



ROBERT C. GALLUP
N.Y. Professional Engineer # 069840-1

1	05/27/2015		
No.	Date	Revision	Approved

ENGINEERING DEPARTMENT

**WORLD
TRADE
CENTER**

GENERAL

Title

**BPS - VSC
BOLLARD PROTECTION SYSTEM**

**INDEX OF CONTRACT
DRAWINGS**

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S.OLIVER M.DIAZ R.GALLUP
Designed by Drawn by Checked by
Date 04/29/2015

Contract Number **WTC-964.952**

Drawing Number **G003**

PID# #####

RELEASED_DATE

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**LOCATION AND
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PLAN**

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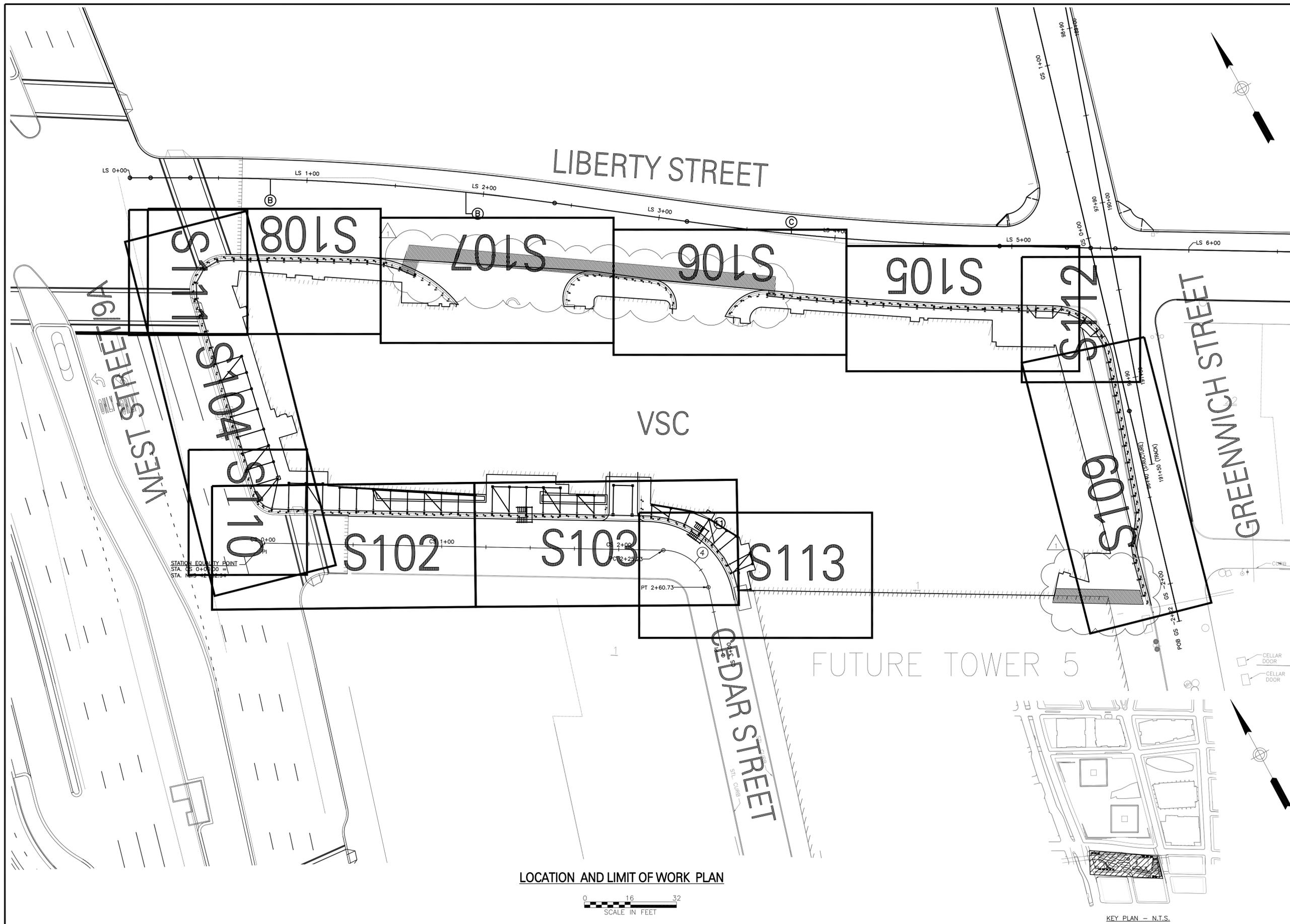
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Contract Number **WTC-964.952**

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LOCATION AND LIMIT OF WORK PLAN



KEY PLAN - N.T.S.



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**BPS - VSC
BOLLARD PROTECTION SYSTEM
EMERGENCY EGRESS
PLAN**

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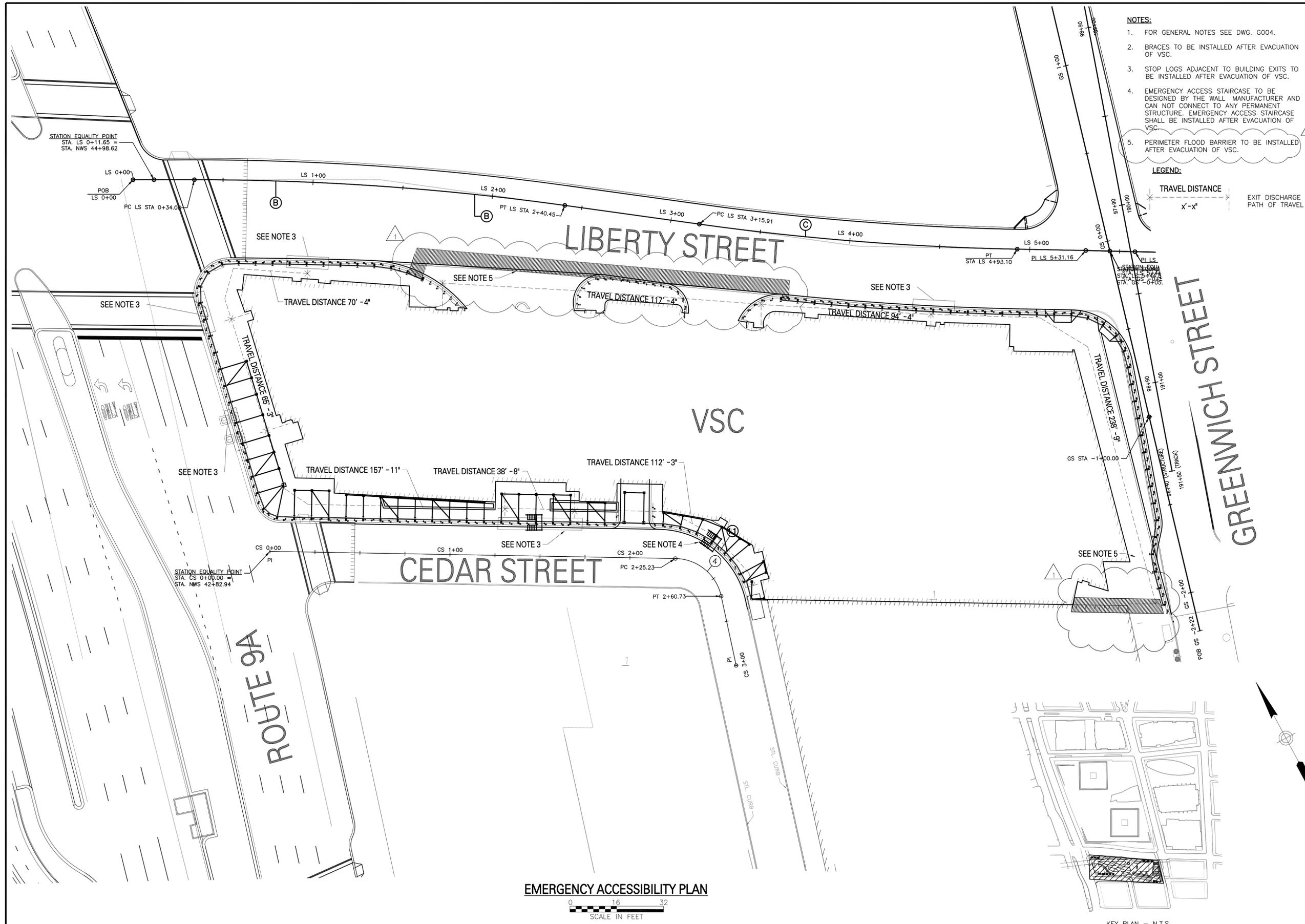
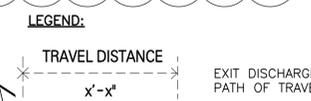
Date 04/29/2015

Contract Number **WTC-964.952**

Drawing Number **G006**

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- NOTES:**
- FOR GENERAL NOTES SEE DWG. G004.
 - BRACES TO BE INSTALLED AFTER EVACUATION OF VSC.
 - STOP LOGS ADJACENT TO BUILDING EXITS TO BE INSTALLED AFTER EVACUATION OF VSC.
 - EMERGENCY ACCESS STAIRCASE TO BE DESIGNED BY THE WALL MANUFACTURER AND CAN NOT CONNECT TO ANY PERMANENT STRUCTURE. EMERGENCY ACCESS STAIRCASE SHALL BE INSTALLED AFTER EVACUATION OF VSC.
 - PERIMETER FLOOD BARRIER TO BE INSTALLED AFTER EVACUATION OF VSC.



EMERGENCY ACCESSIBILITY PLAN
0 16 32
SCALE IN FEET

KEY PLAN - N.T.S.

STRUCTURAL NOTES

BPS FLOODWALL SYSTEM SHALL BE DESIGNED TO MEET THE FOLLOWING DESIGN CRITERIA:

1. DESIGN THE FLOODWALL SYSTEM TO RESIST WATER TO A BASE FLOOD ELEVATION OF 312.0 IN PORT AUTHORITY DATUM WHICH INCLUDES FREEBOARD AND FUTURE SEA LEVEL RISE.

2. A CONCRETE SIDEWALK SUBSLAB HAUNCH WAS CONSTRUCTED ALONG WEST ST, LIBERTY ST, GREENWICH ST AND CEDAR ST (SEE REFERENCE DRAWINGS FOR LIMITS AND DETAILS) BEARING AGAINST THE BOLLARD FOUNDATION. THIS CONCRETE SUBSLAB HAUNCH WAS CONSTRUCTED TO RESIST A MAXIMUM 3060 POUNDS/LINEAR FOOT ACTING AT A LINE OF ACTION 9 INCHES BELOW THE SIDEWALK SURFACE FOR 1000 POUNDS COLLISION MASS. AT TREE PIT LOCATIONS, THE SYSTEM WILL RELY UPON ARCHING TO DISTRIBUTE THE HORIZONTAL FORCE.

3. UNIT WEIGHTS:

A. SEAWATER = 64 PCF

B. MOIST SOIL = 120 PCF

C. CONCRETE = 150 PCF

D. SUBGRADE CONSISTS OF MEDIUM DENSE SAND WITH AN EFFECTIVE FRICTION ANGLE OF 30 DEGREES AND A PASSIVE LATERAL EARTH PRESSURE COEFFICIENT (kp = 3.0).

4. MINIMUM STRENGTH DESIGN LOAD FACTORS FOR CRITICAL LOAD COMBINATION IN ACCORDANCE WITH ASCE 7 SECTION 2.3:

A. DEAD LOAD - 1.2

B. HYDROSTATIC LOAD - 1.6

C. HYDRODYNAMIC LOAD - 1.6

D. WIND LOAD - 1.0

E. COLLISION IMPACT (FLOOD) LOAD (ASCE 7 SECTION 2.3.3) - 2.0

5. SLIDING AND OVERTURNING:

A. MINIMUM FACTOR OF SAFETY AGAINST SLIDING = 1.5 (FLOOD CONDITION WITHOUT COLLISION IMPACT LOAD) OR 1.25 (FLOOD CONDITION WITH COLLISION IMPACT LOAD) .

B. MINIMUM FACTOR OF SAFETY AGAINST OVERTURNING = 1.5

C. BOLLARDS ARE SUFFICIENTLY EMBEDDED IN THE UNDERLYING FOUNDATION SUBSTRUCTURE ON LIBERTY ST, GREENWICH ST, CEDAR ST AND WEST ST TO ENGAGE THE COMPLETE FOUNDATION MASS.

D. THE SIDEWALK WAS DESIGNED FOR A LIVE LOAD CAPACITY OF 600 PSF. ANALYZE THE LOADS FROM THE FLOODWALL SYSTEM BRACE ON THE SIDEWALK BASED ON THE EXISTING SIDEWALK CONDITION.

E. DO NOT RELY ON FRICTION FOR SLIDING RESISTANCE.

6. HYDROSTATIC LOAD:

A. HYDROSTATIC PRESSURE ACTS ABOVE THE TOP OF ROADWAY PAVEMENT ELEVATION.

B. USE 1-FOOT OF ADDITIONAL DESIGN HEIGHT TO COMPUTE HYDROSTATIC LOAD IN ACCORDANCE WITH ASCE 7 SECTION 5.4.2.

7. HYDRODYNAMIC AND COLLISION IMPACT LOAD

A. NO WAVE LOAD.

B. COLLISION IMPACT LOAD: APPLY AN EQUIVALENT STATIC IMPACT LOAD AS A CONCENTRATED FORCE ON THE FLOODWALL AT 1.0 FOOT BELOW STILL WATER ELEVATION (SWEL) FOR FOUNDATION DESIGN AND GLOBAL STABILITY.

C. HYDRODYNAMIC LOAD SHALL BE BASED ON WATER VELOCITY OF 3.0 FEET PER SECOND.

D. 1,000 POUND FLOATING DEBRIS AT A VELOCITY OF 3.0 FEET PER SECOND AT 90 DEGREES, WHICH IS ASSUMED TO SIMULATE FLOOD-BORNE DEBRIS ACTING AT 1 FOOT BELOW SWEL. ALL MEMBERS SHALL BE DESIGNED FOR MAXIMUM FORCE EFFECT. POSTS SHALL BE DESIGNED FOR A DIRECT COLLISION LOAD AT MID-SPAN BETWEEN BRACING POINTS. ALL STOP LOGS SHALL BE DESIGNED TO DISSIPATE LOAD BOTH HORIZONTALLY AND VERTICALLY FOR A COLLISION AT MID-SPAN.

E. USE THE FOLLOWING ASCE 7 AND FEMA 259 STANDARDS OR EQUAL STANDARDS IN ACCORDANCE WITH ACCEPTED STRUCTURAL ENGINEERING PRACTICE TO DETERMINE COLLISION IMPACT LOADS:

- HYDRODYNAMIC MASS COEFFICIENT = 1.25
- DRAG COEFFICIENT = 2.0
- IMPACT DURATION = 0.03 SECONDS
- NATURAL PERIOD OF STRUCTURE = 0.01 SECONDS
- MAXIMUM RESPONSE RATIO FOR IMPULSIVE LOAD = 1.8
- IMPORTANCE COEFFICIENT = 1.2
- ORIENTATION COEFFICIENT = 0.8
- DEPTH COEFFICIENT = 1.0
- BLOCKAGE COEFFICIENT = 1.0 (NO SCREENING)

F. AN EFFECTIVE FOOTING LENGTH OF 15 LINEAR FEET IS MOBILIZED TO RESIST COLLISION IMPACT LOAD.

8. WIND LOAD

A. IN ACCORDANCE WITH ASCE 7 TABLE 1.5-1, CLASSIFY THE FLOOD PROTECTION SYSTEM AS RISK CATEGORY III.

B. 130 MILES PER HOUR BASIC WIND SPEED IN ACCORDANCE WITH ASCE SECTION 26.5.1 & FIGURE 26.5-1B.



THE PERIMETER FLOOD BARRIER SHALL BE DESIGNED TO MEET THE FOLLOWING DESIGN CRITERIA:

1. THE PERIMETER FLOOD BARRIER SHALL MEET ALL OF THE REQUIREMENTS OF FM APPROVAL (CLASS 2511) AND HAVE A CERTIFICATE OF COMPLIANCE.

2. DEVIATIONS FROM THE CONTRACT DRAWINGS MUST BE SUBMITTED FOR APPROVAL IN ADVANCE OF THE SHOP DRAWING SUBMISSIONS.

OPERATIONAL AND LOGISTICAL REQUIREMENTS:

1. STRUCTURAL MEMBERS SHALL BE COLOR-CODED TO AID WITH DEPLOYMENT. ANY ATYPICAL SECTIONS MUST BE SIMILARLY MARKED AS DESCRIBED IN SPECIFICATION SECTION 05520 FLOODWALL SYSTEM.

2. DESIGN SHALL BE ADVANCED BASED ON THE UNDERSTANDING THAT ERECTION OF THE FLOODWALL CAN BE PERFORMED USING MANPOWER AND LIMITED LIGHT WEIGHT EQUIPMENT. THE MAXIMUM WEIGHT OF ANY COMPONENT PIECE SHALL BE 500 POUNDS.

3. THE LANE CLOSEST TO THE FLOODWALL SYSTEM WILL BE CLOSED DURING ERECTION HOWEVER AT LEAST ONE LANE SHALL REMAIN ON THE STREETWARD SIDE OF THE FLOODWALL DURING/AFTER DEPLOYMENT.

4. EXCEPT IN ATYPICAL AREAS IDENTIFIED IN THE REQUIRED TOLERANCE ANALYSIS DELIVERABLE, ALL COMPONENTS OF THE WALL SHALL HAVE IDENTICAL PARTS. STOP LOGS SHALL BE INSTALLED TO THE MAXIMUM HEIGHT WITHOUT EXCEEDING THE TOP OF THE BPS POSTS. ALL STOP LOGS SHALL HAVE IDENTICAL CROSS SECTIONS.

5. PROVIDE TWO EMERGENCY ACCESS STAIRCASES TO PROVIDE ACCESS TO THE VSC WHEN THE FLOODWALL SYSTEM IS DEPLOYED. EMERGENCY ACCESS STAIRCASES SHALL HAVE A MINIMUM WIDTH OF 22 INCHES AND SHALL BE DESIGNED TO MEET OSHA STANDARDS.

PERMANENT FOOTING REQUIREMENTS:

1. EXISTING STRUCTURES TO REMAIN SHALL BE PROTECTED TO PREVENT DAMAGE DURING THE PERFORMANCE OF THE WORK OF THIS CONTRACT. ANY PORTION OF THE EXISTING STRUCTURE REMOVED, DISTURBED OR DAMAGED IN THE COURSE OF WORK BY THE CONTRACTOR SHALL BE REPAIRED BY THE CONTRACTOR TO ITS ORIGINAL CONDITION AND TO THE SATISFACTION OF THE ENGINEER. THIS WORK SHALL BE DONE AT NO ADDITIONAL COST TO THE AUTHORITY.

2. HOLES SHALL NOT BE DRILLED OR CUT INTO THE EXISTING STRUCTURAL MEMBERS EXCEPT WHERE SPECIFIED ON THE CONTRACT DOCUMENTS.

3. MACHINE EXCAVATION IS NOT PERMITTED WITHIN 3 FEET OF EXISTING STRUCTURES, POWER DUCT LINES OR ANY OTHER FACILITIES UNTIL THEY HAVE BEEN CAREFULLY EXPOSED BY HAND EXCAVATION.

4. SHOP DRAWINGS FOR CONCRETE WORK SHALL BE PREPARED UNDER THE SUPERVISION OF AN EXPERIENCED CONCRETE STRUCTURE DETAILER WHO HAS THE KNOWLEDGE OF THE REQUIREMENTS OF ACI 318 BUILDING CODE FOR STRUCTURAL CONCRETE, ACI 315 DETAILS AND DETAILING OF CONCRETE REINFORCEMENT AND CRSI MANUAL OF STANDARD PRACTICE.

5. ALL CONCRETE WORK SHALL CONFORM TO THE ACI 318-05 BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE AND SPECIFICATION DIVISION 3, SECTION 03301.

6. ALL CONCRETE SHALL BE NORMAL WEIGHT (AGGREGATE) CONCRETE HAVING A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 5000 PSI AT 56 DAYS, CATEGORY V UNLESS OTHERWISE NOTED.

7. PORTLAND CEMENT SHALL CONFORM TO ASTM C150. USE TYPE I/II CEMENT FOR CONCRETE IN CONTACT WITH SOIL.

8. ALL CONCRETE SHALL COMPLY WITH THE REQUIREMENTS OF THE SPECIFICATIONS AND ACI 318 STRUCTURAL CONCRETE CODE. MIX PREPARED BY CONTRACTOR SHALL BE TESTED BY AN INDEPENDENT TESTING LABORATORY. ALL CONCRETE MIX DESIGNS SHALL BE SUBMITTED TO THE AUTHORITY MEU FOR REVIEW AND APPROVAL.

9. REINFORCING BARS SHALL BE DEFORMED BAR CONFORMING TO ASTM A615 GRADE 60 UNCOATED. REINFORCING BARS TO BE WELDED SHALL CONFORM TO ASTM A706 GRADE 60 UNCOATED.

10. THE CONTRACTOR SHALL SECURE ALL REINFORCING STEEL IN PLACE SO IT WILL MAINTAIN ITS POSITION DURING CONCRETE POUR, CHAIRS, TIES, SPACERS, ADDITIONAL BARS AND STIRRUPS, ETC. SHALL BE PROVIDED BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE AUTHORITY.

11. THE CONTRACTOR SHALL NOT PLACE CONCRETE UNTIL THE REINFORCEMENT STEEL IS INSPECTED AND PERMISSION FOR PLACING CONCRETE IS GRANTED BY THE ENGINEER. ALL CONCRETE PLACED IN VIOLATION OF THIS PROVISION SHALL BE REJECTED AND REMOVED.

12. MINIMUM CONCRETE COVER FOR REINFORCING STEEL SHALL BE 3 INCHES FOR CONCRETE CAST AGAINST AND PERMANENTLY EXPOSED TO EARTH, UNLESS OTHERWISE NOTED.

13. FURNISH AND INSTALL ALL PIPE SLEEVES, BOXED OPENINGS, ANCHOR RODS, ETC., AS REQUIRED FOR THE VARIOUS TRADES.

14. ALL WORK SHALL CONFORM TO PROJECT SPECIFICATIONS.

SPECIAL INSPECTIONS:

1. THE AUTHORITY WILL PERFORM QUALITY ASSURANCE INSPECTIONS AND TESTING TO ENSURE QUALITY PRODUCTS AND WORKMANSHIP BY THE CONTRACTOR. THIS DOES NOT RELIEVE THE CONTRACTOR FROM FOLLOWING THEIR OWN QA/QC REQUIREMENTS.

2. IT IS THE CONTRACTOR RESPONSIBILITY TO NOTIFY THE ENGINEER RESPONSIBLE FOR SPECIAL INSPECTIONS, AT LEAST 48 HOURS PRIOR TO WHEN WORK IS READY FOR INSPECTION.

3. THE FOLLOWING ITEMS ARE SUBJECT TO SPECIAL INSPECTION IN ACCORDANCE WITH ARTICLE 27-132 OF THE BUILDING CODE OF THE CITY OF NEW YORK. THESE INSPECTIONS WILL BE PERFORMED BY THE OWNER'S ENGINEER. THE CONTRACTORS SHALL PERFORM THEIR OWN QA/QC.

- A. CONCRETE
 - STRENGTH TEST
 - STEEL REINFORCEMENT
 - PLACEMENT AND CURING FORMWORK
- B. SOILS
 - PREPARATION OF FILL AREA
 - PLACEMENT OF COMPACTED "STRUCTURAL SOIL"
 - SOIL DENSITY
- C. POST-INSTALLED CONCRETE ANCHORS PER 2008 NYCBC SECTION 1704.13, MANUFACTURER'S INSTRUCTIONS, AND ICC-ES ESR-2302 FOR HILTI KWIK BOLD 3 EXPANSIONS ANCHORS.



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STRUCTURAL			
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BPS - VSC BOLLARD PROTECTION SYSTEM			
STRUCTURAL NOTES			

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Date **04/29/2015**

Contract Number **WTC-964.952**

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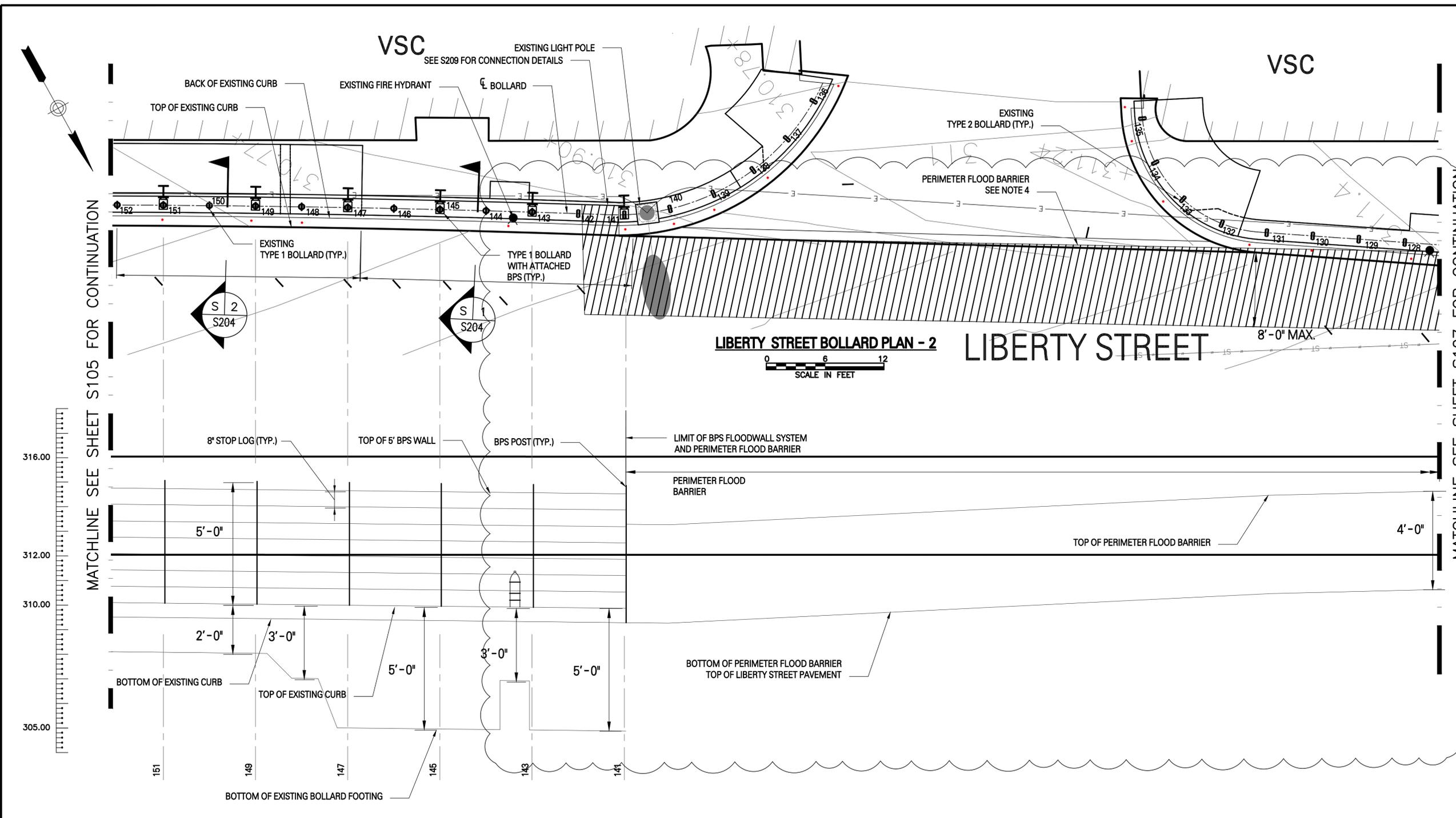
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BPS - VSC BOLLARD PROTECTION SYSTEM	
LIBERTY STREET BPS PLAN AND ELEVATION - 2	

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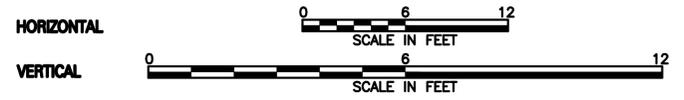


LIBERTY STREET BOLLARD PLAN - 2



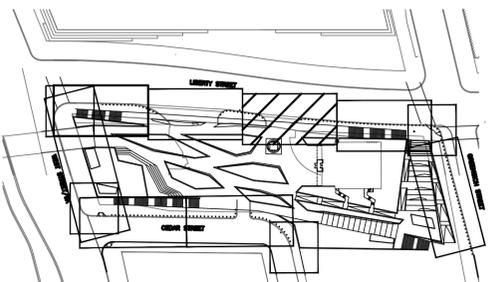
LIBERTY STREET

LIBERTY STREET ELEVATION - 2 (WET SIDE)



NOTES:

- FOR GENERAL NOTES SEE DWG. G004.
- FOR STRUCTURAL NOTES SEE DWG. S101.
- CONTRACTOR SHALL VERIFY EXISTING CONDITIONS BY SURVEY.
- FINAL LAYOUT TO BE DETERMINED BY THE CONTRACTOR AND APPROVED BY THE AUTHORITY BASED ON EXISTING CONDITIONS AND IN COORDINATION WITH THE MANUFACTURER. SEE SPECIFICATION SECTION 05510 PERIMETER FLOOD BARRIER.



KEY PLAN - N.T.S.

MATCHLINE SEE SHEET S105 FOR CONTINUATION

MATCHLINE SEE SHEET S107 FOR CONTINUATION



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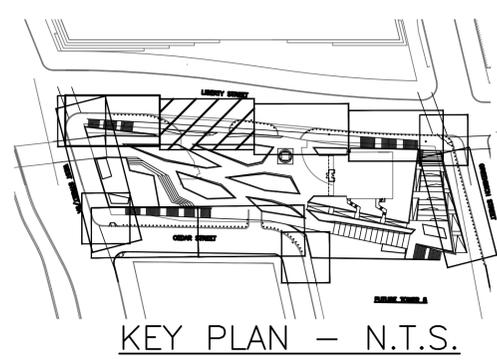
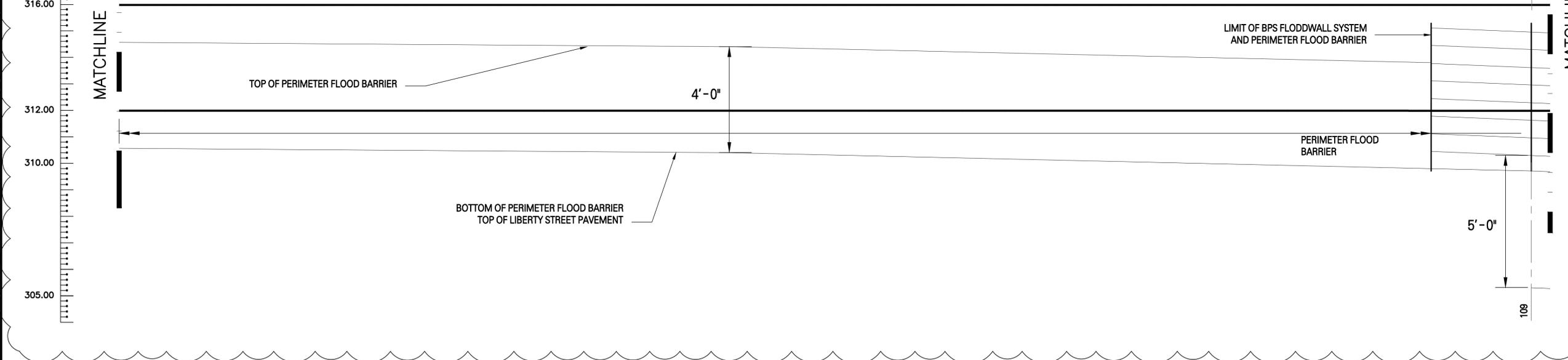
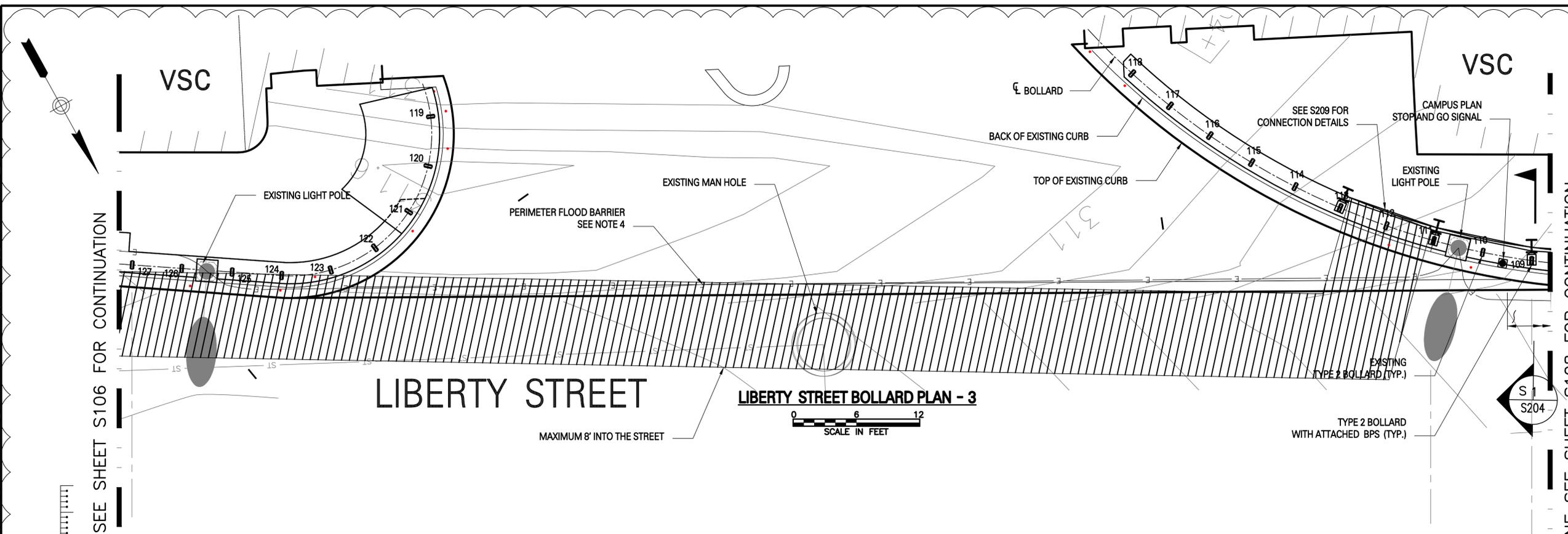
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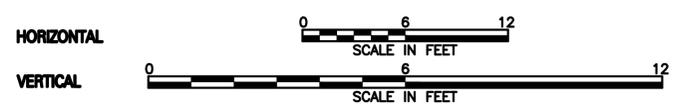
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LIBERTY STREET BPS PLAN AND ELEVATION - 3			

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LIBERTY STREET ELEVATION - 3 (WET SIDE)



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- CONTRACTOR SHALL VERIFY EXISTING CONDITIONS BY SURVEY.
- FINAL LAYOUT TO BE DETERMINED BY THE CONTRACTOR AND APPROVED BY THE AUTHORITY BASED ON EXISTING CONDITIONS AND IN COORDINATION WITH THE MANUFACTURER. SEE SPECIFICATION SECTION 05510 PERIMETER FLOOD BARRIER.



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**BPS - VSC
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**GREENWICH STREET
BPS PLAN
AND ELEVATION**

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S.OLIVER M.DIAZ R.GALLUP
Designed by Drawn by Checked by

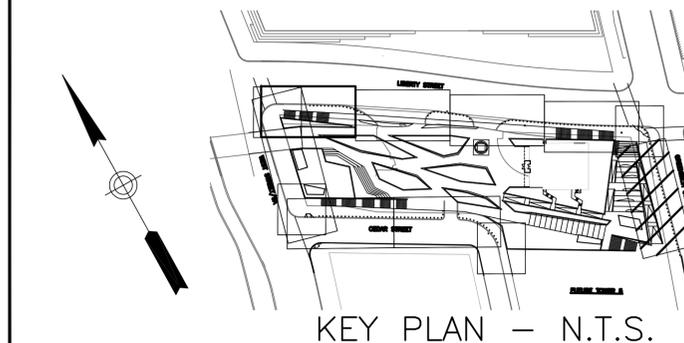
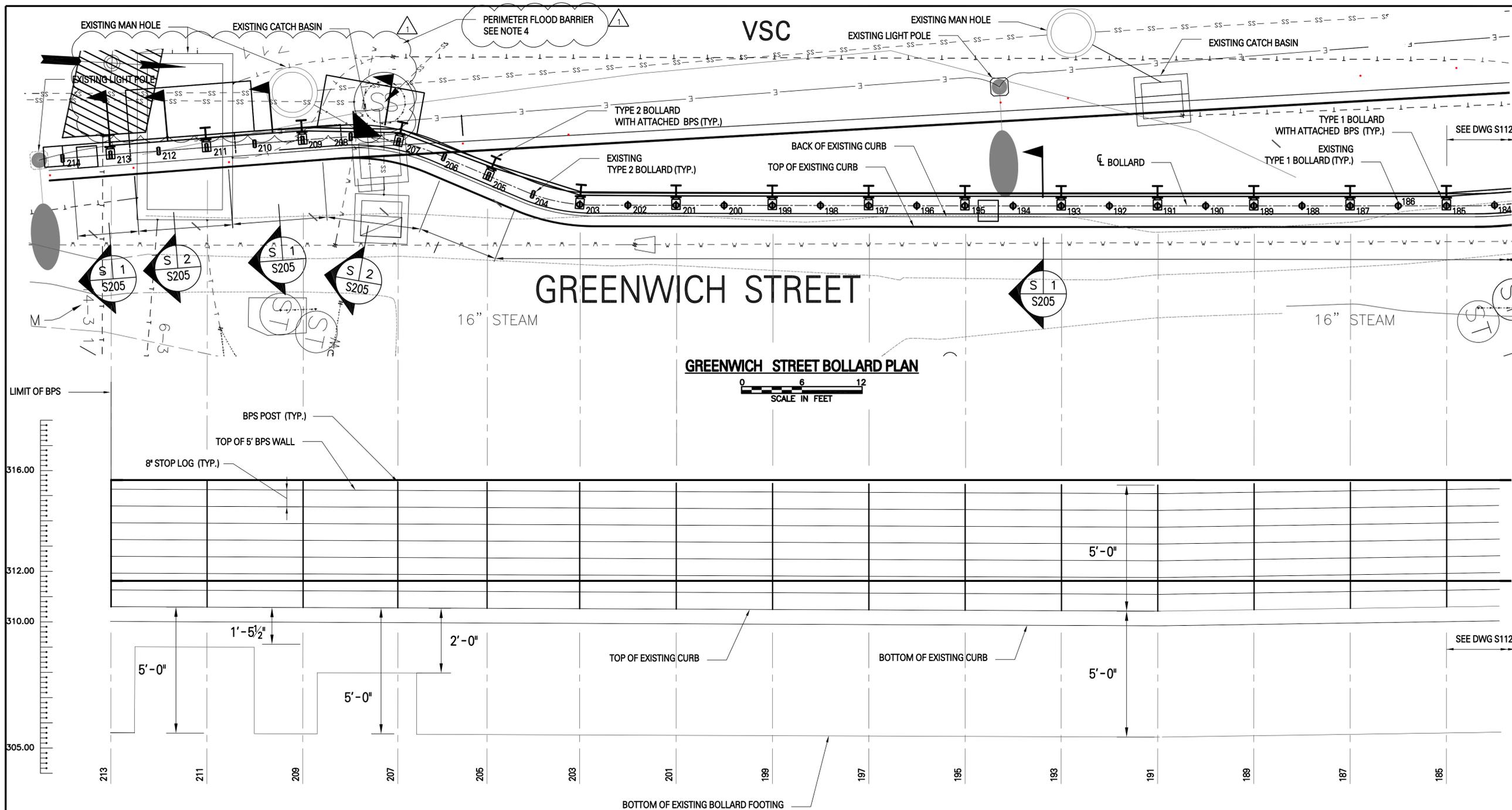
Date 04/29/2015

Contract Number **WTC-964.952**

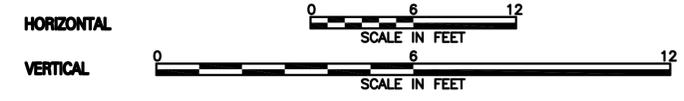
Drawing Number **S109**

PID# #####

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GREENWICH STREET ELEVATION - (WET SIDE)



NOTES:

- FOR GENERAL NOTES SEE DWG. G004.
- FOR STRUCTURAL NOTES SEE DWG. S101.
- CONTRACTOR SHALL VERIFY EXISTING CONDITIONS BY SURVEY.
- FINAL LAYOUT TO BE DETERMINED BY THE CONTRACTOR AND APPROVED BY THE AUTHORITY BASED ON EXISTING CONDITIONS AND IN COORDINATION WITH THE MANUFACTURER. SEE SPECIFICATION SECTION 05510 PERIMETER FLOOD BARRIER. SEE S114 FOR PLAN AND ELEVATION AND S209 FOR CONNECTION DETAILS.



ROBERT C. GALLUP
N.Y. Professional Engineer # 069840-1

No.	Date	Revision	Approved
	05/27/2015		

ENGINEERING DEPARTMENT

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STRUCTURAL

Title
**BPS - VSC
BOLLARD PROTECTION SYSTEM**

**GREENWICH STREET
TO BUILDING PERIMETER
FLOOD BARRIER
PLAN AND ELEVATION**

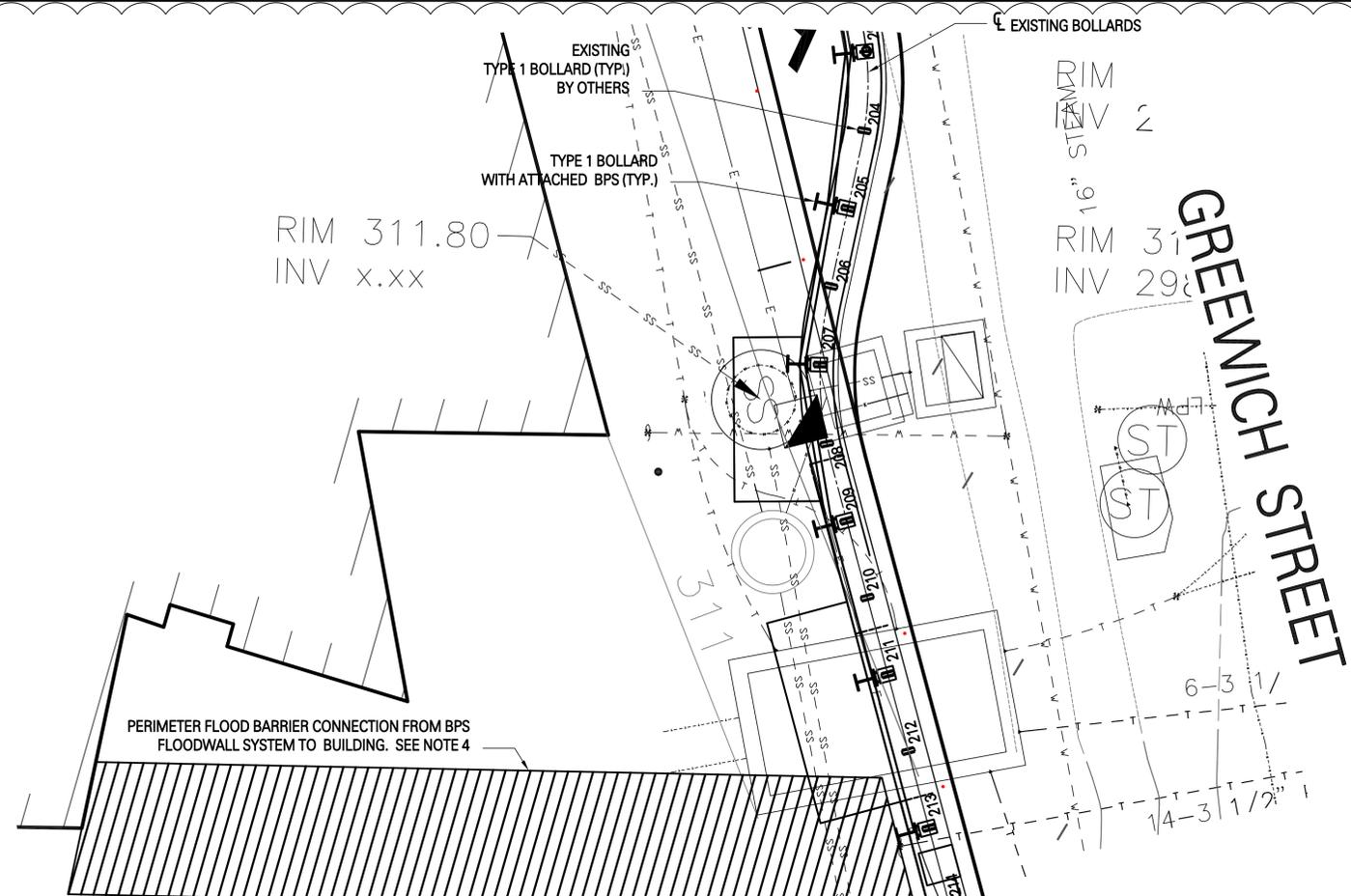
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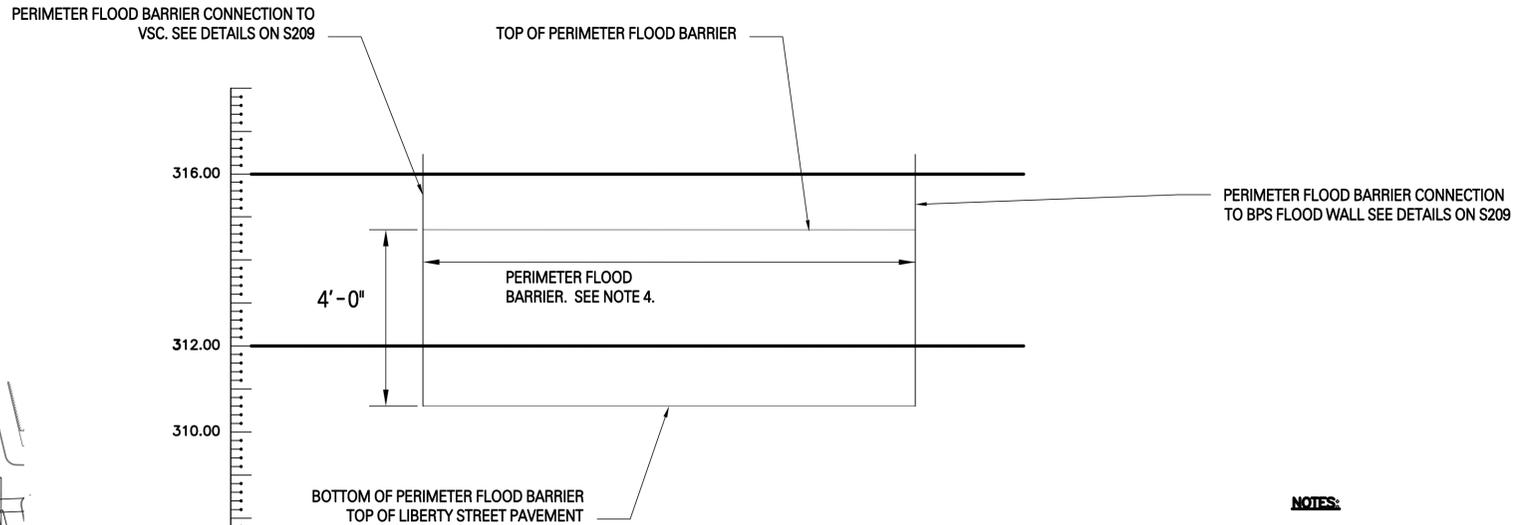
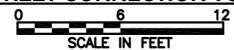
Date 04/29/2015

Contract Number **WTC-964.952**

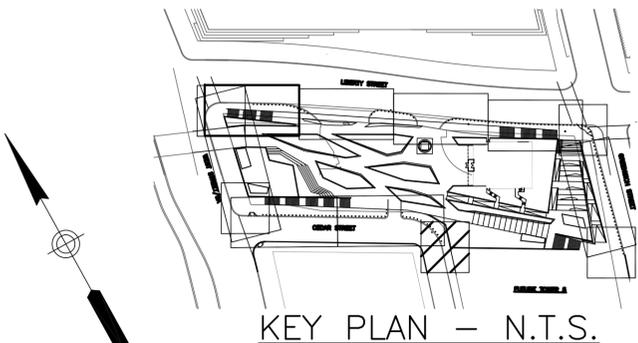
Drawing Number **S114**
PID# #####



GREENWICH STREET CONNECTION TO THE BUILDING PLAN



GREENWICH STREET CONNECTION TO BUILDING ELEVATION (WET SIDE)



- NOTES:**
- FOR GENERAL NOTES SEE DWG. G004.
 - FOR STRUCTURAL NOTES SEE DWG. S101.
 - CONTRACTOR SHALL VERIFY EXISTING CONDITIONS BY SURVEY.
 - FINAL LENGTH AND LAYOUT TO BE DETERMINED BY THE CONTRACTOR AND APPROVED BY THE AUTHORITY BASED ON EXISTING CONDITIONS AND IN COORDINATION WITH THE MANUFACTURER. SEE SPECIFICATION SECTION 05510 PERIMETER FLOOD BARRIER.



ROBERT C. GALLUP
N.Y. Professional Engineer # 069840-1

No.	Date	Revision	Approved
1	05/27/2015		

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BOLLARD PROTECTION SYSTEM**

**CEDAR STREET
BPS DETAILS - 1**

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D.GREEN M.DIAZ R.GALLUP
Designed by Drawn by Checked by

Date 04/29/2015

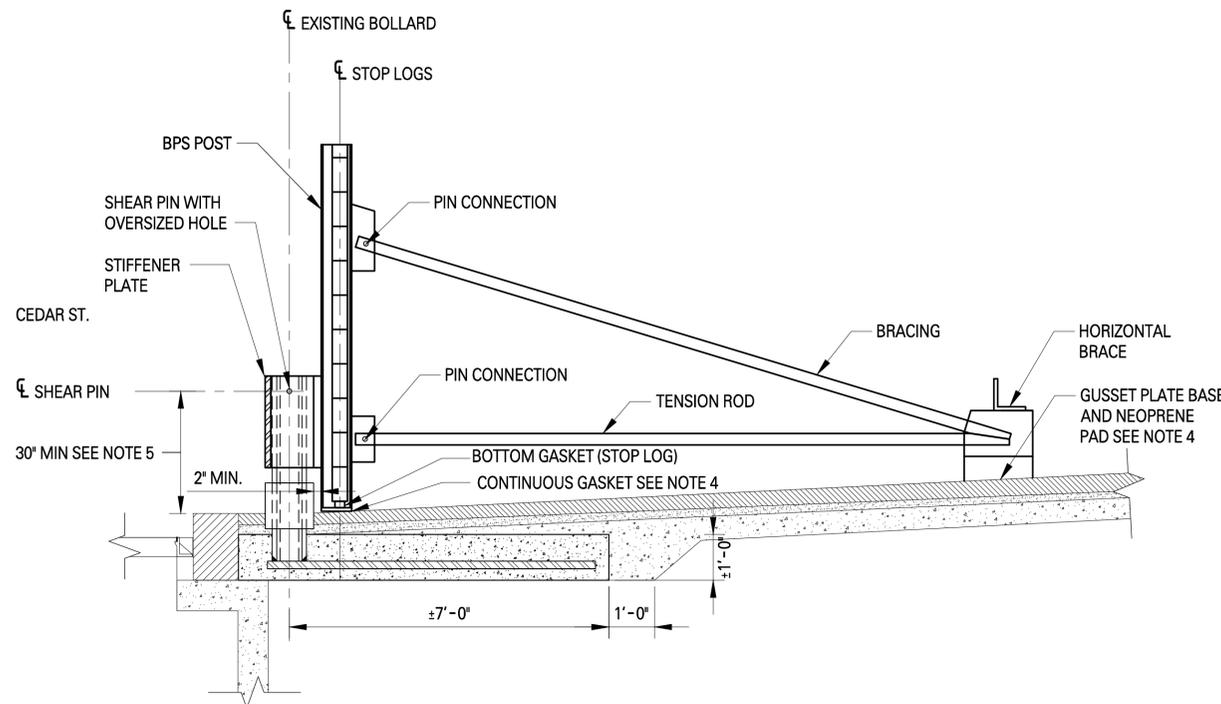
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Drawing Number **S201**

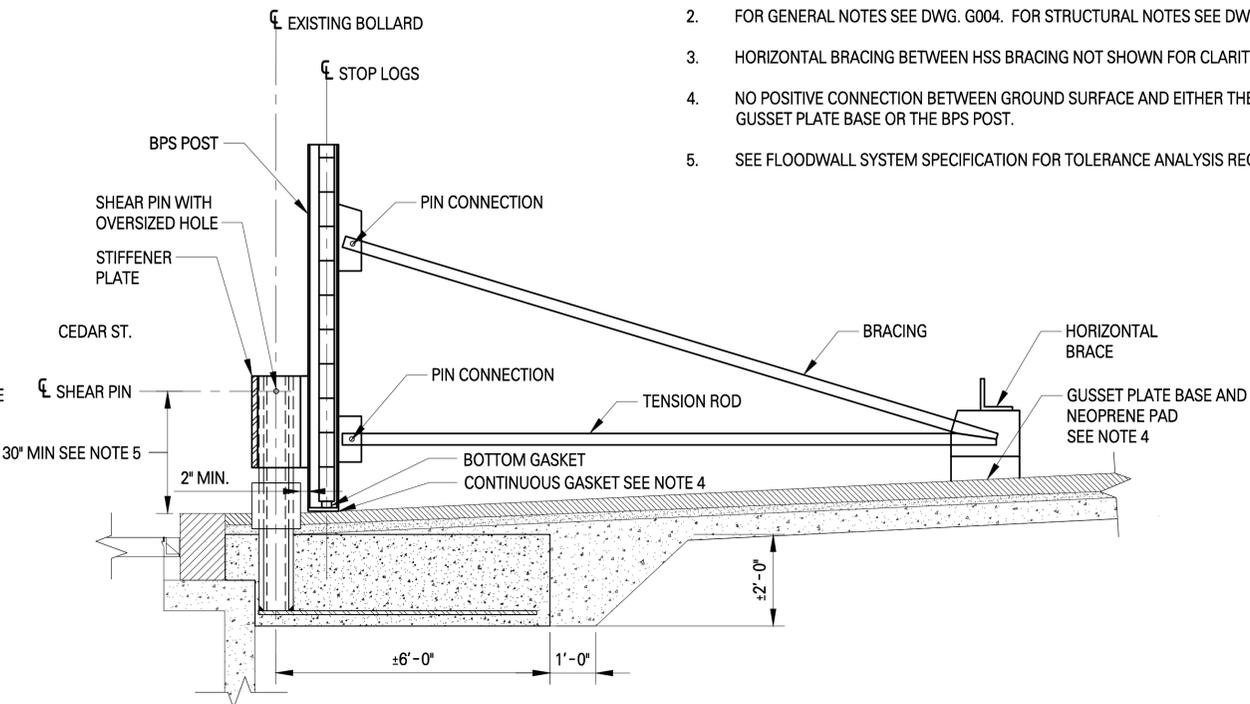
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NOTES.

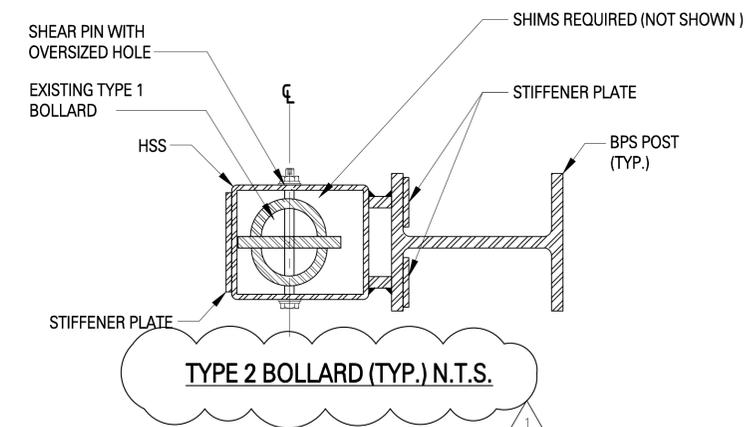
1. THE CONTRACTOR SHALL VERIFY EXISTING CONDITIONS BY SURVEYING.
2. FOR GENERAL NOTES SEE DWG. G004. FOR STRUCTURAL NOTES SEE DWG. S101.
3. HORIZONTAL BRACING BETWEEN HSS BRACING NOT SHOWN FOR CLARITY.
4. NO POSITIVE CONNECTION BETWEEN GROUND SURFACE AND EITHER THE GUSSET PLATE BASE OR THE BPS POST.
5. SEE FLOODWALL SYSTEM SPECIFICATION FOR TOLERANCE ANALYSIS REQUIREMENT.



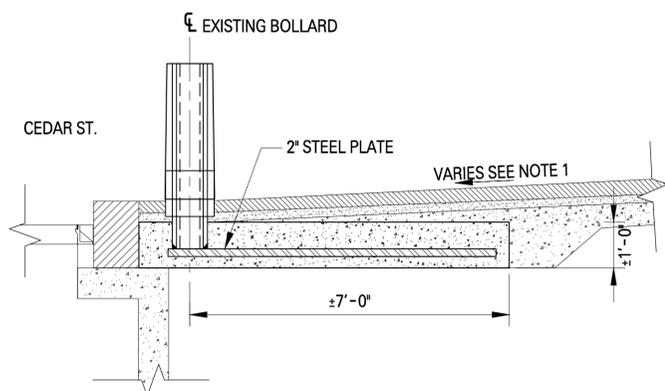
S 1
S103
8' BPS POST
SCALE IN FEET



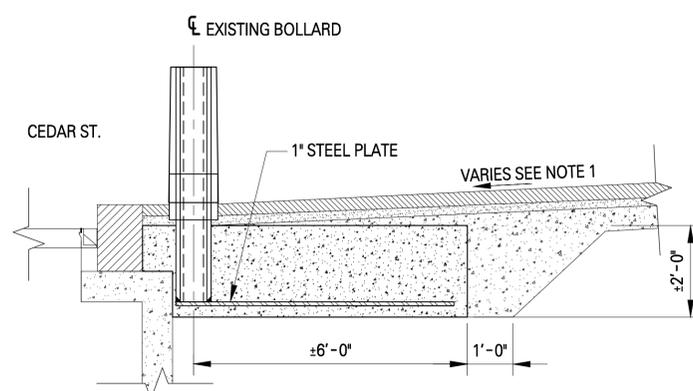
S 2
S102
8' BPS POST
SCALE IN FEET



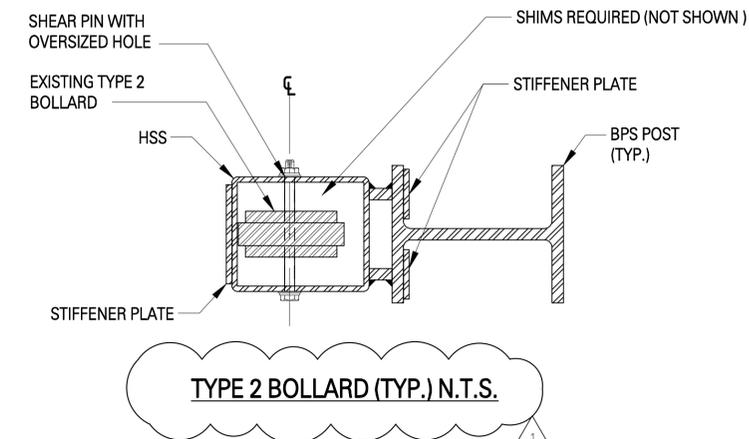
TYPE 2 BOLLARD (TYP.) N.T.S.



S 1
S103
EXISTING SHALLOW FOOTING
SCALE IN FEET



S 2
S102
EXISTING SHALLOW FOOTING
SCALE IN FEET



TYPE 2 BOLLARD (TYP.) N.T.S.



ROBERT C. GALLUP
N.Y. Professional Engineer # 069840-1

No.	Date	Revision	Approved
1	05/27/2015		

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**BPS - VSC
BOLLARD PROTECTION SYSTEM**

**DRIVEWAY
BPS DETAILS - 6**

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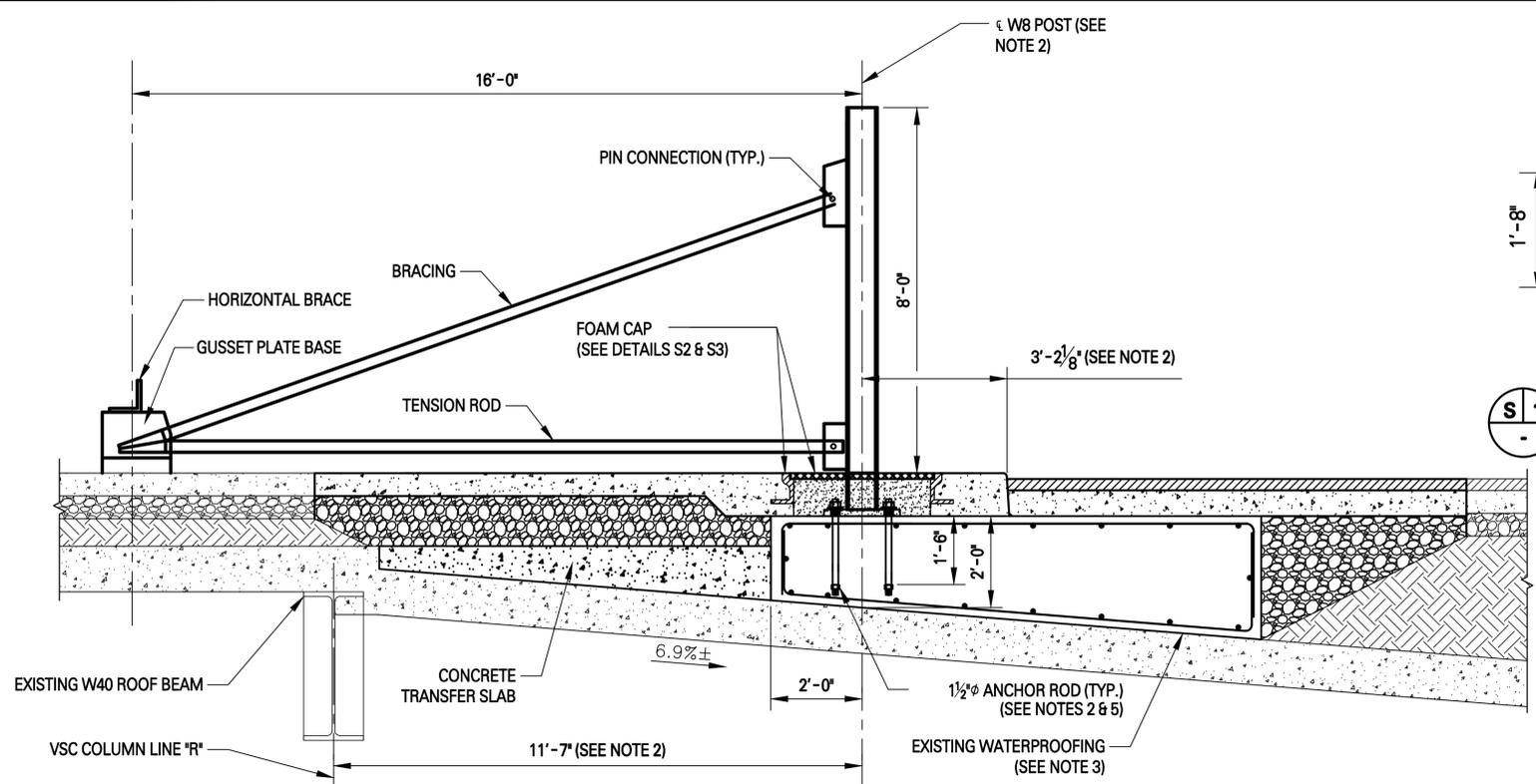
D.GREEN **M.DIAZ** **R.GALLUP**
Designed by Drawn by Checked by

Date 04/29/2015

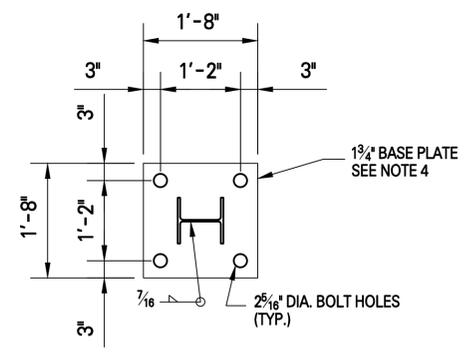
Contract Number **WTC-964.952**

Drawing Number **S206**

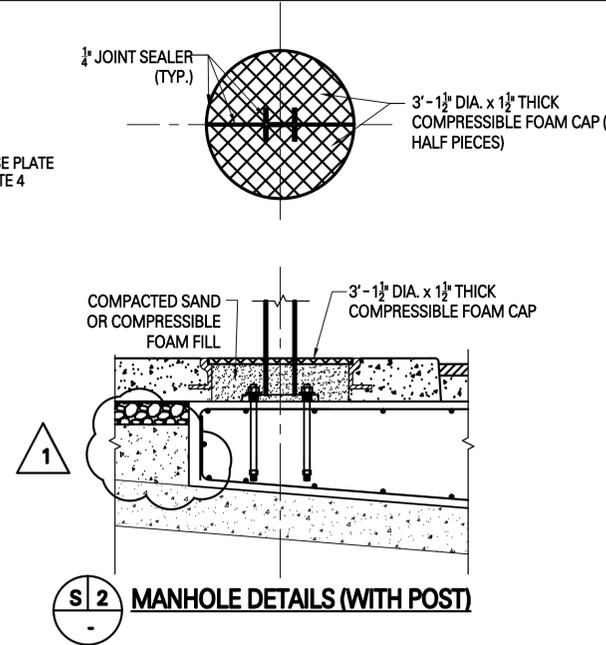
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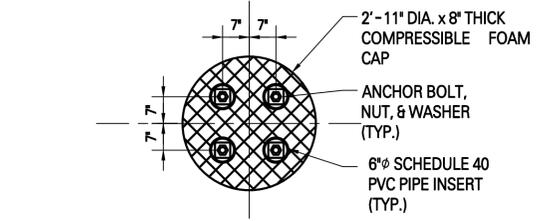
S 5
S103 **CEDAR ST. DRIVEWAY POST SECTION (AT POST)**
SCALE IN FEET



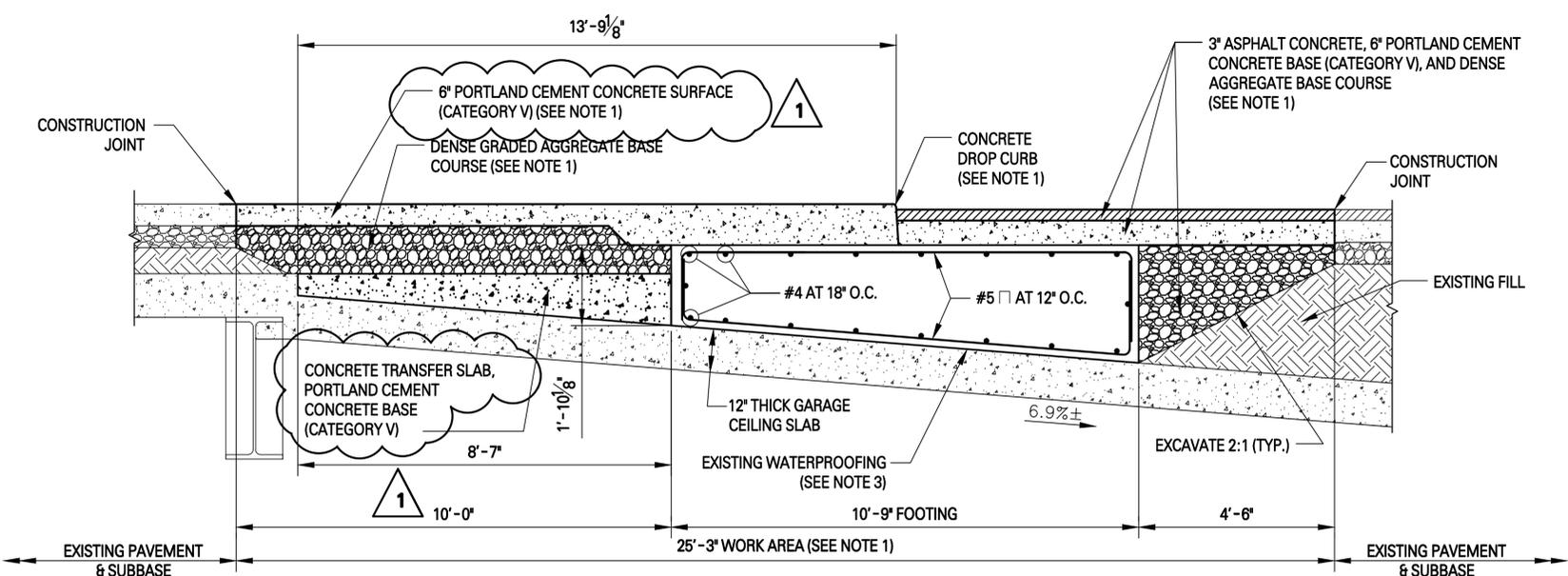
S 1
BASE PLATE DETAIL



S 2
MANHOLE DETAILS (WITH POST)



S 3
MANHOLE DETAILS (WITHOUT POST)



S 6
S103 **CEDAR ST. DRIVEWAY POST SECTION (BETWEEN POST)**
SCALE IN FEET

NOTES.

- CONTRACTOR SHALL VERIFY EXISTING CONDITIONS AND DIMENSIONS BY SURVEY. REMOVAL AND RESTORATION OF THE EXISTING PAVEMENT, CONCRETE BASE, CURB, AND DENSE AGGREGATE SUBBASE SHALL MATCH EXISTING CONDITIONS UNLESS OTHERWISE NOTED.
- ALL DIMENSIONS AND SIZES WERE DEVELOPED ASSUMING A W8x31 POST TO SUPPORT THE FLOODWALL SYSTEM AND DETAILS SIMILAR TO THE TOWER 1 BPS SHOP DRAWINGS. FINAL DIMENSIONS AND SIZES WILL NEED TO BE CONFIRMED BY THE CONTRACTOR IN THE CASE A DIFFERENT POST SIZE IS SELECTED.
- THE EXISTING WATERPROOFING SYSTEM ON THE TOP OF THE GARAGE ROOF SLAB IS TO REMAIN UNDAMAGED DURING THE CONSTRUCTION OF THE NEW FOOTINGS AND ASSOCIATED EXCAVATION OF THE EXISTING FILL.
- COLUMN BASE PLATE AND POST SHALL BE GALVANIZED TO MATCH THE BPS POST ELSEWHERE ON THE PROJECT.
- ANCHOR RODS SHALL BE ASTM F1544 - GRADE 36. ANCHOR ROD NUTS SHALL BE ASTM A563 - GRADE A. ANCHOR ROD WASHERS SHALL BE PLATE (EITHER CIRCULAR OR SQUARE) WASHERS WITH A MINIMUM THICKNESS OF 3/8" AND A MINIMUM DIMENSION OF 3 1/2". ANCHOR RODS, NUTS, AND WASHERS SHALL BE HOT-DIPPED GALVANIZED PER ASTM 153 AND SHIPPED PRE-ASSEMBLED.



ROBERT C. GALLUP
N.Y. Professional Engineer # 069840-1

No.	Date	Revision	Approved
1	05/27/2015		

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Title
**BPS - VSC
BOLLARD PROTECTION SYSTEM**

**LIBERTY STREET AND
CEDAR STREET
BPS TO PERIMETER
FLOOD BARRIER
DETAILS**

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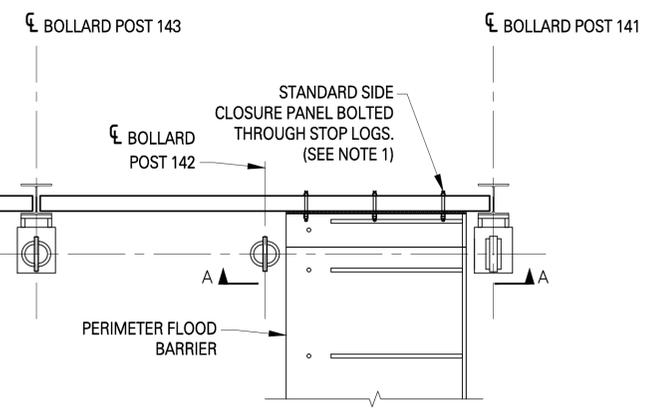
D.GREEN M.DIAZ R.GALLUP
Designed by Drawn by Checked by

Date 04/29/2015

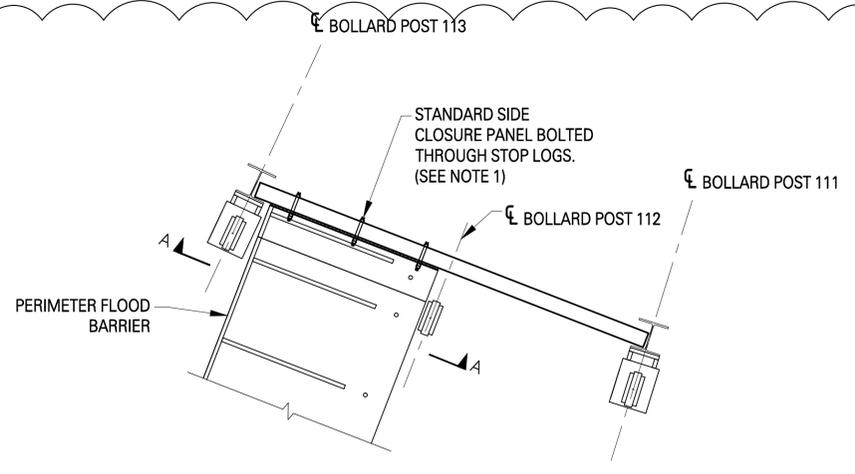
Contract Number **WTC-964.952**

Drawing Number **S209**

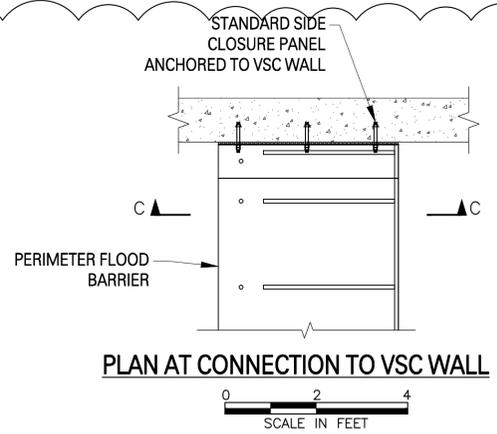
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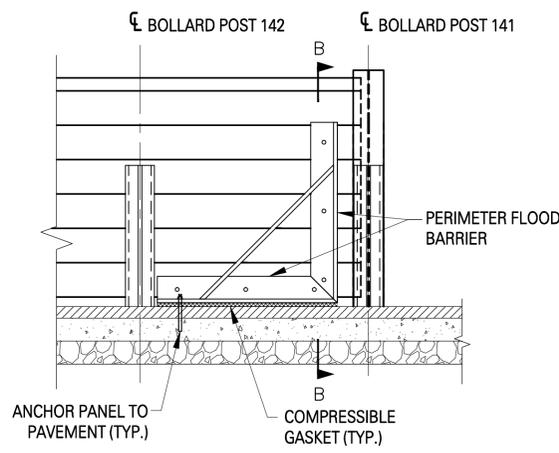
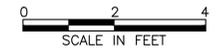
PLAN AT EAST CONNECTION TO BPS



PLAN AT WEST CONNECTION TO BPS



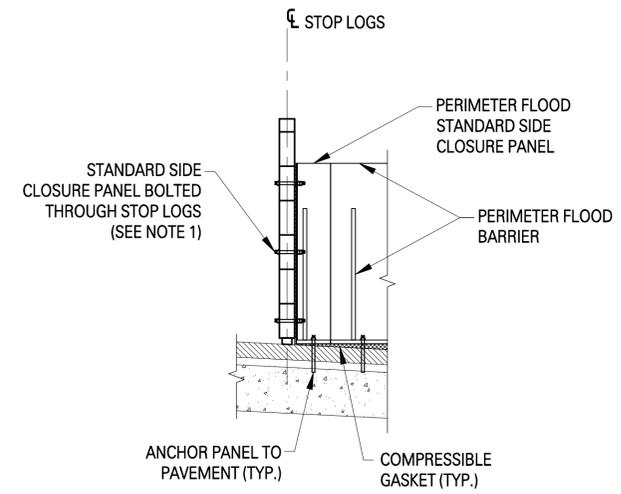
PLAN AT CONNECTION TO VSC WALL



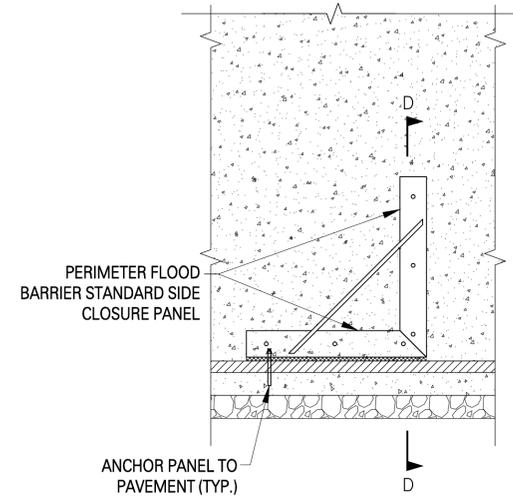
SECTION A-A



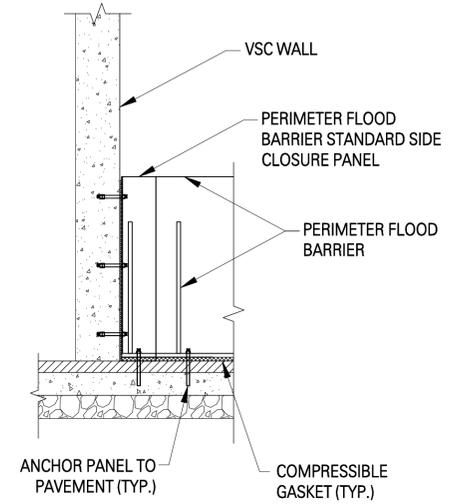
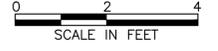
NOTE: EAST CONNECTION SHOWN.
WEST CONNECTION OPPOSITE HAND



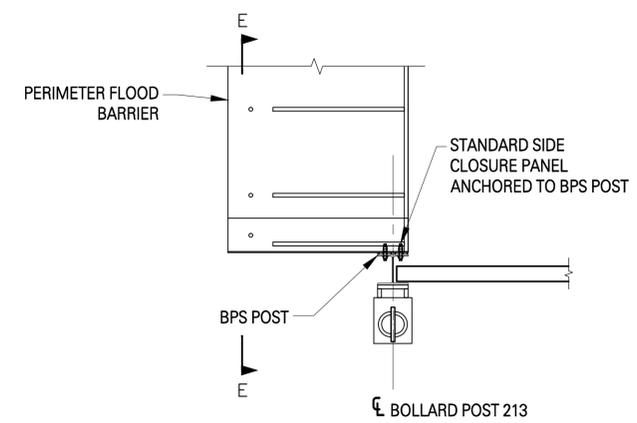
SECTION B-B



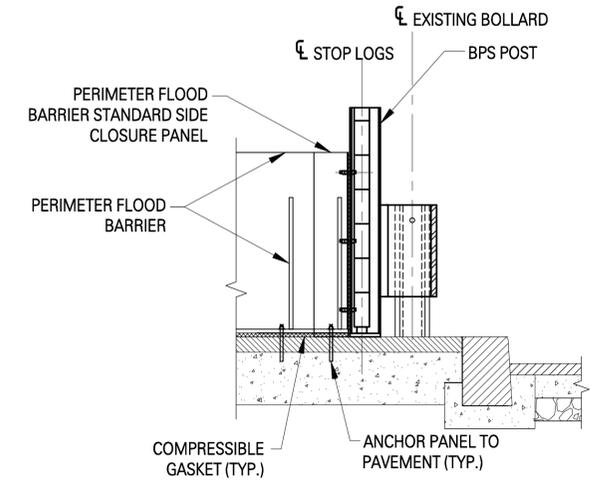
SECTION C-C



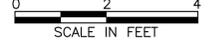
SECTION D-D



PLAN AT CONNECTION TO BPS POST



SECTION E-E



NOTES.

1. CONTRACTOR SHALL VERIFY CAPACITY OF THE STOP LOGS/BPS SYSTEM DUE TO IMPACTS OF CONNECTION OF THE PERIMETER FLOOD BARRIER TO THE BPS FLOOD WALL PANEL AND SHALL STRENGTHEN THE BPS SYSTEM IF REQUIRED.
2. CONTRACTOR SHALL VERIFY EXISTING SITE CONDITIONS AND DIMENSIONS BY SURVEY.
3. PERIMETER FLOOD BARRIER CONNECTIONS AND CONFIGURATION IS PRELIMINARY AND SHALL BE USED FOR ESTIMATING PURPOSES ONLY. FINAL DETAILS ARE TO BE DEVELOPED BY CONTRACTOR AND PERIMETER FLOOD BARRIER MANUFACTURER BASED ON EXISTING CONDITIONS VERIFIED BY SURVEY (SEE NOTE 2).
4. SEE SPECIFICATION 05510 PERIMETER FLOOD BARRIER

**THE PORT AUTHORITY
OF NY & NJ**

**Michael Baker
INTERNATIONAL**



ROBERT C. GALLUP
N.Y. Professional Engineer # 069840-1

1	05/27/2015		
No.	Date	Revision	Approved

ENGINEERING DEPARTMENT

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Title
**BPS - VSC
BOLLARD PROTECTION SYSTEM**

**MAINTENANCE AND
PROTECTION OF TRAFFIC
LIBERTY ST**

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S. OLIVER M. DIAZ R. GALLUP
Designed by Drawn by Checked by

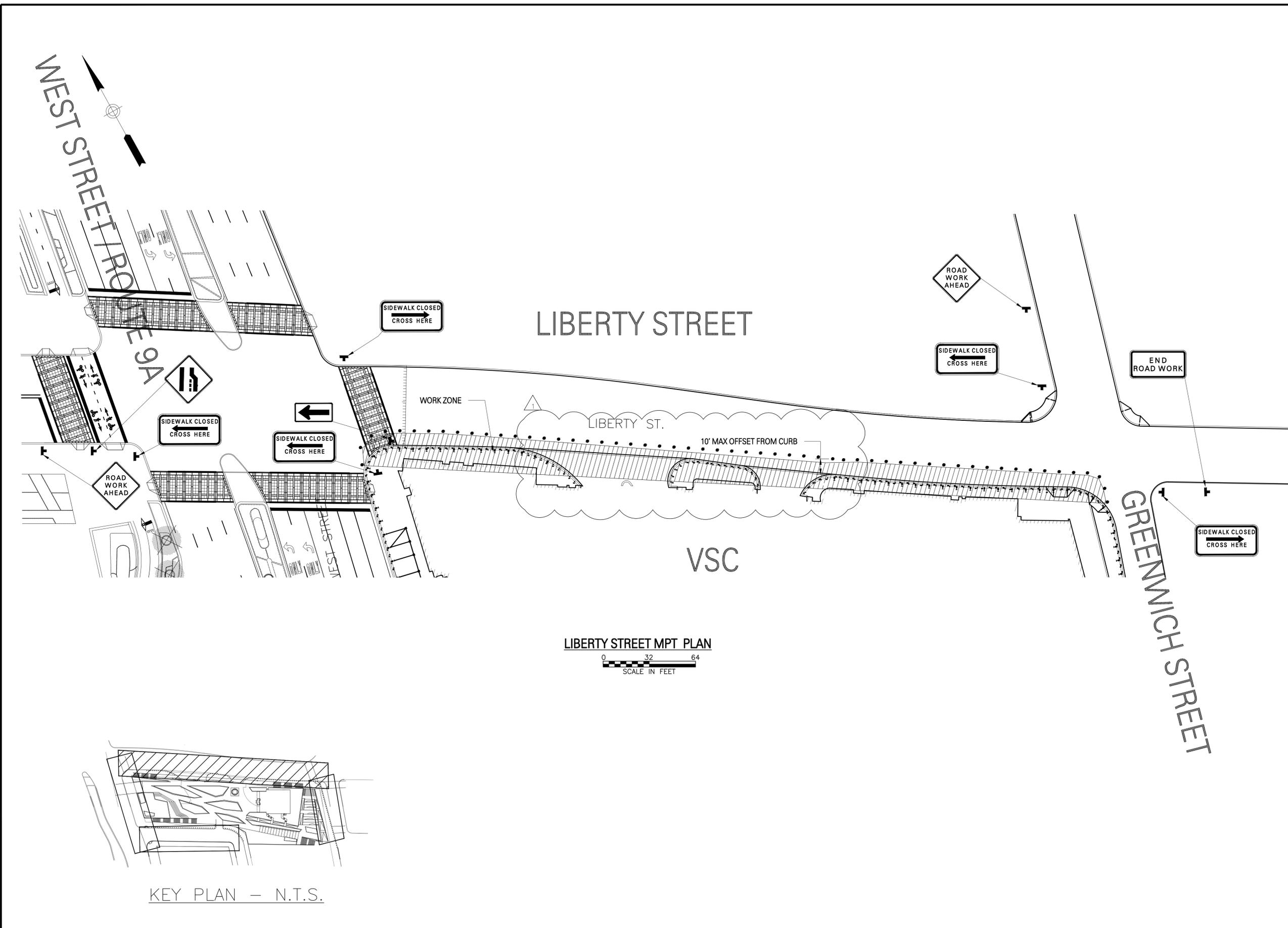
Date 04/29/2015

Contract Number **WTC-964.952**

Drawing Number **MT104**

PID# #####

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**THE PORT AUTHORITY
OF NY & NJ**

**Michael Baker
INTERNATIONAL**



ROBERT C. GALLUP
N.Y. Professional Engineer # 069840-1

No.	Date	Revision	Approved
1	05/27/2015		

ENGINEERING DEPARTMENT

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TRAFFIC

Title
**BPS - VSC
BOLLARD PROTECTION SYSTEM**

**MAINTENANCE AND
PROTECTION OF TRAFFIC
GREENWICH ST**

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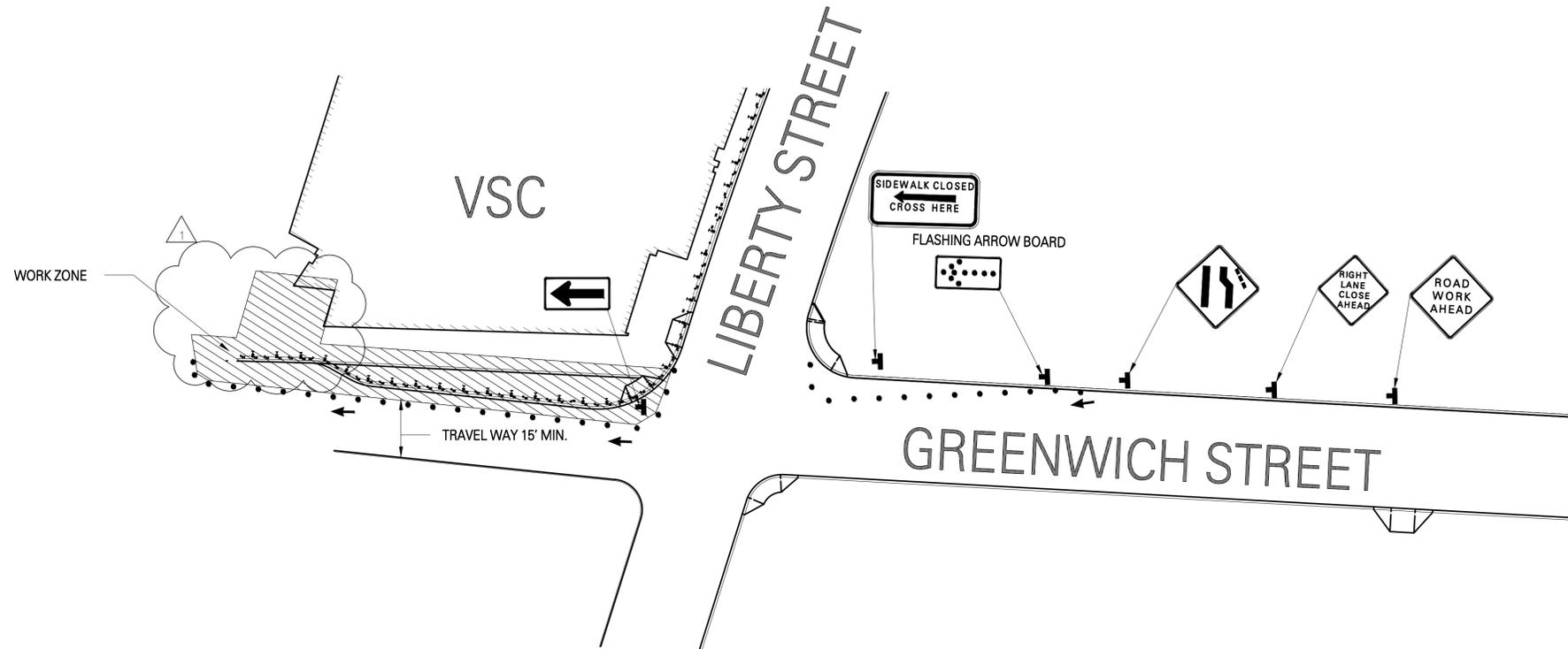
S. OLIVER	M. DIAZ	R. GALLUP
Designed by	Drawn by	Checked by
Date		04/29/2015

Contract Number **WTC-964.952**

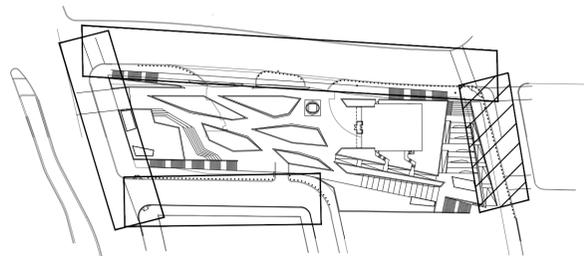
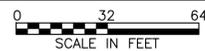
Drawing Number **MT105**

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GREENWICH ST MPT PLAN



KEY PLAN - N.T.S.