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# MEMORANDUM

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**DATE:** February 23, 2016  
**TO:** CAM 004 Project File  
**FROM:** Dennis Carr, MWH  
**CC:** Catherine Woodbury, Cambridge DPW; Richard Burns, MWRA  
**SUBJECT:** Summary of Critical Tasks Involved in Separating the CAM 004 CSO Regulator  
**PROJECT:** Concord Ave (Contract 9) Sewer Separation and Surface Improvements Project

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On December 21, 2015, the CAM 004 Combined Sewer Overflow (CSO) Regulator was separated in advance of the CAM 004 Sewer Separation Program's court-ordered deadline of December 31, 2015. The regulator was located in Drain Vault 5 under the rotary at the intersection of Concord Avenue and Alewife Brook Parkway as shown on Attachment A. All storm water, now free from sanitary connections, discharges to the Little River and Alewife Stormwater Wetland. This memo describes five critical tasks that highlight the successful completion of the CAM 004 sewer separation project.

### **Task 1: Cleaning of storm drain collection system**

In order to flush out residual sediments in the drainage system that may be contaminated with sanitary sewage, the City implemented a program to vacuum out sediments from storm drains, in-line sump manholes, and drain flush vaults in the lower reaches of the CAM 004 collection area. The locations of the cleaning work are shown in Attachment B-1, B-2 and B-3. At each of the five drainage flush vaults, the work included a thorough removal of sediments in the pump chambers, the storage tanks, and grit pits. The location and results of the cleaning effort at Drain Vault #5 are illustrated by Photographs P1, P2, and P3 in Attachments C-1, C-2 and C-3. Other upstream reaches of the drain system were cleared by the contractors of the Contract 8A/B and 9 project areas.

### **Task 2: Water Quality Testing**

Sampling and testing of dry weather flow in the major storm drains tributary to the CSO Regulator located at Drain Vault 5 were performed according to EPA's guidelines. Sand bags were installed samples were collected within the vault and immediately upstream. Samples were analyzed by field kits or sent to the laboratory for analysis. The results met water quality standards for separated storm drain allowing the 24" dry weather connection between the City's 4'x10' box drain and MWRA's 48" sewer to be abandoned.

### **Task 3: Modifications at Drain Vault #5**

The work included the removal of two wooden overflow weirs, removal of two sections of masonry block walls, the reactivation of the grit pit by removing the gravel fill and 15" diversion pipe, and the removal of the wooden bulkhead leading to the 4'x12' box culvert. Opening the

## **Summary of Critical Tasks Involved in Separating the CAM 004 CSO Regulator**

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4'x12' box culvert reduces upstream flooding and diverts storm flows to the newly created stormwater wetland. The location and results of these modifications are illustrated by Photographs P4 through P7 in Attachments C- 1, C-2, C-4 and C-5.

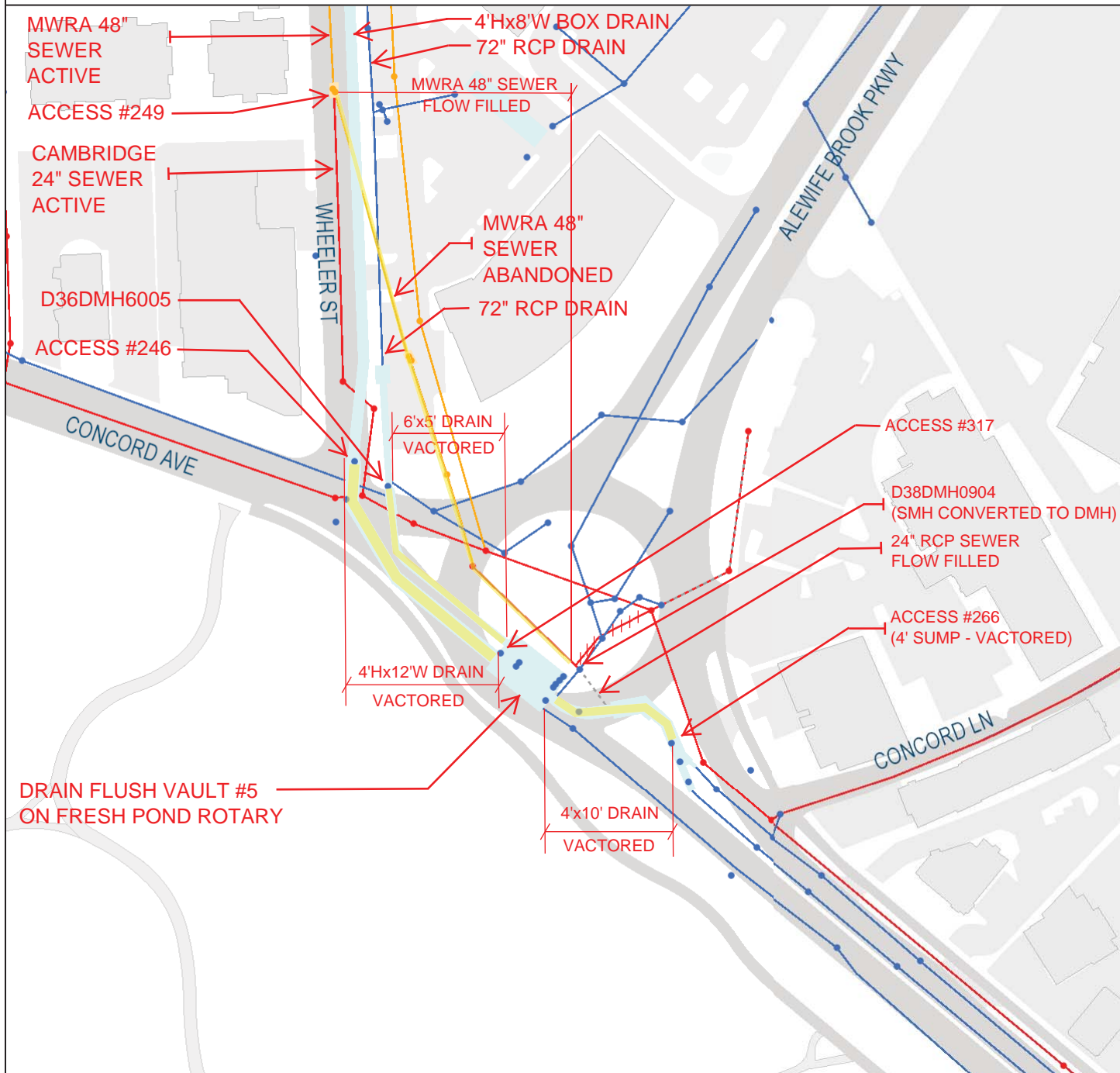
### **Task 4: Plug Connection to MWRA Sewer**

Plugging the connection between the 4'x10' box culvert (drain) and MWRA's sewer required masonry bulkheads at two locations. One is located in the 24" RCP dry weather lateral connection within the box culvert and the other is at the upper end of the MWRA sewer located adjacent to Drain Vault #5. The work also included bulkheading and flow filling the section of MWRA sewer (known as the Alewife Brook Conduit) between the rotary and Wheeler Street. The locations and photographs of these modifications are illustrated in Photographs P8 through P11 on Attachments D-1, D-2 and D-3. MWRA vault #1007029 now serves as the upstream terminal manhole for the MWRA's sewer in this area.

### **Task 5: Modifications to Bending Weir Structure**

Modifications to the bending weir structure included raising the elevation of the weir wall adjacent to the bending weir and removing the temporary masonry block bulkhead that was installed between the 72" storm drain and the 4'x8' box culvert. Removing the bulkhead will deflect more frequent storm flows in the 72" drain to the newly created wetlands. The larger, less frequent storms will cause the bending weir to deflect and release excessive flood waters to Little River. The location of the Bending Weir Structure is shown on Attachment B-1. Details of the modifications are illustrated in Photographs P12, P13, and P14 on Attachments E-1, E-2 and E-3.

**END**



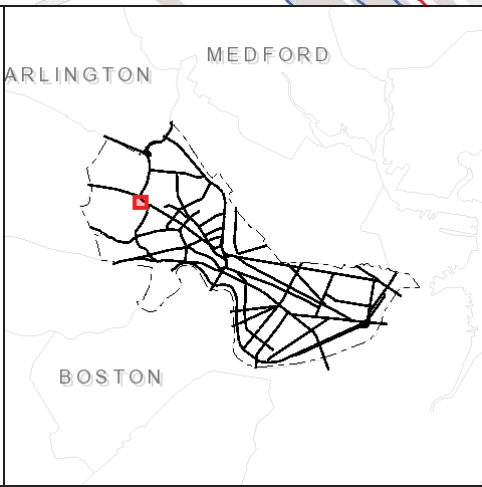
City of Cambridge  
Massachusetts

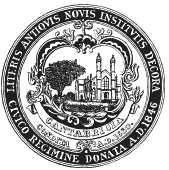
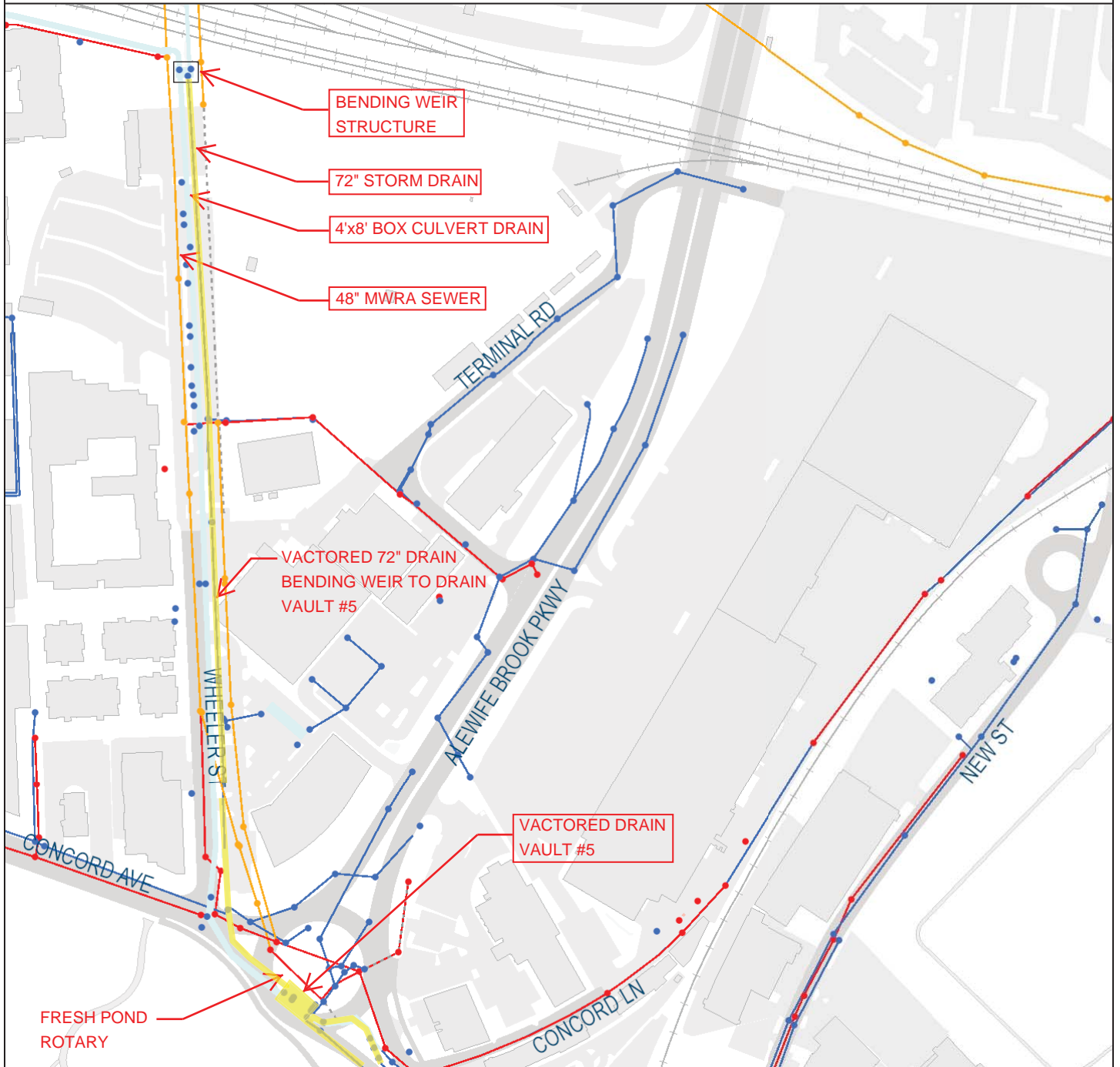
1" = 120 ft

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[www.cambridgema.gov/gis](http://www.cambridgema.gov/gis)

- Gravity Mai
- Stormwater
- Sewage
- Combined Sewage
- Abandoned
- Zoom Three Paved Surfaces
- Paved Roads
- Other Paved Surface
- Bridges
- Public Footpath





City of Cambridge  
Massachusetts

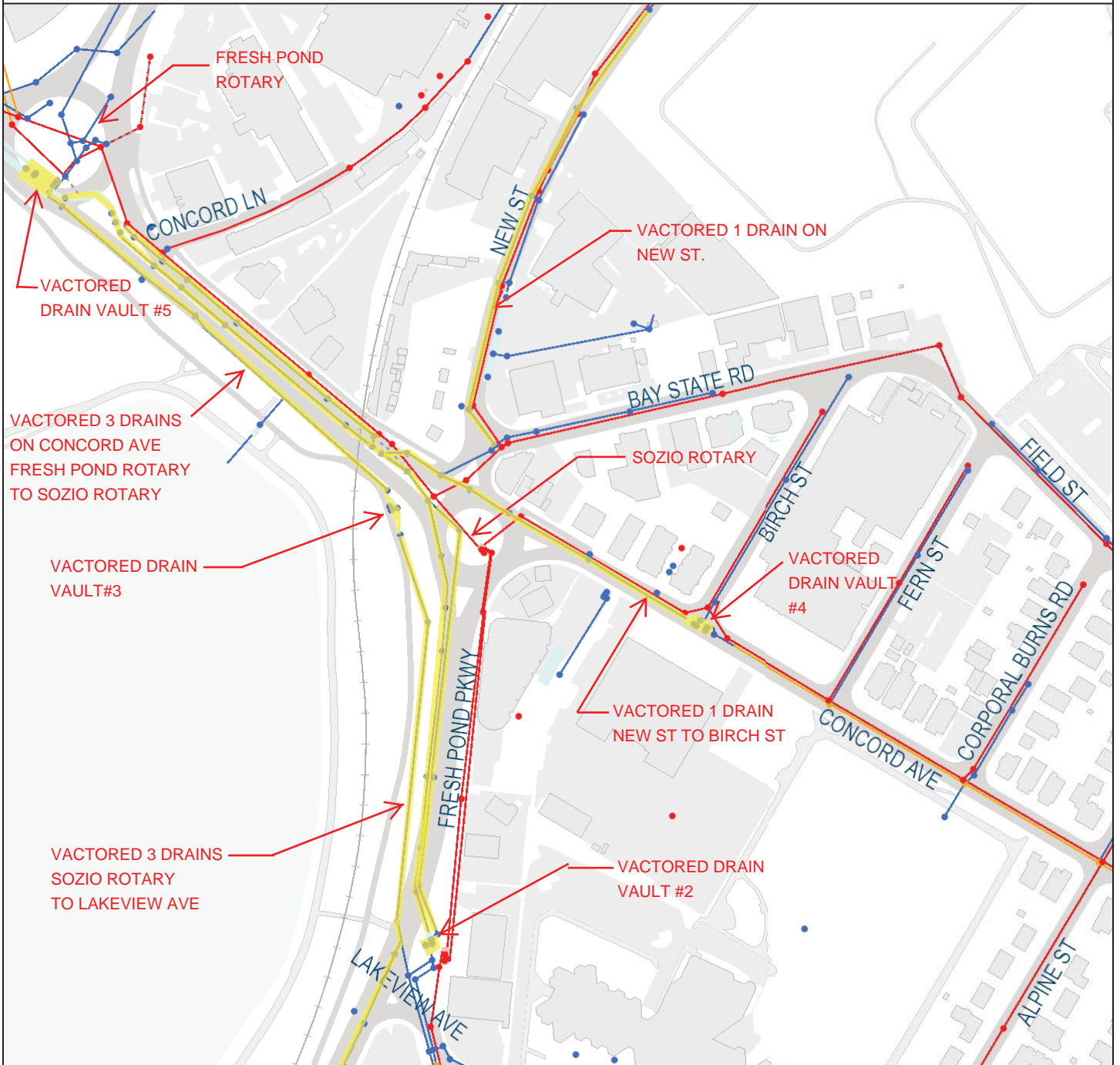
1" = 238 ft

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City of Cambridge  
Massachusetts

1" = 238 ft

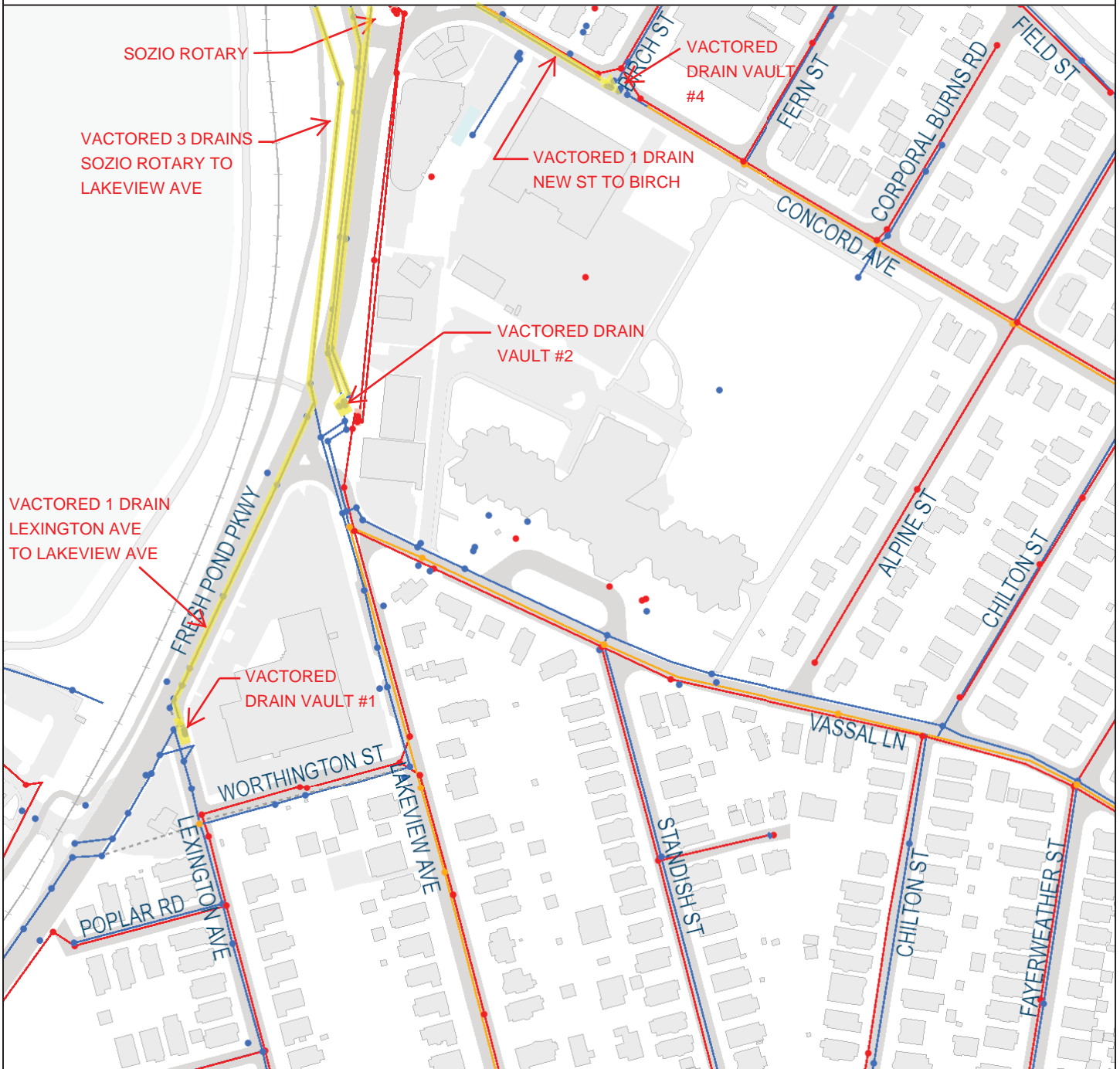
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[www.cambridgema.gov/gis](http://www.cambridgema.gov/gis)

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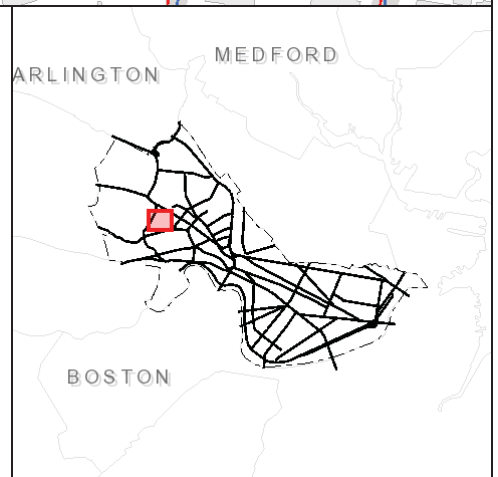
City of Cambridge  
Massachusetts

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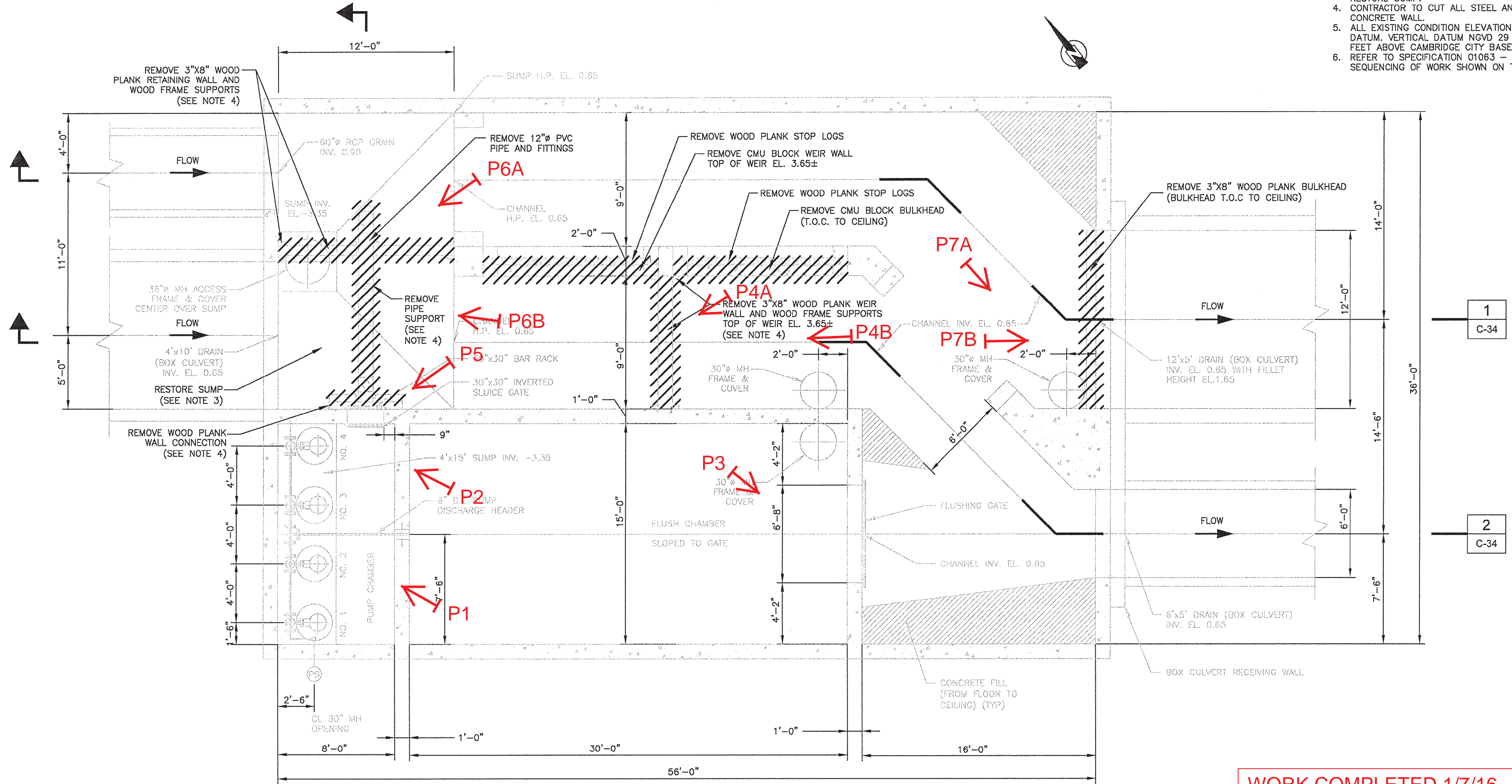
[www.cambridgema.gov/gis](http://www.cambridgema.gov/gis)

- Gravity Mai
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- NOTES:
1. DRAIN VAULT NO. 5 IS AN EXISTING PRECAST STRUCTURE. CONTRACTOR TO MODIFY STRUCTURE AS DESCRIBED HEREIN.
  2. SEE SHEET C-32 FOR SITE LOCATION OF EXISTING DRAIN VAULT.
  3. SUMP FILLED WITH SAND UP TO EL. 0.50 AND CAPPED WITH LEAN CONCRETE TO EL. 0.65 (FLUSH WITH CHANNEL). CONTRACTOR TO REMOVE CONCRETE CAP AND SAND AND RESTORE SUMP.
  4. CONTRACTOR TO CUT ALL STEEL ANCHOR BOLTS FLUSH WITH CONCRETE WALL.
  5. ALL EXISTING CONDITION ELEVATIONS ARE DEPICTED IN NGVD 29 DATUM. VERTICAL DATUM NGVD 29 IS APPROXIMATELY 10.84 FEET ABOVE CAMBRIDGE CITY BASE DATUM.
  6. REFER TO SPECIFICATION 01063 - SEQUENCING OF WORK FOR SEQUENCING OF WORK SHOWN ON THIS SHEET.



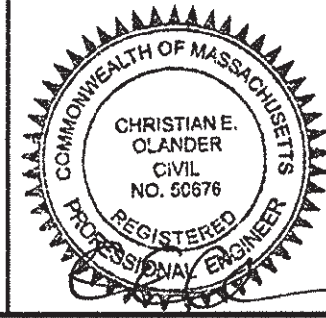
**DRAIN VAULT NO. 5 - PLAN**  
 SLAB EL. -0.35 (EXCEPT PUMP CHAMBER)  
 NOTE: TOP OF ROOF SLAB EL. 7.65±

**WORK COMPLETED 1/7/16**

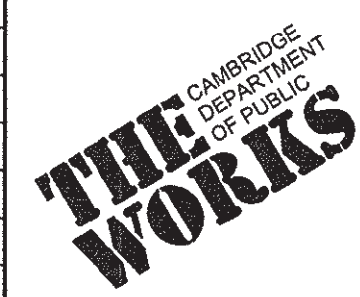
**WORK COMPLETED BEYOND 12/21/15 WAS NOT DIRECTLY REQUIRED TO COMPLETE THE SEWER SEPARATION OF THE CAM004 AREA.**

CONFORMED SET

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Job No.	20120256.001A
Designed by	ZSH
Drawn by	NFT
Checked by	AML
Approved by	EO

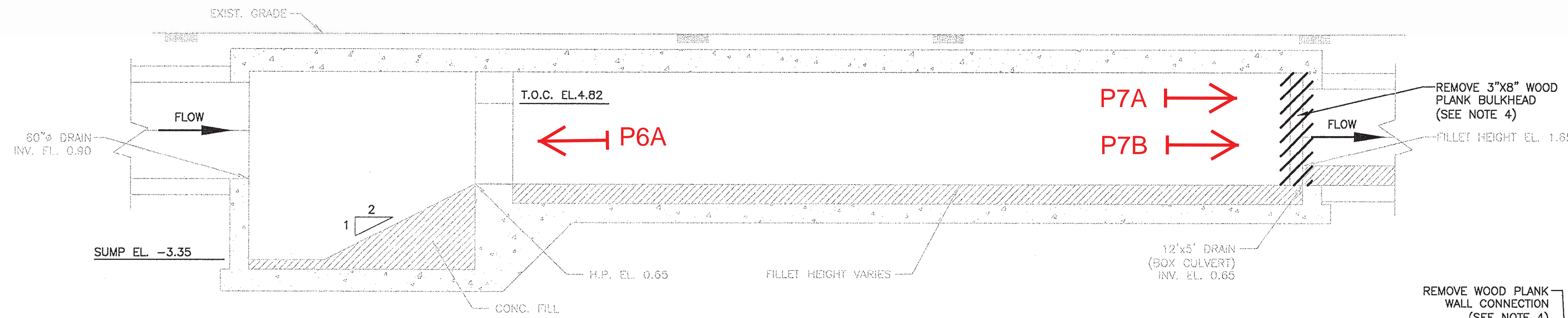


Client	CITY OF CAMBRIDGE, MASSACHUSETTS
Project	CONCORD (CONTRACT 9) SEWER SEPARATION AND SURFACE IMPROVEMENTS PROJECT
Drawing	CIVIL DRAIN VAULT NO. 5 MODIFICATION - PLAN

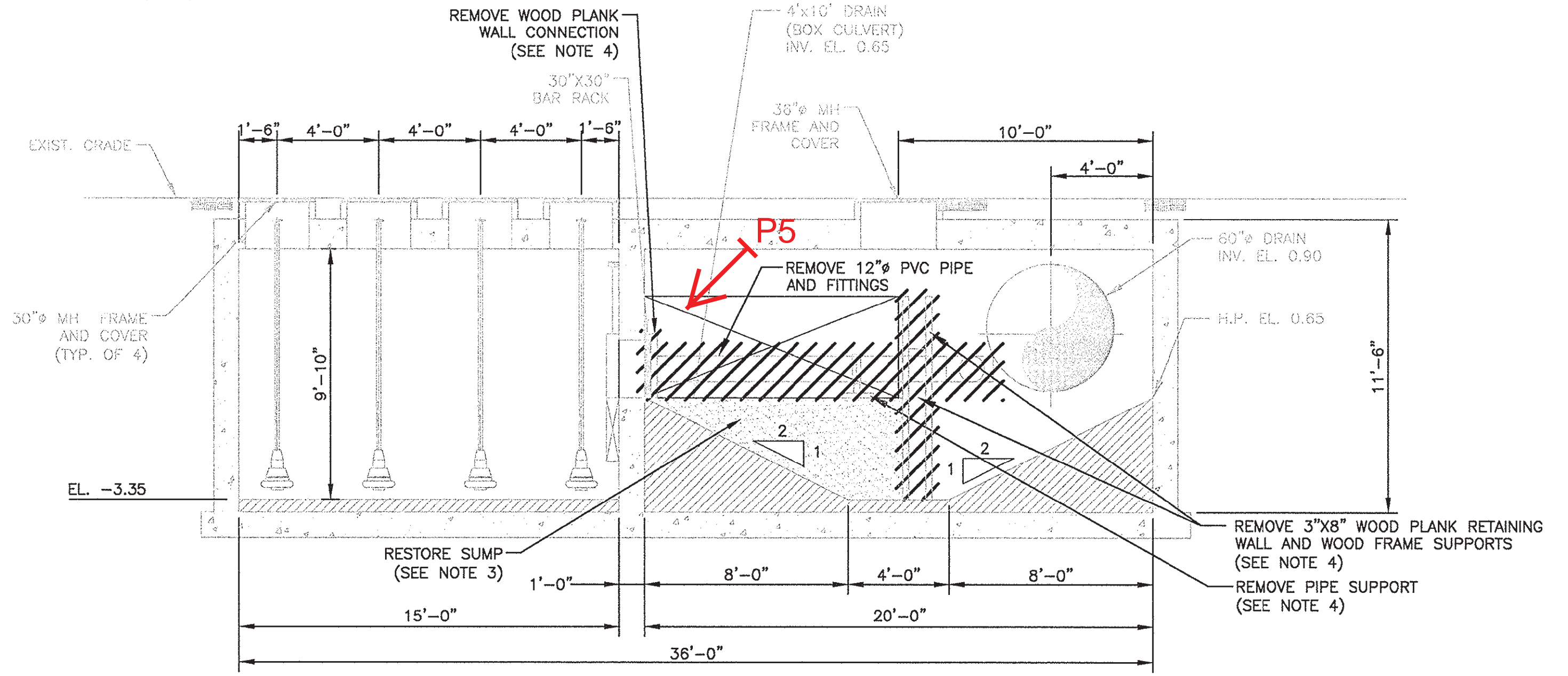
Sheet	C-33
File No.	

ATTACHMENT C-1

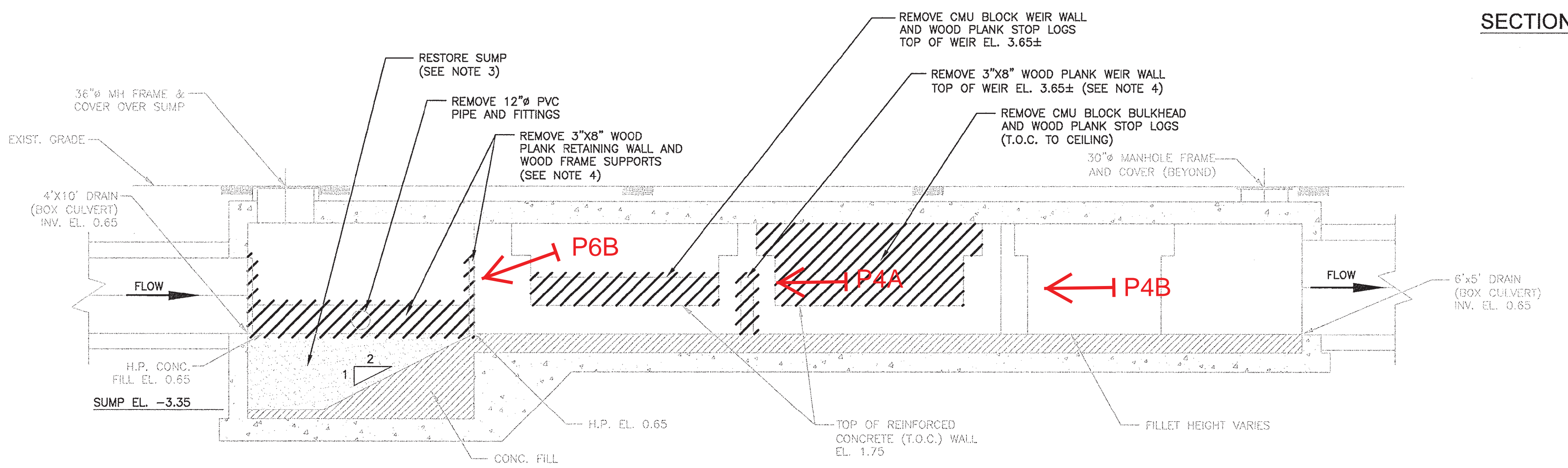




SECTION 1  
C-33



SECTION 3  
C-33

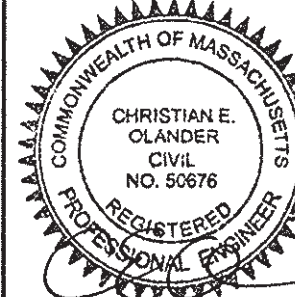


SECTION 2  
C-33

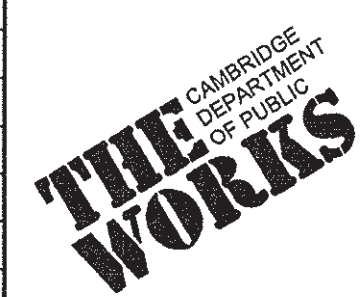
COMPLETED 1/7/2016  
 WORK COMPLETED BEYOND  
 12/21/15 WAS NOT DIRECTLY  
 REQUIRED TO COMPLETE THE  
 SEWER SEPARATION OF THE  
 CAM004 AREA

- NOTES:
1. DRAIN VAULT NO. 5 IS AN EXISTING STRUCTURE. CONTRACTOR TO MODIFY STRUCTURE AS DESCRIBED HEREIN.
  2. SEE SHEET C-32 FOR SITE LOCATION OF EXISTING DRAIN VAULT.
  3. SUMP FILLED WITH SAND UP TO EL. 0.50 AND CAPPED WITH LEAN CONCRETE TO EL. 0.65 (FLUSH WITH CHANNEL). CONTRACTOR TO REMOVE CONCRETE CAP AND SAND AND RESTORE SUMP.
  4. CONTRACTOR TO CUT ALL STEEL ANCHOR BOLTS FLUSH WITH CONCRETE WALL.
  5. ALL EXISTING CONDITION ELEVATIONS ARE DEPICTED IN NGVD 29 DATUM. VERTICAL DATUM NGVD 29 IS APPROXIMATELY 10.84 FEET ABOVE CAMBRIDGE CITY BASE DATUM.
  6. REFER TO SPECIFICATION 01063 - SEQUENCING OF WORK FOR SEQUENCING OF WORK SHOWN ON THIS SHEET.

CONFORMED SET



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Job No.	20120255.001A		
Designed by	ZSH		
Drawn by	NFT		
Checked by	AML	No.	Description
Approved by	EO		Date



Client	CITY OF CAMBRIDGE, MASSACHUSETTS
Project	CONCORD (CONTRACT 9) SEWER SEPARATION AND SURFACE IMPROVEMENTS PROJECT
Drawing	CIVIL DRAIN VAULT NO.5 MODIFICATION - SECTIONS

Sheet	C-34
File No.	

PLOTTED: 12/2/2014 4:45 PM BY: rick@k...  
 CAD FILE: C:\pwworking\0128806\CON9\_C33-C34.dwg LAYOUT: C-34

ATTACHMENT C-2



# Vactoring Sediments from Drain Vault #5



P1 Cleaning crew preparing to enter pump chamber



P2 Pump chamber after removal of sediments



P3 Storage tank after removal of sediments. Upstream side of flush gate at upper left

# Modifications at Drain Vault #5



P7A Looking upstream before removal of 3' high wooden CSO weir



P4B Looking upstream after removal of 3' high wooden CSO weir



P5 Bar rack leading to pump chamber after removal of 15" PVC pipe and wooden cover



# Modifications at DV5



P6A Looking upstream at sumps before removal of wooden CSO weir



P6B Sumps restored after removal of wooden CSO weir



P7A Looking downstream at wooden bulkhead leading to 4'x12' culvert



P7B Looking downstream at 4'x12' culvert after removal of wooden bulkhead



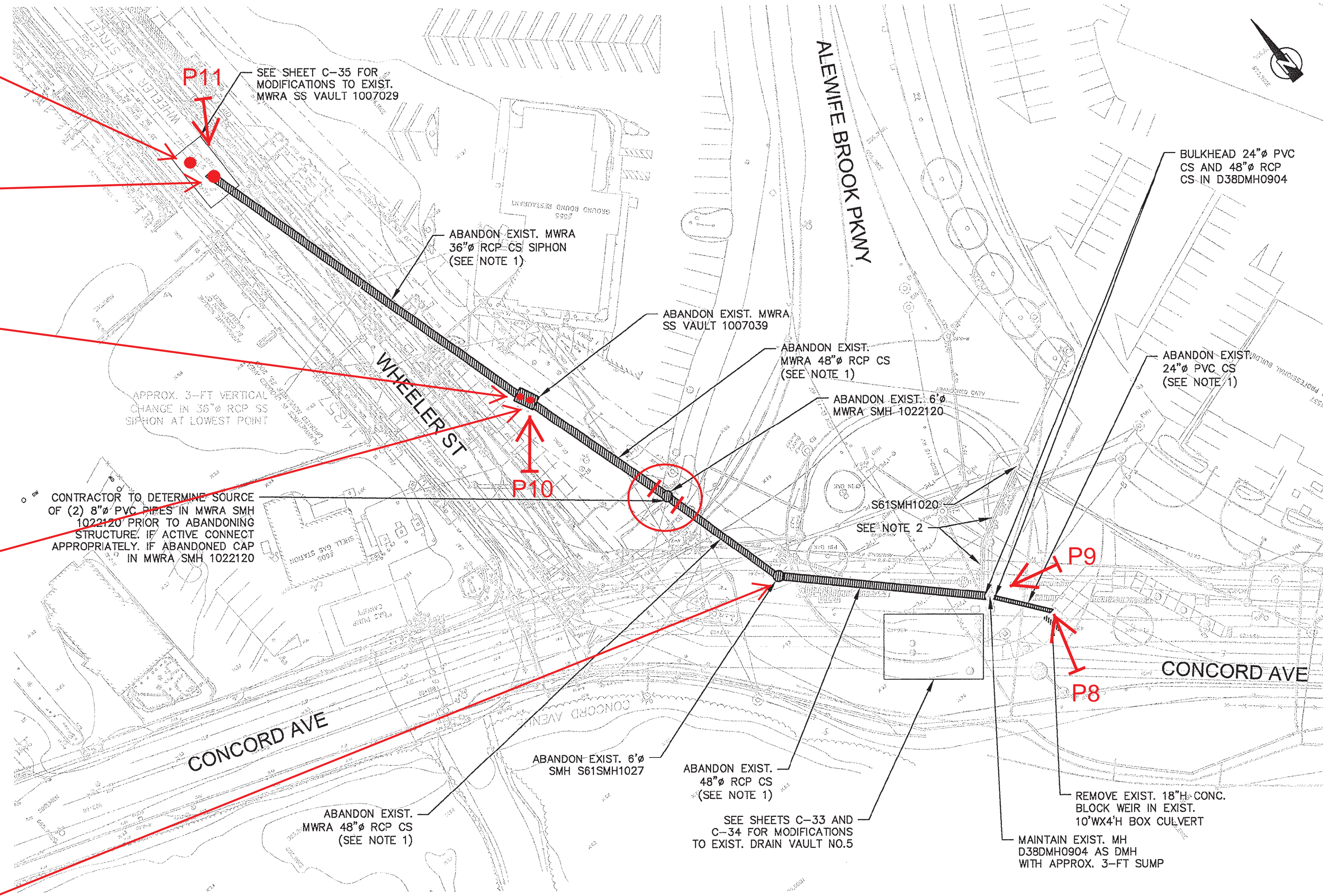
ACCESS 250

ACCESS 249

ACCESS 247

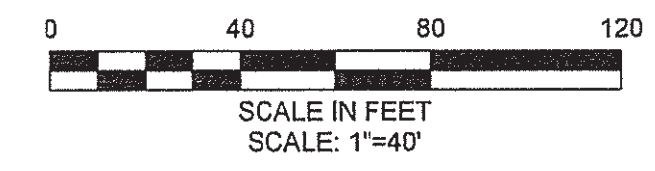
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S61SMH1027



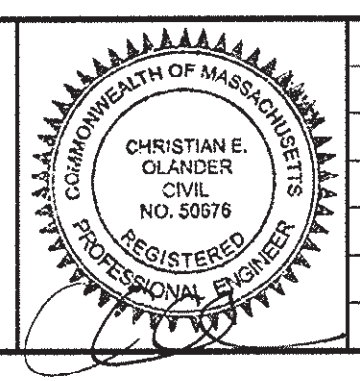
- NOTES:**
- CONTRACTOR TO CCTV THE FOLLOWING REACHES AND CONFIRM THERE ARE NO ACTIVE CONNECTIONS PRIOR TO PIPE BEING ABANDONED. CONTRACTOR TO REPORT RESULTS TO ENGINEER FOR REVIEW 30 DAYS PRIOR TO SCHEDULED ABANDONMENT:
    - 4'X10' BOX CULVERT TO D38DMH0904: APPROX. 33 LF 24"Ø PVC CS
    - D38DMH0904 TO S61SMH1027: APPROX. 115 LF 48"Ø RCP CS
    - S61SMH1027 TO 1022120: APPROX. 72 LF 48"Ø RCP CS
    - 1022120 TO 1007039: APPROX. 88 LF 48"Ø RCP CS
    - 1007039 TO 1007029: APPROX. 215 LF 36"Ø RCP CS SIPHON
  - CONTRACTOR TO CONFIRM 12"Ø SS BETWEEN S61SMH1020 AND 48"Ø RCP CS DOWNSTREAM IS ABANDONED. IF ANY IMPROVEMENTS TO SEWER MANHOLES ARE NECESSARY IN THIS VICINITY MANHOLES SHALL BE CONSTRUCTED FOR ZONE A SURFACE WATERSHEDS AS DIRECTED BY THE ENGINEER.
  - ALL EXISTING CONDITION ELEVATIONS ARE DEPICTED IN NGVD 29 DATUM. VERTICAL DATUM NGVD 29 IS APPROXIMATELY 10.84 FEET ABOVE CAMBRIDGE CITY BASE DATUM.
  - REFER TO DCR PERMIT (APPENDED TO SPECIFICATIONS) FOR ACCESS RESTRICTIONS AND REQUIREMENTS.
  - REFER TO SPECIFICATION 01063 - SEQUENCING OF WORK FOR SEQUENCING OF WORK SHOWN ON THIS SHEET.

**PLAN**  
SCALE: 1"=40'



CONFORMED SET

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 C:\pwworking\12939\CONC\_C12.dwg LAYOUT: C-32



Scale	AS NOTED		
Date	JANUARY 27, 2014		
Job No.	20120256.001A		
Designed by	ZSH		
Drawn by	NFT		
Checked by	AML	No.	Description
Approved by	EO		REVISIONS

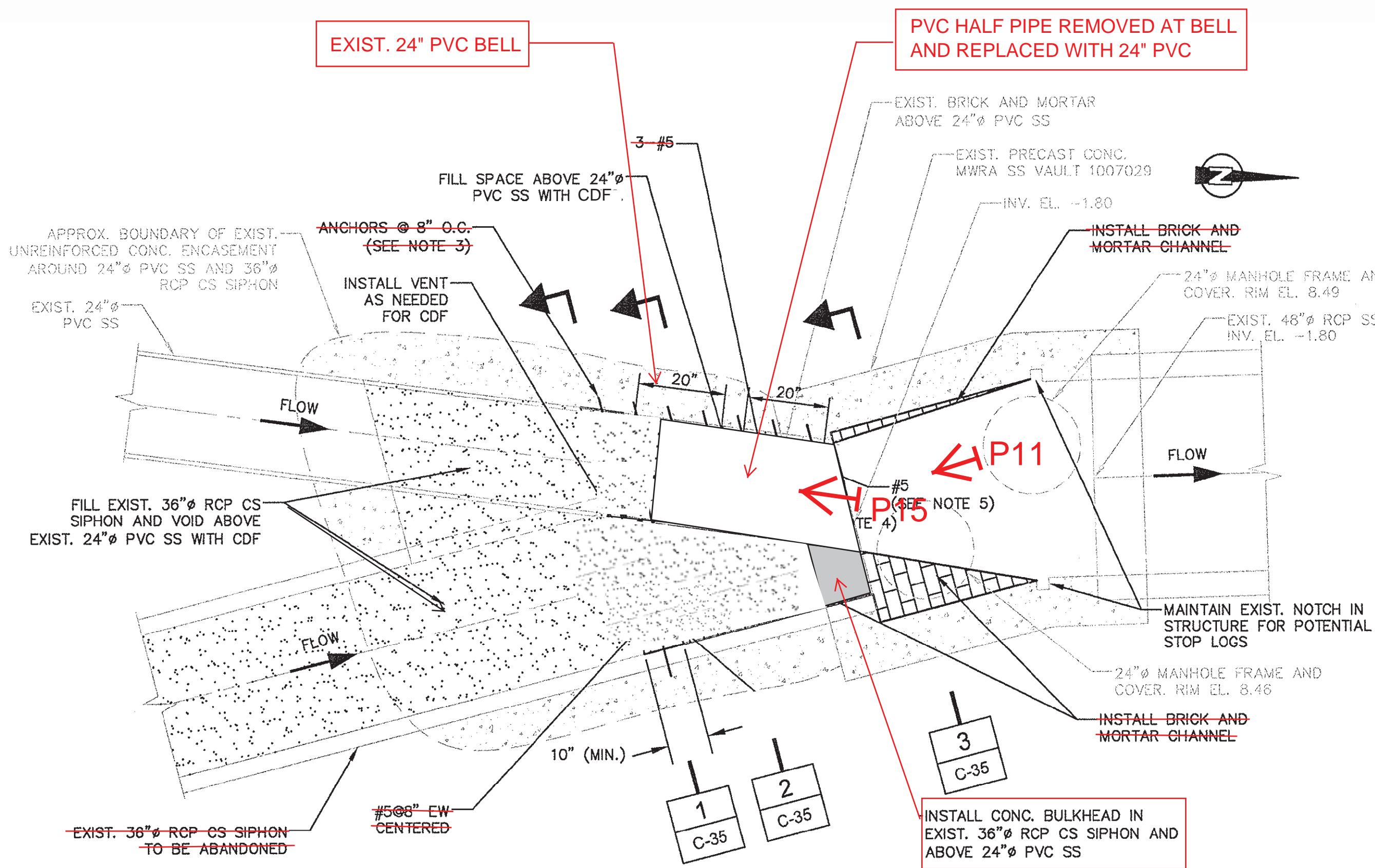


Client	CITY OF CAMBRIDGE, MASSACHUSETTS
Project	CONCORD (CONTRACT 9) SEWER SEPARATION AND SURFACE IMPROVEMENTS PROJECT
Drawing	CIVIL HYDRAULIC MODIFICATIONS AREA I

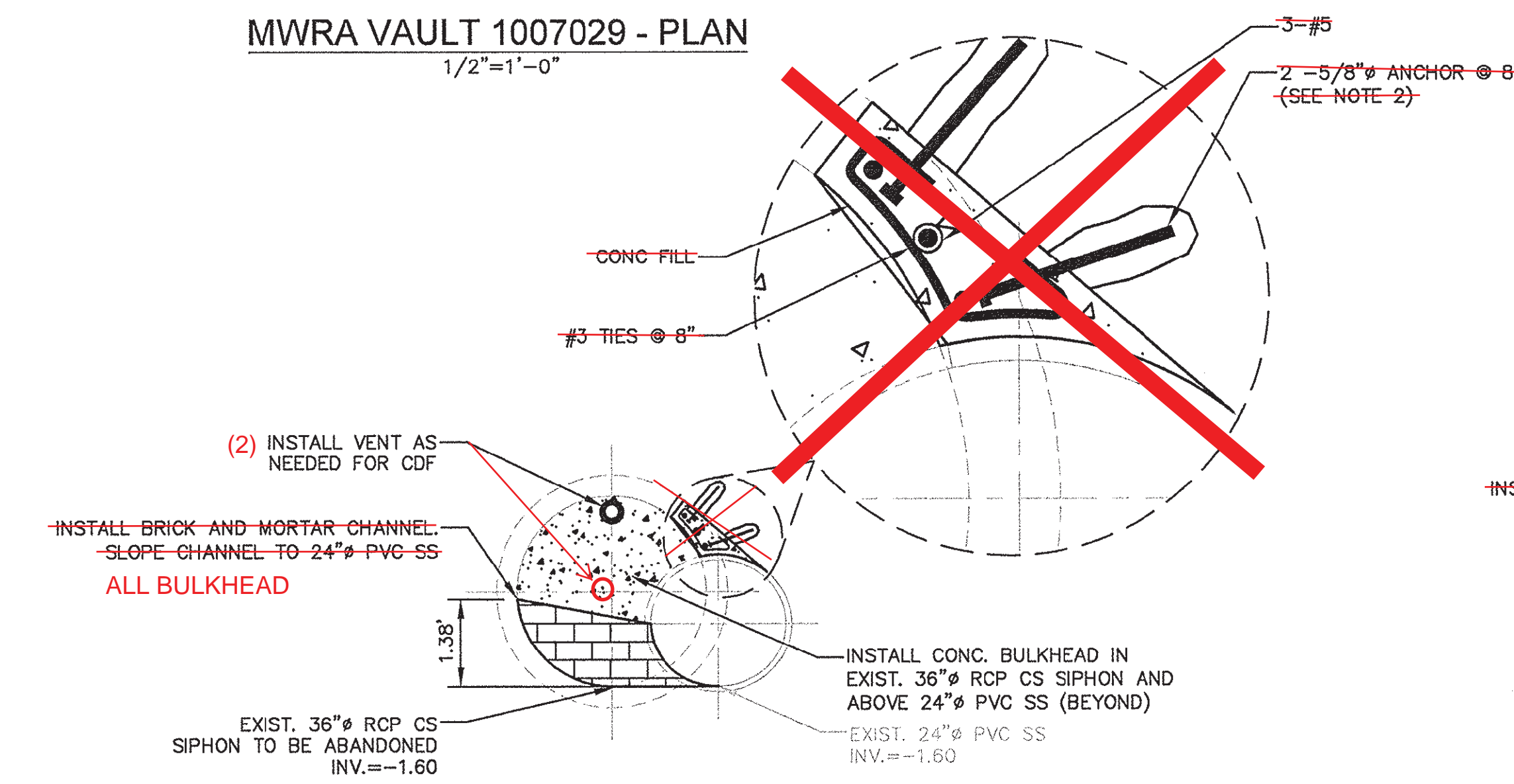
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File No.	

ATTACHMENT D-1

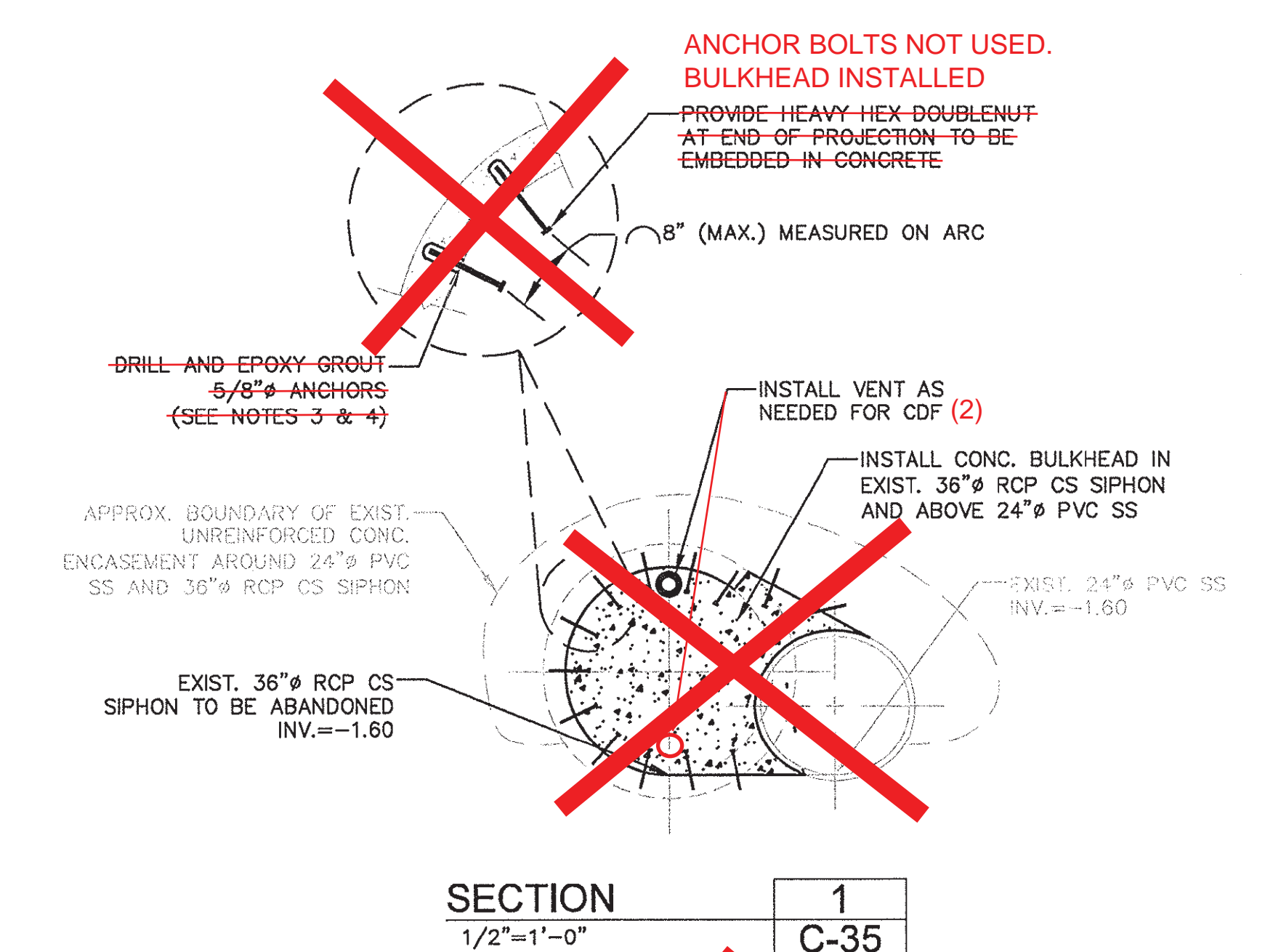




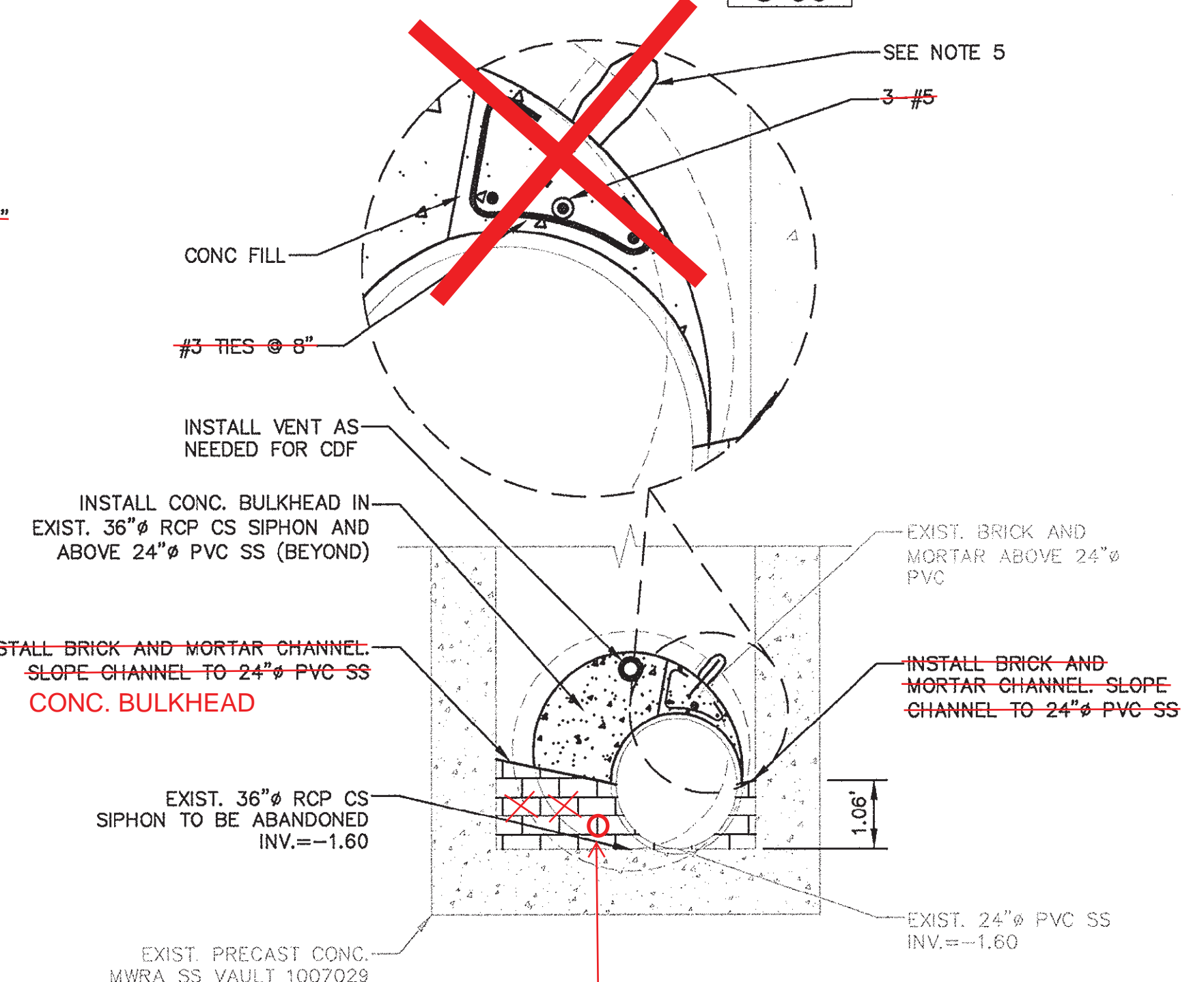
MWRA VAULT 1007029 - PLAN  
1/2"=1'-0"



SECTION 2  
1/2"=1'-0"  
C-35



SECTION 1  
1/2"=1'-0"  
C-35



SECTION 3  
1/2"=1'-0"  
C-35

- NOTES:
- MWRA VAULT 1007029 IS AN EXISTING STRUCTURE. CONTRACTOR TO MODIFY STRUCTURE AS DESCRIBED HEREIN.
  - SEE SHEET C-32 FOR SITE PLAN OF EXISTING 36" RCP CS SIPHON TO BE ABANDONED.
  - ANCHOR SHALL BE HILTI HIT-RE 500 SD WITH 3" EMBEDMENT (MIN.). PROVIDE HAS-E ROD WITH 4" PROJECTION (MIN.).
  - PROVIDE 1 #5 REINFORCEMENT HOOKED INTO BULKHEAD.

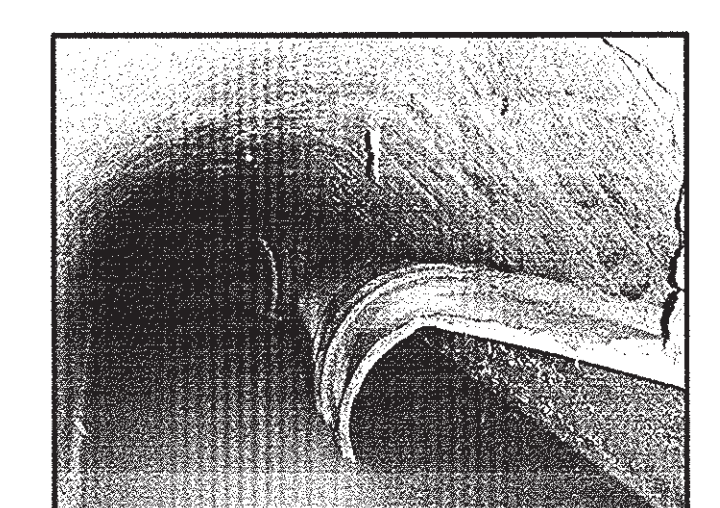
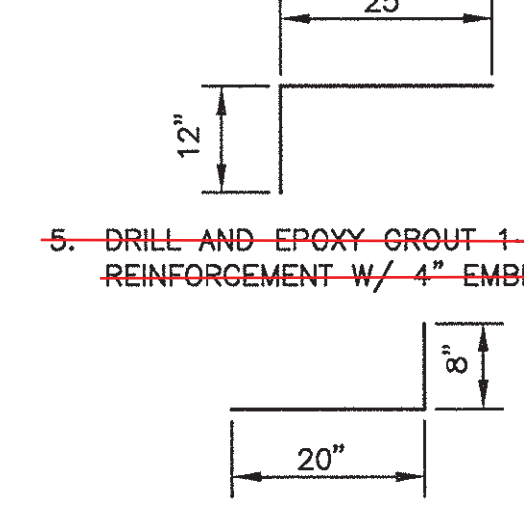


PHOTO 1  
(EXIST. CONNECTION OF 36" RCP SIPHON AND 24" PVC SS IN MWRA VAULT 1007029)

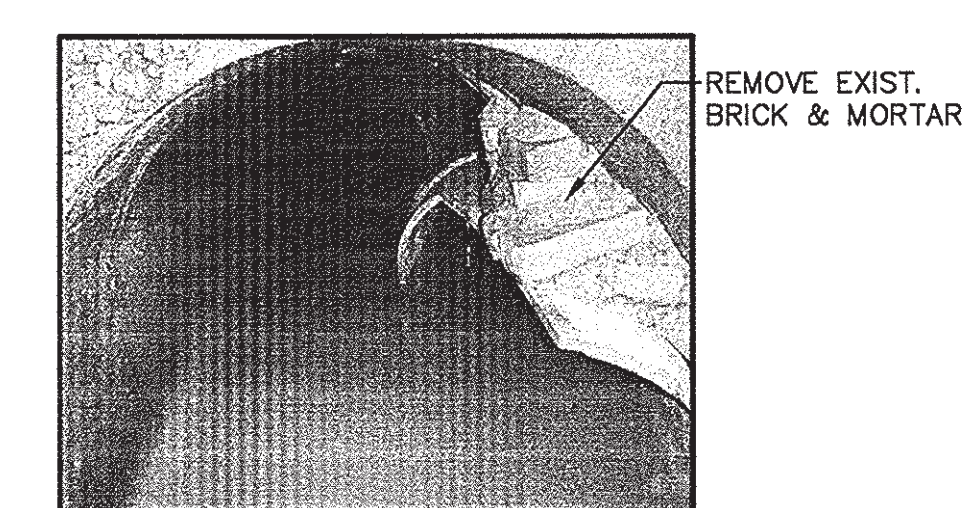


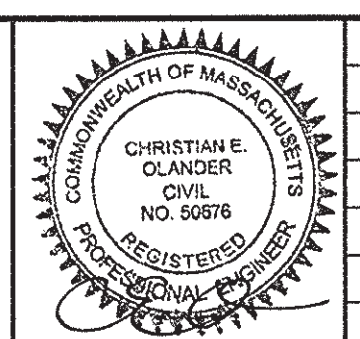
PHOTO 2  
(EXIST. CONNECTION OF 36" RCP SIPHON AND 24" PVC SS IN MWRA VAULT 1007029)

**WORK COMPLETED ON 12/23/15**  
**WORK COMPLETED BEYOND 12/21/15 WAS NOT DIRECTLY REQUIRED TO COMPLETE THE SEWER SEPARATION OF THE CAM004 AREA.**

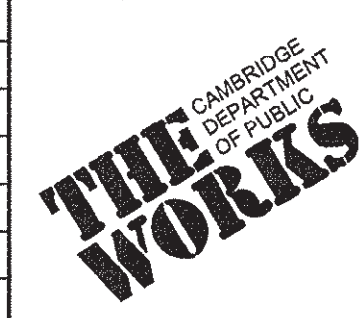
CONFORMED SET

ATTACHMENT D-2

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Designed by	ZSH		
Drawn by	NFT		
Checked by	AML	No.	Description
Approved by	EO		Date



Client	CITY OF CAMBRIDGE, MASSACHUSETTS
Project	CONCORD (CONTRACT 9) SEWER SEPARATION AND SURFACE IMPROVEMENTS PROJECT
Drawing	CIVIL WHEELER ST MWRA VAULT MODIFICATIONS

Sheet	C-35
File No.	



# Removal of Connection Between 4'x10' Storm Drain and MWRA's 48" Sewer



P8 Looking upstream within 4'x10' drain at bulkhead & air vent in 24" RCP dry weather lateral connection



P9 Looking downstream at bulkhead with air vent at end of MWRA's sewer in rotary



P10 – Flow-filling into manhole  
On MWRA's 48" sewer

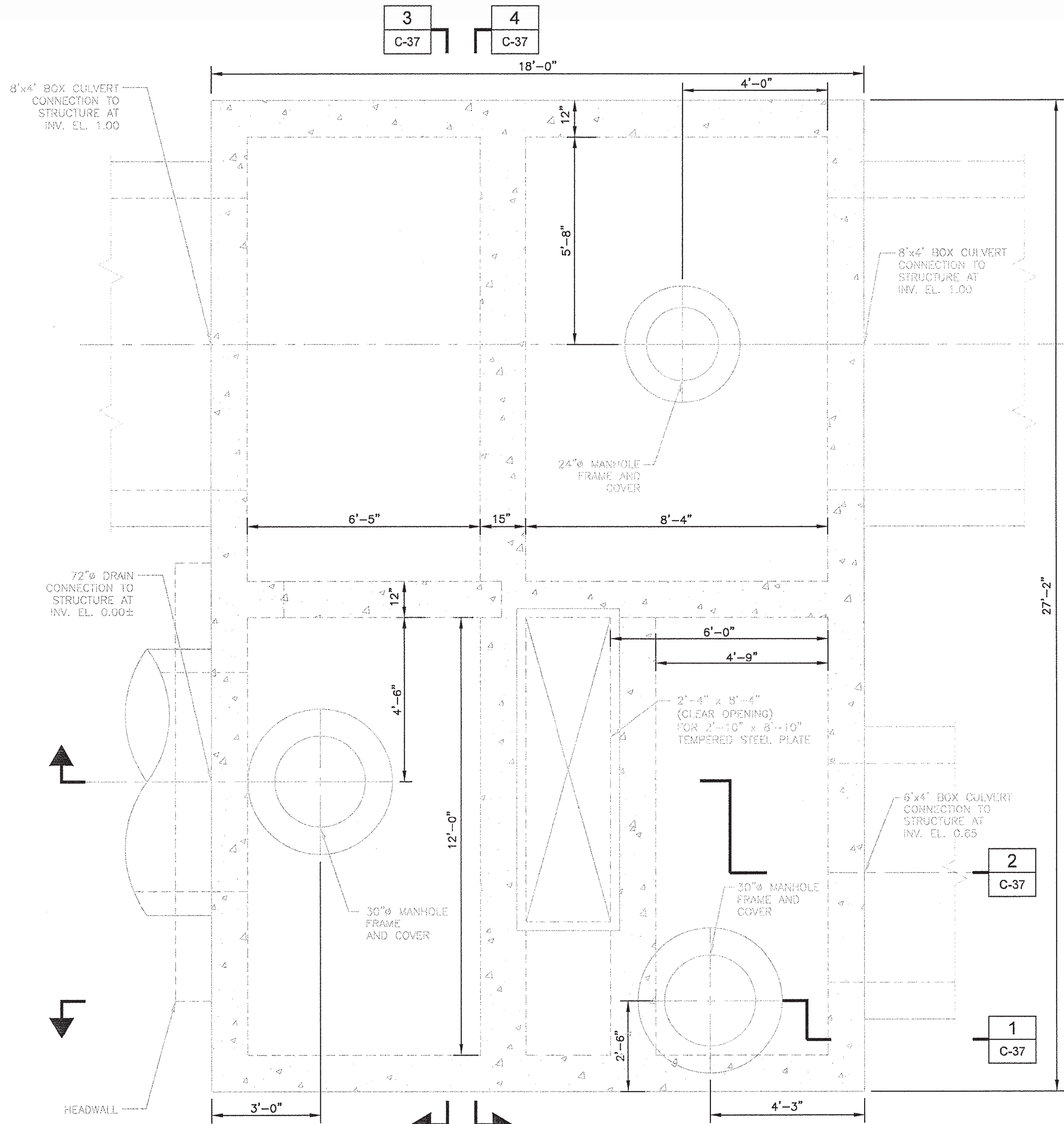


P11 Looking upstream at bulkhead with air  
Vents in MWRA's 48" sewer on Wheeler St.

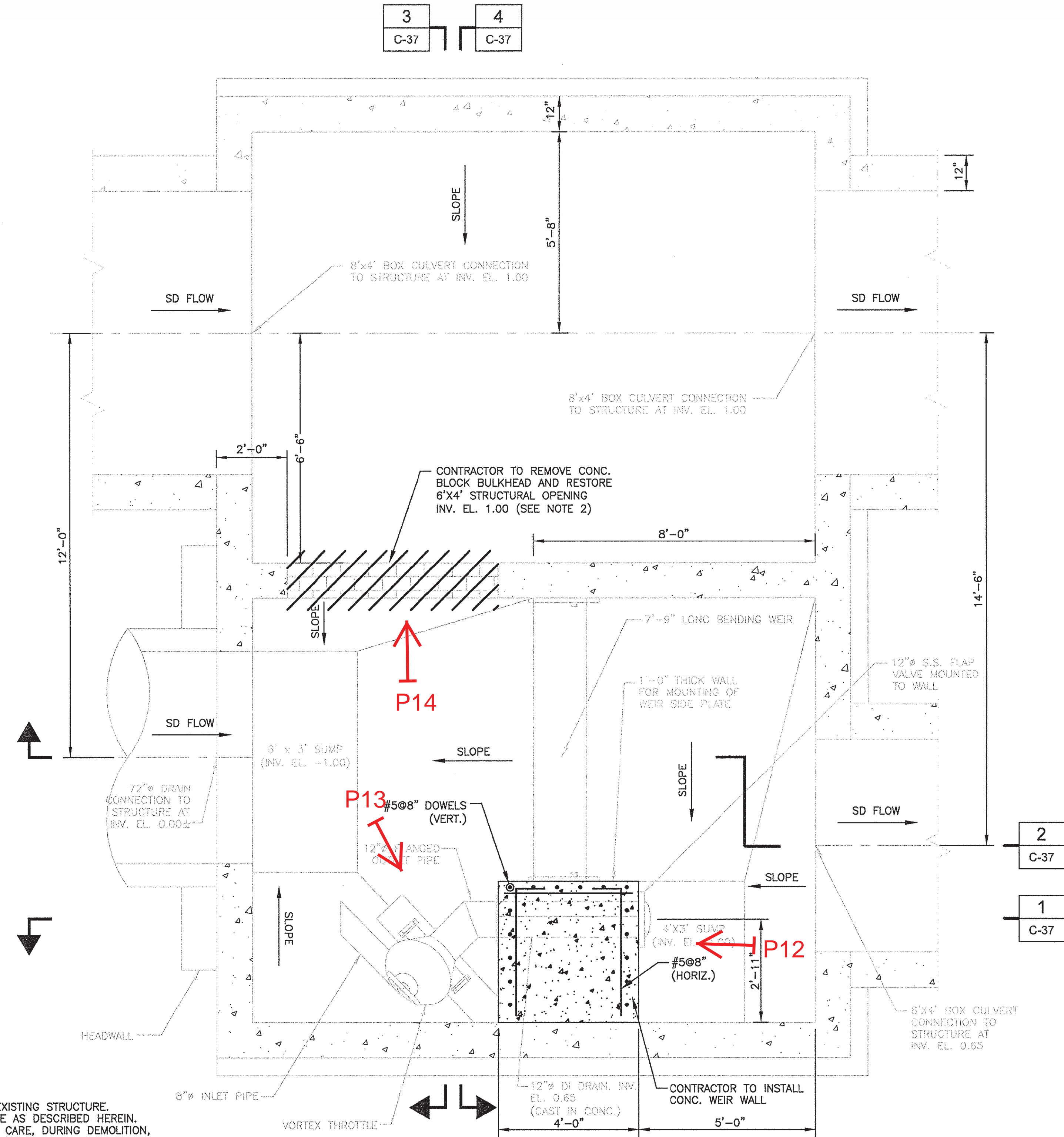


P15 Looking upstream into newly installed 24" PVC pipe  
inserted into existing bell





**BENDING WEIR STRUCTURE ROOF SLAB PLAN**  
1/2"=1'-0"



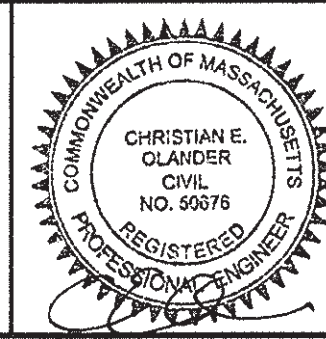
**BENDING WEIR STRUCTURE BASE SLAB PLAN**  
1/2"=1'-0"

- NOTES:**
1. BENDING WEIR STRUCTURE IS AN EXISTING STRUCTURE. CONTRACTOR TO MODIFY STRUCTURE AS DESCRIBED HEREIN.
  2. CONTRACTOR SHALL EXERCISE DUE CARE, DURING DEMOLITION, SO AS NOT TO DAMAGE ANY PART OR COMPONENT OF EXISTING CONSTRUCTION THAT BECOMES INCORPORATED INTO THE FINAL STRUCTURE.
  3. ALL EXISTING CONDITION ELEVATIONS ARE DEPICTED IN NGVD 29 DATUM. VERTICAL DATUM NGVD 29 IS APPROXIMATELY 10.84 FEET ABOVE CAMBRIDGE CITY BASE DATUM.
  4. REFER TO SPECIFICATION 01063 - SEQUENCING OF WORK FOR SEQUENCING OF WORK SHOWN ON THIS SHEET.

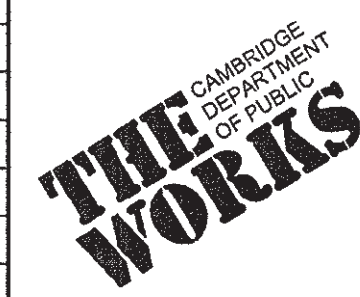
**WORK COMPLETED 12/23/15  
WORK COMPLETED BEYOND 12/21/15  
WAS NOT DIRECTLY REQUIRED TO  
COMPLETE THE SEWER SEPARATION  
OF THE CAM004 AREA.**

CONFORMED SET

PLOTTED: 12/22/14 4:28 PM BY: net:lin  
 CAD FILE: C:\mwh\k1012806\CONR\_C36-37.dwg LAYOUT: C-36



Scale	AS NOTED		
Date	JANUARY 27, 2014		
Job No.	20120256.001A		
Designed by	ZSH		
Drawn by	NFT		
Checked by	AML	No.	Description
Approved by	EO		Date
			REVISIONS



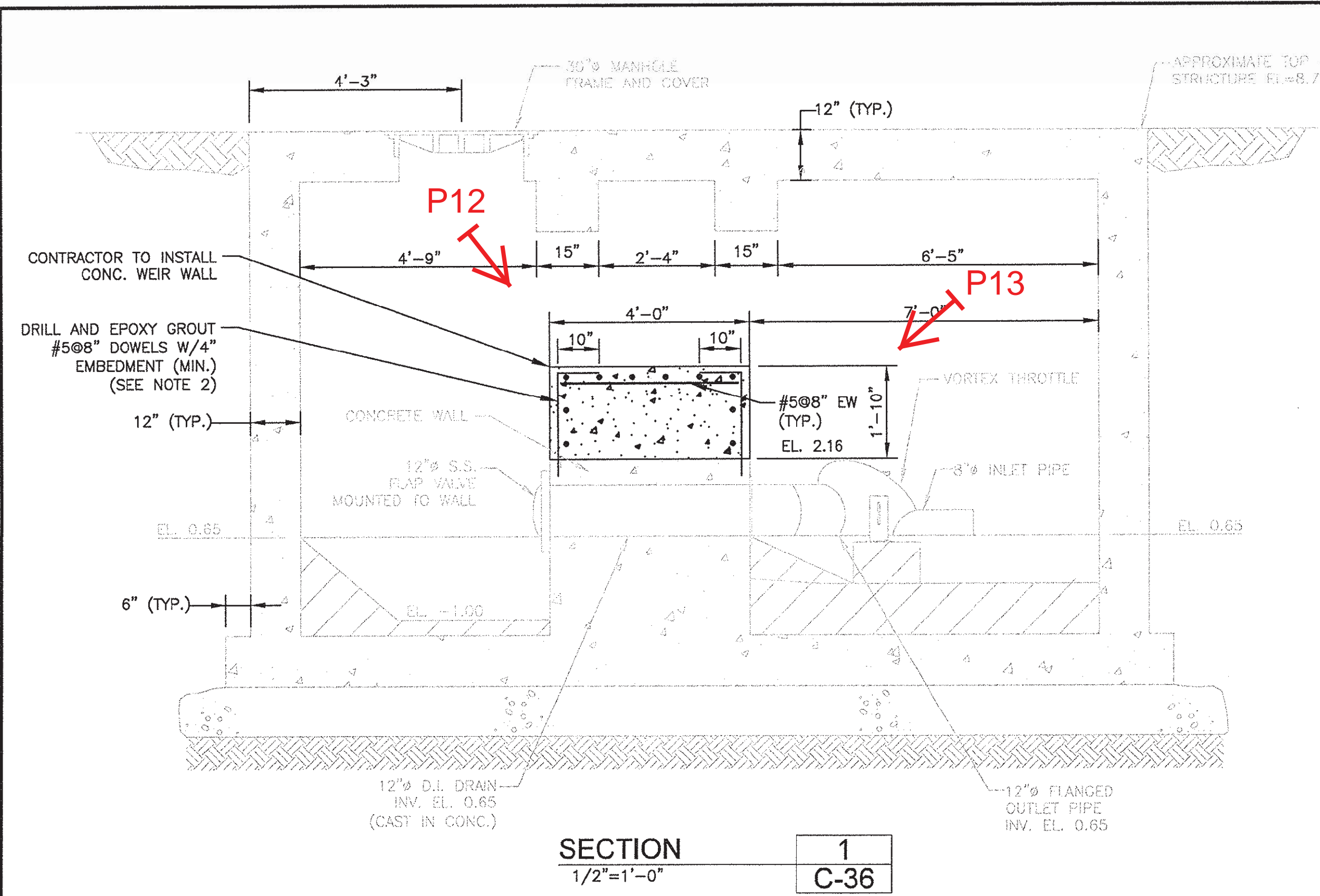
Client	CITY OF CAMBRIDGE, MASSACHUSETTS
Project	CONCORD (CONTRACT 9) SEWER SEPARATION AND SURFACE IMPROVEMENTS PROJECT
Drawing	CIVIL HYDRAULIC MODIFICATIONS AREA II - PLAN

Sheet	C-36
File No.	

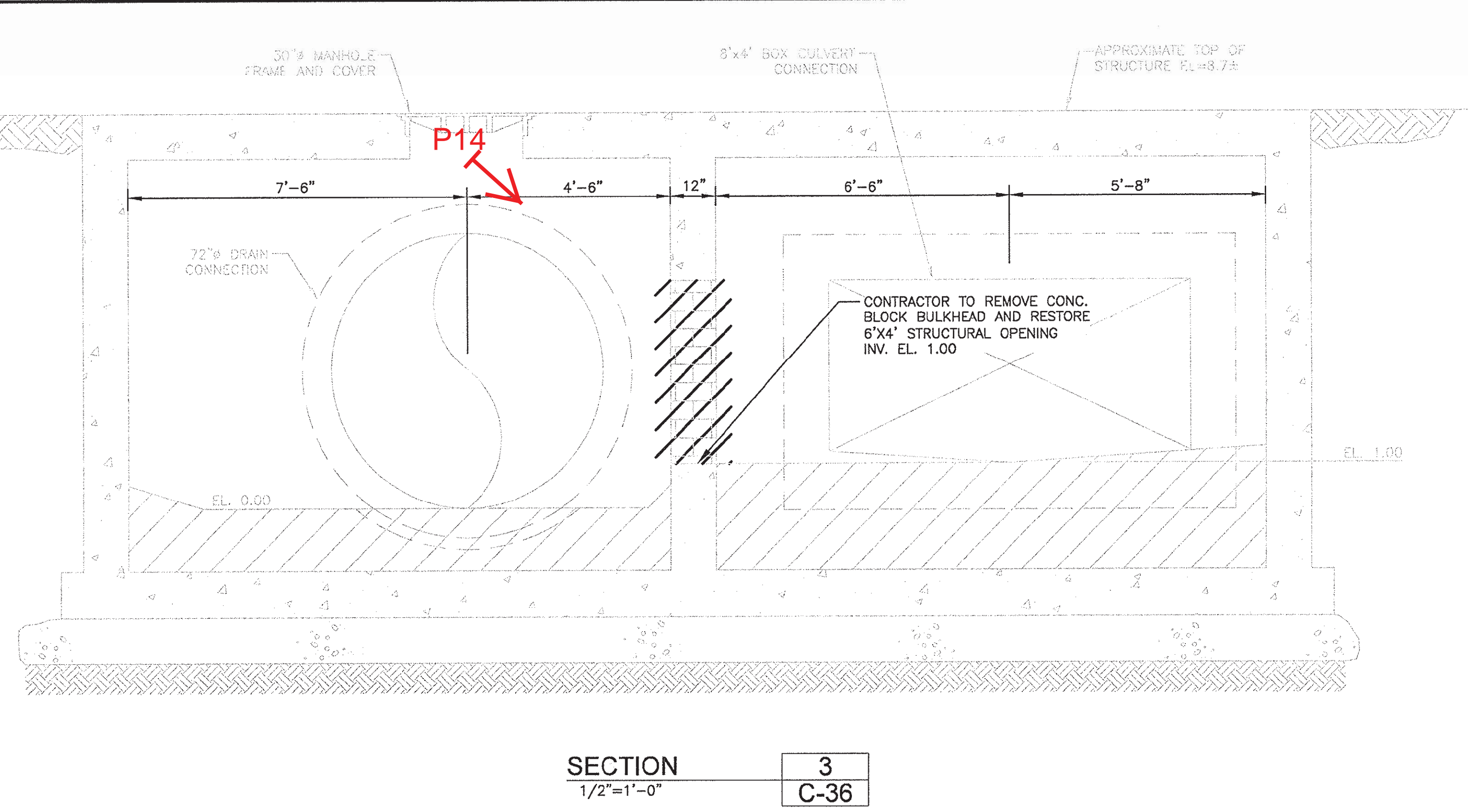
ATTACHMENT E-1



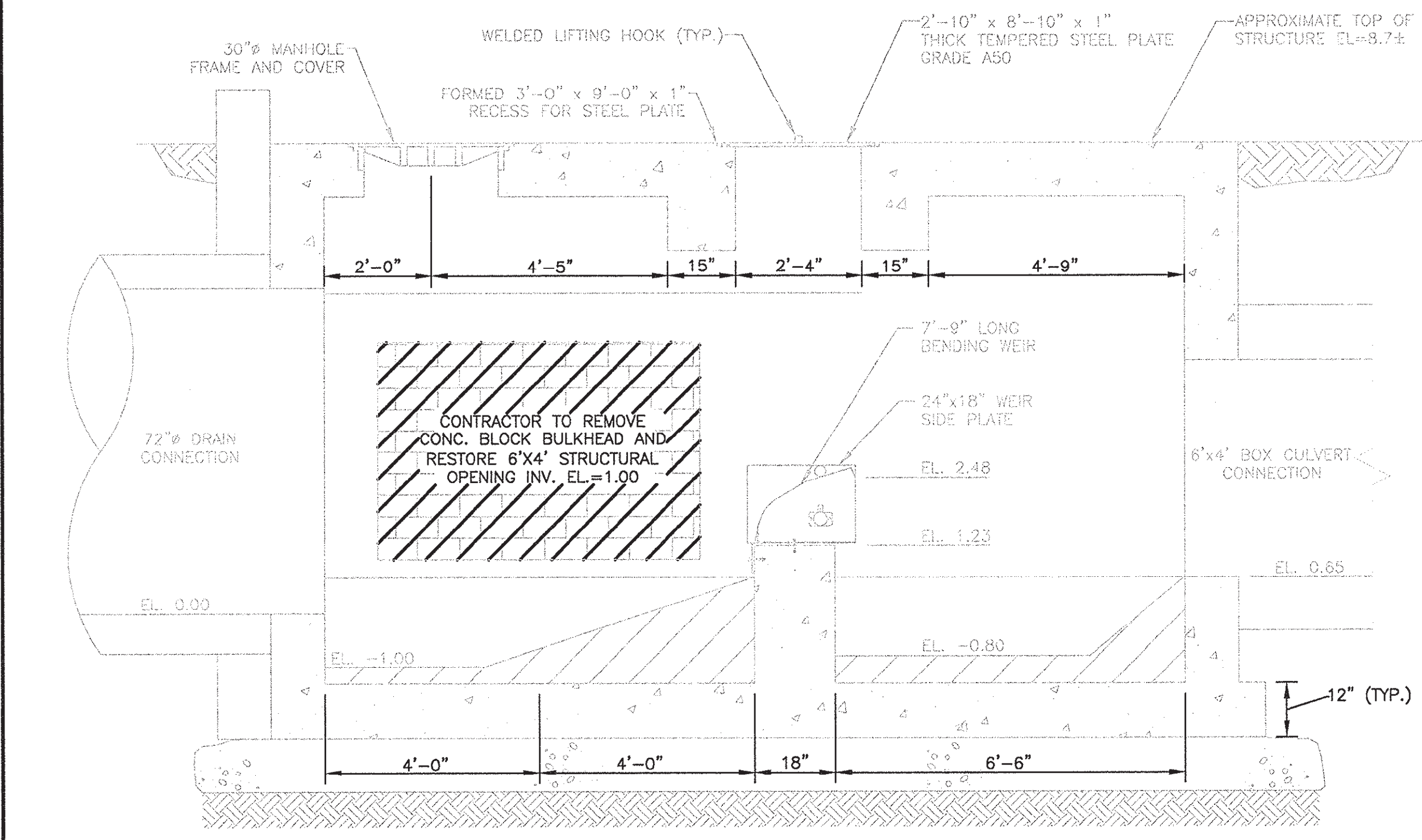
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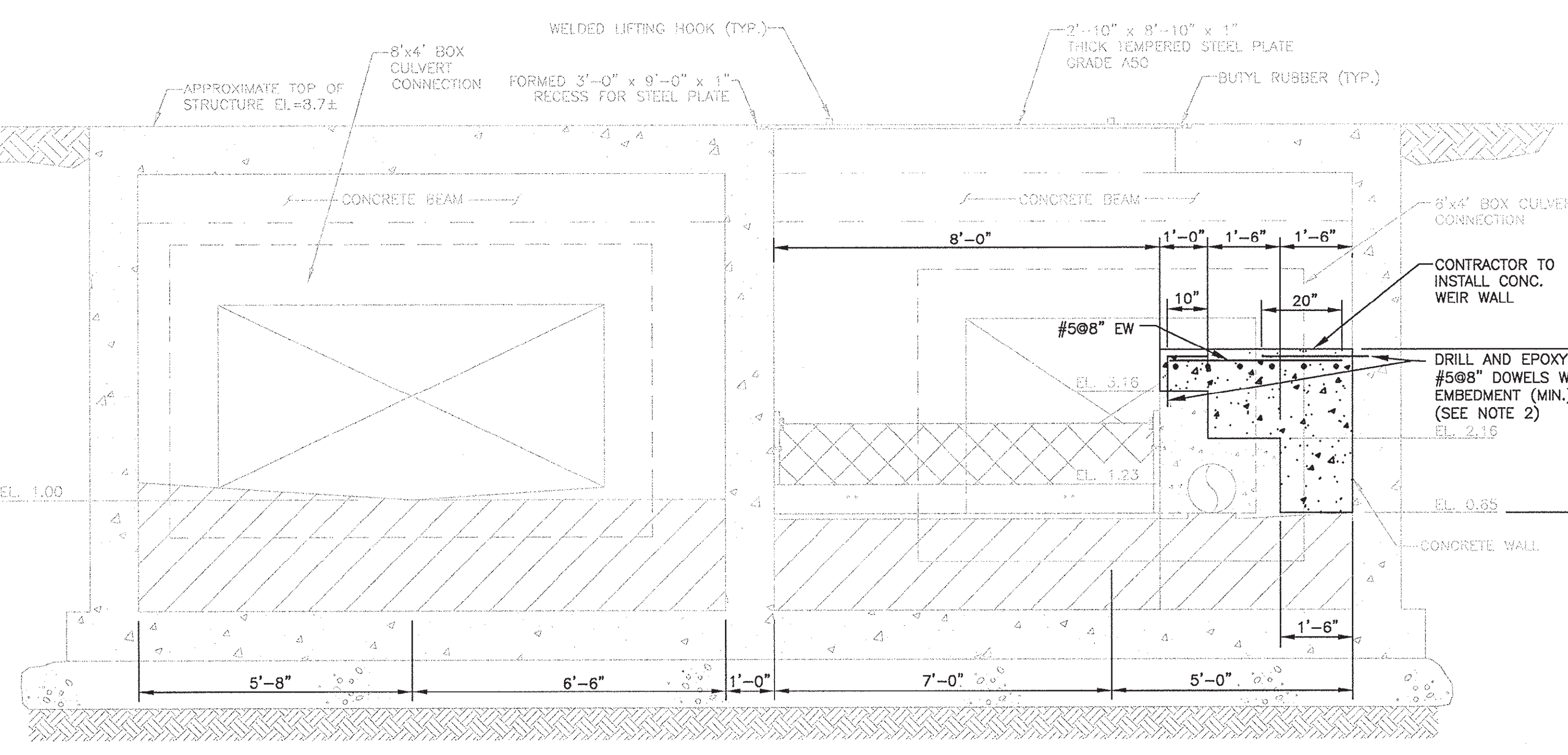
SECTION 1  
1/2"=1'-0"    C-36



SECTION 3  
1/2"=1'-0"    C-36



SECTION 2  
1/2"=1'-0"    C-36



SECTION 4  
1/2"=1'-0"    C-36

- NOTES:**
- BENDING WEIR STRUCTURE IS AN EXISTING STRUCTURE. CONTRACTOR TO MODIFY STRUCTURE AS DESCRIBED HEREIN.
  - PROVIDE HILTI HIT-RE 500 SD WITH 4" EMBEDMENT (MIN.).
  - ALL EXISTING CONDITION ELEVATIONS ARE DEPICTED IN NGVD 29 DATUM. VERTICAL DATUM NGVD 29 IS APPROXIMATELY 10.84 FEET HIGHER THAN CAMBRIDGE CITY BASE DATUM.
  - REFER TO SPECIFICATION 01063 - SEQUENCING OF WORK FOR SEQUENCING OF WORK SHOWN ON THIS SHEET.

CONFORMED SET



Scale	AS NOTED		
Date	JANUARY 27, 2014		
Job No.	20120256.001A		
Designed by	ZSH		
Drawn by	NFT		
Checked by	AML	No.	Description
Approved by	EO		Date
REVISIONS			



Client	CITY OF CAMBRIDGE, MASSACHUSETTS
Project	CONCORD (CONTRACT 9) SEWER SEPARATION AND SURFACE IMPROVEMENTS PROJECT
Drawing	CIVIL HYDRAULIC MODIFICATIONS AREA II - SECTIONS

Sheet	C-37
File No.	

ATTACHMENT E-2



# Modifications to Bending Weir Structure



P12 Looking upstream at elevated weir with flap gate at outlet of vortex throttle



P13 Looking downstream at elevated weir with bending weir (left) and vortex throttle (right)



P14 Bulkhead removed between 72" drain and 4'x8' box culvert