



**ENVIRONMENTAL IMPACT STATEMENT FOR THE
EXTENSION OF HISTORIC STREETCAR SERVICE FROM FISHERMAN'S WHARF
TO THE SAN FRANCISCO MARITIME NATIONAL HISTORICAL PARK
AND GOLDEN GATE NATIONAL RECREATION AREA'S FORT MASON CENTER**

**TECHNICAL STUDY
UTILITIES
September 2008**

1.0 INTRODUCTION

This memorandum provides a background understanding of the existing utility systems that are along the proposed Historic Street Car Extension alignment. This utility information will be used in the infrastructure design development process. Utilities reviewed were:

- Auxiliary Water Supply System (AWSS)
- Domestic Water
- Sanitary Sewer/Storm Drain System (combined system)
- Electric
- Gas
- Telecommunication

The information is presented by two distinct areas: West of Tunnel (Lower Fort Mason) and East of Tunnel (Aquatic Park). The project boundary with the individual utility elements identified is shown in Figure 1. A summary of the existing utility elements is provided in Table 1.

2.0 REGULATORY SETTING

NPS will adhere to all applicable provisions of Executive Order 11752 for the prevention, control, and abatement of environmental pollution for all facilities under its jurisdiction. This includes adequate sewage collection and disposal, solid waste collection and disposal, and protection of the quality of waters within, of flowing through, the area. To accomplish this goal, sewage and water systems will be connected to public utilities wherever possible. NPS will strive to sell or transfer government-owned electrical, telephone, and natural gas distribution systems to public utilities.

City of San Francisco regulations governing the installation and repair of utilities can be found in the following codes:

- **San Francisco Department of Public Works Article 14: Underground Pipes, Wires and Conduits. Section 670. Privilege Granted for Laying Pipes.** The privilege is hereby granted to any person, firm or corporation, organized under the laws of the State of California, to lay down, maintain and operate in the public streets and thoroughfares of the City and County of San Francisco, pipes, wires and conduits, and connections therewith, so far as may be necessary for introducing into and supplying said city and its inhabitants with gas and electricity for lighting, heating and power purposes, upon the terms and conditions set forth in Section 671 to 680, inclusive, of this Article.
- **San Francisco Department of Public Works Article 18: Utility Facilities. Section 901. Permits – Consent.** Every owner or operator of any utility facility before installing, locating or relocating any utility facility shall file with the Director of Public Works a written application for a permit to do such work and obtain a written permit for the work as provided in Article 2.4. In accepting such permit the permittee expressly consents to regulation by any applicable rules or ordinances.

3.0 AUXILIARY WATER SUPPLY SOURCE

The Auxiliary Water Supply Source (AWSS), which is operated by the San Francisco Public Utilities Commission (SFPUC), is a separate and distinct water supply system used only for fire protection. It was developed after the 1906 earthquake, when the need for a reliable firewater supply system was identified. It can be fed with salt water through pumping stations (such as the one at the north end of Van Ness Avenue adjacent to Fort Mason) or fireboats.

Utility information for the Lower Fort Mason was obtained from Mr. James Kren/NPS Historical Architect (415/561-4966). The drawings reviewed were by the U.S. Army Corps of Engineers, titled “Master Plan, Basic Information Maps,” dated September 1961. It should be noted that utility work performed after September 1961 may not be represented on the drawings per Mr. Kren.

3.1 EXISTING SYSTEM

West of Tunnel

The AWSS serving Fort Mason is a 14-inch line. The pipe is cast iron (CI) with double-beaded lead joints. Typical pressures within the project boundary are 300 pounds per square inch (psi). The typical burial depth is 5 feet from top of pipe to grade, but can vary. There is a fireboat manifold at the north end of Pier 1. This will allow the AWSS to be charged with sea water from this location. The 14-inch line parallels the west side of Pier 1 to Laguna Street.

Pipe sections at intersections are typically double-spigot pipe with cast sleeves. Some of the lines are lugged, that is, large tie rods are used to hold the joints together (similar to a flanged fitting), which is necessary due to the high pressure and potential for area settlement. This type of installation maybe present at Lower Fort Mason because of the significant amount of fill material placed in the area.

The line appears to be west of the tunnel portal and does not appear to be affected by the Historic Street Car Turnaround alignment.

A 20-inch-diameter cast iron AWSS line runs north along the west side of Van Ness Avenue, then turns west approximately 33 degrees and enters a tunnel located within Fort Mason, and then enters another tunnel prior to entering Pump Station No. 2. There are two types of tunnel sections: (1) the light section, 7.75 feet tall and 5.5 feet wide with 9-inch-thick reinforced concrete walls; and (2) the heavy section, 8.5 feet tall and 7.0 feet wide with 18-inch-thick reinforced concrete walls. The first tunnel is 278 linear feet; all of which is light section except for 60 linear feet, which is heavy section. The second tunnel is 150 linear feet, and is all light section (AWSS Maps 60, 61, 64, 65). See Elements A1 and A3 in Figure 1.

The contact for AWSS projects in the City and County of San Francisco is Mr. Michael Smith, Bureau of Engineering (michael.smith@ci.sf.ca.us, (415) 558-4536).

East of Tunnel

Beach Street. A 14-inch cast iron AWSS line runs along Beach Street, between Jones Street and Leavenworth (located 19.5 feet north of the south side of Beach Street). The depth of the pipe ranges from 5.75 feet to 6.4 feet (top of asphalt to bottom of trench). One lateral connects main line to hydrant located on sidewalk on northeastern corner of Beach Street and Jones Street (AWSS Maps 455, 613). See Element A2 in Figure 1.

Jefferson Street. The AWSS line is 14-inch-diameter cast iron pipe located 19.83 feet north of south side of Jefferson Street. The bottom of the pipe is 5.75 feet from the top of asphalt. One lateral supplies a hydrant on the south side of Jefferson Street, approximately 209.5 feet east of Leavenworth Street (AWSS Map 456). See Element A4 in Figure 1.

Jones Street. The AWSS line is 14-inch-diameter cast iron pipe located 26.5 feet west of the east side of Jones Street. The bottom of the pipe is 5.67 feet from the top of asphalt. One lateral supplies a hydrant on the southwestern corner of the intersection of Jones and Jefferson Streets, 13 feet south of Jefferson Street on Jones Street (AWSS Map 457). See Element A5 in Figure 1.

Leavenworth Street. The AWSS is 16-inch-diameter cast iron pipe located 27.5 feet east of the west side of Leavenworth Street. Depths (top of asphalt to bottom of trench) range from 5.5 feet to 7.0 feet. No laterals are shown (AWSS Map 454). See Element A6 in Figure 1.

3.2 CONDITION

West of Tunnel

Per a conversation with Mr. Smith, the AWSS lines west of the tunnel within the project boundary were installed during the period from 1910 to 1920 and are considered to be in fair to poor condition. One of the issues facing the system in the area is settlement, which can damage piping. Settlement is likely in Lower Fort Mason because it is in a fill area.

East of Tunnel

The AWSS lines east of the tunnel within the project boundary were installed during the period from 1910 to 1920 and are considered to be in fair to poor condition. One of the issues facing the system in the area is settlement. At the end of Van Ness Avenue is a key pump station (referred to as Pump Station No. 2) supplying sea water into the AWSS system. From the pump station, the discharge pipeline travels through two tunnels. The tunnels may be as little as 1 foot below grade. The condition of both tunnels is not known.

Construction in the immediate area may require relocating lines or settlement monitoring (as determined by the City and County of San Francisco Bureau of Engineering).

3.3 OPERATION

West and East of Tunnel

The AWSS lines within the project boundary have a higher pressure (300 psi) than typical in the system and supply a tank located at Jones and Sacramento Streets, along with hydrants along the route.

3.4 APPURTENANCES

West and East of Tunnel

The system uses fire hydrants that are typically located along the sidewalk of the street parallel to pipeline. The AWSS fire hydrants are larger in diameter than normal hydrants and are painted white with blue tops.

4.0 WATER SYSTEM

4.1 EXISTING SYSTEM

West of Tunnel

Fort Mason domestic water lines are governed by the NPS; therefore, the City and County of San Francisco has no information regarding domestic water lines inside the boundary of Fort Mason.

The NPS owns and operates the water system within Fort Mason. The San Francisco Water Department (SFWD) supplies potable water system at Van Ness Avenue and Bay Street via 8-inch cast iron pipes (CIP). Lower Fort Mason is supplied with a 12-inch CIP line that enters the site parallel to Pier 2 and coming down the hillside. It is sleeved in a 21-inch corrugated metal pipe under the former railroad tracks in the parking area. A 6-inch line runs along the base of the retaining wall. There is also an 8-inch line that parallels Pier 1 on Laguna Street and enters Fort Mason near the main entrance. See Elements W1 and W6 on Figure 1.

East of Tunnel

The San Francisco Water Department (SFWD) potable water system in the proposed project area has a working pressure of approximately 74 psi (per a conversation with Ms. Arleen Chan, SFWD).

These pipelines are expected to be ductile or cast iron, which is typical for lines with diameters of less than 20 inches. The ages of the lines vary, but most are expected to be greater than 40 years old (pre-1970). Existing pipelines installed before 1970 are assumed to be cast iron, while those installed after 1970 are assumed to be ductile iron (per Ms. Chan, SFWD).

The typical depth of the pipelines is 36 inches from top of the pipe to grade. There have not been any recent problems with pipelines in the immediate area, nor are there plans to excavate over the next 5 years (per conversation with Ms. Chan, SFWD).

Contacts for SFWD water projects are: Ms. Arleen Chan, San Francisco Water Department (achan@sfgwater.org, (415) 550-4931); and Mr. Thanh Nguyen, Engineering Manager (tnguyen@sfgwater.org).

Beach Street. The water main size alternates between 6 and 8 inches along Beach Street. All lines along Beach Street are assumed to be cast iron except for those in the block bounded by Polk and Larkin Streets, which are ductile iron (DI). The water main at Jones Street is north of the south side of Beach Street and continues west down Beach Street. Before crossing Leavenworth Street, the main crosses Beach Street, running south of north side of Beach Street.

Between Leavenworth and Hyde Streets, the water main runs through the center of the street and terminates at Polk Street. Laterals run between Leavenworth and Hyde Streets (two, both connecting to the south side of Beach Street), Larkin and Hyde Streets (two, both connecting to the south side of Beach Street; four, two of which connect to south side of Beach Street, the other two connecting to the north side of Beach Street)(SFPUC Map 1B). See Element W2 in Figure 1.

Jefferson Street. The water main along Jefferson Street is an 8-inch-diameter pipe and is located north of south Jefferson Street. Its installation date and as the pipe material are unknown. One lateral at the middle of the block connects to a building on the south side of Jefferson Street (SFPUC Map 2). See Element W3 in Figure 1.

Jones Street. The water main along Jefferson Street is an 8-inch line that is west of the east side of the street. The installation date and pipe material are unknown. There are two laterals on Jones Street, both connecting to the west side of the street (SFPUC Map 2). See Element W4 in Figure 1.

Leavenworth Street. The water main along Jefferson Street is a 6-inch-diameter pipe in the center of the street. The installation date and pipe material are unknown. There are six laterals on Leavenworth Street, with two connecting to the east side and four connecting to west side of Leavenworth Street (SFPUC Map 2). See Element W5 in Figure 1.

Van Ness Street. No domestic water lines are shown north of Beach Street (SFPUC Map 15).

4.2 CONDITION

West and East of Tunnel

The pipelines are assumed to be in good working condition with no major problems reported.

4.3 APPURTENANCES

West of Tunnel

Fire hydrants are indicated along the base of the retaining wall. There are various air release and blow-off valves, although not in the area of the proposed track.

East of Tunnel

Various air release and blow-off valves are located along the proposed line. The locations of appurtenances from curb edge and relative depths are unknown.

5.0 SANITARY SEWER/STORM DRAIN SYSTEM

5.1 EXISTING SYSTEM

West of Tunnel

The Lower Fort Mason sanitary sewer system is partially separated from the stormwater system and operated by the NPS. The sanitary sewer system uses 6- to 18-inch lines in Lower Fort Mason that drain to a wet well just south of Building 312. The roof leaders appear to be connected into the sanitary sewer lines. The dock drains nearest to the piers discharge directly into the Bay. The wet well at Building 312 then drains to the large vault south of the gate house visible on the ground. This vault (referred to as Sewer Box 202A) is connected to the city's North Shore Outfall Tunnel. The rail road tunnel is approximately 27 feet above the city's Outfall Tunnel. See Element S in Figure 1.

According to the Army's files, the Upper Fort Mason sanitary sewer system connects to city sewers on Bay Street and Laguna Street, with the possible exception of the Youth Hostel buildings, which appear to connect to the sewer in lower Fort Mason. The flows from Quarters 1, 2, 3, and 4, which used to drain to the Van Ness sewer by a line running down by the tunnel mouth, are now all intercepted by sewer lift stations and are carried back up into the main Upper Fort Mason sewer system.

Moisture was noted in the tunnel. This condition may be caused by outflow in the sewer system, but likely has various sources that include groundwater and irrigation water. This condition may warrant additional investigation prior to design.

Information on the system can be obtained from Mr. James Kren, NPS Historical Architect and Army files reviewed at Fort Mason..

East of Tunnel

The City and County of San Francisco uses a combined sanitary sewer and storm drain (SS/SD) system. When it rains, storm flows are carried into the system along with sanitary sewer. The system is operated by the San Francisco Public Utilities Commission (SFPUC) Water Pollution Control Division on Van Ness, Beach and Jefferson Streets. The Golden Gate National Recreation Area operates the system at Fort Mason. The trunk line system described is comprised of various types of pipe and materials. (Note: the service laterals connecting to the trunk lines are not discussed because of the lack of information on their locations and type.) The trunk pipelines include a combination of 15- to 54-inch-diameter lines comprised of vitrified clay pipe (VCP) and reinforced concrete pipe (RCP).

The primary contact for this effort was Mr. Nathaniel Lee, Department of Public Works, 1680 Mission Street, (415) 554-8318. Other engineering-related contacts are Mr. Henry Anderson (handerson@sfgwater.org; (415) 648-6882) assisted by Mr. Kent Eickman (keickman@sfgwater.org).

Information on the system can be obtained through the geographic information system (GIS) operated for the SS/SD system by Mr. John Seagrave, Bureau of Engineering, (415) 297-0286 (john.seagrave@sfdpw.org).

Beach Street. West of Polk Street, a 12-inch VCP runs down the middle of Beach Street. This connects to a manhole structure on the southeast side of Polk and Beach Streets leading to a manhole structure between Polk and Leavenworth Streets. After the manhole structure, the line size increases to a 30-inch reinforced concrete pipe (RCP), installed in 1973 (reference Contract A-38,321, Hyde Street Sewer Outfall Construction 3/24/74). The invert elevation of the 30-inch RCP is approximately 7 feet below grade. The alignment is roughly in the middle of the street, approximately 34 feet north of the southern curb line. There is a former 12-inch VCP line that runs parallel to the 30-inch pipe to the south. This line has apparently been abandoned since 1973. See Element S2 in Figure 1.

Jefferson Street. Jefferson Street carries two SS/SD lines. One is a 30-inch force main line that ultimately comes from the Marina. This line runs along the southern edge of Jefferson Street with an invert elevation at approximately 5 feet below grade. A 45-inch RCP line runs just south of the street centerline with an invert elevation of 6 feet below grade. The line was installed in 1973. See Element S3 in Figure 1.

Tunnel. No SS/SD lines were identified in the tunnel beneath Fort Mason.

Van Ness Avenue. There is a 30-inch gravity discharge line from the Marina Pump Station that appears to be beneath the former railroad right-of-way along the shore in front of the Maritime Museum. There is also a 4-inch force main that discharges to the 12-inch line on Beach Street north of the Williams-Sonoma building. See Element S4 in Figure 1.

5.2 CONDITION

West of Tunnel

Information on the system's condition was not readily available. However, NPS personnel who were contacted were not aware of ongoing problems with the system.

East of Tunnel

The trunk system condition appears to be in fair to good condition. The generally stout RCP construction material and relatively recent construction (1973) indicate this condition.

5.3 OPERATIONS

West of Tunnel

All SS lines flow to the City's combined system, with the exception of surface drains near the piers.

East of Tunnel

All lines flow to an overflow structure on Beach Street at Powell Street. From there, the flow is to a juncture box on Beach Street and The Embarcadero. During severe wet weather events, the manhole covers have been known to be lifted off their supports.

5.4 APPURTENANCES

West of Tunnel

There are various manhole structures on the site. A lift station south of Building 312 ultimately discharges to the City/County operated force main.

East of Tunnel

There are manhole structures approximately every block. An abandoned pump station is located on the southwestern side of Jefferson and Hyde Streets.

6.0 ELECTRICAL SYSTEM

6.1 EXISTING SYSTEM

West of Tunnel

PG&E operates the entire electrical system in Lower Fort Mason. Service is fed to the site near Building 304 north of the Gate House. This transformer feeds an underground 4 kV system that runs at the site. The primary switching gear is located near the firehouse (Building 322).

The Upper Fort Mason electrical system is a combination underground and aboveground system maintained by the National Park Service. It is a 4 kV campus system fed from the PG&E substation in Lower Fort Mason by an underground line running east and north across Lower Fort Mason to a transformer house above the retaining wall in Upper Fort Mason. See Element E1 in Figure 1.

The PG&E contact for work on the electrical system is Mr. Ed Chan, Pacific Gas and Electric, (415) 695-3339 (etc2@pge.com).

East of Tunnel

PG&E operates the entire electrical system in this area. Electrical lines are typically 24 to 48 inches below grade; however, all cover depths given are approximations based on design drawings, not as-built drawings, and therefore are subject to discrepancies. The cover distances are from top of grade to bottom of trench.

The PG&E contact for work on the electrical system is Mr. Ed Chan.

Beach Street

- **Between Jones and Leavenworth Streets**

The service in this area is four 4-inch ABS lines running approximately 5 feet south of the north curb (Beach Street), starting at Jones Street and continuing west toward Leavenworth Street into Vault 5483 (14 by 10 by 9 feet). At 220 feet west of Jones Street, one 3-inch plastic conduit crosses the street to a building on south side of Beach Street. At Leavenworth Street, four 4-inch plastic pipes, one 3-inch ABS line, and one 4-inch ABS line run north along east side of Leavenworth Street; one 3-inch and two 4-inch ABS lines cross Beach Street, continuing south down Leavenworth Street, with an indicated 15 inches of cover; and one 4-inch ABS line continues west along Beach Street. Running west, north of southern curb (Beach Street), one 4-inch ABS line crosses Leavenworth Street and terminates approximately 15 feet west of Leavenworth Street. There are two transformers at the northern curb (Beach Street) that are 190 and 215 feet west of Jones Street (PGE Maps 146-E, 146-H). See Element E2 in Figure 1.

- **Between Leavenworth and Hyde Streets**

Continuing from Leavenworth Street, one 4-inch ABS line runs west 163 feet, approximately 8 feet south of the northern curb (Beach Street). Continuing west 77 feet are three 4-inch ABS lines that intercept Vault 5481 (14 feet by 10 feet by 9 feet). West of Vault 5481 are two 4-inch ABS lines that continue to Hyde Street, running 22 feet south of the northern curb (Beach Street), with 3 feet of cover. Upon crossing Hyde Street, the line splits to the north and south, 6 feet west of the eastern curb (Hyde Street). The north split feed into a 5-foot by 5-foot box, approximately 5 feet south of the northern curb (Beach Street), and then continues both north and west. South of Vault 5481 is one 4-inch plastic conduit with 3 feet of cover, which runs approximately 7 feet

north of the southern curb (Beach Street) and turns east for 104 feet before terminating (PGE Maps 146-D, 146-WW). See Element E3 in Figure 1.

- **Between Hyde and Larkin Streets**

From Hyde Street, one 4-inch ABS line, approximately 12 feet south of the northern curb (Beach Street) runs to Vault 5479 (16 feet by 10 feet by 9 feet). Vault 5479 from the south has three 4-inch plastic conduits that travel within 4 feet north of the southern curb (Beach Street). Both lines continue west on Beach Street approximately 11 feet north of the southern curb (Beach Street), with one terminating 65 feet east of Larkin Street, and one 4-inch conduit (30 inches of cover) extending to the center of Beach Street approximately 130 feet west of Vault 5479. There is also a transformer due north of the southern curb (Beach Street), approximately 125 feet east of Larkin Street (PGE Maps 146-SS, 20-GG). See Element E4 in Figure 1.

- **Between Larkin and Polk Streets**

From Hyde Street, one 4-inch soap stone conduit runs west along the center of the street (30 inches of cover), and continues to Vault 2885, which is located approximately 225 feet west of western Polk Street. There is also a privately owned pipe that runs across Beach Street, starting at the southeastern corner of Polk and Beach Streets, and runs northeast (PGE Map 20-GG). See Element E5 in Figure 1.

Jefferson Street. One 4-inch fiber duct coming from Leavenworth Street terminates approximately 220 feet to the east, approximately 5 feet north of the southern curb (Jefferson Street). Approximately 84 feet east of Leavenworth Street, one 4-inch plastic line travels from the southern curb (Jefferson Street) across Jefferson Street to approximately 5 feet south of the northern curb and continues east to Handhole 588 (42 by 42 by 36 inches) alternating as a 4-inch fiber duct and 4-inch plastic conduit. (The amount of cover is not known for this segment of the line.) East of Handhole 588 are two 4-inch plastic conduits, and one 4-inch ABS at 6 feet, 16 feet, and 22 feet south of the northern curb (Jefferson Street) (PGE Map 146-S). See Element E6 in Figure 1.

Jones Street. Starting from Beach Street, one 4-inch plastic pipe travels north (8 feet west of the eastern curb (Jones Street)) approximately 275 feet to Vault 5482 (which is 10 feet by 14 feet by 9 feet). Three additional lines leave Vault 5482 (south), the most notable ties back into a 4-inch plastic pipe 115 feet south of Vault 5482 and runs 15 feet west of the eastern curb (Jones Street). North of Vault 5482 are two 4-inch ASB lines and two 4-inch plastic pipes that are

approximately 15 feet west of the eastern curb (Jones Street) and turn west after crossing the center of Jefferson Street (PGE Map 146-V). See Element E7 in Figure 1.

Laguna Street. Electrical service along Laguna Street includes four 3-inch plastic pipes and one 4-inch plastic pipe. The line runs east of the west curb and connects to an 11.5- by 12.5- by 7.5-foot vault set 31 inches below grade, 9.3 feet north of south Marina and 21.4 feet east of west Laguna Street. North of the vault, one 4-inch plastic conduit and one 3.5-inch plastic conduit travel west of northwest, and two plastic pipes connect to a vault (12 kV system) approximately 160 feet south and 3 feet east of Building A, adjacent to the turnaround loop at the western side of Fort Mason (the depth of pipe vault is not known). See Element E8 in Figure 1.

Leavenworth Street. Starting at Beach Street, there are one 4-inch ABS line and one 3-inch ABS line 15 inches below grade, 10 feet west of the eastern curb, which connect to a 24-inch by 36-inch vault (Vault 5480) 166 feet north of Beach Street. The line then continues with 18-inch cover to Vault 5480 (which is 10 feet by 16 feet by 9 feet), 12 feet south of Jefferson Street. Two transformers are 50 feet and 80 feet south of Jefferson Street, 5 feet west of the eastern curb. A 4-inch plastic pipe also starts at Beach Street (ranging 7 to 8 feet west of east curb with 52 inches of cover) and continues north approximately 130 feet and terminates into adjacent building. A 36-inch by 42-inch vault is located just north of Beach Street, approximately 1 foot west of the eastern curb (Leavenworth Street). Vault 5480 has one 4-inch plastic conduit (with 30 inches of cover) traveling west approximately 25 feet, which then heads north past Jefferson Street, and two 4-inch ABS conduits (42 inches of cover) traveling north and turning west at the center of Jefferson Street. In addition, one 4-inch ABS line begins at the southeastern corner of the intersection of Jefferson and Leavenworth Streets, and travels southwest to 15 feet east of the western curb (Leavenworth Street), then runs north onto Jefferson Street, where the line turns west 18 feet north of the southern curb (Jefferson Street) (PG&E Map 146-U). See Element E9 in Figure 1.

Van Ness Avenue. The electrical service on Van Ness Avenue consists of two 3-inch plastic pipes, starting at transformer T-1818, adjacent to City and County of San Francisco Pumping Station 2, and traveling south along Van Ness Avenue. The line crosses Van Ness Avenue (west to east) approximately 120 feet south of the pumping station and connects to a vault approximately 10 feet west of the eastern curb. A 220-foot line of unknown size connects a vending stand to the vault (additional confirmation of the line's size and use is needed). The 3-inch plastic pipe continues south for 400 feet or more until crossing to the western side of Van Ness Avenue (approximately 10 feet east of the western curb) (PG&E Map 20 RR). See Element E10 in Figure 1.

6.2 CONDITION

West of Tunnel

No problems with the electrical system have been reported. There are plans to upgrade the portion of the system in Upper Fort Mason to 12 kV, likely within the next 5 to 10 years, per Mr. Kren, NPS. The system will become the responsibility of PG&E.

East of Tunnel

Per conversation with Mr. Ed Chan, all electrical lines within the project boundary are in good working condition without recent problems. The most current drawings available are dated between 1970 and 1978.

7.0 GAS SYSTEM

The PG&E contact for work on the gas system is Mr. Ed Chan.

7.1 EXISTING SYSTEM

West of Tunnel

PG&E operates the entire gas system in Lower Fort Mason and the natural gas distribution system above the tunnel in Upper Fort Mason. Gas is supplied to a regulator station north of Building 304. The lines within the Lower Fort Mason site are typically 2 and 3 inches in diameter. No lines are noted in the vicinity of the train portal or area of track layout.

A 2-inch main travels west (out of the west boundary of Fort Mason) to 7 feet west of the eastern curb (Laguna Street), and 15 feet north of the southern curb (Marina). The line then travels over 200 feet north along Laguna Street and intercepts a pressure monitor. A 2-inch line then travels north 23 feet and 15 feet east of existing Warehouse building. The line then continues north along adjacent to existing buildings (PG&E Map 1-DI6A). See Element G1 in Figure 1.

East of Tunnel

All existing gas pipelines in the area are high pressure, and either plastic or metal. PG&E operates the entire gas system. Gas lines are typically 24 inches to 36 inches below grade.

Beach Street. From Jones Street to Leavenworth Street, the gas main is a 2-inch-diameter plastic line. The line starts 23 feet west of Leavenworth Street and 5 feet north of the southern curb, continues east down Beach Street until terminating a half block east of Hyde Street, where it is approximately 19 feet north of the southern curb. A 4-inch-diameter gas main continues along Beach Street at Hyde Street and is approximately 12.3 feet north of the southern curb, which

becomes a 2-inch-diameter gas main west of Polk Street. The gas main terminates just short of the west end of Beach Street (prior to intersecting Van Ness Avenue) and is more than 12.3 feet north of south curb. Laterals include two plastic lines west of Polk Street (one running north, one running south), two lines that are assumed to be plastic between Larkin and Polk Streets (one running north, one running south), two lines that are assumed to be plastic between Leavenworth and Hyde Streets (both running north), and one line that is assumed to be plastic between Jones and Leavenworth Streets running north (PG&E Maps 2-CID, 1-DI6B, 2-CIC). See Element G2 in Figure 1.

Jefferson Street. The 2-inch main is approximately 10 feet north of the southern curb, has two laterals running to the northern curb and a tee running north (48 feet west of Jones) which has a lateral running west approximately 123 feet, 1 foot south of the northern curb) (PG&E Map 2-CID). See Element G3 in Figure 1.

Jones Street. The 2-inch main starts on Jefferson Street, travels south for 45 feet then terminates, and is an unknown distance east of the western curb,. There is one lateral at the end terminal end of line, traveling west (PG&E Map 2-CID). See Element G4 in Figure 1.

Leavenworth Street. A 6-inch main exists an unknown distance east of the western curb. One lateral 101 feet south of Jefferson Street connects to the eastern side of Leavenworth Street (PG&E Map 2-CID). See Element G5 in Figure 1.

Van Ness Avenue. The 3-inch-diameter plastic gas main along Van Ness Avenue begins adjacent to the San Francisco City Pumping Station and continues south, approximately 10 feet east of the western curb (Van Ness Avenue) for 165 feet, then travels laterally across Van Ness Avenue to approximately 10 feet east of the eastern curb (Van Ness Avenue). A 4-inch-diameter line then continues south for 200 feet and then runs laterally (west) to 10 feet west of the eastern curb (Van Ness Avenue). The line then (10 feet west of the eastern curb) extends south down Van Ness Avenue past Beach Street, where it is more than 35 feet west of the eastern curb (Van Ness Avenue) (PG&E Map 1-DI6B). See Element G6 in Figure 1.

7.2 CONDITION

West and East of Tunnel

There was no indication of underperforming or problematic gas pipelines in discussions with PG&E.

8.0 TELECOMMUNICATIONS

West of Tunnel

Telecommunication utility information was taken from U.S. Army Corps of Engineers drawings dated 1961. This information identified conduit and manhole structures at the retaining wall south of Building 314. See Element T1 in Figure 1.

East of Tunnel

Telecommunication utility information is pending. See Table 2 for a summary of utilities that have been contacted and their current status. For the five telecommunication organizations, all but one reported that no utilities are within the project boundary. The typical telecommunication infrastructure will consist of below grade vaults within the street right-of-way serviced with conduits. The vaults are commonly approximately 4 feet to 6 feet wide and up to 10 feet long with a height of 6 feet. The conduits will typically be 4 inches in diameter, and there will be between 25 and 50 of them. See Element T2 in Figure 1.

**Table 1
Existing Utility Infrastructure**

UTILITY	LINE SIZE AND MATERIAL
AWSS	
A1	14 inch, CI
A2	14 inch, CI
A3	20-inch, CI
A4	14-inch, CI
A5	14-inch, CI
A6	16-inch, CI
WATER	
W1	12-inch, CI
W2	6/8-inch, DI
W3	8-inch, DI
W4	8-inch, DI
W5	6-inch
W6	8-inch
SS/SD	
S1	6 to 18-inch
S2	12-inch, VCP
S3	30- and 45-inch
S4	30-inch, 4-inch force main, 12-inch,
ELECTRICAL	
E1	Transformer for underground 4kV system
E2	Up to four 4-inch conduits, two buried transformers
E3	Up to two 4-inch conduits
E4	Up to three 4-inch conduits
E5	One 4-inch conduit
E6	Typically one 4-inch conduit
E7	Up to four 4-inch conduits
E8	Up to five 4-inch conduits, below grade 12kV transformer
E9	Numerous conduits and vaults
E10	Two (or more) 4-inch conduits
GAS	
G1	2 to 3-inch lines w/i Ft. Mason
G2	2-inch line
G3	2-inch line
G4	2-inch line
G5	6-inch line
G6	4-inch line
TELECOM	
T1/T2	Information not received from utility companies.

Abbreviations:

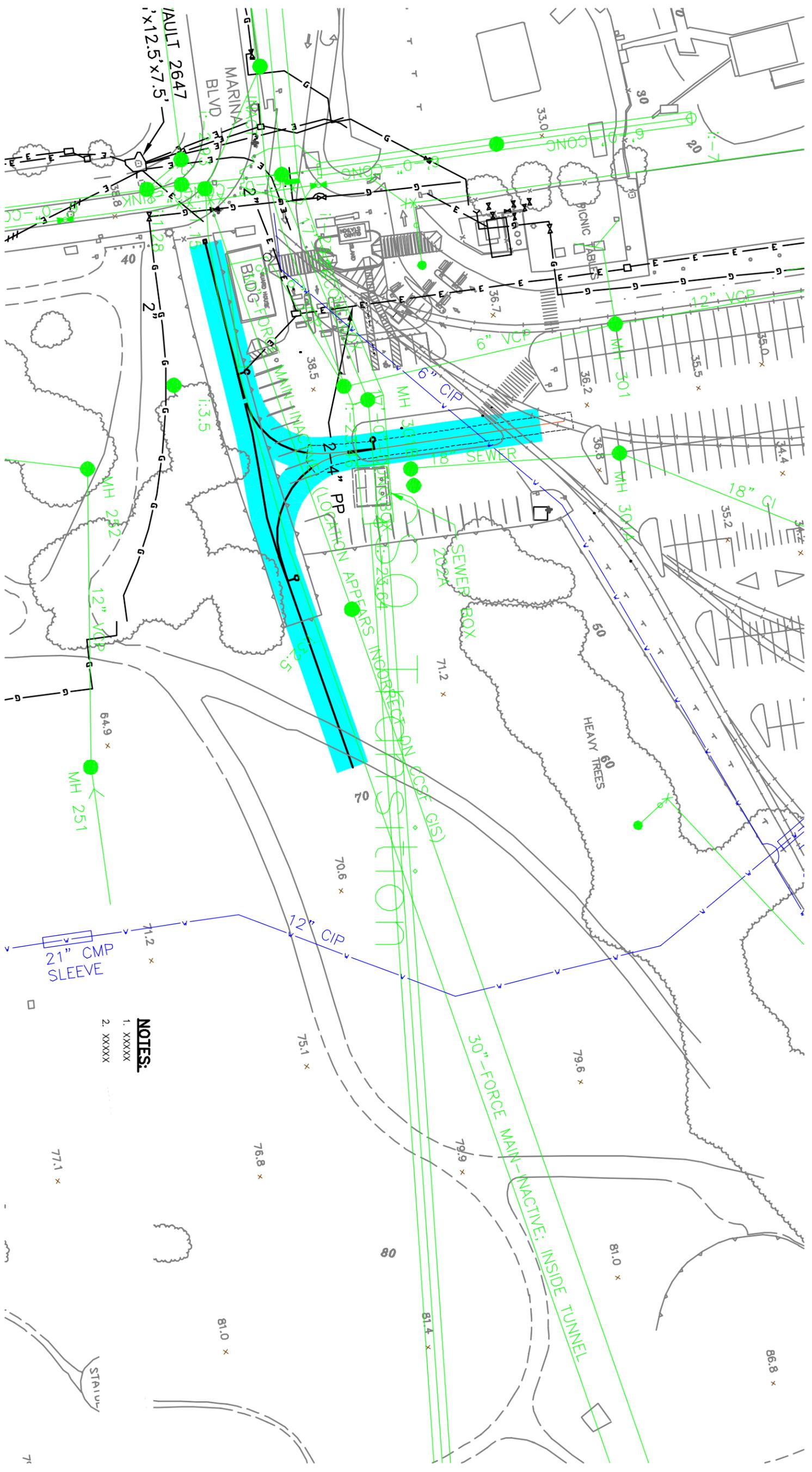
CI – cast iron

DI – ductile iron

VCP – vitrified clay pipe

Table 2
Telecommunication Contacts

Organization	Utility	Representative	Representative Phone	Representative Email	Status
NRG	Steam	Nick Joseph	(415) 725-1814	Nick.Joseph@nrgenergy.com	No utilities in project area
ATT-Local	Telecom	Renee Stevens	(415) 644-7054	rs2364@att.com	Utilities in project area
ATT-Transcontinental	Telecom	James Robinett	(925) 944-8414	james.robinette@worldnet.att.net	No utilities in project area (will follow-up with formal document)
Comcast	Telecom	Gino Graziani	(415) 503-4506	Gino_Graziani@cable.comcast.com	No utilities in project area (will follow-up with drawings)
Level 3	Telecom	Rick Miller	(720) 888-3813	Rick.Miller@Level3.com	No utilities in project area
Verizon/MCI	Telecom	Pam Brown	(415) 970-2109	not available	No utilities in project area



LEGEND:

- E— EXISTING ELECTRIC
- G— EXISTING GAS
- S— EXISTING SEWER
- T— EXISTING TELECOM
- W— EXISTING WATER



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MUNI HISTORIC STREETCAR EXTENSION CONCEPTUAL ALTERNATIVE
 FORT MASON TURN AROUND — EXISTING UTILITIES

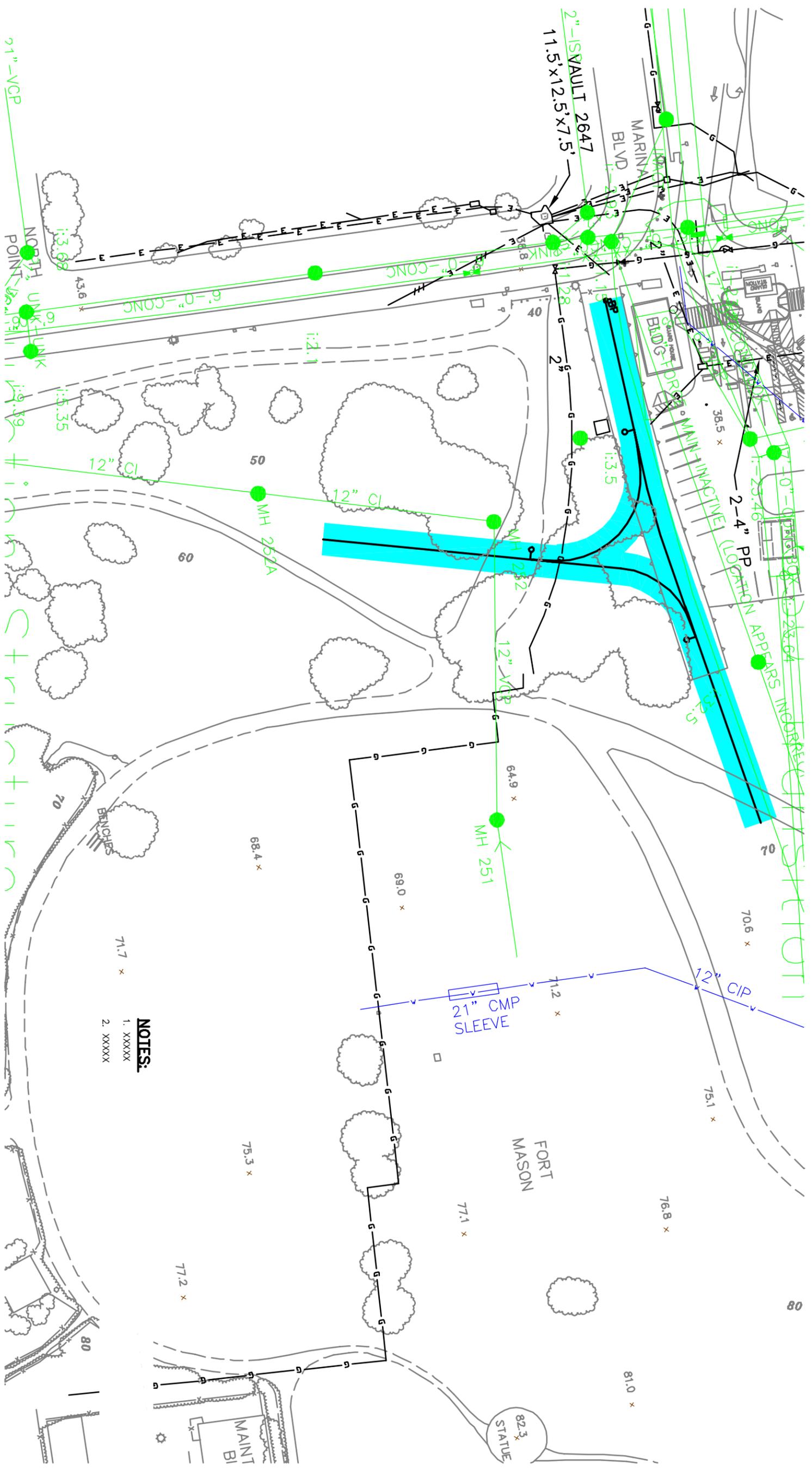
NOTES:

1. XXXXX
2. XXXXX



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FIGURE U.A.1



LEGEND:

- E— EXISTING ELECTRIC
- G— EXISTING GAS
- S— EXISTING SEWER
- T— EXISTING TELECOM
- W— EXISTING WATER

NOTES:

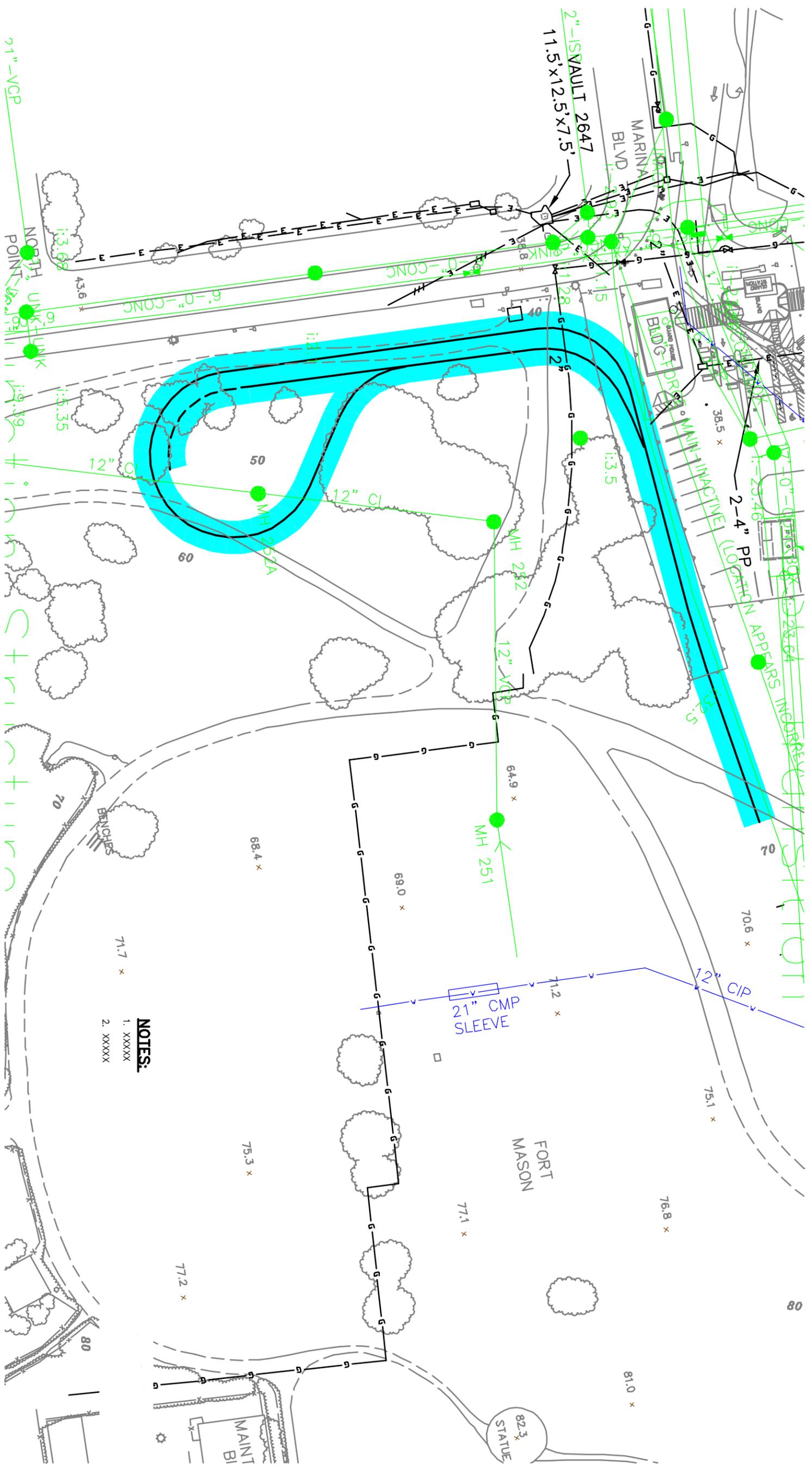
- 1. XXXXX
- 2. XXXXX



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 MUNI HISTORIC STREETCAR EXTENSION CONCEPTUAL ALTERNATIVE
 FORT MASON TURN AROUND — EXISTING UTILITIES

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FIGURE U.A.3



LEGEND:

- E— EXISTING ELECTRIC
- G— EXISTING GAS
- S— EXISTING SEWER
- T— EXISTING TELECOM
- W— EXISTING WATER

NOTES:

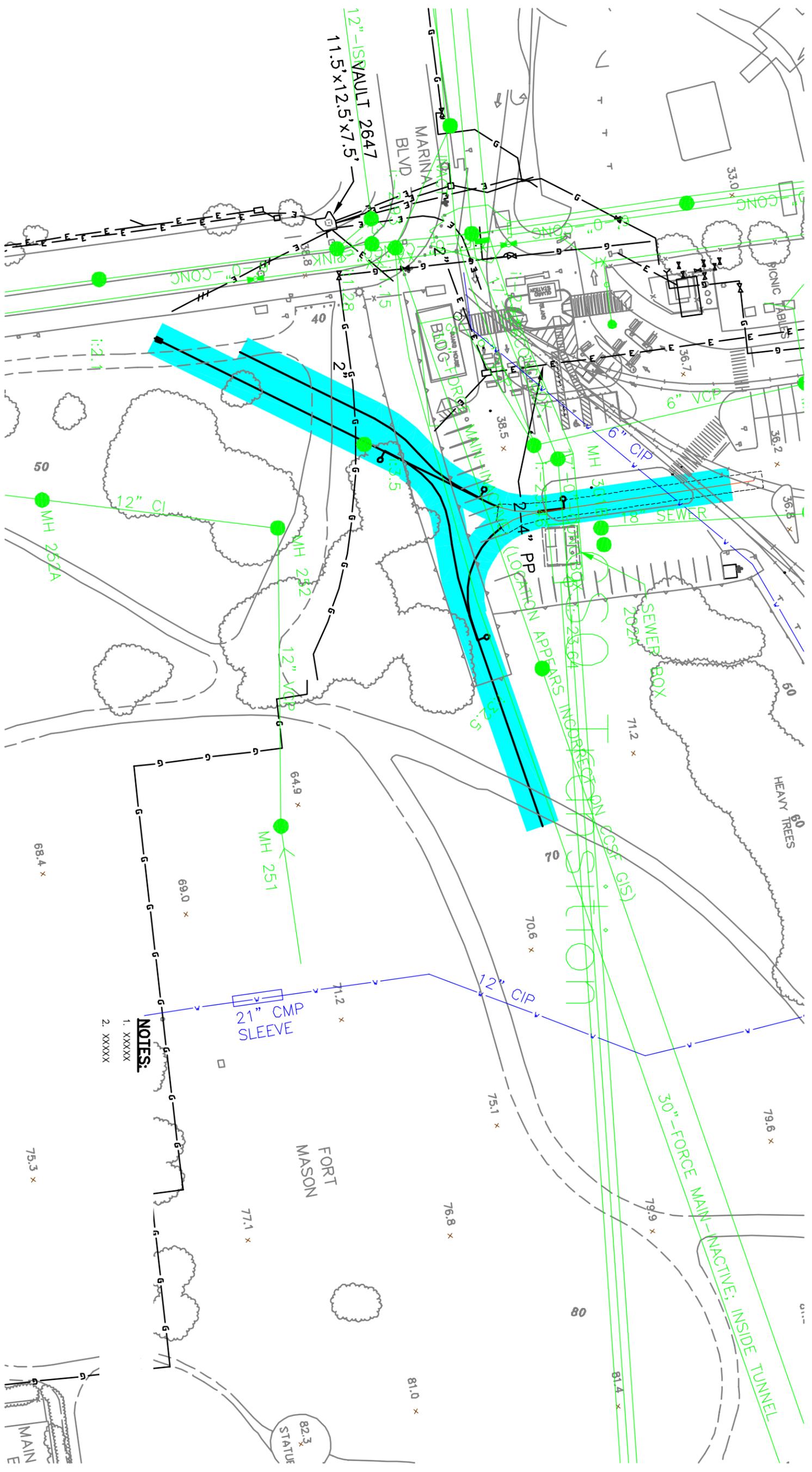
1. XXXXX
2. XXXXX



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MUNI HISTORIC STREETCAR EXTENSION CONCEPTUAL ALTERNATIVE
FORT MASON TURN AROUND — EXISTING UTILITIES**

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FIGURE U.A.4



LEGEND:

- E — EXISTING ELECTRIC
- G — EXISTING GAS
- EXISTING SEWER
- EXISTING TELECOM
- W — EXISTING WATER

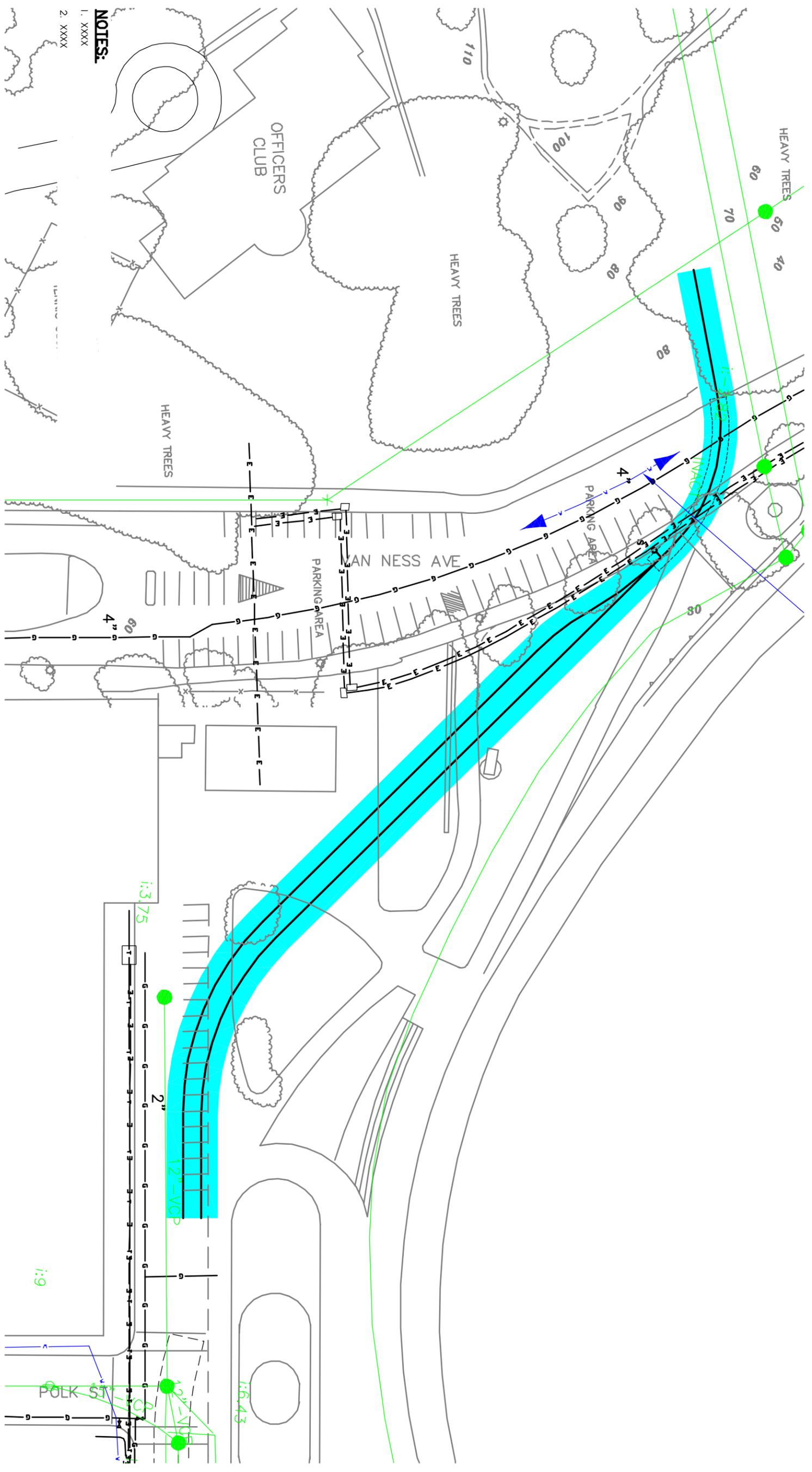
NOTES:
 1. XXXXX
 2. XXXXX



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 MUNI HISTORIC STREETCAR EXTENSION CONCEPTUAL ALTERNATIVE
 FORT MASON TURN AROUND — EXISTING UTILITIES**

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FIGURE U.A.5



NOTES:
 1. XXXX
 2. XXXX

OPTION 1 OF 1

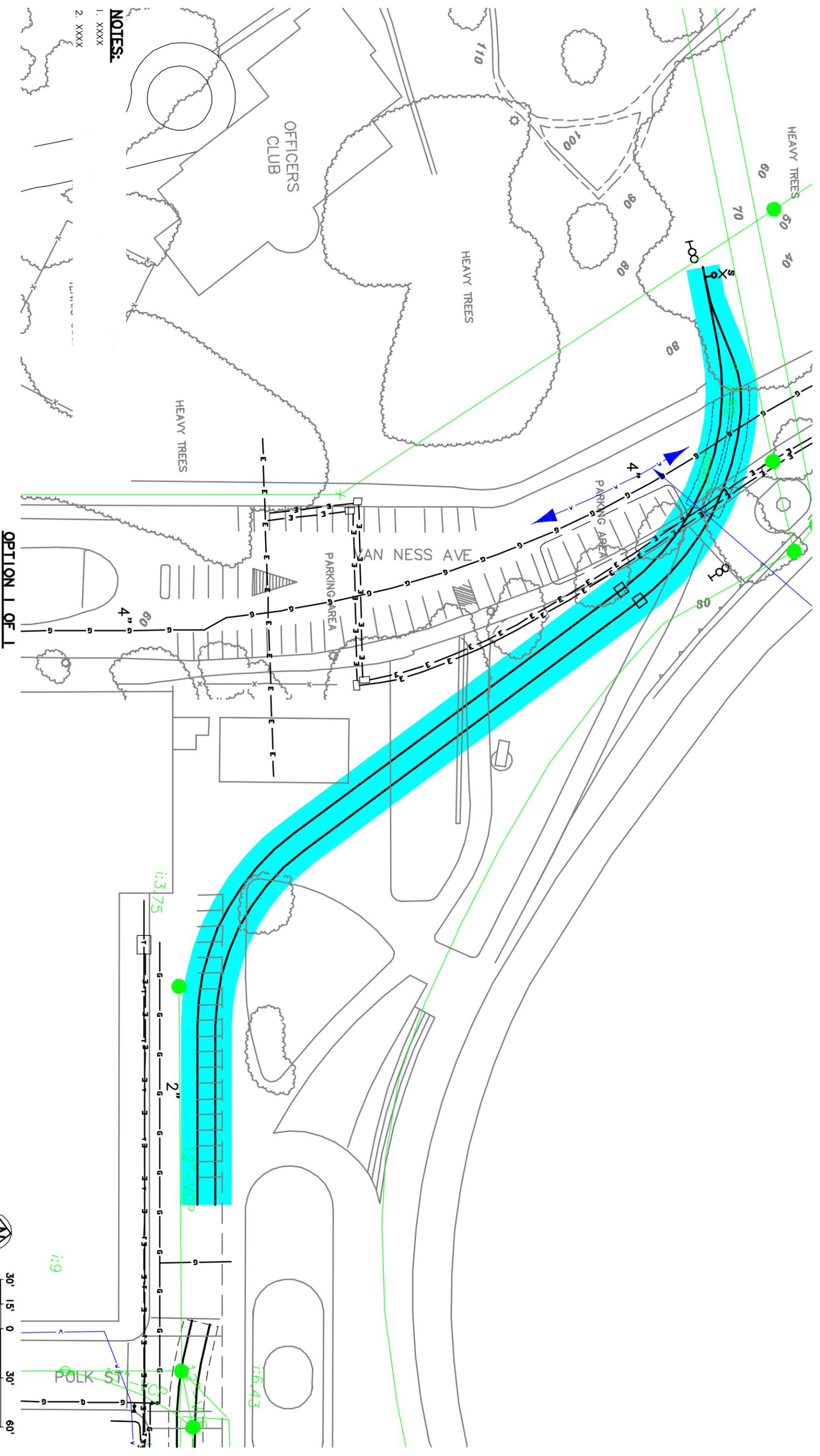
- LEGEND:**
- E— EXISTING ELECTRIC
 - G— EXISTING GAS
 - S— EXISTING SEWER
 - T— EXISTING TELECOM
 - W— EXISTING WATER



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 MUNI HISTORIC STREETCAR EXTENSION CONCEPTUAL ALTERNATIVE
 TRANSITION AREA – EXISTING UTILITIES

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FIGURE U.B.1



NOTES:

- 1. XXXX
- 2. XXXX

LEGEND:

- E— EXISTING ELECTRIC
- G— EXISTING GAS
- S— EXISTING SEWER
- T— EXISTING TELECOM
- W— EXISTING WATER

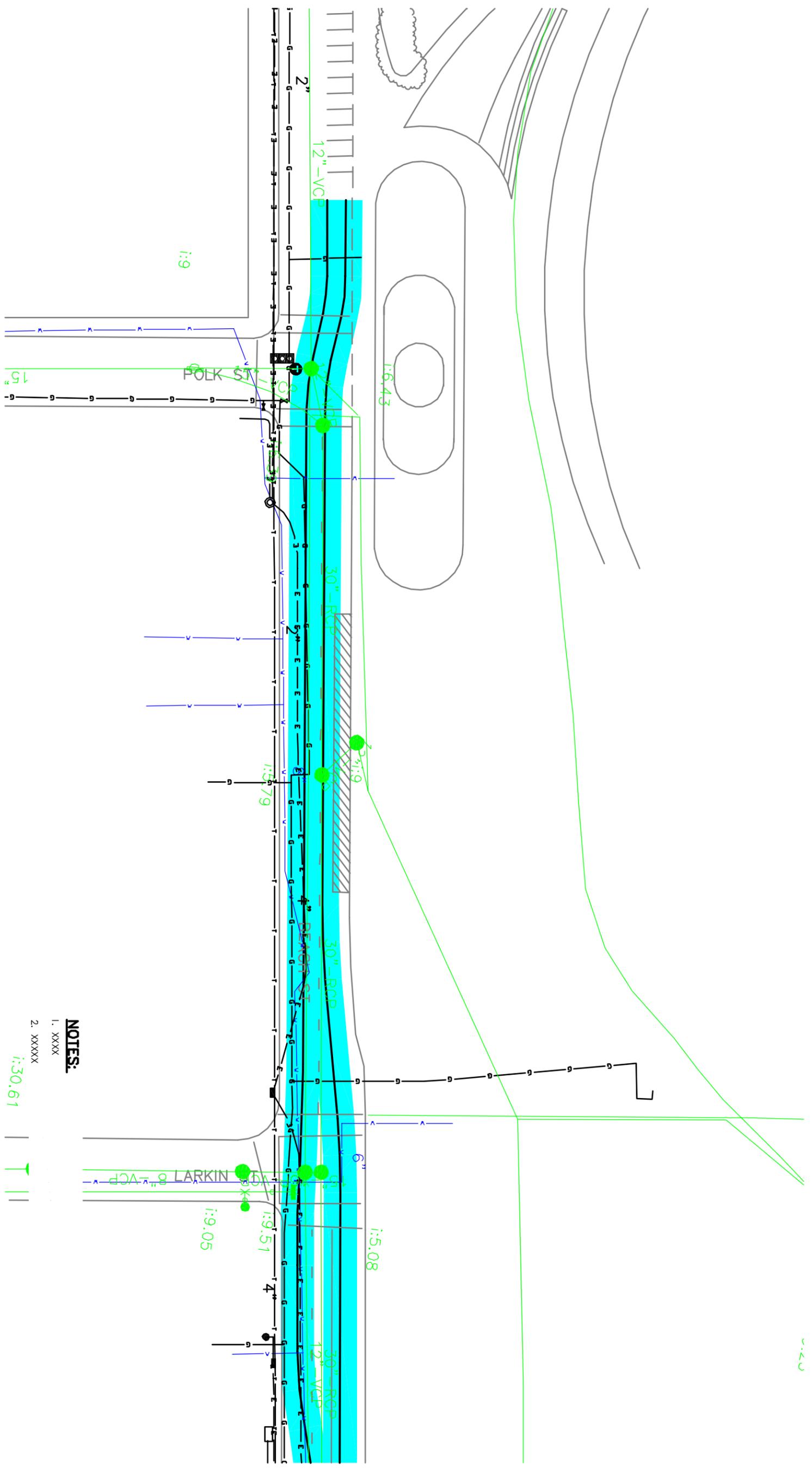
OPTION 1 OF 1



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TRANSITION AREA – EXISTING UTILITIES**

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FIGURE U.B.2



- NOTES:**
- 1. XXXX
 - 2. XXXX



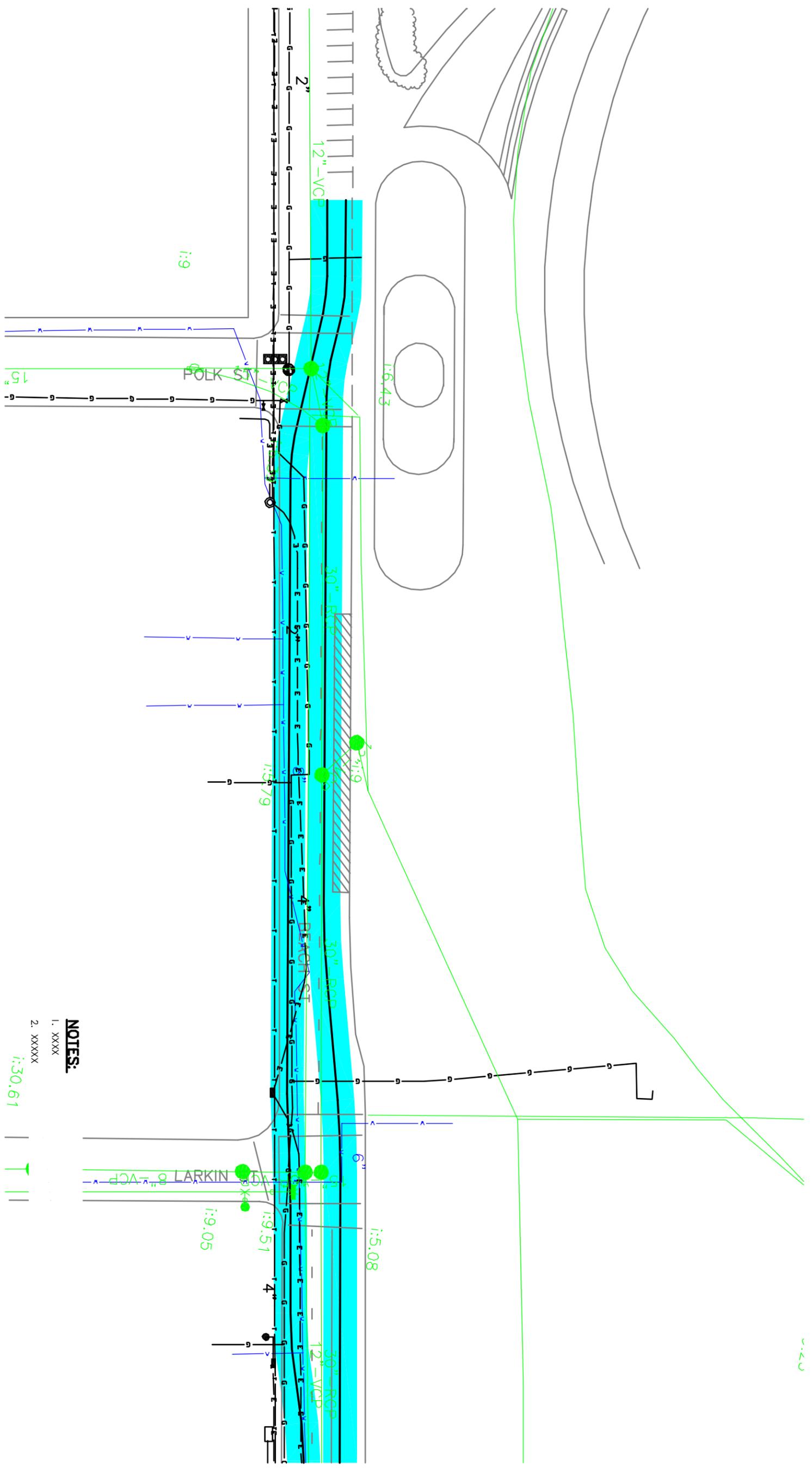
- LEGEND:**
- E— EXISTING ELECTRIC
 - G— EXISTING GAS
 - S— EXISTING SEWER
 - T— EXISTING TELECOM
 - W— EXISTING WATER



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MUNI HISTORIC STREETCAR EXTENSION CONCEPTUAL ALTERNATIVE
BEACH STREET | OF 2 – EXISTING UTILITIES**

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FIGURE U.C.1



- LEGEND:**
- E— EXISTING ELECTRIC
 - G— EXISTING GAS
 - S— EXISTING SEWER
 - T— EXISTING TELECOM
 - W— EXISTING WATER



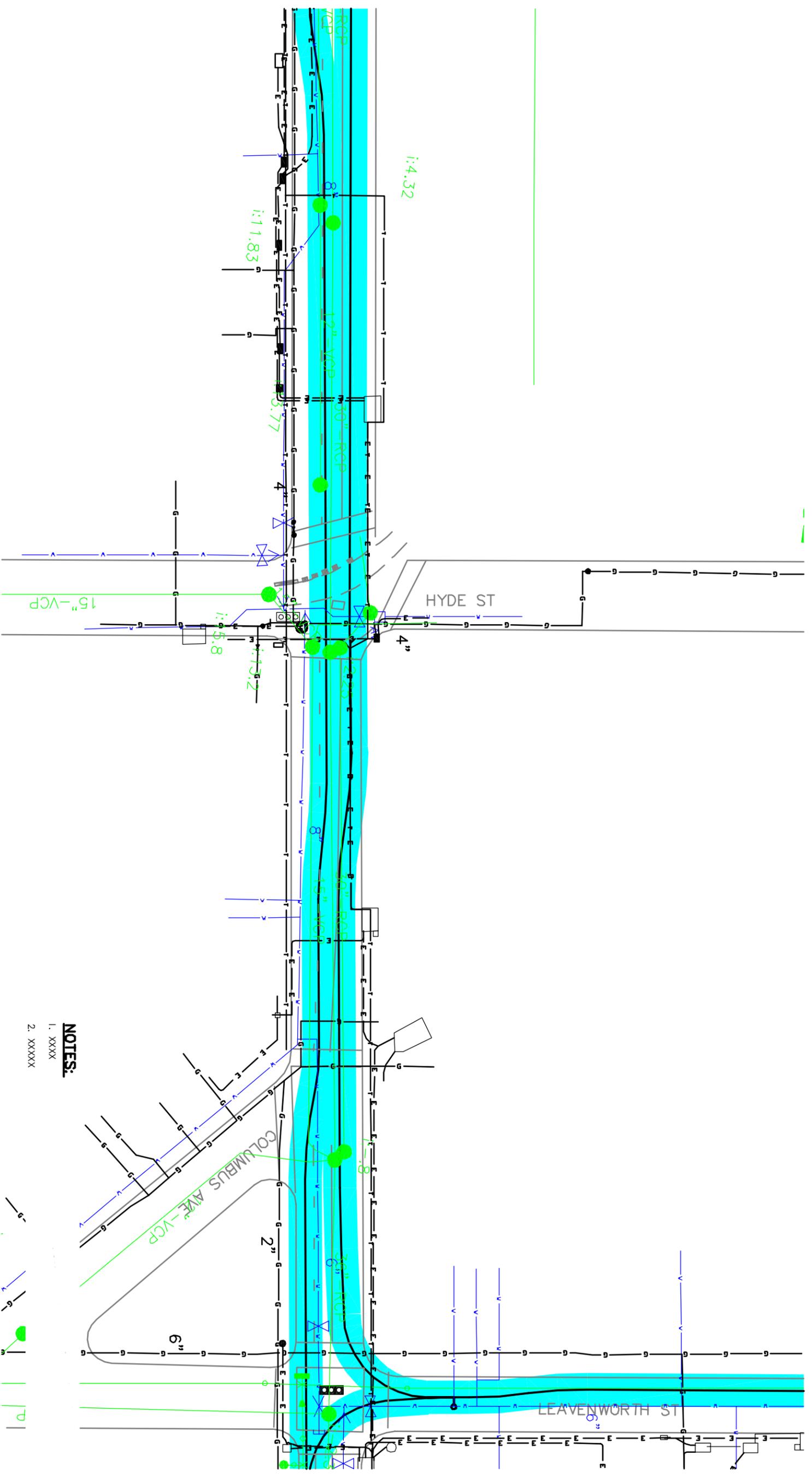
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 MUNI HISTORIC STREETCAR EXTENSION CONCEPTUAL ALTERNATIVE
 BEACH STREET 2 OF 2 – EXISTING UTILITIES

- NOTES:**
1. XXXX
 2. XXXX

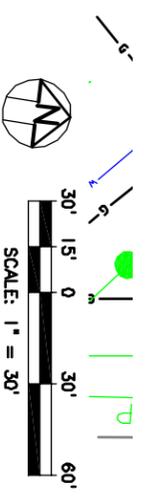


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FIGURE U.C.2



- NOTES:**
 1. XXXX
 2. XXXX



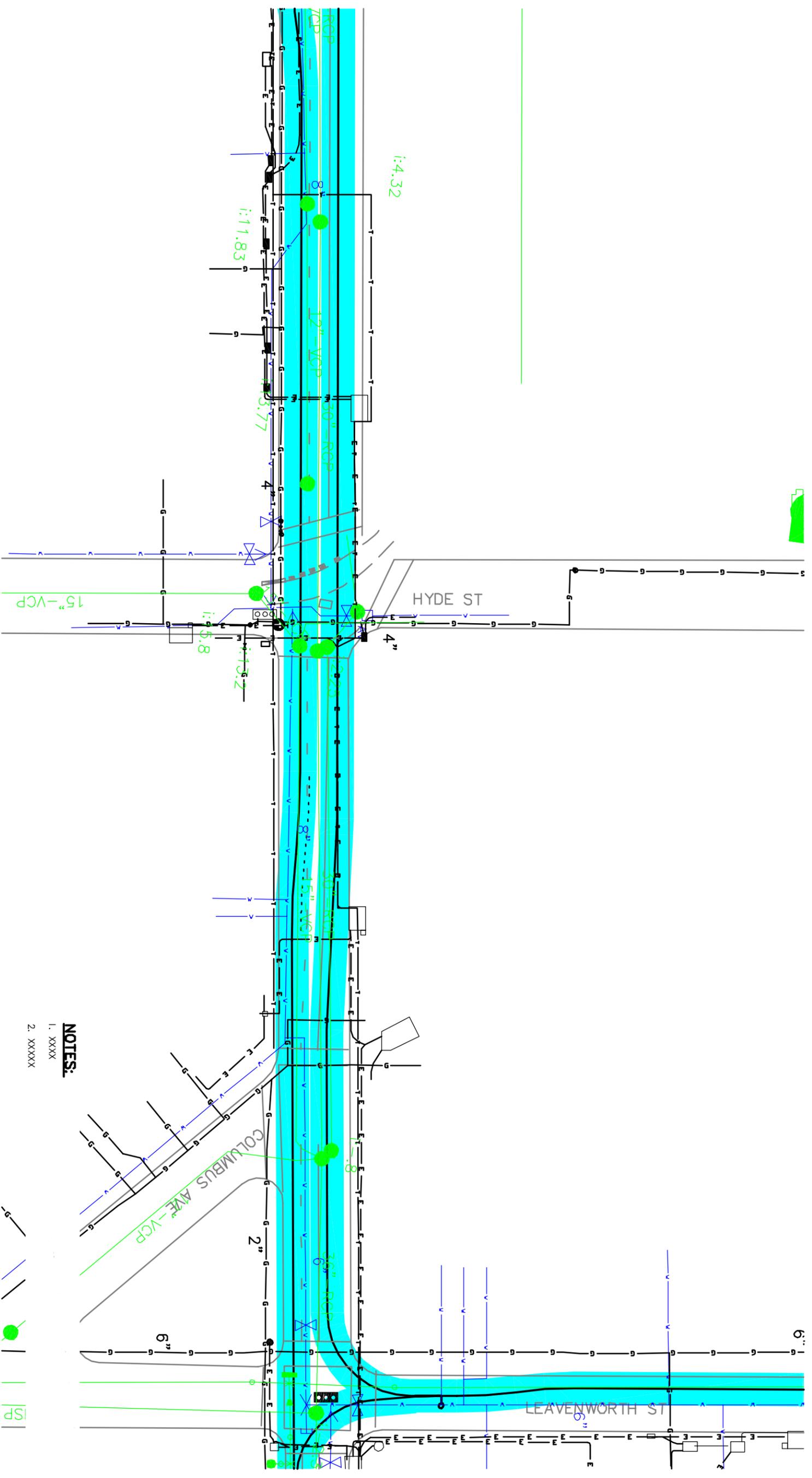
- LEGEND:**
- E— EXISTING ELECTRIC
 - G— EXISTING GAS
 - R— EXISTING SEWER
 - T— EXISTING TELECOM
 - W— EXISTING WATER



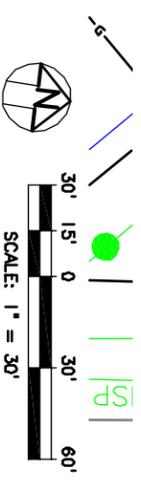
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 BEACH STREET | OF 2 – EXISTING UTILITIES**

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FIGURE U.D.1



- NOTES:**
 1. XXXX
 2. XXXX



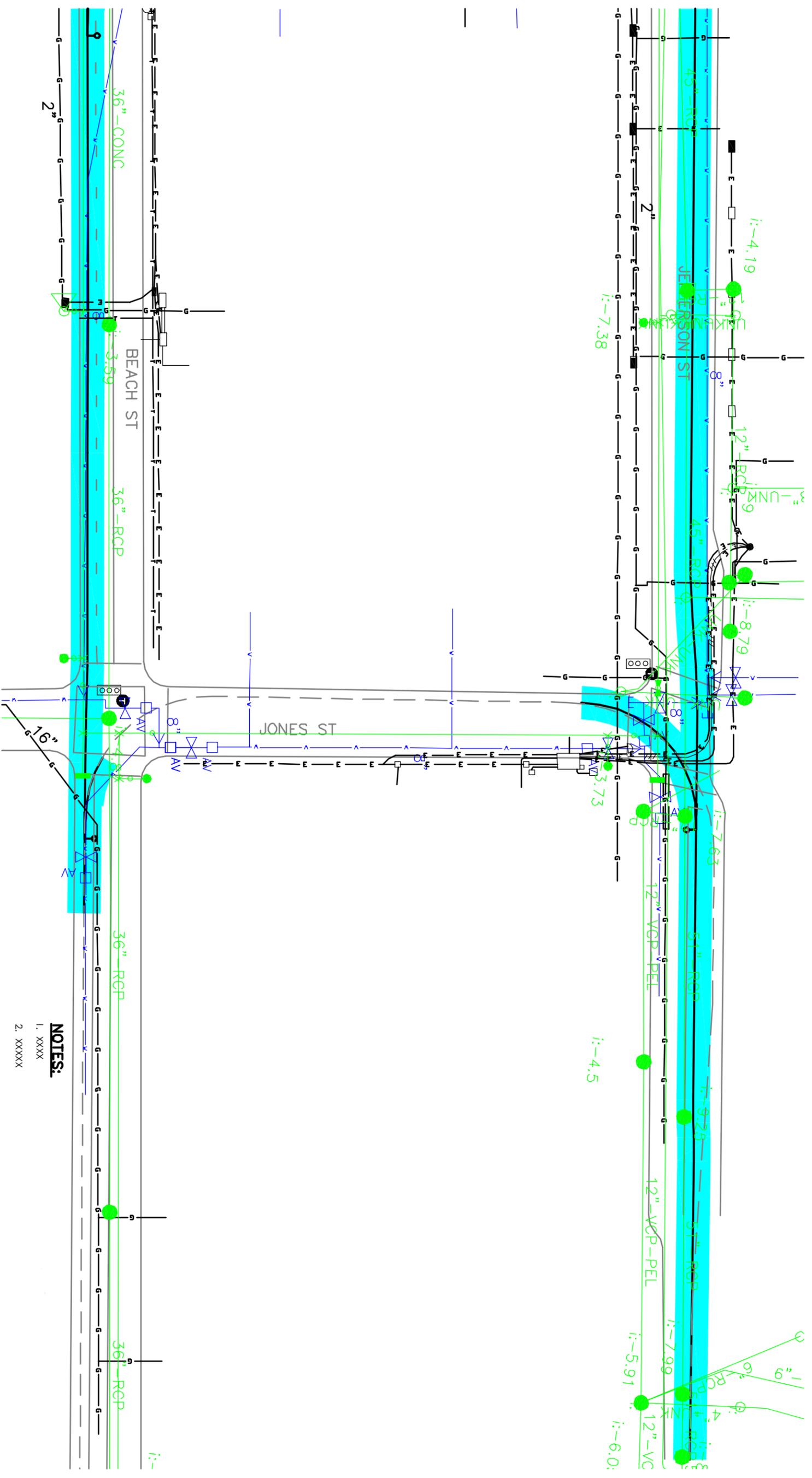
- LEGEND:**
- E— EXISTING ELECTRIC
 - G— EXISTING GAS
 - S— EXISTING SEWER
 - T— EXISTING TELECOM
 - W— EXISTING WATER



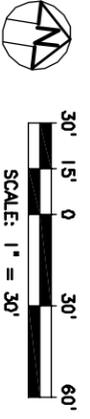
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 MUNI HISTORIC STREETCAR EXTENSION CONCEPTUAL ALTERNATIVE
 BEACH STREET 2 OF 2 – EXISTING UTILITIES

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FIGURE U.D.2



NOTES:
 1. XXXX
 2. XXXXX



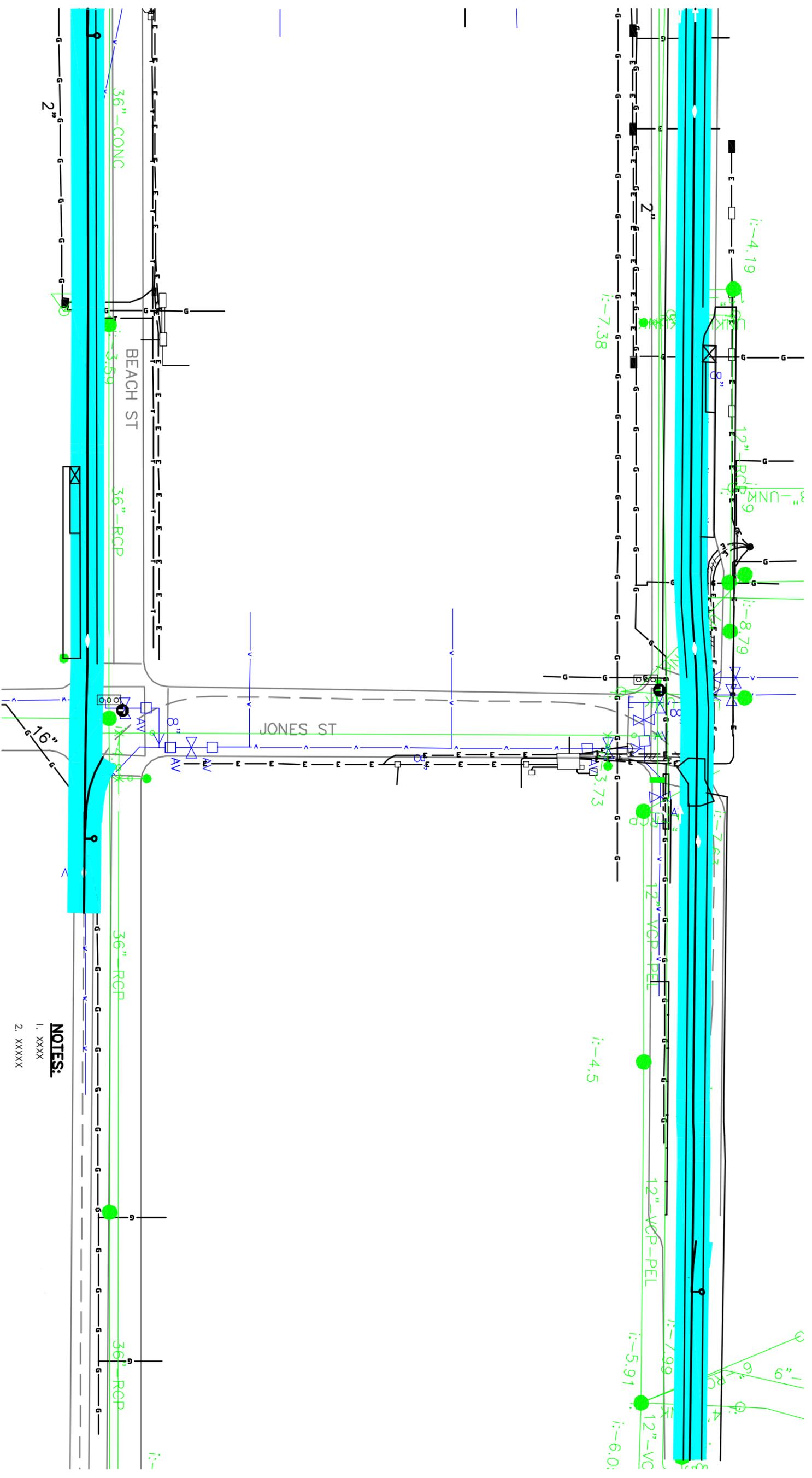
- LEGEND:**
- E — EXISTING ELECTRIC
 - G — EXISTING GAS
 - S — EXISTING SEWER
 - T — EXISTING TELECOM
 - W — EXISTING WATER



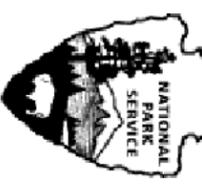
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 MUNI HISTORIC STREETCAR EXTENSION CONCEPTUAL ALTERNATIVE
 CONNECTION TO EXISTING F LINE – EXISTING UTILITIES

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FIGURE U.E.1



- LEGEND:**
- E— EXISTING ELECTRIC
 - G— EXISTING GAS
 - S— EXISTING SEWER
 - T— EXISTING TELECOM
 - W— EXISTING WATER



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 MUNI HISTORIC STREETCAR EXTENSION CONCEPTUAL ALTERNATIVE
 CONNECTION TO EXISTING F LINE – EXISTING UTILITIES

- NOTES:**
1. XXXX
 2. XXXXX



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FIGURE U.E.2