

SCALE 1" = 100'

City of St. Louis
Board of Public Service



**MUNICIPAL RIVER TERMINAL
SEWER CONDITION ASSESSMENT**



December 14, 2012

Prepared by

ST. LOUIS BRIDGE CONSTRUCTION COMPANY



ABS Consulting
AN ABS GROUP COMPANY



EXECUTIVE SUMMARY

St. Louis Bridge Construction team was hired by the City of St Louis to investigate and evaluate existing sewer lines within the Municipal River Terminal (MRT) property boundary. Purpose of the evaluation was to document the location and current condition of major trunk sewers, provide an opinion of their ability to support live loads, and to develop general recommendations for stockpiling bulk materials resulting in increased overburden surcharge loads if placed nearby, or directly over, existing sewer structures. This review is based only information provided by Metropolitan St. Louis Sewer District (MSD) and the City of St. Louis, as well as information obtained during field survey. Detailed engineering analysis, engineering design drawings and/or other reports for the subject sewers were not utilized in this review, based on the limited scope of this study. This report may be used in assessing surface area usage for future dock operations at the MRT, including restrictions on use due to the age or condition of existing sewers.

Based on the field inspections it was observed that the sewers were in general good condition without any major defects of immediate concern. However, the separation of the last section of the Branch sewer should be further evaluated for structural integrity of the sewer. Significant silt and debris were noticed in Benton and North Market sewers, which obstruct flow. The sewers lines reviewed as part of this report appear adequate to support concentrated loads equivalent to HS-20 truck load and/or Cooper E80 railroad live load operating on the surface of the terminal. The newly constructed sewer extension is adequate to support 250 ton crawler crane loads.

Unrestricted placement of materials on the surface, above and in vicinity of existing sewer lines may result in soil consolidation and lead to subsidence of the supporting subgrade, building foundation, etc. To avoid structural damage to existing site infrastructure, future placement of stockpiled materials on large distributed area should be restricted to locations away from existing sewer lines and site improvements. Actual stockpile limits are dependent on the weight of stockpiled material, i.e. its density and height. These limits can be determined through location-specific geotechnical analysis based on verified soil conditions and known stockpile loads. We recommend that plans for future stockpiling are subject to geotechnical review.

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1. PROJECT BACKGROUND

St. Louis Bridge Construction team was hired by the City of St Louis to investigate and evaluate existing sewer lines that exist within the Municipal River Terminal (MRT) property boundary. Purpose of the evaluation was to document the location and condition of major trunk sewers and to determine recommendations for placement of stockpiled bulk materials that may increase existing overburden surcharge loads if placed nearby, or directly over, existing sewer structures. Field evaluation of existing sewers was performed by EDSI, Inc. who also prepared sewer details profiles. Structural review and overburden evaluation was prepared by ABS Consulting with geotechnical input from TSI Engineering.

1.1 General Description of Project Area

The project area for this investigation includes four adjacent tracts of land currently leased by the MRT along the Mississippi River in St. Louis, MO. The approximate property borders are the floodwall/levee to the west, the Mississippi River to the east, Branch St. to the north, and Brooklyn St. to the south. Currently, the property is being used primarily for storage of sand, salt, coal, and other heavy materials being transported along the river. It is located within a heavy industrial area and experiences regular truck and rail traffic moving goods to and from the dock area.

1.2 Project Overview

There are 6 trunk sewer lines running under the MRT property of various sizes as outlined in Table 1. These include Branch, Palm, Benton, North Market Pressure, Madison & Chambers Pressure, and Chambers Low Level. The purpose of the compiled research and field investigations was to provide an adequate depiction of the sewer lines running under the property. This includes the size, shape, and type of each pipe, along with location, elevation, and condition. Data for existing pipes were obtained from a variety of sources including previous studies and reports, as-built drawings, design plans, and field surveys. The collected information was used to determine pipe locations and generate figures showing pipe cross sections and profiles. These were then checked against measurements and conditions observed in the field.



Table1.ListofSewers within Municipal RiverTerminal Property

Location	Upstream Structure	Outfall	Size @ Outfall	Type	Average Cover (Depth)	Description
Branch St.	18D2-080C	BP-038	11' H x14'W	RCHS	25ft	216' -11'x14' RCHS from Branch Pump Station 18D2-080C to Outfall BP-038
Palm St.	18D2-097C	BP-037	18'Wx14.4'H	RCHS	18ft	143'- 18' RCHS from Outfall BP -037 to Emergency Closure Gate 18D2-096C
Benton St.	18D3 - 136C	BP-036	51" x 84"	RCBX	22ft	450'- 60" RCP and 73' of 51" x 84" RCBX from Outfall BP 036 to new access structure
N Market St.	18D3-131C	BP-035	129" x 84"	RCBX	20ft	266'- 84" Old RCP, 45' of new 84" RCP and 44' of 129" x 84" RCBX from Outfall BP 035 to new access structure.
Madison St. & Chambers St.	18D3-145C (60" RCP) 18D3 -165C (30" RCP)	BP-034	66"	RCP	18ft	204'- 66" RCP from Outfall to Junction Chamber 18D3-090C;213'- 36" RCP from Junction Chamber to manhole 18D-165C and approx. 33'- 30" RCP to closure gate; Approx. 189'- 60" RCP from Junction Chamber to Chambers Pumping Station- 18D3-145C
Chambers St.	18D3-169C	BP-033	48" x 60"	RCBX	25ft	44' of 54" RCP from gate closure structure followed by 163' 48"x60" Egg shaped brick, followed by 195' 4'x5' RCBX to Outfall BP 033

2. DATA COLLECTION

2.1 Previous Studies and Reports

Previous studies and reports were used to obtain cross section information and as a check for data collected in the field. A similar study and condition Municipal River Terminal Sewer Evaluation assessment was complete by Horner & Shifrin in 2004. This study provided basic layout, profile, and cross-section information for several of the sewers including Benton, North Market Pressure, Madison & Chambers, and Chambers Low Level. Detailed condition assessments of the four outfall pipes mentioned above and also for the Branch outfall were included in the report. This was used as a check

when completing the condition assessment to ensure that previously noted defects were assessed for further deterioration or adequate repair and to compare noted locations of changes in pipe cross sections.

2.2 As-Built Plans for MSD Sewers

Available as-built plans were used to draw accurate cross sections and provided a check for collected field survey information. Original as-built information was obtained from the U.S. Army Corps of Engineers for the Branch, North Market Pressure, Benton, Madison & Chambers, and Chambers Low Level sewers. This information was primarily used to obtain accurate cross section and layout information. For sewers that are in the process of being built, design plans were used to create figures showing proposed pipe sizes and configurations to be use in the recommendations for future use of the MRT property. This was the case for the Palm, Benton, and North Market Pressure sewers. For Palm, work is commencing on the replacement of the sewer from the emergency closure gate to the outfall. Because the existing pipe is still in place, all figures for the Palm sewer where generated based on the proposed configurations shown on the design plans. Work is near completion on the North Market and Benton sewer extension which includes replacement of approximately 13' of pipe at the Benton outfall, approximately 45' of pipe at the North Market Pressure outfall, and construction of a new reinforced concrete box structure, which terminates at newly constructed Middle Dock bulkhead wall. Locations and elevations shown for these two sewers are based on field surveys where possible. Design plans were used to fill in information that could not be field measured due to incomplete construction or lack of access.

2.3 Field Surveys

Field surveys were conducted to obtain exact structure locations and flowlines where possible. Flowline elevations were measured at all closure structures, outfalls, and any

intermediate structures that could be located in the field, except for the Palm sewer which is currently under construction, as mentioned above. Field measurements were then used to help construct the profile and layout figures for each trunk sewer.

3. FIELD INSPECTIONS

Field inspections and surveys for the sewers within the MRT property boundary were completed on November 8th and 9th, 2012. This included GPS locations of the structures and physical inspections of the trunk sewers to document any pipe defects that were observed during the field inspection. Sewer cross-sections and plan and profile of each sewer as documented from a combination of previous record drawings, field surveys and inspections are presented in Appendix A. Field walk logs and photos taken during the inspection for the sewers are presented in Appendix B.

Branch Street Sewer

The Branch sewer is a 14' wide by 11' high reinforced concrete horseshoe with brick lining at the invert. Overall, the sewer is in good condition, but minor concrete spalling, circumferential cracks, and mineral deposits were observed at various points throughout the reach. The most significant defects were observed at the downstream end of the pipe where flow was spilling into a void below a pipe separation at the invert and daylight was visible at the crown. This section of sewer is separated from the rest of the pipe with no proper jointing as observed during inspection. Exposed rebar was also noted near the end of the pipe.

Palm Sewer

An inspection for the Palm sewer was not performed due to the ongoing replacement of the sewer from the emergency closure gate to the outfall.

Benton Sewer

The Benton sewer consists primarily of a 60" reinforced concrete pipe with a 51" x 84" reinforced concrete box at the outfall. The sewer is in generally good condition with some minor joint offsets. Silt and debris were observed throughout the sewer obstructing the flow.

North Market Pressure Sewer

The North Market Pressure sewer consists primarily of a 84" reinforced concrete pipe with a 129" x 84" reinforced concrete box at the outfall. The sewer is in generally good condition with minor offset and leaking at the joints. Silt and debris were observed throughout the sewer obstructing the flow.

Madison and Chambers Pressure Sewer

The Madison & Chambers sewer consists of a 36" and 60" reinforced concrete pipe that meet at a junction chamber and flow into a 66" reinforce concrete pipe.

Both the 60" and 66" pipes are in generally good condition. However, the 36" pipe has potentially significant defects. Offset joints were observed, including a break at the crown in the pipe just upstream of the junction chamber.

Chambers Low Level Sewer

The Chambers sewer consists of a 54" reinforced concrete pipe in good condition at the upstream end, transitioning to a 48" wide by 60" high brick egg shaped sewer with gunite lining, and then to a 48" wide by 60" high reinforced concrete box at the outfall. Missing bricks and spalled gunite lining were observed in several places throughout the brick egg shaped sewer. A significant dip with standing water was also observed in the reinforced concrete box upstream of the outfall.

4. SEWER CONDITION RECOMMENDATIONS

The plan view of the entire MRT property with location of all the sewers within the property boundary is included in Appendix C . Based on the field inspections it was observed that the sewers were in general good condition without any major defects of immediate concern. However, the separation of the last section of Branch sewer should be further evaluated for structural integrity of the sewer. Significant silt and debris were noticed in Benton and North Market sewers obstructing flow.

5. OVERBURDEN RESTRICTIONS

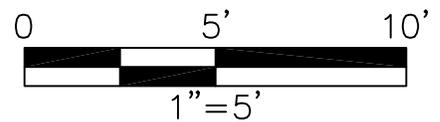
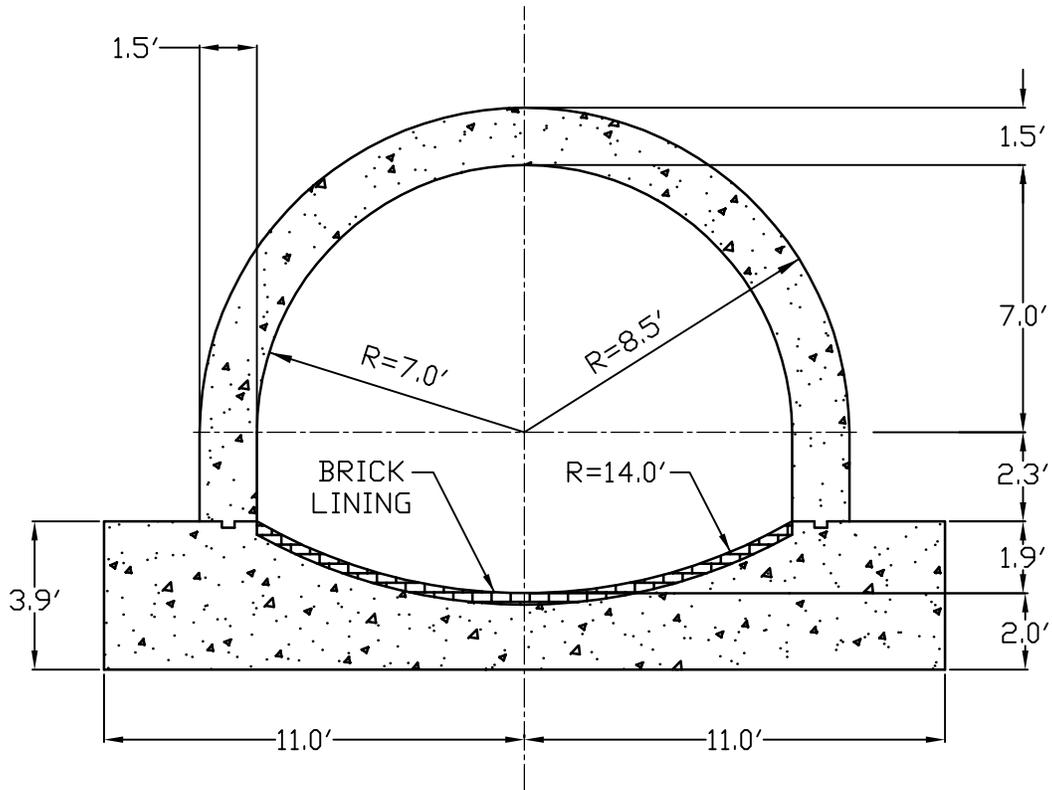
The sewers lines reviewed as part of this report appear adequate to support concentrated loads equivalent to HS-20 truck load and/or Cooper E80 railroad live load operating on the surface of the terminal. The newly constructed sewer extension is adequate to support 250 ton crawler crane loads.

The stockpiling of materials to significant heights and over large areas above the existing sewers at the Municipal River Terminal could result in consolidation of the soil beneath the pipes and resulting settlement of the sewers. To evaluate this possibility would first require characterizing the subsurface conditions beneath the sewers by means of borings and laboratory testing of the soil samples recovered. After the compressibility characteristics of the soils have been determined, a series of settlement analyses should be performed at the locations of the sewers to develop a relationship between the magnitude of the surface load, the area of the load footprint, and the resulting sewer settlement. Since there are many combinations of the magnitude and extent of distributed loads resulting from stockpiling, practical guidelines should be determined for these parameters at the start of the assessment. We recommend that plans for future stockpiling are subject to geotechnical review.

Appendix A

Sewer Cross Sections and Profiles

TYPICAL CROSS-SECTION DETAIL



SOURCE: * FIELD ASSESSMENT RECORDS

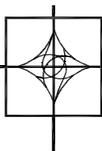
BRANCH

MUNICIPAL RIVER
TERMINAL SEWER
CROSS SECTIONS

SIZE: 14' REINFORCED CONCRETE HORSE SHOE
C.S.O.# BP-038

DATE: 11/14/2012

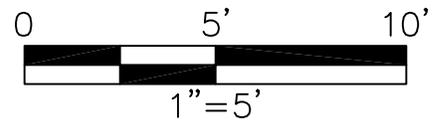
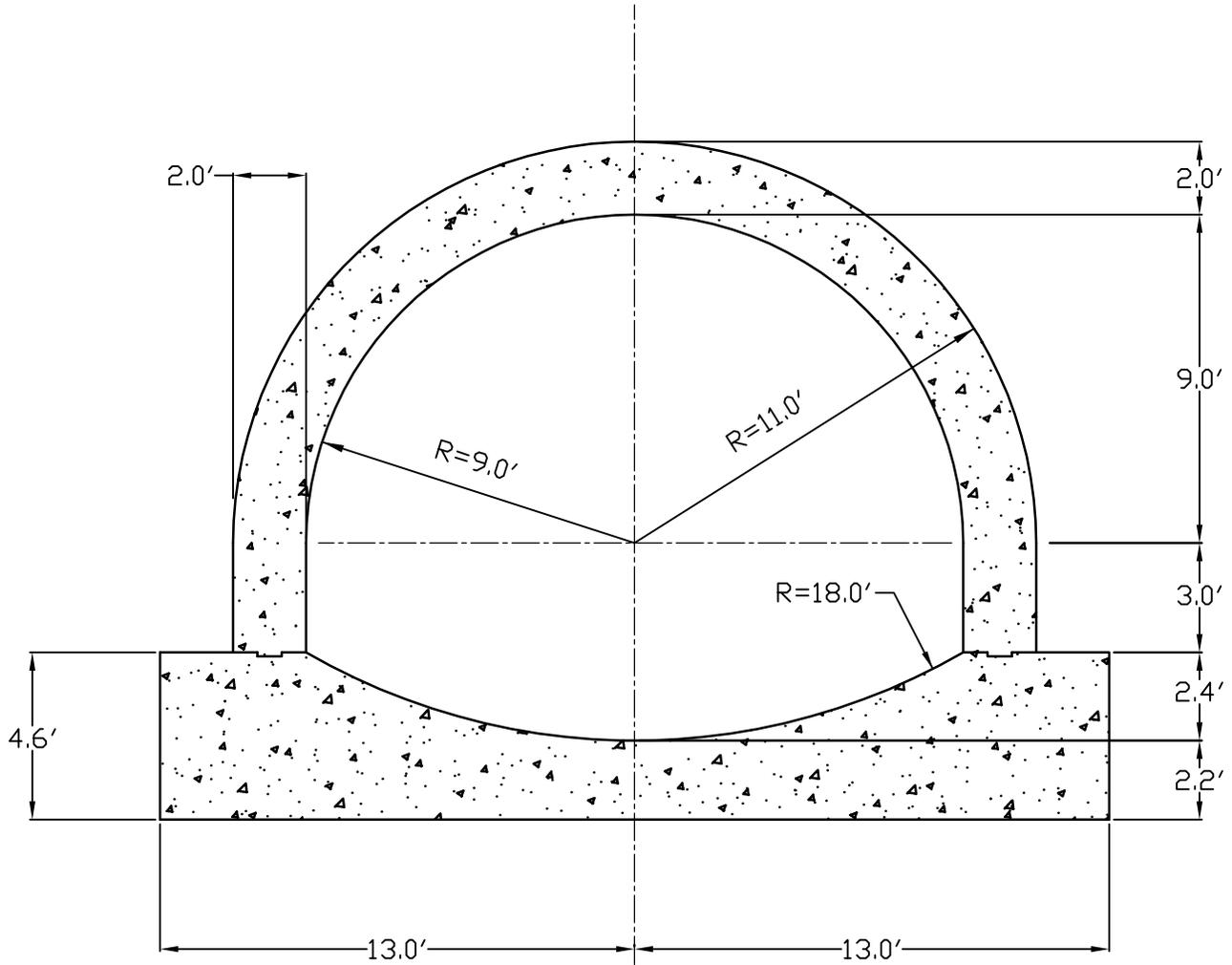
SHEET A-1



EDSI

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16141 SWINGLEY RIDGE RD., SUITE 300
CHESTERFIELD, MO 63017 (636) 537-5585

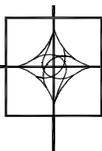
TYPICAL CROSS-SECTION DETAIL



SOURCE: * PALM SEWER REPAIR/REPLACEMENT 10727-015.1 - (2009254) SHEET 5 OF 7

PALM

MUNICIPAL RIVER
TERMINAL SEWER
CROSS SECTIONS



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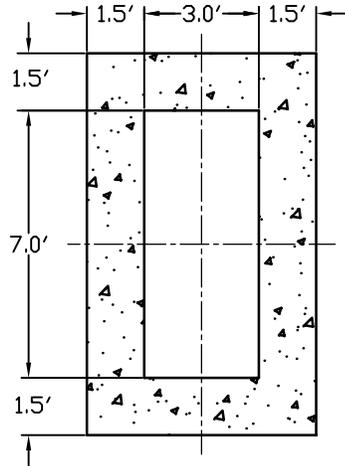
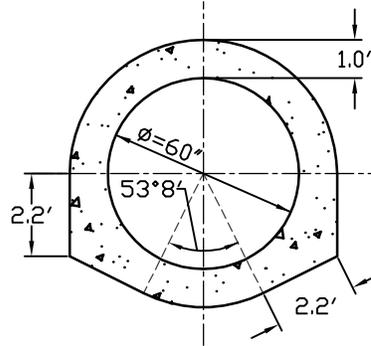
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C.S.O.# BP-037

DATE: 11/14/2012

SHEET A-2

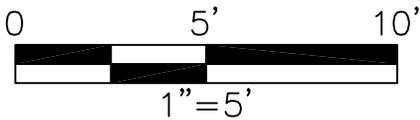
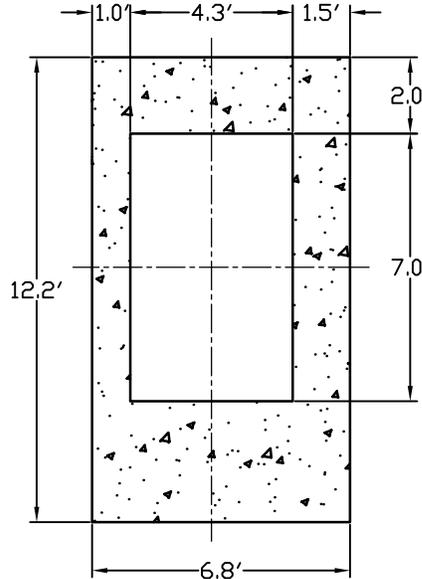
TYPICAL CROSS-SECTION DETAILS

TYPICAL CROSS-SECTION
STA 0+00 TO 4+61



TYPICAL CROSS-SECTION
STA 4+74 TO 5+05

TYPICAL CROSS-SECTION
STA 5+05 TO 5+47



SOURCE(S): * FLOOD PROTECTION-ST. LOUIS, MO. BENTON-NORTH MARKET SEWER SYSTEM ITEM S-9A
SHEET 36 OF 43
* BPS PROJ. NO. 2010-35-233-MRT SOUTH DOCK EXTENSION - SHEET 46 OF 52

BENTON

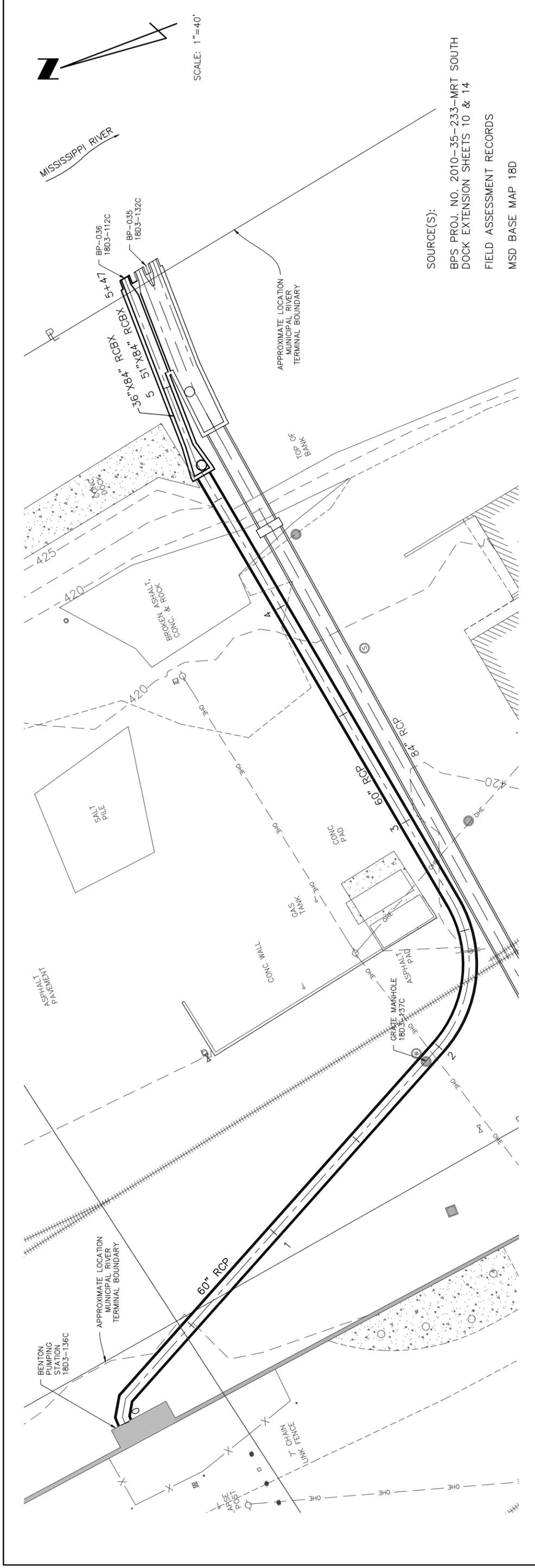
MUNICIPAL RIVER
TERMINAL SEWER
CROSS SECTIONS

SIZE(S): 60" REINFORCED CONCRETE PIPE
51"X84" REINFORCED CONCRETE BOX
C.S.O.# BP-036

DATE: 11/14/2012

SHEET A-3



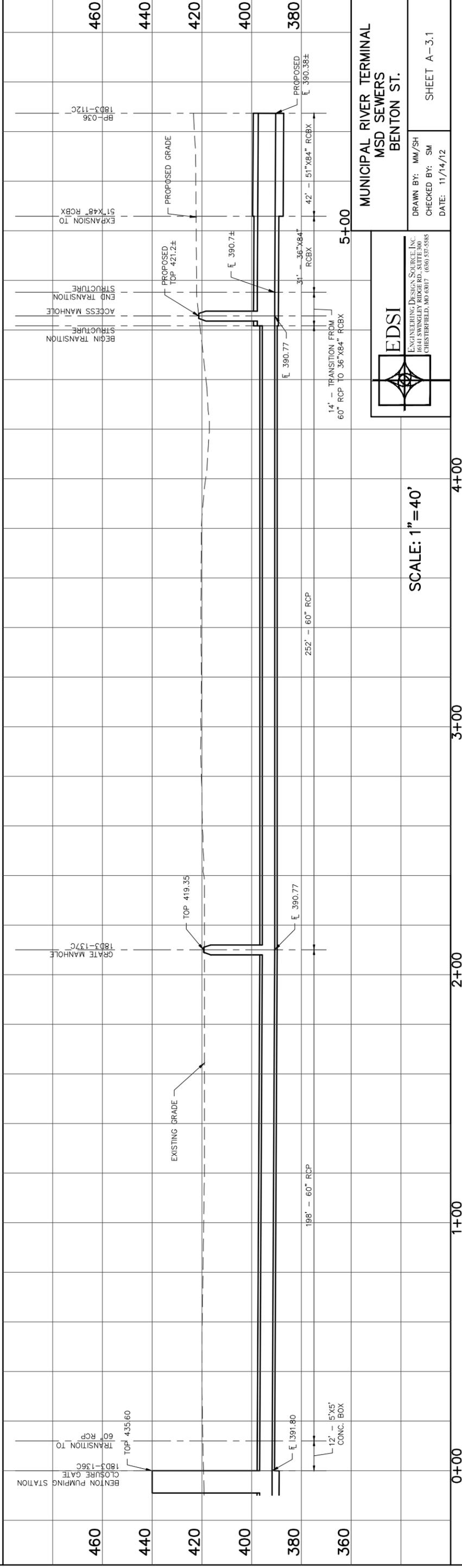


SOURCE(S):

BPS PROJ. NO. 2010-35-233-MRT SOUTH DOCK EXTENSION SHEETS 10 & 14

FIELD ASSESSMENT RECORDS

MSD BASE MAP 18D



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 CHESTERFIELD, MO 63017 (636) 537-5585

**MUNICIPAL RIVER TERMINAL
 MSD SEWERS
 BENTON ST.**

DRAWN BY: MM/SH
 CHECKED BY: SM
 DATE: 11/14/12

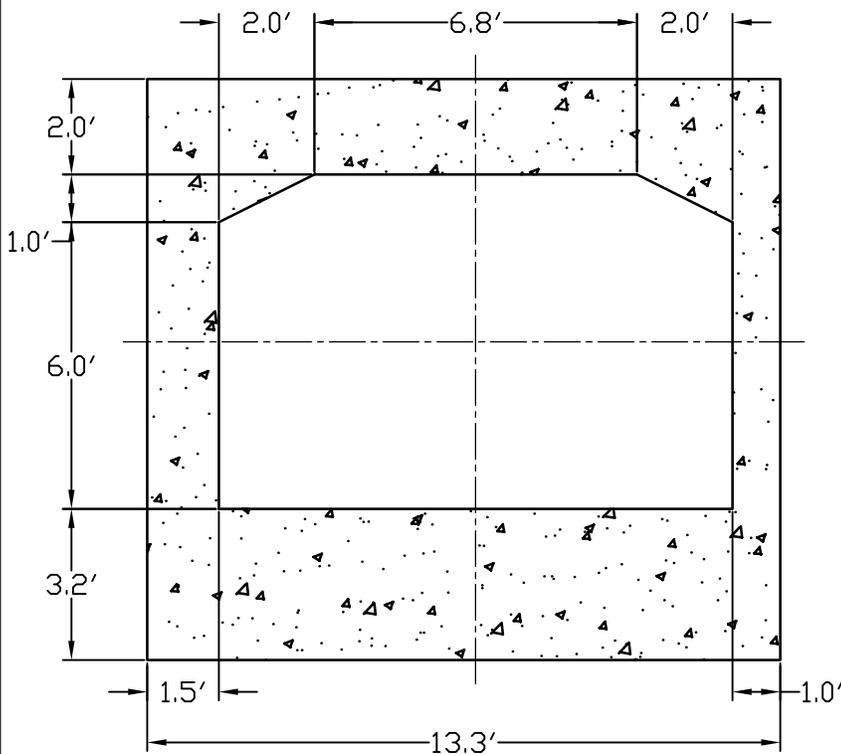
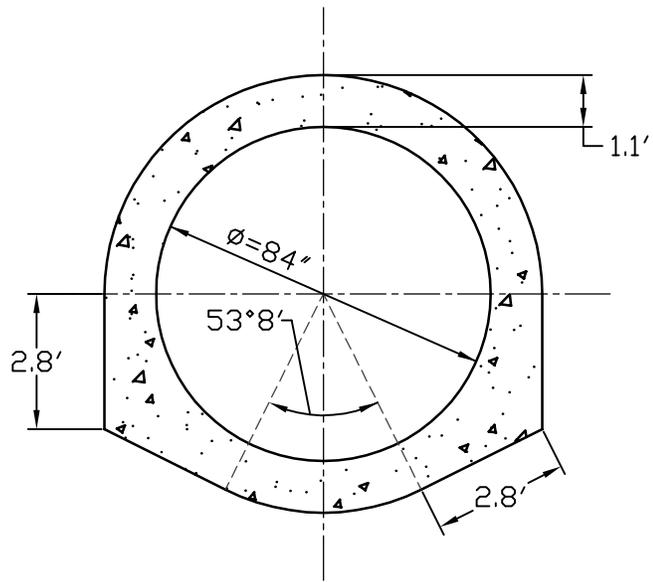
SHEET A-3.1

SCALE: 1"=40'

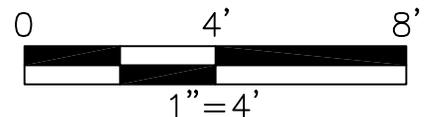
0+00 1+00 2+00 3+00 4+00 5+00

TYPICAL CROSS-SECTION DETAILS

TYPICAL CROSS-SECTION
STA 0+00 TO 3+08



TYPICAL CROSS-SECTION
STA 3+08 TO 3+80



SOURCE(S): * FLOOD PROTECTION-ST. LOUIS, MO. REACH 3-BENTON-NORTH MARKET SEWER SYSTEM ITEM S-9A
SHEET 36 OF 43
* BPS PROJ. NO. 2010-35-233-MRT SOUTH DOCK EXTENSION - SHEET 46 OF 52

NORTH MARKET PRESSURE

MUNICIPAL RIVER
TERMINAL SEWER
CROSS SECTIONS

SIZE(S): 84" REINFORCED CONCRETE PIPE
129"X84" REINFORCED CONCRETE BOX
C.S.O.# BP-035

DATE: 11/14/2012

SHEET A-4

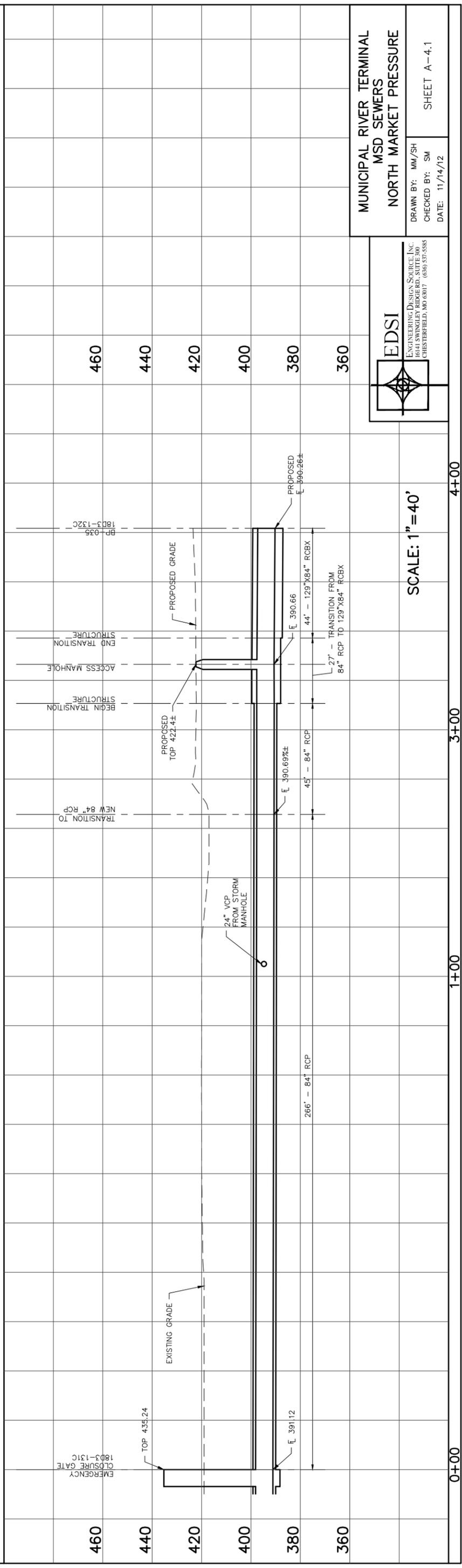
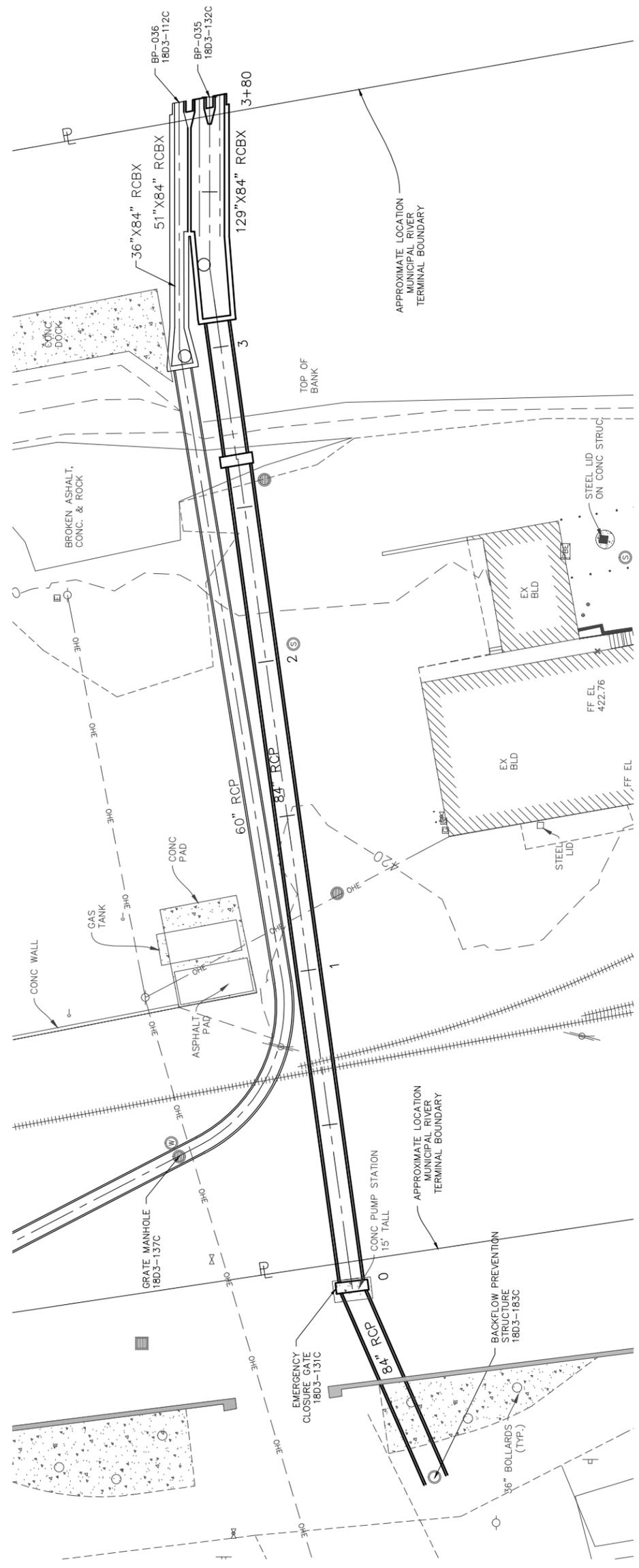




SCALE: 1"=40'

MISSISSIPPI RIVER

SOURCE(S):
 BPS PROJ. NO. 2010-35-233-MRT SOUTH
 DOCK EXTENSION SHEETS 10 & 14
 FIELD ASSESSMENT RECORDS
 MSD BASE MAP 18D

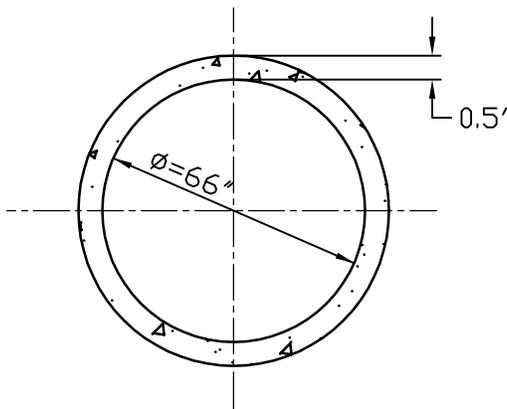
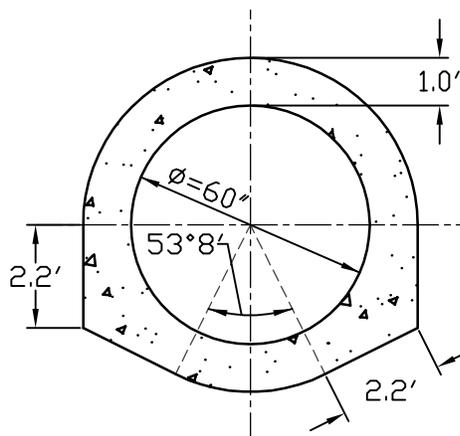


MUNICIPAL RIVER TERMINAL
 MSD SEWERS
 NORTH MARKET PRESSURE
 DRAWN BY: MM/SH
 CHECKED BY: SM
 DATE: 11/14/12
 SHEET A-4.1

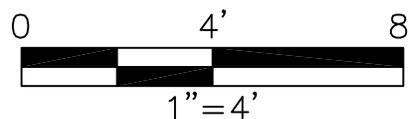
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TYPICAL CROSS-SECTION DETAILS

TYPICAL CROSS-SECTION
18D3-145C TO 18D3-090C
STA 0+00 TO 1+98



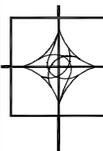
TYPICAL CROSS-SECTION
18D3-090C TO 18D3-147C
STA 1+98 TO 4+02



SOURCE(S): * FLOOD PROTECTION-ST. LOUIS, MO. REACH 3 BENTON-N.MARKET AND CHAMBERS-MADISON SEWER SYSTEM ITEMS S-9B AND S-10B SHEET 79 OF 81
* FIELD ASSESSMENT RECORDS

MADISON & CHAMBERS PRESSURE

MUNICIPAL RIVER
TERMINAL SEWER
CROSS SECTIONS



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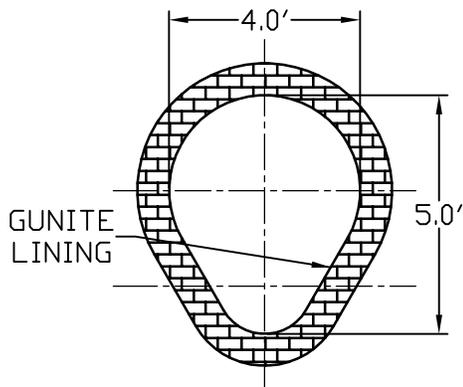
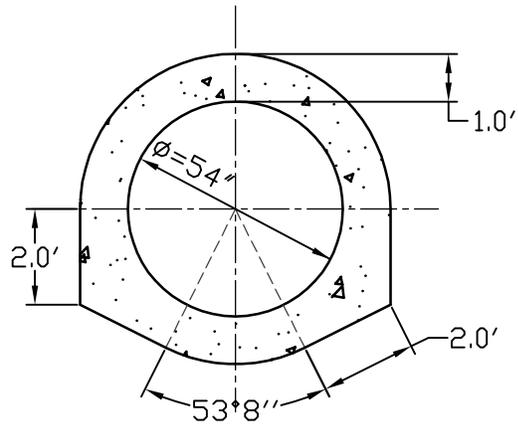
SIZE(S): 66", 60", 36" & 30"
REINFORCED CONCRETE PIPES
C.S.O.# BP-034

DATE: 11/14/2012

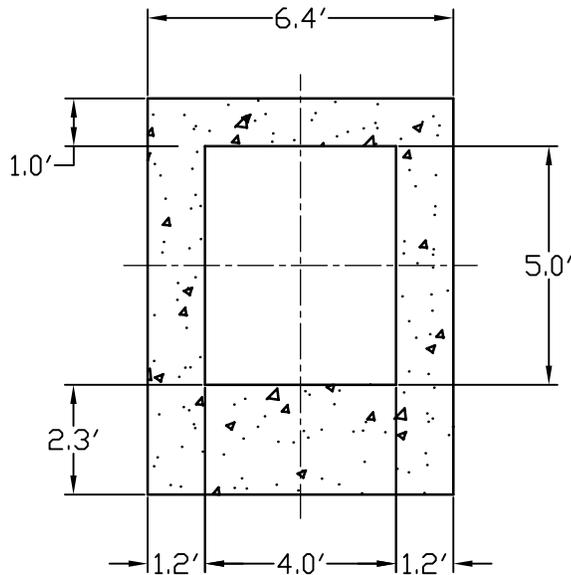
SHEET A-5

TYPICAL CROSS-SECTION DETAILS

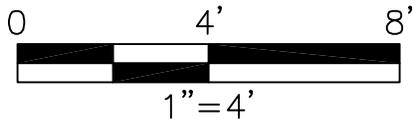
TYPICAL CROSS-SECTION
STA 0+00 TO 0+43



TYPICAL CROSS-SECTION
STA 0+43 TO 2+06



TYPICAL CROSS-SECTION
STA 2+06 TO 4+01



SOURCE(S): * FLOOD PROTECTION-ST. LOUIS, MO.-REACH 3 CHAMBERS SEWER SYSTEM ITEM S-10C, SHEET 63 OF 78
* FIELD ASSESSMENT RECORDS

CHAMBERS LOW LEVEL

SIZE(S): 48"X60" REINFORCED CONCRETE BOX
48"X60" BRICK EGG SHAPED PIPE
54" REINFORCED CONCRETE PIPE

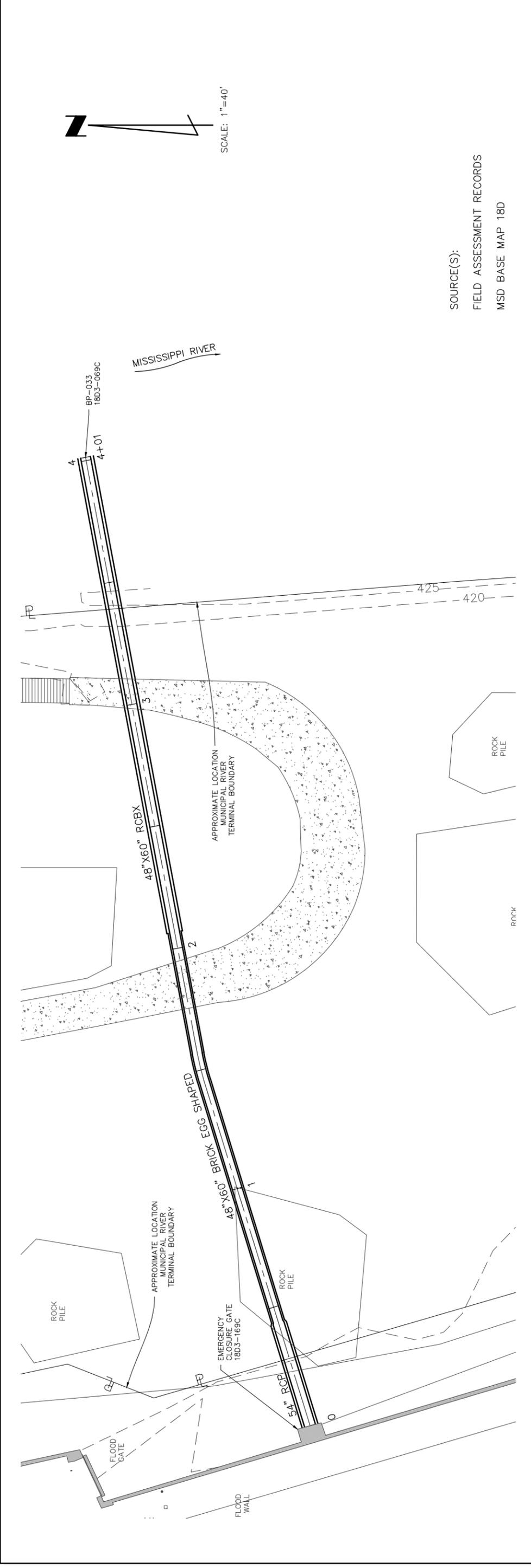
C.S.O.# BP-033

MUNICIPAL RIVER
TERMINAL SEWER
CROSS SECTIONS

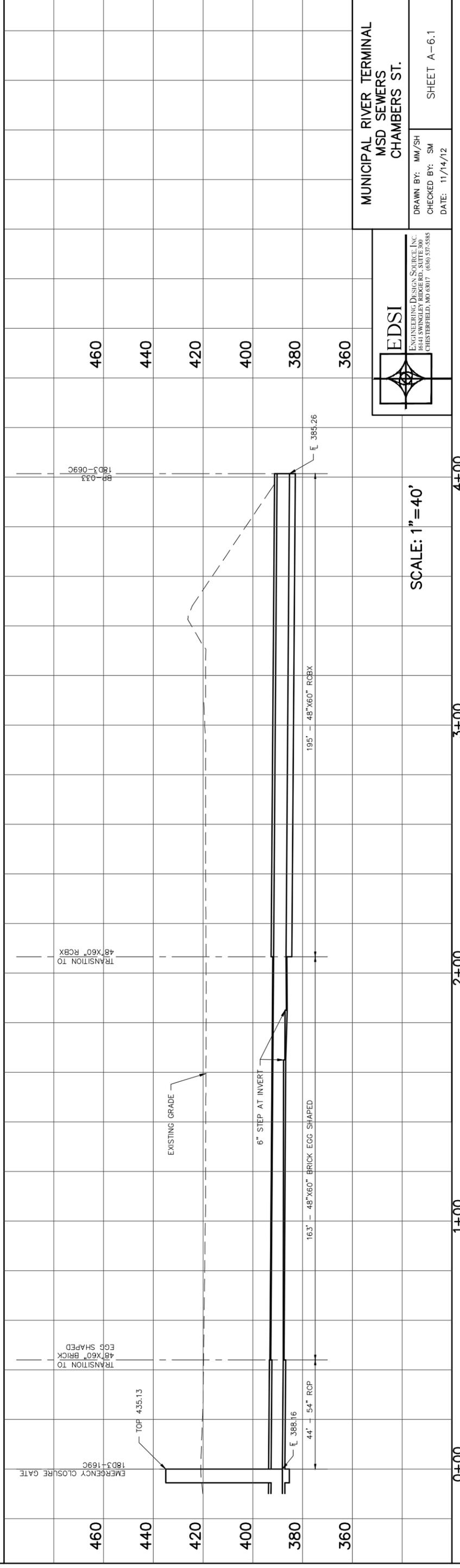
DATE: 11/14/2012

SHEET A-6





SOURCE(S):
FIELD ASSESSMENT RECORDS
MSD BASE MAP 18D



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**MUNICIPAL RIVER TERMINAL
MSD SEWERS
CHAMBERS ST.**

DRAWN BY: MM/SH
CHECKED BY: SM
DATE: 11/14/12

SHEET A-6.1

Appendix B
Field Walk Logs and Photos



Date : <u>November 8, 2012</u>		Inspection Reach (Branch Street Sewer)		
Inspection Team: SM, SH		Structure : <u>18D2-080C</u>	→	Structure : <u>BP-038 (Outfall)</u>
Upstream MH Depth	<u>48.6 ft</u>	Project Sewer : <u>Branch St. Sewer</u>	Shape :	<u>Horse shoe</u>
		Location: <u>Branch St. (Pump Station)</u>	Size :	<u>14' W x 11'H</u>
Downstream MH Depth	<u>12.5 ft</u>	Length : <u>215 ft</u>	Type:	<u>Concrete with brick invert layer</u>
Notes: 18" Concrete invert with 4" brick overlay, 2ft thick vertical wall , 18" thick concrete arch (measured at Sta. 1+77 section separation)		Weather Condition: Sunny		

Station	Defect	Description	Position	Photo
		General Condition looking upstream from fore bay		87
0+01		Minor concrete spalling at crown of arch	1:00 & 10:00	
0+01		Minor circumferencial crack		91, 92
0+03		Leaking mineral deposits, minor circumferencial crack.	Invert/Arch Interface	93
0+25		Drilled holes	3:00	94
0+35		Minor longitudinal crack	9:00	95
0+40		Minor circumferencial crack		
0+50		General Condition looking upstream.		96
0+65		Construction joint - General photo		97
0+75		Minor circumferencial crack		99
0+85		Minor circumferencial crack at top		
1+00		General Condition looking upstream.		101
1+25		Minor circumferencial crack		
1+35		Circumferencial crack (Varies 1" to 8")		102, 103
1+50		General Condition looking upstream.		104
1+55		Minor circumferencial crack, Leaking salt deposits		105



Date : <u>November 8, 2012</u>		Inspection Reach (Branch Street Sewer)	
Inspection Team: SM, SH		Structure : <u>18D2-080C</u>	→
		Structure : <u>BP-038 (Outfall)</u>	
Upstream MH Depth	<u>48.6 ft</u>	Project Sewer : <u>Branch St. Sewer</u>	Shape : <u>Horse shoe</u>
Downstream MH Depth	<u>12.5 ft</u>	Location: <u>Branch St (Pump Station)</u>	Size : <u>14' W x 11'H</u>
Notes:		Length : <u>215 ft</u>	Type: <u>Concrete with brick invert layer</u>
Sewer in general good condition.		Weather Condition:	

Station	Defect	Description	Position	Photo
1+62		Minor circumferential crack, Leaking salt deposits		
1+77		Missing joint, Last section including invert separated from sewer, 5" wide separation		106, 107 , 108
		Flow slipping into separation @ invert, day light visible at crown		
	Measured at separation	18" thick invert with 4" brick overlay, 2ft thick vertical walls with 18"thick arch		
1+87		Minor circumferential crack	2:00 - 5:00	
2+00		General condition looking upstream		109
2+05		Hole with exposed rebar	12:00	110
2+08 to Outfall		Concrete spall with rebar exposure	3:00 - 5:00	111
2+15.5		Outfall , General photo		112



Date : <u>November 8, 2012</u>		Inspection Reach (Benton Sewer)		
Inspection Team: SM, SH		Structure : <u>18D3-136C</u>	→	Structure : <u>BP-036 (Outfall)</u>
Upstream MH Depth	<u>43.8 ft</u>	Project Sewer : <u>Benton Sewer</u> Shape : <u>Circular</u>		
	Downstream MH Depth	<u>33.02 ft</u>	Location: <u>Benton (Pump Station)</u> Size : <u>60 in</u>	
		Length :	Type: <u>RCP</u>	
Notes: Inspection terminated at end of 60in RCP pipe. New concrete box extension from 60in pipe to outfall at sheet piles		Weather Condition: Sunny		
Silt and Debris through out the pipe reach				
Station	Defect	Description	Position	Photo
		General Condition looking upstream from fore bay		113
	12ft long	Concrete box 5' W x 5' H transition to 60" RCP from fore baby. Box structure turns right.		114, 115
0+00		General condition of pipe looking downstream		116
0+25		General condition of pipe looking downstream, MH Lid and frame in pipe obstructing flow.		117
0+71		Minor offset joints, Water leak and deposits through joints.		118 , 119
1+00		General condition of pipe looking downstream		120
1+50		General condition of pipe looking downstream		121
1+80		Manhole	12:00	122
2+00		General condition of pipe looking downstream, Pipe bends to left		123
2+25		Pipe bend		
2+50		General condition of pipe looking downstream		124
3+00		General condition of pipe looking downstream		125
3+50		General condition of pipe looking downstream		126
4+00		General condition of pipe looking downstream		127
4+35		End of 60in pipe looking upstream		128
		Looking downstream at outfall from access structure		129



Date : <u>November 8, 2012</u>		Inspection Reach (N. Market Pressure Sewer)		
Inspection Team: SM, SH		Structure : <u>18D3-131C</u>	→	Structure : <u>BP-035 (Outfall)</u>
Upstream MH Depth	<u>44.12ft</u>	Project Sewer : <u>N Market Pressure</u>	Shape :	<u>Circular</u>
	Downstream MH Depth	<u>33.24 ft</u>	Location: <u>N Market St / Floodwall</u>	Size : <u>84 in</u>
		Length :	Type:	<u>RCP</u>
Notes: Inspection terminated at end of 84in RCP pipe. New concrete box extension from 84in pipe to outfall at sheet piles		Weather Condition: Sunny		
Significant silt and debris through out the pipe reach				
Station	Defect	Description	Position	Photo
0+00		General Condition looking upstream from closure gate		130 , 131
0+20		General condition of pipe looking upstream		132
0+50		General condition of pipe looking downstream		133
0+80		Minor leak at joint		134
1+00		General condition of pipe looking downstream		135
1+50		General condition of pipe looking downstream		136
2+00		General condition of pipe looking downstream		137
2+05		24" incoming pipe, MH 4ft upstream of pipe with outside drop	3:00	138
2+50		General condition of pipe looking downstream		139
2+60		End of old RCP pipe, New RCP pipe offset 1ft to left		140
3+00		General condition of pipe looking downstream		141
3+08		End of RCP pipe. Transition to RCP box, Looking upstream.		142
		Looking downstream at outfall from access structure		143



Date : <u>November 9, 2012</u>		Inspection Reach (Madison Chambers Pressure Sewer)		
Inspection Team: SM, SH		Structure : <u>18D3-145C</u>	→	Structure : <u>18D3-090C</u>
Upstream MH Depth	<u>35.8 ft</u>	Project Sewer : <u>Madison Chambers Pressure</u> Shape : <u>Circular</u>		
		Location: <u>Madison St / Floodwall</u> Size : <u>60 in</u>		
Downstream MH Depth	<u>NA</u>	Length : _____ Type: <u>RCP</u>		
Notes: Entry through backflow prevention structure 18D3-182C Pipe in good condition		Weather Condition: Sunny		
Station	Defect	Description	Position	Photo
		Looking downstream at 48" RCP from backflow prevention structure 18D3-182C		160
		Looking upstream at 48" from fore bay		161
		7'W x 5.5' H Concrete box, 9ft long from fore bay to 60in pipe		162
		Transition from concrete box to 60in pipe		167
0+00		60in RCP pipe begins		
0+43		Pipe bends to right		170
0+50		General condition of pipe looking downstream		171
1+00		General condition of pipe looking downstream		172
1+25		Pipes bends left		
1+50		General condition of pipe looking downstream		173
1+98		Junction Chamber		177



Date : <u>November 9, 2012</u>		Inspection Reach (Chambers Low Level Sewer)		
Inspection Team: SM, SH		Structure : 18D3-169C	→	Structure : BP-033 (Outfall)
Upstream MH Depth	<u>46.97 ft</u>	Project Sewer : <u>Chambers</u> Shape : <u>Circular/Egg/Box</u>		
		Location: <u>Chambers St / Floodwall</u> Size : <u>54"/48"X60"/48"x60"</u>		
Downstream MH Depth	<u>6 ft</u>	Length :	Type: RCP/Brk/RCP	
Notes:		Weather Condition: Sunny		
Station	Defect	Description	Position	Photo
0+00		Looking upstream from gate closure fore bay		210
0+00		Looking downstream from gate closure fore bay , 54" RCP begins		211 , 212
0+25		General condition of pipe looking downstream		213
0+43		Pipe transition to brick egg shape 48"w x 54"H with gunite lining		214
0+43 - 0+60		Spalling gunite lining , Missing bricks		215 , 216
0+57		6" VCP	9:00	217
0+75		General condition of pipe looking downstream		218
1+00		General condition of pipe looking downstream		219
1+00 - 1+15		Missing gunite lining		
1+15		Missing bricks	9:00, 3:00	220 , 221
1+35		Pipe turns right		222
1+50		General condition of pipe looking downstream		223
1+68		6in Drop in pipe invert		
1+75		General condition of pipe looking downstream		224
2+06		Pipe transition to RCP box 48" W x 60" H ,		
2+18		4" deep hole in concrete wall	3:00	227
2+27		Minor crack in vertical walls		229 , 230

Branch Street Sewer Inspection

November 8 , 2012



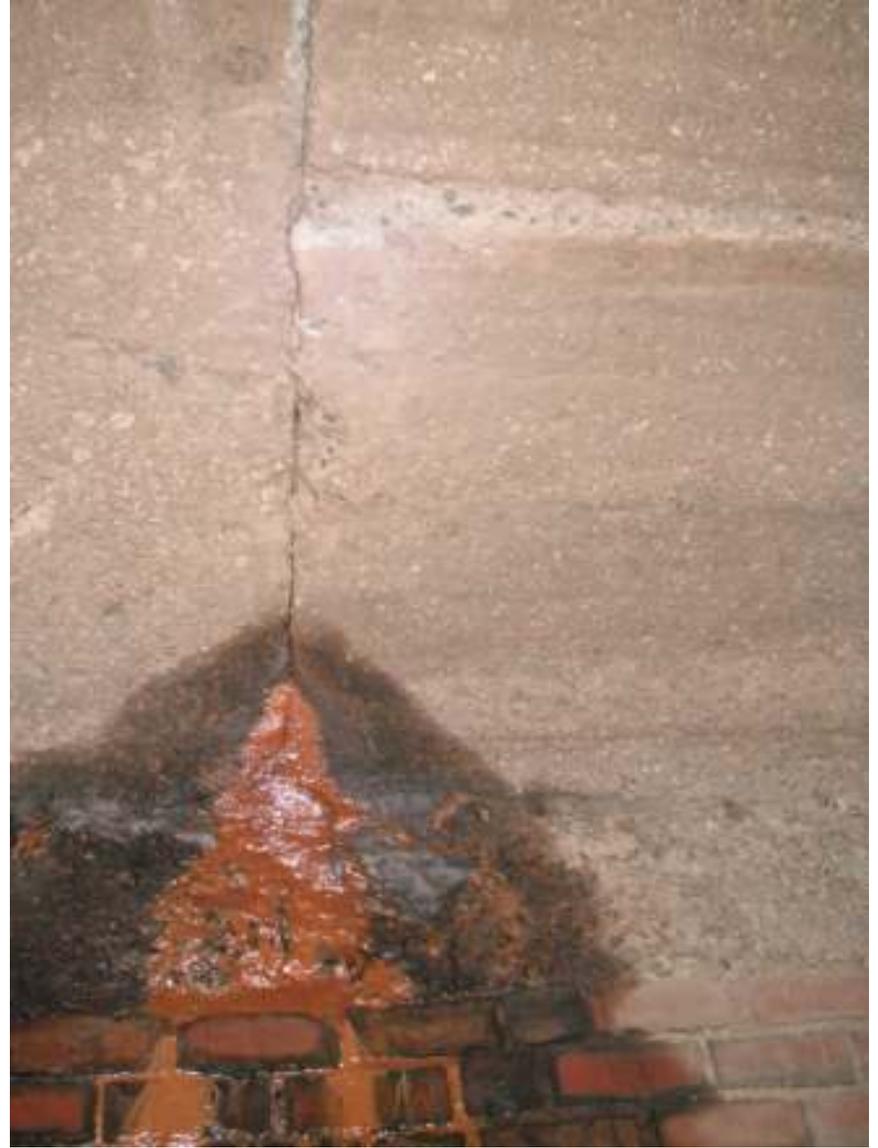
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DSCF0091



DSCF0092



DSCF0093



DSCF0094



DSCF0095



DSCF0096



DSCF0097



DSCF0099



DSCF0101



DSCF0102



DSCF0103



DSCF0104



DSCF0105



DSCF0106



DSCF0107



DSCF0108



DSCF0109



DSCF0110



DSCF0111



DSCF0112

Benton Sewer Inspection

November 8, 2012



DSCF0113



DSCF0114



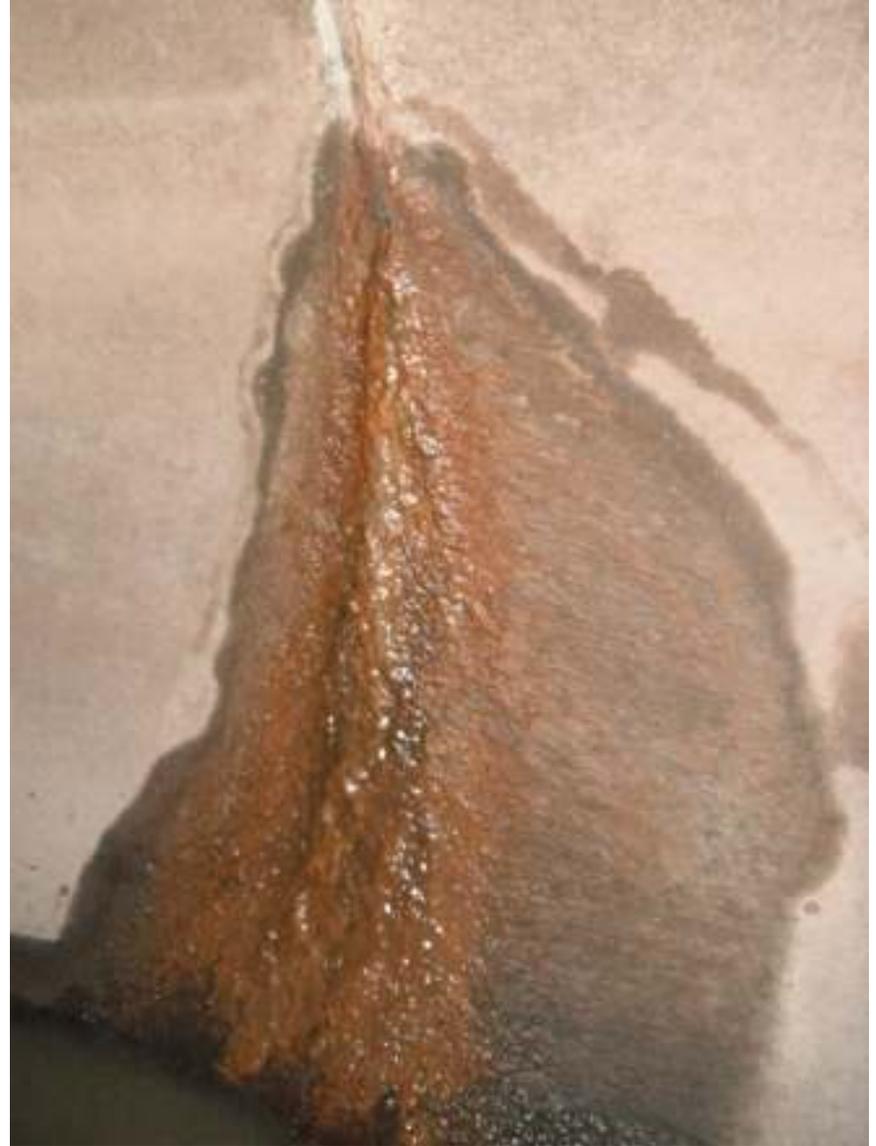
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DSCF0116



DSCF0117



DSCF0118



DSCF0119



DSCF0120



DSCF0121



DSCF0122



DSCF0123



DSCF0124



DSCF0125



DSCF0126



DSCF0127



DSCF0128



DSCF0129

N. Market Pressure Sewer Inspection

November 8, 2012



DSCF0130



DSCF0131



DSCF0132



DSCF0133



DSCF0134



DSCF0135



DSCF0136



DSCF0137



DSCF0138



DSCF0139



DSCF0140



DSCF0141



DSCF0142



DSCF0143

Madison Chambers Pressure Sewer Inspection

November 9 , 2012



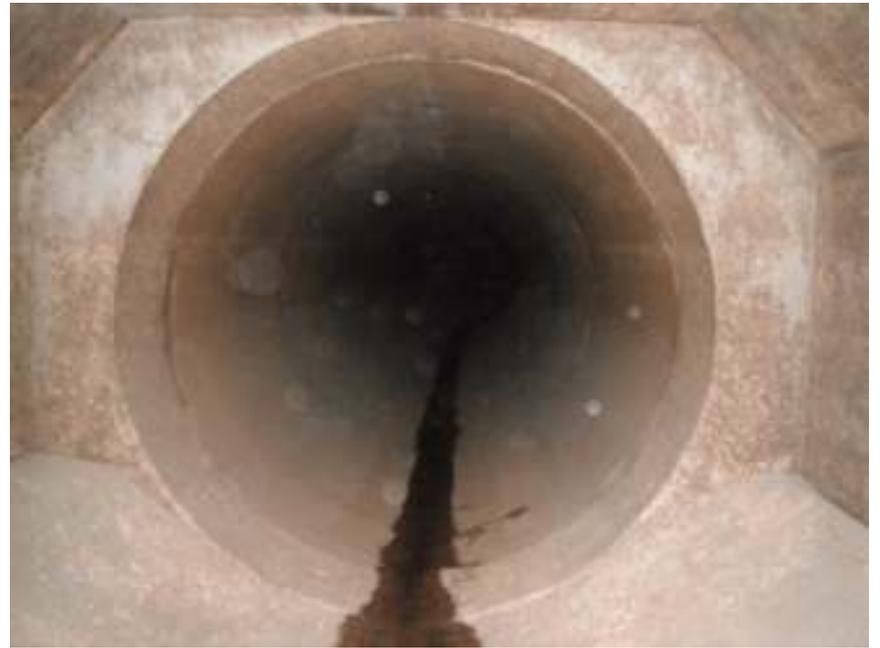
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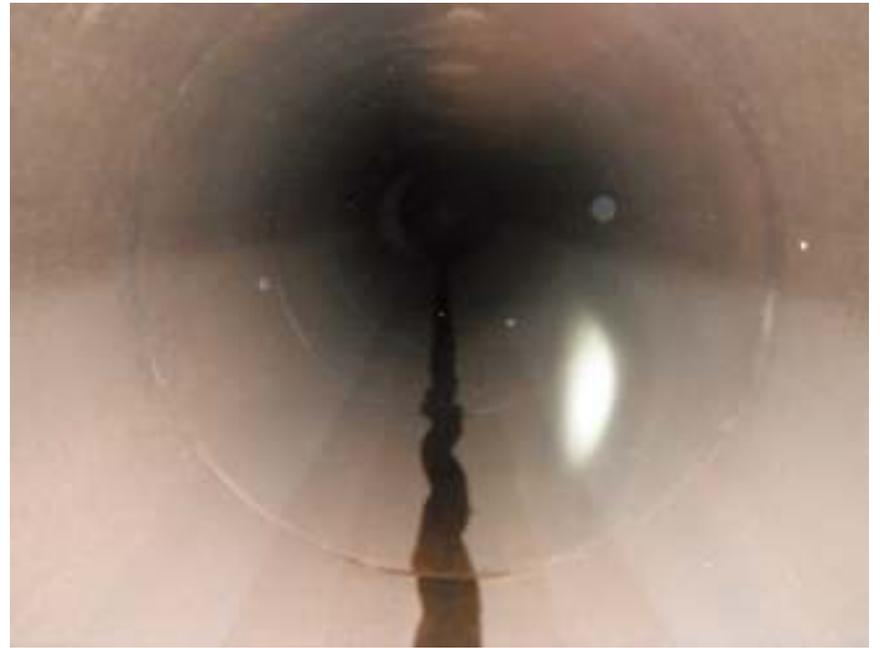
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DSCF0181



DSCF0182



DSCF0183



DSCF0184



DSCF0185



DSCF0186



DSCF0187



DSCF0188



DSCF0189



DSCF0190



DSCF0192



DSCF0193

Chambers Low Level Sewer Inspection

November 9 , 2012



DSCF0210



DSCF0211



DSCF0212



DSCF0213



DSCF0214



DSCF0215



DSCF0216



DSCF0217



DSCF0218



DSCF0219



DSCF0220



DSCF0221



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DSCF0223



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DSCF0231



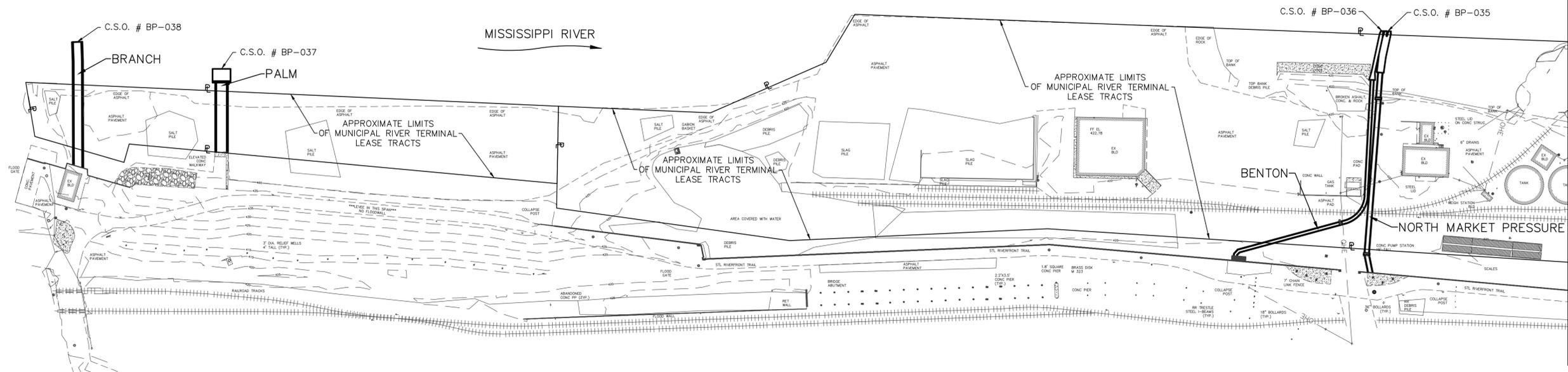
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Appendix C

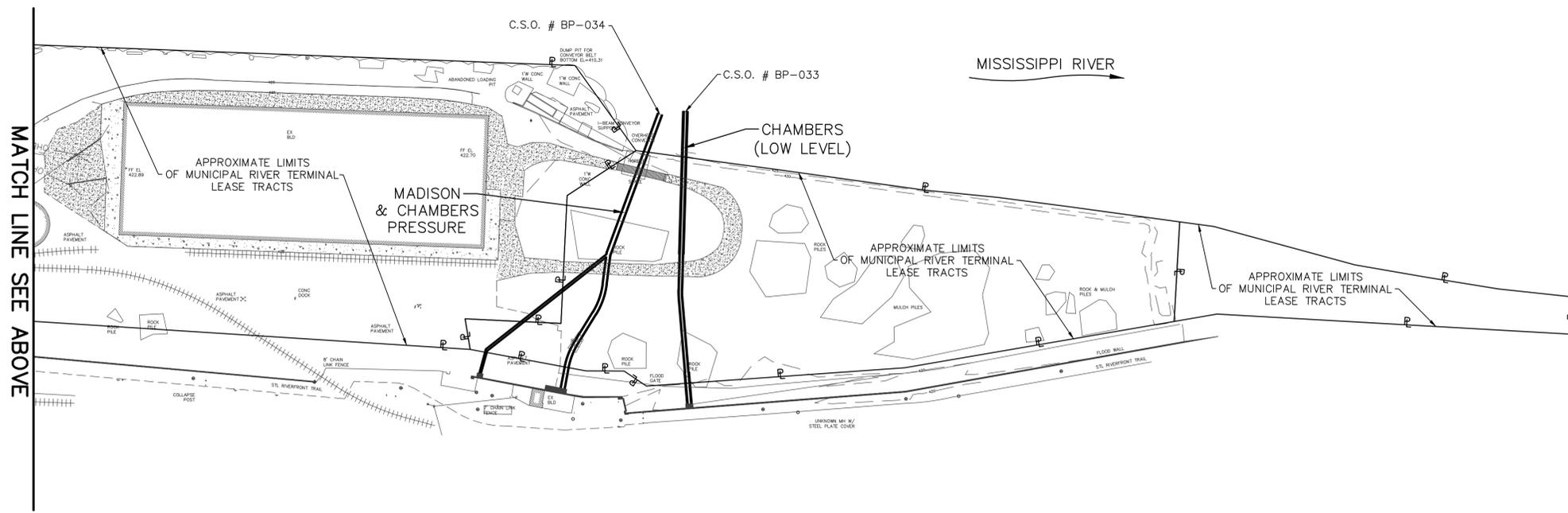
MRT Layout



SCALE: 1"=100'



MATCH LINE SEE BELOW



MATCH LINE SEE ABOVE

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**MUNICIPAL RIVER
 TERMINAL MSD SEWERS**

DATE: 11/14/2012 FIGURE 1

Appendix D
Aerial Photos of Sewer Locations



Fig. D-1: Madison (Pressure) and Chambers (Low Level)

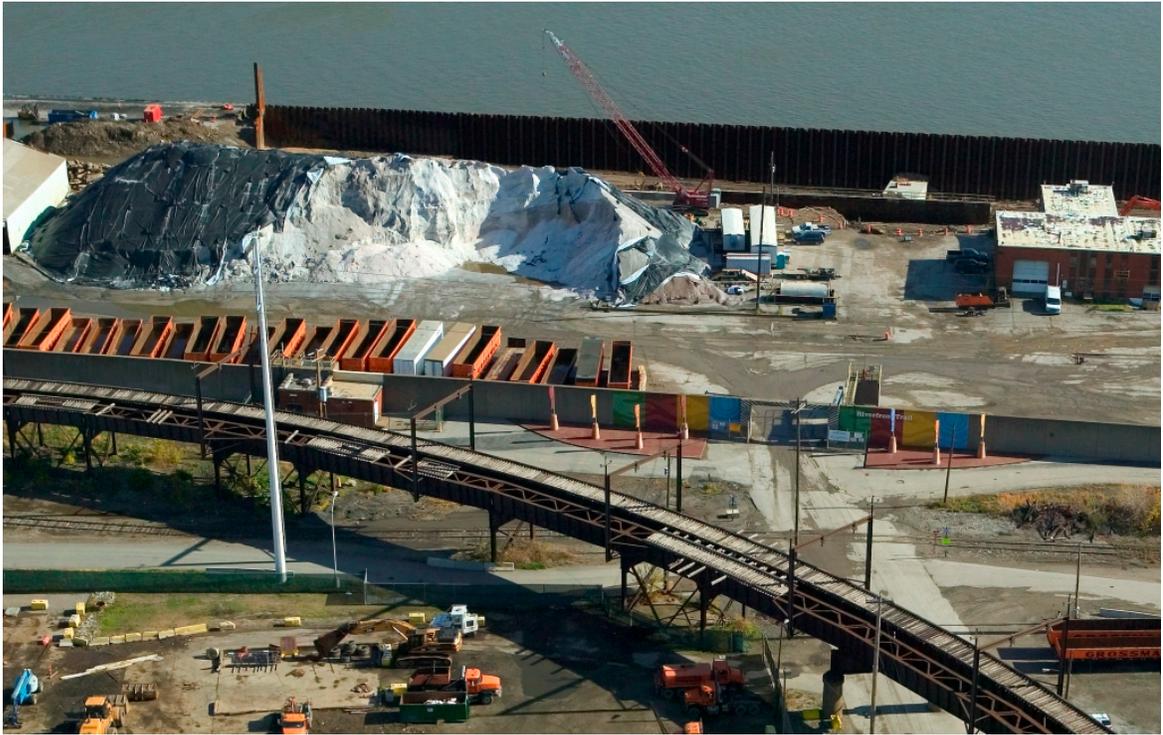


Fig. D-2 North Market & Benton (Pressure) (looking East)

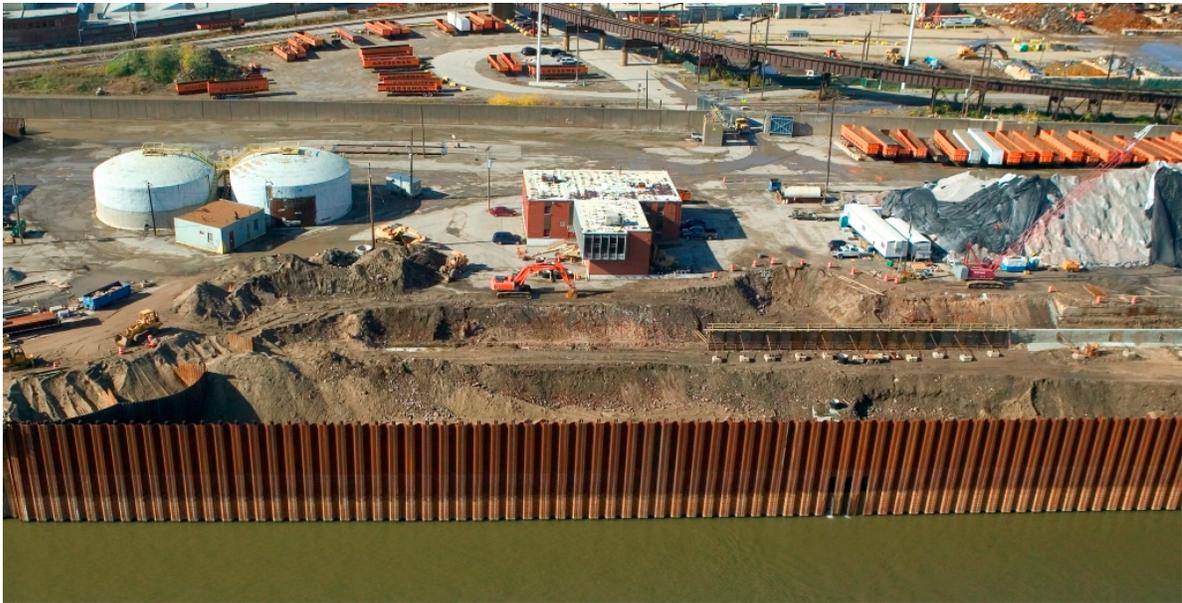


Fig. D-3 North Market & Benton (Pressure) (looking West)



Fig. D-4 - Palm Street



Fig D-5 – Branch Street