	0	620,132	620132.04
06.03.73.04.63	8' Dia Gated Culvert @ 243.9L								
06.03.73.04.63. 1	Excavate, Load & Barge	12000.00	CY	10,321	526	2,169	0	13,017	1.08
06.03.73.04.63. 2	Unload in Disposal Area	14400.00	CY	12,385	632	2,603	0	15,620	1.08
06.03.73.04.63. 3	Mobilization	1.00	JOB	13,154	671	2,765	0	16,590	16589.77
06.03.73.04.63. 4	Demobilization	1.00	JOB	6,889	351	1,448	0	8,689	8688.79
06.03.73.04.63.11	Install 8' Dia Culvert	300.00	JOB	140,575	7,169	29,549	0	177,294	590.98
06.03.73.04.63.12	Backfill	10000.00	CY	63,456	3,236	13,338	0	80,030	8.00
06.03.73.04.63.13	Riprap Slope Protection	300.00	TON	7,162	365	1,506	0	9,033	30.11
TOTAL	8' Dia Gated Culvert @ 243.9L	300.00	LF	253,943	12,951	53,379	0	320,272	1067.57
TOTAL	Reach 4 (NM 220.3 to NM 307.7)	1.00	EA	1,467,766	74,856	308,524	0	1,851,146	1851146
TOTAL	Habitat & Feeding Facilities	1.00	JOB	11,065,399	564,335	2,473,053	0	14,102,787	14102787
TOTAL	F & W Faclts & Sancturies Mitign	1.00	JOB	11,065,399	564,335	2,473,053	0	14,102,787	14102787
TOTAL	Fish and Wildlife Facilities	1.00	JOB	11,065,399	564,335	2,473,053	0	14,102,787	14102787
09	Channels and Canals								
09.01	Channels								
09.01.16	Pipeline Dredging								
09.01.16.01	Reach 1 (NM 0.0 to NM 75.2)	1659734	CY	2,572,588	131,202	405,568	0	3,109,358	1.87
09.01.16.02	Reach 2 (NM 75.2 to NM 119.5)	445995.00	CY	691,292	35,256	108,982	0	835,530	1.87
09.01.16.03	Reach 3 (NM 119.5 to NM 220.3)	1034339	EA	1,603,225	81,764	252,748	0	1,937,738	1.87
09.01.16.04	Reach 4 (NM 220.3 to NM 308.7)	1149500	CY	1,781,725	90,868	280,889	0	2,153,482	1.87
TOTAL	Pipeline Dredging	1.00	EA	6,648,830	339,090	1,048,188	0	8,036,109	8036109
09.01.20	Disposal Areas								
09.01.20.01	Reach 1 (NM 0.0 to NM 75.2)								
09.01.20.01.01	Preparatory Work Area 1								
09.01.20.01.01.01	Clearing and Grubbing	100.00	ACR	211,300	10,776	44,415	0	266,492	2664.92
09.01.20.01.01.02	Strip Topsoil	161333.00	CY	65,794	3,356	13,830	0	82,980	0.51
TOTAL	Preparatory Work Area 1	100.00	ACR	277,094	14,132	58,245	0	349,471	3494.71

		QUANTITY	UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
09.01.20.01.02	Site Work - Area 1								
09.01.20.01.02.02	Dike Construction-Embankment	363902.00	CY	1,759,110	89,715	369,765	0	2,218,590	6.10
09.01.20.01.02.03	Dike Construction-Slope Stabilzt	1.00	CY	48,396	2,468	10,173	0	61,038	61037.55
09.01.20.01.02.04	Dike Construction-Control Str.	1.00	EA	42,175	2,151	8,865	0	53,191	53191.19
09.01.20.01.02.05	Dike Construction-Turfing	21.00	ACR	30,652	1,563	6,443	0	38,658	1840.87
	TOTAL Site Work - Area 1	1.00	EA	1,880,334	95,897	395,246	0	2,371,477	2371477
09.01.20.01.03	Preparatory Work Area 2								
09.01.20.01.03.01	Clearing and Grubbing	267.00	ACR	564,171	28,773	118,589	0	711,533	2664.92
09.01.20.01.03.02	Strip Topsoil	430760.00	CY	175,671	8,959	36,926	0	221,556	0.51
	TOTAL Preparatory Work Area 2	267.00	ACR	739,842	37,732	155,515	0	933,089	3494.71
09.01.20.01.04	Site Work - Area 2								
09.01.20.01.04.02	Dike Construction-Embankment	514624.00	CY	2,641,616	134,722	555,268	0	3,331,606	6.47
09.01.20.01.04.03	Dike Construction-Slope Stabilzt	1.00	JOB	67,798	3,458	14,251	0	85,507	85506.86
09.01.20.01.04.04	Dike Construction-Control Str.	1.00	EA	67,996	3,468	14,293	0	85,757	85757.10
09.01.20.01.04.05	Dike Construction-Turfing	29.00	ACR	42,329	2,159	8,898	0	53,385	1840.87
	TOTAL Site Work - Area 2	1.00	EA	2,819,740	143,807	592,709	0	3,556,256	3556256
09.01.20.01.05	Area 2 - Associated Items								
09.01.20.01.05.01	Pump Station 13,000 gpm	1.00	EA	731,079	37,285	153,673	0	922,037	922037.03
09.01.20.01.05.02	Pump Station Suction Piping	1.00	EA	97,186	4,956	20,428	0	122,571	122570.67
09.01.20.01.05.04	Pump Station Disch Piping-24"	550.00	LF	127,136	6,484	26,724	0	160,344	291.53
09.01.20.01.05.05	Disch Piping-24" Trenching	550.00	LF	15,250	778	3,206	0	19,233	34.97
09.01.20.01.05.10	Pump Station Electrical Controls	1.00	EA	74,026	3,775	15,560	0	93,362	93361.79
09.01.20.01.05.20	Pump Station Elect OH Line	5280.00	LF	60,026	3,061	12,617	0	75,705	14.34
09.01.20.01.05.25	Pump Station Elect Transformer	300.00	KVA	14,217	725	2,988	0	17,930	59.77
09.01.20.01.05.30	Pump Station Concrete Platform	1.00	EA	1,885	96	396	0	2,377	2377.31
	TOTAL Area 2 - Associated Items	1.00	EA	1,120,804	57,161	235,593	0	1,413,558	1413558
	TOTAL Reach 1 (NM 0.0 to NM 75.2)	1.00	EA	6,837,814	348,728	1,437,308	0	8,623,850	8623850
09.01.20.04	Reach 4 (NM 220.3 to NM 307.7)								
	TOTAL Disposal Areas	1.00	EA	6,837,814	348,728	1,437,308	0	8,623,850	8623850
09.01.30	Bank Stablztion, Dikes & Jetties								
09.01.30.01	Reach 1 (NM 0.0 to NM 75.2)								

	QUANTITY	UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
09.01.30.01.01 Bank Stabilization Measures - CG	597079.00	TON	7,314,218	373,025	1,921,811	0	9,609,054	16.09
TOTAL Reach 1 (NM 0.0 to NM 75.2)	597079.00	TON	7,314,218	373,025	1,921,811	0	9,609,054	16.09
09.01.30.02 Reach 2 (NM 75.5 to NM 119.5)								
09.01.30.02.01 Bank Stabilization Measures-CG	306575.00	TON	3,755,544	191,533	986,769	0	4,933,846	16.09
TOTAL Reach 2 (NM 75.5 to NM 119.5)	306575.00	TON	3,755,544	191,533	986,769	0	4,933,846	16.09
09.01.30.03 Reach 3 (NM 119.5 to NM 220.3)								
09.01.30.03.01 Bank Stabilization Measures-CG	530446.00	TON	7,028,410	358,449	1,846,715	0	9,233,573	17.41
TOTAL Reach 3 (NM 119.5 to NM 220.3)	530446.00	TON	7,028,410	358,449	1,846,715	0	9,233,573	17.41
09.01.30.04 Reach 4 (NM 220.3 to NM 307.7)								
09.01.30.04.01 Bank Stabilization Measures-CG	584972.00	TON	7,750,879	395,295	2,036,543	0	10,182,717	17.41
TOTAL Reach 4 (NM 220.3 to NM 307.7)	584972.00	TON	7,750,879	395,295	2,036,543	0	10,182,717	17.41
TOTAL Bank Stablztion, Dikes & Jetties	1.00	JOB	25,849,050	1,318,302	6,791,838	0	33,959,189	33959189
TOTAL Channels	1.00	EA	39,335,694	2,006,120	9,277,334	0	50,619,149	50619149
TOTAL Channels and Canals	1.00	EA	39,335,694	2,006,120	9,277,334	0	50,619,149	50619149
11 Levees and Floodwalls								
11.01 Levees and Floodwalls								
11.01.01 Levees and Floodwalls								
11.01.01.04 Reach 4 (NM 220.3 to NM 308.7)								
12 Navigation, Ports & Harbors (NF)								
12.01 Ports								
12.01.15 Mechanical Dredging								
12.01.15.01 Reach 1 (NM 0.0 to NM 75.2)								
12.01.15.01.10 Dredged Fill								
12.01.15.01.10. 1 Excavate, Load & Barge	1684.00	CY	1,448	74	304	0	1,827	1.08
12.01.15.01.10. 2 Unload in Disposal Area	1684.00	CY	1,448	74	304	0	1,827	1.08

		QUANTITY	UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
12.01.15.01.10. 3	Mobilization	1.00	JOB	8,945	456	1,880	0	11,281	11281.05
12.01.15.01.10. 4	Demobilization	1.00	JOB	4,547	232	956	0	5,735	5734.61
TOTAL	Dredged Fill	1684.00	CY	16,388	836	3,445	0	20,669	12.27
TOTAL	Reach 1 (NM 0.0 to NM 75.2)	1684.00	CY	16,388	836	3,445	0	20,669	12.27
12.01.15.02	Reach 2 (NM 75.2 to NM 119.5)								
12.01.15.02.10	Dredged Fill								
12.01.15.02.10. 1	Excavate, Load & Barge	3554.00	CY	3,057	156	643	0	3,855	1.08
12.01.15.02.10. 2	Unload in Disposal Area	3554.00	CY	3,057	156	643	0	3,855	1.08
12.01.15.02.10. 3	Mobilization	1.00	JOB	8,945	456	1,880	0	11,281	11281.05
12.01.15.02.10. 4	Demobilization	1.00	JOB	4,547	232	956	0	5,735	5734.61
TOTAL	Dredged Fill	3554.00	CY	19,605	1,000	4,121	0	24,726	6.96
TOTAL	Reach 2 (NM 75.2 to NM 119.5)	3554.00	CY	19,605	1,000	4,121	0	24,726	6.96
12.01.15.03	Reach 3 (NM 119.5 to NM 220.3)								
12.01.15.03.10	Dredged Fill								
12.01.15.03.10. 1	Excavate, Load & Barge	7110.00	CY	6,115	312	1,285	0	7,712	1.08
12.01.15.03.10. 2	Unload in Disposal Area	7110.00	CY	6,115	312	1,285	0	7,712	1.08
12.01.15.03.10. 3	Mobilization	1.00	JOB	8,945	456	1,880	0	11,281	11281.05
12.01.15.03.10. 4	Demobilization	1.00	JOB	4,547	232	956	0	5,735	5734.61
TOTAL	Dredged Fill	7110.00	CY	25,722	1,312	5,407	0	32,440	4.56
TOTAL	Reach 3 (NM 119.5 to NM 220.3)	7110.00	CY	25,722	1,312	5,407	0	32,440	4.56
12.01.15.04	Reach 4 (NM 220.3 to NM 308.7)								
12.01.15.04.10	Dredged Fill								
12.01.15.04.10. 1	Excavate, Load & Barge	3555.00	CY	3,058	156	643	0	3,856	1.08
12.01.15.04.10. 2	Unload in Disposal Area	3555.00	CY	3,058	156	643	0	3,856	1.08
12.01.15.04.10. 3	Mobilization	1.00	JOB	8,945	456	1,880	0	11,281	11281.05
12.01.15.04.10. 4	Demobilization	1.00	JOB	4,547	232	956	0	5,735	5734.61
TOTAL	Dredged Fill	3555.00	CY	19,607	1,000	4,121	0	24,728	6.96
TOTAL	Reach 4 (NM 220.3 to NM 308.7)	3555.00	CY	19,607	1,000	4,121	0	24,728	6.96
TOTAL	Mechanical Dredging	1.00	JOB	81,322	4,147	17,094	0	102,563	102563.08

	QUANTITY	UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
12.01.16 Pipeline Dredging								
12.01.16.01 Reach 1 (NM 0.0 to NM 75.2)								
12.01.16.01.02 Pool 3								
12.01.16.02 Reach 2 (NM 75.2 to NM 119.5)								
12.01.16.02.86 Pool 4								
12.01.16.03 Reach 3 (NM 119.5 to NM 220.3)								
12.01.16.03.02 Pool 9								
12.01.16.04 Reach 4 (NM 220.3 to NM 308.7)								
12.01.16.04.03 Pool 12								
TOTAL Ports	1.00	EA	81,322	4,147	17,094	0	102,563	102563.08
12.02 Harbors								
12.02.16 Pipeline Dredging								
12.02.16.01 Reach 1 (NM 0.0 to NM 75.2)								
12.02.16.02 Reach 2 (NM 75.2 to NM 119.5)								
12.02.16.02.02 Pool 6								
12.02.16.03 Reach 3 (NM 119.5 to NM 220.3)								
12.02.16.03.03 Pool 10								
12.02.16.04 Reach 4 (NM 220.3 to NM 308.7)								
12.02.16.04.01 Pool 12								
TOTAL Navigation, Ports & Harbors (NF)	1.00	EA	81,322	4,147	17,094	0	102,563	102563.08
18 Cultural Resource Preservation								
18.00 Cultural Resource Preservation								
18.00.86 Identification, Data Analysis								
18.00.86.01 Reach 1 (NM 0 - 75.2)								
18.00.86.01.55 Cultural/Archaelogical Surveys								
18.00.86.01.55.01 Cultural/Archaelogical Surveys	1.00	JOB	150,000	7,650	31,530	0	189,180	189180.00

		QUANTITY	UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
	TOTAL Cultural/Archaelogical Surveys	1.00	JOB	150,000	7,650	31,530	0	189,180	189180.00
	TOTAL Reach 1 (NM 0 - 75.2)	1.00	JOB	150,000	7,650	31,530	0	189,180	189180.00
18.00.86.02	Reach 2 (NM 75.2 - 119.5)								
18.00.86.02.55	Cultural/Archaelogical Surveys								
18.00.86.02.55.01	Cultural/Archaelogical Surveys	1.00	JOB	50,000	2,550	10,510	0	63,060	63060.00
	TOTAL Cultural/Archaelogical Surveys	1.00	JOB	50,000	2,550	10,510	0	63,060	63060.00
	TOTAL Reach 2 (NM 75.2 - 119.5)	1.00	JOB	50,000	2,550	10,510	0	63,060	63060.00
18.00.86.03	Reach 3 (NM 119.5 - 220.3)								
18.00.86.03.55	Cultural/Archaelogical Surveys								
18.00.86.04	Reach 3 (NM 220.3 - 308.7)								
18.00.86.04.55	Cultural/Archaelogical Surveys								
	TOTAL Identification, Data Analysis	1.00	JOB	200,000	10,200	42,040	0	252,240	252240.00
	TOTAL Cultural Resource Preservation	1.00	JOB	200,000	10,200	42,040	0	252,240	252240.00
	TOTAL Cultural Resource Preservation	1.00	JOB	200,000	10,200	42,040	0	252,240	252240.00
30	Planning, Engineering & Design								
30.20	Project Design Memorandum								
30.20.01	PED								
30.20.01.01	Reach 1 (NM 0.0 to NM 75.2)								
30.20.01.01.01	Surveys&Mapp'g Except Real Estat								
30.20.01.01.01.02	Other Design Costs - Surveys	1.00	JOB	36,000	1,836	7,567	0	45,403	45403.20
	TOTAL Surveys&Mapp'g Except Real Estat	1.00	EA	36,000	1,836	7,567	0	45,403	45403.20
30.20.01.01.03	Hydrology and Hydraulic Studies								
30.20.01.01.03.01	H&H - Sediment Samples			25,421	1,296	5,343	0	32,061	
30.20.01.01.03.02	H&H - Sedimentation Modeling			71,179	3,630	14,962	0	89,771	
30.20.01.01.03.03	H&H - Modeling			762,629	38,894	160,305	0	961,828	

	QUANTITY	UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
TOTAL Hydrology and Hydraulic Studies	1.00	EA	859,229	43,821	180,610	0	1,083,660	1083660
30.20.01.01.06 Model Studies								
30.20.01.01.06.03 Other Design Costs - Barge Study	0.33	JOB	60,716	3,097	12,762	0	76,575	232044.93
30.20.01.01.06.04 Other Design Costs-Hawser Forces	0.33	JOB	46,200	2,356	9,711	0	58,267	176568.00
30.20.01.01.06.05 Other Design Costs-Lock Approach	0.33	JOB	165,000	8,415	34,683	0	208,098	630600.00
30.20.01.01.06.06 Other Design Costs-Barge Impacts	0.33	JOB	82,830	4,224	17,411	0	104,465	316561.20
TOTAL Model Studies	1.00	EA	354,746	18,092	74,568	0	447,405	447405.46
30.20.01.01.07 PED	1.00	JOB	1,440,000	73,440	302,688	0	1,816,128	1816128
TOTAL Reach 1 (NM 0.0 to NM 75.2)	1.00	EA	2,689,975	137,189	565,433	0	3,392,596	3392596
30.20.01.02 Reach 2 (NM 75.5 to 119.5)								
30.20.01.02.03 Hydrology and Hydraulic Studies								
30.20.01.02.03.01 H&H - Sediment Samples			4,412	225	927	0	5,564	
30.20.01.02.03.02 H&H - Sedimentation Modeling			12,355	630	2,597	0	15,582	
30.20.01.02.03.03 H&H - Modeling			132,370	6,751	27,824	0	166,945	
TOTAL Hydrology and Hydraulic Studies	1.00	EA	149,137	7,606	31,349	0	188,092	188091.58
30.20.01.02.06 Model Studies								
30.20.01.02.06.03 Other Design Costs - Barge Study	0.17	JOB	31,278	1,595	6,575	0	39,448	232044.93
30.20.01.02.06.04 Other Design Costs-Hawser Forces	0.17	JOB	23,800	1,214	5,003	0	30,017	176568.00
30.20.01.02.06.05 Other Design Costs-Lock Approach	0.17	JOB	85,000	4,335	17,867	0	107,202	630600.00
30.20.01.02.06.06 Other Design Costs-Barge Impacts	0.17	JOB	42,670	2,176	8,969	0	53,815	316561.20
TOTAL Model Studies	1.00	EA	182,748	9,320	38,414	0	230,482	230481.60
30.20.01.02.07 PED	1.00	JOB	445,757	22,734	93,698	0	562,189	562188.73
TOTAL Reach 2 (NM 75.5 to 119.5)	1.00	EA	777,642	39,660	163,460	0	980,762	980761.92
30.20.01.03 Reach 3 (NM 119.5 to NM 220.3)								
30.20.01.03.03 Hydrology and Hydraulic Studies								
30.20.01.03.03.01 H&H - Sediment Samples			8,330	425	1,751	0	10,506	
30.20.01.03.03.02 H&H - Sedimentation Modeling			23,323	1,189	4,902	0	29,415	
30.20.01.03.03.03 H&H - Modeling			249,887	12,744	52,526	0	315,157	
TOTAL Hydrology and Hydraulic Studies	1.00	EA	281,540	14,359	59,180	0	355,078	355078.25

	QUANTITY	UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
30.20.01.03.06 Model Studies								
30.20.01.03.06.03 Other Design Costs - Barge Study	0.33	JOB	60,716	3,097	12,762	0	76,575	232044.93
30.20.01.03.06.04 Other Design Costs-Hawser Forces	0.33	JOB	46,200	2,356	9,711	0	58,267	176568.00
30.20.01.03.06.05 Other Design Costs-Lock Approach	0.33	JOB	165,000	8,415	34,683	0	208,098	630600.00
30.20.01.03.06.06 Other Design Costs-Barge Impacts	0.33	JOB	82,830	4,224	17,411	0	104,465	316561.20
TOTAL Model Studies	1.00	EA	354,746	18,092	74,568	0	447,405	447405.46
30.20.01.03.07 PED	1.00	JOB	820,802	41,861	172,533	0	1,035,195	1035195
TOTAL Reach 3 (NM 119.5 to NM 220.3)	1.00	EA	1,457,088	74,311	306,280	0	1,837,679	1837679
30.20.01.04 Reach 4 (NM 220.3 to NM 307.7)								
30.20.01.04.03 Hydrology and Hydraulic Studies								
30.20.01.04.03.01 H&H - Sediment Samples			11,837	604	2,488	0	14,929	
30.20.01.04.03.02 H&H - Sedimentation Modeling			33,144	1,690	6,967	0	41,801	
30.20.01.04.03.03 H&H - Modeling			355,114	18,111	74,645	0	447,870	
TOTAL Hydrology and Hydraulic Studies	1.00	EA	400,095	20,405	84,100	0	504,600	504599.81
30.20.01.04.06 Model Studies								
30.20.01.04.06.03 Other Design Costs - Barge Study	0.17	JOB	31,278	1,595	6,575	0	39,448	232044.93
30.20.01.04.06.04 Other Design Costs-Hawser Forces	0.17	JOB	23,800	1,214	5,003	0	30,017	176568.00
30.20.01.04.06.05 Other Design Costs-Lock Approach	0.17	JOB	85,000	4,335	17,867	0	107,202	630600.00
30.20.01.04.06.06 Other Design Costs-Barge Impacts	0.17	JOB	42,670	2,176	8,969	0	53,815	316561.20
TOTAL Model Studies	1.00	EA	182,748	9,320	38,414	0	230,482	230481.60
30.20.01.04.07 PED	1.00	JOB	699,375	35,668	147,009	0	882,052	882051.75
TOTAL Reach 4 (NM 220.3 to NM 307.7)	1.00	EA	1,282,218	65,393	269,522	0	1,617,133	1617133
TOTAL PED	1.00	JOB	6,206,922	316,553	1,304,695	0	7,828,171	7828171
TOTAL Project Design Memorandum	1.00	JOB	6,206,922	316,553	1,304,695	0	7,828,171	7828171
TOTAL Planning, Engineering & Design	1.00	JOB	6,206,922	316,553	1,304,695	0	7,828,171	7828171
31 Construction Management								
31.23 Construction Contracts								
31.23.11 Supervision and Administration								

	QUANTITY	UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
31.23.11.01 Reach 1 (NM 0.0 to NM 75.2)								
31.23.11.01.01 Prjt Office Supervn and Adminstn			1,540,000	78,540	323,708	0	1,942,248	
TOTAL Reach 1 (NM 0.0 to NM 75.2)	1.00	EA	1,540,000	78,540	323,708	0	1,942,248	1942248
31.23.11.02 Reach 2 (NM 75.5 to NM 119.5)								
31.23.11.02.01 Prjt Office Supervn and Adminstn	1.00	JOB	477,597	24,357	100,391	0	602,345	602345.34
TOTAL Reach 2 (NM 75.5 to NM 119.5)	1.00	EA	477,597	24,357	100,391	0	602,345	602345.34
31.23.11.03 Reach 3 (NM 119.5 to NM 220.3)								
31.23.11.03.01 Prjt Office Supervn and Adminstn			879,431	44,851	184,856	0	1,109,138	
TOTAL Reach 3 (NM 119.5 to NM 220.3)	1.00	EA	879,431	44,851	184,856	0	1,109,138	1109138
31.23.11.04 Reach 4 (NM 220.3 to NM 307.7)								
31.23.11.04.01 Prjt Office Supervn and Adminstn			749,331	38,216	157,509	0	945,056	
TOTAL Reach 4 (NM 220.3 to NM 307.7)	1.00	EA	749,331	38,216	157,509	0	945,056	945056.26
TOTAL Supervision and Administration			3,646,359	185,964	766,465	0	4,598,788	
TOTAL Construction Contracts			3,646,359	185,964	766,465	0	4,598,788	
TOTAL Construction Management	1.00	JOB	3,646,359	185,964	766,465	0	4,598,788	4598788
TOTAL Feasibility Cost Es - 3 FT Lower	1.00	EA	64,704,146	3,252,828	14,856,538	0	82,813,511	82813511

	QUANTITY	UOM	CONTRACT	CONTINGN	CONSTNT$	PROJECT
01 Reach 1 (NM 0.0 to NM 75.2)						
01. 01 Lands and Damages						
01. 01.23 Construction Documents						
01. 01.23.03 Real Estate Analysis Documents						
01. 01.23.03.02 Real Estate Acquisition Document	1.00	JOB	150,000	30,000	180,000	180,000
01. 01.23.03.03 Real Estate Condemntn Documents	1.00	JOB	8,000	1,600	9,600	9,600
01. 01.23.03.05 Real Estate Appraisal Documents	1.00	JOB	8,400	1,680	10,080	10,080
01. 01.23.03.06 Real Estate PL 94-646 Asst. Docs	1.00	JOB	800	160	960	960
01. 01.23.03.15 Real Estate Payment Documents	1.00	JOB	756,000	151,120	907,120	907,120
01. 01.23.03 Real Estate Analysis Documents	1.00	JOB	923,200	184,560	1,107,760	1,107,760
01. 01.23 Construction Documents	1.00	JOB	923,200	184,560	1,107,760	1,107,760
01. 01 Lands and Damages	1.00	JOB	923,200	184,560	1,107,760	1,107,760
01. 02 Relocations						
01. 02.01 Roads						
01. 02.01.01 Roads						
01. 02.01.01.10 Roads	1.00	EA	0	0	0	0
01. 02.01.01 Roads	1.00	EA	0	0	0	0
01. 02.01 Roads	1.00	EA	0	0	0	0
01. 02.02 Railroads						
01. 02.02.07 Bridges						
01. 02.02.07.01 Railroads	1.00	EA	0	0	0	0
01. 02.02.07 Bridges	1.00	EA	0	0	0	0
01. 02.02 Railroads	1.00	EA	0	0	0	0
01. 02.03 Utilities						
01. 02.03.01 Pipelines						
01. 02.03.01.51 Demo Pipeline TX East #64-1 (6)	2200.00	FT	1,168,276	245,572	1,413,847	1,473,430
01. 02.03.01 Pipelines	1.00	EA	1,168,276	245,572	1,413,847	1,473,430
01. 02.03.02 Electric Lines						
01. 02.03.02.01 Electric	1.00	EA	0	0	0	0
01. 02.03.02 Electric Lines	1.00	EA	0	0	0	0
01. 02.03 Utilities	1.00	EA	1,168,276	245,572	1,413,847	1,473,430

	QUANTITY	UOM	CONTRACT	CONTINGN	CONSTNT$	PROJECT
01. 02 Relocations	1.00	EA	1,168,276	245,572	1,413,847	1,473,430
01. 05 Locks						
01. 05.62 Approach Walls, Upper & Lower						
01. 05.62.05 Metals						
01. 05.62.05.10 Pinning Guidewalls	1.00	JOB	1,384,649	363,817	1,748,466	1,819,083
01. 05.62.05 Metals	1.00	LS	1,384,649	363,817	1,748,466	1,819,083
01. 05.62 Approach Walls, Upper & Lower	1.00	LS	1,384,649	363,817	1,748,466	1,819,083
01. 05 Locks	1.00	EA	1,384,649	363,817	1,748,466	1,819,083
01. 06 Fish and Wildlife Facilities						
01. 06.03 F & W Faclts & Sancturies Mitign						
01. 06.03.73 Habitat & Feeding Facilities						
01. 06.03.73.10 Boat Ramp at Lower Merrisach	5600.00	SF	0	0	0	0
01. 06.03.73.11 Tern Island from Dredge Material	5600.00	SF	152,589	32,074	184,663	192,445
01. 06.03.73.12 Notch Dikes	46.00	EA	26,505	5,571	32,076	33,427
01. 06.03.73.13 Dredge Coal Pile Entrance Channl	74074.00	CY	153,650	32,297	185,948	193,784
01. 06.03.73.14 Dredge Side Channels @ 44.6 (2)	92593.00	CY	188,691	39,663	228,354	237,977
01. 06.03.73.15 Dredge Side Channel @ 70.6 R	33333.00	CY	69,817	14,675	84,492	88,053
01. 06.03.73.16 Dredge Side Channel @ 71.3L	118518.00	CY	237,745	49,974	287,719	299,844
01. 06.03.73.17 Dredge Side Channels @ 32.2	9259.00	CY	31,011	6,519	37,530	39,111
01. 06.03.73.18 Dredge Side Channels @ 50.9L	18518.00	CY	48,530	10,201	58,732	61,207
01. 06.03.73.21 5' Dia Gated Culvert @ 15.3 R	250.00	LF	282,777	59,440	342,217	356,639
01. 06.03.73.25 Silt Curtains	1.00	JOB	33,580	7,059	40,639	42,351
01. 06.03.73.50 Long Term Management Features	1.00	EA	1,066,223	224,120	1,290,343	1,344,721
01. 06.03.73.51 Adaptive Management Features	1.00	EA	366,700	77,080	443,780	462,482
01. 06.03.73.60 Mussel Mitigation NM 10.5-19.0	1.00	JOB	1,095,814	230,340	1,326,154	1,382,041
01. 06.03.73.65 Mussel Mitigation NM 19.0-75.2	1.00	JOB	5,000	1,051	6,051	6,306
01. 06.03.73.70 Endangered Species Surveys	1.00	JOB	0	0	0	0
01. 06.03.73 Habitat & Feeding Facilities	1.00	JOB	3,758,633	790,065	4,548,697	4,740,388
01. 06.03 F & W Faclts & Sancturies Mitign	1.00	JOB	3,758,633	790,065	4,548,697	4,740,388
01. 06 Fish and Wildlife Facilities	1.00	JOB	3,758,633	790,065	4,548,697	4,740,388
01. 09 Channels and Canals						
01. 09.01 Channels						
01. 09.01.16 Pipeline Dredging						
01. 09.01.16.00 <<< Not Identified >>>	1.00	EA	2,572,588	405,568	2,978,156	3,109,358
01. 09.01.16 Pipeline Dredging	1.00	EA	2,572,588	405,568	2,978,156	3,109,358

	QUANTITY	UOM	CONTRACT	CONTINGN	CONSTNT$	PROJECT
01. 09.01.20 Disposal Areas						
01. 09.01.20.01 Preparatory Work Area 1	100.00	ACR	277,094	58,245	335,339	349,471
01. 09.01.20.02 Site Work - Area 1	1.00	EA	1,880,334	395,246	2,275,580	2,371,477
01. 09.01.20.03 Preparatory Work Area 2	267.00	ACR	739,842	155,515	895,357	933,089
01. 09.01.20.04 Site Work - Area 2	1.00	EA	2,819,740	592,709	3,412,449	3,556,256
01. 09.01.20.05 Area 2 - Associated Items	1.00	EA	1,120,804	235,593	1,356,397	1,413,558
01. 09.01.20 Disposal Areas	1.00	EA	6,837,814	1,437,308	8,275,122	8,623,850
01. 09.01.30 Bank Stablztion, Dikes & Jetties						
01. 09.01.30.01 Bank Stabilization Measures - CG	597079.00	TON	7,314,218	1,921,811	9,236,028	9,609,054
01. 09.01.30 Bank Stablztion, Dikes & Jetties	1.00	JOB	7,314,218	1,921,811	9,236,028	9,609,054
01. 09.01 Channels	1.00	EA	16,724,619	3,764,688	20,489,307	21,342,262
01. 09 Channels and Canals	1.00	EA	16,724,619	3,764,688	20,489,307	21,342,262
01. 11 Levees and Floodwalls						
01. 11.01 Levees and Floodwalls						
01. 11.01.01 Levees and Floodwalls						
01. 11.01.01.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
01. 11.01.01 Levees and Floodwalls	1.00	EA	0	0	0	0
01. 11.01 Levees and Floodwalls	1.00	EA	0	0	0	0
01. 11 Levees and Floodwalls	1.00	EA	0	0	0	0
01. 12 Navigation, Ports & Harbors (NF)						
01. 12.01 Ports						
01. 12.01.15 Mechanical Dredging						
01. 12.01.15.10 Dredged Fill	1684.00	CY	16,388	3,445	19,833	20,669
01. 12.01.15 Mechanical Dredging	1.00	JOB	16,388	3,445	19,833	20,669
01. 12.01.16 Pipeline Dredging						
01. 12.01.16.01 Pool 2	11000.00	CY	0	0	0	0
01. 12.01.16.02 Pool 3	1100.00	CY	0	0	0	0
01. 12.01.16 Pipeline Dredging	1.00	EA	0	0	0	0
01. 12.01 Ports	1.00	EA	16,388	3,445	19,833	20,669
01. 12.02 Harbors						

	QUANTITY	UOM	CONTRACT	CONTINGN	CONSTNT$	PROJECT
01. 12.02.16 Pipeline Dredging						
01. 12.02.16.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
01. 12.02.16 Pipeline Dredging	1.00	EA	0	0	0	0
01. 12.02 Harbors	1.00	EA	0	0	0	0
01. 12 Navigation, Ports & Harbors (NF)	1.00	EA	16,388	3,445	19,833	20,669
01. 18 Cultural Resource Preservation						
01. 18.00 Cultural Resource Preservation						
01. 18.00.86 Identification, Data Analysis						
01. 18.00.86.55 Cultural/Archaelogical Surveys	1.00	JOB	150,000	31,530	181,530	189,180
01. 18.00.86 Identification, Data Analysis	1.00	JOB	150,000	31,530	181,530	189,180
01. 18.00 Cultural Resource Preservation	1.00	JOB	150,000	31,530	181,530	189,180
01. 18 Cultural Resource Preservation	1.00	JOB	150,000	31,530	181,530	189,180
01. 30 Planning, Engineering & Design						
01. 30.20 Project Design Memorandum						
01. 30.20.01 PED						
01. 30.20.01.01 Surveys&Mapp'g Except Real Estat	1.00	EA	36,000	7,567	43,567	45,403
01. 30.20.01.03 Hydrology and Hydraulic Studies	1.00	EA	859,229	180,610	1,039,839	1,083,660
01. 30.20.01.06 Model Studies	1.00	EA	354,746	74,568	429,313	447,405
01. 30.20.01.07 PED	1.00	JOB	1,440,000	302,688	1,742,688	1,816,128
01. 30.20.01 PED	1.00	JOB	2,689,975	565,433	3,255,408	3,392,596
01. 30.20 Project Design Memorandum	1.00	JOB	2,689,975	565,433	3,255,408	3,392,596
01. 30 Planning, Engineering & Design	1.00	JOB	2,689,975	565,433	3,255,408	3,392,596
01. 31 Construction Management						
01. 31.23 Construction Contracts						
01. 31.23.11 Supervision and Administration						
01. 31.23.11.01 Prjt Office Supervn and Adminstn	1.00	LS	1,540,000	323,708	1,863,708	1,942,248
01. 31.23.11 Supervision and Administration	1.00	EA	1,540,000	323,708	1,863,708	1,942,248
01. 31.23 Construction Contracts	1.00	EA	1,540,000	323,708	1,863,708	1,942,248

	QUANTITY	UOM	CONTRACT	CONTINGN	CONSTNT$	PROJECT
01. 31 Construction Management	1.00	JOB	1,540,000	323,708	1,863,708	1,942,248
01 Reach 1 (NM 0.0 to NM 75.2)	1.00	EA	28,355,740	6,272,816	34,628,556	36,027,616
02 Reach 2 (NM 75.5 to NM 119.5)						
02. 01 Lands and Damages						
02. 01.23 Construction Documents						
02. 01.23.03 Real Estate Analysis Documents						
02. 01.23.03.02 Real Estate Acquisition Document	1.00	JOB	0	0	0	0
02. 01.23.03.05 Real Estate Appraisal Documents	1.00	JOB	0	0	0	0
02. 01.23.03.15 Real Estate Land Payments	1.00	JOB	0	0	0	0
02. 01.23.03 Real Estate Analysis Documents	1.00	JOB	0	0	0	0
02. 01.23 Construction Documents	1.00	JOB	0	0	0	0
02. 01 Lands and Damages	1.00	JOB	0	0	0	0
02. 02 Relocations						
02. 02.01 Roads						
02. 02.01.01 Roads						
02. 02.01.01.10 Roads	1.00	EA	0	0	0	0
02. 02.01.01 Roads	1.00	EA	0	0	0	0
02. 02.01 Roads	1.00	EA	0	0	0	0
02. 02.02 Railroads						
02. 02.02.07 Bridges						
02. 02.02.07.01 Railroads	1.00	EA	0	0	0	0
02. 02.02.07 Bridges	1.00	EA	0	0	0	0
02. 02.02 Railroads	1.00	EA	0	0	0	0
02. 02.03 Utilities						
02. 02.03.01 Pipelines						
02. 02.03.01.51 Relocations	1.00	EA	0	0	0	0
02. 02.03.01 Pipelines	1.00	EA	0	0	0	0
02. 02.03.02 Electric Lines						
02. 02.03.02.01 Electric	1.00	EA	0	0	0	0
02. 02.03.02 Electric Lines	1.00	EA	0	0	0	0

	QUANTITY	UOM	CONTRACT	CONTINGN	CONSTNT$	PROJECT
02. 02.03 Utilities	1.00	EA	0	0	0	0
02. 02 Relocations	1.00	EA	0	0	0	0
02. 05 Locks						
02. 05.62 Approach Walls, Upper & Lower						
02. 05.62.05 Metals						
02. 05.62.05.10 Pinning Guidewalls	1.00	JOB	346,162	90,954	437,116	454,771
02. 05.62.05 Metals	1.00	LS	346,162	90,954	437,116	454,771
02. 05.62 Approach Walls, Upper & Lower	1.00	LS	346,162	90,954	437,116	454,771
02. 05 Locks	1.00	EA	346,162	90,954	437,116	454,771
02. 06 Fish and Wildlife Facilities						
02. 06.03 F & W Faclts & Sancturies Mitign						
02. 06.03.73 Habitat & Feeding Facilities						
02. 06.03.73.10 Boat Ramp at NM 85.9	5600.00	SF	0	0	0	0
02. 06.03.73.11 Tern Island from Dredge Material	5600.00	SF	72,975	15,339	88,314	92,036
02. 06.03.73.12 Notch Dikes	47.00	EA	27,081	5,692	32,773	34,154
02. 06.03.73.21 Dredge Side Channel @ 75.3L	5556.00	CY	13,211	2,777	15,988	16,662
02. 06.03.73.22 Dredge Side Channel @ 78.7L	5556.00	CY	24,004	5,046	29,050	30,274
02. 06.03.73.23 Dredge Side Channel @ 82.6L	5556.00	CY	13,211	2,777	15,988	16,662
02. 06.03.73.24 Dredge Side Channel @ 92.6L	3333.00	CY	13,052	2,744	15,796	16,462
02. 06.03.73.25 Dredge Side Channel @ 116.2R	37037.00	CY	0	0	0	0
02. 06.03.73.26 Silt Curtains	2400.00	FT	33,580	7,059	40,639	42,351
02. 06.03.73.27 Dredge Side Channel @ 88.2R	37037.00	CY	76,825	16,149	92,974	96,892
02. 06.03.73.51 Long Term Management Features	1.00	EA	451,223	94,847	546,070	569,083
02. 06.03.73.52 Adaptive Management Features	1.00	EA	366,700	77,080	443,780	462,482
02. 06.03.73.63 8' Dia Gated Culvert @ 110.4L	300.00	LF	253,943	53,379	307,321	320,272
02. 06.03.73.64 8' Dia Gated Culvert @ 110.4R	60.00	LF	124,404	26,150	150,554	156,898
02. 06.03.73.80 Bank Stab @ 91.5 - CG	64059.00	TON	784,723	206,186	990,909	1,030,930
02. 06.03.73 Habitat & Feeding Facilities	1.00	JOB	2,254,933	515,224	2,770,157	2,885,158
02. 06.03 F & W Faclts & Sancturies Mitign	1.00	JOB	2,254,933	515,224	2,770,157	2,885,158
02. 06 Fish and Wildlife Facilities	1.00	JOB	2,254,933	515,224	2,770,157	2,885,158
02. 09 Channels and Canals						
02. 09.01 Channels						
02. 09.01.16 Pipeline Dredging						
02. 09.01.16.00 <<< Not Identified >>>	1.00	EA	691,292	108,982	800,274	835,530

	QUANTITY	UOM	CONTRACT	CONTINGN	CONSTNT$	PROJECT
02. 09.01.16 Pipeline Dredging	1.00	EA	691,292	108,982	800,274	835,530
02. 09.01.20 Disposal Areas						
02. 09.01.20.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
02. 09.01.20 Disposal Areas	1.00	EA	0	0	0	0
02. 09.01.30 Bank Stablztion, Dikes & Jetties						
02. 09.01.30.01 Bank Stabilization Measures-CG	306575.00	TON	3,755,544	986,769	4,742,313	4,933,846
02. 09.01.30 Bank Stablztion, Dikes & Jetties	1.00	JOB	3,755,544	986,769	4,742,313	4,933,846
02. 09.01 Channels	1.00	EA	4,446,836	1,095,751	5,542,587	5,769,376
02. 09 Channels and Canals	1.00	EA	4,446,836	1,095,751	5,542,587	5,769,376
02. 11 Levees and Floodwalls						
02. 11.01 Levees and Floodwalls						
02. 11.01.01 Levees and Floodwalls						
02. 11.01.01.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
02. 11.01.01 Levees and Floodwalls	1.00	EA	0	0	0	0
02. 11.01 Levees and Floodwalls	1.00	EA	0	0	0	0
02. 11 Levees and Floodwalls	1.00	EA	0	0	0	0
02. 12 Navigation, Ports & Harbors (NF)						
02. 12.01 Ports						
02. 12.01.15 Mechanical Dredging						
02. 12.01.15.10 Dredged Fill	3554.00	CY	19,605	4,121	23,726	24,726
02. 12.01.15 Mechanical Dredging	1.00	JOB	19,605	4,121	23,726	24,726
02. 12.01.16 Pipeline Dredging						
02. 12.01.16.01 Pool 6	18700.00	CY	0	0	0	0
02. 12.01.16.86 Pool 4	1100.00	CY	0	0	0	0
02. 12.01.16 Pipeline Dredging	1.00	EA	0	0	0	0
02. 12.01 Ports	1.00	EA	19,605	4,121	23,726	24,726
02. 12.02 Harbors						
02. 12.02.16 Pipeline Dredging						

	QUANTITY	UOM	CONTRACT	CONTINGN	CONSTNT$	PROJECT
02. 12.02.16.01 Pool 4	16670.00	CY	0	0	0	0
02. 12.02.16.02 Pool 6	18500.00	CY	0	0	0	0
02. 12.02.16 Pipeline Dredging	1.00	EA	0	0	0	0
02. 12.02 Harbors	1.00	EA	0	0	0	0
02. 12 Navigation, Ports & Harbors (NF)	1.00	EA	19,605	4,121	23,726	24,726
02. 18 Cultural Resource Preservation						
02. 18.00 Cultural Resource Preservation						
02. 18.00.86 Identification, Data Analysis						
02. 18.00.86.55 Cultural/Archaelogical Surveys	1.00	JOB	50,000	10,510	60,510	63,060
02. 18.00.86 Identification, Data Analysis	1.00	JOB	50,000	10,510	60,510	63,060
02. 18.00 Cultural Resource Preservation	1.00	JOB	50,000	10,510	60,510	63,060
02. 18 Cultural Resource Preservation	1.00	JOB	50,000	10,510	60,510	63,060
02. 30 Planning, Engineering & Design						
02. 30.20 Project Design Memorandum						
02. 30.20.01 PED						
02. 30.20.01.03 Hydrology and Hydraulic Studies	1.00	EA	149,137	31,349	180,486	188,092
02. 30.20.01.06 Model Studies	1.00	EA	182,748	38,414	221,161	230,482
02. 30.20.01.07 PED	1.00	JOB	445,757	93,698	539,455	562,189
02. 30.20.01 PED	1.00	JOB	777,642	163,460	941,102	980,762
02. 30.20 Project Design Memorandum	1.00	JOB	777,642	163,460	941,102	980,762
02. 30 Planning, Engineering & Design	1.00	JOB	777,642	163,460	941,102	980,762
02. 31 Construction Management						
02. 31.23 Construction Contracts						
02. 31.23.11 Supervision and Administration						
02. 31.23.11.01 Prjt Office Supervn and Adminstn	1.00	JOB	477,597	100,391	577,988	602,345
02. 31.23.11 Supervision and Administration	1.00	EA	477,597	100,391	577,988	602,345
02. 31.23 Construction Contracts	1.00	EA	477,597	100,391	577,988	602,345
02. 31 Construction Management	1.00	JOB	477,597	100,391	577,988	602,345

	QUANTITY	UOM	CONTRACT	CONTINGN	CONSTNT$	PROJECT
02 Reach 2 (NM 75.5 to NM 119.5)	1.00	EA	8,372,775	1,980,412	10,353,186	10,780,198
03 Reach 3 (NM 119.5 to NM 220.3)						
03. 01 Lands and Damages						
03. 01.23 Construction Documents						
03. 01.23.03 Real Estate Analysis Documents						
03. 01.23.03.02 Real Estate Acquisition Document	1.00	JOB	0	0	0	0
03. 01.23.03.05 Real Estate Appraisal Documents	1.00	JOB	0	0	0	0
03. 01.23.03.15 Real Estate Land Payments	1.00	JOB	0	0	0	0
03. 01.23.03 Real Estate Analysis Documents	1.00	JOB	0	0	0	0
03. 01.23 Construction Documents	1.00	JOB	0	0	0	0
03. 01 Lands and Damages	1.00	JOB	0	0	0	0
03. 02 Relocations						
03. 02.01 Roads						
03. 02.01.01 Roads						
03. 02.01.01.10 Roads	1.00	EA	0	0	0	0
03. 02.01.01 Roads	1.00	EA	0	0	0	0
03. 02.01 Roads	1.00	EA	0	0	0	0
03. 02.02 Railroads						
03. 02.02.07 Bridges						
03. 02.02.07.01 Railroads	1.00	EA	0	0	0	0
03. 02.02.07 Bridges	1.00	EA	0	0	0	0
03. 02.02 Railroads	1.00	EA	0	0	0	0
03. 02.03 Utilities						
03. 02.03.01 Pipelines						
03. 02.03.01.51 Relocations	1.00	EA	0	0	0	0
03. 02.03.01 Pipelines	1.00	EA	0	0	0	0
03. 02.03.02 Electric Lines						
03. 02.03.02.01 Electric	1.00	EA	0	0	0	0
03. 02.03.02 Electric Lines	1.00	EA	0	0	0	0
03. 02.03 Utilities	1.00	EA	0	0	0	0

	QUANTITY	UOM	CONTRACT	CONTINGN	CONSTNT$	PROJECT
03. 02 Relocations	1.00	EA	0	0	0	0
03. 05 Locks						
03. 05.62 Approach Walls, Upper & Lower						
03. 05.62.05 Metals						
03. 05.62.05.10 Pinning Guidewalls	1.00	JOB	346,162	90,954	437,116	454,771
03. 05.62.05 Metals	1.00	LS	346,162	90,954	437,116	454,771
03. 05.62 Approach Walls, Upper & Lower	1.00	LS	346,162	90,954	437,116	454,771
03. 05 Locks	1.00	EA	346,162	90,954	437,116	454,771
03. 06 Fish and Wildlife Facilities						
03. 06.03 F & W Faclts & Sancturies Mitign						
03. 06.03.73 Habitat & Feeding Facilities						
03. 06.03.73.11 Tern Island from Dredge Material	5600.00	SF	72,975	15,339	88,314	92,036
03. 06.03.73.12 Notch Dikes	64.00	EA	36,876	7,751	44,627	46,508
03. 06.03.73.15 Elevated Shore Line @Sweetin Isl	5600.00	SF	72,975	15,339	88,314	92,036
03. 06.03.73.21 Dredge Side Channel @ 131.0L	222222.00	CY	0	0	0	0
03. 06.03.73.22 Dredge Side Channel @ 164.5L	18519.00	CY	37,739	7,933	45,672	47,596
03. 06.03.73.23 Dredge Side Channel @ 132.2L	37037.00	CY	72,778	15,298	88,076	91,787
03. 06.03.73.25 Silt Curtains	1.00	JOB	16,790	3,529	20,319	21,176
03. 06.03.73.51 Long Term Management Features	1.00	EA	767,600	161,350	928,950	968,097
03. 06.03.73.52 Adaptive Management Features	1.00	EA	491,700	103,355	595,055	620,132
03. 06.03.73.70 Mussel Mitigation NM 119.3-220.3	1.00	JOB	0	0	0	0
03. 06.03.73.80 Bank Stab 143,7-144,2L - CG	85350.00	TON	1,045,538	274,715	1,320,252	1,373,575
03. 06.03.73.81 Bank Stab 163.6-165.3L - CG	79110.00	TON	969,098	254,630	1,223,728	1,273,152
03. 06.03.73 Habitat & Feeding Facilities	1.00	JOB	3,584,068	859,240	4,443,308	4,626,095
03. 06.03 F & W Faclts & Sancturies Mitign	1.00	JOB	3,584,068	859,240	4,443,308	4,626,095
03. 06 Fish and Wildlife Facilities	1.00	JOB	3,584,068	859,240	4,443,308	4,626,095
03. 09 Channels and Canals						
03. 09.01 Channels						
03. 09.01.16 Pipeline Dredging						
03. 09.01.16.00 <<< Not Identified >>>	1.00	EA	1,603,225	252,748	1,855,974	1,937,738
03. 09.01.16 Pipeline Dredging	1.00	EA	1,603,225	252,748	1,855,974	1,937,738
03. 09.01.20 Disposal Areas						
03. 09.01.20.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
03. 09.01.20 Disposal Areas	1.00	EA	0	0	0	0

	QUANTITY	UOM	CONTRACT	CONTINGN	CONSTNT$	PROJECT
03. 09.01.30 Bank Stablztion, Dikes & Jetties						
03. 09.01.30.01 Bank Stabilization Measures-CG	530446.00	TON	7,028,410	1,846,715	8,875,124	9,233,573
03. 09.01.30 Bank Stablztion, Dikes & Jetties	1.00	JOB	7,028,410	1,846,715	8,875,124	9,233,573
03. 09.01 Channels	1.00	EA	8,631,635	2,099,463	10,731,098	11,171,311
03. 09 Channels and Canals	1.00	EA	8,631,635	2,099,463	10,731,098	11,171,311
03. 11 Levees and Floodwalls						
03. 11.01 Levees and Floodwalls						
03. 11.01.01 Levees and Floodwalls						
03. 11.01.01.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
03. 11.01.01 Levees and Floodwalls	1.00	EA	0	0	0	0
03. 11.01 Levees and Floodwalls	1.00	EA	0	0	0	0
03. 11 Levees and Floodwalls	1.00	EA	0	0	0	0
03. 12 Navigation, Ports & Harbors (NF)						
03. 12.01 Ports						
03. 12.01.15 Mechanical Dredging						
03. 12.01.15.10 Dredged Fill	7110.00	CY	25,722	5,407	31,129	32,440
03. 12.01.15 Mechanical Dredging	1.00	JOB	25,722	5,407	31,129	32,440
03. 12.01.16 Pipeline Dredging						
03. 12.01.16.01 Pool 8	1100.00	CY	0	0	0	0
03. 12.01.16.02 Pool 9	1100.00	CY	0	0	0	0
03. 12.01.16 Pipeline Dredging	1.00	EA	0	0	0	0
03. 12.01 Ports	1.00	EA	25,722	5,407	31,129	32,440
03. 12.02 Harbors						
03. 12.02.16 Pipeline Dredging						
03. 12.02.16.01 Pool 8	1100.00	CY	0	0	0	0
03. 12.02.16.02 Pool 9	1100.00	CY	0	0	0	0
03. 12.02.16.03 Pool 10	1100.00	CY	0	0	0	0
03. 12.02.16 Pipeline Dredging	1.00	EA	0	0	0	0
03. 12.02 Harbors	1.00	EA	0	0	0	0

	QUANTITY	UOM	CONTRACT	CONTINGN	CONSTNT$	PROJECT
03. 12 Navigation, Ports & Harbors (NF)	1.00	EA	25,722	5,407	31,129	32,440
03. 18 Cultural Resource Preservation						
03. 18.00 Cultural Resource Preservation						
03. 18.00.86 Identification, Data Analysis						
03. 18.00.86.55 Cultural/Archaelogical Surveys	1.00	JOB	0	0	0	0
03. 18.00.86 Identification, Data Analysis	1.00	JOB	0	0	0	0
03. 18.00 Cultural Resource Preservation	1.00	JOB	0	0	0	0
03. 18 Cultural Resource Preservation	1.00	JOB	0	0	0	0
03. 30 Planning, Engineering & Design						
03. 30.20 Project Design Memorandum						
03. 30.20.01 PED						
03. 30.20.01.03 Hydrology and Hydraulic Studies	1.00	EA	281,540	59,180	340,720	355,078
03. 30.20.01.06 Model Studies	1.00	EA	354,746	74,568	429,313	447,405
03. 30.20.01.07 PED	1.00	JOB	820,802	172,533	993,335	1,035,195
03. 30.20.01 PED	1.00	JOB	1,457,088	306,280	1,763,368	1,837,679
03. 30.20 Project Design Memorandum	1.00	JOB	1,457,088	306,280	1,763,368	1,837,679
03. 30 Planning, Engineering & Design	1.00	JOB	1,457,088	306,280	1,763,368	1,837,679
03. 31 Construction Management						
03. 31.23 Construction Contracts						
03. 31.23.11 Supervision and Administration						
03. 31.23.11.01 Prjt Office Supervn and Adminstn	1.00	LS	879,431	184,856	1,064,287	1,109,138
03. 31.23.11 Supervision and Administration	1.00	EA	879,431	184,856	1,064,287	1,109,138
03. 31.23 Construction Contracts	1.00	EA	879,431	184,856	1,064,287	1,109,138
03. 31 Construction Management	1.00	JOB	879,431	184,856	1,064,287	1,109,138
03 Reach 3 (NM 119.5 to NM 220.3)	1.00	EA	14,924,106	3,546,200	18,470,306	19,231,435
04 Reach 4 (NM 220.3 to NM 307.7)						
04. 01 Lands and Damages						
04. 01.23 Construction Documents						

	QUANTITY	UOM	CONTRACT	CONTINGN	CONSTNT$	PROJECT
04. 01.23.03 Real Estate Analysis Documents						
04. 01.23.03.02 Real Estate Acquisition Document	1.00	JOB	0	0	0	0
04. 01.23.03.05 Real Estate Appraisal Documents	1.00	JOB	0	0	0	0
04. 01.23.03.15 Real Estate Land Payments	1.00	JOB	0	0	0	0
04. 01.23.03 Real Estate Analysis Documents	1.00	JOB	0	0	0	0
04. 01.23 Construction Documents	1.00	JOB	0	0	0	0
04. 01 Lands and Damages	1.00	JOB	0	0	0	0
04. 02 Relocations						
04. 02.01 Roads						
04. 02.01.01 Roads						
04. 02.01.01.10 Roads	1.00	EA	0	0	0	0
04. 02.01.01 Roads	1.00	EA	0	0	0	0
04. 02.01 Roads	1.00	EA	0	0	0	0
04. 02.02 Railroads						
04. 02.02.07 Bridges						
04. 02.02.07.01 Railroads	1.00	EA	0	0	0	0
04. 02.02.07 Bridges	1.00	EA	0	0	0	0
04. 02.02 Railroads	1.00	EA	0	0	0	0
04. 02.03 Utilities						
04. 02.03.01 Pipelines						
04. 02.03.01.51 Relocations	1.00	EA	0	0	0	0
04. 02.03.01 Pipelines	1.00	EA	0	0	0	0
04. 02.03.02 Electric Lines						
04. 02.03.02.01 Electric	1.00	EA	0	0	0	0
04. 02.03.02 Electric Lines	1.00	EA	0	0	0	0
04. 02.03 Utilities	1.00	EA	0	0	0	0
04. 02 Relocations	1.00	EA	0	0	0	0
04. 05 Locks						

	QUANTITY	UOM	CONTRACT	CONTINGN	CONSTNT$	PROJECT
04. 05.62 Approach Walls, Upper & Lower						
04. 05.62.05 Metals						
04. 05.62.05.10 Pinning Guidewalls	1.00	JOB	0	0	0	0
04. 05.62.05 Metals	1.00	LS	0	0	0	0
04. 05.62 Approach Walls, Upper & Lower	1.00	LS	0	0	0	0
04. 05 Locks	1.00	EA	0	0	0	0
04. 06 Fish and Wildlife Facilities						
04. 06.03 F & W Faclts & Sancturies Mitign						
04. 06.03.73 Habitat & Feeding Facilities						
04. 06.03.73.10 Boat Ramp at NM 272.0L	5600.00	SF	0	0	0	0
04. 06.03.73.11 Tern Islnds from Dredge Material	5600.00	SF	42,554	8,945	51,499	53,669
04. 06.03.73.12 Notch Dikes	39.00	EA	22,471	4,723	27,195	28,341
04. 06.03.73.21 Dredge Side Channel @ 276.0R	37037.00	CY	72,778	15,298	88,076	91,787
04. 06.03.73.25 Silt Curtains	1.00	JOB	5,597	1,176	6,773	7,059
04. 06.03.73.51 Long Term Management Features	1.00	EA	578,723	121,648	700,371	729,886
04. 06.03.73.52 Adaptive Management Features	1.00	EA	491,700	103,355	595,055	620,132
04. 06.03.73.63 8' Dia Gated Culvert @ 243.9L	300.00	LF	253,943	53,379	307,321	320,272
04. 06.03.73 Habitat & Feeding Facilities	1.00	JOB	1,467,766	308,524	1,776,290	1,851,146
04. 06.03 F & W Faclts & Sancturies Mitign	1.00	JOB	1,467,766	308,524	1,776,290	1,851,146
04. 06 Fish and Wildlife Facilities	1.00	JOB	1,467,766	308,524	1,776,290	1,851,146
04. 09 Channels and Canals						
04. 09.01 Channels						
04. 09.01.16 Pipeline Dredging						
04. 09.01.16.00 <<< Not Identified >>>	1.00	EA	1,781,725	280,889	2,062,614	2,153,482
04. 09.01.16 Pipeline Dredging	1.00	EA	1,781,725	280,889	2,062,614	2,153,482
04. 09.01.20 Disposal Areas						
04. 09.01.20.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
04. 09.01.20 Disposal Areas	1.00	EA	0	0	0	0
04. 09.01.30 Bank Stablztion, Dikes & Jetties						
04. 09.01.30.01 Bank Stabilization Measures-CG	584972.00	TON	7,750,879	2,036,543	9,787,422	10,182,717
04. 09.01.30 Bank Stablztion, Dikes & Jetties	1.00	JOB	7,750,879	2,036,543	9,787,422	10,182,717
04. 09.01 Channels	1.00	EA	9,532,604	2,317,432	11,850,036	12,336,199

	QUANTITY	UOM	CONTRACT	CONTINGN	CONSTNT$	PROJECT
04. 09 Channels and Canals	1.00	EA	9,532,604	2,317,432	11,850,036	12,336,199
04. 11 Levees and Floodwalls						
04. 11.01 Levees and Floodwalls						
04. 11.01.01 Levees and Floodwalls						
04. 11.01.01.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
04. 11.01.01 Levees and Floodwalls	1.00	EA	0	0	0	0
04. 11.01 Levees and Floodwalls	1.00	EA	0	0	0	0
04. 11 Levees and Floodwalls	1.00	EA	0	0	0	0
04. 12 Navigation, Ports & Harbors (NF)						
04. 12.01 Ports						
04. 12.01.15 Mechanical Dredging						
04. 12.01.15.10 Dredged Fill	3555.00	CY	19,607	4,121	23,728	24,728
04. 12.01.15 Mechanical Dredging	1.00	JOB	19,607	4,121	23,728	24,728
04. 12.01.16 Pipeline Dredging						
04. 12.01.16.01 Pool 10	1100.00	CY	0	0	0	0
04. 12.01.16.03 Pool 12	483430.00	CY	0	0	0	0
04. 12.01.16 Pipeline Dredging	1.00	EA	0	0	0	0
04. 12.01 Ports	1.00	EA	19,607	4,121	23,728	24,728
04. 12.02 Harbors						
04. 12.02.16 Pipeline Dredging						
04. 12.02.16.01 Pool 12	483430.00	CY	0	0	0	0
04. 12.02.16 Pipeline Dredging	1.00	EA	0	0	0	0
04. 12.02 Harbors	1.00	EA	0	0	0	0
04. 12 Navigation, Ports & Harbors (NF)	1.00	EA	19,607	4,121	23,728	24,728
04. 18 Cultural Resource Preservation						
04. 18.00 Cultural Resource Preservation						
04. 18.00.86 Identification, Data Analysis						
04. 18.00.86.55 Cultural/Archaelogical Surveys	1.00	JOB	0	0	0	0
04. 18.00.86 Identification, Data Analysis	1.00	JOB	0	0	0	0

	QUANTITY	UOM	CONTRACT	CONTINGN	CONSTNT$	PROJECT
04. 18.00 Cultural Resource Preservation	1.00	JOB	0	0	0	0
04. 18 Cultural Resource Preservation	1.00	JOB	0	0	0	0
04. 30 Planning, Engineering & Design						
04. 30.20 Project Design Memorandum						
04. 30.20.01 PED						
04. 30.20.01.03 Hydrology and Hydraulic Studies	1.00	EA	400,095	84,100	484,195	504,600
04. 30.20.01.06 Model Studies	1.00	EA	182,748	38,414	221,161	230,482
04. 30.20.01.07 PED	1.00	JOB	699,375	147,009	846,384	882,052
04. 30.20.01 PED	1.00	JOB	1,282,218	269,522	1,551,740	1,617,133
04. 30.20 Project Design Memorandum	1.00	JOB	1,282,218	269,522	1,551,740	1,617,133
04. 30 Planning, Engineering & Design	1.00	JOB	1,282,218	269,522	1,551,740	1,617,133
04. 31 Construction Management						
04. 31.23 Construction Contracts						
04. 31.23.11 Supervision and Administration						
04. 31.23.11.01 Prjt Office Supervn and Adminstn	1.00	LS	749,331	157,509	906,840	945,056
04. 31.23.11 Supervision and Administration	1.00	EA	749,331	157,509	906,840	945,056
04. 31.23 Construction Contracts	1.00	EA	749,331	157,509	906,840	945,056
04. 31 Construction Management	1.00	JOB	749,331	157,509	906,840	945,056
04 Reach 4 (NM 220.3 to NM 307.7)	1.00	EA	13,051,525	3,057,110	16,108,635	16,774,263
Feasibility Cost Es - 3 FT Lower	1.00	EA	64,704,146	14,856,538	79,560,683	82,813,511

ARKANSAS RIVER NAVIGATION STUDY,
ARKANSAS AND OKLAHOMA
FEASIBILITY STUDY

TAB D

- MCACES Cost Estimate -

One-Foot Lower (10 Foot) Additional Operation and Maintenance Reaches 1- 4

Feasi O&M Cost Est - 1 FT Lower Alternative - Lower the MKARNS Navigation Channel Bottom 1 Foot (10 ft) - Operations and Maintenance Cost Estimate

Designed By: Design Branch
Estimated By: Cost Engineering & Support Sectn

Prepared By: George Losak

Preparation Date: 07/19/05
Effective Date of Pricing: 02/25/05
Est Construction Time: 22 Days

Sales Tax: 7.00%

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Release 5.31

This project is to increase the depth of the navigation channel in Arkansas for the McClellan-Kerr Arkansas River Navigation System (MKARNS) from 9 feet to 10 feet. There are 12 navigation locks and dams in the MKARNS in Arkansas. Tulsa District is developing the modification costs for the Oklahoma segment of the MKARNS.

This cost estimate quantifies the operations and maintenance cost to maintain a 10 foot MKARNS navigation channel.

Many of the costs contained herein are based upon the designers experience. No detailed engineering surveys, drawings nor quantities were developed for these cost estimates.

ASSUMPTIONS:

1. Work on the project will not start for several years.

2. Dredged material from harbors and ports is to be disposed of in nearby disposal sites.

EXCLUSIONS:

1. No escalation because work to be done in less than a year.

INCLUSIONS:

1. Contingency 20 percent because of the lack of information.

2. Prime contractor profit of 7.58 percent.

3. Sales tax of 7 percent.

4. Supervision and administration cost for construction contracts of 7.5 percent was furnished by Construction Branch personnel.

SUMMARY REPORTS SUMMARY PAGE

PROJECT OWNER SUMMARY - 1st Levl.....1
2ND VIEW SUMMARY.....2

No Detailed Estimate...

No Backup Reports...

* * * END TABLE OF CONTENTS * * *

		QUANTITY	UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
05	Locks	1.00	EA	60,488	0	12,098	0	72,586	72585.60
06	Fish and Wildlife Facilities	1.00	EA	161,043	0	0	0	161,043	161043.00
09	Channels and Canals	1.00	EA	478,016	0	103,504	0	581,520	581519.65
30	Design Work for O&M	1.00	JOB	44,169	0	6,625	0	50,794	50794.35
31	Construction Management	1.00	JOB	47,324	0	9,465	0	56,789	56788.80
TOTAL	Feasi O&M Cost Est - 1 FT Lower	1.00	EA	791,040	0	131,692	0	922,731	922731.40

	QUANTITY	UOM	CONTRACT	CONTINGN	Constnt$	PROJECT
01 Reach 1 (NM 0.0 to NM 75.2)						
01. 04 Dams						
01. 04.01 Main Dam						
01. 04.01.42 Earth and Rockfill Dam						
01. 04.01.42.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
01. 04.01.42 Earth and Rockfill Dam	1.00	EA	0	0	0	0
01. 04.01 Main Dam	1.00	EA	0	0	0	0
01. 04.02 Spillway						
01. 04.02.01 Spillway						
01. 04.02.01.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
01. 04.02.01 Spillway	1.00	EA	0	0	0	0
01. 04.02 Spillway	1.00	EA	0	0	0	0
01. 04 Dams	1.00	EA	0	0	0	0
01. 05 Locks						
01. 05.00 Locks						
01. 05.00.99 Assoc'd Items(Tow Haulage)						
01. 05.00.99.15 Mechanical - Towhaulage Equip	1.00	EA	27,501	5,500	33,002	33,002
01. 05.00.99 Assoc'd Items(Tow Haulage)	1.00	EA	27,501	5,500	33,002	33,002
01. 05.00 Locks	1.00	EA	27,501	5,500	33,002	33,002
01. 05 Locks	1.00	EA	27,501	5,500	33,002	33,002
01. 06 Fish and Wildlife Facilities						
01. 06.03 Wildlife Facilities & Sanctuarys						
01. 06.03.73 Habitat and Feeding Facilities						
01. 06.03.73.01 Annual Cost for Mitigation	1.00	EA	0	0	0	0
01. 06.03.73.02 Ann Cost for Side Channel Dredge	1.00	LS	122,163	0	122,163	122,163
01. 06.03.73 Habitat and Feeding Facilities	1.00	EA	122,163	0	122,163	122,163
01. 06.03 Wildlife Facilities & Sanctuarys	1.00	EA	122,163	0	122,163	122,163
01. 06 Fish and Wildlife Facilities	1.00	EA	122,163	0	122,163	122,163

	QUANTITY	UOM	CONTRACT	CONTINGN	Constnt$	PROJECT
01. 09 Channels and Canals						
01. 09.01 Channels						
01. 09.01.16 Pipeline Dredging						
01. 09.01.16.00 <<< Not Identified >>>	1.00	EA	39,685	9,921	49,606	49,606
01. 09.01.16 Pipeline Dredging	1.00	EA	39,685	9,921	49,606	49,606
01. 09.01.30 Bank Stablztion, Dikes & Jetties						
01. 09.01.30.01 Bank Stabilization Measures	5714.00	TON	69,997	10,499	80,496	80,496
01. 09.01.30 Bank Stablztion, Dikes & Jetties	1.00	JOB	69,997	10,499	80,496	80,496
01. 09.01 Channels	1.00	EA	109,681	20,421	130,102	130,102
01. 09 Channels and Canals	1.00	EA	109,681	20,421	130,102	130,102
01. 30 Design Work for O&M						
01. 30.20 Project Design Memorandum						
01. 30.20.01 O&M Design						
01. 30.20.01.07 O&M Design Documents	1.00	JOB	10,135	1,520	11,655	11,655
01. 30.20.01 O&M Design	1.00	JOB	10,135	1,520	11,655	11,655
01. 30.20 Project Design Memorandum	1.00	JOB	10,135	1,520	11,655	11,655
01. 30 Design Work for O&M	1.00	JOB	10,135	1,520	11,655	11,655
01. 31 Construction Management						
01. 31.23 Construction Contracts						
01. 31.23.11 Supervision and Administration						
01. 31.23.11.01 Prjt Office Supervn and Adminstn	1.00	JOB	10,859	2,172	13,031	13,031
01. 31.23.11 Supervision and Administration	1.00	EA	10,859	2,172	13,031	13,031
01. 31.23 Construction Contracts	1.00	EA	10,859	2,172	13,031	13,031
01. 31 Construction Management	1.00	JOB	10,859	2,172	13,031	13,031
01 Reach 1 (NM 0.0 to NM 75.2)	1.00	EA	280,340	29,613	309,953	309,953
02 Reach 2 (NM 75.5 to NM 119.5)						
02. 04 Dams						
02. 04.01 Main Dam						

	QUANTITY	UOM	CONTRACT	CONTINGN	Constnt$	PROJECT
02. 04.01.42 Earth and Rockfill Dam						
02. 04.01.42.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
02. 04.01.42 Earth and Rockfill Dam	1.00	EA	0	0	0	0
02. 04.01 Main Dam	1.00	EA	0	0	0	0
02. 04.02 Spillway						
02. 04.02.01 Spillway						
02. 04.02.01.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
02. 04.02.01 Spillway	1.00	EA	0	0	0	0
02. 04.02 Spillway	1.00	EA	0	0	0	0
02. 04 Dams	1.00	EA	0	0	0	0
02. 05 Locks						
02. 05.00 Locks						
02. 05.00.99 Assoc'd Items(Tow Haulage)						
02. 05.00.99.15 Mechanical - Towhaulage Equip	1.00	EA	4,712	942	5,654	5,654
02. 05.00.99 Assoc'd Items(Tow Haulage)	1.00	EA	4,712	942	5,654	5,654
02. 05.00 Locks	1.00	EA	4,712	942	5,654	5,654
02. 05 Locks	1.00	EA	4,712	942	5,654	5,654
02. 06 Fish and Wildlife Facilities						
02. 06.03 Wildlife Facilities & Sanctuarys						
02. 06.03.73 Habitat and Feeding Facilities						
02. 06.03.73.01 Annual Cost for Mitigation	1.00	EA	0	0	0	0
02. 06.03.73.02 Ann Cost for Side Channel Dredge	1.00	LS	13,783	0	13,783	13,783
02. 06.03.73 Habitat and Feeding Facilities	1.00	EA	13,783	0	13,783	13,783
02. 06.03 Wildlife Facilities & Sanctuarys	1.00	EA	13,783	0	13,783	13,783
02. 06 Fish and Wildlife Facilities	1.00	EA	13,783	0	13,783	13,783
02. 09 Channels and Canals						
02. 09.01 Channels						
02. 09.01.16 Pipeline Dredging						

	QUANTITY	UOM	CONTRACT	CONTINGN	Constnt$	PROJECT
02. 09.01.16.00 <<< Not Identified >>>	1.00	EA	34,291	8,573	42,863	42,863
02. 09.01.16 Pipeline Dredging	1.00	EA	34,291	8,573	42,863	42,863
02. 09.01.30 Bank Stablztion, Dikes & Jetties						
02. 09.01.30.01 Bank Stabilization Measures	4082.00	TON	50,005	7,501	57,505	57,505
02. 09.01.30 Bank Stablztion, Dikes & Jetties	1.00	JOB	50,005	7,501	57,505	57,505
02. 09.01 Channels	1.00	EA	84,295	16,073	100,368	100,368
02. 09 Channels and Canals	1.00	EA	84,295	16,073	100,368	100,368
02. 30 Design Work for O&M						
02. 30.20 Project Design Memorandum						
02. 30.20.01 O&M Design						
02. 30.20.01.07 O&M Design	1.00	JOB	7,788	1,168	8,956	8,956
02. 30.20.01 O&M Design	1.00	JOB	7,788	1,168	8,956	8,956
02. 30.20 Project Design Memorandum	1.00	JOB	7,788	1,168	8,956	8,956
02. 30 Design Work for O&M	1.00	JOB	7,788	1,168	8,956	8,956
02. 31 Construction Management						
02. 31.23 Construction Contracts						
02. 31.23.11 Supervision and Administration						
02. 31.23.11.01 Prjt Office Supervn and Adminstn	1.00	EA	8,345	1,669	10,014	10,014
02. 31.23.11 Supervision and Administration	1.00	EA	8,345	1,669	10,014	10,014
02. 31.23 Construction Contracts	1.00	EA	8,345	1,669	10,014	10,014
02. 31 Construction Management	1.00	JOB	8,345	1,669	10,014	10,014
02 Reach 2 (NM 75.5 to NM 119.5)	1.00	EA	118,923	19,853	138,776	138,776
03 Reach 3 (NM 119.5 to NM 220.3)						
03. 04 Dams						
03. 04.01 Main Dam						
03. 04.01.42 Earth and Rockfill Dam						
03. 04.01.42.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
03. 04.01.42 Earth and Rockfill Dam	1.00	EA	0	0	0	0

	QUANTITY	UOM	CONTRACT	CONTINGN	Constnt$	PROJECT
03. 04.01 Main Dam	1.00	EA	0	0	0	0
03. 04.02 Spillway						
03. 04.02.01 Spillway						
03. 04.02.01.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
03. 04.02.01 Spillway	1.00	EA	0	0	0	0
03. 04.02 Spillway	1.00	EA	0	0	0	0
03. 04 Dams	1.00	EA	0	0	0	0
03. 05 Locks						
03. 05.00 Locks						
03. 05.00.99 Assoc'd Items(Tow Haulage)						
03. 05.00.99.15 Mechanical - Towhaulage Equip	1.00	EA	18,850	3,770	22,620	22,620
03. 05.00.99 Assoc'd Items(Tow Haulage)	1.00	EA	18,850	3,770	22,620	22,620
03. 05.00 Locks	1.00	EA	18,850	3,770	22,620	22,620
03. 05 Locks	1.00	EA	18,850	3,770	22,620	22,620
03. 06 Fish and Wildlife Facilities						
03. 06.03 Wildlife Facilities & Sanctuarys						
03. 06.03.73 Habitat and Feeding Facilities						
03. 06.03.73.01 Annual Cost for Mitigation	1.00	EA	0	0	0	0
03. 06.03.73.02 Ann Cost for Side Channel Dredge	1.00	LS	19,828	0	19,828	19,828
03. 06.03.73 Habitat and Feeding Facilities	1.00	EA	19,828	0	19,828	19,828
03. 06.03 Wildlife Facilities & Sanctuarys	1.00	EA	19,828	0	19,828	19,828
03. 06 Fish and Wildlife Facilities	1.00	EA	19,828	0	19,828	19,828
03. 09 Channels and Canals						
03. 09.01 Channels						
03. 09.01.16 Pipeline Dredging						
03. 09.01.16.00 <<< Not Identified >>>	1.00	EA	39,782	9,946	49,728	49,728
03. 09.01.16 Pipeline Dredging	1.00	EA	39,782	9,946	49,728	49,728
03. 09.01.30 Bank Stablztion, Dikes & Jetties						

	QUANTITY	UOM	CONTRACT	CONTINGN	Constnt$	PROJECT
03. 09.01.30.01 Bank Stabilization Measures	1888.00	JOB	24,997	3,750	28,747	28,747
03. 09.01.30 Bank Stablztion, Dikes & Jetties	1.00	JOB	24,997	3,750	28,747	28,747
03. 09.01 Channels	1.00	EA	64,779	13,695	78,475	78,475
03. 09 Channels and Canals	1.00	EA	64,779	13,695	78,475	78,475
03. 30 Design Work for O&M						
03. 30.20 Project Design Memorandum						
03. 30.20.01 O&M Design						
03. 30.20.01.07 O&M Design	1.00	JOB	5,986	898	6,884	6,884
03. 30.20.01 O&M Design	1.00	JOB	5,986	898	6,884	6,884
03. 30.20 Project Design Memorandum	1.00	JOB	5,986	898	6,884	6,884
03. 30 Design Work for O&M	1.00	JOB	5,986	898	6,884	6,884
03. 31 Construction Management						
03. 31.23 Construction Contracts						
03. 31.23.11 Supervision and Administration						
03. 31.23.11.01 Prjt Office Supervn and Adminstn	1.00	EA	6,413	1,283	7,696	7,696
03. 31.23.11 Supervision and Administration	1.00	EA	6,413	1,283	7,696	7,696
03. 31.23 Construction Contracts	1.00	EA	6,413	1,283	7,696	7,696
03. 31 Construction Management	1.00	JOB	6,413	1,283	7,696	7,696
03 Reach 3 (NM 119.5 to NM 220.3)	1.00	EA	115,856	19,646	135,502	135,502
04 Reach 4 (NM 220.3 to NM 307.7)						
04. 04 Dams						
04. 04.01 Main Dam						
04. 04.01.42 Earth and Rockfill Dam						
04. 04.01.42.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
04. 04.01.42 Earth and Rockfill Dam	1.00	EA	0	0	0	0
04. 04.01 Main Dam	1.00	EA	0	0	0	0

	QUANTITY	UOM	CONTRACT	CONTINGN	Constnt$	PROJECT
04. 04.02 Spillway						
04. 04.02.01 Spillway						
04. 04.02.01.00 <<< Not Identified >>>	1.00	EA	0	0	0	0
04. 04.02.01 Spillway	1.00	EA	0	0	0	0
04. 04.02 Spillway	1.00	EA	0	0	0	0
04. 04 Dams	1.00	EA	0	0	0	0
04. 05 Locks						
04. 05.00 Locks						
04. 05.00.99 Assoc'd Items(Tow Haulage)						
04. 05.00.99.15 Mechanical - Towhaulage Equip	1.00	EA	9,425	1,885	11,310	11,310
04. 05.00.99 Assoc'd Items(Tow Haulage)	1.00	EA	9,425	1,885	11,310	11,310
04. 05.00 Locks	1.00	EA	9,425	1,885	11,310	11,310
04. 05 Locks	1.00	EA	9,425	1,885	11,310	11,310
04. 06 Fish and Wildlife Facilities						
04. 06.03 Wildlife Facilities & Sanctuarys						
04. 06.03.73 Habitat and Feeding Facilities						
04. 06.03.73.01 Annual Cost for Mitigation	1.00	EA	0	0	0	0
04. 06.03.73.02 Ann Cost for Side Channel Dredge	1.00	LS	5,269	0	5,269	5,269
04. 06.03.73 Habitat and Feeding Facilities	1.00	EA	5,269	0	5,269	5,269
04. 06.03 Wildlife Facilities & Sanctuarys	1.00	EA	5,269	0	5,269	5,269
04. 06 Fish and Wildlife Facilities	1.00	EA	5,269	0	5,269	5,269
04. 09 Channels and Canals						
04. 09.01 Channels						
04. 09.01.16 Pipeline Dredging						
04. 09.01.16.00 <<< Not Identified >>>	1.00	EA	204,259	51,065	255,324	255,324
04. 09.01.16 Pipeline Dredging	1.00	EA	204,259	51,065	255,324	255,324
04. 09.01.30 Bank Stablztion, Dikes & Jetties						
04. 09.01.30.01 Bank Stabilization Measures	1133.00	JOB	15,001	2,250	17,251	17,251
04. 09.01.30 Bank Stablztion, Dikes & Jetties	1.00	JOB	15,001	2,250	17,251	17,251

	QUANTITY	UOM	CONTRACT	CONTINGN	Constnt$	PROJECT
04. 09.01 Channels	1.00	EA	219,260	53,315	272,575	272,575
04. 09 Channels and Canals	1.00	EA	219,260	53,315	272,575	272,575
04. 30 Design Work for O&M						
04. 30.20 Project Design Memorandum						
04. 30.20.01 O&M Design						
04. 30.20.01.07 O&M Design Effort	1.00	JOB	20,260	3,039	23,299	23,299
04. 30.20.01 O&M Design	1.00	JOB	20,260	3,039	23,299	23,299
04. 30.20 Project Design Memorandum	1.00	JOB	20,260	3,039	23,299	23,299
04. 30 Design Work for O&M	1.00	JOB	20,260	3,039	23,299	23,299
04. 31 Construction Management						
04. 31.23 Construction Contracts						
04. 31.23.11 Supervision and Administration						
04. 31.23.11.01 Prjt Office Supervn and Adminstn	1.00	EA	21,707	4,341	26,048	26,048
04. 31.23.11 Supervision and Administration	1.00	EA	21,707	4,341	26,048	26,048
04. 31.23 Construction Contracts	1.00	EA	21,707	4,341	26,048	26,048
04. 31 Construction Management	1.00	JOB	21,707	4,341	26,048	26,048
04 Reach 4 (NM 220.3 to NM 307.7)	1.00	EA	275,921	62,580	338,501	338,501
Feasi O&M Cost Est - 1 FT Lower	1.00	EA	791,040	131,692	922,731	922,731

ARKANSAS RIVER NAVIGATION STUDY,
ARKANSAS AND OKLAHOMA
FEASIBILITY STUDY

TAB F

- MCACES Cost Estimate -

Three-Foot Lower (12 Foot) Additional Operation and Maintenance Reaches 1- 4

Prelim O&M Cost Est - 3 FT Lower Alternative - Lower the MKARNS Navigation Channel Bottom 3 Foot (12 FT) - Operations and Maintenance Cost

Designed By: Design Branch
Estimated By: Cost Engineering & Support Sectn

Prepared By: George Losak, Romy Buen

Preparation Date: 07/19/05
Effective Date of Pricing: 02/25/05
Est Construction Time: 44 Days

Sales Tax: 7.00%

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M C A C E S G O L D E D I T I O N
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Release 5.31

This project is to increase the depth of the navigation channel in Arkansas for the McClellan-Kerr Arkansas River Navigation System (MKARNS) from 9 feet to 10 feet. There are 12 navigation locks and dams in the MKARNS in Arkansas. Tulsa District is developing the modification costs for the Oklahoma segment of the MKARNS.

This cost estimate quantifies the cost to maintain a 12ft (3 ft lower) MKARNS navigation channel.

Many of the costs contained herein are based upon the designers experience. No detailed engineering surveys, drawings nor quantities were developed for these cost estimates.

ASSUMPTIONS:

1. Work on the project will not start for several years.

2. Dredged material from harbors and ports is to be disposed of in nearby disposal sites.

EXCLUSIONS:

INCLUSIONS:

1. Assumed escalation 10 percent.

2. Contingency 20 percent because of the lack of information.

3. Prime contractor profit of 7.58 percent.

4. Sales tax of 7 percent.

5. Supervision and administration cost for construction contracts of 7.5 percent was furnished by Construction Branch personnel.

SUMMARY REPORTS SUMMARY PAGE

PROJECT OWNER SUMMARY - 1st Levl.....1
2ND VIEW SUMMARY.....2

No Detailed Estimate...

No Backup Reports...

* * * END TABLE OF CONTENTS * * *

		QUANTITY	UOM	CONTRACT	ESCALATN	CONTINGN	SIOH	TOTAL COST	UNIT COST
05	Locks	1.00	EA	176,025	0	35,205	0	211,230	211229.92
06	Fish and Wildlife Facilities	1.00	EA	161,043	0	0	0	161,043	161043.00
09	Channels and Canals	1.00	EA	1,059,760	0	248,940	0	1,308,700	1308700
30	Planning, Engineering & Design	1.00	JOB	74,183	0	11,127	0	85,310	85310.45
31	Construction Management	1.00	JOB	79,482	0	15,896	0	95,378	95378.40
TOTAL	Prelim O&M Cost Est - 3 FT Lower	1.00	EA	1,550,493	0	311,169	0	1,861,662	1861662

	QUANTITY	UOM	CONTRACT	CONTINGN	Constnt$	PROJECT
01 Reach 1 (NM 0.0 to NM 75.2)						
01. 05 Locks						
01. 05.00 Locks						
01. 05.00.99 Associated General Items						
01. 05.00.99.15 Mechanical - Towhaulage Equip	1.00	EA	80,018	16,004	96,021	96,021
01. 05.00.99 Associated General Items	1.00	EA	80,018	16,004	96,021	96,021
01. 05.00 Locks	1.00	EA	80,018	16,004	96,021	96,021
01. 05 Locks	1.00	EA	80,018	16,004	96,021	96,021
01. 06 Fish and Wildlife Facilities						
01. 06.03 Wildlife Facilities & Sanctuarys						
01. 06.03.73 Habitat and Feeding Facilities						
01. 06.03.73.01 Annual Cost for Mitigation	1.00	EA	0	0	0	0
01. 06.03.73.02 Ann Cost for Side Channel Dredge	1.00	LS	122,163	0	122,163	122,163
01. 06.03.73 Habitat and Feeding Facilities	1.00	EA	122,163	0	122,163	122,163
01. 06.03 Wildlife Facilities & Sanctuarys	1.00	EA	122,163	0	122,163	122,163
01. 06 Fish and Wildlife Facilities	1.00	EA	122,163	0	122,163	122,163
01. 09 Channels and Canals						
01. 09.01 Channels						
01. 09.01.16 Pipeline Dredging						
01. 09.01.16.00 <<< Not Identified >>>	1.00	EA	144,497	36,124	180,622	180,622
01. 09.01.16 Pipeline Dredging	1.00	EA	144,497	36,124	180,622	180,622
01. 09.01.30 Bank Stablztion, Dikes & Jetties						
01. 09.01.30.01 Bank Stabilization Measures	18500.00	TON	69,997	10,499	80,496	80,496
01. 09.01.30 Bank Stablztion, Dikes & Jetties	1.00	JOB	69,997	10,499	80,496	80,496
01. 09.01 Channels	1.00	EA	214,494	46,624	261,117	261,117
01. 09 Channels and Canals	1.00	EA	214,494	46,624	261,117	261,117
01. 30 Planning, Engineering & Design						
01. 30.20 Project Design Memorandum						
01. 30.20.01 O&M Design Documents						
01. 30.20.01.07 O&M Design Documents	1.00	JOB	15,015	2,252	17,267	17,267

	QUANTITY	UOM	CONTRACT	CONTINGN	Constnt$	PROJECT
01. 30.20.01 O&M Design Documents	1.00	JOB	15,015	2,252	17,267	17,267
01. 30.20 Project Design Memorandum	1.00	JOB	15,015	2,252	17,267	17,267
01. 30 Planning, Engineering & Design	1.00	JOB	15,015	2,252	17,267	17,267
01. 31 Construction Management						
01. 31.23 Construction Contracts						
01. 31.23.11 Supervision and Administration						
01. 31.23.11.01 Prjt Office Supervn and Adminstn	1.00	JOB	16,087	3,217	19,304	19,304
01. 31.23.11 Supervision and Administration	1.00	EA	16,087	3,217	19,304	19,304
01. 31.23 Construction Contracts	1.00	EA	16,087	3,217	19,304	19,304
01. 31 Construction Management	1.00	JOB	16,087	3,217	19,304	19,304
01 Reach 1 (NM 0.0 to NM 75.2)	1.00	EA	447,776	68,097	515,873	515,873
02 Reach 2 (NM 75.5 to NM 119.5)						
02. 05 Locks						
02. 05.00 Locks						
02. 05.00.99 Associated General Items						
02. 05.00.99.15 Mechanical - Towhaulage Equip	1.00	EA	13,716	2,743	16,459	16,459
02. 05.00.99 Associated General Items	1.00	EA	13,716	2,743	16,459	16,459
02. 05.00 Locks	1.00	EA	13,716	2,743	16,459	16,459
02. 05 Locks	1.00	EA	13,716	2,743	16,459	16,459
02. 06 Fish and Wildlife Facilities						
02. 06.03 Wildlife Facilities & Sanctuarys						
02. 06.03.73 Habitat and Feeding Facilities						
02. 06.03.73.01 Annual Cost for Mitigation	1.00	EA	0	0	0	0
02. 06.03.73.02 Ann Cost for Side Channel Dredge	1.00	LS	13,783	0	13,783	13,783
02. 06.03.73 Habitat and Feeding Facilities	1.00	EA	13,783	0	13,783	13,783
02. 06.03 Wildlife Facilities & Sanctuarys	1.00	EA	13,783	0	13,783	13,783

	QUANTITY	UOM	CONTRACT	CONTINGN	Constnt$	PROJECT
02. 06 Fish and Wildlife Facilities	1.00	EA	13,783	0	13,783	13,783
02. 09 Channels and Canals						
02. 09.01 Channels						
02. 09.01.16 Pipeline Dredging						
02. 09.01.16.00 <<< Not Identified >>>	1.00	EA	118,077	29,519	147,597	147,597
02. 09.01.16 Pipeline Dredging	1.00	EA	118,077	29,519	147,597	147,597
02. 09.01.30 Bank Stablztion, Dikes & Jetties						
02. 09.01.30.01 Bank Stabilization Measures	10000.00	TON	50,005	7,501	57,505	57,505
02. 09.01.30 Bank Stablztion, Dikes & Jetties	1.00	JOB	50,005	7,501	57,505	57,505
02. 09.01 Channels	1.00	EA	168,082	37,020	205,102	205,102
02. 09 Channels and Canals	1.00	EA	168,082	37,020	205,102	205,102
02. 30 Planning, Engineering & Design						
02. 30.20 Project Design Memorandum						
02. 30.20.01 O&M Design Documents						
02. 30.20.01.07 O&M Design Documents	1.00	JOB	11,765	1,765	13,530	13,530
02. 30.20.01 O&M Design Documents	1.00	JOB	11,765	1,765	13,530	13,530
02. 30.20 Project Design Memorandum	1.00	JOB	11,765	1,765	13,530	13,530
02. 30 Planning, Engineering & Design	1.00	JOB	11,765	1,765	13,530	13,530
02. 31 Construction Management						
02. 31.23 Construction Contracts						
02. 31.23.11 Supervision and Administration						
02. 31.23.11.01 Prjt Office Supervn and Adminstn	1.00	EA	12,606	2,521	15,127	15,127
02. 31.23.11 Supervision and Administration	1.00	EA	12,606	2,521	15,127	15,127
02. 31.23 Construction Contracts	1.00	EA	12,606	2,521	15,127	15,127
02. 31 Construction Management	1.00	JOB	12,606	2,521	15,127	15,127
02 Reach 2 (NM 75.5 to NM 119.5)	1.00	EA	219,952	44,049	264,001	264,001

	QUANTITY	UOM	CONTRACT	CONTINGN	Constnt$	PROJECT
03 Reach 3 (NM 119.5 to NM 220.3)						
03. 05 Locks						
03. 05.00 Locks						
03. 05.00.99 Associated General Items						
03. 05.00.99.15 Mechanical - Towhaulage Equip	1.00	EA	54,862	10,972	65,834	65,834
03. 05.00.99 Associated General Items	1.00	EA	54,862	10,972	65,834	65,834
03. 05.00 Locks	1.00	EA	54,862	10,972	65,834	65,834
03. 05 Locks	1.00	EA	54,862	10,972	65,834	65,834
03. 06 Fish and Wildlife Facilities						
03. 06.03 Wildlife Facilities & Sanctuarys						
03. 06.03.73 Habitat and Feeding Facilities						
03. 06.03.73.01 Annual Cost for Mitigation	1.00	EA	0	0	0	0
03. 06.03.73.02 Ann Cost for Side Channel Dredge	1.00	LS	19,828	0	19,828	19,828
03. 06.03.73 Habitat and Feeding Facilities	1.00	EA	19,828	0	19,828	19,828
03. 06.03 Wildlife Facilities & Sanctuarys	1.00	EA	19,828	0	19,828	19,828
03. 06 Fish and Wildlife Facilities	1.00	EA	19,828	0	19,828	19,828
03. 09 Channels and Canals						
03. 09.01 Channels						
03. 09.01.16 Pipeline Dredging						
03. 09.01.16.00 <<< Not Identified >>>	1.00	EA	220,996	55,249	276,245	276,245
03. 09.01.16 Pipeline Dredging	1.00	EA	220,996	55,249	276,245	276,245
03. 09.01.30 Bank Stablztion, Dikes & Jetties						
03. 09.01.30.01 Bank Stabilization Measures	12500.00	TON	24,997	3,750	28,747	28,747
03. 09.01.30 Bank Stablztion, Dikes & Jetties	1.00	JOB	24,997	3,750	28,747	28,747
03. 09.01 Channels	1.00	EA	245,993	58,999	304,992	304,992
03. 09 Channels and Canals	1.00	EA	245,993	58,999	304,992	304,992
03. 30 Planning, Engineering & Design						
03. 30.20 Project Design Memorandum						
03. 30.20.01 O&M Design Documents						
03. 30.20.01.07 O&M Design Documents	1.00	JOB	17,220	2,583	19,803	19,803

	QUANTITY	UOM	CONTRACT	CONTINGN	Constnt$	PROJECT
03. 30.20.01 O&M Design Documents	1.00	JOB	17,220	2,583	19,803	19,803
03. 30.20 Project Design Memorandum	1.00	JOB	17,220	2,583	19,803	19,803
03. 30 Planning, Engineering & Design	1.00	JOB	17,220	2,583	19,803	19,803
03. 31 Construction Management						
03. 31.23 Construction Contracts						
03. 31.23.11 Supervision and Administration						
03. 31.23.11.01 Prjt Office Supervn and Adminstn	1.00	EA	18,450	3,690	22,140	22,140
03. 31.23.11 Supervision and Administration	1.00	EA	18,450	3,690	22,140	22,140
03. 31.23 Construction Contracts	1.00	EA	18,450	3,690	22,140	22,140
03. 31 Construction Management	1.00	JOB	18,450	3,690	22,140	22,140
03 Reach 3 (NM 119.5 to NM 220.3)	1.00	EA	356,353	76,244	432,596	432,596
04 Reach 4 (NM 220.3 to NM 308.7)						
04. 05 Locks						
04. 05.00 Locks						
04. 05.00.99 Associated General Items						
04. 05.00.99.15 Mechanical - Towhaulage Equip	1.00	EA	27,430	5,486	32,916	32,916
04. 05.00.99 Associated General Items	1.00	EA	27,430	5,486	32,916	32,916
04. 05.00 Locks	1.00	EA	27,430	5,486	32,916	32,916
04. 05 Locks	1.00	EA	27,430	5,486	32,916	32,916
04. 06 Fish and Wildlife Facilities						
04. 06.03 Wildlife Facilities & Sanctuarys						
04. 06.03.73 Habitat and Feeding Facilities						
04. 06.03.73.01 Annual Cost for Mitigation	1.00	EA	0	0	0	0
04. 06.03.73.02 Ann Cost for Side Channel Dredge	1.00	LS	5,269	0	5,269	5,269
04. 06.03.73 Habitat and Feeding Facilities	1.00	EA	5,269	0	5,269	5,269
04. 06.03 Wildlife Facilities & Sanctuarys	1.00	EA	5,269	0	5,269	5,269

	QUANTITY	UOM	CONTRACT	CONTINGN	Constnt$	PROJECT
04. 06 Fish and Wildlife Facilities	1.00	EA	5,269	0	5,269	5,269
04. 09 Channels and Canals						
04. 09.01 Channels						
04. 09.01.16 Pipeline Dredging						
04. 09.01.16.00 <<< Not Identified >>>	1.00	EA	416,191	104,048	520,238	520,238
04. 09.01.16 Pipeline Dredging	1.00	EA	416,191	104,048	520,238	520,238
04. 09.01.30 Bank Stablztion, Dikes & Jetties						
04. 09.01.30.01 Bank Stabilization Measures	8600.00	TON	15,001	2,250	17,251	17,251
04. 09.01.30 Bank Stablztion, Dikes & Jetties	1.00	JOB	15,001	2,250	17,251	17,251
04. 09.01 Channels	1.00	EA	431,191	106,298	537,489	537,489
04. 09 Channels and Canals	1.00	EA	431,191	106,298	537,489	537,489
04. 30 Planning, Engineering & Design						
04. 30.20 Project Design Memorandum						
04. 30.20.01 O&M Design Documents						
04. 30.20.01.07 O&M Design Documents	1.00	JOB	30,183	4,527	34,710	34,710
04. 30.20.01 O&M Design Documents	1.00	JOB	30,183	4,527	34,710	34,710
04. 30.20 Project Design Memorandum	1.00	JOB	30,183	4,527	34,710	34,710
04. 30 Planning, Engineering & Design	1.00	JOB	30,183	4,527	34,710	34,710
04. 31 Construction Management						
04. 31.23 Construction Contracts						
04. 31.23.11 Supervision and Administration						
04. 31.23.11.01 Prjt Office Supervn and Adminstn	1.00	EA	32,339	6,468	38,807	38,807
04. 31.23.11 Supervision and Administration	1.00	EA	32,339	6,468	38,807	38,807
04. 31.23 Construction Contracts	1.00	EA	32,339	6,468	38,807	38,807
04. 31 Construction Management	1.00	JOB	32,339	6,468	38,807	38,807
04 Reach 4 (NM 220.3 to NM 308.7)	1.00	EA	526,412	122,779	649,191	649,191

	QUANTITY	UOM	CONTRACT	CONTINGN	Constnt$	PROJECT
Prelim O&M Cost Est - 3 FT Lower	1.00	EA	1,550,493	311,169	1,861,662	1,861,662

ARKANSAS RIVER NAVIGATION STUDY,
ARKANSAS AND OKLAHOMA
FEASIBILITY STUDY

TAB G

- MCACES Cost Estimate -

One-Foot Lower (10 Foot) Navigational Channel Reaches 5 - 6

DREDGE ALT,CUT M-K TO 13' 7/05
CWE OF DREDGING M-K
CHANNEL TO A DEPTH OF 13'
INCLUDES REAL ESTATE, MITIGATION
& PINNING UPDATED JULY 18, 2005

Designed By: IN HOUSE
Estimated By: IN HOUSE

Prepared By: TED MCCLEARY, Rev by George Losak

Preparation Date: 07/18/05
Effective Date of Pricing: 06/03/04

Sales Tax: 6.95%

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Release 5.31

DECEMBER 2004 UPDATE:
THE FOLLOWING CHANGES WERE MADE TO ADDRESS COMMENTS BY SWL:
1. WBS CODES WERE INCORPORATED INTO THE FORMAT.
2. REACH NUMBERS WERE ALSO INCORPORATED.
3. E & D AND S & I WERE MOVED FROM OWNER COSTS TO WBS FEATURES.
4. THE PROJECT NOW CONSISTS OF 3 SEPERATE ESTIMATES, ONE FOR EACH DEPTH.
5. COSTS FOR REAL ESTATE WILL BE INCORPORATED LATER-WE HAVE NONE AT PRESENT.
6. COSTS FOR 02 AND 06 WERE NOT OMITTED. WILDLIFE MITIGATION WILL BE A SEPARATE PROJECT AND WE HAVE NO RELOCATIONS.

THE FOLLOWING CHANGES WERE MADE PER PM REQUESTS:
1. POOL NUMBERS REMAIN IN THE FORMAT OF THE ESTIMATE.
2. CONTINGENCIES WERE LOWERED FROM 25% TO 20%. (Changed to 15% 12/09/04)
3. ESCALATION AND CONTINGENCIES ARE APPLIED TO CODES 30 AND 31. (Escalation Deleted 12/09/04)
THE FOLLOWING CHANGES WERE MADE PER DESIGN REFINEMENT:
1. IN POOL 15 42,700 CY OF RIP RAP WAS DELETED.
2. IN POOL 16 RIP RAP WAS REDUCED BY 13,200 CY & REPLACED WITH SILT FENCE.

Revisions made 12/09/04;
1. Changed contingencies to 15 percent.
2. Deleted escalation costs.
3. Changed E&D to 8.0 percent.
4. Changed S&I to 7.5 percent.

Changes made 10 December 2004.
1. Escalation (5.1%) was added as required by EI 01D010, 1 Sept 1997.
2. Contingencies were adjusted to 20 percent for all features except dredging. The reason for this was that more information was available to determine dredging quantities that for the other components (dikes and dredge material disposal areas.)

Changes made 25 Jan., 2005:
Costs for Bank Stabilization within pool 15 were deleted thus reducing costs for E & D, S & I, contingencies, and escalation.

Changes made 14 June 2005:
Included costs for real estate, mitigation, and pinning of guide walls. The costs were provided by others.

SUMMARY REPORTS SUMMARY PAGE

PROJECT OWNER SUMMARY - TASKS.....1
2ND VIEW SUMMARY.....14

No Detailed Estimate...

No Backup Reports...

* * * END TABLE OF CONTENTS * * *

		QUANTITY	UOM	CONTRACT	CONTINGN	ESCALATN	TOTAL COST
5	REACH 5						
5.13	POOL #13						
5.13.01	LANDS AND DAMAGES						
5.13.01.23	LANDS AND DAMAGES						
5.13.01.23.03	LANDS AND DAMAGES						
5.13.01.23.03.02	Real Estate Acquisition Documnts	1.00	EA	381,200	0	0	381,200
5.13.01.23.03.03	Real Estate Condemnation Docmnts	1.00	EA	15,600	0	0	15,600
5.13.01.23.03.05	Real Estate Appraisal Documents	1.00	EA	138,700	0	0	138,700
5.13.01.23.03.06	Real Estate PL 91-646 Assstnce D	1.00	EA	12,600	0	0	12,600
5.13.01.23.03.15	Real Estate Payment Documents	1.00	EA	523,400	0	0	523,400
	TOTAL LANDS AND DAMAGES	1.00	EA	1,071,500	0	0	1,071,500
	TOTAL LANDS AND DAMAGES	1.00	EA	1,071,500	0	0	1,071,500
	TOTAL LANDS AND DAMAGES	1.00	EA	1,071,500	0	0	1,071,500
5.13.06	FISH AND WILDLIFE FACILITIES						
5.13.06.03	WILDLIFE FACILITIES/SANCTUARY						
5.13.06.03.49	Adapative Management Costs						
5.13.06.03.49.01	Backwaters & Trib Mouths Dredgin	1.00	JOB	55,600	11,100	3,400	70,100
5.13.06.03.49.02	Gravel Bar Monitoring	1.00	JOB	41,700	8,300	2,600	52,600
5.13.06.03.49.03	Dike Field Mods	1.00	JOB	33,400	6,700	2,000	42,100
5.13.06.03.49.04	Mussel Bed Reconalization	1.00	JOB	33,400	6,700	2,000	42,100
5.13.06.03.49.05	Hardoods & Marshlands Monitoring	1.00	JOB	16,700	3,300	1,000	21,100
	TOTAL Adapative Management Costs	1.00	EA	180,800	36,200	11,100	228,000
5.13.06.03.50	Long Term Management Costs						
5.13.06.03.50.06	Bathymetry	1.00	JOB	22,300	4,500	1,400	28,100
5.13.06.03.50.07	Substrate Sampling	1.00	JOB	6,700	1,300	400	8,500
5.13.06.03.50.08	LIDAAR/GIS	1.00	JOB	16,700	3,300	1,000	21,100
5.13.06.03.50.09	Backwater Reevaluations	1.00	JOB	8,900	1,800	500	11,200
5.13.06.03.50.10	Diversity & Presence @ Trib Mout	1.00	JOB	8,900	1,800	500	11,200
5.13.06.03.50.11	Gravel Model for Sus. Substrates	1.00	JOB	10,000	2,000	600	12,600
5.13.06.03.50.12	Gravel Monitoring for Hab Qual	1.00	JOB	32,500	6,500	2,000	41,000
5.13.06.03.50.13	Fish Sampling	1.00	JOB	33,400	6,700	2,000	42,100
5.13.06.03.50.14	Hardwood Habitat Quality & Sustn	1.00	JOB	8,000	1,600	500	10,100

	QUANTITY	UOM	CONTRACT	CONTINGN	ESCALATN	TOTAL COST
5.13.06.03.50.15 Water Quality Monitoring	1.00	JOB	33,400	6,700	2,000	42,100
TOTAL Long Term Management Costs	1.00	EA	180,800	36,200	11,100	228,000
5.13.06.03.73 WILDLIFE HABITAT						
5.13.06.03.73. D AQUATIC SANCTUARY IMPROVEMENTS	1.00	EA	36,600	7,300	2,200	46,200
5.13.06.03.73. E Other Mitigation			168,800	0	8,600	177,400
5.13.06.03.73. F Oklahoma Mussel Mitigation			17,500	3,500	1,100	22,100
TOTAL WILDLIFE HABITAT	1.00	EA	222,900	10,800	11,900	245,600
TOTAL WILDLIFE FACILITIES/SANCTUARY	1.00	EA	584,500	83,100	34,000	701,700
TOTAL FISH AND WILDLIFE FACILITIES	1.00	EA	584,500	83,100	34,000	701,700
5.13.09 CHANNELS AND CANALS						
5.13.09.01 CHANNELS						
5.13.09.01.16 PIPELINE DREDGING						
5.13.09.01.16. 1 DREDGE W/PIT DISPOSAL-FROM CEDEP	398800	CY	610,200	91,500	35,800	737,500
TOTAL PIPELINE DREDGING	1.00	EA	610,200	91,500	35,800	737,500
5.13.09.01.20 DISPOSAL AREAS						
5.13.09.01.20. 2 DISPOSAL PIT CONSTRUCTION	43.80	ACR	1,321,800	264,400	80,900	1,667,100
5.13.09.01.20. 3 ACCESS ROAD TO PIT-BASED ON	1.50	MI	161,500	32,300	9,900	203,600
TOTAL DISPOSAL AREAS	43.80	ACR	1,483,300	296,700	90,800	1,870,700
5.13.09.01.30 BANK STABLIZATN, DIKES & JETTIES						
5.13.09.01.30. 4 ROCK FOR FINGER DIKES	61810.00	CY	1,562,400	312,500	95,600	1,970,500
TOTAL BANK STABLIZATN, DIKES & JETTIES	61810.00	CY	1,562,400	312,500	95,600	1,970,500
TOTAL CHANNELS	1.00	EA	3,655,900	700,700	222,200	4,578,700
TOTAL CHANNELS AND CANALS	1.00	EA	3,655,900	700,700	222,200	4,578,700
5.13.18 CULTURAL RESOURCE PRESERVATION						

		QUANTITY	UOM	CONTRACT	CONTINGN	ESCALATN	TOTAL COST
5.13.18.01	Cultural/Archaelogical Surveys	1.00	JOB	62,500	12,500	3,800	78,800
	TOTAL CULTURAL RESOURCE PRESERVATION	1.00	JOB	62,500	12,500	3,800	78,800
5.13.30	PLANNING, ENGINEERING, & DESIGN	1.00	EA	309,600	61,900	18,900	390,400
5.13.31	SUPERVISION AND INSPECTION	1.00	EA	274,600	54,900	16,800	346,300
	TOTAL POOL #13	1.00	EA	5,958,400	913,100	295,800	7,167,400
5.14	POOL #14						
5.14.06	FISH AND WILDLIFE FACILITIES						
5.14.06.03	WILDLIFE FACILITIES/SANCTUARY						
5.14.06.03.73	WILDLIFE HABITAT						
5.14.06.03.73. F	Oklahoma Mussel Mitigation			17,500	3,500	1,100	22,100
	TOTAL WILDLIFE HABITAT	1.00	EA	17,500	3,500	1,100	22,100
	TOTAL WILDLIFE FACILITIES/SANCTUARY	1.00	EA	17,500	3,500	1,100	22,100
	TOTAL FISH AND WILDLIFE FACILITIES	1.00	EA	17,500	3,500	1,100	22,100
5.14.18	CULTURAL RESOURCE PRESERVATION						
5.14.18.01	Cultural/Archaelogical Surveys	1.00	JOB	62,500	12,500	3,800	78,800
	TOTAL CULTURAL RESOURCE PRESERVATION	1.00	JOB	62,500	12,500	3,800	78,800
	TOTAL POOL #14	1.00	EA	80,000	16,000	4,900	100,900
5.15	POOL #15						
5.15.01	LANDS AND DAMAGES						
5.15.01.23	LANDS AND DAMAGES						
5.15.01.23.03	LANDS AND DAMAGES						
5.15.01.23.03.02	Real Estate Acquisition Documnts	1.00	EA	190,600	0	0	190,600
5.15.01.23.03.03	Real Estate Condemnation Docmnts	1.00	EA	7,800	0	0	7,800
5.15.01.23.03.05	Real Estate Appraisal Documents	1.00	EA	69,300	0	0	69,300
5.15.01.23.03.06	Real Estate PL 91-646 Assstnce D	1.00	EA	6,300	0	0	6,300
5.15.01.23.03.15	Real Estate Payment Documents	1.00	EA	261,700	0	0	261,700

		QUANTITY	UOM	CONTRACT	CONTINGN	ESCALATN	TOTAL COST
	TOTAL LANDS AND DAMAGES	1.00	EA	535,700	0	0	535,700
	TOTAL LANDS AND DAMAGES	1.00	EA	535,700	0	0	535,700
	TOTAL LANDS AND DAMAGES	1.00	EA	535,700	0	0	535,700
5.15.05	LOCKS						
5.15.05.00	LOCKS						
5.15.05.00.61	GUIDE WALLS						
5.15.05.00.61.05	GUIDE WALL PINNING (COST CAME	1.00	EA	237,500	47,500	14,500	299,500
	TOTAL GUIDE WALLS	1.00	EA	237,500	47,500	14,500	299,500
	TOTAL LOCKS	1.00	EA	237,500	47,500	14,500	299,500
	TOTAL LOCKS	1.00	EA	237,500	47,500	14,500	299,500
5.15.06	FISH AND WILDLIFE FACILITIES						
5.15.06.03	WILDLIFE FACILITIES/SANCTUARY						
5.15.06.03.49	Adapative Management Costs						
5.15.06.03.49.01	Backwaters & Trib Mouths Dredgin	1.00	JOB	55,600	11,100	3,400	70,100
5.15.06.03.49.02	Gravel Bar Monitoring	1.00	JOB	41,700	8,300	2,600	52,600
5.15.06.03.49.03	Dike Field Mods	1.00	JOB	33,400	6,700	2,000	42,100
5.15.06.03.49.04	Mussel Bed Reconalization	1.00	JOB	33,400	6,700	2,000	42,100
5.15.06.03.49.05	Hardoods & Marshlands Monitoring	1.00	JOB	16,700	3,300	1,000	21,100
	TOTAL Adapative Management Costs	1.00	EA	180,800	36,200	11,100	228,000
5.15.06.03.51	Long Term Management Costs						
5.15.06.03.51.06	Bathymetry	1.00	JOB	22,300	4,500	1,400	28,100
5.15.06.03.51.07	Substrate Sampling	1.00	JOB	6,700	1,300	400	8,500
5.15.06.03.51.08	LIDAAR/GIS	1.00	JOB	16,700	3,300	1,000	21,100
5.15.06.03.51.09	Backwater Reevaluations	1.00	JOB	8,900	1,800	500	11,200
5.15.06.03.51.10	Diversity & Presence @ Trib Mout	1.00	JOB	8,900	1,800	500	11,200
5.15.06.03.51.11	Gravel Model for Sus. Substrates	1.00	JOB	10,000	2,000	600	12,600
5.15.06.03.51.12	Gravel Monitoring for Hab Qual	1.00	JOB	32,500	6,500	2,000	41,000
5.15.06.03.51.13	Fish Sampling	1.00	JOB	33,400	6,700	2,000	42,100
5.15.06.03.51.14	Hardwood Habitat Quality & Sustn	1.00	JOB	8,000	1,600	500	10,100
5.15.06.03.51.15	Water Quality Monitoring	1.00	JOB	33,400	6,700	2,000	42,100
	TOTAL Long Term Management Costs	1.00	EA	180,800	36,200	11,100	228,000

	QUANTITY	UOM	CONTRACT	CONTINGN	ESCALATN	TOTAL COST
5.15.06.03.73 WILDLIFE HABITAT						
5.15.06.03.73. D AQUATIC SANCTUARY IMPROVEMENTS	1.00	EA	31,200	6,200	1,900	39,400
5.15.06.03.73. E Other Mitigation			168,800	0	8,600	177,400
5.15.06.03.73. F Oklahoma Mussel Mitigation			158,000	31,600	9,700	199,300
TOTAL WILDLIFE HABITAT	1.00	EA	358,000	37,800	20,200	416,000
TOTAL WILDLIFE FACILITIES/SANCTUARY	1.00	EA	719,600	110,200	42,300	872,100
TOTAL FISH AND WILDLIFE FACILITIES	1.00	EA	719,600	110,200	42,300	872,100
5.15.09 CHANNELS AND CANALS						
5.15.09.01 CHANNELS						
5.15.09.01.16 PIPELINE DREDGING						
5.15.09.01.16. 1 DREDGE-PIT DISPOSAL-FROM CEDEP	316000	CY	483,500	72,500	28,400	584,400
5.15.09.01.16. 4 DREDGE-OPEN WATER DISP.-CEDEP	1618630	CY	2,104,200	315,600	123,400	2,543,300
5.15.09.01.16. 6 ROCK FOR PLACEMENT AREA DIKES	45160.00	CY	1,141,600	228,300	69,900	1,439,700
5.15.09.01.16. 7 SITES W/SILT FENCE CONTAINMENT	5.00	EA	269,600	53,900	16,500	340,100
TOTAL PIPELINE DREDGING	1.00	EA	3,998,900	670,400	238,100	4,907,400
5.15.09.01.20 DISPOSAL AREAS						
5.15.09.01.20. 2 DISPOSAL PIT CONSTRUCTION	22.90	ACR	652,300	130,500	39,900	822,700
5.15.09.01.20. 3 ACCESS ROAD TO PIT-BASED ON	1.00	MI	129,200	25,800	7,900	162,900
TOTAL DISPOSAL AREAS	22.90	ACR	781,500	156,300	47,800	985,600
TOTAL CHANNELS	1.00	EA	4,780,300	826,700	286,000	5,893,000
TOTAL CHANNELS AND CANALS	1.00	EA	4,780,300	826,700	286,000	5,893,000
5.15.12 PORTS AND HARBORS						
5.15.12.01 PORTS						
5.15.12.01.16 PIPELINE DREDGING	1.00	EA	16,200	3,200	1,000	20,400
TOTAL PORTS	1.00	EA	16,200	3,200	1,000	20,400
TOTAL PORTS AND HARBORS	1.00	EA	16,200	3,200	1,000	20,400
5.15.18 CULTURAL RESOURCE PRESERVATION						

		QUANTITY	UOM	CONTRACT	CONTINGN	ESCALATN	TOTAL COST
5.15.18.01	Cultural/Archaelogical Surveys	1.00	JOB	62,500	12,500	3,800	78,800
	TOTAL CULTURAL RESOURCE PRESERVATION	1.00	JOB	62,500	12,500	3,800	78,800
5.15.30	PLANNING, ENGINEERING, & DESIGN	1.00	EA	435,400	87,100	26,600	549,200
5.15.31	SUPERVISION AND INSPECTION	1.00	EA	392,600	78,500	24,000	495,100
	TOTAL POOL #15	1.00	EA	7,179,800	1,165,700	398,300	8,743,800
5.16	POOL #16						
5.16.01	LANDS AND DAMAGES						
5.16.01.23	LANDS AND DAMAGES						
5.16.01.23.03	LANDS AND DAMAGES						
5.16.01.23.03.02	Real Estate Acquisition Documnts	1.00	EA	190,600	0	0	190,600
5.16.01.23.03.03	Real Estate Condemnation Docmnts	1.00	EA	7,800	0	0	7,800
5.16.01.23.03.05	Real Estate Appraisal Documents	1.00	EA	69,300	0	0	69,300
5.16.01.23.03.06	Real Estate PL 91-646 Assstnce D	1.00	EA	6,300	0	0	6,300
5.16.01.23.03.15	Real Estate Payment Documents	1.00	EA	261,700	0	0	261,700
	TOTAL LANDS AND DAMAGES	1.00	EA	535,700	0	0	535,700
	TOTAL LANDS AND DAMAGES	1.00	EA	535,700	0	0	535,700
	TOTAL LANDS AND DAMAGES	1.00	EA	535,700	0	0	535,700
5.16.05	LOCKS						
5.16.05.00	LOCKS						
5.16.05.00.61	GUIDE WALLS						
5.16.05.00.61.05	GUIDE WALL PINNING (COST CAME	1.00	EA	237,500	47,500	14,500	299,500
	TOTAL GUIDE WALLS	1.00	EA	237,500	47,500	14,500	299,500
	TOTAL LOCKS	1.00	EA	237,500	47,500	14,500	299,500
	TOTAL LOCKS	1.00	EA	237,500	47,500	14,500	299,500
5.16.06	FISH AND WILDLIFE FACILITIES						
5.16.06.03	WILDLIFE FACILITIES/SANCTUARY						
5.16.06.03.49	Adapative Management Costs						

		QUANTITY	UOM	CONTRACT	CONTINGN	ESCALATN	TOTAL COST
5.16.06.03.49.01	Backwaters & Trib Mouths Dredgin	1.00	JOB	55,600	11,100	3,400	70,100
5.16.06.03.49.02	Gravel Bar Monitoring	1.00	JOB	41,700	8,300	2,600	52,600
5.16.06.03.49.03	Dike Field Mods	1.00	JOB	33,400	6,700	2,000	42,100
5.16.06.03.49.04	Mussel Bed Reconalization	1.00	JOB	33,400	6,700	2,000	42,100
5.16.06.03.49.05	Hardoods & Marshlands Monitoring	1.00	JOB	16,700	3,300	1,000	21,100
	TOTAL Adapative Management Costs	1.00	EA	180,800	36,200	11,100	228,000
5.16.06.03.51	Long Term Management Costs						
5.16.06.03.51.06	Bathymetry	1.00	JOB	22,300	4,500	1,400	28,100
5.16.06.03.51.07	Substrate Sampling	1.00	JOB	6,700	1,300	400	8,500
5.16.06.03.51.08	LIDAAR/GIS	1.00	JOB	16,700	3,300	1,000	21,100
5.16.06.03.51.09	Backwater Reevaluations	1.00	JOB	8,900	1,800	500	11,200
5.16.06.03.51.10	Diversity & Presence @ Trib Mout	1.00	JOB	8,900	1,800	500	11,200
5.16.06.03.51.11	Gravel Model for Sus. Substrates	1.00	JOB	10,000	2,000	600	12,600
5.16.06.03.51.12	Gravel Monitoring for Hab Qual	1.00	JOB	32,500	6,500	2,000	41,000
5.16.06.03.51.13	Fish Sampling	1.00	JOB	33,400	6,700	2,000	42,100
5.16.06.03.51.14	Hardwood Habitat Quality & Sustn	1.00	JOB	8,000	1,600	500	10,100
5.16.06.03.51.15	Water Quality Monitoring	1.00	JOB	33,400	6,700	2,000	42,100
	TOTAL Long Term Management Costs	1.00	EA	180,800	36,200	11,100	228,000
5.16.06.03.73	WILDLIFE HABITAT						
5.16.06.03.73. D	AQUATIC SANCTUARY IMPROVEMENTS	1.00	EA	206,500	41,300	12,600	260,400
5.16.06.03.73. E	Other Mitigation			168,800	0	8,600	177,400
5.16.06.03.73. F	Oklahoma Mussel Mitigation			10,500	2,100	600	13,200
	TOTAL WILDLIFE HABITAT	1.00	EA	385,800	43,400	21,900	451,100
	TOTAL WILDLIFE FACILITIES/SANCTUARY	1.00	EA	747,400	115,700	44,000	907,100
	TOTAL FISH AND WILDLIFE FACILITIES	1.00	EA	747,400	115,700	44,000	907,100
5.16.09	CHANNELS AND CANALS						
5.16.09.01	CHANNELS						
5.16.09.01.16	PIPELINE DREDGING						
5.16.09.01.16. A	DREDGING & DISPOSAL-FROM CEDEP	842500	CY	1,289,000	193,400	75,600	1,558,000
5.16.09.01.16. D	DREDGE-OPEN WATER DISP.-CEDEP	232150	CY	301,800	60,400	18,500	380,600
5.16.09.01.16. F	ROCK FOR PLACEMENT AREA DIKES	6970.00	CY	176,200	35,200	10,800	222,200
5.16.09.01.16.SF	SITES W/SILT FENCE CONTAINMENT	1.00	EA	53,900	8,100	3,200	65,200
	TOTAL PIPELINE DREDGING	1.00	EA	1,820,900	297,000	108,000	2,226,000

	QUANTITY	UOM	CONTRACT	CONTINGN	ESCALATN	TOTAL COST
5.16.09.01.20 DISPOSAL AREAS						
5.16.09.01.20. B DISPOSAL PIT CONSTRUCTION	100.50	ACR	2,380,800	476,200	145,700	3,002,700
5.16.09.01.20. C ACCESS ROAD TO PIT-BASED ON	3.50	MI	452,100	90,400	27,700	570,200
TOTAL DISPOSAL AREAS	100.50	ACR	2,832,900	566,600	173,400	3,572,800
5.16.09.01.30 BANK STABLIZATN, DIKES & JETTIES						
5.16.09.01.30. E ROCK FOR FINGER DIKES	21500.00	CY	543,500	108,700	33,300	685,400
TOTAL BANK STABLIZATN, DIKES & JETTIES	21500.00	CY	543,500	108,700	33,300	685,400
TOTAL CHANNELS	1.00	EA	5,197,300	972,300	314,600	6,484,200
TOTAL CHANNELS AND CANALS	1.00	EA	5,197,300	972,300	314,600	6,484,200
5.16.18 CULTURAL RESOURCE PRESERVATION						
5.16.18.01 Cultural/Archaelogical Surveys	1.00	JOB	62,500	12,500	3,800	78,800
TOTAL CULTURAL RESOURCE PRESERVATION	1.00	JOB	62,500	12,500	3,800	78,800
5.16.30 PLANNING, ENGINEERING, & DESIGN	1.00	EA	458,900	91,800	28,100	578,800
5.16.31 SUPERVISION AND INSPECTION	1.00	EA	414,600	82,900	25,400	522,800
TOTAL POOL #16	1.00	EA	7,653,800	1,322,700	430,500	9,407,000
TOTAL REACH 5	1.00	EA	20,872,100	3,417,500	1,129,500	25,419,100
6 REACH 6						
6.16 POOL 16						
6.16.06 FISH AND WILDLIFE FACILITIES						
6.16.06.03 WILDLIFE FACILITIES/SANCTUARY						
6.16.06.03.73 WILDLIFE HABITAT						
6.16.06.03.73. D AQUATIC SANCTUARY IMPROVEMENTS	1.00	EA	18,900	3,800	1,200	23,800
TOTAL WILDLIFE HABITAT	1.00	EA	18,900	3,800	1,200	23,800
TOTAL WILDLIFE FACILITIES/SANCTUARY	1.00	EA	18,900	3,800	1,200	23,800
TOTAL FISH AND WILDLIFE FACILITIES	1.00	EA	18,900	3,800	1,200	23,800

	QUANTITY	UOM	CONTRACT	CONTINGN	ESCALATN	TOTAL COST
TOTAL POOL 16	1.00	EA	18,900	3,800	1,200	23,800
6.17 POOL 17						
6.17.01 LANDS AND DAMAGES						
6.17.01.23 LANDS AND DAMAGES						
6.17.01.23.03 LANDS AND DAMAGES						
6.17.01.23.03.02 Real Estate Acquisition Documnts	1.00	EA	190,600	0	0	190,600
6.17.01.23.03.03 Real Estate Condemnation Docmnts	1.00	EA	7,800	0	0	7,800
6.17.01.23.03.05 Real Estate Appraisal Documents	1.00	EA	69,300	0	0	69,300
6.17.01.23.03.06 Real Estate PL 91-646 Assstnce D	1.00	EA	6,300	0	0	6,300
6.17.01.23.03.15 Real Estate Payment Documents	1.00	EA	261,700	0	0	261,700
TOTAL LANDS AND DAMAGES	1.00	EA	535,700	0	0	535,700
TOTAL LANDS AND DAMAGES	1.00	EA	535,700	0	0	535,700
TOTAL LANDS AND DAMAGES	1.00	EA	535,700	0	0	535,700
6.17.06 FISH AND WILDLIFE FACILITIES						
6.17.06.03 WILDLIFE FACILITIES/SANCTUARY						
6.17.06.03.49 Adapative Management Costs						
6.17.06.03.49.01 Backwaters & Trib Mouths Dredgin	1.00	JOB	83,400	16,700	5,100	105,200
6.17.06.03.49.02 Gravel Bar Monitoring	1.00	JOB	62,500	12,500	3,800	78,800
6.17.06.03.49.03 Dike Field Mods	1.00	JOB	25,000	5,000	1,500	31,500
6.17.06.03.49.05 Hardoods & Marshlands Monitoring	1.00	JOB	25,000	5,000	1,500	31,500
TOTAL Adapative Management Costs	1.00	EA	195,900	39,200	12,000	247,100
6.17.06.03.51 Long Term Management Costs						
6.17.06.03.51.06 Bathymetry	1.00	JOB	33,400	6,700	2,000	42,100
6.17.06.03.51.07 Substrate Sampling	1.00	JOB	10,000	2,000	600	12,600
6.17.06.03.51.08 LIDAAR/GIS	1.00	JOB	25,000	5,000	1,500	31,500
6.17.06.03.51.09 Backwater Reevaluations	1.00	JOB	13,400	2,700	800	16,900
6.17.06.03.51.10 Diversity & Presence @ Trib Mout	1.00	JOB	13,400	2,700	800	16,900
6.17.06.03.51.11 Gravel Model for Sus. Substrates	1.00	JOB	15,000	3,000	900	18,900
6.17.06.03.51.12 Gravel Monitoring for Hab Qual	1.00	JOB	48,800	9,800	3,000	61,500
6.17.06.03.51.13 Fish Sampling	1.00	JOB	50,000	10,000	3,100	63,100
6.17.06.03.51.14 Hardwood Habitat Quality & Sustn	1.00	JOB	12,000	2,400	700	15,100
6.17.06.03.51.15 Water Quality Monitoring	1.00	JOB	50,000	10,000	3,100	63,100

	QUANTITY	UOM	CONTRACT	CONTINGN	ESCALATN	TOTAL COST
TOTAL Long Term Management Costs	1.00	EA	271,000	54,200	16,600	341,800
6.17.06.03.73 WILDLIFE HABITAT						
6.17.06.03.73. D AQUATIC SANCTUARY IMPROVEMENT	1.00	EA	293,200	58,600	17,900	369,800
6.17.06.03.73. E Other Mitigation			3,240,000	0	165,200	3,405,200
6.17.06.03.73. F Oklahoma Mussel Mitigation	5.00	EA	17,500	3,500	1,100	22,100
TOTAL WILDLIFE HABITAT	1.00	EA	3,550,700	62,100	184,300	3,797,100
TOTAL WILDLIFE FACILITIES/SANCTUARY	1.00	EA	4,017,600	155,500	212,800	4,386,000
TOTAL FISH AND WILDLIFE FACILITIES	1.00	EA	4,017,600	155,500	212,800	4,386,000
6.17.09 CHANNELS AND CANALS						
6.17.09.01 CHANNELS						
6.17.09.01.16 PIPELINE DREDGING						
6.17.09.01.16. A DREDGING & DISPOSAL-FROM CEDEP	827650	CY	1,266,300	253,300	77,500	1,597,100
TOTAL PIPELINE DREDGING	1.00	EA	1,266,300	253,300	77,500	1,597,100
6.17.09.01.20 DISPOSAL AREAS						
6.17.09.01.20. B DISPOSAL PIT CONSTRUCTION	37.40	ACR	1,195,400	239,100	73,200	1,507,700
6.17.09.01.20. C ACCESS ROAD TO PIT-BASED ON	5.25	MI	678,100	135,600	41,500	855,200
TOTAL DISPOSAL AREAS	37.40	ACR	1,873,500	374,700	114,700	2,362,900
6.17.09.01.30 BANK STABILZTION; DIKES & JETTIS						
TOTAL CHANNELS	1.00	EA	3,139,800	628,000	192,200	3,960,000
TOTAL CHANNELS AND CANALS	1.00	EA	3,139,800	628,000	192,200	3,960,000
6.17.18 CULTURAL RESOURCE PRESERVATION						
6.17.18.01 Cultural/Archaelogical Surveys	1.00	JOB	125,000	25,000	7,600	157,700
TOTAL CULTURAL RESOURCE PRESERVATION	1.00	JOB	125,000	25,000	7,600	157,700
6.17.30 PLANNING, ENGINEERING, & DESIGN	1.00	EA	286,900	57,400	17,600	361,900
6.17.31 SUPERVISION AND INSPECTION	1.00	EA	238,500	47,700	14,600	300,800
TOTAL POOL 17	1.00	EA	8,343,600	913,600	444,800	9,702,000

		QUANTITY	UOM	CONTRACT	CONTINGN	ESCALATN	TOTAL COST
6.18	POOL 18						
6.18.01	LANDS AND DAMAGES						
6.18.01.23	LANDS AND DAMAGES						
6.18.01.23.03	LANDS AND DAMAGES						
6.18.01.23.03.02	Real Estate Acquisition Documnts	1.00	EA	190,600	0	0	190,600
6.18.01.23.03.03	Real Estate Condemnation Docmnts	1.00	EA	7,800	0	0	7,800
6.18.01.23.03.05	Real Estate Appraisal Documents	1.00	EA	69,300	0	0	69,300
6.18.01.23.03.06	Real Estate PL 91-646 Assstnce D	1.00	EA	6,300	0	0	6,300
6.18.01.23.03.15	Real Estate Payment Documents	1.00	EA	261,700	0	0	261,700
	TOTAL LANDS AND DAMAGES	1.00	EA	535,700	0	0	535,700
	TOTAL LANDS AND DAMAGES	1.00	EA	535,700	0	0	535,700
	TOTAL LANDS AND DAMAGES	1.00	EA	535,700	0	0	535,700
6.18.06	FISH AND WILDLIFE FACILITIES						
6.18.06.03	WILDLIFE FACILITIES/SANCTUARY						
6.18.06.03.49	Adapative Management Costs						
6.18.06.03.49.01	Backwaters & Trib Mouths Dredgin	1.00	JOB	83,400	16,700	5,100	105,200
6.18.06.03.49.02	Gravel Bar Monitoring	1.00	JOB	62,500	12,500	3,800	78,800
6.18.06.03.49.03	Dike Field Mods	1.00	JOB	25,000	5,000	1,500	31,500
6.18.06.03.49.05	Hardoods & Marshlands Monitoring	1.00	JOB	25,000	5,000	1,500	31,500
	TOTAL Adapative Management Costs	1.00	EA	195,900	39,200	12,000	247,100
6.18.06.03.51	Long Term Management Costs						
6.18.06.03.51.06	Bathymetry	1.00	JOB	33,400	6,700	2,000	42,100
6.18.06.03.51.07	Substrate Sampling	1.00	JOB	10,000	2,000	600	12,600
6.18.06.03.51.08	LIDAAR/GIS	1.00	JOB	25,000	5,000	1,500	31,500
6.18.06.03.51.09	Backwater Reevaluations	1.00	JOB	13,400	2,700	800	16,900
6.18.06.03.51.10	Diversity & Presence @ Trib Mout	1.00	JOB	13,400	2,700	800	16,900
6.18.06.03.51.11	Gravel Model for Sus. Substrates	1.00	JOB	15,000	3,000	900	18,900
6.18.06.03.51.12	Gravel Monitoring for Hab Qual	1.00	JOB	48,800	9,800	3,000	61,500
6.18.06.03.51.13	Fish Sampling	1.00	JOB	50,000	10,000	3,100	63,100
6.18.06.03.51.14	Hardwood Habitat Quality & Sustn	1.00	JOB	12,000	2,400	700	15,100
6.18.06.03.51.15	Water Quality Monitoring	1.00	JOB	50,000	10,000	3,100	63,100
	TOTAL Long Term Management Costs	1.00	EA	271,000	54,200	16,600	341,800

	QUANTITY	UOM	CONTRACT	CONTINGN	ESCALATN	TOTAL COST
6.18.06.03.73 WILDLIFE HABITAT						
6.18.06.03.73. D AQUATIC SANCTUARY IMPROVEMENT	1.00	EA	113,200	22,600	6,900	142,800
6.18.06.03.73. E Other Mitigation			1,500,000	0	76,500	1,576,500
6.18.06.03.73. F Sampling of Areas	3.00	EA	10,500	2,100	600	13,200
6.18.06.03.73. G Relocate Mussel Patch P49-2	1.00	EA	10,000	2,000	600	12,600
6.18.06.03.73. H Investigate Mussel Relocation st	1.00	EA	40,000	8,000	2,400	50,400
6.18.06.03.73. I Investigate Other Mussel Relo st	1.00	EA	3,500	700	200	4,400
TOTAL WILDLIFE HABITAT	1.00	EA	1,677,200	35,400	87,300	1,800,000
TOTAL WILDLIFE FACILITIES/SANCTUARY	1.00	EA	2,144,100	128,800	115,900	2,388,900
TOTAL FISH AND WILDLIFE FACILITIES	1.00	EA	2,144,100	128,800	115,900	2,388,900
6.18.09 CHANNELS AND CANALS						
6.18.09.01 CHANNELS						
6.18.09.01.16 PIPELINE DREDGING						
6.18.09.01.16. 1 DREDGING & DISPOSAL-FROM CEDEP	213000	CY	325,900	65,200	19,900	411,000
TOTAL PIPELINE DREDGING	1.00	EA	325,900	65,200	19,900	411,000
6.18.09.01.20 DISPOSAL AREAS						
6.18.09.01.20. 2 DISPOSAL PIT CONSTRUCTION	21.30	ACR	745,100	149,000	45,600	939,700
6.18.09.01.20. 3 ACCESS ROAD TO PIT-BASED ON	2.50	MI	322,900	64,600	19,800	407,300
TOTAL DISPOSAL AREAS	21.30	ACR	1,068,000	213,600	65,400	1,347,000
6.18.09.01.30 BANK STABILZATN; DIKES & JETTIES						
TOTAL CHANNELS	1.00	EA	1,393,900	278,800	85,300	1,758,000
TOTAL CHANNELS AND CANALS	1.00	EA	1,393,900	278,800	85,300	1,758,000
6.18.12 PORTS AND HARBORS						
6.18.12.01 PORTS						
6.18.12.01.16 PIPELINE DREDGING	1.00	EA	161,800	32,400	9,900	204,000
TOTAL PORTS	1.00	EA	161,800	32,400	9,900	204,000
TOTAL PORTS AND HARBORS	1.00	EA	161,800	32,400	9,900	204,000

		QUANTITY	UOM	CONTRACT	CONTINGN	ESCALATN	TOTAL COST
6.18.18	CULTURAL RESOURCE PRESERVATION						
6.18.18.01	Cultural/Archaelogical Surveys	1.00	JOB	125,000	25,000	7,600	157,700
	TOTAL CULTURAL RESOURCE PRESERVATION	1.00	JOB	125,000	25,000	7,600	157,700
6.18.30	PLANNING, ENGINEERING, & DESIGN	1.00	EA	147,200	29,400	9,000	185,700
6.18.31	SUPERVISION AND INSPECTION	1.00	EA	107,600	21,500	6,600	135,700
	TOTAL POOL 18	1.00	EA	4,615,400	515,900	234,400	5,365,700
	TOTAL REACH 6	1.00	EA	12,977,900	1,433,300	680,300	15,091,500
	TOTAL DREDGE ALT,CUT M-K TO 13' 7/05	1.00	EA	33,850,000	4,850,800	1,809,800	40,510,600

	QUANTITY	UOM	CONTRACT	CONTINGN	ESC COST	PROJECT
01 LANDS AND DAMAGES						
01.23 LANDS AND DAMAGES						
01.23.03 LANDS AND DAMAGES	1.00	EA	3,214,400	0	3,214,400	3,214,400
01.23 LANDS AND DAMAGES	1.00	EA	3,214,400	0	3,214,400	3,214,400
01 LANDS AND DAMAGES	1.00	EA	3,214,400	0	3,214,400	3,214,400
05 LOCKS						
05.00 LOCKS						
05.00.61 GUIDE WALLS	1.00	EA	475,000	95,000	504,100	599,100
05.00 LOCKS	1.00	EA	475,000	95,000	504,100	599,100
05 LOCKS	1.00	EA	475,000	95,000	504,100	599,100
06 FISH AND WILDLIFE FACILITIES						
06.03 WILDLIFE FACILITIES/SANCTUARY						
06.03.49 Adapative Management Costs	1.00	EA	934,200	186,800	991,400	1,178,200
06.03.50 Long Term Management Costs	1.00	EA	180,800	36,200	191,900	228,000
06.03.51 Long Term Management Costs	1.00	EA	903,600	180,700	958,900	1,139,600
06.03.73 WILDLIFE HABITAT	1.00	EA	6,231,000	196,900	6,558,800	6,755,800
06.03 WILDLIFE FACILITIES/SANCTUARY	1.00	EA	8,249,600	600,600	8,701,000	9,301,600
06 FISH AND WILDLIFE FACILITIES	1.00	EA	8,249,600	600,600	8,701,000	9,301,600
09 CHANNELS AND CANALS						
09.01 CHANNELS						
09.01.16 PIPELINE DREDGING	1.00	EA	8,022,200	1,377,400	8,501,600	9,879,000
09.01.20 DISPOSAL AREAS	43.80	ACR	8,039,200	1,607,800	8,531,200	10,139,000
09.01.30 BANK STABLIZATN, DIKES & JETTIES	61810.00	CY	2,105,900	421,200	2,234,800	2,656,000
09.01 CHANNELS	1.00	EA	18,167,200	3,406,400	19,267,500	22,673,900
09 CHANNELS AND CANALS	1.00	EA	18,167,200	3,406,400	19,267,500	22,673,900
12 PORTS AND HARBORS						
12.01 PORTS						
12.01.16 PIPELINE DREDGING	1.00	EA	178,000	35,600	188,900	224,400
12.01 PORTS	1.00	EA	178,000	35,600	188,900	224,400
12 PORTS AND HARBORS	1.00	EA	178,000	35,600	188,900	224,400

	QUANTITY	UOM	CONTRACT	CONTINGN	ESC COST	PROJECT
18 CULTURAL RESOURCE PRESERVATION						
18.01 Cultural/Archaelogical Surveys						
18.01.00 <<< Not Identified >>>	61810.00	CY	500,000	100,000	530,600	630,600
18.01 Cultural/Archaelogical Surveys	1.00	JOB	500,000	100,000	530,600	630,600
18 CULTURAL RESOURCE PRESERVATION	1.00	JOB	500,000	100,000	530,600	630,600
30 PLANNING, ENGINEERING, & DESIGN						
30.00 <<< Not Identified >>>						
30.00.00 <<< Not Identified >>>	61810.00	CY	1,638,000	327,600	1,738,300	2,065,900
30.00 <<< Not Identified >>>	1.00	JOB	1,638,000	327,600	1,738,300	2,065,900
30 PLANNING, ENGINEERING, & DESIGN	1.00	EA	1,638,000	327,600	1,738,300	2,065,900
31 SUPERVISION AND INSPECTION						
31.00 <<< Not Identified >>>						
31.00.00 <<< Not Identified >>>	61810.00	CY	1,427,800	285,600	1,515,100	1,800,700
31.00 <<< Not Identified >>>	1.00	JOB	1,427,800	285,600	1,515,100	1,800,700
31 SUPERVISION AND INSPECTION	1.00	EA	1,427,800	285,600	1,515,100	1,800,700
DREDGE ALT,CUT M-K TO 13' 7/05	1.00	EA	33,850,000	4,850,800	35,659,800	40,510,600

ARKANSAS RIVER NAVIGATION STUDY,
ARKANSAS AND OKLAHOMA
FEASIBILITY STUDY

TAB H

- MCACES Cost Estimate -

Two-Foot Lower (11 Foot) Navigational Channel Reaches 5- 6

DREDGE ALT,CUT M-K TO 14' 6/05
CWE OF DREDGING M-K
CHANNEL TO A DEPTH OF 14'
INCLUDES REAL ESTATE, MITIGATION
& PINNING UPDATED JUNE 15, 2005

Designed By: IN HOUSE
Estimated By: IN HOUSE

Prepared By: TED MCCLEARY, rev by George Losak & Tom Skelton

Preparation Date: 07/18/05
Effective Date of Pricing: 06/03/04

Sales Tax: 6.95%

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Release 5.31

DECEMBER 2004 UPDATE:
THE FOLLOWING CHANGES WERE MADE TO ADDRESS COMMENTS BY SWL:
1. WBS CODES WERE INCORPORATED INTO THE FORMAT.
2. REACH NUMBERS WERE ALSO INCORPORATED.
3. E & D AND S & I WERE MOVED FROM OWNER COSTS TO WBS FEATURES.
4. COSTS FOR REAL ESTATE WILL BE INCORPORATED LATER-WE HAVE NONE AT PRESENT.
5. COSTS FOR 02 AND 06 WERE NOT OMITTED, THEY ARE NOT PART OF THIS PROJECT.
WE HAVE NO RELOCATIONS AND NO WILDLIFE MITIGATION COSTS.

THE FOLLOWING CHANGES WERE MADE PER PM REQUESTS:
1. POOL NUMBERS REMAIN IN THE FORMAT OF THE ESTIMATE.
2. CONTINGENCIES WERE LOWERED FROM 25% TO 20%. (Changed to 15% 12/09/04)
3. ESCALATION AND CONTINGENCIES ARE APPLIED TO CODES 30 AND 31.
(Escalation Deleted 12/09/04)
THE FOLLOWING CHANGES WERE MADE PER DESIGN REFINEMENT:
1. IN POOL 15 42,700 CY OF RIP RAP WAS DELETED.
2. IN POOL 16 RIP RAP WAS REDUCED BY 13,200 CY & REPLACED WITH SILT FENCE.

Changes made12/09/04;
1. Changed contingencies to 15%.
2. Deleted escalation.
3. Changed E&D to 8.0%.
4. Changed S&I to 7.5%.

Changes made 10 December 2004.
1. Escalation (5.1%) was added as required by EI 01D010, 1 Sept 1997.
2. Contingencies were adjusted to 20 percent for all features except dredging. The reason for this was that more information was available to determine dredging quantities that for the other components (dikes and dredge material disposal areas.)

Changes made 25 Jan., 2005:
1. Costs for Bank Stabilization within pool 15 were deleted thus reducing costs for E & D, S & I, escalation, and contingencies.

Changes made 14 June, 2005:
Included costs for real estate, mitigation, and pinning of guide walls. All these costs were provided by others.

SUMMARY REPORTS SUMMARY PAGE

PROJECT OWNER SUMMARY - TASKS.....1
2ND VIEW SUMMARY.....15

No Detailed Estimate...

No Backup Reports...

* * * END TABLE OF CONTENTS * * *

		QUANTITY	UOM	CONTRACT	CONTINGN	ESCALATN	TOTAL COST	UNIT
5	REACH 5							
5.13	POOL #13							
5.13.01	LANDS AND DAMAGES							
5.13.01.23	LANDS AND DAMAGES							
5.13.01.23.03	LANDS AND DAMAGES							
5.13.01.23.03.02	Real Estate Acquisition Documnts	1.00	EA	190,600	0	0	190,600	190613
5.13.01.23.03.03	Real Estate Condemnation Docmnts	1.00	EA	7,800	0	0	7,800	7800.00
5.13.01.23.03.05	Real Estate Appraisal Documents	1.00	EA	69,300	0	0	69,300	69333
5.13.01.23.03.06	Real Estate PL 91-646 Assstnce D	1.00	EA	6,300	0	0	6,300	6283.00
5.13.01.23.03.15	Real Estate Payment Documents	1.00	EA	261,700	0	0	261,700	261701
	TOTAL LANDS AND DAMAGES	1.00	EA	535,700	0	0	535,700	535730
	TOTAL LANDS AND DAMAGES	1.00	EA	535,700	0	0	535,700	535730
	TOTAL LANDS AND DAMAGES	1.00	EA	535,700	0	0	535,700	535730
5.13.06	FISH AND WILDLIFE FACILITIES							
5.13.06.03	WILDLIFE FACILITIES/SANCTUARY							
5.13.06.03.49	Adapative Management Costs							
5.13.06.03.49.01	Backwaters & Trib Mouths Dredgin	1.00	JOB	41,700	8,300	2,600	52,600	52592
5.13.06.03.49.02	Gravel Bar Monitoring	1.00	JOB	31,300	6,300	1,900	39,500	39476
5.13.06.03.49.03	Dike Field Mods	1.00	JOB	25,000	5,000	1,500	31,500	31530
5.13.06.03.49.04	Mussel Bed Reconalization	1.00	JOB	25,000	5,000	1,500	31,500	31530
5.13.06.03.49.05	Hardoods & Marshlands Monitoring	1.00	JOB	12,500	2,500	800	15,800	15765
	TOTAL Adapative Management Costs	1.00	EA	135,500	27,100	8,300	170,900	170893
5.13.06.03.50	Long Term Management Costs							
5.13.06.03.50.06	Bathymetry	1.00	JOB	16,700	3,300	1,000	21,100	21062
5.13.06.03.50.07	Substrate Sampling	1.00	JOB	5,000	1,000	300	6,300	6306.00
5.13.06.03.50.08	LIDAAR/GIS	1.00	JOB	12,500	2,500	800	15,800	15765
5.13.06.03.50.09	Backwater Reevaluations	1.00	JOB	6,700	1,300	400	8,500	8450.04
5.13.06.03.50.10	Diversity & Presence @ Trib Mout	1.00	JOB	6,700	1,300	400	8,500	8450.04
5.13.06.03.50.11	Gravel Model for Sus. Substrates	1.00	JOB	7,500	1,500	500	9,500	9459.00
5.13.06.03.50.12	Gravel Monitoring for Hab Qual	1.00	JOB	24,400	4,900	1,500	30,800	30773
5.13.06.03.50.13	Fish Sampling	1.00	JOB	25,000	5,000	1,500	31,500	31530
5.13.06.03.50.14	Hardwood Habitat Quality & Sustn	1.00	JOB	6,000	1,200	400	7,600	7567.20

	QUANTITY	UOM	CONTRACT	CONTINGN	ESCALATN	TOTAL COST	UNIT
5.13.06.03.50.15 Water Quality Monitoring	1.00	JOB	25,000	5,000	1,500	31,500	31530
TOTAL Long Term Management Costs	1.00	EA	135,500	27,100	8,300	170,900	170893
5.13.06.03.73 WILDLIFE HABITAT							
5.13.06.03.73. D AQUATIC SANCTUARY IMPROVEMENTS	1.00	EA	36,600	7,300	2,200	46,200	46164
5.13.06.03.73. E Other Mitigation			168,800	0	8,600	177,400	
5.13.06.03.73. F Oklahoma Mussel Mitigation			17,500	3,500	1,100	22,100	
TOTAL WILDLIFE HABITAT	1.00	EA	222,900	10,800	11,900	245,600	245612
TOTAL WILDLIFE FACILITIES/SANCTUARY	1.00	EA	493,900	65,000	28,500	587,400	587397
TOTAL FISH AND WILDLIFE FACILITIES	1.00	EA	493,900	65,000	28,500	587,400	587397
5.13.09 CHANNELS AND CANALS							
5.13.09.01 CHANNELS							
5.13.09.01.16 PIPELINE DREDGING							
5.13.09.01.16. 1 DREDGING & DISPOSAL-FROM CEDEP	1314900	CY	2,011,800	301,800	118,000	2,431,600	1.85
TOTAL PIPELINE DREDGING	1.00	EA	2,011,800	301,800	118,000	2,431,600	2431558
5.13.09.01.20 DISPOSAL AREAS							
5.13.09.01.20. 2 DISPOSAL PIT CONSTRUCTION	90.40	ACR	2,127,100	425,400	130,200	2,682,700	29676
5.13.09.01.20. 3 ACCESS ROAD TO PIT-BASED ON	2.00	MI	258,300	51,700	15,800	325,800	162903
TOTAL DISPOSAL AREAS	1.00	ACR	2,385,400	477,100	146,000	3,008,500	3008474
5.13.09.01.30 BANK STABLIZTN; DIKES & JETTIES							
5.13.09.01.30.FD ROCK FOR FINGER DIKES	123620	CY	1,562,400	312,500	95,600	1,970,500	15.94
TOTAL BANK STABLIZTN; DIKES & JETTIES	1.00	TON	1,562,400	312,500	95,600	1,970,500	1970540
TOTAL CHANNELS	1.00	EA	5,959,600	1,091,300	359,600	7,410,600	7410572
TOTAL CHANNELS AND CANALS	1.00	EA	5,959,600	1,091,300	359,600	7,410,600	7410572
5.13.18 CULTURAL RESOURCE PRESERVATION							

		QUANTITY	UOM	CONTRACT	CONTINGN	ESCALATN	TOTAL COST	UNIT
5.13.18.01	Cultural/Archaelogical Surveys	1.00	JOB	62,500	12,500	3,800	78,800	78825
	TOTAL CULTURAL RESOURCE PRESERVATION	1.00	JOB	62,500	12,500	3,800	78,800	78825
5.13.30	PLANNING, ENGINEERING, & DESIGN	1.00	EA	489,700	97,900	30,000	617,600	617559
5.13.31	SUPERVISION AND INSPECTION	1.00	EA	447,300	89,500	27,400	564,200	564183
	TOTAL POOL #13	1.00	EA	7,988,700	1,356,300	449,300	9,794,300	9794266
5.14	POOL #14							
5.14.01	LANDS AND DAMAGES							
5.14.01.23	LANDS AND DAMAGES							
5.14.01.23.03	LANDS AND DAMAGES							
5.14.01.23.03.02	Real Estate Acquisition Documnts	1.00	EA	190,600	0	0	190,600	190613
5.14.01.23.03.03	Real Estate Condemnation Docmnts	1.00	EA	7,800	0	0	7,800	7800.00
5.14.01.23.03.05	Real Estate Appraisal Documents	1.00	EA	69,300	0	0	69,300	69333
5.14.01.23.03.06	Real Estate PL 91-646 Assstnce D	1.00	EA	6,300	0	0	6,300	6283.00
5.14.01.23.03.15	Real Estate Payment Documents	1.00	EA	261,700	0	0	261,700	261701
	TOTAL LANDS AND DAMAGES	1.00	EA	535,700	0	0	535,700	535730
	TOTAL LANDS AND DAMAGES	1.00	EA	535,700	0	0	535,700	535730
	TOTAL LANDS AND DAMAGES	1.00	EA	535,700	0	0	535,700	535730
5.14.06	FISH AND WILDLIFE FACILITIES							
5.14.06.03	WILDLIFE FACILITIES/SANCTUARY							
5.14.06.03.49	Adapative Management Costs							
5.14.06.03.49.01	Backwaters & Trib Mouths Dredgin	1.00	JOB	41,700	8,300	2,600	52,600	52592
5.14.06.03.49.02	Gravel Bar Monitoring	1.00	JOB	31,300	6,300	1,900	39,500	39476
5.14.06.03.49.03	Dike Field Mods	1.00	JOB	25,000	5,000	1,500	31,500	31530
5.14.06.03.49.04	Mussel Bed Reconalization	1.00	JOB	25,000	5,000	1,500	31,500	31530
5.14.06.03.49.05	Hardoods & Marshlands Monitoring	1.00	JOB	12,500	2,500	800	15,800	15765
	TOTAL Adapative Management Costs	1.00	EA	135,500	27,100	8,300	170,900	170893
5.14.06.03.50	Long Term Management Costs							
5.14.06.03.50.06	Bathymetry	1.00	JOB	16,700	3,300	1,000	21,100	21062
5.14.06.03.50.07	Substrate Sampling	1.00	JOB	5,000	1,000	300	6,300	6306.00
5.14.06.03.50.08	LIDAAR/GIS	1.00	JOB	12,500	2,500	800	15,800	15765

		QUANTITY	UOM	CONTRACT	CONTINGN	ESCALATN	TOTAL COST	UNIT
5.14.06.03.50.09	Backwater Reevaluations	1.00	JOB	6,700	1,300	400	8,500	8450.04
5.14.06.03.50.10	Diversity & Presence @ Trib Mout	1.00	JOB	6,700	1,300	400	8,500	8450.04
5.14.06.03.50.11	Gravel Model for Sus. Substrates	1.00	JOB	7,500	1,500	500	9,500	9459.00
5.14.06.03.50.12	Gravel Monitoring for Hab Qual	1.00	JOB	24,400	4,900	1,500	30,800	30773
5.14.06.03.50.13	Fish Sampling	1.00	JOB	25,000	5,000	1,500	31,500	31530
5.14.06.03.50.14	Hardwood Habitat Quality & Sustn	1.00	JOB	6,000	1,200	400	7,600	7567.20
5.14.06.03.50.15	Water Quality Monitoring	1.00	JOB	25,000	5,000	1,500	31,500	31530
	TOTAL Long Term Management Costs	1.00	EA	135,500	27,100	8,300	170,900	170893
5.14.06.03.73	WILDLIFE HABITAT							
5.14.06.03.73. D	AQUATIC SANCTUARY IMPROVEMENTS	1.00	EA	64,900	13,000	4,000	81,900	81870
5.14.06.03.73. E	Other Mitigation			168,800	0	8,600	177,400	
5.14.06.03.73. F	Oklahoma Mussel Mitigation			17,500	3,500	1,100	22,100	
	TOTAL WILDLIFE HABITAT	1.00	EA	251,200	16,500	13,700	281,300	281319
	TOTAL WILDLIFE FACILITIES/SANCTUARY	1.00	EA	522,200	70,700	30,200	623,100	623104
	TOTAL FISH AND WILDLIFE FACILITIES	1.00	EA	522,200	70,700	30,200	623,100	623104
5.14.09	CHANNELS AND CANALS							
5.14.09.01	CHANNELS							
5.14.09.01.16	PIPELINE DREDGING							
5.14.09.01.16. 1	DREDGING & DISPOSAL-FROM CEDEP	118720	CY	181,600	27,200	10,700	219,500	1.85
	TOTAL PIPELINE DREDGING	1.00	EA	181,600	27,200	10,700	219,500	219541
5.14.09.01.20	DISPOSAL AREAS							
5.14.09.01.20. 2	DISPOSAL PIT CONSTRUCTION	10.50	ACR	301,700	60,300	18,500	380,500	36238
5.14.09.01.20. 3	ACCESS ROAD TO PIT-BASED ON	0.50	MI	64,600	12,900	4,000	81,500	162903
	TOTAL DISPOSAL AREAS	1.00	ACR	366,300	73,300	22,400	461,900	461949
5.14.09.01.30	BANK STABLIZTN; DIKES & JETTIES							
	TOTAL CHANNELS	1.00	EA	547,900	100,500	33,100	681,500	681490
	TOTAL CHANNELS AND CANALS	1.00	EA	547,900	100,500	33,100	681,500	681490
5.14.18	CULTURAL RESOURCE PRESERVATION							

	QUANTITY	UOM	CONTRACT	CONTINGN	ESCALATN	TOTAL COST	UNIT
5.14.18.01 Cultural/Archaelogical Surveys	1.00	JOB	62,500	12,500	3,800	78,800	78825
TOTAL CULTURAL RESOURCE PRESERVATION	1.00	JOB	62,500	12,500	3,800	78,800	78825
5.14.30 PLANNING, ENGINEERING, & DESIGN	1.00	EA	58,400	11,700	3,600	73,600	73629
5.14.31 SUPERVISION AND INSPECTION	1.00	EA	43,000	8,600	2,600	54,200	54248
TOTAL POOL #14	1.00	EA	1,769,700	204,000	73,300	2,047,000	2047026
5.15 POOL #15							
5.15.01 LANDS AND DAMAGES							
5.15.01.23 LANDS AND DAMAGES							
5.15.01.23.03 LANDS AND DAMAGES							
5.15.01.23.03.02 Real Estate Acquisition Documnts	1.00	EA	190,600	0	0	190,600	190613
5.15.01.23.03.03 Real Estate Condemnation Docmnts	1.00	EA	7,800	0	0	7,800	7800.00
5.15.01.23.03.05 Real Estate Appraisal Documents	1.00	EA	69,300	0	0	69,300	69333
5.15.01.23.03.06 Real Estate PL 91-646 Assstnce D	1.00	EA	6,300	0	0	6,300	6283.00
5.15.01.23.03.15 Real Estate Payment Documents	1.00	EA	261,700	0	0	261,700	261701
TOTAL LANDS AND DAMAGES	1.00	EA	535,700	0	0	535,700	535730
TOTAL LANDS AND DAMAGES	1.00	EA	535,700	0	0	535,700	535730
TOTAL LANDS AND DAMAGES	1.00	EA	535,700	0	0	535,700	535730
5.15.05 LOCKS							
5.15.05.00 LOCKS							
5.15.05.00.61 GUIDE WALLS							
5.15.05.00.61.05 GUIDE WALL PINNING (COST CAME	1.00	EA	237,500	47,500	14,500	299,500	299535
TOTAL GUIDE WALLS	1.00	EA	237,500	47,500	14,500	299,500	299535
TOTAL LOCKS	1.00	EA	237,500	47,500	14,500	299,500	299535
TOTAL LOCKS	1.00	EA	237,500	47,500	14,500	299,500	299535
5.15.06 FISH AND WILDLIFE FACILITIES							
5.15.06.03 WILDLIFE FACILITIES/SANCTUARY							
5.15.06.03.49 Adapative Management Costs							

		QUANTITY	UOM	CONTRACT	CONTINGN	ESCALATN	TOTAL COST	UNIT
5.15.06.03.49.01	Backwaters & Trib Mouths Dredgin	1.00	JOB	41,700	8,300	2,600	52,600	52592
5.15.06.03.49.02	Gravel Bar Monitoring	1.00	JOB	31,300	6,300	1,900	39,500	39476
5.15.06.03.49.03	Dike Field Mods	1.00	JOB	25,000	5,000	1,500	31,500	31530
5.15.06.03.49.04	Mussel Bed Reconalization	1.00	JOB	25,000	5,000	1,500	31,500	31530
5.15.06.03.49.05	Hardoods & Marshlands Monitoring	1.00	JOB	12,500	2,500	800	15,800	15765
TOTAL	Adapative Management Costs	1.00	EA	135,500	27,100	8,300	170,900	170893
5.15.06.03.50	Long Term Management Costs							
5.15.06.03.50.06	Bathymetry	1.00	JOB	16,700	3,300	1,000	21,100	21062
5.15.06.03.50.07	Substrate Sampling	1.00	JOB	5,000	1,000	300	6,300	6306.00
5.15.06.03.50.08	LIDAAR/GIS	1.00	JOB	12,500	2,500	800	15,800	15765
5.15.06.03.50.09	Backwater Reevaluations	1.00	JOB	6,700	1,300	400	8,500	8450.04
5.15.06.03.50.10	Diversity & Presence @ Trib Mout	1.00	JOB	6,700	1,300	400	8,500	8450.04
5.15.06.03.50.11	Gravel Model for Sus. Substrates	1.00	JOB	7,500	1,500	500	9,500	9459.00
5.15.06.03.50.12	Gravel Monitoring for Hab Qual	1.00	JOB	24,400	4,900	1,500	30,800	30773
5.15.06.03.50.13	Fish Sampling	1.00	JOB	25,000	5,000	1,500	31,500	31530
5.15.06.03.50.14	Hardwood Habitat Quality & Sustn	1.00	JOB	6,000	1,200	400	7,600	7567.20
5.15.06.03.50.15	Water Quality Monitoring	1.00	JOB	25,000	5,000	1,500	31,500	31530
TOTAL	Long Term Management Costs	1.00	EA	135,500	27,100	8,300	170,900	170893
5.15.06.03.73	WILDLIFE HABITAT							
5.15.06.03.73. D	AQUATIC SANCTUARY IMPROVEMENTS	1.00	EA	31,200	6,200	1,900	39,400	39362
5.15.06.03.73. E	Other Mitigation			168,800	0	8,600	177,400	
5.15.06.03.73. F	Oklahoma Mussel Mitigation			158,000	31,600	9,700	199,300	
TOTAL	WILDLIFE HABITAT	1.00	EA	358,000	37,800	20,200	416,000	416009
TOTAL	WILDLIFE FACILITIES/SANCTUARY	1.00	EA	629,000	92,000	36,800	757,800	757794
TOTAL	FISH AND WILDLIFE FACILITIES	1.00	EA	629,000	92,000	36,800	757,800	757794
5.15.09	CHANNELS AND CANALS							
5.15.09.01	CHANNELS							
5.15.09.01.16	PIPELINE DREDGING							
5.15.09.01.16. 1	DREDGING & DISPOSAL-FROM CEDEP	535400	CY	819,200	122,900	48,000	990,100	1.85
5.15.09.01.16. 4	DREDGE-OPEN WATER DISP.-CEDEP	1618630	CY	2,104,200	315,600	123,400	2,543,300	1.57
5.15.09.01.16. 6	ROCK FOR PLACEMENT AREA DIKES	45160.00	CY	1,141,600	228,300	69,900	1,439,700	31.88
5.15.09.01.16. 7	SITES W/SILT FENCE CONTAINMENT	5.00	EA	269,600	53,900	16,500	340,100	68013
5.15.09.01.16.1A	DREDGE-OPEN WATER DISP.-CEDEP	2533600	CY	3,293,700	494,100	193,200	3,980,900	1.57
5.15.09.01.16.SF	SITES W/SILT FENCE CONTAINMENT	5.00	EA	269,600	53,900	16,500	340,100	68013

		QUANTITY	UOM	CONTRACT	CONTINGN	ESCALATN	TOTAL COST	UNIT
	TOTAL PIPELINE DREDGING	1.00	EA	7,897,900	1,268,700	467,500	9,634,100	9634105
5.15.09.01.20	DISPOSAL AREAS							
5.15.09.01.20. 2	DISPOSAL PIT CONSTRUCTION	43.20	ACR	1,855,300	371,100	113,500	2,339,900	54163
5.15.09.01.20. 3	ACCESS ROAD TO PIT-BASED ON	3.25	MI	549,000	109,800	33,600	692,300	213026
5.15.09.01.20.PD	ROCK FOR PLACEMENT AREA DIKES	45160.00	CY	1,141,600	228,300	69,900	1,439,700	31.88
	TOTAL DISPOSAL AREAS	1.00	ACR	3,545,800	709,200	217,000	4,471,900	4471926
	TOTAL CHANNELS	1.00	EA	11,443,700	1,977,900	684,500	14,106,00	014106031
	TOTAL CHANNELS AND CANALS	1.00	EA	11,443,700	1,977,900	684,500	14,106,00	014106031
5.15.12	PORTS AND HARBORS							
5.15.12.01	PORTS							
5.15.12.01.16	PIPELINE DREDGING	1.00	EA	27,000	5,400	1,700	34,000	34006
	TOTAL PORTS	1.00	EA	27,000	5,400	1,700	34,000	34006
	TOTAL PORTS AND HARBORS	1.00	EA	27,000	5,400	1,700	34,000	34006
5.15.18	CULTURAL RESOURCE PRESERVATION							
5.15.18.01	Cultural/Archaelogical Surveys	1.00	JOB	62,500	12,500	3,800	78,800	78825
	TOTAL CULTURAL RESOURCE PRESERVATION	1.00	JOB	62,500	12,500	3,800	78,800	78825
5.15.30	PLANNING, ENGINEERING, & DESIGN	1.00	EA	601,500	120,300	36,800	758,700	758672
5.15.31	SUPERVISION AND INSPECTION	1.00	EA	552,200	110,400	33,800	696,500	696476
	TOTAL POOL #15	1.00	EA	14,089,100	2,366,100	811,900	17,267,10	017267070
5.16	POOL #16							
5.16.01	LANDS AND DAMAGES							
5.16.01.23	LANDS AND DAMAGES							
5.16.01.23.03	LANDS AND DAMAGES							
5.16.01.23.03.02	Real Estate Acquisition Documnts	1.00	EA	190,600	0	0	190,600	190613
5.16.01.23.03.03	Real Estate Condemnation Docmnts	1.00	EA	7,800	0	0	7,800	7800.00
5.16.01.23.03.05	Real Estate Appraisal Documents	1.00	EA	69,300	0	0	69,300	69333
5.16.01.23.03.06	Real Estate PL 91-646 Assstnce D	1.00	EA	6,300	0	0	6,300	6283.00

		QUANTITY	UOM	CONTRACT	CONTINGN	ESCALATN	TOTAL COST	UNIT
5.16.01.23.03.15	Real Estate Payment Documents	1.00	EA	261,700	0	0	261,700	261701
	TOTAL LANDS AND DAMAGES	1.00	EA	535,700	0	0	535,700	535730
	TOTAL LANDS AND DAMAGES	1.00	EA	535,700	0	0	535,700	535730
	TOTAL LANDS AND DAMAGES	1.00	EA	535,700	0	0	535,700	535730
5.16.05	LOCKS							
5.16.05.00	LOCKS							
5.16.05.00.61	GUIDE WALLS							
5.16.05.00.61.05	GUIDE WALL PINNING (COST CAME	1.00	EA	237,500	47,500	14,500	299,500	299535
	TOTAL GUIDE WALLS	1.00	EA	237,500	47,500	14,500	299,500	299535
	TOTAL LOCKS	1.00	EA	237,500	47,500	14,500	299,500	299535
	TOTAL LOCKS	1.00	EA	237,500	47,500	14,500	299,500	299535
5.16.06	FISH AND WILDLIFE FACILITIES							
5.16.06.03	WILDLIFE FACILITIES/SANCTUARY							
5.16.06.03.49	Adapative Management Costs							
5.16.06.03.49.01	Backwaters & Trib Mouths Dredgin	1.00	JOB	41,700	8,300	2,600	52,600	52592
5.16.06.03.49.02	Gravel Bar Monitoring	1.00	JOB	31,300	6,300	1,900	39,500	39476
5.16.06.03.49.03	Dike Field Mods	1.00	JOB	25,000	5,000	1,500	31,500	31530
5.16.06.03.49.04	Mussel Bed Reconalization	1.00	JOB	25,000	5,000	1,500	31,500	31530
5.16.06.03.49.05	Hardoods & Marshlands Monitoring	1.00	JOB	12,500	2,500	800	15,800	15765
	TOTAL Adapative Management Costs	1.00	EA	135,500	27,100	8,300	170,900	170893
5.16.06.03.50	Long Term Management Costs							
5.16.06.03.50.06	Bathymetry	1.00	JOB	16,700	3,300	1,000	21,100	21062
5.16.06.03.50.07	Substrate Sampling	1.00	JOB	5,000	1,000	300	6,300	6306.00
5.16.06.03.50.08	LIDAAR/GIS	1.00	JOB	12,500	2,500	800	15,800	15765
5.16.06.03.50.09	Backwater Reevaluations	1.00	JOB	6,700	1,300	400	8,500	8450.04
5.16.06.03.50.10	Diversity & Presence @ Trib Mout	1.00	JOB	6,700	1,300	400	8,500	8450.04
5.16.06.03.50.11	Gravel Model for Sus. Substrates	1.00	JOB	7,500	1,500	500	9,500	9459.00
5.16.06.03.50.12	Gravel Monitoring for Hab Qual	1.00	JOB	24,400	4,900	1,500	30,800	30773
5.16.06.03.50.13	Fish Sampling	1.00	JOB	25,000	5,000	1,500	31,500	31530
5.16.06.03.50.14	Hardwood Habitat Quality & Sustn	1.00	JOB	6,000	1,200	400	7,600	7567.20

		QUANTITY	UOM	CONTRACT	CONTINGN	ESCALATN	TOTAL COST	UNIT
5.16.06.03.50.15	Water Quality Monitoring	1.00	JOB	25,000	5,000	1,500	31,500	31530
	TOTAL Long Term Management Costs	1.00	EA	135,500	27,100	8,300	170,900	170893
5.16.06.03.73	WILDLIFE HABITAT							
5.16.06.03.73. D	AQUATIC SANCTUARY IMPROVEMENTS	1.00	EA	206,500	41,300	12,600	260,400	260404
5.16.06.03.73. E	Other Mitigation			168,800	0	8,600	177,400	
5.16.06.03.73. F	Oklahoma Mussel Mitigation			10,500	2,100	600	13,200	
	TOTAL WILDLIFE HABITAT	1.00	EA	385,700	43,400	21,900	451,000	451023
	TOTAL WILDLIFE FACILITIES/SANCTUARY	1.00	EA	656,700	97,600	38,500	792,800	792809
	TOTAL FISH AND WILDLIFE FACILITIES	1.00	EA	656,700	97,600	38,500	792,800	792809
5.16.09	CHANNELS AND CANALS							
5.16.09.01	CHANNELS							
5.16.09.01.16	PIPELINE DREDGING							
5.16.09.01.16. 1	DREDGING & DISPOSAL-FROM CEDEP	2074100	CY	3,173,400	476,000	186,100	3,835,500	1.85
5.16.09.01.16.1A	DREDGE-OPEN WATER DISP.-CEDEP	310700	CY	403,900	60,600	23,700	488,200	1.57
5.16.09.01.16.SF	SITES W/SILT FENCE CONTAINMENT	1.00	EA	53,900	10,800	3,300	68,000	68013
	TOTAL PIPELINE DREDGING	2384800	CY	3,631,200	547,400	213,100	4,391,700	1.84
5.16.09.01.20	DISPOSAL AREAS							
5.16.09.01.20. 2	DISPOSAL PIT CONSTRUCTION	179.10	ACR	3,646,200	729,200	223,200	4,598,600	25676
5.16.09.01.20. 3	ACCESS ROAD TO PIT-BASED ON	6.75	MI	871,900	174,400	53,400	1,099,600	162903
5.16.09.01.20.PD	ROCK FOR PLACEMENT AREA DIKES	6970.00	CY	176,200	35,200	10,800	222,200	31.88
	TOTAL DISPOSAL AREAS	179.10	ACR	4,694,300	938,900	287,300	5,920,400	33057
5.16.09.01.30	BANK STABLIZTN; DIKES & JETTIES							
5.16.09.01.30.FD	ROCK FOR FINGER DIKES	56180.00	CY	1,420,100	284,000	86,900	1,791,100	31.88
	TOTAL BANK STABLIZTN; DIKES & JETTIES	56180.00	TON	1,420,100	284,000	86,900	1,791,100	31.88
	TOTAL CHANNELS	1.00	EA	9,745,600	1,770,300	587,300	12,103,20012103193	
	TOTAL CHANNELS AND CANALS	1.00	EA	9,745,600	1,770,300	587,300	12,103,20012103193	

	QUANTITY	UOM	CONTRACT	CONTINGN	ESCALATN	TOTAL COST	UNIT
5.16.18 CULTURAL RESOURCE PRESERVATION							
5.16.18.01 Cultural/Archaelogical Surveys	1.00	JOB	62,500	12,500	3,800	78,800	78825
TOTAL CULTURAL RESOURCE PRESERVATION	1.00	JOB	62,500	12,500	3,800	78,800	78825
5.16.30 PLANNING, ENGINEERING, & DESIGN	1.00	EA	818,600	163,700	50,100	1,032,400	1032363
5.16.31 SUPERVISION AND INSPECTION	1.00	EA	755,700	151,100	46,200	953,100	953061
TOTAL POOL #16	1.00	EA	12,812,300	2,242,700	740,500	15,795,500	15795515
TOTAL REACH 5	1.00	EA	36,659,900	6,169,000	2,075,000	44,903,900	44903878
6 REACH 6							
6.16 POOL 16							
6.16.06 FISH AND WILDLIFE FACILITIES							
6.16.06.03 WILDLIFE FACILITIES/SANCTUARY							
6.16.06.03.73 WILDLIFE HABITAT							
6.16.06.03.73. D AQUATIC SANCTUARY IMPROVEMENTS	1.00	EA	18,900	3,800	1,200	23,800	23804
TOTAL WILDLIFE HABITAT	1.00	EA	18,900	3,800	1,200	23,800	23804
TOTAL WILDLIFE FACILITIES/SANCTUARY	1.00	EA	18,900	3,800	1,200	23,800	23804
TOTAL FISH AND WILDLIFE FACILITIES	1.00	EA	18,900	3,800	1,200	23,800	23804
TOTAL POOL 16	1.00	EA	18,900	3,800	1,200	23,800	23804
6.17 POOL 17							
6.17.01 LANDS AND DAMAGES							
6.17.01.23 LANDS AND DAMAGES							
6.17.01.23.03 LANDS AND DAMAGES							
6.17.01.23.03.02 Real Estate Acquisition Documnts	1.00	EA	190,600	0	0	190,600	190613
6.17.01.23.03.03 Real Estate Condemnation Docmnts	1.00	EA	7,800	0	0	7,800	7800.00
6.17.01.23.03.05 Real Estate Appraisal Documents	1.00	EA	69,300	0	0	69,300	69333
6.17.01.23.03.06 Real Estate PL 91-646 Assstnce D	1.00	EA	6,300	0	0	6,300	6283.00
6.17.01.23.03.15 Real Estate Payment Documents	1.00	EA	261,700	0	0	261,700	261701
TOTAL LANDS AND DAMAGES	1.00	EA	535,700	0	0	535,700	535730

	QUANTITY	UOM	CONTRACT	CONTINGN	ESCALATN	TOTAL COST	UNIT
TOTAL LANDS AND DAMAGES	1.00	EA	535,700	0	0	535,700	535730
TOTAL LANDS AND DAMAGES	1.00	EA	535,700	0	0	535,700	535730
6.17.06 FISH AND WILDLIFE FACILITIES							
6.17.06.03 WILDLIFE FACILITIES/SANCTUARY							
6.17.06.03.49 Adapative Management Costs							
6.17.06.03.49.01 Backwaters & Trib Mouths Dredgin	1.00	JOB	83,400	16,700	5,100	105,200	105184
6.17.06.03.49.02 Gravel Bar Monitoring	1.00	JOB	62,500	12,500	3,800	78,800	78825
6.17.06.03.49.03 Dike Field Mods	1.00	JOB	25,000	5,000	1,500	31,500	31530
6.17.06.03.49.05 Hardoods & Marshlands Monitoring	1.00	JOB	25,000	5,000	1,500	31,500	31530
TOTAL Adapative Management Costs	1.00	EA	195,900	39,200	12,000	247,100	247069
6.17.06.03.51 Long Term Management Costs							
6.17.06.03.51.06 Bathymetry	1.00	JOB	33,400	6,700	2,000	42,100	42124
6.17.06.03.51.07 Substrate Sampling	1.00	JOB	10,000	2,000	600	12,600	12612
6.17.06.03.51.08 LIDAAR/GIS	1.00	JOB	25,000	5,000	1,500	31,500	31530
6.17.06.03.51.09 Backwater Reevaluations	1.00	JOB	13,400	2,700	800	16,900	16900
6.17.06.03.51.10 Diversity & Presence @ Trib Mout	1.00	JOB	13,400	2,700	800	16,900	16900
6.17.06.03.51.11 Gravel Model for Sus. Substrates	1.00	JOB	15,000	3,000	900	18,900	18918
6.17.06.03.51.12 Gravel Monitoring for Hab Qual	1.00	JOB	48,800	9,800	3,000	61,500	61547
6.17.06.03.51.13 Fish Sampling	1.00	JOB	50,000	10,000	3,100	63,100	63060
6.17.06.03.51.14 Hardwood Habitat Quality & Sustn	1.00	JOB	12,000	2,400	700	15,100	15134
6.17.06.03.51.15 Water Quality Monitoring	1.00	JOB	50,000	10,000	3,100	63,100	63060
TOTAL Long Term Management Costs	1.00	EA	271,000	54,200	16,600	341,800	341785
6.17.06.03.73 WILDLIFE HABITAT							
6.17.06.03.73. D AQUATIC SANCTUARY IMPROVEMENT	1.00	EA	293,200	58,600	17,900	369,800	369819
6.17.06.03.73. E Other Mitigation			3,240,000	0	165,200	3,405,200	
6.17.06.03.73. F Sampling of areas	5.00	EA	17,500	3,500	1,100	22,100	4414.20
TOTAL WILDLIFE HABITAT	1.00	EA	3,550,700	62,100	184,300	3,797,100	3797130
TOTAL WILDLIFE FACILITIES/SANCTUARY	1.00	EA	4,017,600	155,500	212,800	4,386,000	4385984
TOTAL FISH AND WILDLIFE FACILITIES	1.00	EA	4,017,600	155,500	212,800	4,386,000	4385984
6.17.09 CHANNELS AND CANALS							
6.17.09.01 CHANNELS							

	QUANTITY	UOM	CONTRACT	CONTINGN	ESCALATN	TOTAL COST	UNIT
6.17.09.01.16 PIPELINE DREDGING							
6.17.09.01.16. 1 DREDGING & DISPOSAL-FROM CEDEP	1289765	CY	1,973,300	296,000	115,700	2,385,100	1.85
TOTAL PIPELINE DREDGING	1.00	EA	1,973,300	296,000	115,700	2,385,100	2385078
6.17.09.01.20 DISPOSAL AREAS							
6.17.09.01.20. 2 DISPOSAL PIT CONSTRUCTION	54.70	ACR	1,388,900	277,800	85,000	1,751,700	32024
6.17.09.01.20. 3 ACCESS ROAD TO PIT-BASED ON	6.75	MI	871,900	174,400	53,400	1,099,600	162903
TOTAL DISPOSAL AREAS	1.00	ACR	2,260,800	452,200	138,400	2,851,300	2851292
6.17.09.01.30 BANK STABLIZATN; DIKES & JETTIES							
TOTAL CHANNELS	1.00	EA	4,234,100	748,200	254,100	5,236,400	5236370
TOTAL CHANNELS AND CANALS	1.00	EA	4,234,100	748,200	254,100	5,236,400	5236370
6.17.18 CULTURAL RESOURCE PRESERVATION							
6.17.18.01 Cultural/Archaelogical Surveys	1.00	JOB	125,000	25,000	7,600	157,700	157650
TOTAL CULTURAL RESOURCE PRESERVATION	1.00	JOB	125,000	25,000	7,600	157,700	157650
6.17.30 PLANNING, ENGINEERING, & DESIGN	1.00	EA	371,200	74,200	22,700	468,200	468193
6.17.31 SUPERVISION AND INSPECTION	1.00	EA	317,600	63,500	19,400	400,500	400504
TOTAL POOL 17	1.00	EA	9,601,300	1,066,400	516,700	11,184,400	11184431
6.18 POOL 18							
6.18.01 LANDS AND DAMAGES							
6.18.01.23 LANDS AND DAMAGES							
6.18.01.23.03 LANDS AND DAMAGES							
6.18.01.23.03.02 Real Estate Acquisition Documnts	1.00	EA	190,600	0	0	190,600	190613
6.18.01.23.03.03 Real Estate Condemnation Docmnts	1.00	EA	7,800	0	0	7,800	7800.00
6.18.01.23.03.05 Real Estate Appraisal Documents	1.00	EA	69,300	0	0	69,300	69333
6.18.01.23.03.06 Real Estate PL 91-646 Assstnce D	1.00	EA	6,300	0	0	6,300	6283.00
6.18.01.23.03.15 Real Estate Payment Documents	1.00	EA	261,700	0	0	261,700	261701
TOTAL LANDS AND DAMAGES	1.00	EA	535,700	0	0	535,700	535730
TOTAL LANDS AND DAMAGES	1.00	EA	535,700	0	0	535,700	535730

		QUANTITY	UOM	CONTRACT	CONTINGN	ESCALATN	TOTAL COST	UNIT
	TOTAL LANDS AND DAMAGES	1.00	EA	535,700	0	0	535,700	535730
6.18.06	FISH AND WILDLIFE FACILITIES							
6.18.06.03	WILDLIFE FACILITIES/SANCTUARY							
6.18.06.03.49	Adapative Management Costs							
6.18.06.03.49.01	Backwaters & Trib Mouths Dredgin	1.00	JOB	83,400	16,700	5,100	105,200	105184
6.18.06.03.49.02	Gravel Bar Monitoring	1.00	JOB	62,500	12,500	3,800	78,800	78825
6.18.06.03.49.03	Dike Field Mods	1.00	JOB	25,000	5,000	1,500	31,500	31530
6.18.06.03.49.05	Hardoods & Marshlands Monitoring	1.00	JOB	25,000	5,000	1,500	31,500	31530
	TOTAL Adapative Management Costs	1.00	EA	195,900	39,200	12,000	247,100	247069
6.18.06.03.51	Long Term Management Costs							
6.18.06.03.51.06	Bathymetry	1.00	JOB	33,400	6,700	2,000	42,100	42124
6.18.06.03.51.07	Substrate Sampling	1.00	JOB	10,000	2,000	600	12,600	12612
6.18.06.03.51.08	LIDAAR/GIS	1.00	JOB	25,000	5,000	1,500	31,500	31530
6.18.06.03.51.09	Backwater Reevaluations	1.00	JOB	13,400	2,700	800	16,900	16900
6.18.06.03.51.10	Diversity & Presence @ Trib Mout	1.00	JOB	13,400	2,700	800	16,900	16900
6.18.06.03.51.11	Gravel Model for Sus. Substrates	1.00	JOB	15,000	3,000	900	18,900	18918
6.18.06.03.51.12	Gravel Monitoring for Hab Qual	1.00	JOB	48,800	9,800	3,000	61,500	61547
6.18.06.03.51.13	Fish Sampling	1.00	JOB	50,000	10,000	3,100	63,100	63060
6.18.06.03.51.14	Hardwood Habitat Quality & Sustn	1.00	JOB	12,000	2,400	700	15,100	15134
6.18.06.03.51.15	Water Quality Monitoring	1.00	JOB	50,000	10,000	3,100	63,100	63060
	TOTAL Long Term Management Costs	1.00	EA	271,000	54,200	16,600	341,800	341785
6.18.06.03.73	WILDLIFE HABITAT							
6.18.06.03.73. D	AQUATIC SANCTUARY IMPROVEMENT	1.00	EA	113,200	22,600	6,900	142,800	142827
6.18.06.03.73. E	Other Mitigation			1,500,000	0	76,500	1,576,500	
6.18.06.03.73. F	Sampling of Areas	3.00	EA	10,500	2,100	600	13,200	4414.20
6.18.06.03.73. G	Relocate Mussel Patch P49-2	1.00	EA	10,000	2,000	600	12,600	12612
6.18.06.03.73. H	Investigate Mussel Relocation st	1.00	EA	40,000	8,000	2,400	50,400	50448
6.18.06.03.73. I	Investigate Other Mussel Relo st	1.00	EA	3,500	700	200	4,400	4414.20
	TOTAL WILDLIFE HABITAT	1.00	EA	1,677,200	35,400	87,300	1,800,000	1800043
	TOTAL WILDLIFE FACILITIES/SANCTUARY	1.00	EA	2,144,100	128,800	115,900	2,388,900	2388898
	TOTAL FISH AND WILDLIFE FACILITIES	1.00	EA	2,144,100	128,800	115,900	2,388,900	2388898
6.18.09	CHANNELS AND CANALS							

	QUANTITY	UOM	CONTRACT	CONTINGN	ESCALATN	TOTAL COST	UNIT
6.18.09.01 CHANNELS							
6.18.09.01.16 PIPELINE DREDGING							
6.18.09.01.16. 1 DREDGING & DISPOSAL-FROM CEDEP	414670	CY	634,400	95,200	37,200	766,800	1.85
TOTAL PIPELINE DREDGING	1.00	EA	634,400	95,200	37,200	766,800	766822
6.18.09.01.20 DISPOSAL AREAS							
6.18.09.01.20. 2 DISPOSAL PIT CONSTRUCTION	37.30	ACR	1,124,900	225,000	68,800	1,418,700	38036
6.18.09.01.20. 3 ACCESS ROAD TO PIT-BASED ON	2.25	MI	290,600	58,100	17,800	366,500	162903
TOTAL DISPOSAL AREAS	37.30	ACR	1,415,500	283,100	86,600	1,785,300	47863
6.18.09.01.30 BANK STABLIZATN; DIKES & JETTIES							
TOTAL CHANNELS	1.00	EA	2,050,000	378,300	123,800	2,552,100	2552097
TOTAL CHANNELS AND CANALS	1.00	EA	2,050,000	378,300	123,800	2,552,100	2552097
6.18.12 PORTS AND HARBORS							
6.18.12.01 PORTS							
6.18.12.01.16 PIPELINE DREDGING	1.00	EA	323,600	64,700	19,800	408,100	408076
TOTAL PORTS	1.00	EA	323,600	64,700	19,800	408,100	408076
TOTAL PORTS AND HARBORS	1.00	EA	323,600	64,700	19,800	408,100	408076
6.18.18 CULTURAL RESOURCE PRESERVATION							
6.18.18.01 Cultural/Archaelogical Surveys	1.00	JOB	125,000	25,000	7,600	157,700	157650
TOTAL CULTURAL RESOURCE PRESERVATION	1.00	JOB	125,000	25,000	7,600	157,700	157650
6.18.30 PLANNING, ENGINEERING, & DESIGN	1.00	EA	199,700	39,900	12,200	251,900	251902
6.18.31 SUPERVISION AND INSPECTION	1.00	EA	156,800	31,400	9,600	197,700	197731
TOTAL POOL 18	1.00	EA	5,534,900	668,100	289,000	6,492,100	6492084
TOTAL REACH 6	1.00	EA	15,155,100	1,738,300	806,900	17,700,300	17700319
TOTAL DREDGE ALT,CUT M-K TO 14' 6/05	1.00	EA	51,815,000	7,907,300	2,881,900	62,604,200	62604197

	QUANTITY	UOM	CONTRACT	CONTINGN	ESC COST	PROJECT
5 REACH 5						
5.01 LANDS AND DAMAGES						
5.01.23 LANDS AND DAMAGES						
5.01.23.03 LANDS AND DAMAGES	1.00	EA	2,142,900	0	2,142,900	2,142,900
5.01.23 LANDS AND DAMAGES	1.00	EA	2,142,900	0	2,142,900	2,142,900
5.01 LANDS AND DAMAGES	1.00	EA	2,142,900	0	2,142,900	2,142,900
5.05 LOCKS						
5.05.00 LOCKS						
5.05.00.61 GUIDE WALLS	1.00	EA	475,000	95,000	504,100	599,100
5.05.00 LOCKS	1.00	EA	475,000	95,000	504,100	599,100
5.05 LOCKS	1.00	EA	475,000	95,000	504,100	599,100
5.06 FISH AND WILDLIFE FACILITIES						
5.06.03 WILDLIFE FACILITIES/SANCTUARY						
5.06.03.49 Adapative Management Costs	1.00	EA	542,000	108,400	575,200	683,600
5.06.03.50 Adapative Management Costs	1.00	EA	542,000	108,400	575,200	683,600
5.06.03.73 WILDLIFE HABITAT	1.00	EA	1,217,800	108,500	1,285,400	1,394,000
5.06.03 WILDLIFE FACILITIES/SANCTUARY	1.00	EA	2,301,800	325,300	2,435,800	2,761,100
5.06 FISH AND WILDLIFE FACILITIES	1.00	EA	2,301,800	325,300	2,435,800	2,761,100
5.09 CHANNELS AND CANALS						
5.09.01 CHANNELS						
5.09.01.16 PIPELINE DREDGING	1.00	EA	13,722,500	2,145,100	14,531,800	16,676,900
5.09.01.20 DISPOSAL AREAS	1.00	ACR	10,991,700	2,198,300	11,664,400	13,862,800
5.09.01.30 BANK STABLIZTN; DIKES & JETTIES	1.00	TON	2,982,500	596,500	3,165,100	3,761,600
5.09.01 CHANNELS	1.00	EA	27,696,800	4,940,000	29,361,300	34,301,300
5.09 CHANNELS AND CANALS	1.00	EA	27,696,800	4,940,000	29,361,300	34,301,300
5.12 PORTS AND HARBORS						
5.12.01 PORTS						
5.12.01.16 PIPELINE DREDGING	1.00	EA	27,000	5,400	28,600	34,000
5.12.01 PORTS	1.00	EA	27,000	5,400	28,600	34,000
5.12 PORTS AND HARBORS	1.00	EA	27,000	5,400	28,600	34,000

	QUANTITY	UOM	CONTRACT	CONTINGN	ESC COST	PROJECT
5.18 CULTURAL RESOURCE PRESERVATION						
5.18.01 Cultural/Archaelogical Surveys						
5.18.01.00 <<< Not Identified >>>	1.00	TON	250,000	50,000	265,300	315,300
5.18.01 Cultural/Archaelogical Surveys	1.00	JOB	250,000	50,000	265,300	315,300
5.18 CULTURAL RESOURCE PRESERVATION	1.00	JOB	250,000	50,000	265,300	315,300
5.30 PLANNING, ENGINEERING, & DESIGN						
5.30.00 <<< Not Identified >>>						
5.30.00.00 <<< Not Identified >>>	1.00	EA	1,968,100	393,600	2,088,600	2,482,200
5.30.00 <<< Not Identified >>>	1.00	JOB	1,968,100	393,600	2,088,600	2,482,200
5.30 PLANNING, ENGINEERING, & DESIGN	1.00	EA	1,968,100	393,600	2,088,600	2,482,200
5.31 SUPERVISION AND INSPECTION						
5.31.00 <<< Not Identified >>>						
5.31.00.00 <<< Not Identified >>>	1.00	EA	1,798,300	359,700	1,908,300	2,268,000
5.31.00 <<< Not Identified >>>	1.00	JOB	1,798,300	359,700	1,908,300	2,268,000
5.31 SUPERVISION AND INSPECTION	1.00	EA	1,798,300	359,700	1,908,300	2,268,000
5 REACH 5	1.00	EA	36,659,900	6,169,000	38,734,900	44,903,900
6 REACH 6						
6.01 LANDS AND DAMAGES						
6.01.23 LANDS AND DAMAGES						
6.01.23.03 LANDS AND DAMAGES	1.00	EA	1,071,500	0	1,071,500	1,071,500
6.01.23 LANDS AND DAMAGES	1.00	EA	1,071,500	0	1,071,500	1,071,500
6.01 LANDS AND DAMAGES	1.00	EA	1,071,500	0	1,071,500	1,071,500
6.06 FISH AND WILDLIFE FACILITIES						
6.06.03 WILDLIFE FACILITIES/SANCTUARY						
6.06.03.49 Adapative Management Costs	1.00	EA	391,800	78,400	415,800	494,100
6.06.03.50 Adapative Management Costs	1.00	EA	0	0	0	0
6.06.03.51 Long Term Management Costs	1.00	EA	542,000	108,400	575,200	683,600
6.06.03.73 WILDLIFE HABITAT	1.00	EA	5,246,800	101,400	5,519,600	5,621,000
6.06.03 WILDLIFE FACILITIES/SANCTUARY	1.00	EA	6,180,600	288,100	6,510,600	6,798,700
6.06 FISH AND WILDLIFE FACILITIES	1.00	EA	6,180,600	288,100	6,510,600	6,798,700

	QUANTITY	UOM	CONTRACT	CONTINGN	ESC COST	PROJECT
6.09 CHANNELS AND CANALS						
6.09.01 CHANNELS						
6.09.01.16 PIPELINE DREDGING	1.00	EA	2,607,800	391,200	2,760,700	3,151,900
6.09.01.20 DISPOSAL AREAS	1.00	ACR	3,676,300	735,300	3,901,300	4,636,600
6.09.01.30 BANK STABLIZATN; DIKES & JETTIES	1.00	CY	0	0	0	0
6.09.01 CHANNELS	1.00	EA	6,284,100	1,126,400	6,662,000	7,788,500
6.09 CHANNELS AND CANALS	1.00	EA	6,284,100	1,126,400	6,662,000	7,788,500
6.12 PORTS AND HARBORS						
6.12.01 PORTS						
6.12.01.16 PIPELINE DREDGING	1.00	EA	323,600	64,700	343,400	408,100
6.12.01 PORTS	1.00	EA	323,600	64,700	343,400	408,100
6.12 PORTS AND HARBORS	1.00	EA	323,600	64,700	343,400	408,100
6.18 CULTURAL RESOURCE PRESERVATION						
6.18.01 Cultural/Archaelogical Surveys						
6.18.01.00 <<< Not Identified >>>	1.00	CY	250,000	50,000	265,300	315,300
6.18.01 Cultural/Archaelogical Surveys	1.00	JOB	250,000	50,000	265,300	315,300
6.18 CULTURAL RESOURCE PRESERVATION	1.00	JOB	250,000	50,000	265,300	315,300
6.30 PLANNING, ENGINEERING, & DESIGN						
6.30.00 <<< Not Identified >>>						
6.30.00.00 <<< Not Identified >>>	1.00	EA	571,000	114,200	605,900	720,100
6.30.00 <<< Not Identified >>>	1.00	JOB	571,000	114,200	605,900	720,100
6.30 PLANNING, ENGINEERING, & DESIGN	1.00	EA	571,000	114,200	605,900	720,100
6.31 SUPERVISION AND INSPECTION						
6.31.00 <<< Not Identified >>>						
6.31.00.00 <<< Not Identified >>>	1.00	EA	474,300	94,900	503,400	598,200
6.31.00 <<< Not Identified >>>	1.00	JOB	474,300	94,900	503,400	598,200
6.31 SUPERVISION AND INSPECTION	1.00	EA	474,300	94,900	503,400	598,200
6 REACH 6	1.00	EA	15,155,100	1,738,300	15,962,000	17,700,300

	QUANTITY	UOM	CONTRACT	CONTINGN	ESC COST	PROJECT
DREDGE ALT,CUT M-K TO 14' 6/05	1.00	EA	51,815,000	7,907,300	54,696,900	62,604,200

ARKANSAS RIVER NAVIGATION STUDY,
ARKANSAS AND OKLAHOMA
FEASIBILITY STUDY

TAB I

- MCACES Cost Estimate -

Three-Foot Lower (12 Foot) Navigational Channel Reaches 5- 6

DREDGE ALT,CUT M-K TO 15' 7/05
CWE OF DREDGING M-K
CHANNEL TO A DEPTH OF 15'
INCLUDES REAL ESTATE, MITIGATION
& PINNING UPDATED JULY 18, 2005

Designed By: IN HOUSE
Estimated By: IN HOUSE

Prepared By: TED MCCLEARY, Rev by George Losak

Preparation Date: 07/18/05
Effective Date of Pricing: 06/03/04

Sales Tax: 6.95%

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Release 5.31

DECEMBER 2004 UPDATE:
THE FOLLOWING CHANGES WERE MADE TO ADDRESS COMMENTS BY SWL:
1. WBS CODES WERE INCORPORATED INTO THE FORMAT.
2. REACH NUMBERS WERE ALSO INCORPORATED.
3. E & D AND S & I WERE MOVED FROM OWNER COSTS TO WBS FEATURES.
4. COSTS FOR REAL ESTATE WILL BE INCORPORATED LATER-WE HAVE NONE AT PRESENT.
5. COSTS FOR 02 AND 06 WERE NOT OMITTED, THEY ARE NOT PART OF THIS PROJECT.
WE HAVE NO RELOCATIONS AND NO WILDLIFE MITIGATION COSTS.

THE FOLLOWING CHANGES WERE MADE PER PM REQUESTS:
1. POOL NUMBERS REMAIN IN THE FORMAT OF THE ESTIMATE.
2. CONTINGENCIES WERE LOWERED FROM 25% TO 20%. (Changed to 15% 12/09/04)
3. ESCALATION AND CONTINGENCIES ARE APPLIED TO CODES 30 AND 31.
(Escalation deleted 12/09/04)
THE FOLLOWING CHANGES WERE MADE PER DESIGN REFINEMENT:
1. IN POOL 15 42,700 CY OF RIP RAP WAS DELETED.
2. IN POOL 16 RIP RAP WAS REDUCED BY 13,200 CY & REPLACED WITH SILT FENCE.

Revisions made 12/09/04;
1. Changed contingencies to 15%.
2. Deleted escalation.
3. Changed E&D to 8.0%.
4. Changed S&I to 7.5%.

Changes made 10 December 2004.
1. Escalation (5.1%) was added as required by EI 01D010, 1 Sept 1997.
2. Contingencies were adjusted to 20 percent for all features except dredging. The reason for this was that more information was available to determine dredging quantities that for the other components (dikes and dredge material disposal areas.)

Changes made 25 Jan., 2005:
1. Costs for Bank Stabilization within pool 15 were deleted thus reducing costs for E & d, S & I, escalation, and contingencies.

Changes made 4 Feb, 05:
Quantities were adjusted per comments of review by G. Losak.

Chanmges made 14 June:
Included costs for real estate, pinning of the guide walls, and mitigation. These costs were provided by others.

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No Detailed Estimate...

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	QUANTITY	UOM	CONTRACT	CONTINGN	ESCALATN	TOTAL COST	UNIT
5 REACH 5							
5.13 POOL #13							
5.13.01 LANDS AND DAMAGES							
5.13.01.23 LANDS AND DAMAGES							
5.13.01.23.03 LANDS AND DAMAGES							
5.13.01.23.03.02 Real Estate Acquisition Documnts	1.00	EA	190,600	0	0	190,600	190613
5.13.01.23.03.03 Real Estate Condemnation Docmnts	1.00	EA	7,800	0	0	7,800	7800.00
5.13.01.23.03.05 Real Estate Appraisal Documents	1.00	EA	69,300	0	0	69,300	69333
5.13.01.23.03.06 Real Estate PL 91-646 Assstnce D	1.00	EA	6,300	0	0	6,300	6283.00
5.13.01.23.03.15 Real Estate Payment Documents	1.00	EA	261,700	0	0	261,700	261701
TOTAL LANDS AND DAMAGES	1.00	EA	535,700	0	0	535,700	535730
TOTAL LANDS AND DAMAGES	1.00	EA	535,700	0	0	535,700	535730
TOTAL LANDS AND DAMAGES	1.00	EA	535,700	0	0	535,700	535730
5.13.06 FISH AND WILDLIFE FACILITIES							
5.13.06.03 WILDLIFE FACILITIES/SANCTUARY							
5.13.06.03.49 Adapative Management Costs							
5.13.06.03.49.01 Backwaters & Trib Mouths Dredgin	1.00	JOB	41,700	8,300	2,600	52,600	52592
5.13.06.03.49.02 Gravel Bar Monitoring	1.00	JOB	31,300	6,300	1,900	39,500	39476
5.13.06.03.49.03 Dike Field Mods	1.00	JOB	25,000	5,000	1,500	31,500	31530
5.13.06.03.49.04 Mussel Bed Reconalization	1.00	JOB	25,000	5,000	1,500	31,500	31530
5.13.06.03.49.05 Hardoods & Marshlands Monitoring	1.00	JOB	12,500	2,500	800	15,800	15765
TOTAL Adapative Management Costs	1.00	EA	135,500	27,100	8,300	170,900	170893
5.13.06.03.50 Long Term Management Costs							
5.13.06.03.50.06 Bathymetry	1.00	JOB	16,700	3,300	1,000	21,100	21062
5.13.06.03.50.07 Substrate Sampling	1.00	JOB	5,000	1,000	300	6,300	6306.00
5.13.06.03.50.08 LIDAAR/GIS	1.00	JOB	12,500	2,500	800	15,800	15765
5.13.06.03.50.09 Backwater Reevaluations	1.00	JOB	6,700	1,300	400	8,500	8450.04
5.13.06.03.50.10 Diversity & Presence @ Trib Mout	1.00	JOB	6,700	1,300	400	8,500	8450.04
5.13.06.03.50.11 Gravel Model for Sus. Substrates	1.00	JOB	7,500	1,500	500	9,500	9459.00
5.13.06.03.50.12 Gravel Monitoring for Hab Qual	1.00	JOB	24,400	4,900	1,500	30,800	30773
5.13.06.03.50.13 Fish Sampling	1.00	JOB	25,000	5,000	1,500	31,500	31530
5.13.06.03.50.14 Hardwood Habitat Quality & Sustn	1.00	JOB	6,000	1,200	400	7,600	7567.20

	QUANTITY	UOM	CONTRACT	CONTINGN	ESCALATN	TOTAL COST	UNIT
5.13.06.03.50.15 Water Quality Monitoring	1.00	JOB	25,000	5,000	1,500	31,500	31530
TOTAL Long Term Management Costs	1.00	EA	135,500	27,100	8,300	170,900	170893
5.13.06.03.73 WILDLIFE HABITAT							
5.13.06.03.73. D AQUATIC SANCTUARY IMPROVEMENTS	1.00	EA	36,600	7,300	2,200	46,200	46164
5.13.06.03.73. E Other Mitigation			168,800	0	8,600	177,400	
5.13.06.03.73. F Oklahoma Mussel Mitigation			17,500	3,500	1,100	22,100	
TOTAL WILDLIFE HABITAT	1.00	EA	222,900	10,800	11,900	245,600	245612
TOTAL WILDLIFE FACILITIES/SANCTUARY	1.00	EA	493,900	65,000	28,500	587,400	587397
TOTAL FISH AND WILDLIFE FACILITIES	1.00	EA	493,900	65,000	28,500	587,400	587397
5.13.09 CHANNELS AND CANALS							
5.13.09.01 CHANNELS							
5.13.09.01.16 PIPELINE DREDGING							
5.13.09.01.16. 1 DREDGING & DISPOSAL-FROM CEDEP	1890370	CY	2,892,300	433,800	169,600	3,495,700	1.85
TOTAL PIPELINE DREDGING	1.00	EA	2,892,300	433,800	169,600	3,495,700	3495737
5.13.09.01.20 DISPOSAL AREAS							
5.13.09.01.20. 2 DISPOSAL PIT CONSTRUCTION	136.20	ACR	2,551,000	510,200	156,100	3,217,300	23622
5.13.09.01.20. 3 ACCESS ROAD TO PIT-BASED ON	2.00	MI	258,300	51,700	15,800	325,800	162903
TOTAL DISPOSAL AREAS	1.00	EA	2,809,300	561,900	171,900	3,543,100	3543092
5.13.09.01.30 BANK STABILZATN; DIKES & JETTIES							
5.13.09.01.30.FD ROCK FOR FINGER DIKES	187300	CY	1,562,400	312,500	95,600	1,970,500	10.52
TOTAL BANK STABILZATN; DIKES & JETTIES	1.00	EA	1,562,400	312,500	95,600	1,970,500	1970540
TOTAL CHANNELS	1.00	EA	7,264,000	1,308,200	437,200	9,009,400	9009369
TOTAL CHANNELS AND CANALS	1.00	EA	7,264,000	1,308,200	437,200	9,009,400	9009369
5.13.18 CULTURAL RESOURCE PRESERVATION							

	QUANTITY	UOM	CONTRACT	CONTINGN	ESCALATN	TOTAL COST	UNIT
5.13.18.01 Cultural/Archaelogical Surveys	1.00	JOB	62,500	12,500	3,800	78,800	78825
TOTAL CULTURAL RESOURCE PRESERVATION	1.00	JOB	62,500	12,500	3,800	78,800	78825
5.13.30 PLANNING, ENGINEERING, & DESIGN	1.00	EA	593,900	118,800	36,300	749,100	749067
5.13.31 SUPERVISION AND INSPECTION	1.00	EA	545,100	109,000	33,400	687,500	687471
TOTAL POOL #13	1.00	EA	9,495,100	1,613,500	539,200	11,647,900	11647860
5.14 POOL #14							
5.14.01 LANDS AND DAMAGES							
5.14.01.23 LANDS AND DAMAGES							
5.14.01.23.03 LANDS AND DAMAGES							
5.14.01.23.03.02 Real Estate Acquisition Documnts	1.00	EA	190,600	0	0	190,600	190613
5.14.01.23.03.03 Real Estate Condemnation Docmnts	1.00	EA	7,800	0	0	7,800	7800.00
5.14.01.23.03.05 Real Estate Appraisal Documents	1.00	EA	69,300	0	0	69,300	69333
5.14.01.23.03.06 Real Estate PL 91-646 Assstnce D	1.00	EA	6,300	0	0	6,300	6283.00
5.14.01.23.03.15 Real Estate Payment Documents	1.00	EA	261,700	0	0	261,700	261701
TOTAL LANDS AND DAMAGES	1.00	EA	535,700	0	0	535,700	535730
TOTAL LANDS AND DAMAGES	1.00	EA	535,700	0	0	535,700	535730
TOTAL LANDS AND DAMAGES	1.00	EA	535,700	0	0	535,700	535730
5.14.06 FISH AND WILDLIFE FACILITIES							
5.14.06.03 WILDLIFE FACILITIES/SANCTUARY							
5.14.06.03.49 Adapative Management Costs							
5.14.06.03.49.01 Backwaters & Trib Mouths Dredgin	1.00	JOB	41,700	8,300	2,600	52,600	52592
5.14.06.03.49.02 Gravel Bar Monitoring	1.00	JOB	31,300	6,300	1,900	39,500	39476
5.14.06.03.49.03 Dike Field Mods	1.00	JOB	25,000	5,000	1,500	31,500	31530
5.14.06.03.49.04 Mussel Bed Reconalization	1.00	JOB	25,000	5,000	1,500	31,500	31530
5.14.06.03.49.05 Hardoods & Marshlands Monitoring	1.00	JOB	12,500	2,500	800	15,800	15765
TOTAL Adapative Management Costs	1.00	EA	135,500	27,100	8,300	170,900	170893
5.14.06.03.50 Long Term Management Costs							
5.14.06.03.50.06 Bathymetry	1.00	JOB	16,700	3,300	1,000	21,100	21062
5.14.06.03.50.07 Substrate Sampling	1.00	JOB	5,000	1,000	300	6,300	6306.00
5.14.06.03.50.08 LIDAAR/GIS	1.00	JOB	12,500	2,500	800	15,800	15765

		QUANTITY	UOM	CONTRACT	CONTINGN	ESCALATN	TOTAL COST	UNIT
5.14.06.03.50.09	Backwater Reevaluations	1.00	JOB	6,700	1,300	400	8,500	8450.04
5.14.06.03.50.10	Diversity & Presence @ Trib Mout	1.00	JOB	6,700	1,300	400	8,500	8450.04
5.14.06.03.50.11	Gravel Model for Sus. Substrates	1.00	JOB	7,500	1,500	500	9,500	9459.00
5.14.06.03.50.12	Gravel Monitoring for Hab Qual	1.00	JOB	24,400	4,900	1,500	30,800	30773
5.14.06.03.50.13	Fish Sampling	1.00	JOB	25,000	5,000	1,500	31,500	31530
5.14.06.03.50.14	Hardwood Habitat Quality & Sustn	1.00	JOB	6,000	1,200	400	7,600	7567.20
5.14.06.03.50.15	Water Quality Monitoring	1.00	JOB	25,000	5,000	1,500	31,500	31530
	TOTAL Long Term Management Costs	1.00	EA	135,500	27,100	8,300	170,900	170893
5.14.06.03.73	WILDLIFE HABITAT							
5.14.06.03.73. D	AQUATIC SANCTUARY IMPROVEMENTS	1.00	EA	64,900	13,000	4,000	81,900	81870
5.14.06.03.73. E	Other Mitigation			168,800	0	8,600	177,400	
5.14.06.03.73. F	Oklahoma Mussel Mitigation			17,500	3,500	1,100	22,100	
	TOTAL WILDLIFE HABITAT	1.00	EA	251,200	16,500	13,700	281,300	281319
	TOTAL WILDLIFE FACILITIES/SANCTUARY	1.00	EA	522,200	70,700	30,200	623,100	623104
	TOTAL FISH AND WILDLIFE FACILITIES	1.00	EA	522,200	70,700	30,200	623,100	623104
5.14.09	CHANNELS AND CANALS							
5.14.09.01	CHANNELS							
5.14.09.01.16	PIPELINE DREDGING							
5.14.09.01.16. 1	DREDGING & DISPOSAL-FROM CEDEP	235279	CY	360,000	54,000	21,100	435,100	1.85
	TOTAL PIPELINE DREDGING	1.00	EA	360,000	54,000	21,100	435,100	435086
5.14.09.01.20	DISPOSAL AREAS							
5.14.09.01.20. 2	DISPOSAL PIT CONSTRUCTION	18.00	ACR	363,100	72,600	22,200	458,000	25442
5.14.09.01.20. 3	ACCESS ROAD TO PIT-BASED ON	0.50	MI	64,600	12,900	4,000	81,500	162903
	TOTAL DISPOSAL AREAS	1.00	EA	427,700	85,500	26,200	539,400	539410
5.14.09.01.30	BANK STABILZATN; DIKES & JETTIES							
	TOTAL CHANNELS	1.00	EA	787,700	139,500	47,300	974,500	974496
	TOTAL CHANNELS AND CANALS	1.00	EA	787,700	139,500	47,300	974,500	974496
5.14.18	CULTURAL RESOURCE PRESERVATION							

	QUANTITY	UOM	CONTRACT	CONTINGN	ESCALATN	TOTAL COST	UNIT
5.14.18.01 Cultural/Archaelogical Surveys	1.00	JOB	62,500	12,500	3,800	78,800	78825
TOTAL CULTURAL RESOURCE PRESERVATION	1.00	JOB	62,500	12,500	3,800	78,800	78825
5.14.30 PLANNING, ENGINEERING, & DESIGN	1.00	EA	77,600	15,500	4,700	97,800	97824
5.14.31 SUPERVISION AND INSPECTION	1.00	EA	61,000	12,200	3,700	76,900	76931
TOTAL POOL #14	1.00	EA	2,046,600	250,400	89,800	2,386,900	2386910
5.15 POOL #15							
5.15.01 LANDS AND DAMAGES							
5.15.01.23 LANDS AND DAMAGES							
5.15.01.23.03 LANDS AND DAMAGES							
5.15.01.23.03.02 Real Estate Acquisition Documnts	1.00	EA	190,600	0	0	190,600	190613
5.15.01.23.03.03 Real Estate Condemnation Docmnts	1.00	EA	7,800	0	0	7,800	7800.00
5.15.01.23.03.05 Real Estate Appraisal Documents	1.00	EA	69,300	0	0	69,300	69333
5.15.01.23.03.06 Real Estate PL 91-646 Assstnce D	1.00	EA	6,300	0	0	6,300	6283.00
5.15.01.23.03.15 Real Estate Payment Documents	1.00	EA	261,700	0	0	261,700	261701
TOTAL LANDS AND DAMAGES	1.00	EA	535,700	0	0	535,700	535730
TOTAL LANDS AND DAMAGES	1.00	EA	535,700	0	0	535,700	535730
TOTAL LANDS AND DAMAGES	1.00	EA	535,700	0	0	535,700	535730
5.15.05 LOCKS							
5.15.05.00 LOCKS							
5.15.05.00.61 GUIDE WALLS							
5.15.05.00.61.05 GUIDE WALL PINNING (COST WAS	1.00	EA	237,500	47,500	14,500	299,500	299535
TOTAL GUIDE WALLS	1.00	EA	237,500	47,500	14,500	299,500	299535
TOTAL LOCKS	1.00	EA	237,500	47,500	14,500	299,500	299535
TOTAL LOCKS	1.00	EA	237,500	47,500	14,500	299,500	299535
5.15.06 FISH AND WILDLIFE FACILITIES							
5.15.06.03 WILDLIFE FACILITIES/SANCTUARY							
5.15.06.03.49 Adapative Management Costs							

		QUANTITY	UOM	CONTRACT	CONTINGN	ESCALATN	TOTAL COST	UNIT
5.15.06.03.49.01	Backwaters & Trib Mouths Dredgin	1.00	JOB	41,700	8,300	2,600	52,600	52592
5.15.06.03.49.02	Gravel Bar Monitoring	1.00	JOB	31,300	6,300	1,900	39,500	39476
5.15.06.03.49.03	Dike Field Mods	1.00	JOB	25,000	5,000	1,500	31,500	31530
5.15.06.03.49.04	Mussel Bed Reconalization	1.00	JOB	25,000	5,000	1,500	31,500	31530
5.15.06.03.49.05	Hardoods & Marshlands Monitoring	1.00	JOB	12,500	2,500	800	15,800	15765
	TOTAL Adapative Management Costs	1.00	EA	135,500	27,100	8,300	170,900	170893
5.15.06.03.50	Long Term Management Costs							
5.15.06.03.50.06	Bathymetry	1.00	JOB	16,700	3,300	1,000	21,100	21062
5.15.06.03.50.07	Substrate Sampling	1.00	JOB	5,000	1,000	300	6,300	6306.00
5.15.06.03.50.08	LIDAAR/GIS	1.00	JOB	12,500	2,500	800	15,800	15765
5.15.06.03.50.09	Backwater Reevaluations	1.00	JOB	6,700	1,300	400	8,500	8450.04
5.15.06.03.50.10	Diversity & Presence @ Trib Mout	1.00	JOB	6,700	1,300	400	8,500	8450.04
5.15.06.03.50.11	Gravel Model for Sus. Substrates	1.00	JOB	7,500	1,500	500	9,500	9459.00
5.15.06.03.50.12	Gravel Monitoring for Hab Qual	1.00	JOB	24,400	4,900	1,500	30,800	30773
5.15.06.03.50.13	Fish Sampling	1.00	JOB	25,000	5,000	1,500	31,500	31530
5.15.06.03.50.14	Hardwood Habitat Quality & Sustn	1.00	JOB	6,000	1,200	400	7,600	7567.20
5.15.06.03.50.15	Water Quality Monitoring	1.00	JOB	25,000	5,000	1,500	31,500	31530
	TOTAL Long Term Management Costs	1.00	EA	135,500	27,100	8,300	170,900	170893
5.15.06.03.73	WILDLIFE HABITAT							
5.15.06.03.73. D	AQUATIC SANCTUARY IMPROVEMENTS	1.00	EA	31,200	6,200	1,900	39,400	39362
5.15.06.03.73. E	Other Mitigation			168,800	0	8,600	177,400	
5.15.06.03.73. F	Oklahoma Mussel Mitigation			158,000	31,600	9,700	199,300	
	TOTAL WILDLIFE HABITAT	1.00	EA	358,000	37,800	20,200	416,000	416009
	TOTAL WILDLIFE FACILITIES/SANCTUARY	1.00	EA	629,000	92,000	36,800	757,800	757794
	TOTAL FISH AND WILDLIFE FACILITIES	1.00	EA	629,000	92,000	36,800	757,800	757794
5.15.09	CHANNELS AND CANALS							
5.15.09.01	CHANNELS							
5.15.09.01.16	PIPELINE DREDGING							
5.15.09.01.16. 1	DREDGE-PIT DISPOSAL-FROM CEDEP	1326000	CY	2,028,800	304,300	119,000	2,452,100	1.85
5.15.09.01.16.1A	DREDGE-OPEN WATER DISP.-CEDEP	3115110	CY	4,049,600	607,400	237,500	4,894,600	1.57
5.15.09.01.16.SF	SITES W/SILT FENCE CONTAINMENT	5.00	EA	269,600	53,900	16,500	340,100	68013
	TOTAL PIPELINE DREDGING	1.00	EA	6,348,100	965,700	373,000	7,686,700	7686749

	QUANTITY	UOM	CONTRACT	CONTINGN	ESCALATN	TOTAL COST	UNIT
5.15.09.01.20 DISPOSAL AREAS							
5.15.09.01.20. 2 DISPOSAL PIT CONSTRUCTION	93.70	ACR	2,159,400	431,900	132,200	2,723,400	29065
5.15.09.01.20. 3 ACCESS ROAD TO PIT-BASED ON	4.25	MI	549,000	109,800	33,600	692,300	162903
5.15.09.01.20.PD ROCK FOR PLACEMENT AREA DIKES	45160.00	CY	1,141,600	228,300	69,900	1,439,700	31.88
TOTAL DISPOSAL AREAS	1.00	EA	3,849,900	770,000	235,600	4,855,500	4855482
TOTAL CHANNELS	1.00	EA	10,197,900	1,735,700	608,600	12,542,200	12542231
TOTAL CHANNELS AND CANALS	1.00	EA	10,197,900	1,735,700	608,600	12,542,200	12542231
5.15.12 PORTS AND HARBORS							
5.15.12.01 PORTS							
5.15.12.01.16 PIPELINE DREDGING	1.00	EA	33,700	6,700	2,100	42,500	42508
TOTAL PORTS	1.00	EA	33,700	6,700	2,100	42,500	42508
TOTAL PORTS AND HARBORS	1.00	EA	33,700	6,700	2,100	42,500	42508
5.15.18 CULTURAL RESOURCE PRESERVATION							
5.15.18.01 Cultural/Archaelogical Surveys	1.00	JOB	62,500	12,500	3,800	78,800	78825
TOTAL CULTURAL RESOURCE PRESERVATION	1.00	JOB	62,500	12,500	3,800	78,800	78825
5.15.30 PLANNING, ENGINEERING, & DESIGN	1.00	EA	864,600	172,900	52,900	1,090,500	1090479
5.15.31 SUPERVISION AND INSPECTION	1.00	EA	798,900	159,800	48,900	1,007,500	1007545
TOTAL POOL #15	1.00	EA	13,359,900	2,227,200	767,600	16,354,600	16354648
5.16 POOL #16							
5.16.01 LANDS AND DAMAGES							
5.16.01.23 LANDS AND DAMAGES							
5.16.01.23.03 LANDS AND DAMAGES							
5.16.01.23.03.02 Real Estate Acquisition Documnts	1.00	EA	190,600	0	0	190,600	190613
5.16.01.23.03.03 Real Estate Condemnation Docmnts	1.00	EA	7,800	0	0	7,800	7800.00
5.16.01.23.03.05 Real Estate Appraisal Documents	1.00	EA	69,300	0	0	69,300	69333
5.16.01.23.03.06 Real Estate PL 91-646 Assstnce D	1.00	EA	6,300	0	0	6,300	6283.00
5.16.01.23.03.15 Real Estate Payment Documents	1.00	EA	261,700	0	0	261,700	261701

	QUANTITY	UOM	CONTRACT	CONTINGN	ESCALATN	TOTAL COST	UNIT
TOTAL LANDS AND DAMAGES	1.00	EA	535,700	0	0	535,700	535730
TOTAL LANDS AND DAMAGES	1.00	EA	535,700	0	0	535,700	535730
TOTAL LANDS AND DAMAGES	1.00	EA	535,700	0	0	535,700	535730
5.16.05 LOCKS							
5.16.05.00 LOCKS							
5.16.05.00.61 GUIDE WALLS							
5.16.05.00.61.05 GUIDE WALL PINNING (COST WAS	1.00	EA	237,500	47,500	14,500	299,500	299535
TOTAL GUIDE WALLS	1.00	EA	237,500	47,500	14,500	299,500	299535
TOTAL LOCKS	1.00	EA	237,500	47,500	14,500	299,500	299535
TOTAL LOCKS	1.00	EA	237,500	47,500	14,500	299,500	299535
5.16.06 FISH AND WILDLIFE FACILITIES							
5.16.06.03 WILDLIFE FACILITIES/SANCTUARY							
5.16.06.03.49 Adapative Management Costs							
5.16.06.03.49.01 Backwaters & Trib Mouths Dredgin	1.00	JOB	41,700	8,300	2,600	52,600	52592
5.16.06.03.49.02 Gravel Bar Monitoring	1.00	JOB	31,300	6,300	1,900	39,500	39476
5.16.06.03.49.03 Dike Field Mods	1.00	JOB	25,000	5,000	1,500	31,500	31530
5.16.06.03.49.04 Mussel Bed Reconalization	1.00	JOB	25,000	5,000	1,500	31,500	31530
5.16.06.03.49.05 Hardoods & Marshlands Monitoring	1.00	JOB	12,500	2,500	800	15,800	15765
TOTAL Adapative Management Costs	1.00	EA	135,500	27,100	8,300	170,900	170893
5.16.06.03.50 Long Term Management Costs							
5.16.06.03.50.06 Bathymetry	1.00	JOB	16,700	3,300	1,000	21,100	21062
5.16.06.03.50.07 Substrate Sampling	1.00	JOB	5,000	1,000	300	6,300	6306.00
5.16.06.03.50.08 LIDAAR/GIS	1.00	JOB	12,500	2,500	800	15,800	15765
5.16.06.03.50.09 Backwater Reevaluations	1.00	JOB	6,700	1,300	400	8,500	8450.04
5.16.06.03.50.10 Diversity & Presence @ Trib Mout	1.00	JOB	6,700	1,300	400	8,500	8450.04
5.16.06.03.50.11 Gravel Model for Sus. Substrates	1.00	JOB	7,500	1,500	500	9,500	9459.00
5.16.06.03.50.12 Gravel Monitoring for Hab Qual	1.00	JOB	24,400	4,900	1,500	30,800	30773
5.16.06.03.50.13 Fish Sampling	1.00	JOB	25,000	5,000	1,500	31,500	31530
5.16.06.03.50.14 Hardwood Habitat Quality & Sustn	1.00	JOB	6,000	1,200	400	7,600	7567.20
5.16.06.03.50.15 Water Quality Monitoring	1.00	JOB	25,000	5,000	1,500	31,500	31530
TOTAL Long Term Management Costs	1.00	EA	135,500	27,100	8,300	170,900	170893

	QUANTITY	UOM	CONTRACT	CONTINGN	ESCALATN	TOTAL COST	UNIT
5.16.06.03.73 WILDLIFE HABITAT							
5.16.06.03.73. D AQUATIC SANCTUARY IMPROVEMENTS	1.00	EA	206,500	41,300	12,600	260,400	260404
5.16.06.03.73. E Other Mitigation			168,800	0	8,600	177,400	
5.16.06.03.73. F Oklahoma Mussel Mitigation			10,500	2,100	600	13,200	
TOTAL WILDLIFE HABITAT	1.00	EA	385,700	43,400	21,900	451,000	451023
TOTAL WILDLIFE FACILITIES/SANCTUARY	1.00	EA	656,700	97,600	38,500	792,800	792809
TOTAL FISH AND WILDLIFE FACILITIES	1.00	EA	656,700	97,600	38,500	792,800	792809
5.16.09 CHANNELS AND CANALS							
5.16.09.01 CHANNELS							
5.16.09.01.16 PIPELINE DREDGING							
5.16.09.01.16. 1 DREDGING & DISPOSAL-FROM CEDEP	2543595	CY	3,891,700	583,800	228,200	4,703,700	1.85
5.16.09.01.16.1A DREDGE-OPEN WATER DISP.-CEDEP	374180	CY	486,400	73,000	28,500	587,900	1.57
5.16.09.01.16.SF SITES W/SILT FENCE CONTAINMENT	1.00	EA	53,900	10,800	3,300	68,000	68013
TOTAL PIPELINE DREDGING	1.00	EA	4,432,100	667,500	260,100	5,359,600	5359645
5.16.09.01.20 DISPOSAL AREAS							
5.16.09.01.20. 2 DISPOSAL PIT CONSTRUCTION	263.70	ACR	4,835,000	967,000	295,900	6,097,900	23124
5.16.09.01.20. 3 ACCESS ROAD TO PIT-BASED ON	7.50	MI	968,700	193,700	59,300	1,221,800	162903
5.16.09.01.20.PD ROCK FOR PLACEMENT AREA DIKES	6970.00	CY	176,200	35,200	10,800	222,200	31.88
TOTAL DISPOSAL AREAS	1.00	EA	5,979,900	1,196,000	366,000	7,541,800	7541843
5.16.09.01.30 BANK STABILZATN; DIKES & JETTIES							
5.16.09.01.30.FD ROCK FOR FINGER DIKES	91915.00	CY	2,323,400	464,700	142,200	2,930,300	31.88
TOTAL BANK STABILZATN; DIKES & JETTIES	1.00	EA	2,323,400	464,700	142,200	2,930,300	2930305
TOTAL CHANNELS	1.00	EA	12,735,400	2,328,200	768,200	15,831,800	15831793
TOTAL CHANNELS AND CANALS	1.00	EA	12,735,400	2,328,200	768,200	15,831,800	15831793
5.16.12 PORTS AND HARBORS							
5.16.12.01 PORTS							

	QUANTITY	UOM	CONTRACT	CONTINGN	ESCALATN	TOTAL COST	UNIT
5.16.12.01.16 PIPELINE DREDGING	1.00	EA	161,800	32,400	9,900	204,000	204038
TOTAL PORTS	1.00	EA	161,800	32,400	9,900	204,000	204038
TOTAL PORTS AND HARBORS	1.00	EA	161,800	32,400	9,900	204,000	204038
5.16.18 CULTURAL RESOURCE PRESERVATION							
5.16.18.01 Cultural/Archaelogical Surveys	1.00	JOB	62,500	12,500	3,800	78,800	78825
TOTAL CULTURAL RESOURCE PRESERVATION	1.00	JOB	62,500	12,500	3,800	78,800	78825
5.16.30 PLANNING, ENGINEERING, & DESIGN	1.00	EA	1,060,000	212,000	64,900	1,336,900	1336872
5.16.31 SUPERVISION AND INSPECTION	1.00	EA	979,900	196,000	60,000	1,235,900	1235866
TOTAL POOL #16	1.00	EA	16,429,500	2,926,100	959,800	20,315,500	20315468
TOTAL REACH 5	1.00	EA	41,331,200	7,017,200	2,356,500	50,704,900	50704885
6 REACH 6							
6.16 POOL 16							
6.16.06 FISH AND WILDLIFE FACILITIES							
6.16.06.03 WILDLIFE FACILITIES/SANCTUARY							
6.16.06.03.73 WILDLIFE HABITAT							
6.16.06.03.73. D AQUATIC SANCTUARY IMPROVEMENTS	1.00	EA	18,900	3,800	1,200	23,800	23804
TOTAL WILDLIFE HABITAT	1.00	EA	18,900	3,800	1,200	23,800	23804
TOTAL WILDLIFE FACILITIES/SANCTUARY	1.00	EA	18,900	3,800	1,200	23,800	23804
TOTAL FISH AND WILDLIFE FACILITIES	1.00	EA	18,900	3,800	1,200	23,800	23804
TOTAL POOL 16	1.00	EA	18,900	3,800	1,200	23,800	23804
6.17 POOL 17							
6.17.01 LANDS AND DAMAGES							
6.17.01.23 LANDS AND DAMAGES							
6.17.01.23.03 LANDS AND DAMAGES							
6.17.01.23.03.02 Real Estate Acquisition Documnts	1.00	EA	190,600	0	0	190,600	190613

		QUANTITY	UOM	CONTRACT	CONTINGN	ESCALATN	TOTAL COST	UNIT
6.17.01.23.03.03	Real Estate Condemnation Docmnts	1.00	EA	7,800	0	0	7,800	7800.00
6.17.01.23.03.05	Real Estate Appraisal Documents	1.00	EA	69,300	0	0	69,300	69333
6.17.01.23.03.06	Real Estate PL 91-646 Assstnce D	1.00	EA	6,300	0	0	6,300	6283.00
6.17.01.23.03.15	Real Estate Payment Documents	1.00	EA	261,700	0	0	261,700	261701
	TOTAL LANDS AND DAMAGES	1.00	EA	535,700	0	0	535,700	535730
	TOTAL LANDS AND DAMAGES	1.00	EA	535,700	0	0	535,700	535730
	TOTAL LANDS AND DAMAGES	1.00	EA	535,700	0	0	535,700	535730
6.17.06	FISH AND WILDLIFE FACILITIES							
6.17.06.03	WILDLIFE FACILITIES/SANCTUARY							
6.17.06.03.49	Adapative Management Costs							
6.17.06.03.49.01	Backwaters & Trib Mouths Dredgin	1.00	JOB	83,400	16,700	5,100	105,200	105184
6.17.06.03.49.02	Gravel Bar Monitoring	1.00	JOB	62,500	12,500	3,800	78,800	78825
6.17.06.03.49.03	Dike Field Mods	1.00	JOB	25,000	5,000	1,500	31,500	31530
6.17.06.03.49.05	Hardoods & Marshlands Monitoring	1.00	JOB	25,000	5,000	1,500	31,500	31530
	TOTAL Adapative Management Costs	1.00	EA	195,900	39,200	12,000	247,100	247069
6.17.06.03.51	Long Term Management Costs							
6.17.06.03.51.06	Bathymetry	1.00	JOB	33,400	6,700	2,000	42,100	42124
6.17.06.03.51.07	Substrate Sampling	1.00	JOB	10,000	2,000	600	12,600	12612
6.17.06.03.51.08	LIDAAR/GIS	1.00	JOB	25,000	5,000	1,500	31,500	31530
6.17.06.03.51.09	Backwater Reevaluations	1.00	JOB	13,400	2,700	800	16,900	16900
6.17.06.03.51.10	Diversity & Presence @ Trib Mout	1.00	JOB	13,400	2,700	800	16,900	16900
6.17.06.03.51.11	Gravel Model for Sus. Substrates	1.00	JOB	15,000	3,000	900	18,900	18918
6.17.06.03.51.12	Gravel Monitoring for Hab Qual	1.00	JOB	48,800	9,800	3,000	61,500	61547
6.17.06.03.51.13	Fish Sampling	1.00	JOB	50,000	10,000	3,100	63,100	63060
6.17.06.03.51.14	Hardwood Habitat Quality & Sustn	1.00	JOB	12,000	2,400	700	15,100	15134
6.17.06.03.51.15	Water Quality Monitoring	1.00	JOB	50,000	10,000	3,100	63,100	63060
	TOTAL Long Term Management Costs	1.00	EA	271,000	54,200	16,600	341,800	341785
6.17.06.03.73	WILDLIFE HABITAT							
6.17.06.03.73. D	AQUATIC SANCTUARY IMPROVEMENT	1.00	EA	293,200	58,600	17,900	369,800	369819
6.17.06.03.73. E	Other Mitigation			3,240,000	0	165,200	3,405,200	
6.17.06.03.73. F	Oklahoma Mussel Mitigation	5.00	EA	17,500	3,500	1,100	22,100	4414.20
	TOTAL WILDLIFE HABITAT	1.00	EA	3,550,700	62,100	184,300	3,797,100	3797130

	QUANTITY	UOM	CONTRACT	CONTINGN	ESCALATN	TOTAL COST	UNIT
TOTAL WILDLIFE FACILITIES/SANCTUARY	1.00	EA	4,017,600	155,500	212,800	4,386,000	4385984
TOTAL FISH AND WILDLIFE FACILITIES	1.00	EA	4,017,600	155,500	212,800	4,386,000	4385984
6.17.09 CHANNELS AND CANALS							
6.17.09.01 CHANNELS							
6.17.09.01.16 PIPELINE DREDGING							
6.17.09.01.16. 1 DREDGING & DISPOSAL-FROM CEDEP	2188000	CY	3,347,600	502,100	196,300	4,046,100	1.85
TOTAL PIPELINE DREDGING	1.00	EA	3,347,600	502,100	196,300	4,046,100	4046125
6.17.09.01.20 DISPOSAL AREAS							
6.17.09.01.20. 2 DISPOSAL PIT CONSTRUCTION	89.90	ACR	2,217,300	443,500	135,700	2,796,500	31106
6.17.09.01.20. 3 ACCESS ROAD TO PIT-BASED ON	6.75	MI	871,900	174,400	53,400	1,099,600	162903
TOTAL DISPOSAL AREAS	1.00	EA	3,089,200	617,800	189,100	3,896,000	3896047
6.17.09.01.30 BANK STABILZATN; DIKES & JETTIES							
TOTAL CHANNELS	1.00	EA	6,436,800	1,120,000	385,400	7,942,200	7942172
TOTAL CHANNELS AND CANALS	1.00	EA	6,436,800	1,120,000	385,400	7,942,200	7942172
6.17.18 CULTURAL RESOURCE PRESERVATION							
6.17.18.01 Cultural/Archaelogical Surveys	1.00	JOB	125,000	25,000	7,600	157,700	157650
TOTAL CULTURAL RESOURCE PRESERVATION	1.00	JOB	125,000	25,000	7,600	157,700	157650
6.17.30 PLANNING, ENGINEERING, & DESIGN	1.00	EA	547,400	109,500	33,500	690,400	690436
6.17.31 SUPERVISION AND INSPECTION	1.00	EA	482,800	96,600	29,500	608,900	608857
TOTAL POOL 17	1.00	EA	12,145,400	1,506,500	668,900	14,320,800	14320829
6.18 POOL 18							
6.18.01 LANDS AND DAMAGES							
6.18.01.23 LANDS AND DAMAGES							
6.18.01.23.03 LANDS AND DAMAGES							
6.18.01.23.03.02 Real Estate Acquisition Documnts	1.00	EA	190,600	0	0	190,600	190613

		QUANTITY	UOM	CONTRACT	CONTINGN	ESCALATN	TOTAL COST	UNIT
6.18.01.23.03.03	Real Estate Condemnation Docmnts	1.00	EA	7,800	0	0	7,800	7800.00
6.18.01.23.03.05	Real Estate Appraisal Documents	1.00	EA	69,300	0	0	69,300	69333
6.18.01.23.03.06	Real Estate PL 91-646 Assstnce D	1.00	EA	6,300	0	0	6,300	6283.00
6.18.01.23.03.15	Real Estate Payment Documents	1.00	EA	261,700	0	0	261,700	261701
	TOTAL LANDS AND DAMAGES	1.00	EA	535,700	0	0	535,700	535730
	TOTAL LANDS AND DAMAGES	1.00	EA	535,700	0	0	535,700	535730
	TOTAL LANDS AND DAMAGES	1.00	EA	535,700	0	0	535,700	535730
6.18.06	FISH AND WILDLIFE FACILITIES							
6.18.06.03	WILDLIFE FACILITIES/SANCTUARY							
6.18.06.03.49	Adapative Management Costs							
6.18.06.03.49.01	Backwaters & Trib Mouths Dredgin	1.00	JOB	83,400	16,700	5,100	105,200	105184
6.18.06.03.49.02	Gravel Bar Monitoring	1.00	JOB	62,500	12,500	3,800	78,800	78825
6.18.06.03.49.03	Dike Field Mods	1.00	JOB	25,000	5,000	1,500	31,500	31530
6.18.06.03.49.05	Hardoods & Marshlands Monitoring	1.00	JOB	25,000	5,000	1,500	31,500	31530
	TOTAL Adapative Management Costs	1.00	EA	195,900	39,200	12,000	247,100	247069
6.18.06.03.51	Long Term Management Costs							
6.18.06.03.51.06	Bathymetry	1.00	JOB	33,400	6,700	2,000	42,100	42124
6.18.06.03.51.07	Substrate Sampling	1.00	JOB	10,000	2,000	600	12,600	12612
6.18.06.03.51.08	LIDAAR/GIS	1.00	JOB	25,000	5,000	1,500	31,500	31530
6.18.06.03.51.09	Backwater Reevaluations	1.00	JOB	13,400	2,700	800	16,900	16900
6.18.06.03.51.10	Diversity & Presence @ Trib Mout	1.00	JOB	13,400	2,700	800	16,900	16900
6.18.06.03.51.11	Gravel Model for Sus. Substrates	1.00	JOB	15,000	3,000	900	18,900	18918
6.18.06.03.51.12	Gravel Monitoring for Hab Qual	1.00	JOB	48,800	9,800	3,000	61,500	61547
6.18.06.03.51.13	Fish Sampling	1.00	JOB	50,000	10,000	3,100	63,100	63060
6.18.06.03.51.14	Hardwood Habitat Quality & Sustn	1.00	JOB	12,000	2,400	700	15,100	15134
6.18.06.03.51.15	Water Quality Monitoring	1.00	JOB	50,000	10,000	3,100	63,100	63060
	TOTAL Long Term Management Costs	1.00	EA	271,000	54,200	16,600	341,800	341785
6.18.06.03.73	WILDLIFE HABITAT							
6.18.06.03.73. D	AQUATIC SANCTUARY IMPROVEMENT	1.00	EA	113,200	22,600	6,900	142,800	142827
6.18.06.03.73. E	Other Mitigation			1,500,000	0	76,500	1,576,500	
6.18.06.03.73. F	Sampling of Areas	3.00	EA	10,500	2,100	600	13,200	4414.20
6.18.06.03.73. G	Relocate Mussel Patch P49-2	1.00	EA	10,000	2,000	600	12,600	12612
6.18.06.03.73. H	Investigate Mussel Relocation st	1.00	EA	40,000	8,000	2,400	50,400	50448
6.18.06.03.73. I	Investigate Other Mussel Relo st	1.00	EA	3,500	700	200	4,400	4414.20

	QUANTITY	UOM	CONTRACT	CONTINGN	ESCALATN	TOTAL COST	UNIT
TOTAL WILDLIFE HABITAT	1.00	EA	1,677,200	35,400	87,300	1,800,000	1800043
TOTAL WILDLIFE FACILITIES/SANCTUARY	1.00	EA	2,144,100	128,800	115,900	2,388,900	2388898
TOTAL FISH AND WILDLIFE FACILITIES	1.00	EA	2,144,100	128,800	115,900	2,388,900	2388898
6.18.09 CHANNELS AND CANALS							
6.18.09.01 CHANNELS							
6.18.09.01.16 PIPELINE DREDGING							
6.18.09.01.16. 1 DREDGING & DISPOSAL-FROM CEDEP	906760	CY	1,387,300	208,100	81,400	1,676,800	1.85
TOTAL PIPELINE DREDGING	1.00	EA	1,387,300	208,100	81,400	1,676,800	1676812
6.18.09.01.20 DISPOSAL AREAS							
6.18.09.01.20. 2 DISPOSAL PIT CONSTRUCTION	79.60	ACR	1,811,500	362,300	110,900	2,284,700	28702
6.18.09.01.20. 3 ACCESS ROAD TO PIT-BASED ON	2.25	MI	290,600	58,100	17,800	366,500	162903
TOTAL DISPOSAL AREAS	1.00	EA	2,102,100	420,400	128,700	2,651,200	2651222
6.18.09.01.30 BANK STABILZATN; DIKES & JETTIES							
TOTAL CHANNELS	1.00	EA	3,489,500	628,500	210,000	4,328,000	4328034
TOTAL CHANNELS AND CANALS	1.00	EA	3,489,500	628,500	210,000	4,328,000	4328034
6.18.12 PORTS AND HARBORS							
6.18.12.01 PORTS							
6.18.12.01.16 PIPELINE DREDGING	1.00	EA	485,300	97,100	29,700	612,100	612114
TOTAL PORTS	1.00	EA	485,300	97,100	29,700	612,100	612114
TOTAL PORTS AND HARBORS	1.00	EA	485,300	97,100	29,700	612,100	612114
6.18.18 CULTURAL RESOURCE PRESERVATION							
6.18.18.01 Cultural/Archaelogical Surveys	1.00	JOB	125,000	25,000	7,600	157,700	157650
TOTAL CULTURAL RESOURCE PRESERVATION	1.00	JOB	125,000	25,000	7,600	157,700	157650
6.18.30 PLANNING, ENGINEERING, & DESIGN	1.00	EA	314,900	63,000	19,300	397,100	397142

		QUANTITY	UOM	CONTRACT	CONTINGN	ESCALATN	TOTAL COST	UNIT
6.18.31	SUPERVISION AND INSPECTION	1.00	EA	264,700	52,900	16,200	333,900	333894
	TOTAL POOL 18	1.00	EA	7,359,300	995,400	398,800	8,753,500	8753461
	TOTAL REACH 6	1.00	EA	19,523,600	2,505,700	1,068,800	23,098,100	23098095
	TOTAL DREDGE ALT,CUT M-K TO 15' 7/05	1.00	EA	60,854,800	9,522,900	3,425,300	73,803,000	73802980

	QUANTITY	UOM	CONTRACT	CONTINGN	ESC COST	PROJECT
5 REACH 5						
5.01 LANDS AND DAMAGES						
5.01.23 LANDS AND DAMAGES						
5.01.23.03 LANDS AND DAMAGES	1.00	EA	2,142,900	0	2,142,900	2,142,900
5.01.23 LANDS AND DAMAGES	1.00	EA	2,142,900	0	2,142,900	2,142,900
5.01 LANDS AND DAMAGES	1.00	EA	2,142,900	0	2,142,900	2,142,900
5.05 LOCKS						
5.05.00 LOCKS						
5.05.00.61 GUIDE WALLS	1.00	EA	475,000	95,000	504,100	599,100
5.05.00 LOCKS	1.00	EA	475,000	95,000	504,100	599,100
5.05 LOCKS	1.00	EA	475,000	95,000	504,100	599,100
5.06 FISH AND WILDLIFE FACILITIES						
5.06.03 WILDLIFE FACILITIES/SANCTUARY						
5.06.03.49 Adapative Management Costs	1.00	EA	542,000	108,400	575,200	683,600
5.06.03.50 Long Term Management Costs	1.00	EA	542,000	108,400	575,200	683,600
5.06.03.73 WILDLIFE HABITAT	1.00	EA	1,217,800	108,500	1,285,400	1,394,000
5.06.03 WILDLIFE FACILITIES/SANCTUARY	1.00	EA	2,301,800	325,300	2,435,800	2,761,100
5.06 FISH AND WILDLIFE FACILITIES	1.00	EA	2,301,800	325,300	2,435,800	2,761,100
5.09 CHANNELS AND CANALS						
5.09.01 CHANNELS						
5.09.01.16 PIPELINE DREDGING	1.00	EA	14,032,400	2,121,000	14,856,200	16,977,200
5.09.01.20 DISPOSAL AREAS	1.00	EA	13,066,800	2,613,400	13,866,500	16,479,800
5.09.01.30 BANK STABILZATN; DIKES & JETTIES	1.00	EA	3,885,900	777,200	4,123,700	4,900,800
5.09.01 CHANNELS	1.00	EA	30,985,000	5,511,600	32,846,300	38,357,900
5.09 CHANNELS AND CANALS	1.00	EA	30,985,000	5,511,600	32,846,300	38,357,900
5.12 PORTS AND HARBORS						
5.12.01 PORTS						
5.12.01.16 PIPELINE DREDGING	1.00	EA	195,500	39,100	207,400	246,500
5.12.01 PORTS	1.00	EA	195,500	39,100	207,400	246,500
5.12 PORTS AND HARBORS	1.00	EA	195,500	39,100	207,400	246,500

	QUANTITY	UOM	CONTRACT	CONTINGN	ESC COST	PROJECT
5.18 CULTURAL RESOURCE PRESERVATION						
5.18.01 Cultural/Archaelogical Surveys						
5.18.01.00 <<< Not Identified >>>	1.00	EA	250,000	50,000	265,300	315,300
5.18.01 Cultural/Archaelogical Surveys	1.00	JOB	250,000	50,000	265,300	315,300
5.18 CULTURAL RESOURCE PRESERVATION	1.00	JOB	250,000	50,000	265,300	315,300
5.30 PLANNING, ENGINEERING, & DESIGN						
5.30.00 <<< Not Identified >>>						
5.30.00.00 <<< Not Identified >>>	1.00	EA	2,596,100	519,200	2,755,000	3,274,200
5.30.00 <<< Not Identified >>>	1.00	JOB	2,596,100	519,200	2,755,000	3,274,200
5.30 PLANNING, ENGINEERING, & DESIGN	1.00	EA	2,596,100	519,200	2,755,000	3,274,200
5.31 SUPERVISION AND INSPECTION						
5.31.00 <<< Not Identified >>>						
5.31.00.00 <<< Not Identified >>>	1.00	EA	2,384,900	477,000	2,530,800	3,007,800
5.31.00 <<< Not Identified >>>	1.00	JOB	2,384,900	477,000	2,530,800	3,007,800
5.31 SUPERVISION AND INSPECTION	1.00	EA	2,384,900	477,000	2,530,800	3,007,800
5 REACH 5	1.00	EA	41,331,200	7,017,200	43,687,700	50,704,900
6 REACH 6						
6.01 LANDS AND DAMAGES						
6.01.23 LANDS AND DAMAGES						
6.01.23.03 LANDS AND DAMAGES	1.00	EA	1,071,500	0	1,071,500	1,071,500
6.01.23 LANDS AND DAMAGES	1.00	EA	1,071,500	0	1,071,500	1,071,500
6.01 LANDS AND DAMAGES	1.00	EA	1,071,500	0	1,071,500	1,071,500
6.06 FISH AND WILDLIFE FACILITIES						
6.06.03 WILDLIFE FACILITIES/SANCTUARY						
6.06.03.49 Adapative Management Costs	1.00	EA	391,800	78,400	415,800	494,100
6.06.03.51 Long Term Management Costs	1.00	EA	542,000	108,400	575,200	683,600
6.06.03.73 WILDLIFE HABITAT	1.00	EA	5,246,800	101,400	5,519,600	5,621,000
6.06.03 WILDLIFE FACILITIES/SANCTUARY	1.00	EA	6,180,600	288,100	6,510,600	6,798,700
6.06 FISH AND WILDLIFE FACILITIES	1.00	EA	6,180,600	288,100	6,510,600	6,798,700

	QUANTITY	UOM	CONTRACT	CONTINGN	ESC COST	PROJECT
6.09 CHANNELS AND CANALS						
6.09.01 CHANNELS						
6.09.01.16 PIPELINE DREDGING	1.00	EA	4,735,000	710,200	5,012,700	5,722,900
6.09.01.20 DISPOSAL AREAS	1.00	EA	5,191,300	1,038,300	5,509,000	6,547,300
6.09.01.30 BANK STABILZATN; DIKES & JETTIES	1.00	EA	0	0	0	0
6.09.01 CHANNELS	1.00	EA	9,926,300	1,748,500	10,521,700	12,270,200
6.09 CHANNELS AND CANALS	1.00	EA	9,926,300	1,748,500	10,521,700	12,270,200
6.12 PORTS AND HARBORS						
6.12.01 PORTS						
6.12.01.16 PIPELINE DREDGING	1.00	EA	485,300	97,100	515,000	612,100
6.12.01 PORTS	1.00	EA	485,300	97,100	515,000	612,100
6.12 PORTS AND HARBORS	1.00	EA	485,300	97,100	515,000	612,100
6.18 CULTURAL RESOURCE PRESERVATION						
6.18.01 Cultural/Archaelogical Surveys						
6.18.01.00 <<< Not Identified >>>	1.00	EA	250,000	50,000	265,300	315,300
6.18.01 Cultural/Archaelogical Surveys	1.00	JOB	250,000	50,000	265,300	315,300
6.18 CULTURAL RESOURCE PRESERVATION	1.00	JOB	250,000	50,000	265,300	315,300
6.30 PLANNING, ENGINEERING, & DESIGN						
6.30.00 <<< Not Identified >>>						
6.30.00.00 <<< Not Identified >>>	1.00	EA	862,300	172,500	915,100	1,087,600
6.30.00 <<< Not Identified >>>	1.00	JOB	862,300	172,500	915,100	1,087,600
6.30 PLANNING, ENGINEERING, & DESIGN	1.00	EA	862,300	172,500	915,100	1,087,600
6.31 SUPERVISION AND INSPECTION						
6.31.00 <<< Not Identified >>>						
6.31.00.00 <<< Not Identified >>>	1.00	EA	747,500	149,500	793,300	942,800
6.31.00 <<< Not Identified >>>	1.00	JOB	747,500	149,500	793,300	942,800
6.31 SUPERVISION AND INSPECTION	1.00	EA	747,500	149,500	793,300	942,800
6 REACH 6	1.00	EA	19,523,600	2,505,700	20,592,400	23,098,100

	QUANTITY	UOM	CONTRACT	CONTINGN	ESC COST	PROJECT
DREDGE ALT,CUT M-K TO 15' 7/05	1.00	EA	60,854,800	9,522,900	64,280,100	73,803,000

ARKANSAS RIVER NAVIGATION STUDY,
ARKANSAS AND OKLAHOMA
FEASIBILITY STUDY

TAB J

- Cost Summary -

Summary of Costs of Deepening the McClellan-Kerr Arkansas River Navigation Channel-Mouth of the White River (Navigation Mile (NM) 0.0) to Catoosa, OK (NM 445.2)

	Depth of Channel		
	10 foot	**11 foot**	**12 foot**
GRAND TOTAL - REACHES 1 THRU 6			
Construction			
02.03 Demolition	$1,473,430	$1,473,430	$1,473,430
05.62 Locks - Pin Guide Walls	$3,327,625	$3,327,725	$3,327,725
09.01.16 Dredging and Rock Removal	$12,622,458	$24,096,037	$30,736,208
09.01.20 Dredged Material Disposal Areas	$18,762,850	$27,123,250	$31,650,950
09.01.30 Dikes and Jetties	$21,964,037	$28,082,076	$38,859,990
Subtotal	$58,150,400	$84,102,518	$106,048,303
01. Real Estate - Dredge Material Disposal Areas	$4,322,060	$4,322,060	$4,322,060
06. Mitigation	$22,784,371	$23,042,471	$23,042,471
06. Environmental Sustainability	$620,116	$620,116	$620,116
Subtotal	$27,106,431	$27,364,531	$27,364,531
12. Investment by Ports (Non-Federal)	$246,557	$529,985	$961,163
18. Cultural Resource Preservation	$882,640	$882,840	$882,840
30. Planning Engineering and Design	$8,067,757	$9,424,856	$12,189,970
31. Contract Administration	$4,931,540	$6,478,194	$8,549,387
Total	$99,385,325	$128,782,924	$155,996,194
Note: Contingency included in the total above is	$15,569,069	$19,968,794	$24,424,178
Escalation included in the total above is	$4,144,935	$5,516,984	$6,688,986
Operations and Maintenance (O&M) (Annual Cost)			
Dredging	$847,521	$1,274,851	$1,772,702
Locks, Tow Haulage	$72,586	$144,956	$211,230
Dikes and Jetties	$383,999	$383,999	$383,999
Mitigation and Monitoring	$192,452	$192,452	$192,452
Engineering and Design	$82,139	$113,589	$125,763
Contract Administration	$89,497	$124,230	$137,590
Total Annual O&M	$1,668,193	$2,234,076	$2,823,735

1/ Based on MCACES cost estimates prepared 18 Jul 2005.

2/ Based on MCACES cost estimates prepared 18 Jul 2005.

Summary of Costs of Deepening the McClellan-Kerr Arkansas River Navigation Channel-Mouth of the White River (Navigation Mile (NM) 0.0) to Catoosa, OK (NM 445.2)

	Depth of Channel		
	10 foot	**11 foot**	**12 foot**
Reach 1 - Mouth of White River, AR to Pine Bluff, AR (NM 0.0 to NM 75.2)			
Construction			
02.03 Demolition	$1,473,430	$1,473,430	$1,473,430
05.62 Locks - Pin Guide Walls	$1,819,083	$1,819,083	$1,819,083
09.01.16 Dredging and Rock Removal	$1,481,144	$1,911,719	$3,109,358
09.01.20 Dredged Material Disposal Areas	$8,623,850	$8,623,850	$8,623,850
09.01.30 Dikes and Jetties	$7,509,407	$8,078,326	$9,609,054
Subtotal	$20,906,914	$21,906,408	$24,634,775
01. Real Estate - Dredge Material Disposal Areas	$1,107,760	$1,107,760	$1,107,760
06. Mitigation	$4,440,544	$4,440,544	$4,440,544
06. Environmental Sustainability	$299,844	$299,844	$299,844
Subtotal	$5,848,148	$5,848,148	$5,848,148
12. Investment by Ports (Non-Federal)	$0	$18,842	$20,669
18. Cultural/Archelogical Surveys	$189,180	$189,180	$189,180
30. Planning Engineering and Design	$2,677,317	$2,689,929	$3,392,596
31. Contract Administration	$1,664,784	$1,740,456	$1,942,248
Total 1/	$31,286,343	$32,392,963	$36,027,616
Note: Contingency included in the total above is	$5,411,257	$5,600,096	$6,212,456
Escalation included in the total above is	$1,193,225	$1,241,964	$1,384,416
Operations and Maintenance (O&M) (Annual Cost)			
Dredging	$49,606	$101,651	$180,622
Locks, Tow Haulage	$33,002	$65,905	$96,021
Dikes and Jetties	$80,496	$80,496	$80,496
Mitigation and Monitoring	$122,163	$122,163	$122,163
Engineering and Design	$11,655	$16,079	$17,267
Contract Administration	$13,031	$17,977	$19,304
Total Annual O&M 2/	$309,953	$404,271	$515,873

1/ Based on MCACES cost estimates prepared 18 Jul 2005.

2/ Based on MCACES cost estimates prepared 18 Jul 2005.

Summary of Costs of Deepening the McClellan-Kerr Arkansas River Navigation Channel-Mouth of the White River (Navigation Mile (NM) 0.0) to Catoosa, OK (NM 445.2)

	Depth of Channel		
	10 foot	**11 foot**	**12 foot**
Reach 2 - Pine Bluff, AR to Little Rock, AR (NM 75.2 to NM 119.5)			
Construction			
02.03 Demolition	$0	$0	$0
05.62 Locks - Pin Guide Walls	$454,771	$454,771	$454,771
09.01.16 Dredging and Rock Removal	$185,334	$422,485	$835,530
09.01.20 Dredged Material Disposal Areas	$0	$0	$0
09.01.30 Dikes and Jetties	$3,583,477	$4,061,662	$4,933,846
Subtotal	$4,223,582	$4,938,918	$6,224,147
01. Real Estate - Dredge Material Disposal Areas	$0	$0	$0
06. Mitigation	$2,564,886	$2,564,886	$2,564,886
06. Environmental Sustainability	$320,272	$320,272	$320,272
Subtotal	$2,885,158	$2,885,158	$2,885,158
12. Investment by Ports (Non-Federal)	$0	$20,871	$24,726
18. Cultural Resource Preservation	$63,060	$63,060	$63,060
30. Planning Engineering and Design	$1,053,711	$1,059,025	$980,762
31. Contract Administration	$454,234	$507,223	$602,345
Total 1/	$8,679,745	$9,474,255	$10,780,198
Note: Contingency included in the total above is	$1,625,031	$1,765,055	$1,996,560
Escalation included in the total above is	$347,034	$379,843	$430,930
Operations and Maintenance (O&M) (Annual Cost)			
Dredging	42,863	83,708	147,597
Locks, Tow Haulage	5,654	11,293	16,459
Dikes and Jetties	57,505	57,505	57,505
Mitigation and Monitoring	13,783	13,783	13,783
Engineering and Design	8,956	12,429	13,530
Contract Administration	10,014	13,896	15,127
Total Annual O&M 2/	$138,775	$192,614	$264,001

1/ Based on MCACES cost estimates prepared 18 Jul 2005.

2/ Based on MCACES cost estimates prepared 18 Jul 2005.

Summary of Costs of Deepening the McClellan-Kerr Arkansas River Navigation Channel-Mouth of the White River (Navigation Mile (NM) 0.0) to Catoosa, OK (NM 445.2)

	Cost		
Depth of Channel	**10 foot**	**11 foot**	**12 foot**
Reach 3 - Little Rock, AR to Dardanelle, AR (NM 119.5 to NM 220.3)			
Construction			
02.03 Demolition	$0	$0	$0
05.62 Locks - Pin Guide Walls	$454,771	454,771	454,771
09.01.16 Dredging and Rock Removal	$368,083	$799,621	$1,937,738
09.01.20 Dredged Material Disposal Areas	$0	$0	$0
09.01.30 Dikes and Jetties	$2,171,773	$5,476,284	$9,233,573
Subtotal	$2,994,627	$6,730,676	$11,626,082
01. Real Estate - Dredge Material Disposal Areas	$0	$0	$0
06. Mitigation	$4,626,095	$4,626,095	$4,626,095
06. Environmental Sustainability	$0	$0	$0
Subtotal	$4,626,095	$4,626,095	$4,626,095
12. Investment by Ports (Non-Federal)	$22,157	$27,299	$32,440
18. Cultural Resource Preservation	$0	$0	$0
30. Planning Engineering and Design	$1,222,993	$1,394,600	$1,837,679
31. Contract Administration	$477,846	$749,544	$1,109,138
Total 1/	$9,343,718	$13,528,214	$19,231,434
Note: Contingency included above is	$1,808,677	$2,600,867	$3,635,152
Escalation included in the total above is	$391,538	$557,201	$782,712
Operations and Maintenance (O&M) (Annual Cost)			
Dredging	49,728	129,375	276,245
Locks, Tow Haulage	22,620	45,172	65,834
Dikes and Jetties	28,747	28,747	28,747
Mitigation and Monitoring	19,828	19,828	19,828
Engineering and Design	6,884	13,654	19,803
Contract Administration	7,696	15,266	22,140
Total Annual O&M 2/	$135,503	$252,042	$432,597

1/ Based on MCACES cost estimates prepared 18 Jul 2005.

2/ Based on MCACES cost estimates prepared 18 Jul 2005.

Summary of Costs of Deepening the McClellan-Kerr Arkansas River Navigation Channel-Mouth of the White River (Navigation Mile (NM) 0.0) to Catoosa, OK (NM 445.2)

	Depth of Channel		
	10 foot	**11 foot**	**12 foot**
Reach 4 - Dardanelle, AR to Fort Smith, AR (NM 220.0 to NM 308.7)			
Construction			
02.03 Demolition	$0	$0	$0
05.62 Locks - Pin Guide Walls	0	0	0
09.01.16 Dredging and Rock Removal	$708,897	$1,133,412	$2,153,482
09.01.20 Dredged Material Disposal Areas	$0	$0	$0
09.01.30 Dikes and Jetties	$6,043,480	$6,704,204	$10,182,717
Subtotal	$6,752,377	$7,837,616	$12,336,199
01. Real Estate - Dredge Material Disposal Areas	$0	$0	$0
06. Mitigation	$1,851,146	$1,851,146	$1,851,146
06. Environmental Sustainability	$0	$0	$0
Subtotal	$1,851,146	$1,851,146	$1,851,146
12. Investment by Ports (Non-Federal)	$0	$20,873	$24,728
18. Cultural Resource Preservation	$0	$0	$0
30. Planning Engineering and Design	$1,047,736	$1,079,002	$1,617,133
31 Contract Administration	$533,976	$614,771	$945,056
Total 1/	$10,185,235	$11,403,408	$16,774,262
Note: Contingency included above is	$1,873,304	$2,082,976	$3,057,110
Escalation included in the total above is	$403,338	$452,276	$665,628
Operations and Maintenance (O&M) (Annual Cost)			
Dredging	255,324	385,117	520,238
Locks, Tow Haulage	11,310	22,586	32,916
Dikes and Jetties	17,251	17,251	17,251
Mitigation and Monitoring	5,269	5,269	5,269
Engineering and Design	23,299	34,332	34,710
Contract Administration	26,048	38,383	38,807
Total Annual O&M 2/	$338,501	$502,938	$649,191

1/ Based on MCACES cost estimates prepared 18 Jul 2005.

2/ Based on MCACES cost estimates prepared 18 Jul 2005.

Summary of Costs of Deepening the McClellan-Kerr Arkansas River Navigation Channel-Mouth of the White River (Navigation Mile (NM) 0.0) to Catoosa, OK (NM 445.2)

	Depth of Channel		
	10 foot	**11 foot**	**12 foot**
Reach 5 - Ft. Smith, AR to Muskogee, OK (NM 308.7 to NM 394.0)			
Construction			
02. Demolition	$0	$0	$0
05.62 Locks - Pin Guide Walls	$599,000	$599,100	$599,100
09.01.16 Dredging and Rock Removal	$7,870,900	$16,676,900	$16,977,200
09.01.20 Dredged Material Disposal Areas	$6,429,100	$13,862,800	$16,479,800
09.01.30 Dikes and Jetties	$2,655,900	$3,761,600	$4,900,800
Subtotal	$17,554,900	$34,900,400	$38,956,900
01. Real Estate - Dredge Material Disposal Areas	$2,142,900	$2,142,900	$2,142,900
06. Mitigation	$2,503,000	$2,761,100	$2,761,100
06. Environmental Sustainability	$0	$0	$0
Subtotal	$4,645,900	$4,904,000	$4,904,000
12. Investment by Ports (Non-Federal)	$20,400	$34,000	$246,500
18. Cultural Resource Preservation	$315,200	$315,200	$315,200
30. Planning Engineering and Design	$1,518,400	$2,482,200	$3,274,200
31. Contract Administration	$1,364,200	$2,268,000	$3,007,800
Total 1/	$25,419,000	$44,903,800	$50,704,600
Note: Contingency included above is	$3,417,500	$6,181,500	$7,017,200
Escalation included in the total above is	$1,129,500	$2,078,800	$2,356,500
Operations and Maintenance (O&M) (Annual Cost)			
Dredging	250,000	300,000	334,000
Locks, Tow Haulage	0	0	0
Dikes and Jetties	168,000	168,000	168,000
Mitigation and Monitoring	7,500	7,500	7,500
Engineering and Design	19,573	21,873	23,437
Contract Administration	20,424	22,824	24,456
Total Annual O&M 2/	$465,497	$520,197	$557,393

1/ Based on MCACES cost estimates prepared 18 Jul 2005.

2/ O&M cost estimates prepared 3 June 2005 by Tulsa District Operations Division.

Note: In accordance to Table 4-8 in Feasibility Report, E&D and S&A are approximately 4% of Total O&M costs, with contingencies of 15% and 20%

Summary of Costs of Deepening the McClellan-Kerr Arkansas River Navigation Channel-Mouth of the White River (Navigation Mile (NM) 0.0) to Catoosa, OK (NM 445.2)

	Depth of Channel		
	10 foot	**11 foot**	**12 foot**
Reach 6 - Muskogee, OK to Catoosa, OK (NM 394.0 to NM 445.2)			
Construction			
02. Demolition	$0	$0	$0
05.62 Locks - Pin Guide Walls	$0	$0	$0
09.01.16 Dredging and Rock Removal	$2,008,100	$3,151,900	$5,722,900
09.01.20 Dredged Material Disposal Areas	$3,709,900	$4,636,600	$6,547,300
09.01.30 Dikes and Jetties	$0	$0	$0
Subtotal	$5,718,000	$7,788,500	$12,270,200
01. Real Estate - Dredge Material Disposal Areas	$1,071,400	$1,071,400	$1,071,400
06. Mitigation	$6,798,700	$6,798,700	$6,798,700
06. Environmental Sustainability	$0	$0	$0
Subtotal	$7,870,100	$7,870,100	$7,870,100
12. Investment by Ports (Non-Federal)	$204,000	$408,100	$612,100
18. Cultural Resource Preservation	315,400	$315,400	$315,400
30. Planning Engineering and Design	$547,600	$720,100	$1,087,600
31. Contract Administration	$436,500	$598,200	$942,800
Total 1/	$15,091,600	$17,700,400	$23,098,200
Note: Contingency included above is	$1,433,300	$1,738,300	$2,505,700
Escalation included in the total above is	$680,300	$806,900	$1,068,800
Operations and Maintenance (O&M) (Annual Cost)			
Dredging	200,000	275,000	314,000
Locks, Tow Haulage	0	0	0
Dikes and Jetties	32,000	32,000	32,000
Mitigation and Monitoring	23,909	23,909	23,909
Engineering and Design	11,772	15,222	17,016
Contract Administration	12,284	15,884	17,756
Total Annual O&M 2/	$279,964	$362,014	$404,680

1/ Based on MCACES cost estimates prepared 23 Jun 2005.

2/ O&M cost estimates prepared 3 June 2005 by Tulsa District Operations Division.

Note: In accordance to Table 4-8 in Feasibility Report, E&D and S&A are approximately 4% of Total O&M costs, with contingencies of 15% and 20%
Note: O&M Mitigation calculated from SWT email listing areas to be dredged on 5-10 year repeated basis.

Summary of Costs of Deepening the McClellan-Kerr Arkansas River Navigation Channel-Mouth of the White River (Navigation Mile (NM) 0.0) to Catoosa, OK (NM 445.2)

	Depth of Channel		
	10 foot	**11 foot**	**12 foot**
Subtotal Oklahoma Reaches 5 & 6 - Fort Smith, AR to Catoosa, OK (NM 308.7 to NM 445.2)			
Construction			
02. Demolition	$0	$0	$0
05.62 Locks - Pin Guide Walls	$599,000	$599,100	$599,100
09.01.16 Dredging and Rock Removal	$9,879,000	$19,828,800	$22,700,100
09.01.20 Dredged Material Disposal Areas	$10,139,000	$18,499,400	$23,027,100
09.01.30 Dikes and Jetties	$2,655,900	$3,761,600	$4,900,800
Subtotal	23,272,900	42,688,900	51,227,100
01. Real Estate - Dredge Material Disposal Areas	$3,214,300	$3,214,300	$3,214,300
06. Mitigation	$9,301,700	$9,559,800	$9,559,800
06. Environmental Sustainability	$0	$0	$0
Subtotal	$12,516,000	$12,774,100	$12,774,100
12. Investment by Ports (Non-Federal)	$224,400	$442,100	$858,600
18. Cultural Resource Preservation	$630,400	$630,600	$630,600
30. Planning Engineering and Design	$2,066,000	$3,202,300	$4,361,800
31. Contract Administration	$1,800,700	$2,866,200	$3,950,600
Total	$40,510,400	$62,604,200	$73,802,800
Note: Contingency included above is	$4,850,800	$7,919,800	$9,522,900
Escalation included in the total above is	$1,809,800	$2,885,700	$3,425,300
Operations and Maintenance (O&M) (Annual Cost)			
Dredging	$450,000	$575,000	$648,000
Locks, Tow Haulage	$0	$0	$0
Dikes and Jetties	$200,000	$200,000	$200,000
Mitigation Monitoring	$31,409	$31,409	$31,409
Engineering and Design	$31,345	$37,095	$40,453
Contract Administration	$32,708	$38,708	$42,212
Total Annual O&M	$745,461	$882,211	$962,073

Summary of Costs of Deepening the McClellan-Kerr Arkansas River Navigation Channel-Mouth of the White River (Navigation Mile (NM) 0.0) to Catoosa, OK (NM 445.2)

	Depth of Channel		
	10 foot	**11 foot**	**12 foot**
Arkansas Total - Reaches 1 Thru 4 (NM 0.0 to NM 308.7)			
Construction			
02.03 Demolition	$1,473,430	$1,473,430	$1,473,430
05.62 Locks - Pin Guide Walls	$2,728,625	$2,728,625	$2,728,625
09.01.16 Dredging and Rock Removal	$2,743,458	$4,267,237	$8,036,108
09.01.20 Dredged Material Disposal Areas	$8,623,850	$8,623,850	$8,623,850
09.01.30 Dikes and Jetties	$19,308,137	$24,320,476	$33,959,190
Subtotal	$34,877,500	$41,413,618	$54,821,203
01. Real Estate - Dredge Material Disposal Areas	$1,107,760	$1,107,760	$1,107,760
06. Mitigation	$13,482,671	$13,482,671	$13,482,671
06. Environmental Sustainability	$620,116	$620,116	$620,116
Subtotal	$15,210,547	$15,210,547	$15,210,547
12 Investment by Ports	$22,157	$87,885	$102,563
18. Cultural Resource Preservation	$252,240	$252,240	$252,240
30. Planning Engineering and Design	$6,001,757	$6,222,556	$7,828,170
31. Contract Administration	$3,130,840	$3,611,994	$4,598,787
Total	$59,242,801	$66,546,600	$82,561,270
Note: Contingency included in the total above is	$10,718,269	$12,048,994	$14,901,278
Escalation included in the total above is	$2,335,135	$2,631,284	$3,263,686
Operations and Maintenance (O&M) (Annual Cost)			
Dredging	$99,334	$231,026	$456,867
Locks, Tow Haulage	$72,586	$144,956	$211,230
Dikes and Jetties	$183,999	$183,999	$183,999
Mitigation Monitoring	$161,043	$161,043	$161,043
Engineering and Design	$50,794	$76,494	$85,310
Contract Administration	$56,789	$85,522	$95,378
Total Annual O&M	$624,545	$883,040	$1,193,827

ARKANSAS RIVER NAVIGATION STUDY,
ARKANSAS AND OKLAHOMA
FEASIBILITY STUDY

TAB K

- Contingencies to Be Used in the Cost Estimate -

Arkansas River Navigation Study
Proposed Contingencies to be used in the Cost Estimate
30 June 2005

Purpose: The purpose of this paper is to obtain SWD and HQ concurrence for the contingencies used in the baseline cost estimates for the Arkansas River Navigation Study Feasibility Report.

Guidance: ER 1110-2-1150 states in Section 13.9.1 regarding the feasibility phase baseline cost estimate "The level of detail may vary according to the design information/detail established to support the feasibility report. Contingencies shall be developed based on the risk related to the uncertainties or unanticipated conditions identified by the investigation data and design detail available at the time the estimate is prepared. Contingencies will vary throughout the cost estimate and could have a significant impact on overall costs being high when lack of design data is associated with critical cost items. Part of the PDT overall project evaluation shall be whether to perform additional investigations or studies in order to reduce the uncertainties and refine the cost estimate or to proceed with the higher estimate and contingencies."

Engineering Instructions 01D010 "Construction Cost Estimates" states in Section 13-6 b (2) table 13-1 that construction contingencies for recon/feasibility phase estimates should be 20% when construction costs are equal to or greater than $10,000,000. It further states that "The table provides a guide for contingency development and is not intended to restrict or limit contingencies to these values. If overall contingency value developed through a detailed analysis exceeds the guidelines, additional site analysis and/or design should be considered in those areas where uncertainties may be reduced."

Background: The McClellan-Kerr Arkansas River Navigation System is 445 miles in length. Construction of the navigation system reached Little Rock, AR in December 1968; Fort Smith, AR in December 1969; and the Port of Catoosa in OK, the head of navigation in December 1970. The system begins at the confluence of the White River and the Mississippi River, proceeds 10 miles upstream on the White River to the manmade Arkansas Post Canal, then 9 miles through the canal to the Arkansas River. The navigation system then crosses the State of Arkansas into Oklahoma on the Arkansas River to the mouth of the Verdigris River in Muskogee, OK. The system terminates 51 miles upstream on the Verdigris River at the Port of Catoosa near Tulsa, OK. There are 18 locks and dams on the system. Thirteen are in Arkansas and 5 are in Oklahoma. All locks are 110 fee wide and 600 feet long. Channel widths are 300 feet on the White River and Arkansas Post Canal; 250 feet on the Arkansas River; and 150 feet on the Verdigris River. The current minimum channel depth is 9 feet throughout the system.

The Cost Estimate: The total costs of implementing the navigation channel deepening alternatives include initial construction costs for: demolition; dredging; dredge material disposal areas; mitigation; real estate actions including acquisition of lands; easements;

rights-of-way; investments by ports; planning, engineering and design; and supervision and administration. In addition to the initial construction costs there are also operation and maintenance costs in the estimate and these include: maintenance dredging, maintenance of dikes and jetties, engineering and design, and supervision and administration. The initial construction costs without contingencies for the various channel depth are approximately $85,500,000 for a 10-foot depth; $110,500,000 for an 11-foot depth; and $136,600,000 for a 12-foot depth.

Engineering, Estimating, and Real Estate Experience: We have performed maintenance dredging on the system since its completion. We maintain an indefinite delivery contract for maintenance dredging and are experienced in estimating dredging costs. We know the areas where rock is likely be encountered when going to a deeper channel. Dredging costs were developed in relation to the pumping distance to the nearest disposal site. In addition, the dredging quantities are based on recent field surveys of the navigation channel.

The navigation system includes many stone dikes and revetments which were built to stabilize the channel. These structures have been maintained throughout the life of the project. We also maintain an indefinite delivery contract in order to build and/or maintain these river training structures. As with dredging, we have thirty five years of experience estimating the cost of stone structure construction and repairs.

Because of the Arkansas River Additional Land Acquisition Project (ARALA), the Little Rock District also has extensive experience related to real estate acquisitions. This project involved the acquisition of easements in over 2000 parcels of land. Real estate interests, permanent and occasional easements, along the 300-mile waterway in Arkansas have been acquired over the past 10 years to bring the existing operation plan for the navigation system into compliance with the legal obligations under the 5th Amendment to the Constitution of the United States.

Uncertianties: As with every project, there are areas of uncertainty in the cost estimates. Several primary features are sensitive to change in the channel deepening cost estimates: amount of monitoring needed for environmental mitigation, cost of petroleum products, and riprap quantity estimates for the modification and construction of structures. Petroleum prices impact the cost of production of materials such as rock riprap. The cost of petroleum is unstable; with recent prices of oil peaking over $50 a barrel and the price dependent on worldwide events, the cost estimate is sensitive to fluctuation. The riprap quantity estimates for modification and construction of structures is based on results of the hydrologic and hydraulic analysis with very limited survey data. The surveys of the navigation channel used to determine the dredge quantities did not extend out far enough to include the dikes and jetties except in Pool 2. Modeling was done in Pool 2 to determine the need to modify existing structures and/or the need for new structures to scour the channel. However, the other pools have not been modeled and the results of the Pool 2 modeling were used as the basis for estimating the structures needed in the other pools. It will be necessary to verify the estimated structures (size, location, and impacts) with proposed 2-D numerical or physical modeling in the next phase of the project study, PED. The additional modeling should refine the riprap quantities estimates.

Contingencies: The following is a summary of the contingencies that we believe are appropriate for the various features of the cost estimate.

Initial Construction

Feature	Approx. % of Total Costs	Contingency %	Rationale
Demolition	1%	80%	The demolition involves the removal of an abandoned pipeline. There is no survey data available and the district has limited experience with pipeline removal. We therefore believe a high contingence is justified.
Dredging	19%	15%	Quantities are based on actual surveys. SWL and SWT have 30+ years of experience dealing with dredging contracts. Since costs and quantities are relatively firm we believe 15% is the appropriate contingency for this feature.
Dredge Material Disposal Area	18%	20%	Almost all dredge disposal in Arkansas will be done in existing in-stream disposal areas (with the exception of the Arkansas Post Canal). Although no field survey data is available, SWL and SWT have 30+ years of experience building and maintaining dredge upland disposal areas.
Dikes and Jetties	30%	25%	Although there has been only limited

			design modeling and no survey data is available on other parts of the system besides Pool 2, the districts do have as-built drawings of existing structures, they do annual inspections, and they have 30+ years of experience building and maintaining dikes and jetties. We believe a slightly higher than normal contingency is appropriate for this feature.
Mitigation	16%	25%	The estimate is partially based on future mitigation to be determined by long-term monitoring results. Therefore we believe a higher than normal contingency is warranted.
Real Estate – Dredge Disp. Areas	2%	20% for AR; 25% for OK	Little Rock has extensive experience due to the ARALA Project. Tulsa is less experienced and therefore a higher contingency is warranted.
Investments by Ports	0.5%	20%	Although included in the cost estimate, this is not a Federal cost. Estimates were provided by port operators.
PED	8%	20%	Most of the work during PED will be the modeling of suspected trouble areas. Pool 2 was modeled during the feasibility phase and

			therefore the districts have a good grasp of the costs associated with the modeling.
S&A	6%	20%	Used 20% as indicated in Engineering Instructions 01D010.

Although not initial construction costs, operations and maintenance (O&M) costs for the 10, 11, and 12-foot channel depths are included in the cost estimates and are included in the benefit/cost ratio calculations. The O&M costs without contingencies for the various channel depth are approximately $1,140,000 for a 10-foot depth; $1,150,000 for an 11-foot depth; and $1,990,000 for a 12-foot depth. The details of the contingencies we recommend for the O&M costs are shown in the table below.

Operations and Maintenance

Feature	Approx. % of Total Costs	Contingency %	Rationale
Dredging	75%	25%	Although only limited sediment studies have been done in AR., sediment assessments and geomorphic assessments indicate negligible degradation and/or aggradation. The assessments were performed by ERDC.
Dikes & Jetties	17%	15%	The districts have a history of maintaining dikes and jetties on the system for 30+ years.
E&D	4%	15%	The districts have 30+ years of experience doing engineering and design for operation and maintenance of the navigation system
S&A	4%	20%	Used 20% as indicated in Engineering Instructions 01D010.