

I-579 Urban Open Space Cap

Pittsburgh, Pennsylvania

Category: Bridges | Projects Over \$20M



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AMERICAN SOCIETY OF HIGHWAY ENGINEERS

National Project of the Year Award

OFFICIAL ENTRY FORM

AWARD CATEGORY (Check One): Under \$20 Million Over \$20 Million

SPONSORING REGION (Check One):

- | | | |
|---|--|---|
| <input checked="" type="checkbox"/> Northeast | <input type="checkbox"/> Great Lakes | <input type="checkbox"/> Northwest |
| <input type="checkbox"/> Mid-Atlantic | <input type="checkbox"/> North Central | <input type="checkbox"/> Rocky Mountain |
| <input type="checkbox"/> Southeast | <input type="checkbox"/> South Central | <input type="checkbox"/> Southwest |

CONTACT INFORMATION FOR SUBMITTING REGION:

Contact Name: Scott R. Eshenaur ASHE Region Position: Judging Committee Chairperson
Phone (Office): 717.790.9565 Phone (Mobile): 717.580.8426 E-Mail Address: sreshenaur@modjeski.com
ext. 10422

PROJECT INFORMATION:

ENTERING AGENCY/COMPANY'S NAME: HDR
PROJECT NAME: I-579 Urban Open Space Cap TYPE: Bridge
PROJECT LOCATION: City of Pittsburgh
CITY: Pittsburgh COUNTY: Allegheny STATE: Pennsylvania
FINAL CONSTRUCTION COST: \$30 million BUDGETED CONSTRUCTION COST: \$30 million
PROJECT COMPLETION DATE: November 2021

PROJECT ASHE SECTION: Pittsburgh ASHE SECTION CONTACT NAME: Jason Zang
PHONE (OFFICE): 412-429-5007 PHONE (MOBILE): 412-401-9756 E-MAIL: jzang@pa.gov

PROJECT TEAM:

PROJECT OWNER: City of Pittsburgh
STREET ADDRESS: City County Building, Suite 301, 414 Grant Street
CITY: Pittsburgh STATE: Pennsylvania ZIP: 15219
CONTACT PERSON: Jeff Skalican PHONE: 412-255-2373
E-MAIL ADDRESS: jeff.skalican@pittsburghpa.gov

PROJECT DESIGN FIRM: HDR
STREET ADDRESS: 301 Grant Street, Suite 1700
CITY: Pittsburgh STATE: Pennsylvania ZIP: 15219
CONTACT PERSON: Roger Eaton PHONE: 412-497-6010
E-MAIL ADDRESS: roger.eaton@hdrinc.com

PRIME CONTRACTOR: Fay, S&B USA Construction
STREET ADDRESS: Nova Tower 1, Suite 301, One Allegheny Square
CITY: Pittsburgh STATE: Pennsylvania ZIP: 15212
CONTACT PERSON: Chuck Grabner, PE PHONE: 412-779-8354
E-MAIL ADDRESS: cgrabner@shikunusa.com

Entry Form Completed By: Roger Eaton **Date:** January 24, 2023



Project Narrative

Introduction

In the 1950s, homes and businesses in Pittsburgh's Lower Hill District neighborhood were demolished to construct the former Civic Arena, alongside other development activities. During that time, Crosstown Boulevard, now Interstate 579, was built which created a "concrete canyon" of tall retaining walls and noisy interstate traffic, essentially separating the Hill from Downtown — reducing land values and job opportunities for Hill District residents.

The I-579 Urban Open Space Cap Project is a new, urban three-acre green space that reconnects Pittsburgh's historic Hill District with the city's Downtown business and cultural center. This first-of-its-kind project seeks to remedy historical development that harmed the Hill District by reconnecting this predominantly African American neighborhood through a unique land bridge spanning over the interstate.

Complexity

Of all this project's challenges, developing a viable structural solution for the bridge was the greatest hurdle. The new bridge had to "fill the gap" between the two existing vehicular bridges, maintain vertical clearance above the interstate, and carry sufficient soil depth to sustain plantings. HDR's solution minimized initial cost, limited impacts to the existing structures and interstate traffic, and utilized low maintenance components. The result was a series of adjacent prestressed concrete superstructures supported on semi-integral abutments and multi-column bents.

- The new abutments were constructed behind the existing retaining walls that separated the interstate from the adjacent facilities. The retaining walls were trimmed to accommodate the new bridge beams. New abutments were supported by over 200 drilled micropiles, which minimized disturbance to the existing walls and spread footings. The micropile foundations were unconventional since lateral load had to be resisted by battering the piles away from the new superstructure to avoid conflicts with the retaining walls. This resulted in battered tension micropiles.
- Adjacent prestressed concrete box beams were utilized for the superstructure to minimize construction impacts to the interstate below. The superstructure was divided into three units transversely to allow transverse post-tensioning of the beams and align the new piers with the existing gore areas/adjacent structures. Two of the units consist of 2-span continuous bridges while the third unit is a 3-span continuous bridge.

- New piers were founded on drilled shafts installed in narrow gore areas and transition directly into slender multicolumn bents, to limit impact to the interstate roadway template and avoid conflicts with existing retaining walls.
- Redundant waterproofing layers prevent water in the park soil from penetrating the structural deck. This included: water stops between structure units, layers of waterproofing membrane, a 4-inch fiber-reinforced concrete protection slab, and continuous sloping drainage layer.

The project's complexity was exacerbated because there are no standard design codes for bridges carrying a park. HDR developed a project specific criterion to meet the demands associated with the intended use of the park area. The criteria evaluated both the final in-service condition of the bridge and the construction loadings associated with placing the fill/amenities on the bridge.

New application of Existing Techniques/Originality/Innovation

The Cap is Pittsburgh's first park over an interstate and located in a dense urban site, bordered by existing multi-span bridges on two sides and existing retaining walls from the 1960s on the other two sides. The new structure and park had to tie into the existing surrounding sidewalks, resulting in a steep park site requiring a 20-foot elevation change from the Northwest to Southeast corners. The team addressed project challenges through innovative design, construction, and material solutions, including:

- Reducing the deadload on the bridge beams caused by the park's varied topography and soil depth, the team buried geofam block, which weighs less than 3 pounds per cubic foot, yet can support trucks on the park surface.
- Delivering and placing 126 unique, sloped, adjacent concrete beams in downtown Pittsburgh without long-term closures of I-579 required a 300+ ton crawler crane with specialized rigging. The team developed detailed staging for beam delivery and erection to verify constructability. The contractor ultimately built the structure in a very similar fashion.
- Constructing 42 drilled shafts in gore areas some 30 feet below the interstate roadway was carefully evaluated to verify sufficient work area while minimizing lane and ramp closures. The shafts utilized TIP testing to determine acceptability of the concrete. This was one of the first uses of this technology in District 11-0.

Social/Economic Considerations

The 3-acre Cap is a “ladder of opportunity” project for the economically disadvantaged Hill District community. Over 50 years of isolation and disinvestment have led to a community that has lost 80% of its peak population, leading to widespread land vacancy. Over 21% of its residents are unemployed. Over 50% walk or take public transportation to work.

The Urban Redevelopment Authority of Pittsburgh (URA) has stated that the Cap Project is building “critical infrastructure that will leverage further development, create jobs and provide added opportunities to the greater Hill community.”

Two key measures of commercial success for this project are 1) greater access to jobs for residents and 2) unlocking the development potential for the benefit of current residents. By providing a reliable, safe, and affordable way to reach Downtown, the project has increased opportunities for residents including the pool of over 78,000 jobs in Downtown. The Cap is now literally a bridge to prosperity for job seekers, connecting them to the significant concentration of job opportunities Downtown.

Safety

In addition to adding world-class park amenities, the Cap project improved safety of pedestrians and bicyclists using the site and surrounding streets in several ways:

- Elimination of substandard discontinuous sidewalk along the Webster Avenue Bridge used by pedestrians.
- Reconstruction/upgrade of the pedestrian crosswalk at the Bigelow Boulevard/Chatham Street intersection, including curb cut ramps, pedestrian pushbuttons, and audible countdown pedestrian signal heads.
- Incorporation of pedestrian and bicycle signage.
- Installation of path lighting for safety of all users.
- Addition of landscaping, benches, and resting areas among other public amenities.
- Reconstruction of severely deteriorated sidewalks along the perimeter of the site.
- Addition of fully ADA accessible paths.

During construction, the contractor approached work with the highest commitment to keeping workers, work areas, and the general public safe. They took an interactive approach to safety, which required employees to participate in continuous training and engagement. The program was measured constantly with regular audits for its effectiveness and improvement.

Aesthetics and Sustainable Features

To help heal effects of past development, a robust community listening, and design review process was utilized to obtain input from Hill residents and other stakeholders regarding the design for the three-acre public urban open space that makes up the surface of the Cap. Through this process, six key themes emerged for incorporation in the new park: water, green, destination, music, seating, and connection. Specific expressions of these six themes were developed by a team of artists from the Hill and incorporated by the project landscape architect. Integrated enhancements in the park include:

- Story walls celebrating the life of Hill District figures Martin Delany and Frankie Pace.
- Wayfinding signage highlighting the park’s amenities.
- Art totems.
- An outdoor classroom garden with integrated seating and an interactive musical theme.
- A water course that is part of the storm water management system.

These elements add value to park users, provide educational opportunities, and appropriately highlight local African American history and experience.

The new park lawns are permeable areas capturing stormwater that currently runs off the concrete pavement of I-579. The lawn’s specially designed soil composition can absorb up to six inches of rainwater. Additionally, a system of open trench drains captures storm water and re-directs it to six rain gardens located in the lower northwest corner of the site. The rain gardens and lawn detain the water and encourage it to evaporate, to be absorbed by plants or to slowly infiltrate back into the soil below the site. The project has resulted in a net reduction of stormwater discharge to the public storm sewer system compared to previous conditions.

The park will contribute to the city’s urban tree cover. Trees filter air, water, and provide shade. They slow winds and stormwater runoff. The shade provided by trees lessens the urban heat island effect thereby reducing the temperature of surrounding buildings.

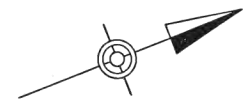
Meeting and Exceeding Owner's/Client's Needs

The project met and exceeded expectations of the owner, the public, and the multitude of agencies involved. From a budgetary standpoint, the project was let with a winning bid of \$29.4 million and constructed with minimal overruns.

Like many aspects of life, construction of the Cap was disrupted in March of 2020 at the start of the COVID-19 pandemic. In the midst of complex beam erection operations at the site, PennDOT construction projects in Pennsylvania were halted on March 15, 2020. Site work did not resume again until April 27th. This work stoppage could have caused a month and a half delay in the project completion date; however, the contractor was able to work with PennDOT to accelerate remaining construction operations. In the end, the project completed on time.

The project resulted in a tremendous addition to Downtown Pittsburgh that will serve users for decades to come.

Plans



1-579 CAP CONSTR @ STA 900+00.00 =
CHATHAM ST SURVEY & R/W @ STA 101+28.61

HORIZONTAL CURVE DATA

1-579 CAP

BRIDGE IN TANGENT

VERTICAL CURVE DATA

1-579 CAP

BRIDGE IN TANGENT

NOTES:

- FOR ELEVATION (SECTION A-A AND SECTION B-B), SEE SHEET 2.
- FOR GENERAL NOTES, SEE SHEETS 7 AND 8.
- FOR INDEX OF SHEETS AND SUPPLEMENTAL DRAWINGS LIST, SEE SHEET 5.
- SURFACE GRADING NOT SHOWN FOR CLARITY.

LEGEND

- BORING (AGES 2016)
- 1'-0" SLANTED TEXT INDICATES EXISTING
- 1'-0" VERTICAL TEXT INDICATES PROPOSED
- * EXISTING HORIZONTAL CLEARANCE
- PROPOSED HORIZONTAL CLEARANCE
- - - EXISTING CONTOURS

BIGELOW BLVD SURVEY & R/W @
PI STA 3+60.63
Δ = 17°40'42"
D = 38°11'50"
T = 23.33'
L = 46.28'
R = 150.00'
PC STA 3+37.35
PT STA 3+83.63

BIGELOW BLVD SURVEY & R/W @
PI STA 5+62.74
Δ = 62°47'30", RT
D = 28°38'52"
T = 122.060'
L = 219.18'
R = 200.00'
PC STA 4+40.68
PT STA 6+59.87

WEBSTER AVE SURVEY & R/W @
PI STA 206+65.07
Δ = 19°29'18", LT
D = 12°43'57"
T = 77.277'
L = 153.06'
R = 450.00'
PC STA 205+87.79
PT STA 207+40.85

CENTRE AVE SURVEY & R/W @
PI STA 11+11.16
Δ = 23°57'11", RT
D = 7°09'43"
T = 169.702'
L = 334.45'
R = 800.00'
PC STA 9+41.46
PT STA 12+75.91

AS-DRILLED BORING LOCATIONS

BORING NO.	STATION	OFFSET
C-1	900+58	105.5' RT
C-2	901+00	50.0' RT
C-3	901+57	59.5' LT
C-4	902+01	44.0' LT
C-5	901+40	133.5' RT
C-6	902+38	8.0' RT
C-7	903+26	78.5' LT
C-8	902+44	126.0' RT
C-9	903+30	32.0' RT
C-10	904+25	75.0' LT
C-11 **	903+88	275.5' LT
C-12 **	904+54	233.5' LT

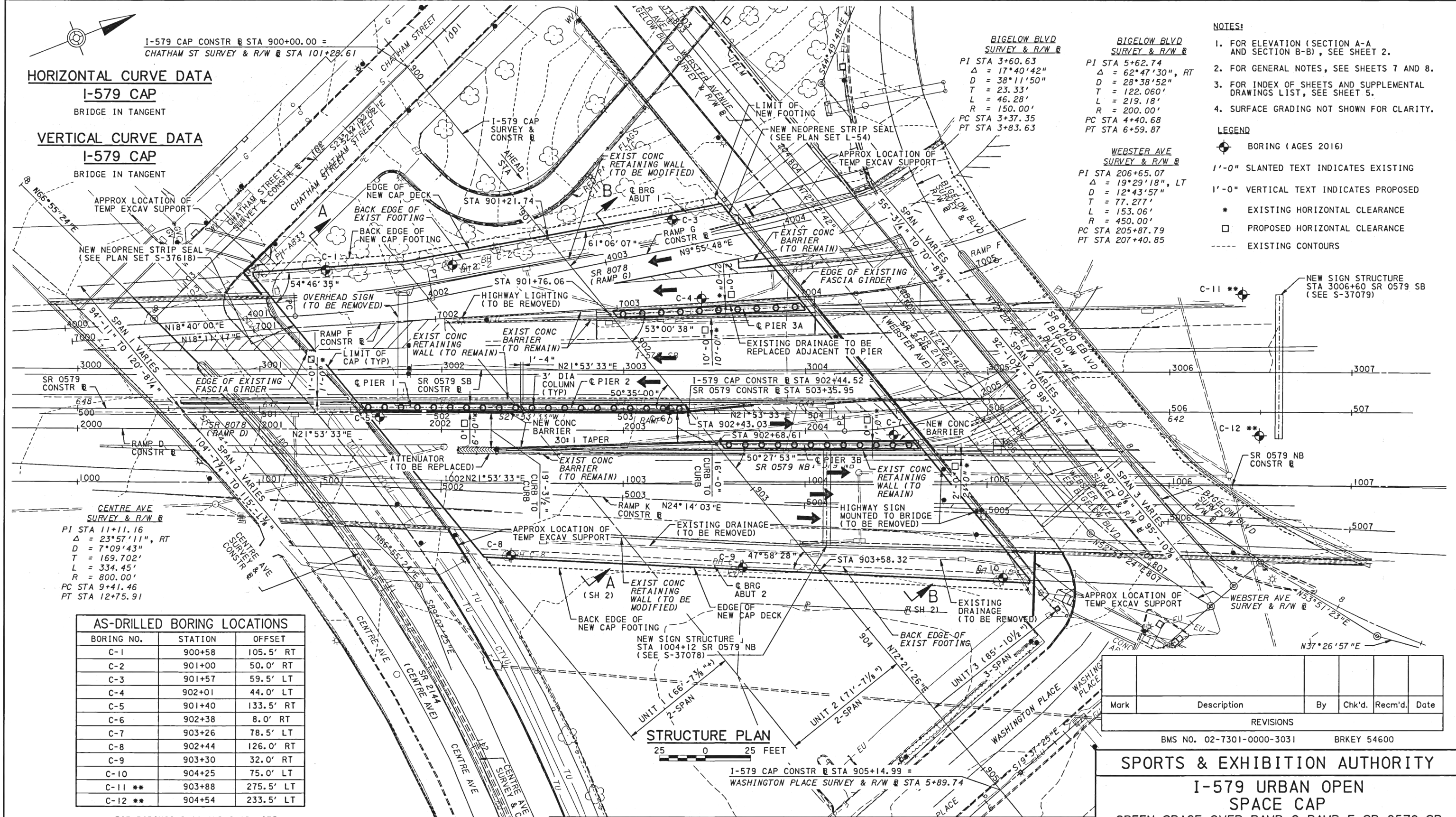
** FOR BORINGS C-11 AND C-12, SEE SIGN STRUCTURE PLAN S-37079

SCOPE OF WORK:

- BUILD NEW CAP PIERS IN I-579 GORE AREAS
- BUILD NEW CAP ABUTMENTS BEHIND EXISTING I-579 RETAINING WALLS.
- REMOVE TOP OF EXISTING I-579 RETAINING WALLS.
- BUILD NEW CAP SUPERSTRUCTURE OVER I-579.

DES: NJB DWG: SWM CKD: RAE

USER: dwl1000 PLOT DIR: I:\Projects\12-12-2018\3-05125 PA
 PATH: c:\pwworking\hrr\bin\lisp\acut.plt
 FILE: SEA-1579-ST-GP1



STRUCTURE PLAN

25 0 25 FEET

1-579 CAP CONSTR @ STA 905+14.99 =
WASHINGTON PLACE SURVEY & R/W @ STA 5+89.74

Mark	Description	By	Chk'd.	Recm'd.	Date
REVISIONS					

BMS NO. 02-7301-0000-3031 BRKEY 54600

SPORTS & EXHIBITION AUTHORITY

I-579 URBAN OPEN SPACE CAP

GREEN SPACE OVER RAMP G, RAMP F, SR 0579 SB
RAMP D, SR 0579 NB AND RAMP K
2 SPAN/3 SPAN CONTINUOUS
COMPOSITE P/S ADJACENT BOX BEAM BRIDGE

GENERAL PLAN

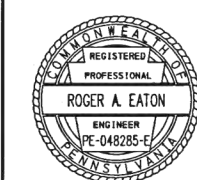
SHEET 1 OF 113

L-53

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION

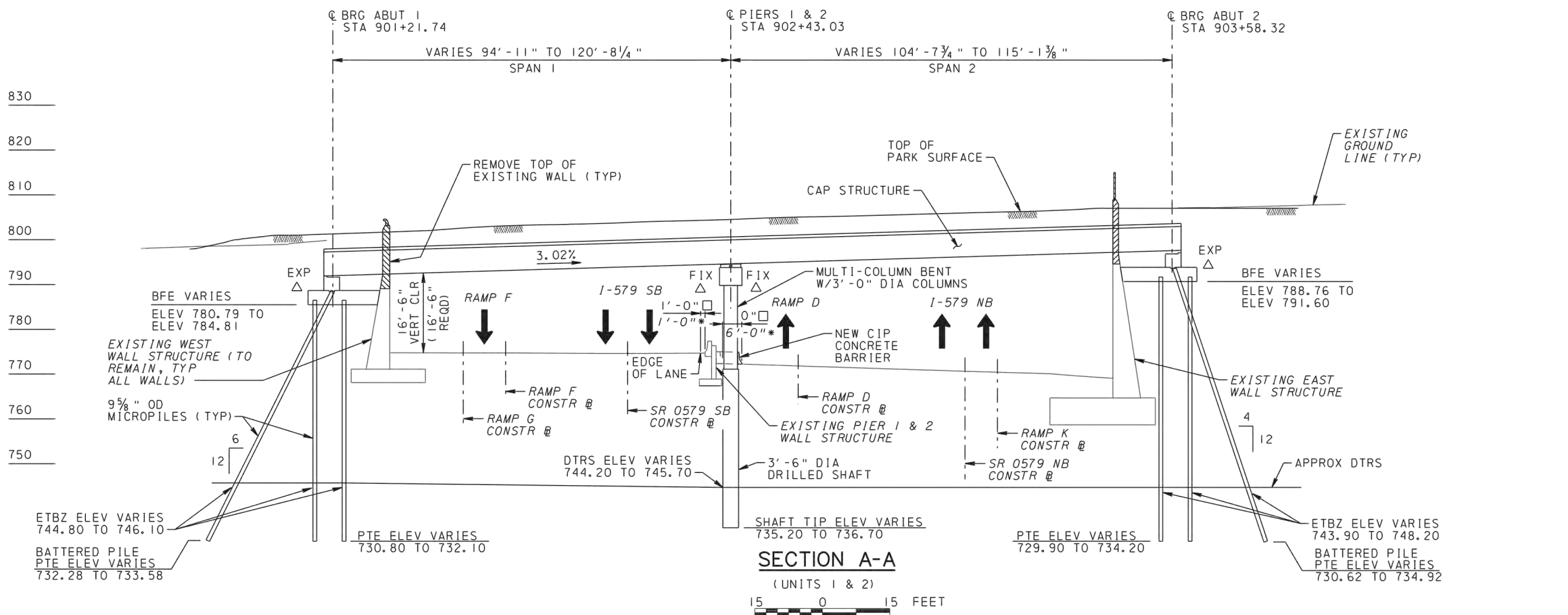
APPROVED **DECEMBER 14** 2018
FOR STRUCTURAL ADEQUACY ONLY

James J. Ring
DISTRICT BRIDGE ENGINEER



SIGNATURE & DATE *Roger A. Eaton* 12-12-18

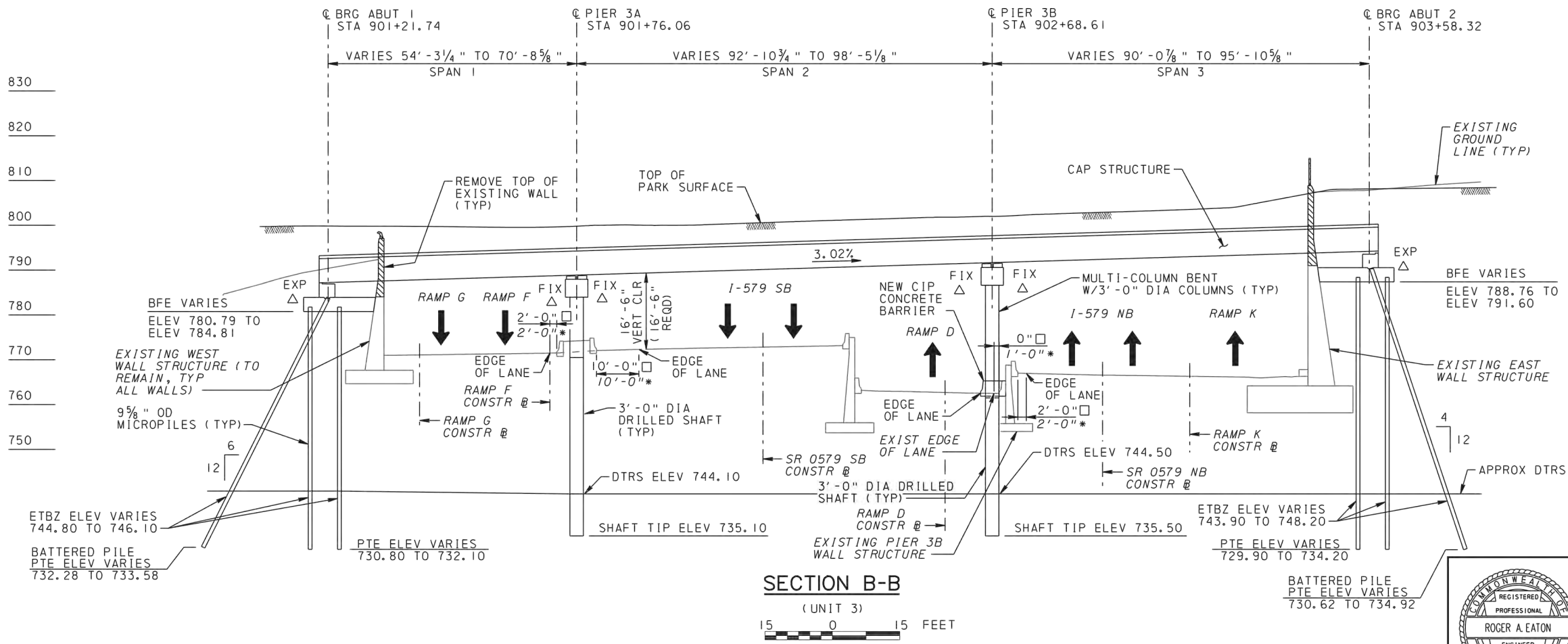
PREPARED BY:
HDR
HDR ENGINEERING, INC.
11 STANWIX STREET
SUITE 800
PITTSBURGH, PA 15222



- LEGEND:**
- ↓ DIRECTION OF TRAFFIC
 - △ ELASTOMERIC BEARINGS
 - 2'-0" SLANTED TEXT INDICATES EXISTING
 - 2'-0" VERTICAL TEXT INDICATES PROPOSED
 - * EXISTING HORIZONTAL CLEARANCE (MEASURED PERPENDICULAR TO GUTTER LINE)
 - PROPOSED HORIZONTAL CLEARANCE (MEASURED PERPENDICULAR TO GUTTER LINE)
 - PTE - ESTIMATED PILE TIP ELEVATION
 - DTRS - DESIGN TOP OF ROCK SOCKET
 - BFE - PROPOSED BOTTOM OF FOOTING ELEVATION
 - ETBZ - ESTIMATED TOP OF BOND ZONE ELEVATION, LOCATED A MINIMUM OF 1 FOOT BELOW DTRS

- EXISTING FOUNDATION NOTES:**
- FOUNDATIONS FOR EXISTING WALLS SHOWN AND ADJACENT BRIDGE STRUCTURES ARE SPREAD FOOTINGS ON ROCK.
 - EXISTING FOUNDATIONS SHOW NO SIGNS OF SETTLEMENT OR SCOUR.
 - EXISTING WALL BOTTOM OF FOOTING ELEVATIONS VARY AS FOLLOWS:
 WEST WALL STRUCTURE: 765.50 TO 768.00
 PIER 1 & 2 WALL STRUCTURE: 759.25 TO 767.50
 PIER 3B WALL STRUCTURE: 752.50 TO 762.00
 EAST WALL STRUCTURE: 757.00 TO 759.50

- NOTES:**
- FOR GENERAL PLAN, SEE SHEET 1.
 - FOR GENERAL NOTES, SEE SHEETS 7 AND 8.
 - ALL STATIONING IS MEASURED ALONG I-579 CAP CONSTR @



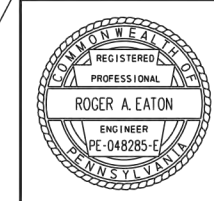
Mark	Description	By	Chk'd.	Recm'd.	Date
REVISIONS					

SPORTS & EXHIBITION AUTHORITY

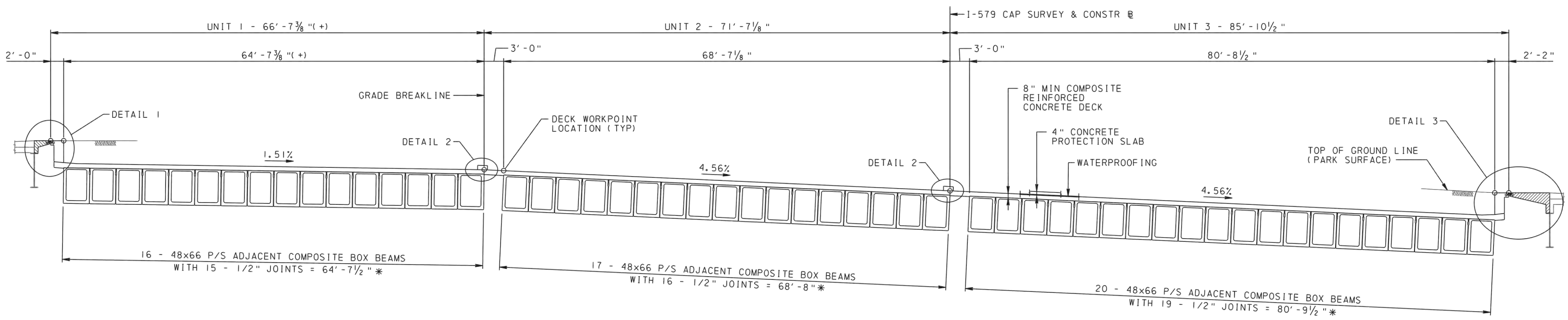
I-579 URBAN OPEN SPACE CAP

GREEN SPACE OVER RAMP G, RAMP F, SR 0579 SB
RAMP D, SR 0579 NB AND RAMP K
2 SPAN/3 SPAN CONTINUOUS
COMPOSITE P/S ADJACENT BOX BEAM BRIDGE

ELEVATIONS



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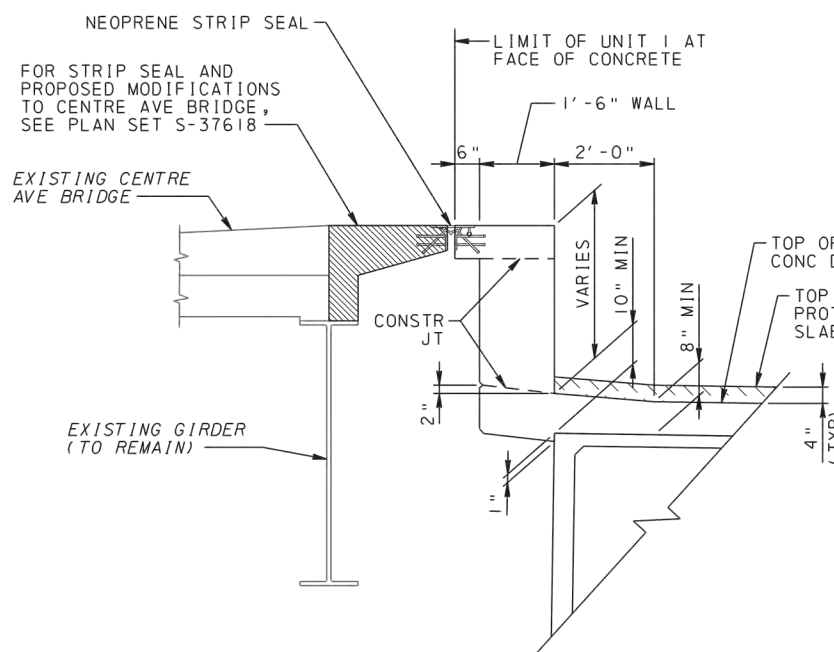


TYPICAL DECK SECTION

LOOKING BACK ON STATION

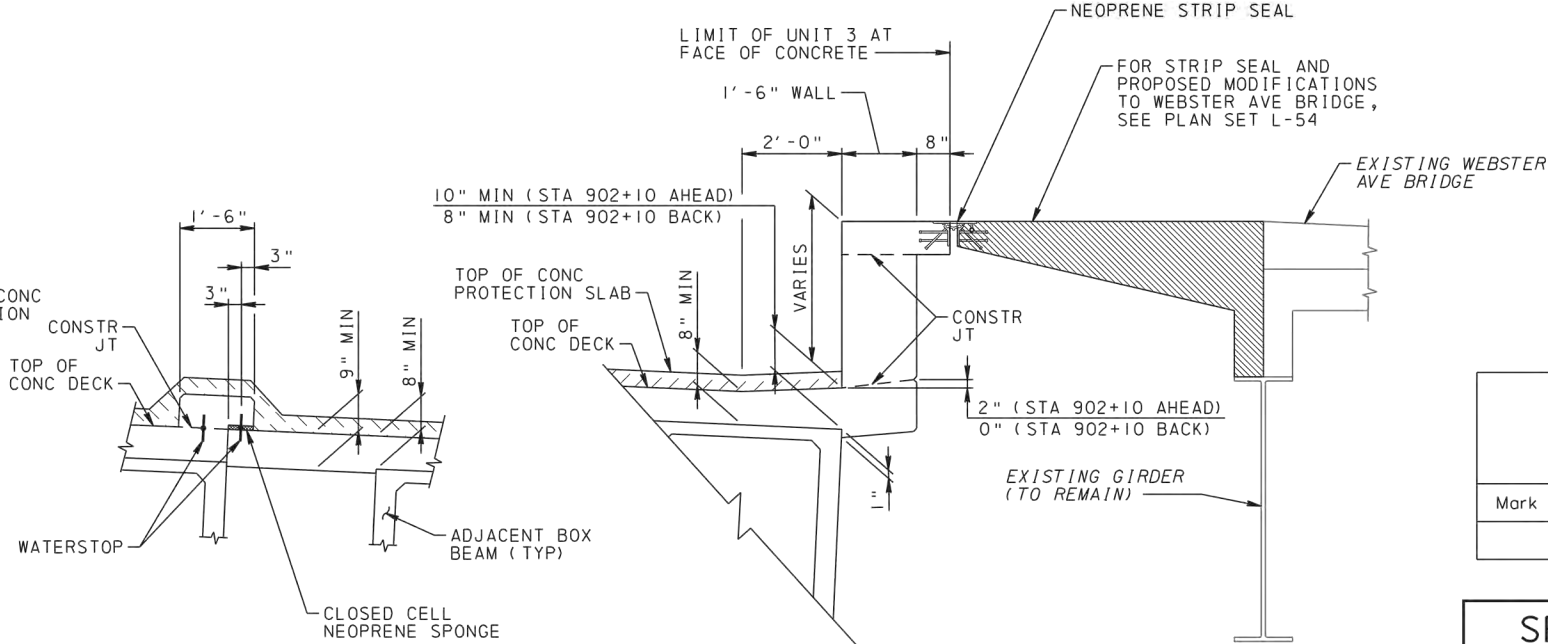


* MEASURED ALONG SLOPE



NOTE:
 PLACE PARK FILL PRIOR TO PLACING CONCRETE IN CENTRE AVE BRIDGE OVERHANG AND INSTALLING EXPANSION JOINT. SEE CONSTRUCTION SEQUENCE NOTES ON SHEET 86.

DETAIL 1



NOTE:
 PLACE PARK FILL PRIOR TO PLACING CONCRETE IN WEBSTER AVE BRIDGE OVERHANG AND INSTALLING EXPANSION JOINT. SEE CONSTRUCTION SEQUENCE NOTES ON SHEET 95.

DETAIL 2



DETAIL 3



- NOTES:
- FOR GENERAL NOTES, SEE SHEETS 7 AND 8.
 - FOR DECK WATERPROOFING DETAILS, INCLUDING PROTECTION SLAB AND WATERSTOPS, SEE SHEETS 98 AND 99.

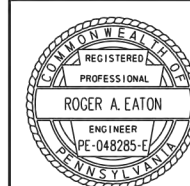
Mark	Description	By	Chk'd.	Recm'd.	Date
REVISIONS					

SPORTS & EXHIBITION AUTHORITY

I-579 URBAN OPEN SPACE CAP

GREEN SPACE OVER RAMP G, RAMP F, SR 0579 SB RAMP D, SR 0579 NB AND RAMP K
 2 SPAN/3 SPAN CONTINUOUS COMPOSITE P/S ADJACENT BOX BEAM BRIDGE

TYPICAL DECK SECTION



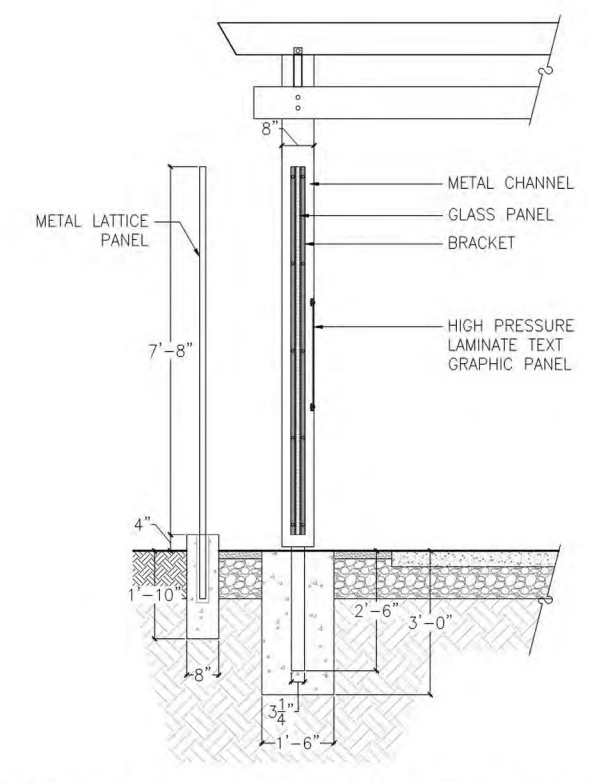
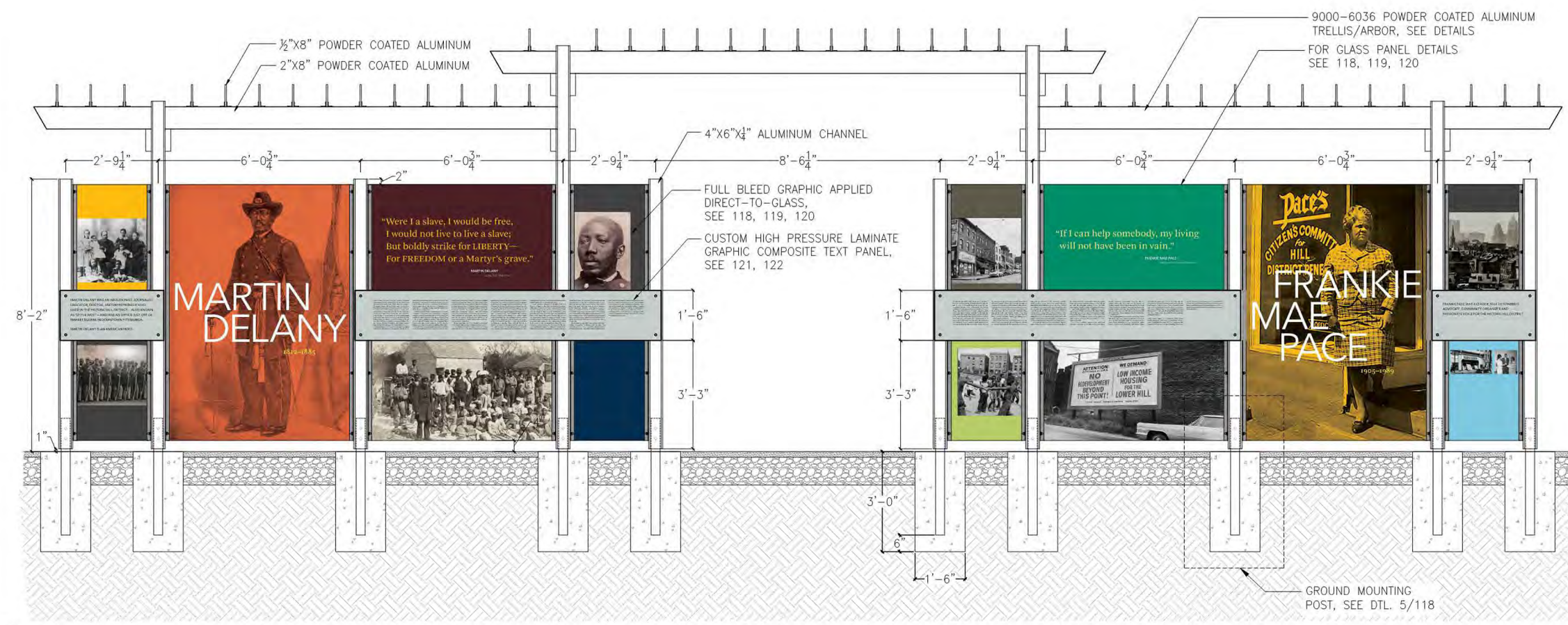
DISTRICT	COUNTY	ROUTE	SECTION	SHEET
11-0	ALLEGHENY	0579	A10	8 OF 142
CITY OF PITTSBURGH				
REVISION NUMBER	REVISIONS			DATE



NOTES:
 1. AREAS 1, 2, 3, 4, 5 AND 6
 OUTLINED DEFINE AREAS CALLED OUT IN
 TABULATION QUANTITIES.

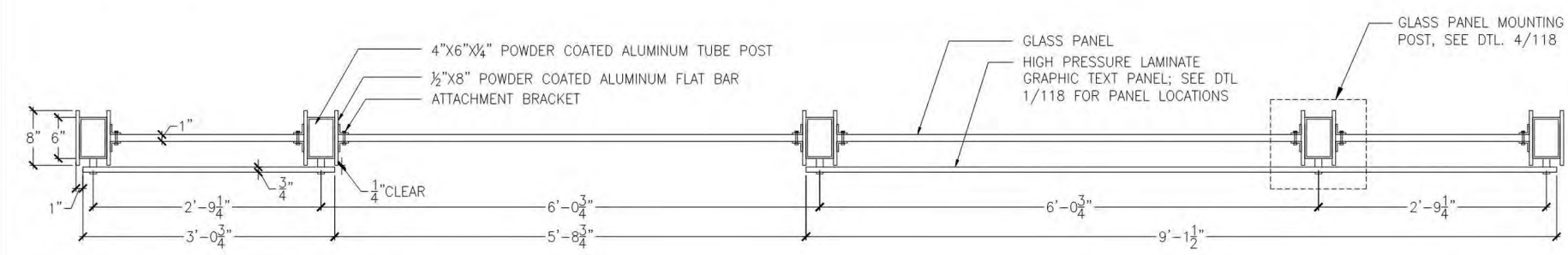


DISTRICT	COUNTY	ROUTE	SECTION	SHEET
11-0	ALLEGHENY	0579	A10	118 OF 142
CITY OF PITTSBURGH				
REVISION NUMBER	REVISIONS			DATE

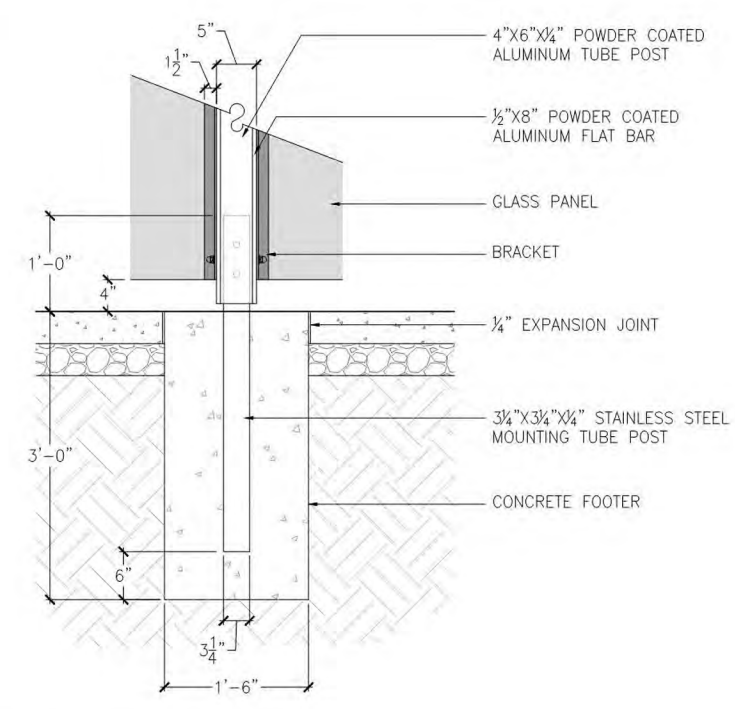


1 9000-6035 POWDER COATED ALUMINUM/GLASS STORY WALL - ELEVATION
118 0 1 2 FEET

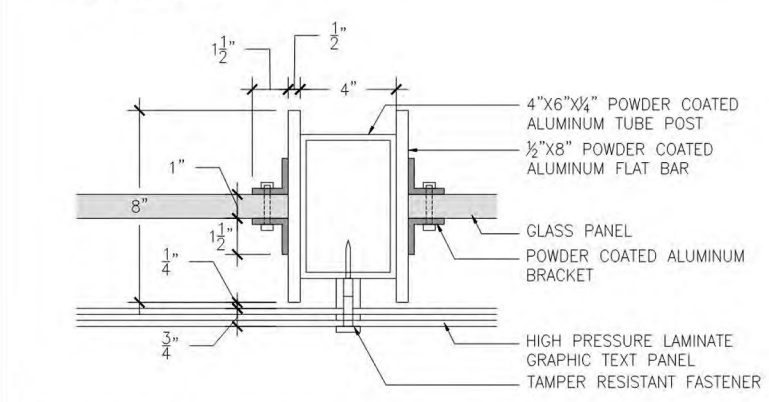
2 9000-6035 POWDER COATED ALUMINUM/GLASS STORY WALL - SIDE ELEVATION
118 0 1 2 FEET



3 9000-6035 POWDER COATED ALUMINUM/GLASS STORY WALL - PLAN
118 6 0 6 12 INCHES



5 GROUND MOUNTING POST - ENLARGEMENT
118 0 1 2 FEET



4 GLASS PANEL MOUNTING POST - PLAN
118 0 3 INCHES

POWDER COATED ALUMINUM/GLASS STORY WALL DETAILS

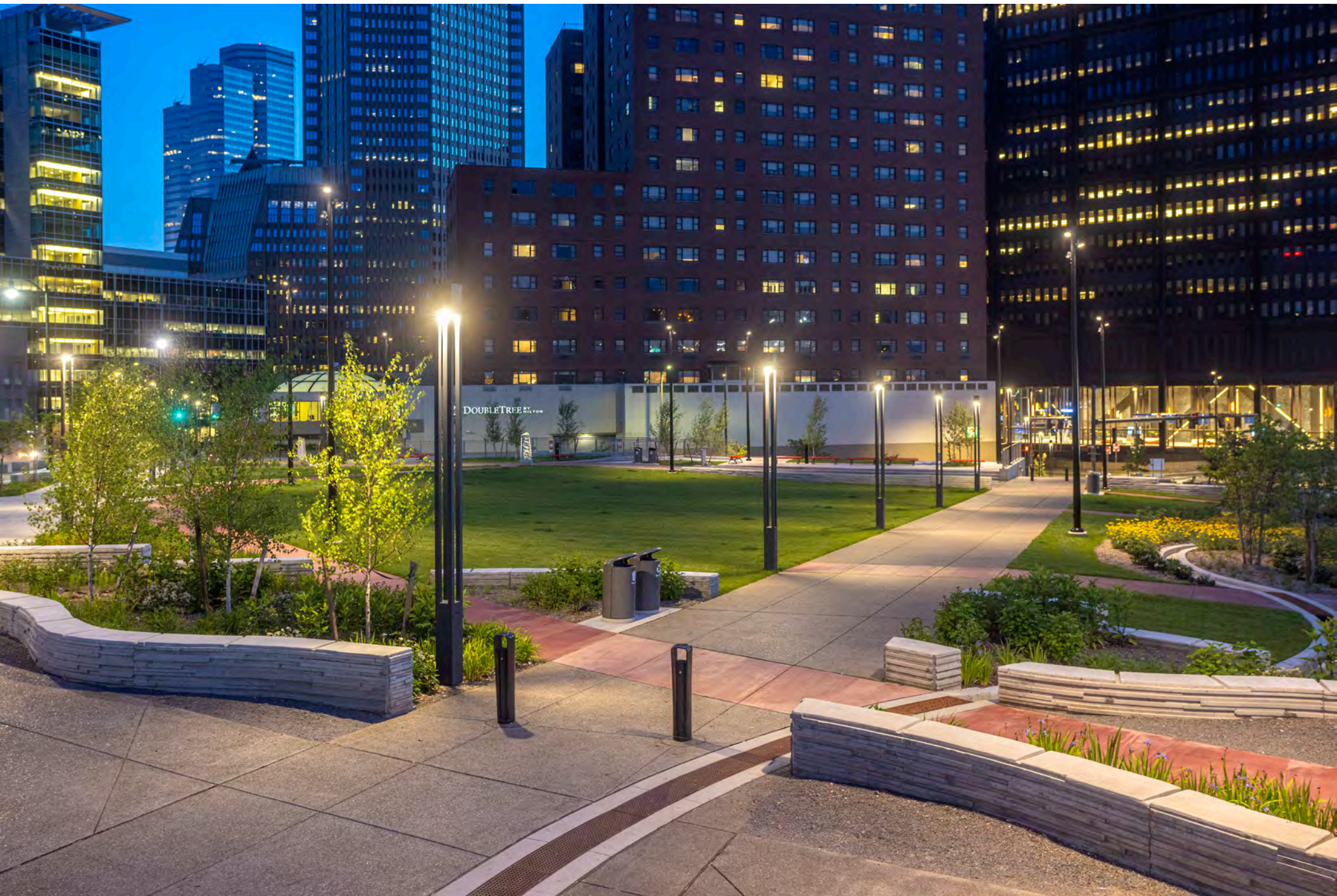


Photos

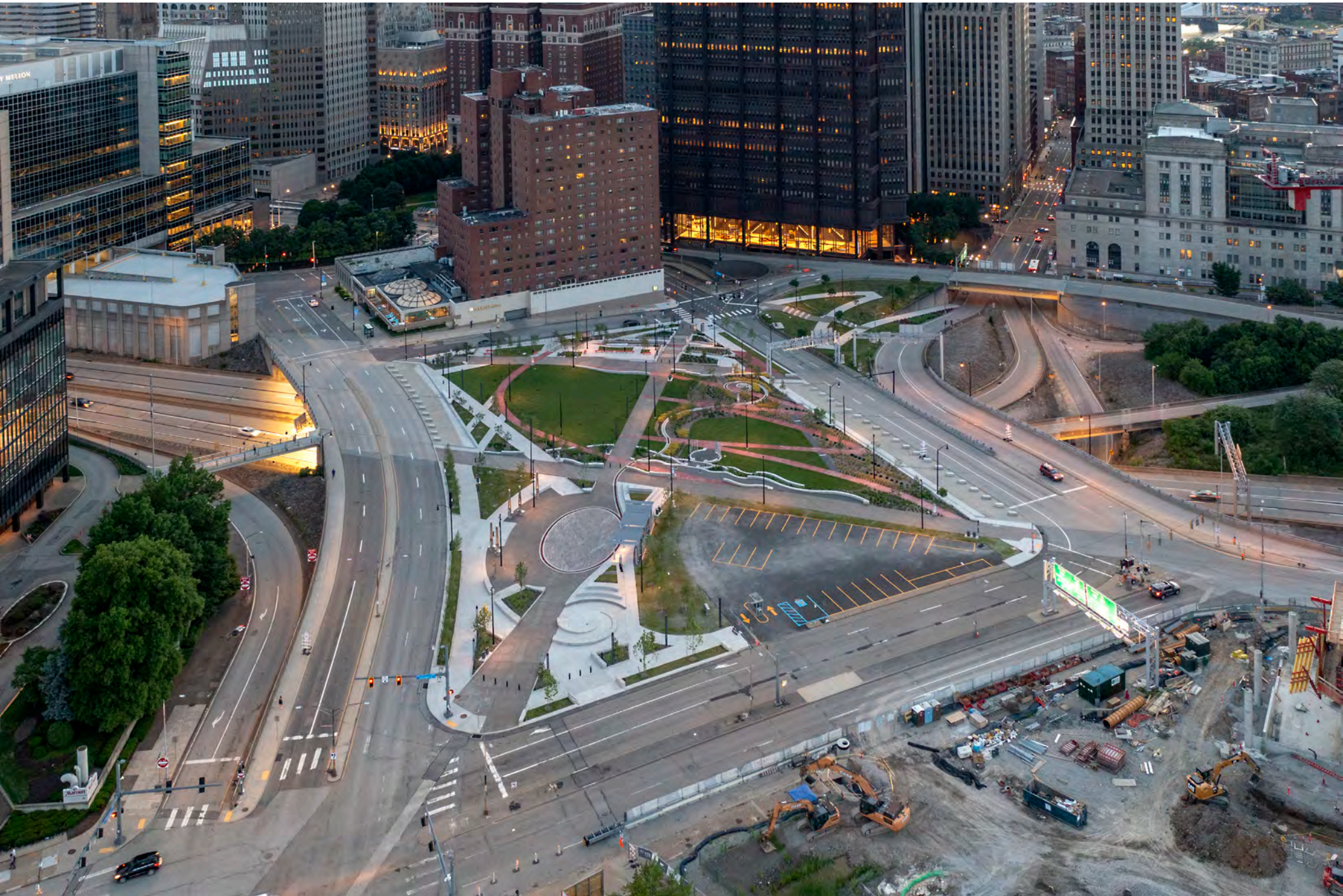








DOUBLE TREE BY HYATT





Verification of Substantial Completion

LOCAL NEWS >

I-579 Cap Project Connecting Lower Hill District And Downtown Complete

CBS NEWS
PITTSBURGH

NOVEMBER 22, 2021 / 7:20 PM / CBS PITTSBURGH



The park opened to the public on November 22, 2021.



**Statement of
Commitment to
Attend Awards
Luncheon**

At least one representative from the project team will attend the awards luncheon.



One Oxford Centre
301 Grant Street, Suite 1700
Pittsburgh, PA 15219
412.497.6000

hdrinc.com

We practice increased use of sustainable materials and reduction of material use.

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