

# SEWER AREA STUDY FOR

## Whittier Boulevard Business Park Industrial Warehouse Development

12352 Whittier Blvd  
Whittier, CA 90606

Prepared for  
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July 20, 2022

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RCE 56155

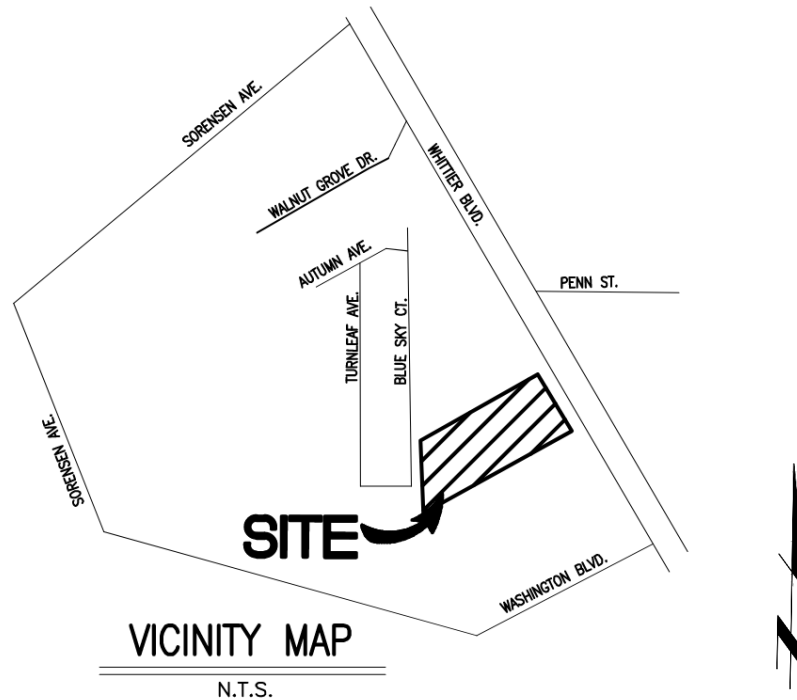
Exp. 12/31/22

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## I. INTRODUCTION

The proposed Whittier Boulevard Business Park Industrial Warehouse development is located on 12352 Whittier Blvd in city of Whittier California, approximately 1/3 miles north-west of the intersection of Washington Blvd and Whittier Blvd.



## II. PROJECT DESCRIPTION

The 13.49-acre subject property is located within the 12300 block and south side of Whittier Blvd. The site is occupied by an abandoned concrete tilt-up warehouse building with surrounding asphalt and concrete pavement. The proposed Whittier Boulevard Business Park Industrial Warehouse Development includes one industrial warehouse buildings covering a total of approximately 295,499 sf with truck docks, vehicular parking and landscaped areas.

## III. SITE DESCRIPTION

The project site is an irregular-shaped parcel elongated in a north to south direction. It is bounded by an existing commercial storage building on the north, residential homes and hospital parking lot on the west, industrial building on the south and Whittier Blvd on the east.

The zoning of the site and adjacent properties to the is per the specific plan zone SP, The general plan land use is General Industrial (M). General plan land use of the properties to the

east is school Code (E) and Civic Facility (H). Figure 2 shows the existing land use for the project site and surrounding area.

#### IV. DESCRIPTION OF EXISTING SEWAGE SYSTEM

The existing industrial building discharge into the existing 6" VCP sewer line which runs from north to south near the west property line.

#### V. DESCRIPTION OF PROPOSED SEWAGE SYSTEM

Whittier Boulevard Business Center Development will be discharge to the existing 6-inch gravity sewer along west property line which it currently discharges to. Figure 3 shows the sewer index of the existing gravity sewer in relation to the project.

To verify the current sewer flow condition, temporary flow gauging was conducted at three different manholes, one upstream of the project and two downstream by US<sup>3</sup> Utility Systems, Science and Software and used as means to determine the actual sewage flow in the existing 6" VCP line and the results are below.

#### VI. DISCUSSION

The existing condition peak flow calculations show segments of the 6-inch diameter sewer are flowing at max 19.5% of the pipe and could be 50% per city of Whittier sewer master plan requirement table 5-1. These segments are tabulated in the Table 1. Sewer Capacity Analysis.

#### PROPOSED SEWER CAPACITY ANALYSIS

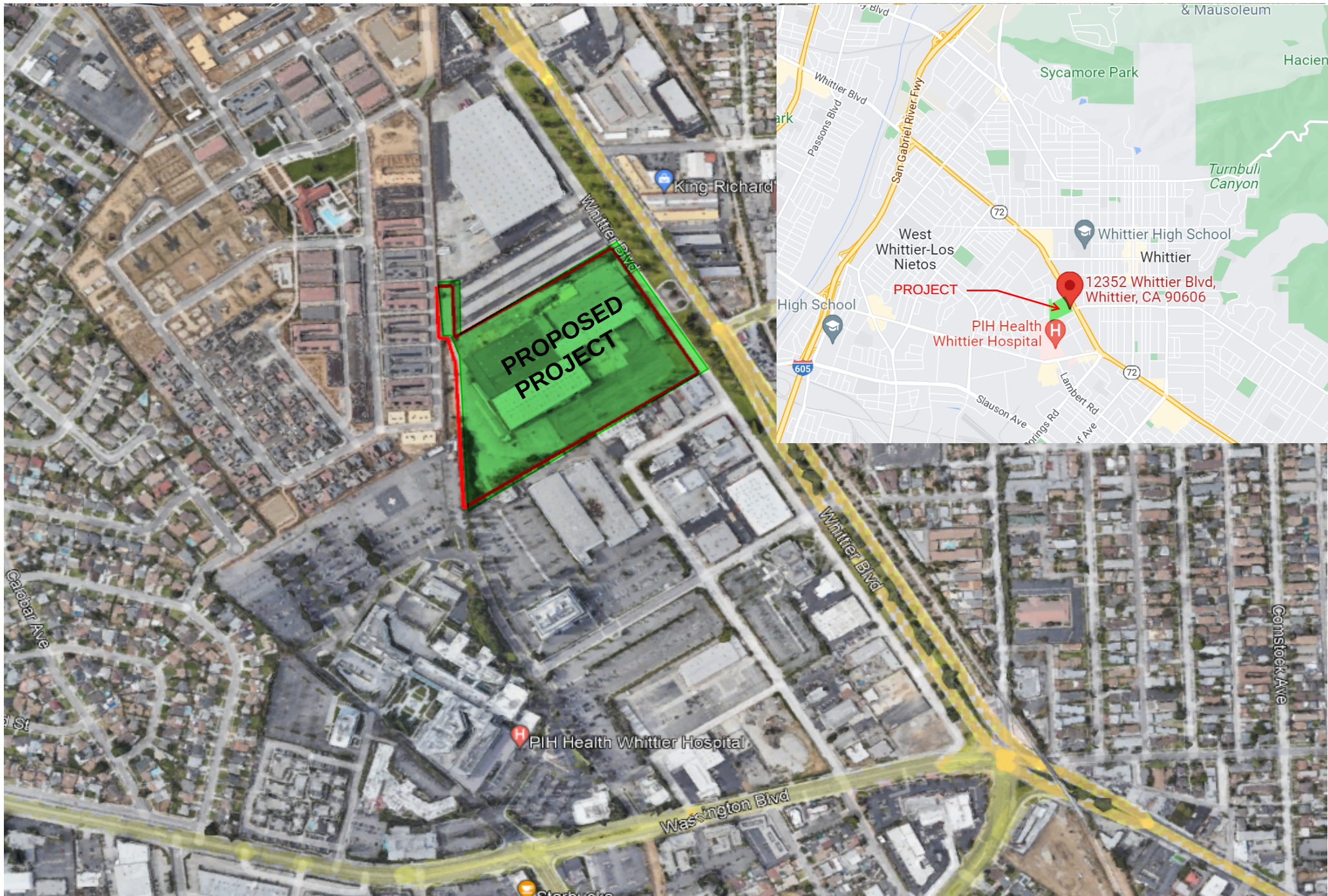
| Street Name           | Segment |        | EXISTING<br>% Full   | PROPOSED<br>% Full            |
|-----------------------|---------|--------|----------------------|-------------------------------|
|                       | M.H. #  | M.H. # | Comulative<br>Flow / | Comulative<br>Flow / Capacity |
| Easement              | 797     | 796    | 2.9                  | 2.9                           |
| Site Peak Sewage Flow | 796     | 796    | 2.9                  | 19.5                          |
| Easement              | 796     | 795    | 2.9                  | 19.5                          |
| Easement              | 795     | 794    | 2.6                  | 17.1                          |
| Easement              | 794     | 793    | 2.1                  | 14.0                          |
| Easement              | 793     | 792    | 2.3                  | 15.4                          |
| Easement              | 792     | 791    | 1.2                  | 7.7                           |
| Easement              | 791     | 790    | 8.1                  | 14.0                          |
| Easement              | 790     | 789c   | 13.3                 | 19.2                          |

**Table 1.** (None at or Exceeding 50% flow depth)

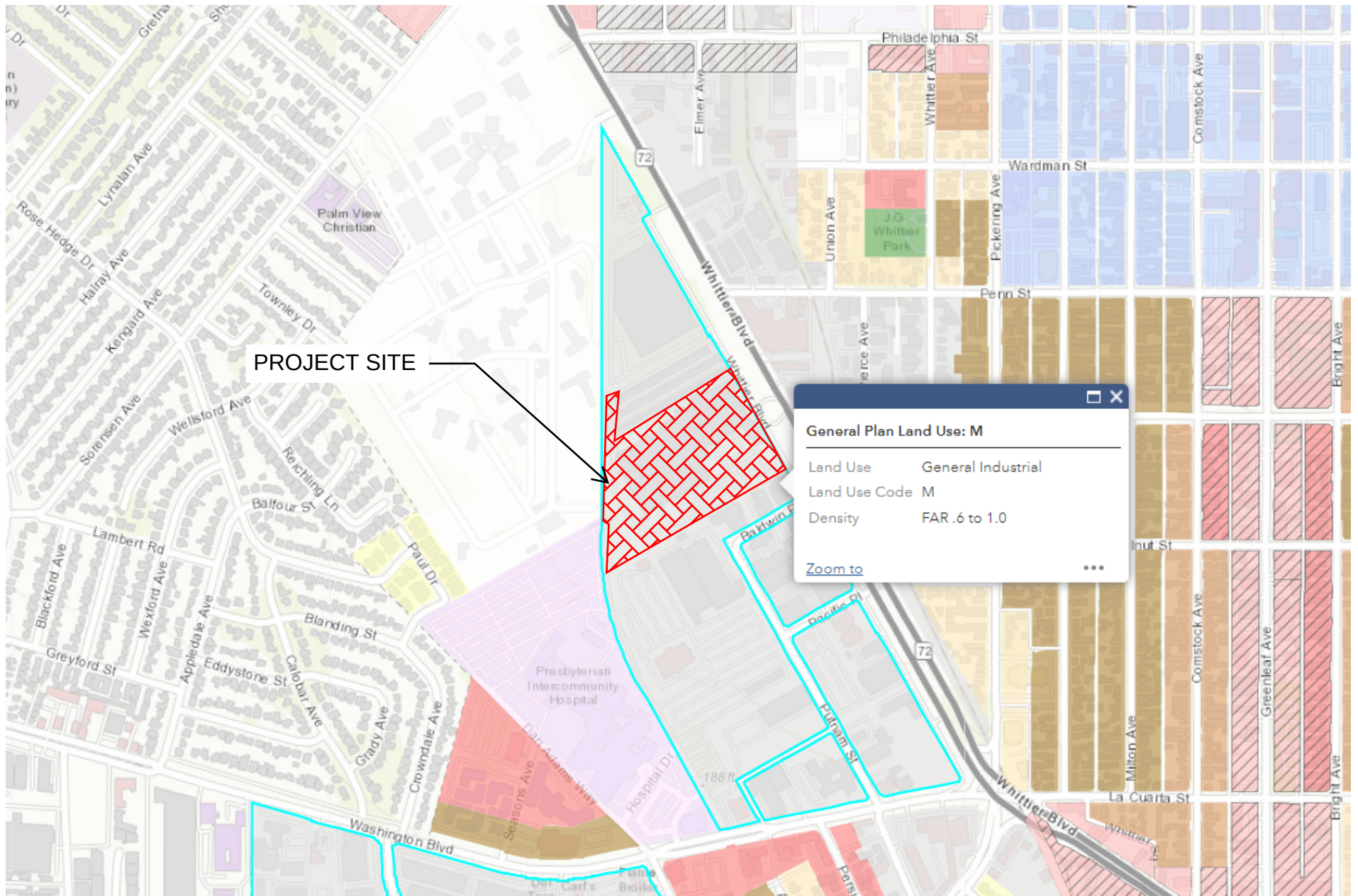
The proposed project will contribute an additional maximum peak flow of 0.139 cfs which equates to an addition of 16.6% of peak sewage flow to the existing system with city of Whittier. More importantly we have calculated that the proposed total flow inclusive of the proposed project accounts for 33.2 of the design capacity of the sewer at its worse location (design capacity taking only 50% depth of the pipe). Hence 66.8 of the sewer capacity remain in the sewer for future developments.

## **VII. CONCLUSION**

Based on the actual gauged flows, the 6" sewer through line running north to south near the west property line on our site has more than sufficient excess capacity. The project has minimum impact to downstream sewer capacities.



a) Figure 1. Vicinity Map and Project Location



Legend

General Plan Land Use

General Industrial

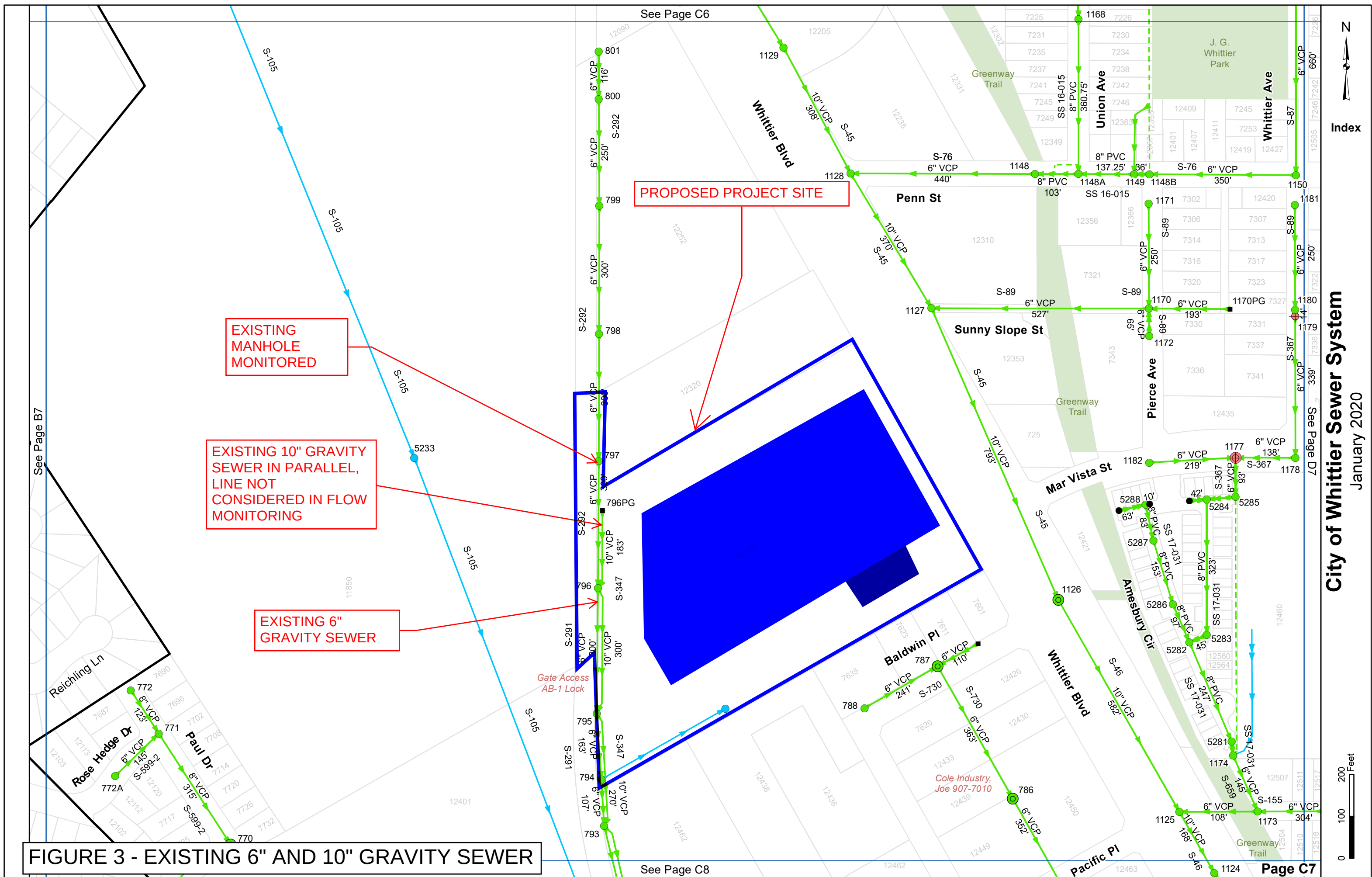
Civic Facility

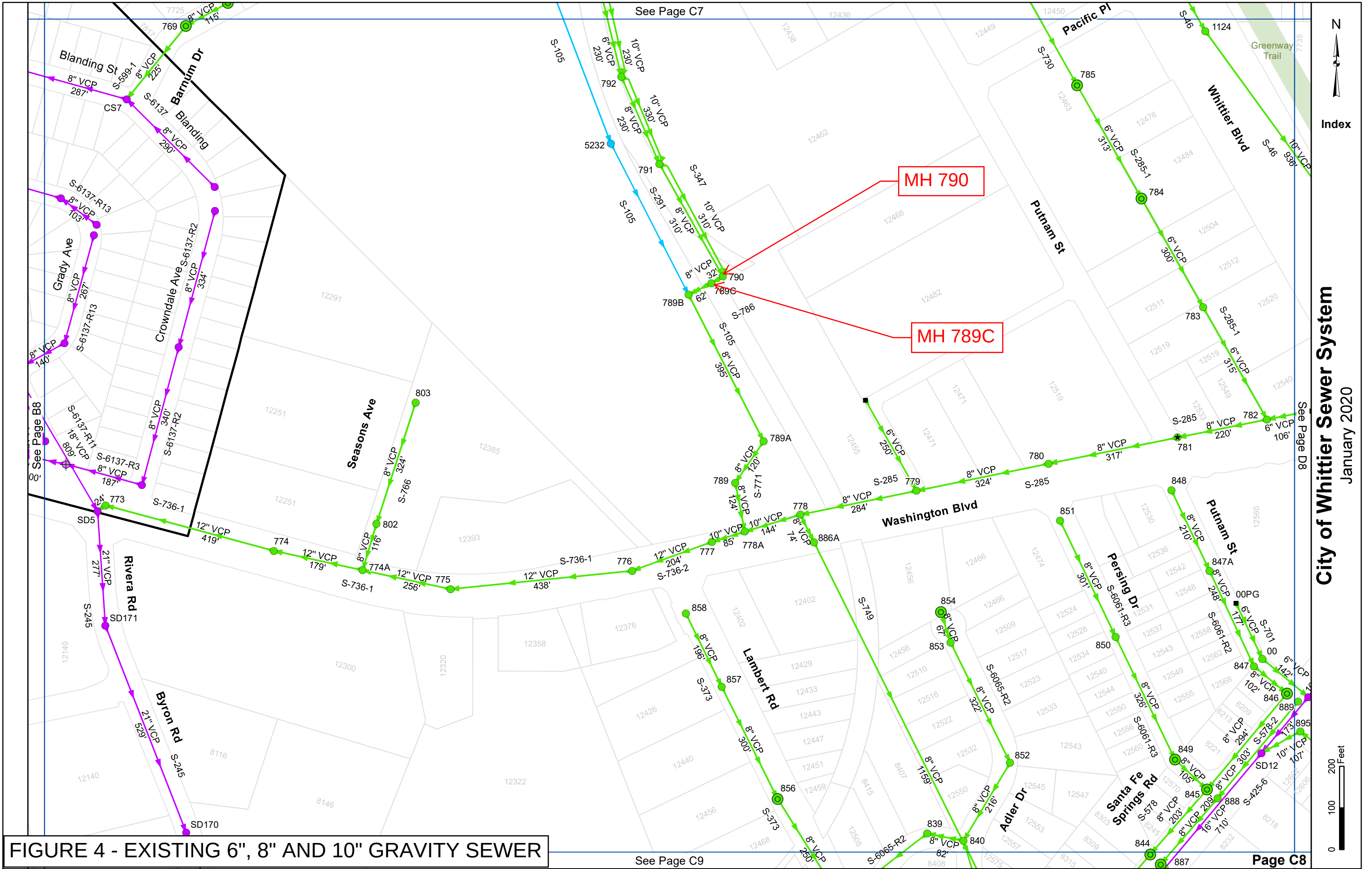
Whittier Boulevard Business Center Development

**Sewer System Evaluation**



b) Figure 2 - Zoning and Land Use in the Vicinity of the proposed Project





# EXISTING SEWER CAPACITY ANALYSIS

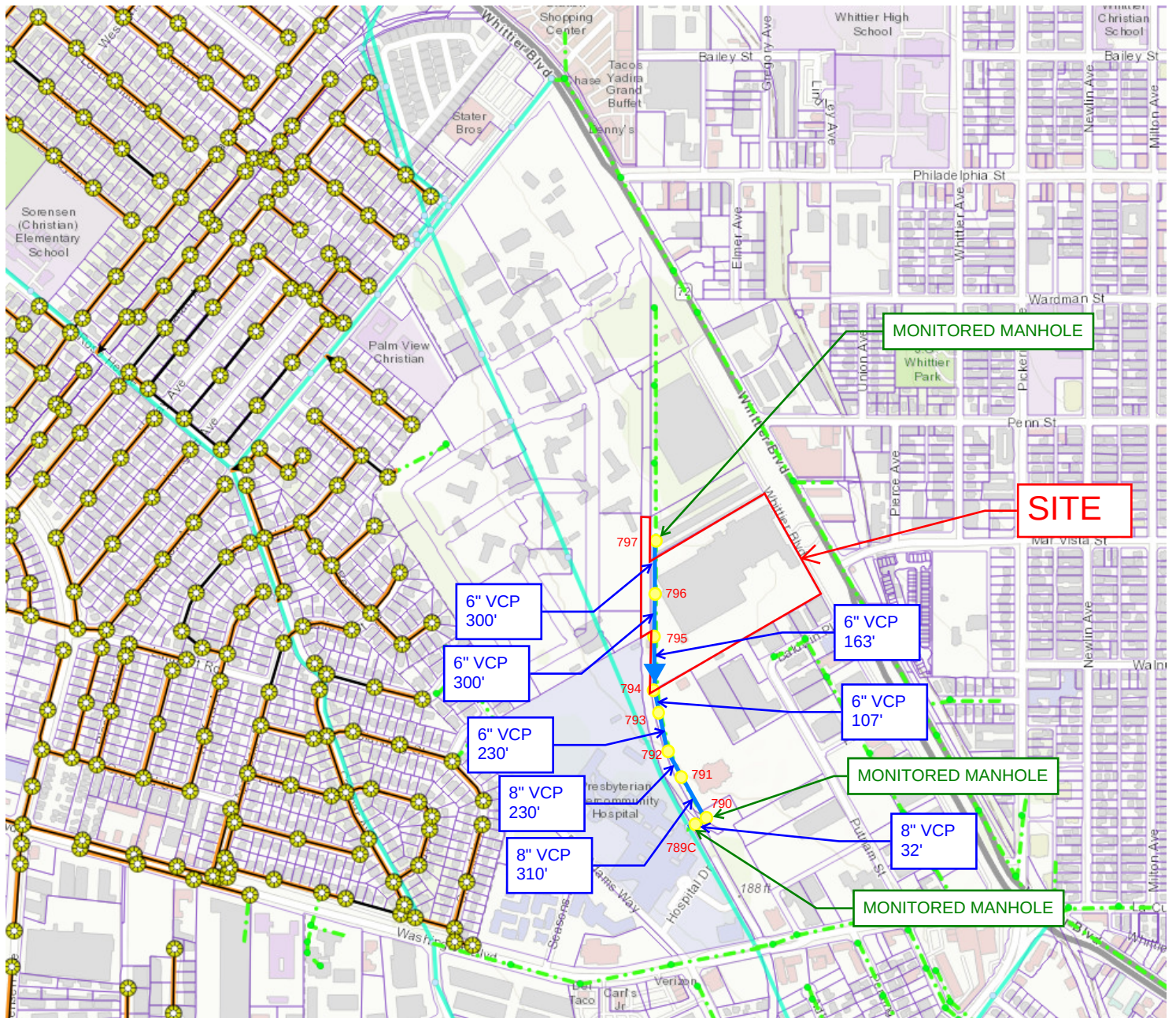
| Street Name | Segment |        | Pipe       |           | Design Capacity   |                   | Area<br>(Acres) | Zoning<br>Coeff. | Calculated<br>Flow (cfs) | Monitored Flow<br>Corrected Flow<br>(cfs) | Cumulative<br>Calculate<br>Flow (cfs) | PC or CI<br>Construction<br>Plan # | % Full<br>Cumulative<br>Flow / Capacity | Comment           | Jurisdiction     |
|-------------|---------|--------|------------|-----------|-------------------|-------------------|-----------------|------------------|--------------------------|-------------------------------------------|---------------------------------------|------------------------------------|-----------------------------------------|-------------------|------------------|
|             | M.H. #  | M.H. # | Size (in.) | Slope (%) | 1/2<br>Full(<15") | 3/4<br>Full(<15") |                 |                  |                          |                                           |                                       |                                    |                                         |                   |                  |
| Easement    | 797     | 796    | 6          | 1.2       | 0.840             |                   | 0               | 0                | 0                        | 0.0247                                    | 0.025                                 | S-292                              | 2.9                                     | Monitored Manhole | City of Whittier |
| Easement    | 796     | 795    | 6          | 1.2       | 0.840             |                   | 0               | 0                | 0                        |                                           | 0.025                                 | S-292                              | 2.9                                     |                   | City of Whittier |
| Easement    | 795     | 794    | 6          | 1.367     | 0.957             |                   | 0               | 0                | 0                        |                                           | 0.025                                 | S-347                              | 2.6                                     |                   | City of Whittier |
| Easement    | 794     | 793    | 6          | 1.667     | 1.167             |                   | 0               | 0                | 0                        |                                           | 0.025                                 | S-347                              | 2.1                                     |                   | City of Whittier |
| Easement    | 793     | 792    | 6          | 1.522     | 1.065             |                   | 0               | 0                | 0                        |                                           | 0.025                                 | S-347                              | 2.3                                     |                   | City of Whittier |
| Easement    | 792     | 791    | 8          | 1.065     | 2.131             |                   | 0               | 0                | 0                        |                                           | 0.025                                 | S-347                              | 1.2                                     |                   | City of Whittier |
| Easement    | 791     | 790    | 8          | 1.177     | 2.356             |                   | 0               | 0                | 0                        | 0.167                                     | 0.192                                 | S-347                              | 8.1                                     | Monitored Manhole | City of Whittier |
| Easement    | 790     | 789c   | 8          | 1.177     | 2.356             |                   | 0               | 0                | 0                        | 0.121                                     | 0.313                                 | S-347                              | 13.3                                    | Monitored Manhole | City of Whittier |

e) Existing Sewer Capacity Analysis

**PROPOSED SEWER CAPACITY ANALYSIS**

| Street Name           | Segment |        | Pipe       |           | Design Capacity   |                   | Area<br>(Acres) | Zoning<br>Coeff. | Calculated<br>Flow (cfs) | Monitored Flow<br>Corrected Flow<br>(cfs) | Cumulative<br>Calculate<br>Flow (cfs) | PC or CI<br>Construction<br>Plan # | % Full                        | Comment           | Jurisdiction     |
|-----------------------|---------|--------|------------|-----------|-------------------|-------------------|-----------------|------------------|--------------------------|-------------------------------------------|---------------------------------------|------------------------------------|-------------------------------|-------------------|------------------|
|                       | M.H. #  | M.H. # | Size (in.) | Slope (%) | 1/2<br>Full(<15") | 3/4<br>Full(<15") |                 |                  |                          |                                           |                                       |                                    | Comulative<br>Flow / Capacity |                   |                  |
| Easement              | 797     | 796    | 6          | 1.2       | 0.840             |                   | 0               | 0                | 0                        | 0.0247                                    | 0.025                                 | S-292                              | 2.9                           | Monitored Manhole | City of Whittier |
| Site Peak Sewage Flow | 796     | 796    | 6          | 1.2       | 0.840             |                   |                 | 0                | 0.139                    |                                           | 0.164                                 |                                    | 19.5                          | Site Connection   | City of Whittier |
| Easement              | 796     | 795    | 6          | 1.2       | 0.840             |                   | 0               | 0                | 0                        |                                           | 0.164                                 | S-292                              | 19.5                          |                   | City of Whittier |
| Easement              | 795     | 794    | 6          | 1.367     | 0.957             |                   | 0               | 0                | 0                        |                                           | 0.164                                 | S-347                              | 17.1                          |                   | City of Whittier |
| Easement              | 794     | 793    | 6          | 1.667     | 1.167             |                   | 0               | 0                | 0                        |                                           | 0.164                                 | S-347                              | 14.0                          |                   | City of Whittier |
| Easement              | 793     | 792    | 6          | 1.522     | 1.065             |                   | 0               | 0                | 0                        |                                           | 0.164                                 | S-347                              | 15.4                          |                   | City of Whittier |
| Easement              | 792     | 791    | 8          | 1.065     | 2.131             |                   | 0               | 0                | 0                        |                                           | 0.164                                 | S-347                              | 7.7                           |                   | City of Whittier |
| Easement              | 791     | 790    | 8          | 1.177     | 2.356             |                   | 0               | 0                | 0                        | 0.167                                     | 0.331                                 | S-347                              | 14.0                          | Monitored Manhole | City of Whittier |
| Easement              | 790     | 789c   | 8          | 1.177     | 2.356             |                   | 0               | 0                | 0                        | 0.121                                     | 0.452                                 |                                    | 19.2                          | Monitored Manhole | City of Whittier |

f) Proposed Sewer Capacity Analysis



g) Figure 5 – Existing Sewer Line Plan View Exhibit

## h) US3 UTILITY SYSTEMS, SIENCE AND SOFTWARE REPORT

i) Site Report Temporary Flow Study on MH # 797



Thienes Engr

MH at ~12320 Whittier Blvd

Whittier, CA 90602

2022.04 Whittier Blvd MH 797

MH # 797

Access:

MH in parking area, west of address

System Type:

Sanitary ☒

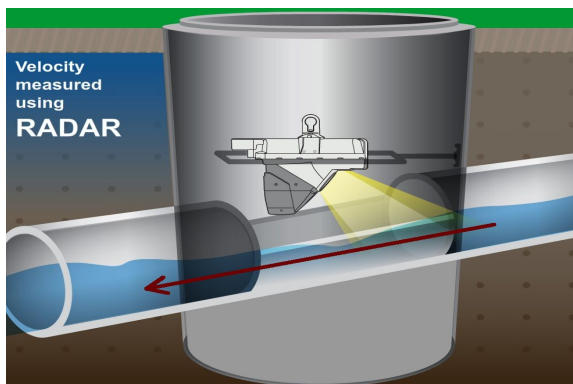
Storm ☐

Install Date: 4/06/2022

Map



Technology



Sewer Plan



Flow Meter

Meter Depth: 52.5"

MH Coordinates: 33.973656, -118.048766

Slow to moderate open channel hydraulics

| Avg Velocity | Avg Measured Level | Multiplier |
|--------------|--------------------|------------|
| 0.6 fps      | 0.5"               | 1.0        |

Gas

| O2   | H2S | CO | LEL |
|------|-----|----|-----|
| 20.9 | 0   | 0  | 0   |

Notes

No laterals; monitored US line as directed.

Traffic Safety

MH in secure area in storage lot; used cones to delineate work zone.

Land Use

| Residential | Commercial | Industrial | Trunk |
|-------------|------------|------------|-------|
|             | X          |            |       |

Manhole Depth 65"

Monitored Pipe Size 6"

Inner Pipe Size (In/Out) 6"/6"

Pipe Shape Round

Pipe Condition Good

Manhole Material Concrete

Silt None observed

Velocity Profile Data Passed

Velocity Profile Taken 0.4 2-D

Sensor Offset 12.5"

Sensor Dist. to Crown 6.5"

Sensor Direction Upstream

Flow Heading South



## Meter Site Document

2022.04 Whittier Blvd MH 797

MH at ~12320 Whittier Blvd

Whittier, CA 90602

Site



Manhole Before Install



Installation Process



Installed



Upstream



Downstream Pipe Size



# Temporary Flow Study

Thienes Engr

2022.04 Whittier Blvd MH 797

|                          |       |                |            |
|--------------------------|-------|----------------|------------|
| Meter Start Date         |       | From           | 4/6/2022   |
| Meter Stop Date          |       | To             | 4/27/2022  |
| Velocity (fps)           |       | Level (in)     | Flow (mgd) |
| Average                  | 0.601 | 0.486          | 0.003      |
| Maximum                  | 2.120 | 0.930          | 0.016      |
| Minimum                  | 0.250 | 0.330          | 0.001      |
| Pipe Size                |       | 6.000          |            |
| Estimated Capacity (mgd) |       | Not Calculated |            |
| Capacity Used            |       | Not Calculated |            |
| Sensor Type              |       | Hach - Flodar  |            |

## Utility Systems, Science and Software

9314 Bond Av, Suite A

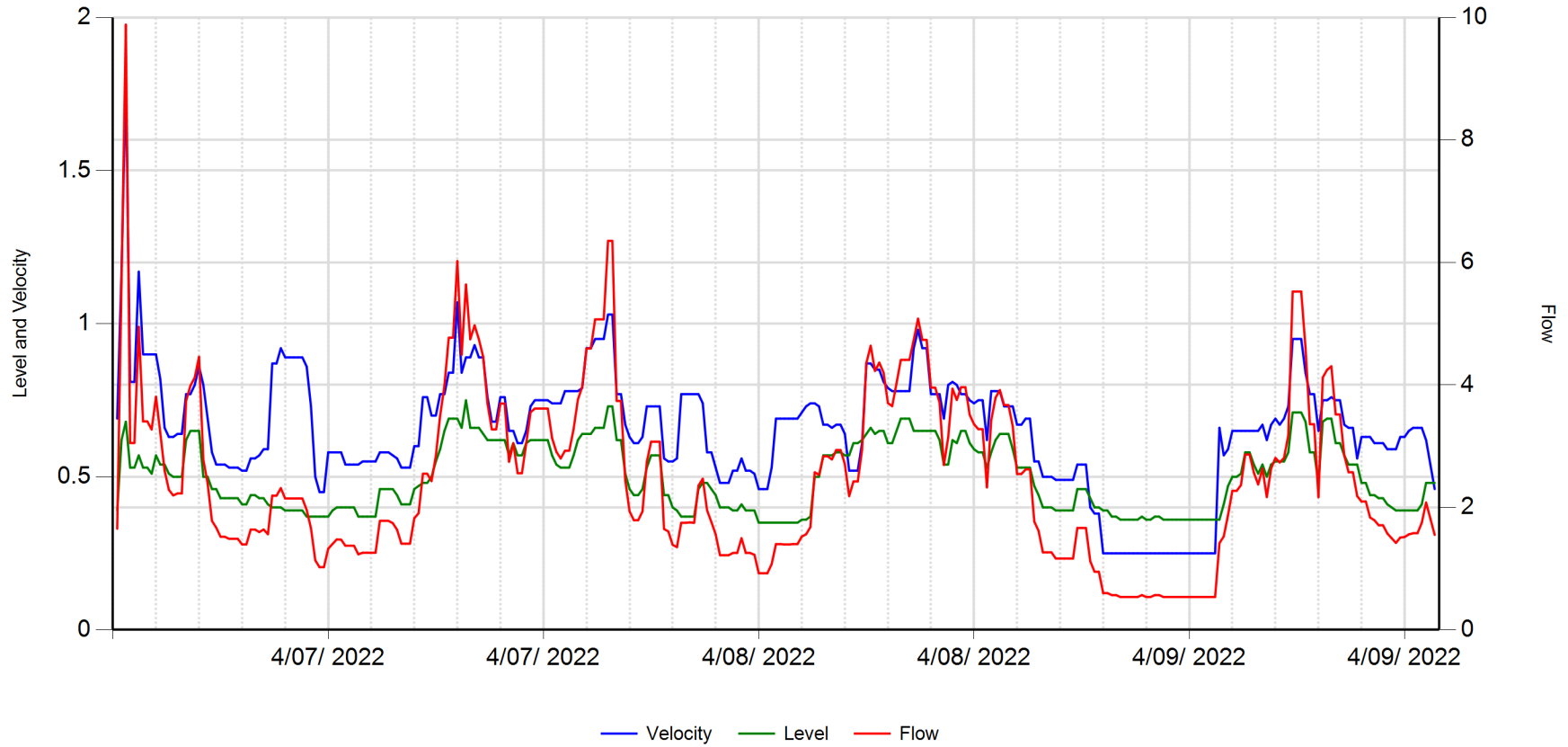
El Cajon, CA 92021

601 N. Parkcenter Dr, Suite 209

Santa Ana, CA 92705

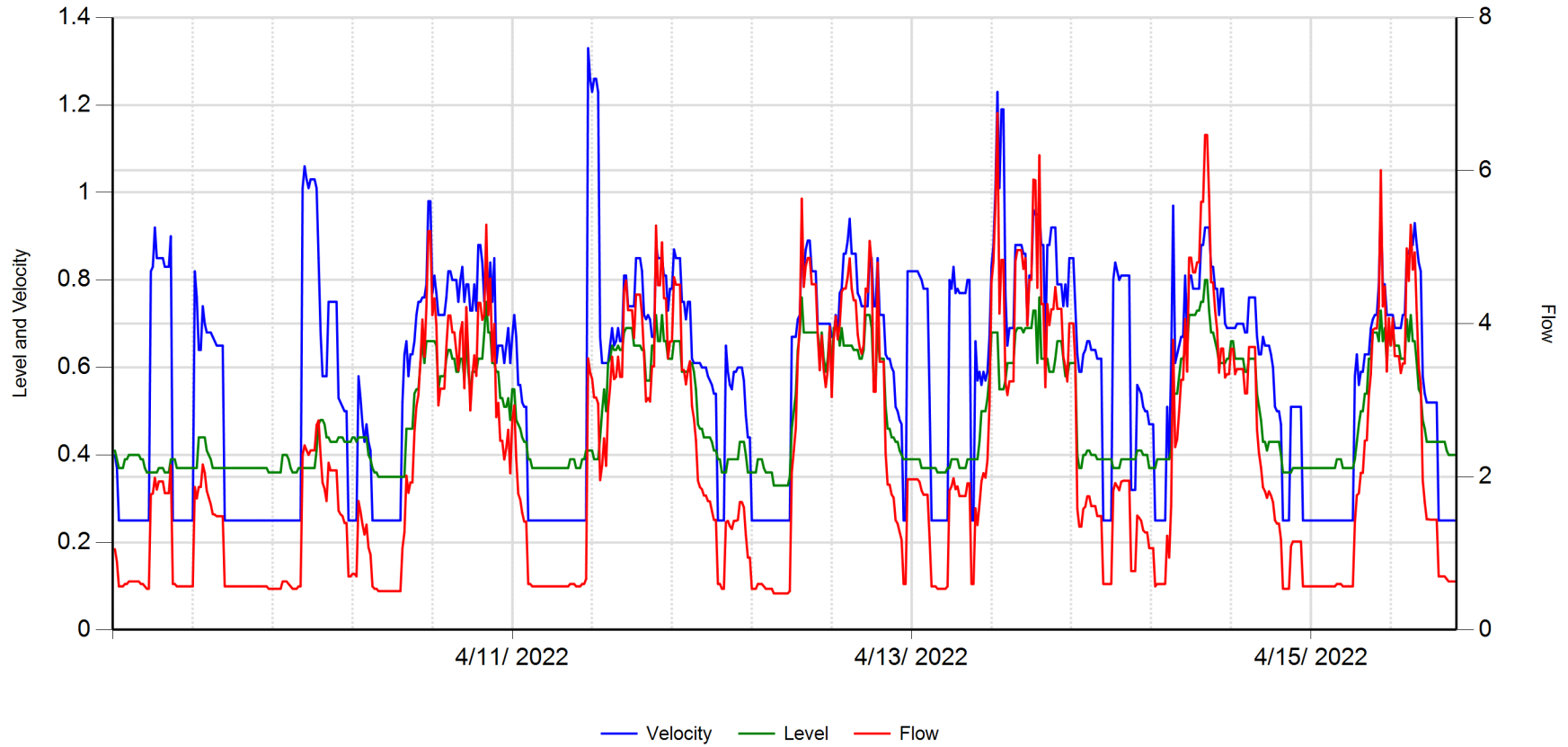


## 2022.04 Whittier Blvd MH 797



|         | Velocity (fps) | Level (in) | Flow (gpm) |          |        |  |
|---------|----------------|------------|------------|----------|--------|---------------------------------------------------------------------------------------|
| Average | 0.654          | 0.499      | 2.474      | RainFall | Inches |                                                                                       |
| Maximum | 1.800          | 0.750      | 9.884      |          |        |                                                                                       |
| Minimum | 0.250          | 0.350      | 0.537      |          |        |                                                                                       |
|         |                |            |            |          |        | 5/04/2022                                                                             |

## 2022.04 Whittier Blvd MH 797

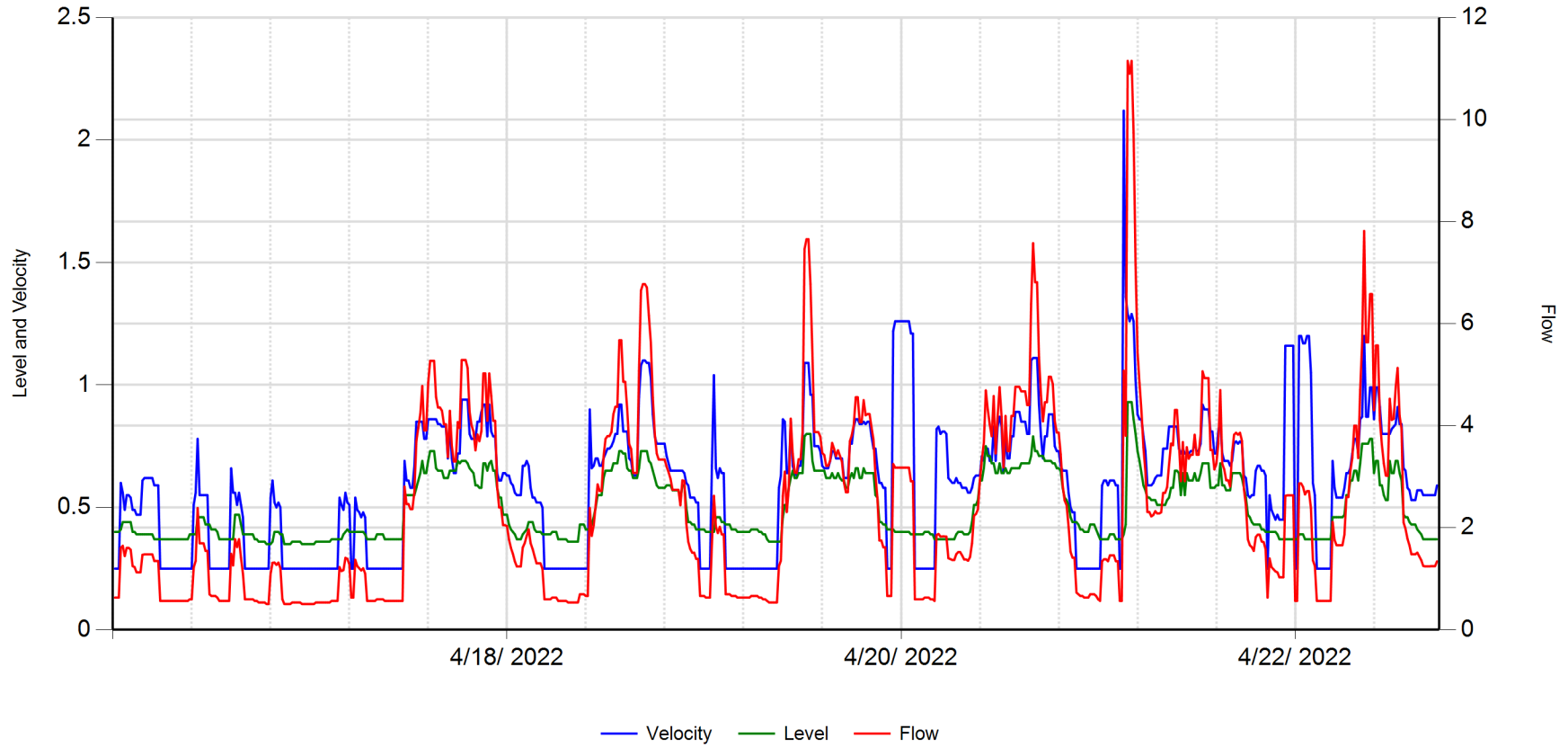


|         | Velocity (fps) | Level (in) | Flow (gpm) |          |        |
|---------|----------------|------------|------------|----------|--------|
| Average | 0.581          | 0.486      | 2.219      | RainFall | Inches |
| Maximum | 1.330          | 0.800      | 6.752      |          |        |
| Minimum | 0.250          | 0.330      | 0.477      |          |        |



5/04/2022

## 2022.04 Whittier Blvd MH 797

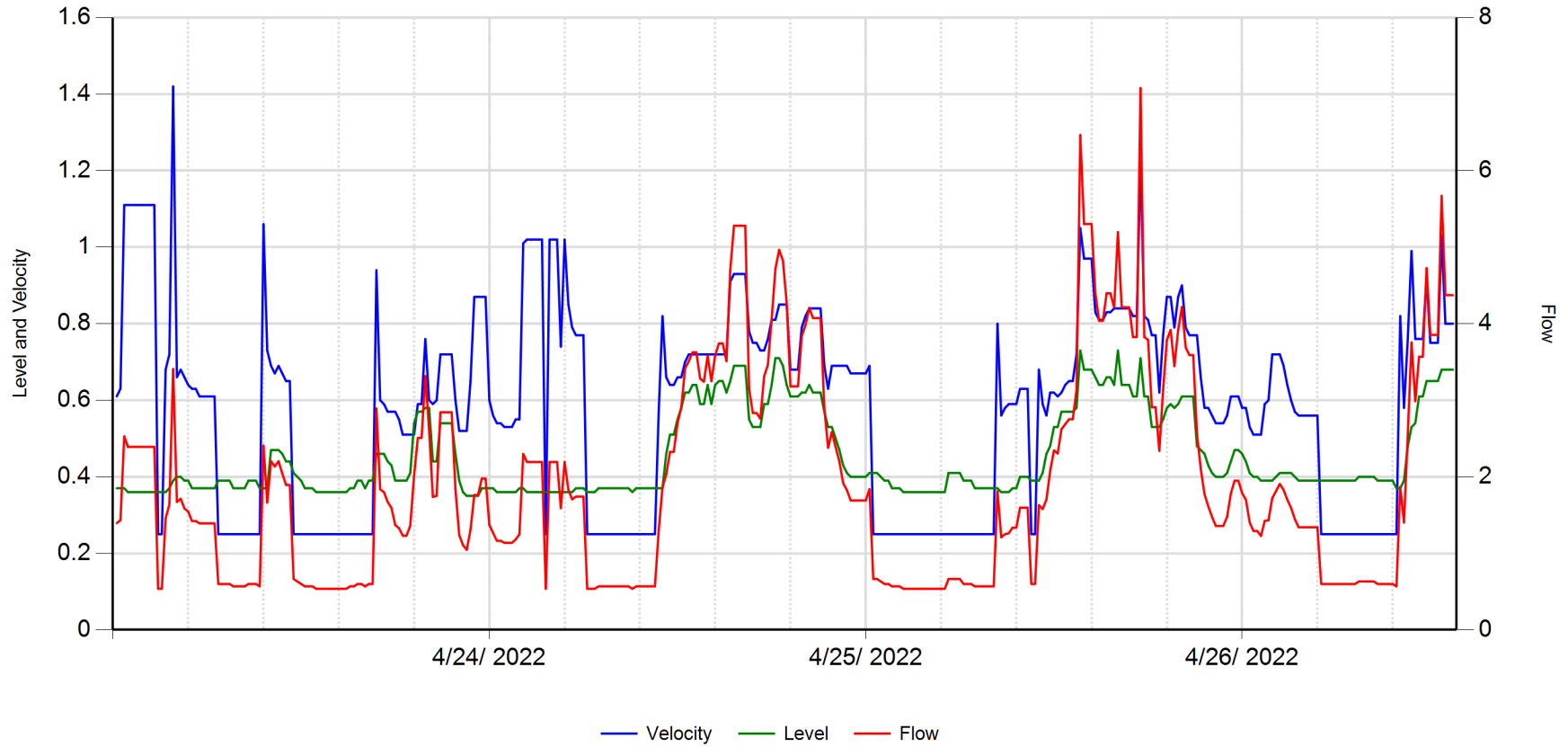


|         | Velocity (fps) | Level (in) | Flow (gpm) |          |        |
|---------|----------------|------------|------------|----------|--------|
| Average | 0.599          | 0.497      | 2.380      | RainFall | Inches |
| Maximum | 2.120          | 0.930      | 11.151     |          |        |
| Minimum | 0.250          | 0.350      | 0.507      |          |        |



5/04/2022

## 2022.04 Whittier Blvd MH 797

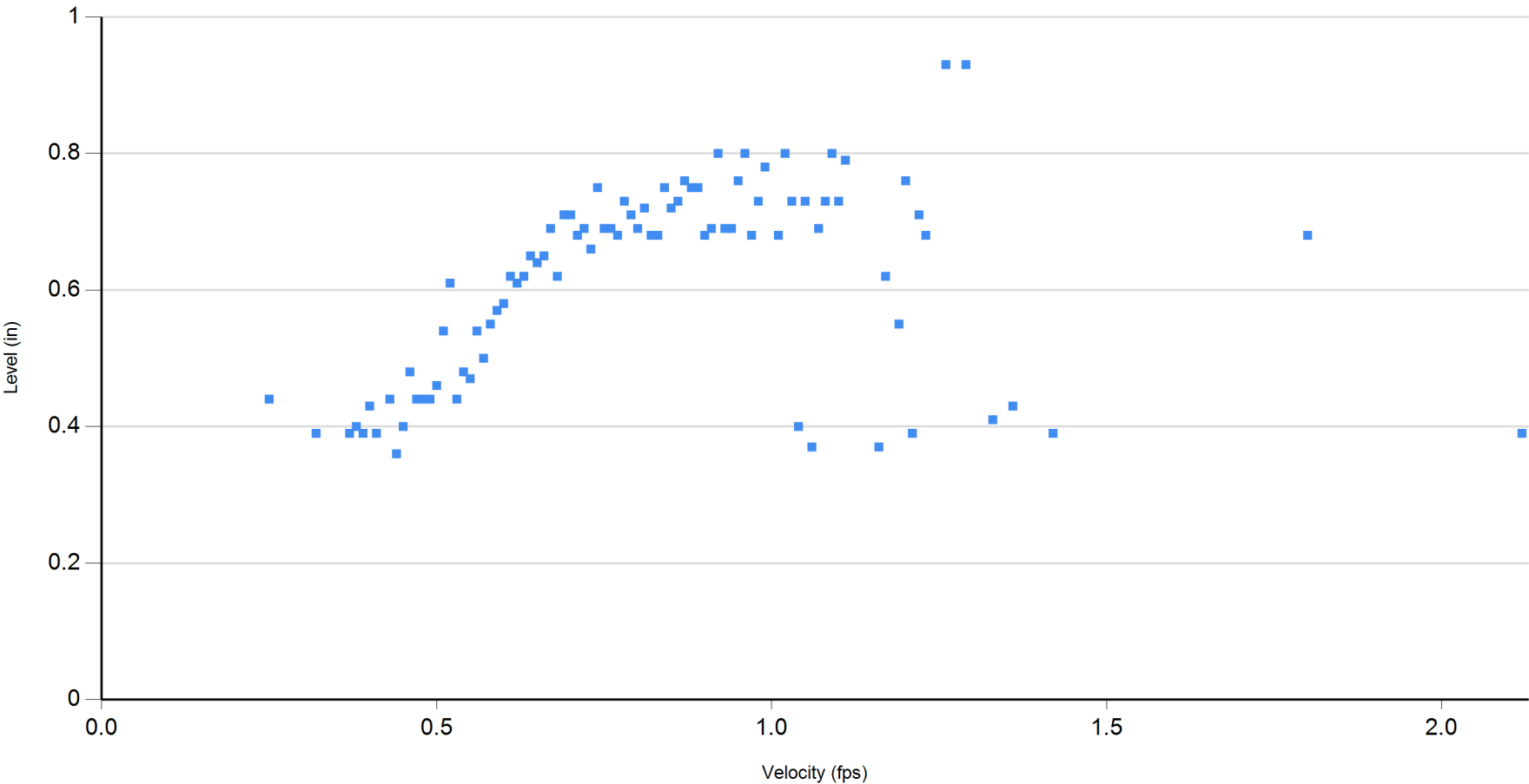


|         | Velocity (fps) | Level (in) | Flow (gpm) |          |        |
|---------|----------------|------------|------------|----------|--------|
| Average | 0.581          | 0.452      | 1.938      | RainFall | Inches |
| Maximum | 1.420          | 0.730      | 7.080      |          |        |
| Minimum | 0.250          | 0.350      | 0.537      |          |        |



5/04/2022

2022.04 Whittier Blvd MH 797



4/6/2022 thru 4/27/2022



5/4/2022 5:05:16 PM

Statistics for 2022.04 Whittier Blvd MH 797: 04/06/2022 thru 04/27/2022

|              | Flow (GPM)  |             |             | Flow (MGD)  |             |             | Velocity (FPS) |             |             | Level (inches) |             |             |               |      |
|--------------|-------------|-------------|-------------|-------------|-------------|-------------|----------------|-------------|-------------|----------------|-------------|-------------|---------------|------|
| Date         | Avg         | Max         | Min         | Avg         | Max         | Min         | Avg            | Max         | Min         | Avg            | Max         | Min         | Total Gal     | Rain |
| 4/6/22       | 2.60        | 9.88        | 1.14        | 0.00        | 0.01        | 0.00        | 0.76           | 1.80        | 0.50        | 0.48           | 0.68        | 0.37        | 3,750         |      |
| 4/7/22       | 2.77        | 6.35        | 1.02        | 0.00        | 0.01        | 0.00        | 0.70           | 1.07        | 0.45        | 0.52           | 0.75        | 0.37        | 3,987         |      |
| 4/8/22       | 2.40        | 5.08        | 0.54        | 0.00        | 0.01        | 0.00        | 0.62           | 0.98        | 0.25        | 0.50           | 0.69        | 0.35        | 3,452         |      |
| 4/9/22       | 1.78        | 5.53        | 0.54        | 0.00        | 0.01        | 0.00        | 0.54           | 0.95        | 0.25        | 0.45           | 0.71        | 0.36        | 2,568         |      |
| 4/10/22      | 1.15        | 2.74        | 0.54        | 0.00        | 0.00        | 0.00        | 0.46           | 1.06        | 0.25        | 0.39           | 0.48        | 0.36        | 1,656         |      |
| <b>Week:</b> | <b>2.14</b> | <b>9.88</b> | <b>0.54</b> | <b>0.00</b> | <b>0.01</b> | <b>0.00</b> | <b>0.61</b>    | <b>1.80</b> | <b>0.25</b> | <b>0.47</b>    | <b>0.75</b> | <b>0.35</b> | <b>15,412</b> |      |
| 4/11/22      | 2.32        | 5.29        | 0.51        | 0.00        | 0.01        | 0.00        | 0.57           | 0.98        | 0.25        | 0.50           | 0.75        | 0.35        | 3,344         |      |
| 4/12/22      | 2.53        | 5.28        | 0.54        | 0.00        | 0.01        | 0.00        | 0.63           | 1.33        | 0.25        | 0.51           | 0.72        | 0.36        | 3,639         |      |
| 4/13/22      | 2.51        | 5.64        | 0.48        | 0.00        | 0.01        | 0.00        | 0.61           | 0.94        | 0.25        | 0.51           | 0.76        | 0.33        | 3,613         |      |
| 4/14/22      | 2.77        | 6.75        | 0.54        | 0.00        | 0.01        | 0.00        | 0.71           | 1.23        | 0.25        | 0.51           | 0.76        | 0.36        | 3,995         |      |
| 4/15/22      | 2.37        | 6.47        | 0.54        | 0.00        | 0.01        | 0.00        | 0.58           | 0.97        | 0.25        | 0.51           | 0.80        | 0.36        | 3,410         |      |
| 4/16/22      | 1.91        | 6.01        | 0.57        | 0.00        | 0.01        | 0.00        | 0.51           | 0.98        | 0.25        | 0.48           | 0.73        | 0.37        | 2,756         |      |
| 4/17/22      | 0.82        | 2.39        | 0.51        | 0.00        | 0.00        | 0.00        | 0.34           | 0.78        | 0.25        | 0.38           | 0.47        | 0.35        | 1,185         |      |
| <b>Week:</b> | <b>2.18</b> | <b>6.75</b> | <b>0.48</b> | <b>0.00</b> | <b>0.01</b> | <b>0.00</b> | <b>0.56</b>    | <b>1.33</b> | <b>0.25</b> | <b>0.49</b>    | <b>0.80</b> | <b>0.33</b> | <b>21,941</b> |      |

|                | Flow (GPM)  |              |             | Flow (MGD)  |             |             | Velocity (FPS) |             |             | Level (inches) |             |             |               |      |
|----------------|-------------|--------------|-------------|-------------|-------------|-------------|----------------|-------------|-------------|----------------|-------------|-------------|---------------|------|
| Date           | Avg         | Max          | Min         | Avg         | Max         | Min         | Avg            | Max         | Min         | Avg            | Max         | Min         | Total Gal     | Rain |
| 4/18/22        | 2.60        | 5.29         | 0.57        | 0.00        | 0.01        | 0.00        | 0.61           | 0.94        | 0.25        | 0.52           | 0.73        | 0.37        | 3,741         |      |
| 4/19/22        | 2.43        | 6.78         | 0.54        | 0.00        | 0.01        | 0.00        | 0.57           | 1.10        | 0.25        | 0.52           | 0.73        | 0.36        | 3,505         |      |
| 4/20/22        | 2.63        | 7.66         | 0.54        | 0.00        | 0.01        | 0.00        | 0.65           | 1.26        | 0.25        | 0.52           | 0.80        | 0.36        | 3,792         |      |
| 4/21/22        | 2.72        | 7.58         | 0.57        | 0.00        | 0.01        | 0.00        | 0.64           | 1.11        | 0.25        | 0.53           | 0.79        | 0.37        | 3,910         |      |
| 4/22/22        | 3.18        | 11.15        | 0.57        | 0.00        | 0.02        | 0.00        | 0.76           | 2.12        | 0.25        | 0.54           | 0.93        | 0.37        | 4,582         |      |
| 4/23/22        | 2.44        | 7.82         | 0.54        | 0.00        | 0.01        | 0.00        | 0.71           | 1.42        | 0.25        | 0.47           | 0.78        | 0.36        | 3,515         |      |
| 4/24/22        | 1.41        | 3.32         | 0.54        | 0.00        | 0.00        | 0.00        | 0.55           | 1.06        | 0.25        | 0.40           | 0.58        | 0.35        | 2,034         |      |
| <b>Week:</b>   | <b>2.49</b> | <b>11.15</b> | <b>0.54</b> | <b>0.00</b> | <b>0.02</b> | <b>0.00</b> | <b>0.64</b>    | <b>2.12</b> | <b>0.25</b> | <b>0.50</b>    | <b>0.93</b> | <b>0.35</b> | <b>25,079</b> |      |
| 4/25/22        | 2.17        | 5.28         | 0.54        | 0.00        | 0.01        | 0.00        | 0.55           | 0.93        | 0.25        | 0.49           | 0.71        | 0.36        | 3,120         |      |
| 4/26/22        | 2.34        | 7.08         | 0.54        | 0.00        | 0.01        | 0.00        | 0.63           | 1.22        | 0.25        | 0.49           | 0.73        | 0.36        | 3,370         |      |
| 4/27/22        | 1.82        | 5.67         | 0.57        | 0.00        | 0.01        | 0.00        | 0.49           | 1.03        | 0.25        | 0.47           | 0.68        | 0.37        | 2,623         |      |
| <b>Week:</b>   | <b>2.11</b> | <b>7.08</b>  | <b>0.54</b> | <b>0.00</b> | <b>0.01</b> | <b>0.00</b> | <b>0.55</b>    | <b>1.22</b> | <b>0.25</b> | <b>0.48</b>    | <b>0.73</b> | <b>0.36</b> | <b>9,113</b>  |      |
| <b>Totals:</b> | <b>2.26</b> | <b>11.15</b> | <b>0.48</b> | <b>0.00</b> | <b>0.02</b> | <b>0.00</b> | <b>0.60</b>    | <b>2.12</b> | <b>0.25</b> | <b>0.48</b>    | <b>0.93</b> | <b>0.33</b> | <b>71,545</b> |      |

ii) Site Report Temporary Flow Study MH # 790



Thienes Engr

MH at ~12455 Washington Blvd

Whittier, CA 90602

2022.04 Washington MH 790

MH # 790

Access:

MH in parking area, north of address

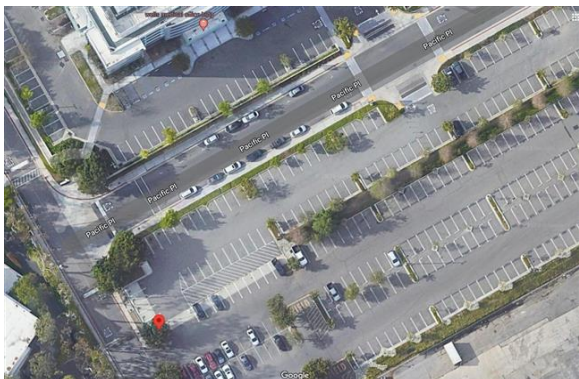
System Type:

Sanitary ☒

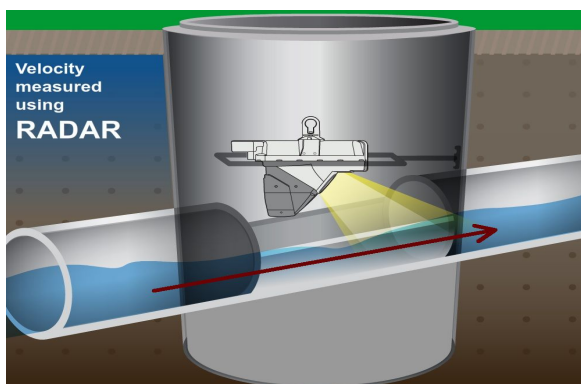
Storm ☐

Install Date: 4/06/2022

Map



Technology



Sewer Plan



Flow Meter

Meter Depth: 15.14"

MH Coordinates: 33.969250, -118.047672

Debris on shelf & in trough with turbulent hydraulics from drop inlets

| Avg Velocity | Avg Measured Level | Multiplier |
|--------------|--------------------|------------|
| 2.2 fps      | 0.8"               | 1.0        |

Gas

| O2   | H2S | CO | LEL |
|------|-----|----|-----|
| 20.9 | 0   | 0  | 0   |

Notes

Inlets from north, NE & NW (2 drop inlets); monitored downstream line to get total flow.

Traffic Safety

MH in planter in parking lot; used cones & signs per site-specific CATTCH requirements.

Land Use

| Residential | Commercial | Industrial | Trunk |
|-------------|------------|------------|-------|
|             | X          |            |       |

Manhole Depth 55"

Monitored Pipe Size 8"

Inner Pipe Size (In/Out) 8"/8"

Pipe Shape Round

Pipe Condition Good

Manhole Material Brick

Silt Debris observed

Velocity Profile Data Passed

Velocity Profile Taken 0.4 2-D

Sensor Offset 15.1"

Sensor Dist. to Crown 7.1"

Sensor Direction Downstream

Flow Heading Southwest



## Meter Site Document

2022.04 Washington MH 790

MH at ~12455 Washington Blvd

Whittier, CA 90602

Site



Manhole Before Install



Installation Process



Installed



Downstream Pipe Size



Downstream



# Temporary Flow Study

Thienes Engr

2022.04 Washington MH 790

|                          |       |                |            |
|--------------------------|-------|----------------|------------|
| Meter Start Date         |       | From           | 4/6/2022   |
| Meter Stop Date          |       | To             | 4/27/2022  |
| Velocity (fps)           |       | Level (in)     | Flow (mgd) |
| Average                  | 2.224 | 0.830          | 0.030      |
| Maximum                  | 3.289 | 1.710          | 0.108      |
| Minimum                  | 0.430 | 0.150          | 0.000      |
| Pipe Size                |       | 8.000          |            |
| Estimated Capacity (mgd) |       | Not Calculated |            |
| Capacity Used            |       | Not Calculated |            |
| Sensor Type              |       | Hach - Flodar  |            |

## Utility Systems, Science and Software

9314 Bond Av, Suite A

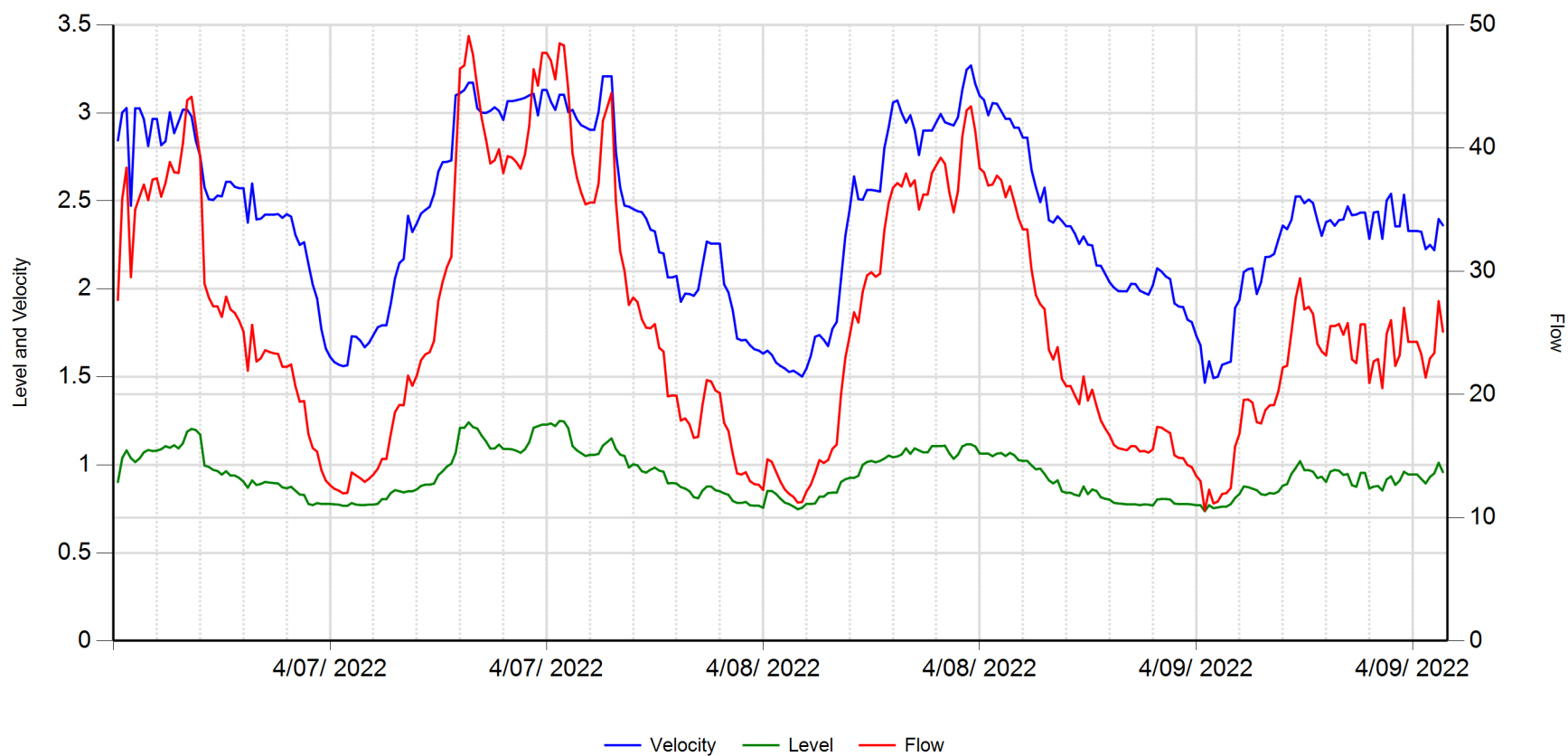
El Cajon, CA 92021

601 N. Parkcenter Dr, Suite 209

Santa Ana, CA 92705



## 2022.04 Washington MH 790

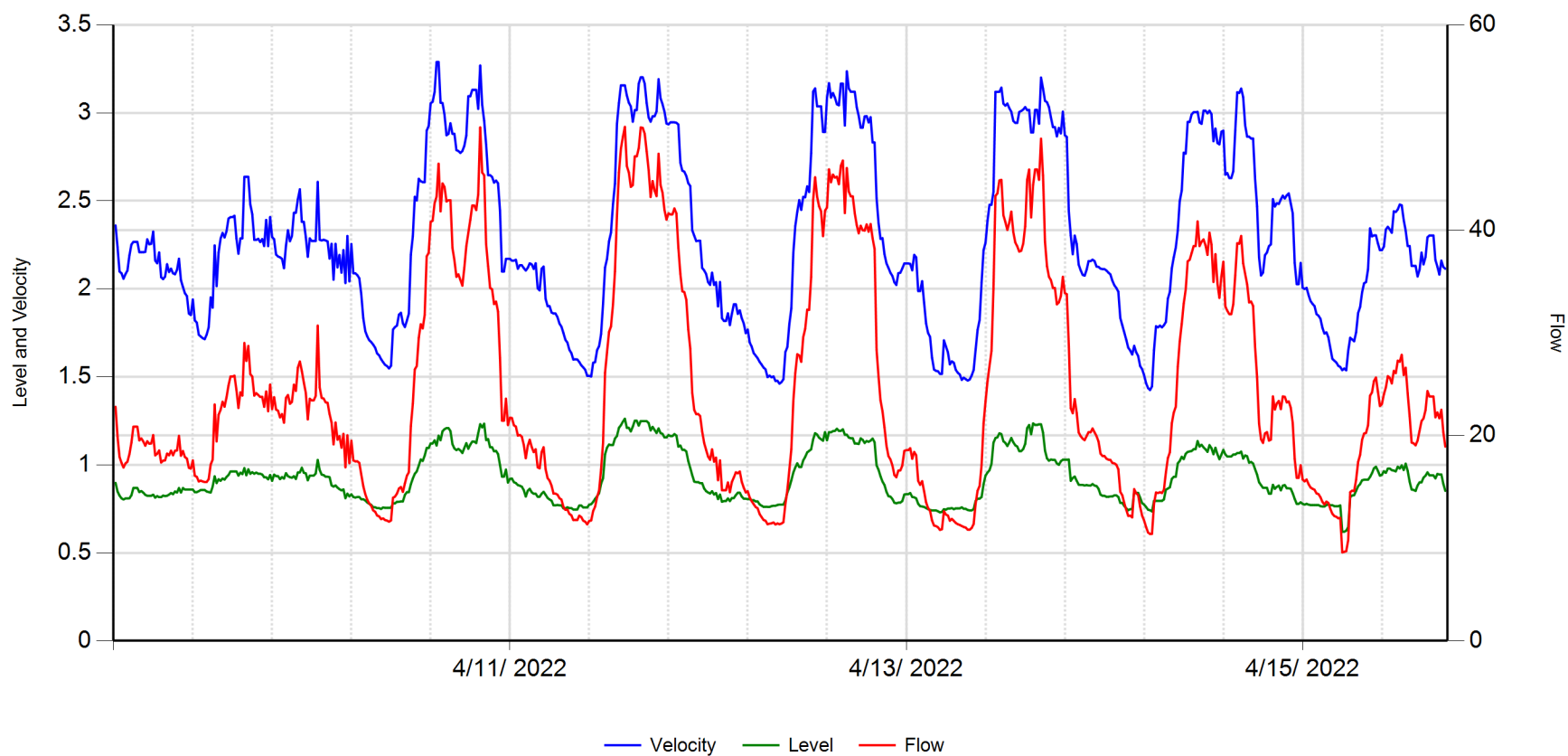


|         | Velocity (fps) | Level (in) | Flow (gpm) |          |        |
|---------|----------------|------------|------------|----------|--------|
| Average | 2.402          | 0.938      | 25.841     | RainFall | Inches |
| Maximum | 3.269          | 1.250      | 49.094     |          |        |
| Minimum | 1.467          | 0.737      | 10.598     |          |        |



5/04/2022

## 2022.04 Washington MH 790

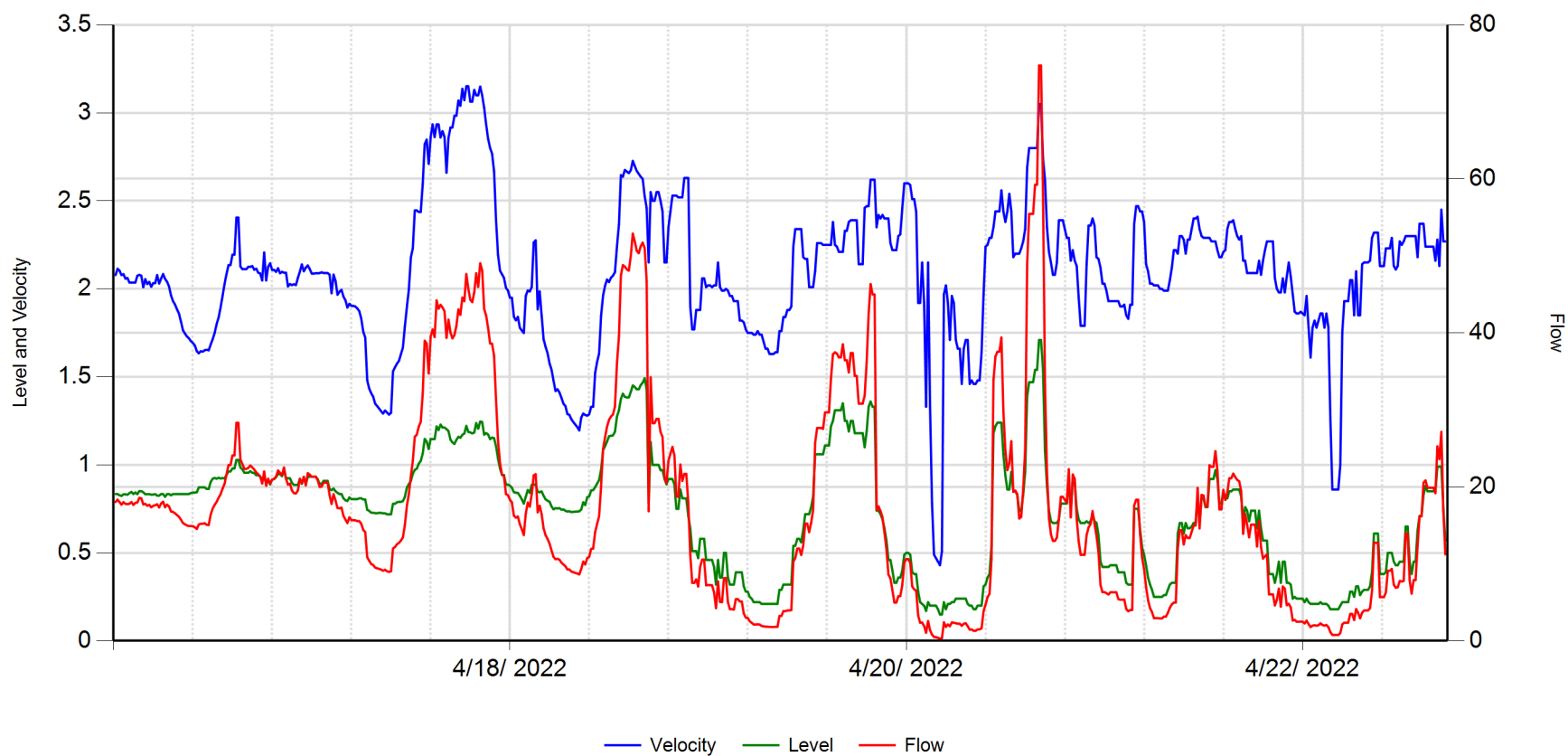


|         | Velocity (fps) | Level (in) | Flow (gpm) |          |        |
|---------|----------------|------------|------------|----------|--------|
| Average | 2.283          | 0.931      | 24.504     | RainFall | Inches |
| Maximum | 3.289          | 1.262      | 50.066     |          |        |
| Minimum | 1.425          | 0.620      | 8.623      |          |        |



5/04/2022

## 2022.04 Washington MH 790

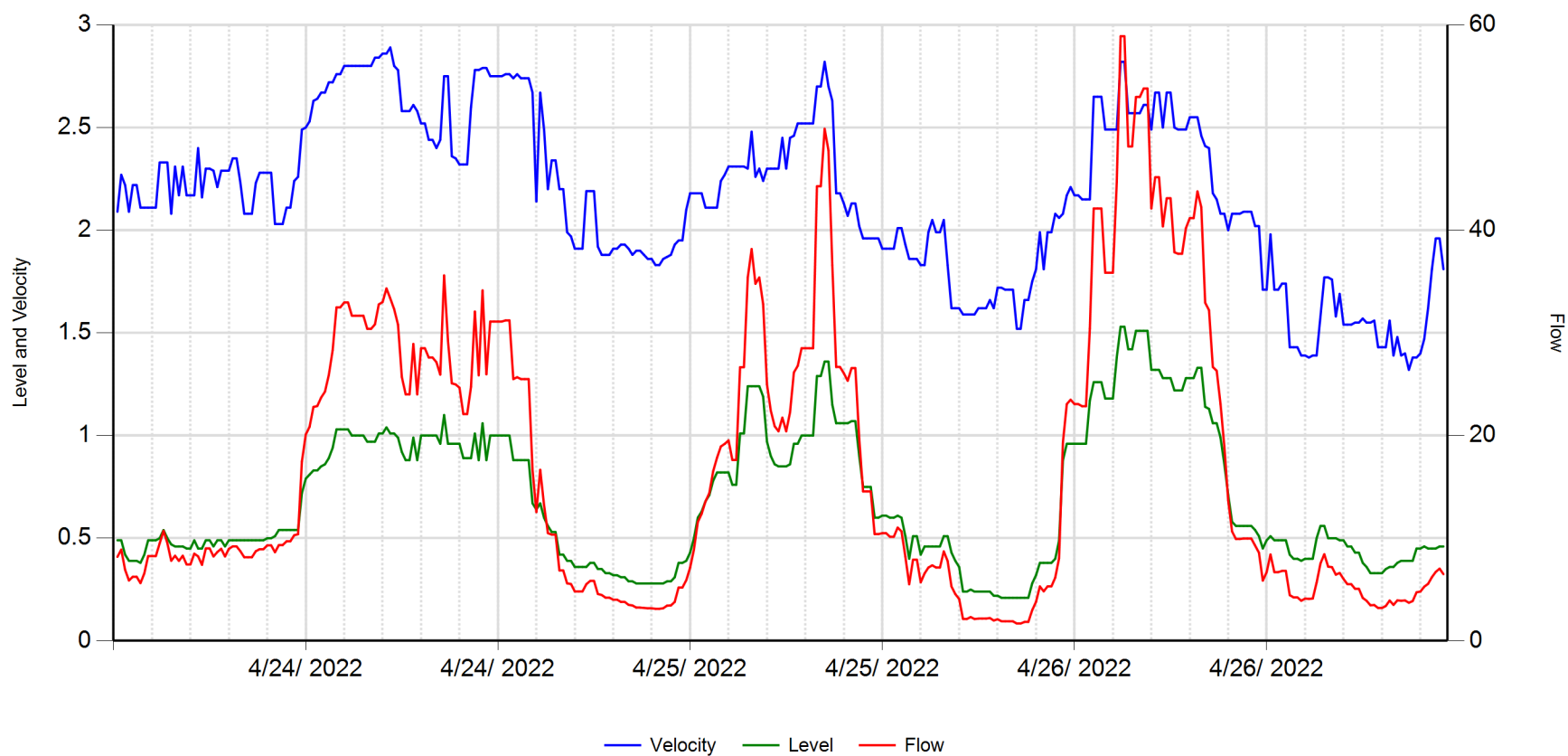


|         | Velocity (fps) | Level (in) | Flow (gpm) |          |        |
|---------|----------------|------------|------------|----------|--------|
| Average | 2.088          | 0.733      | 17.113     | RainFall | Inches |
| Maximum | 3.151          | 1.710      | 74.726     |          |        |
| Minimum | 0.430          | 0.150      | 0.302      |          |        |



5/04/2022

## 2022.04 Washington MH 790

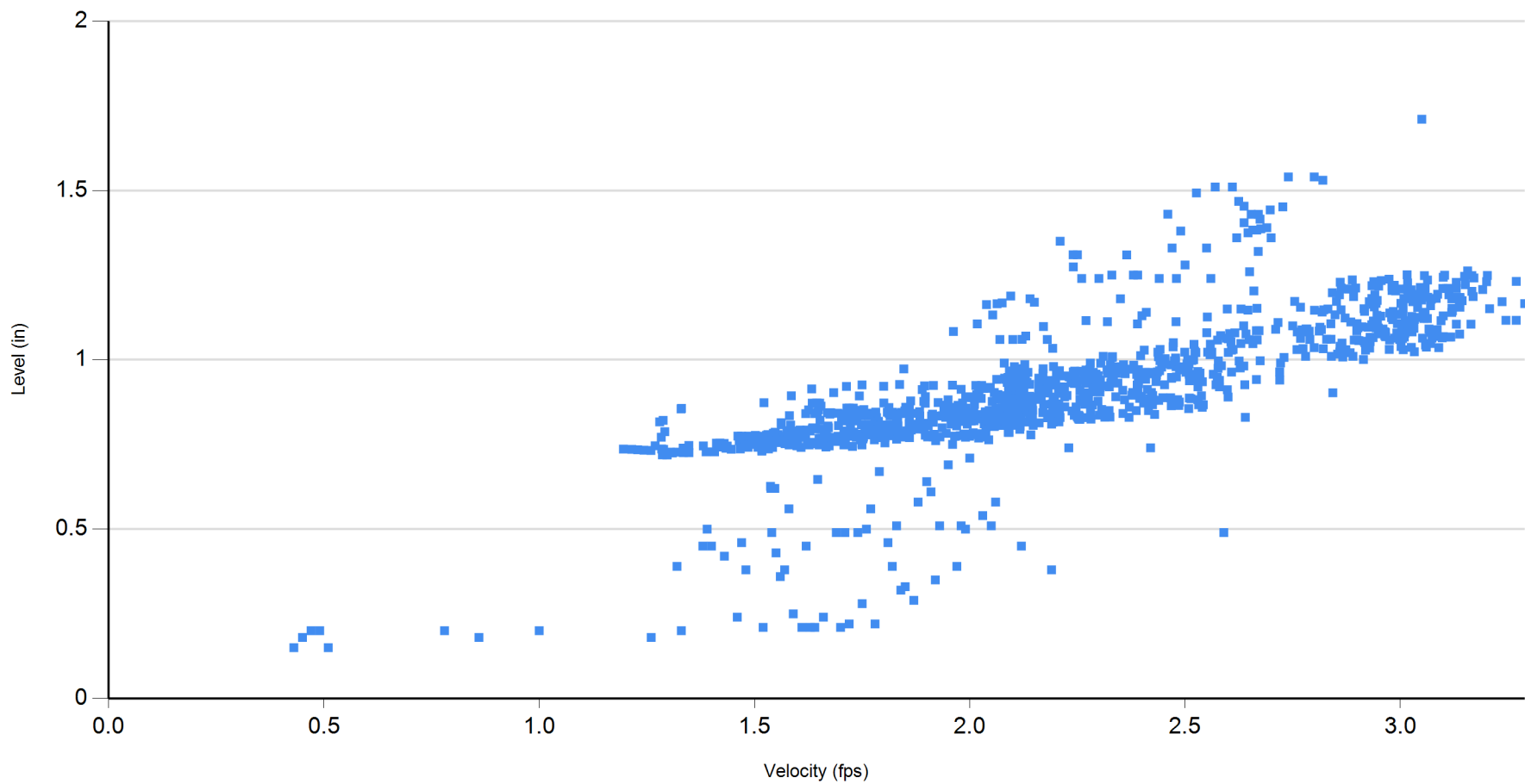


|         | Velocity (fps) | Level (in) | Flow (gpm) |          |        |
|---------|----------------|------------|------------|----------|--------|
| Average | 2.160          | 0.688      | 16.652     | RainFall | Inches |
| Maximum | 2.890          | 1.530      | 58.895     |          |        |
| Minimum | 1.320          | 0.210      | 1.693      |          |        |



5/04/2022

## 2022.04 Washington MH 790



4/6/2022 thru 4/27/2022



5/4/2022 5:03:41 PM



Utility Systems Science and Software

Report Date: 05/04/2022  
 Customer: Thienes Engr  
 Group: Whittier Business Park  
 Site: 2022.04 Washington MH 790

### Statistics for 2022.04 Washington MH 790: 04/06/2022 thru 04/27/2022

|              | Flow (GPM)   |              |              | Flow (MGD)  |             |             | Velocity (FPS) |             |             | Level (inches) |             |             |                |      |
|--------------|--------------|--------------|--------------|-------------|-------------|-------------|----------------|-------------|-------------|----------------|-------------|-------------|----------------|------|
| Date         | Avg          | Max          | Min          | Avg         | Max         | Min         | Avg            | Max         | Min         | Avg            | Max         | Min         | Total Gal      | Rain |
| 4/6/22       | 29.34        | 44.16        | 15.36        | 0.04        | 0.06        | 0.02        | 2.63           | 3.03        | 1.95        | 0.98           | 1.20        | 0.77        | 42,251         |      |
| 4/7/22       | 28.61        | 49.09        | 11.97        | 0.04        | 0.07        | 0.02        | 2.48           | 3.21        | 1.56        | 0.98           | 1.25        | 0.77        | 41,192         |      |
| 4/8/22       | 25.10        | 43.38        | 11.23        | 0.04        | 0.06        | 0.02        | 2.37           | 3.27        | 1.50        | 0.93           | 1.12        | 0.75        | 36,145         |      |
| 4/9/22       | 20.08        | 29.43        | 10.60        | 0.03        | 0.04        | 0.02        | 2.18           | 2.54        | 1.47        | 0.86           | 1.02        | 0.74        | 28,912         |      |
| 4/10/22      | 21.69        | 30.71        | 15.48        | 0.03        | 0.04        | 0.02        | 2.20           | 2.64        | 1.71        | 0.91           | 1.03        | 0.81        | 31,235         |      |
| <b>Week:</b> | <b>24.96</b> | <b>49.09</b> | <b>10.60</b> | <b>0.04</b> | <b>0.07</b> | <b>0.02</b> | <b>2.37</b>    | <b>3.27</b> | <b>1.47</b> | <b>0.93</b>    | <b>1.25</b> | <b>0.74</b> | <b>179,735</b> |      |
| 4/11/22      | 26.51        | 50.01        | 11.61        | 0.04        | 0.07        | 0.02        | 2.36           | 3.29        | 1.55        | 0.96           | 1.23        | 0.75        | 38,172         |      |
| 4/12/22      | 27.35        | 50.07        | 11.35        | 0.04        | 0.07        | 0.02        | 2.32           | 3.20        | 1.50        | 0.98           | 1.26        | 0.75        | 39,379         |      |
| 4/13/22      | 26.02        | 46.78        | 11.34        | 0.04        | 0.07        | 0.02        | 2.32           | 3.24        | 1.46        | 0.95           | 1.21        | 0.74        | 37,470         |      |
| 4/14/22      | 25.82        | 48.92        | 10.81        | 0.04        | 0.07        | 0.02        | 2.34           | 3.20        | 1.48        | 0.94           | 1.24        | 0.73        | 37,181         |      |
| 4/15/22      | 24.82        | 40.86        | 10.41        | 0.04        | 0.06        | 0.02        | 2.36           | 3.14        | 1.43        | 0.92           | 1.14        | 0.74        | 35,746         |      |
| 4/16/22      | 19.00        | 27.86        | 8.62         | 0.03        | 0.04        | 0.01        | 2.05           | 2.48        | 1.54        | 0.86           | 1.01        | 0.62        | 27,364         |      |
| 4/17/22      | 19.26        | 28.32        | 14.53        | 0.03        | 0.04        | 0.02        | 1.99           | 2.41        | 1.63        | 0.90           | 1.03        | 0.80        | 27,735         |      |
| <b>Week:</b> | <b>24.11</b> | <b>50.07</b> | <b>8.62</b>  | <b>0.03</b> | <b>0.07</b> | <b>0.01</b> | <b>2.25</b>    | <b>3.29</b> | <b>1.43</b> | <b>0.93</b>    | <b>1.26</b> | <b>0.62</b> | <b>243,046</b> |      |

|                | Flow (GPM)   |              |             | Flow (MGD)  |             |             | Velocity (FPS) |             |             | Level (inches) |             |             |                |      |
|----------------|--------------|--------------|-------------|-------------|-------------|-------------|----------------|-------------|-------------|----------------|-------------|-------------|----------------|------|
| Date           | Avg          | Max          | Min         | Avg         | Max         | Min         | Avg            | Max         | Min         | Avg            | Max         | Min         | Total Gal      | Rain |
| 4/18/22        | 26.17        | 49.05        | 8.97        | 0.04        | 0.07        | 0.01        | 2.24           | 3.15        | 1.29        | 0.97           | 1.25        | 0.72        | 37,688         |      |
| 4/19/22        | 20.18        | 52.90        | 4.06        | 0.03        | 0.08        | 0.01        | 2.03           | 2.73        | 1.20        | 0.85           | 1.49        | 0.32        | 29,055         |      |
| 4/20/22        | 15.76        | 46.34        | 1.06        | 0.02        | 0.07        | 0.00        | 2.13           | 2.62        | 1.33        | 0.66           | 1.36        | 0.17        | 22,690         |      |
| 4/21/22        | 16.51        | 74.73        | 0.30        | 0.02        | 0.11        | 0.00        | 2.05           | 3.05        | 0.43        | 0.66           | 1.71        | 0.15        | 23,778         |      |
| 4/22/22        | 10.89        | 24.64        | 1.79        | 0.02        | 0.04        | 0.00        | 2.15           | 2.47        | 1.61        | 0.54           | 0.97        | 0.21        | 15,675         |      |
| 4/23/22        | 8.16         | 27.15        | 0.77        | 0.01        | 0.04        | 0.00        | 2.08           | 2.45        | 0.86        | 0.45           | 0.99        | 0.18        | 11,755         |      |
| 4/24/22        | 20.91        | 35.60        | 4.82        | 0.03        | 0.05        | 0.01        | 2.49           | 2.89        | 1.91        | 0.78           | 1.10        | 0.36        | 30,112         |      |
| <b>Week:</b>   | <b>16.94</b> | <b>74.73</b> | <b>0.30</b> | <b>0.02</b> | <b>0.11</b> | <b>0.00</b> | <b>2.17</b>    | <b>3.15</b> | <b>0.43</b> | <b>0.70</b>    | <b>1.71</b> | <b>0.15</b> | <b>170,753</b> |      |
| 4/25/22        | 15.34        | 49.88        | 3.13        | 0.02        | 0.07        | 0.00        | 2.10           | 2.82        | 1.62        | 0.68           | 1.36        | 0.28        | 22,086         |      |
| 4/26/22        | 19.91        | 58.90        | 1.69        | 0.03        | 0.08        | 0.00        | 2.06           | 2.82        | 1.38        | 0.76           | 1.53        | 0.21        | 28,673         |      |
| 4/27/22        | 4.87         | 7.19         | 3.20        | 0.01        | 0.01        | 0.00        | 1.55           | 1.96        | 1.32        | 0.42           | 0.50        | 0.33        | 7,010          |      |
| <b>Week:</b>   | <b>13.37</b> | <b>58.90</b> | <b>1.69</b> | <b>0.02</b> | <b>0.08</b> | <b>0.00</b> | <b>1.90</b>    | <b>2.82</b> | <b>1.32</b> | <b>0.62</b>    | <b>1.53</b> | <b>0.21</b> | <b>57,769</b>  |      |
| <b>Totals:</b> | <b>20.56</b> | <b>74.73</b> | <b>0.30</b> | <b>0.03</b> | <b>0.11</b> | <b>0.00</b> | <b>2.20</b>    | <b>3.29</b> | <b>0.43</b> | <b>0.81</b>    | <b>1.71</b> | <b>0.15</b> | <b>651,303</b> |      |

iii) Site Report Temporary Flow Study MH # 789C



# Site Report

5/04/2022

**Confidential Proprietary Information**

**Thienes Engr**

MH at ~12455 Washington Blvd

Whittier, CA 90602

2022.04 Washington MH 789C

MH # 789C

Access:

MH in parking area, north of address

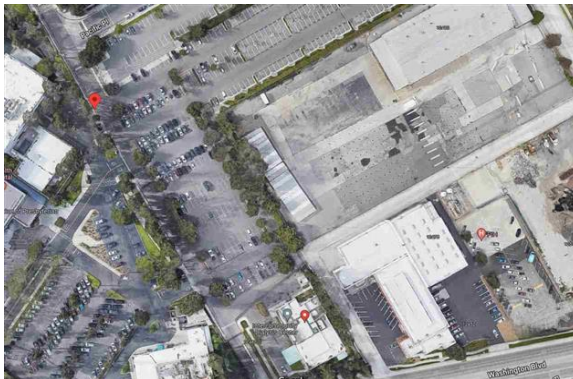
System Type:

Sanitary ☒

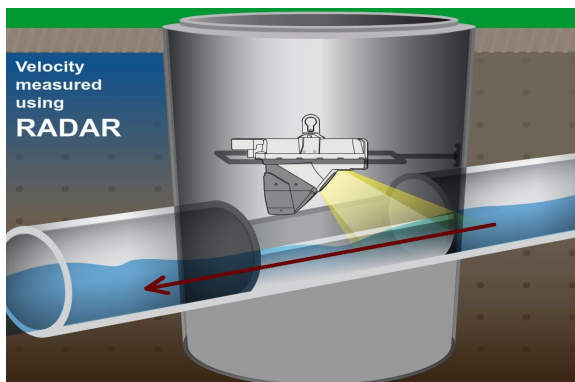
Storm ☐

Install Date: 4/06/2022

Map



Technology



Sewer Plan



## Flow Meter

Meter Depth: 49"

MH Coordinates: 33.969146, -118.047802

Moderate to rapid open channel hydraulics

| Avg Velocity | Avg Measured Level | Multiplier |
|--------------|--------------------|------------|
| 3.7 fps      | 0.75"              | 1.0        |

## Gas

| O2   | H2S | CO | LEL |
|------|-----|----|-----|
| 20.9 | 0   | 0  | 0   |

## Notes

No laterals; due to hydraulics in MH 790, monitored US line to validate data from MH 790.

## Traffic Safety

MH in drive aisle in parking lot; used cones & signs per site-specific CATTCH requirements.

## Land Use

| Residential | Commercial | Industrial | Trunk |
|-------------|------------|------------|-------|
|             | X          |            |       |

Manhole Depth 64"

Monitored Pipe Size 8"

Inner Pipe Size (In/Out) 8"/8"

Pipe Shape Round

Pipe Condition Good

Manhole Material Concrete

Silt None observed

Velocity Profile Data Passed

Velocity Profile Taken 0.4 2-D

Sensor Offset 14.9"

Sensor Dist. to Crown 6.9"

Sensor Direction Upstream

Flow Heading Southwest



## Meter Site Document

2022.04 Washington MH 789C

MH at ~12455 Washington Blvd

Whittier, CA 90602

Site



Manhole Before Install



Installation Process



Installed



Upstream Pipe Size



Downstream



# Temporary Flow Study

Thienes Engr

2022.04 Washington MH 789C

|                          |       |                |            |
|--------------------------|-------|----------------|------------|
| Meter Start Date         |       | From           | 4/6/2022   |
| Meter Stop Date          |       | To             | 4/19/2022  |
| Velocity (fps)           |       | Level (in)     | Flow (mgd) |
| Average                  | 3.733 | 0.754          | 0.041      |
| Maximum                  | 5.500 | 0.940          | 0.078      |
| Minimum                  | 2.310 | 0.540          | 0.019      |
| Pipe Size                |       | 8.000          |            |
| Estimated Capacity (mgd) |       | Not Calculated |            |
| Capacity Used            |       | Not Calculated |            |
| Sensor Type              |       | Hach - Flodar  |            |

## Utility Systems, Science and Software

9314 Bond Av, Suite A

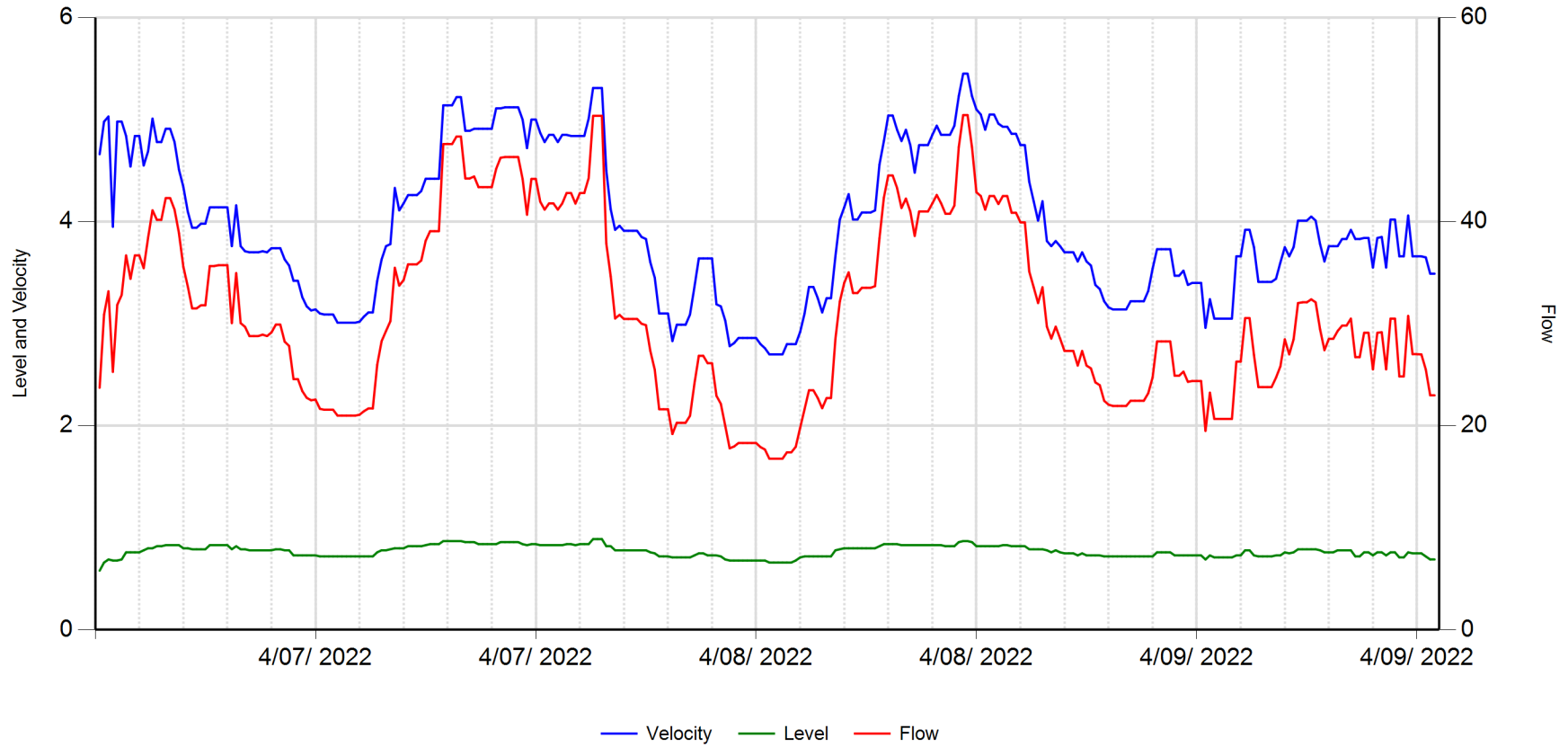
El Cajon, CA 92021

601 N. Parkcenter Dr, Suite 209

Santa Ana, CA 92705

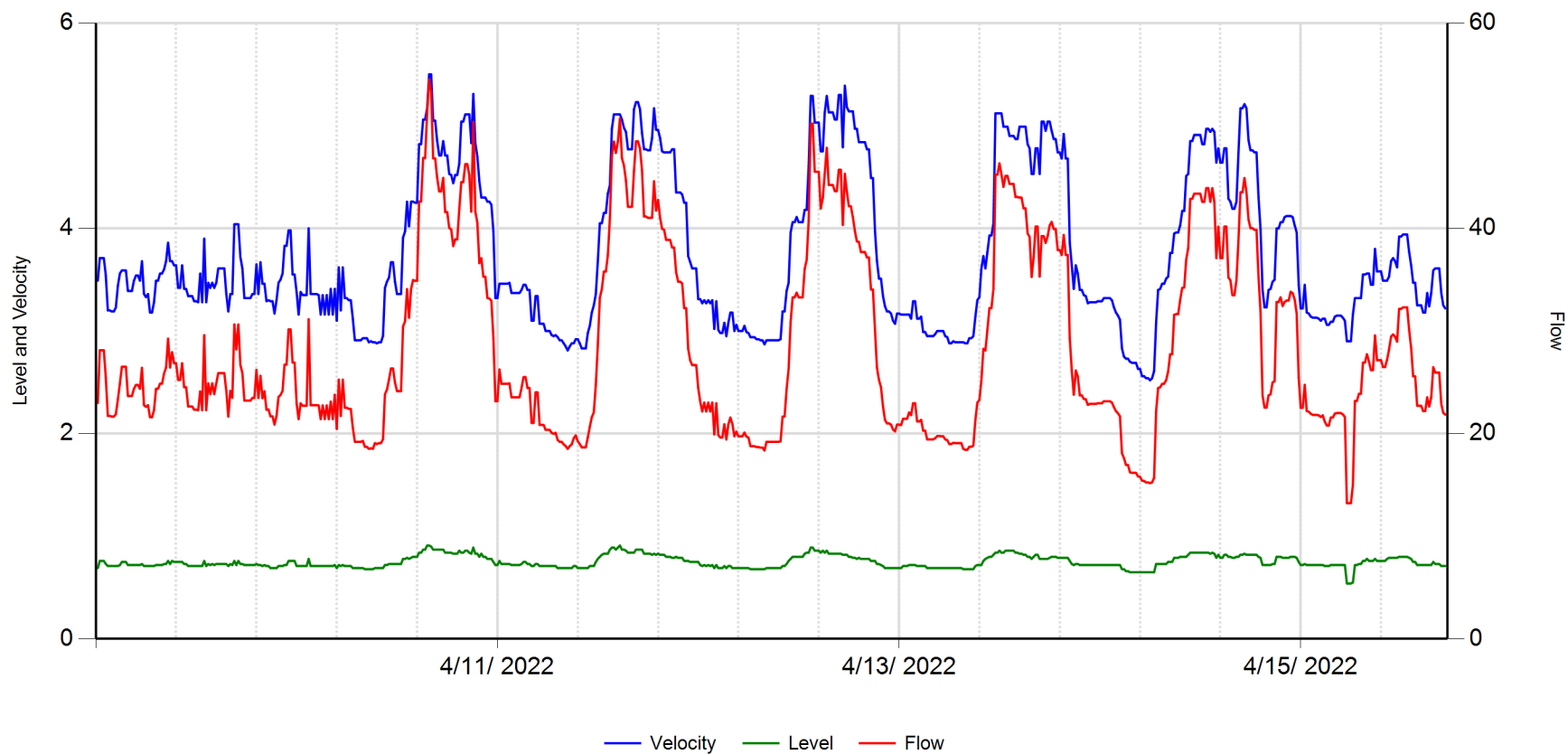


## 2022.04 Washington MH 789C



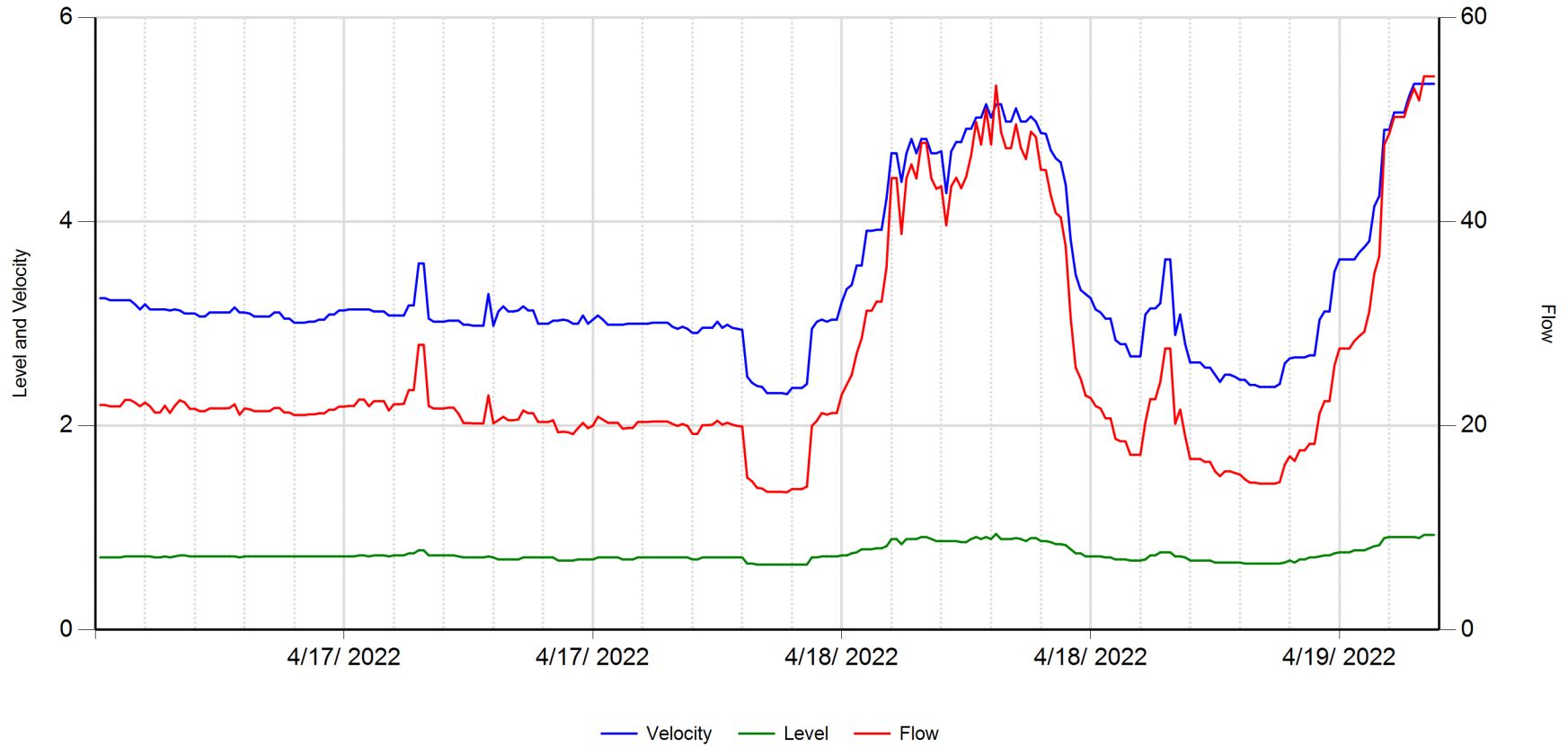
|         | Velocity (fps) | Level (in) | Flow (gpm) |          |        |  |
|---------|----------------|------------|------------|----------|--------|---------------------------------------------------------------------------------------|
| Average | 3.967          | 0.771      | 31.215     | RainFall | Inches |                                                                                       |
| Maximum | 5.450          | 0.890      | 50.444     |          |        |                                                                                       |
| Minimum | 2.700          | 0.580      | 16.777     |          |        |                                                                                       |
|         |                |            |            |          |        | 5/04/2022                                                                             |

## 2022.04 Washington MH 789C



|         | Velocity (fps) | Level (in) | Flow (gpm) |          |           |  |
|---------|----------------|------------|------------|----------|-----------|---------------------------------------------------------------------------------------|
| Average | 3.753          | 0.751      | 28.565     | RainFall | Inches    |                                                                                       |
| Maximum | 5.500          | 0.910      | 54.507     |          |           |                                                                                       |
| Minimum | 2.520          | 0.540      | 13.225     |          |           |                                                                                       |
|         |                |            |            |          | 5/04/2022 |                                                                                       |

## 2022.04 Washington MH 789C

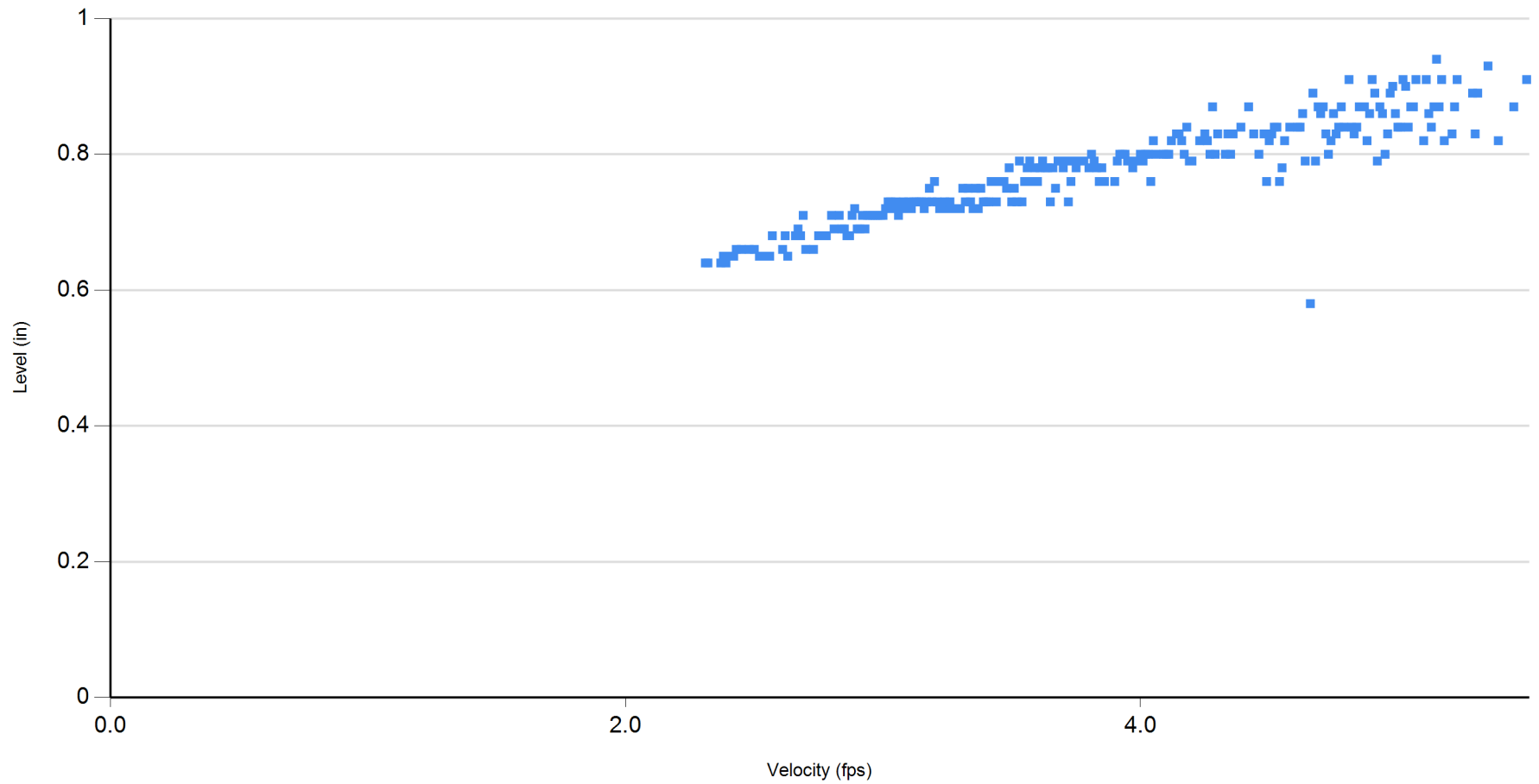


|         | Velocity (fps) | Level (in) | Flow (gpm) |          |        |
|---------|----------------|------------|------------|----------|--------|
| Average | 3.359          | 0.742      | 25.482     | RainFall | Inches |
| Maximum | 5.350          | 0.940      | 54.237     |          |        |
| Minimum | 2.310          | 0.640      | 13.486     |          |        |



5/04/2022

## 2022.04 Washington MH 789C



4/6/2022 thru 4/19/2022



5/4/2022 5:02:59 PM

Statistics for 2022.04 Washington MH 789C: 04/06/2022 thru 04/19/2022

|                | Flow (GPM)   |              |              | Flow (MGD)  |             |             | Velocity (FPS) |             |             | Level (inches) |             |             |                |      |
|----------------|--------------|--------------|--------------|-------------|-------------|-------------|----------------|-------------|-------------|----------------|-------------|-------------|----------------|------|
| Date           | Avg          | Max          | Min          | Avg         | Max         | Min         | Avg            | Max         | Min         | Avg            | Max         | Min         | Total Gal      | Rain |
| 4/6/22         | 33.42        | 42.31        | 23.72        | 0.05        | 0.06        | 0.03        | 4.27           | 5.03        | 3.57        | 0.78           | 0.83        | 0.58        | 48,125         |      |
| 4/7/22         | 33.88        | 50.37        | 19.19        | 0.05        | 0.07        | 0.03        | 4.11           | 5.31        | 2.83        | 0.79           | 0.89        | 0.71        | 48,782         |      |
| 4/8/22         | 30.86        | 50.44        | 16.78        | 0.04        | 0.07        | 0.02        | 3.93           | 5.45        | 2.70        | 0.77           | 0.87        | 0.66        | 44,444         |      |
| 4/9/22         | 25.83        | 32.39        | 19.50        | 0.04        | 0.05        | 0.03        | 3.56           | 4.06        | 2.96        | 0.74           | 0.79        | 0.69        | 37,199         |      |
| 4/10/22        | 24.35        | 31.15        | 20.45        | 0.04        | 0.04        | 0.03        | 3.47           | 4.04        | 3.10        | 0.72           | 0.78        | 0.69        | 35,066         |      |
| <b>Week:</b>   | <b>29.67</b> | <b>50.44</b> | <b>16.78</b> | <b>0.04</b> | <b>0.07</b> | <b>0.02</b> | <b>3.87</b>    | <b>5.45</b> | <b>2.70</b> | <b>0.76</b>    | <b>0.89</b> | <b>0.58</b> | <b>213,617</b> |      |
| 4/11/22        | 31.19        | 54.51        | 18.52        | 0.04        | 0.08        | 0.03        | 3.92           | 5.50        | 2.88        | 0.77           | 0.91        | 0.68        | 44,915         |      |
| 4/12/22        | 30.44        | 50.69        | 18.51        | 0.04        | 0.07        | 0.03        | 3.86           | 5.23        | 2.81        | 0.77           | 0.91        | 0.69        | 43,827         |      |
| 4/13/22        | 29.47        | 50.19        | 18.35        | 0.04        | 0.07        | 0.03        | 3.85           | 5.39        | 2.87        | 0.75           | 0.89        | 0.68        | 42,441         |      |
| 4/14/22        | 29.62        | 46.33        | 18.43        | 0.04        | 0.07        | 0.03        | 3.87           | 5.12        | 2.88        | 0.75           | 0.86        | 0.68        | 42,656         |      |
| 4/15/22        | 30.54        | 44.90        | 15.17        | 0.04        | 0.06        | 0.02        | 3.90           | 5.21        | 2.52        | 0.76           | 0.84        | 0.65        | 43,977         |      |
| 4/16/22        | 23.68        | 32.30        | 13.22        | 0.03        | 0.05        | 0.02        | 3.32           | 3.94        | 2.90        | 0.73           | 0.80        | 0.54        | 34,101         |      |
| 4/17/22        | 21.10        | 27.93        | 19.18        | 0.03        | 0.04        | 0.03        | 3.06           | 3.59        | 2.91        | 0.71           | 0.78        | 0.68        | 30,377         |      |
| <b>Week:</b>   | <b>28.01</b> | <b>54.51</b> | <b>13.22</b> | <b>0.04</b> | <b>0.08</b> | <b>0.02</b> | <b>3.68</b>    | <b>5.50</b> | <b>2.52</b> | <b>0.75</b>    | <b>0.91</b> | <b>0.54</b> | <b>282,294</b> |      |
| 4/18/22        | 30.12        | 53.32        | 13.49        | 0.04        | 0.08        | 0.02        | 3.69           | 5.15        | 2.31        | 0.77           | 0.94        | 0.64        | 43,369         |      |
| 4/19/22        | 27.05        | 54.24        | 14.33        | 0.04        | 0.08        | 0.02        | 3.41           | 5.35        | 2.38        | 0.75           | 0.93        | 0.65        | 38,957         |      |
| <b>Week:</b>   | <b>28.59</b> | <b>54.24</b> | <b>13.49</b> | <b>0.04</b> | <b>0.08</b> | <b>0.02</b> | <b>3.55</b>    | <b>5.35</b> | <b>2.31</b> | <b>0.76</b>    | <b>0.94</b> | <b>0.64</b> | <b>82,326</b>  |      |
| <b>Totals:</b> | <b>28.68</b> | <b>54.51</b> | <b>13.22</b> | <b>0.04</b> | <b>0.08</b> | <b>0.02</b> | <b>3.73</b>    | <b>5.50</b> | <b>2.31</b> | <b>0.75</b>    | <b>0.94</b> | <b>0.54</b> | <b>578,237</b> |      |

iv) US<sup>3</sup> Project, Equipment & Company Information

## Methods & Procedures & Equipment

### Methods and Procedures

Utility Systems Science & Software provided Thienes Engineering with an off the shelf, non-proprietary flow monitoring solution that included three state of the art Hach Flo-Dar® AV Sensor systems. The project course of action is listed below. The US<sup>3</sup> team:

- Assessed permitting and traffic control at the sites in Whittier, CA.
- Obtained a City Encroachment Permit.
- Installed and removed traffic control in accord with site-specific California Temporary Traffic Control Handbook (CATTCH) requirements for both the installation and removal of flow monitoring equipment.
- Validated the sites for suitability for sewer flow monitoring for the Whittier Blvd Business Park Project.
  - Manhole (MH) 797 had no laterals and slow to moderate open channel hydraulics.
  - MH 790 had an inlet from the north plus two drop inlets from the northeast and the northwest. Due to the poor hydraulics in MH 790 and the good hydraulics in downstream MH 789C, MH 789C was also monitored for a short period in order to validate the calibration of the equipment in MH 790.
- Installed and calibrated the flow monitoring equipment at the sites per manufacturer recommendations on 4/06/2022.
  - Follow-up on 4/19/2022 confirmed equipment was reading properly.
  - Collected 15-minute interval depth and velocity data points over the entire monitoring period.
- Removed the equipment on 4/27/2022 and validated the data.
  - All of the equipment went through diagnostic testing before and after the study with less than a 1% deviation between manual and meter level readings and less than a 5% deviation between manual and meter velocity readings.
  - Equipment calibration was verified in accordance with manufacturer specifications.
- Prepared the data reports.
  - The table below contains a summary of the average (Avg) and maximum (Max) velocities (Vel) and levels (Lev) collected during this study as well as the calculated flow rates (Flow) and depth versus diameter ratios (d/D).

| MH   | Pipe Size (in) | Avg Vel (fps) | Max Vel (fps) | Avg Lev (in) | Max Lev (in) | Avg Flow (gpm) | Max Flow (gpm) | Avg d/D | Max d/D |
|------|----------------|---------------|---------------|--------------|--------------|----------------|----------------|---------|---------|
| 789C | 8              | 3.72          | 5.50          | 0.75         | 0.94         | 28.55          | 54.51          | 0.09    | 0.12    |
| 790  | 8              | 2.21          | 3.29          | 0.82         | 1.71         | 20.86          | 74.73          | 0.10    | 0.12    |
| 797  | 6              | 0.60          | 2.12          | 0.49         | 0.93         | 2.26           | 11.15          | 0.08    | 0.16    |

## Equipment

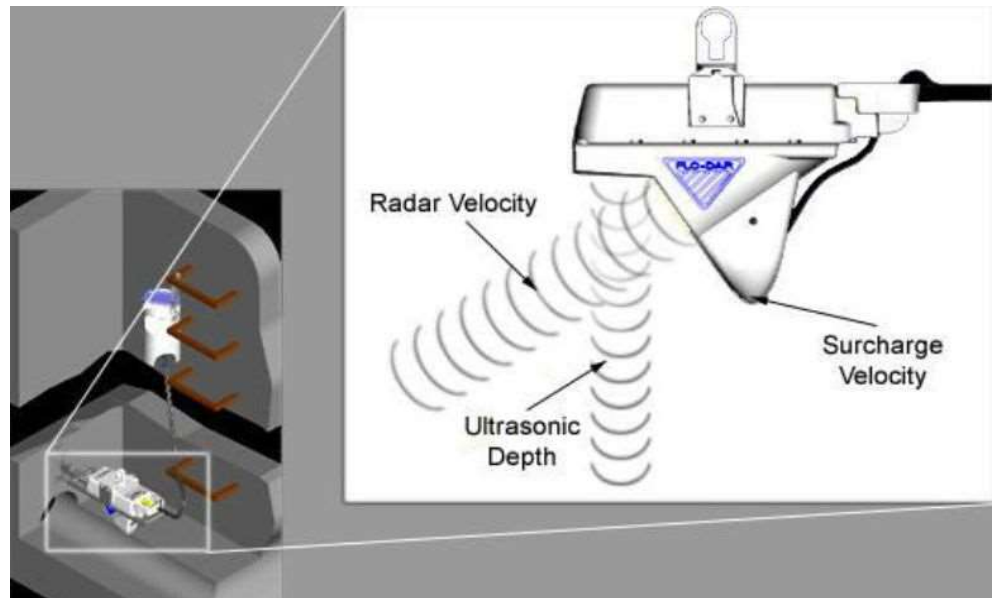


Figure above: Equipment installed for the Sewer Flow Monitoring Study



Figure above: Web-Enabled Flo-Dar® AV Sensor, Radar-Based Velocity/Area Flow Meter

**FloDar® AV Sensor Specifications:**

- **Enclosure**
  - IP68 Waterproof rating, Polystyrene
- **Dimensions**
  - 160.5 W x 432.2 L x 297 D mm (6.32 x 16.66 x 11.7 in.),
  - With SVS, D = 387 mm (15.2 in.)
- **Weight**
  - 4.8 kg (10.5 lbs.)
- **Operating Temperature**
  - -10 to 50°C (14 to 122°F)
- **Storage Temperature**
  - -40 to 60°C (-40 to 140°F)
- **Power Requirements**
  - Supplied by FL900 Flow Logger, Flo-Logger, or Flo-Station
- **Interconnecting Cable**
  - Disconnect available at both sensor and logger or Flo-Station
  - Polyurethane, 0.400 (±0.015) in. diameter; IP68
  - Standard length 9 m (30 ft), maximum 305 m (1000 ft)
- **Cables – available in two styles:**
  - connectors at both ends
  - connector from sensor with open leads to desiccant hub, desiccant hub with connector to logger. A potting/sealant kit will be included. This can be used to run the cable through conduit.
- **Certification**
  - Certified to: FCC Part 15.245: FCC ID: VIC-FLODAR24
  - Industry Canada Spec. RSS210. v7: IC No.: 6149A-FLODAR24

**SURCHARGE DEPTH MEASUREMENT**

- Auto zero function maintains zero error below 0.5 cm (0.2 in.)
- **Method**
  - Piezo-resistive pressure transducer with stainless steel diaphragm
- **Range**
  - 3.5 m (138 in.), overpressure rating 2.5 x full scale

**VELOCITY MEASUREMENT**

- **Method**
  - Radar
- **Range**
  - 0.23 to 6.10 m/s (0.75 to 20 ft/s)

- **Frequency Range**
  - 24.075 to 24.175 GHz, 15.2 mW (max.)
- **Accuracy**
  - $\pm 0.5\%$ ;  $\pm 0.03$  m/s ( $\pm 0.1$  ft/s)

#### DEPTH MEASUREMENT

- **Method**
  - Ultrasonic
- **Standard Operating Range from Flo-Dar® Housing to Liquid**
  - 0 to 152.4 cm (0 to 60 in.)
- **Optional Extended Level Operating Range from Transducer Face to Liquid**
  - 0 to 6.1 m (0 to 20 ft.) with 43.18 cm (17 in.) dead band, temperature compensated.
- **Accuracy**
  - $\pm 1\%$ ;  $\pm 0.25$  cm ( $\pm 0.1$  in.)

#### FLOW MEASUREMENT

- **Method**
  - Based on Continuity Equation
- **Accuracy**
  - $\pm 5\%$  of reading typical where flow is in a channel with uniform flow conditions and is not surcharged,  $\pm 1\%$  full scale max.

#### SURCHARGE CONDITIONS DEPTH/VELOCITY DEPTH (Std with Flo-Dar® Sensor)

- **Surcharge depth supplied by Flo-Dar® sensor.**

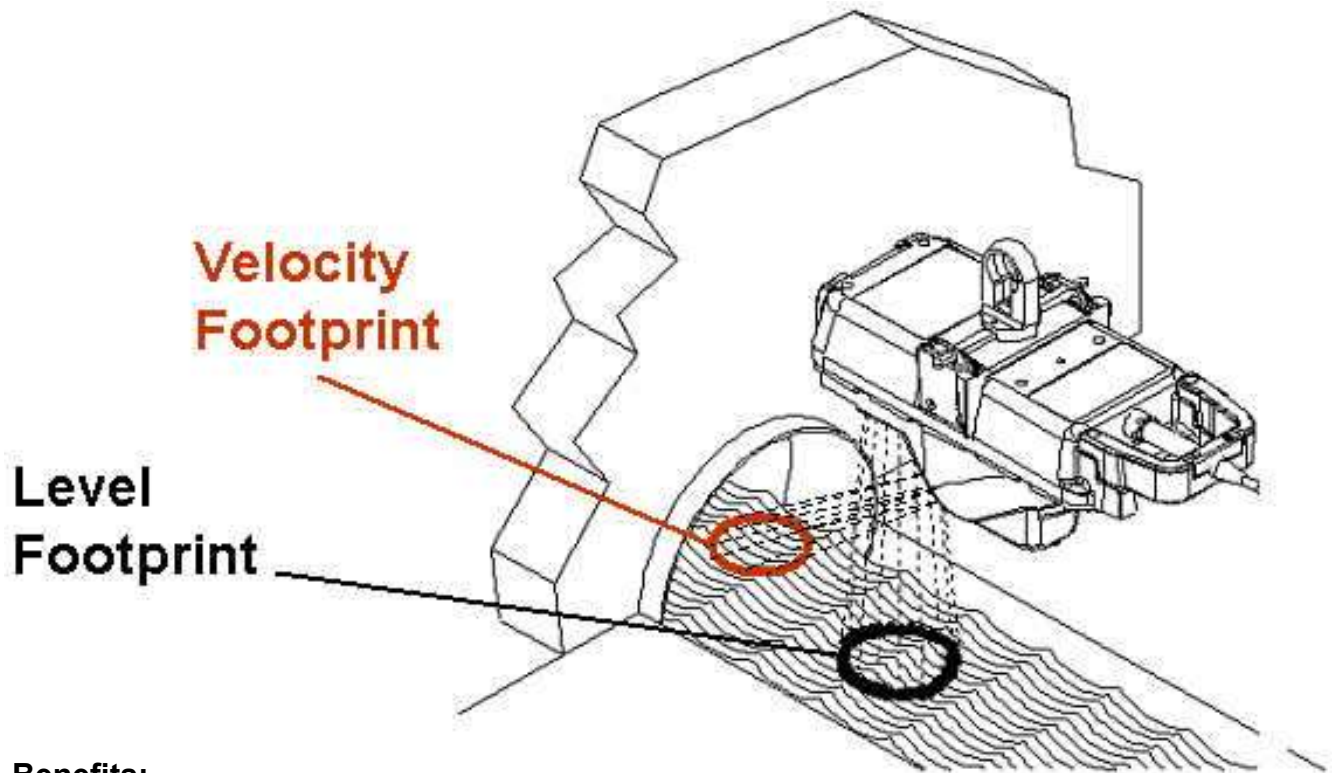
#### VELOCITY (Optional Surcharge Velocity Sensor)

- **Method**
  - Electromagnetic
- **Range**
  - $\pm 4.8$  m/s ( $\pm 16$  ft/s)
- **Accuracy**
  - $\pm 0.15$  ft/s or 4% of reading, whichever is greater.
- **Zero Stability**
  - $\pm 0.05$  ft/s

The Flo-Dar® Open Channel Flow Meters provide an innovative approach to open channel flow monitoring. Combining digital Doppler radar velocity sensing with ultrasonic pulse echo level sensing Flo-Dar® provides accurate open channel flow monitoring without the fouling problems associated with submerged sensors.

**Perfect Solution for Difficult Flow Conditions:**

- Flows with High Solids Content
- High Temperature Flows
- Caustic Flows
- Large Man-Made Channel
- High Velocities
- Shallow Flows

**Benefits:**

1. Personnel have no contact with the flow during installation.
2. Maintenance caused by sensor fouling is eliminated
3. Field Replaceable/Interchangeable Sensors and Monitors

## How It Works

Flo-Dar® transmits a digital Doppler radar beam that interacts with the fluid and reflects back signals at a different frequency than that which was transmitted. These reflected signals are compared with the transmitted frequency. The resulting frequency shift provides an accurate measure of the velocity and the direction of the flow. Level is detected by ultrasonic pulse echo. Flow is then calculated based on the Continuity Equation:

$$Q = V \times A, \text{ Where } Q = \text{Flow}, V = \text{Average Velocity and } A = \text{Area}$$

## Accurate Flow Measurements

Flo-Dar® provides the user with highly accurate flow measurements under a wide range of flows and site conditions. By measuring the velocity of the fluid from above, Flo-Dar® eliminates accuracy problems inherent with submerged sensors including sensor disturbances, high solids content and distribution of reflectors.

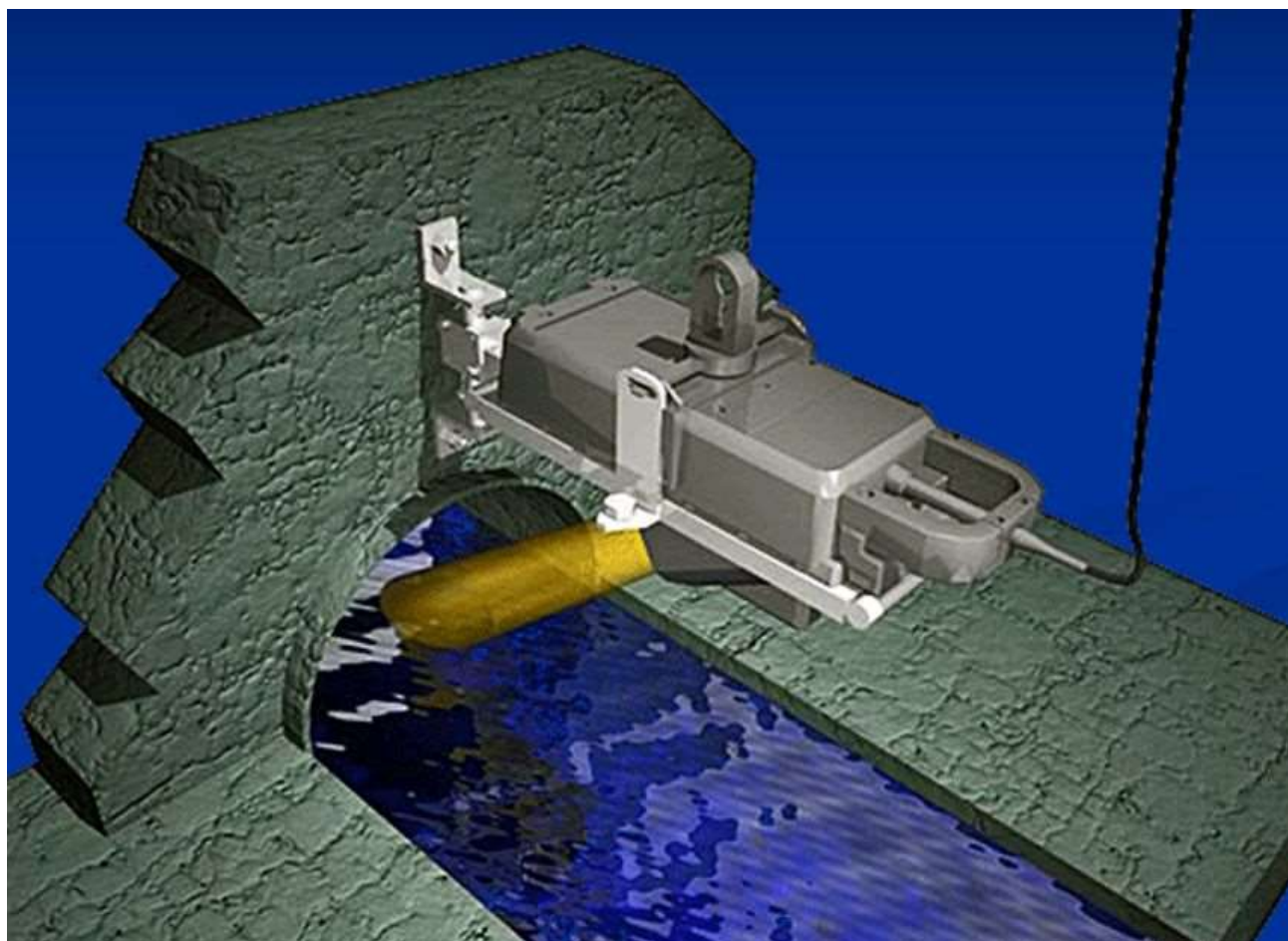


**Figure above:** US<sup>3</sup> utilizes exclusively Hach March-McBirney Flo-Dar® Meters

## US<sup>3</sup> Company Information

**US<sup>3</sup>** is a California Corporation **Federal ID No. 33-0729605** and qualifies as a Minority Business Enterprise. US<sup>3</sup> has certified as an MBE with the California Public Utility Commission's authorized clearinghouse, **Verification Number: 97ES0008**.

**US<sup>3</sup>** is a specialty service company for the Water & Waste Water industry, providing monitoring and control for Utilities since 1996. US<sup>3</sup> is in the forefront of this industry by taking the proven technological approaches developed in other high-tech industries and applying them to protect one of our most precious natural resources - our water.

**US<sup>3</sup>** engineers and technical personnel have applied advanced instrumentation system technology to water/wastewater open channel flow monitoring, pipeline evaluation, engineering, and data analysis, all coupled to the power of the Internet. This unique integrated systems approach allows the company to bring greater insight and intelligence to gathering information about water/wastewater system performance of our clients, and in turn, to support the fulfillment of their commitments to manage and cost effectively design, operate, and maintain these systems.

Moreover, **US<sup>3</sup>** supports Municipalities, Consulting Engineering firms and other water/waste water systems integrators by providing temporary technical services for engineering, software programming and technical site maintenance and calibration site support work, primarily in the Water and Waste Water industries.

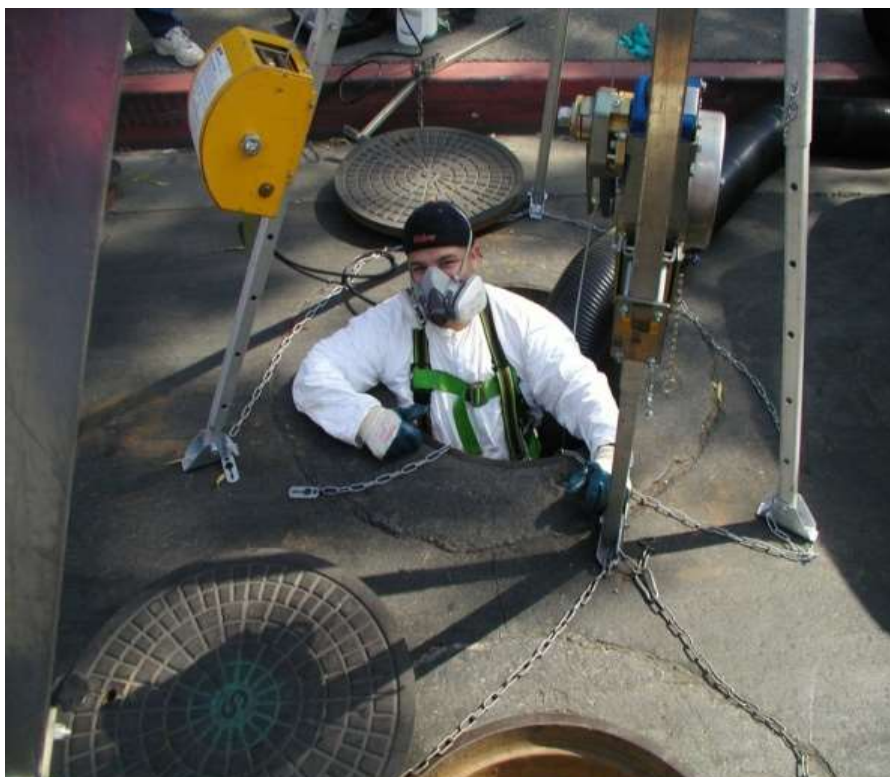


**Figure at right:** All US<sup>3</sup> technicians are certified for Confined Space Entry.

## Key Personnel Assigned

**US<sup>3</sup>** provided the necessary resources to fully implement this project. Primary in support of this effort were the following personnel:

**Mr. Mark Serres:** Mr. Serres is a degreed electrical engineer with over 25 years of experience with fresh/wastewater systems, project management, and systems integration in relation to complex industrial systems. This includes experience in industrial automation and water/wastewater industries. Mr. Serres is responsible for assuring client satisfaction and marshalling the required resources to meet the project requirements.

**Mr. Thomas Williams:** Mr. Williams is an Engineering Manager with over 20 years of experience in complex systems development for wastewater monitoring. This experience includes hydraulic compatibility, instrumentation, communications and analysis. Mr. Williams is responsible for assuring that the required equipment is designed and calibrated to meet the project requirements.

**Darlene Szczublewski, PE:** Mrs. Szczublewski is a licensed Civil Engineer in multiple states. She has over 15 years of engineering experience with stormwater/wastewater related projects. She assisted in the completion of several Sanitary Sewer Evaluation Surveys and Capacity Analysis projects to meet Consent Decrees as well as completing numerous Infiltration and Inflow (I&I) studies for other clients. Mrs. Szczublewski has developed numerous flow data analysis techniques to present a clear informative picture of flow in a monitored system. Her work also includes the development of training programs for clients describing I&I and capacity analysis methodologies. Mrs. Szczublewski is responsible for analyzing the data as well as the data collection process and assuring that the reports meet the project requirements.

**Name, title, address and telephone number of persons to contact regarding this US<sup>3</sup> project.**

**Darlene Szczublewski, PE**  
**Senior Civil Engineer**  
[darlene.szczublewski@uscubed.com](mailto:darlene.szczublewski@uscubed.com)

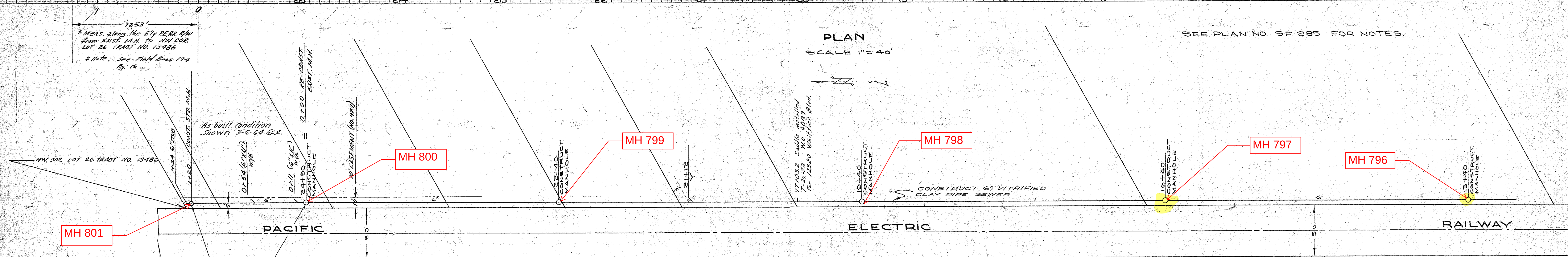
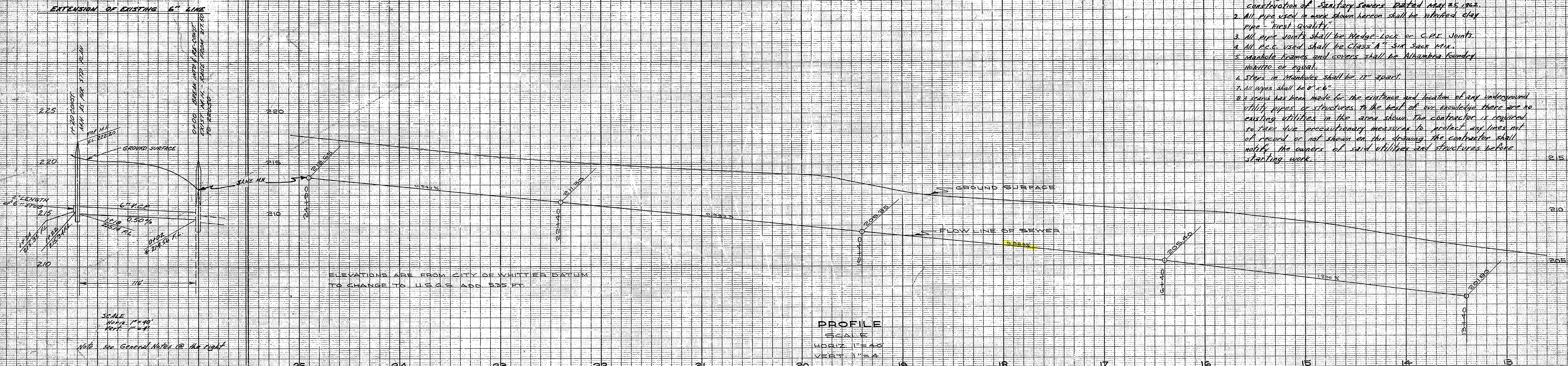
9314 Bond Av, Suite A  
El Cajon, CA 92021  
619-546-4281 (work)  
619-246-5304 (cell)

**Tom Williams**  
**Engineering Manager**  
[tom.williams@uscubed.com](mailto:tom.williams@uscubed.com)

9314 Bond Av, Suite A  
El Cajon, CA 92021  
619-546-4281 (work)  
619-398-7799 (cell)

### GENERAL NOTES

1. All material furnished and work done shall conform to Los Angeles County Standard Specifications for the construction of Sanitary Sewers dated May 25, 1944.
2. All pipe used in work shown herein shall be vitrified clay pipe - "First Quality".
3. All pipe joints shall be Wedge-Lock or G.P.E. Joints.
4. All P.C.C. used shall be Class "A" Six Sack Mix.
5. Manhole frames and covers shall be Alhambra Foundry, Newitto or equal.
6. Steps in Manholes shall be 17" apart.
7. All pipes shall be 6" x 6".
8. A search has been made for the existence and location of any underground utility pipes or structures to the best of our knowledge there are no existing utilities in the area shown. The contractor is required to take due precautionary measures to protect any lines not of record or not shown on this drawing. The contractor shall notify the owners of said utilities and structures before starting work.



Bench Mark: On Penn St. @ Whittier Bldg. spike  
in north curb 2' from end. Elev. 231.26  
This bench mark for this section only  
See F.B. 194-16, 17

NO CONNECTIONS FOR THE DISPOSAL OF  
INDUSTRIAL WASTES SHALL BE MADE TO  
SEWERS SHOWN ON THESE DRAWINGS  
WITHOUT WRITTEN PERMISSION FROM THE  
CHIEF ENGINEER AND GENERAL MANAGER  
OF THE COUNTY SANITATION DISTRICTS.

REVISION

EXTENSION OF SEWER LINE  
FROM 24+00 TO 122' NORTHERLY

RAM  
Feb 7, 1947

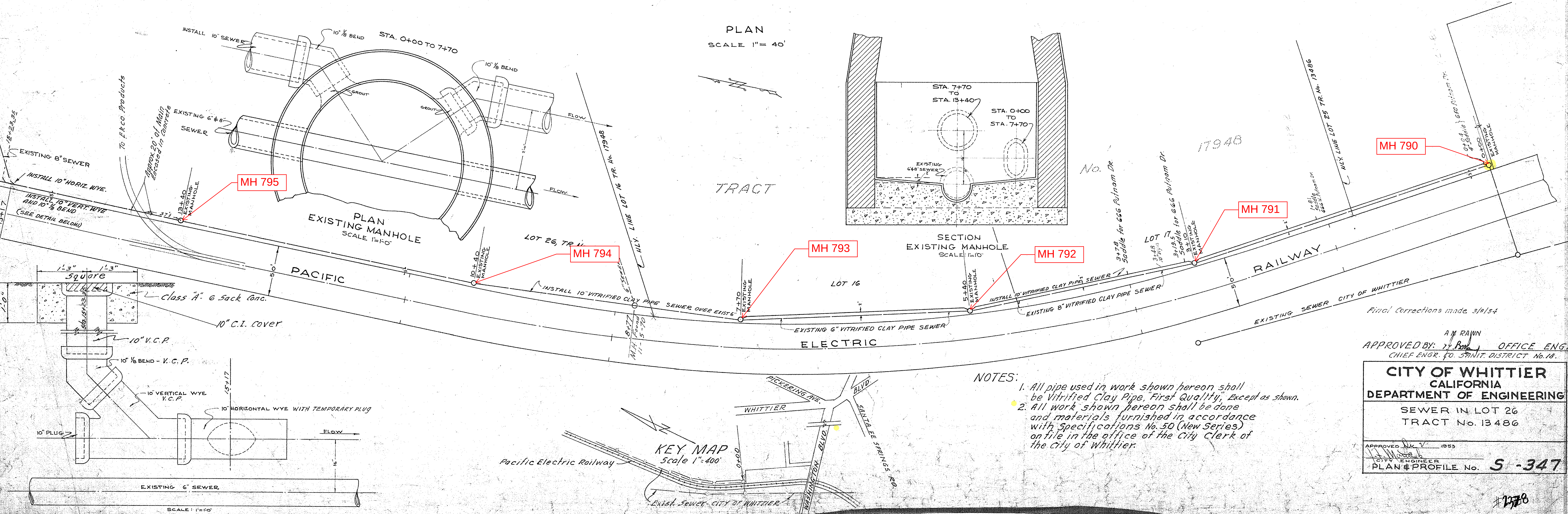
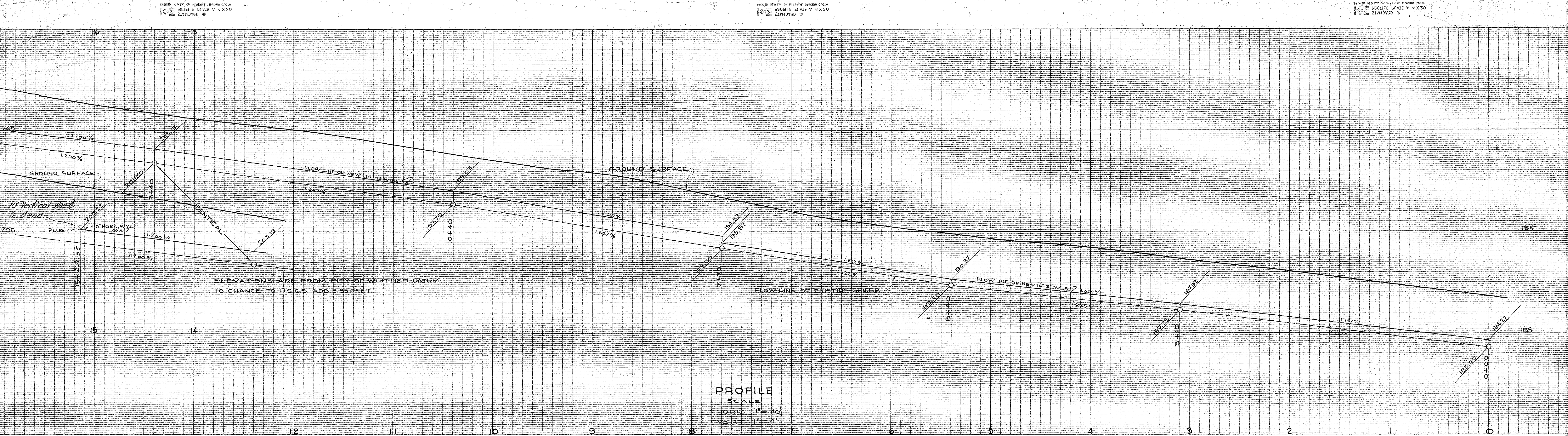
CITY OF WHITTIER  
CALIFORNIA  
DEPARTMENT OF ENGINEERING

SEWER IN LOT 26  
TRACT NO. 13486

APPROVED  
COUNTY SANITATION DISTRICTS  
OF LOS ANGELES COUNTY

FEB 20 1947

APPROVED  
J. D. [Signature]  
PLAN & PROFILE NO. S. 292



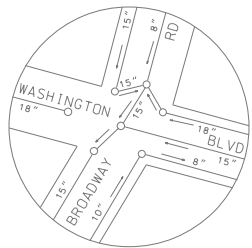
NOTES:  
1. All pipe used in work shown hereon shall be Vitrified Clay Pipe, First Quality, Except as shown.  
2. All work shown hereon shall be done and materials furnished in accordance with Specifications No. 50 (New Series) on file in the office of the City Clerk of the City of Whittier.

APPROVED BY: [Signature] OFFICE ENGR  
CHIEF ENGR. TO SANIT. DISTRICT No. 18.  
CITY OF WHITTIER  
CALIFORNIA  
DEPARTMENT OF ENGINEERING  
SEWER IN LOT 26  
TRACT No. 13486  
APPROVED [Signature] 1913  
CITY ENGINEER  
PLAN & PROFILE No. S-347

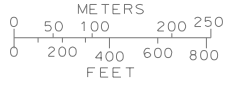
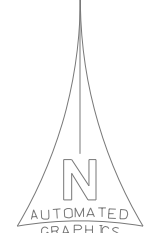
1278

C-159  
C-160  
C-163  
C-164  
C-165

THIS MAP IS INTENDED FOR  
USE ONLY AS OPERATIONS  
MAP BY LOS ANGELES  
COUNTY SEWER  
MAINTENANCE DISTRICTS.  
LOS ANGELES COUNTY  
EXPRESSLY DISCLAIMS ANY  
LIABILITY FOR ANY  
INACCURACIES WHICH MAY  
BE PRESENT IN THIS MAP.



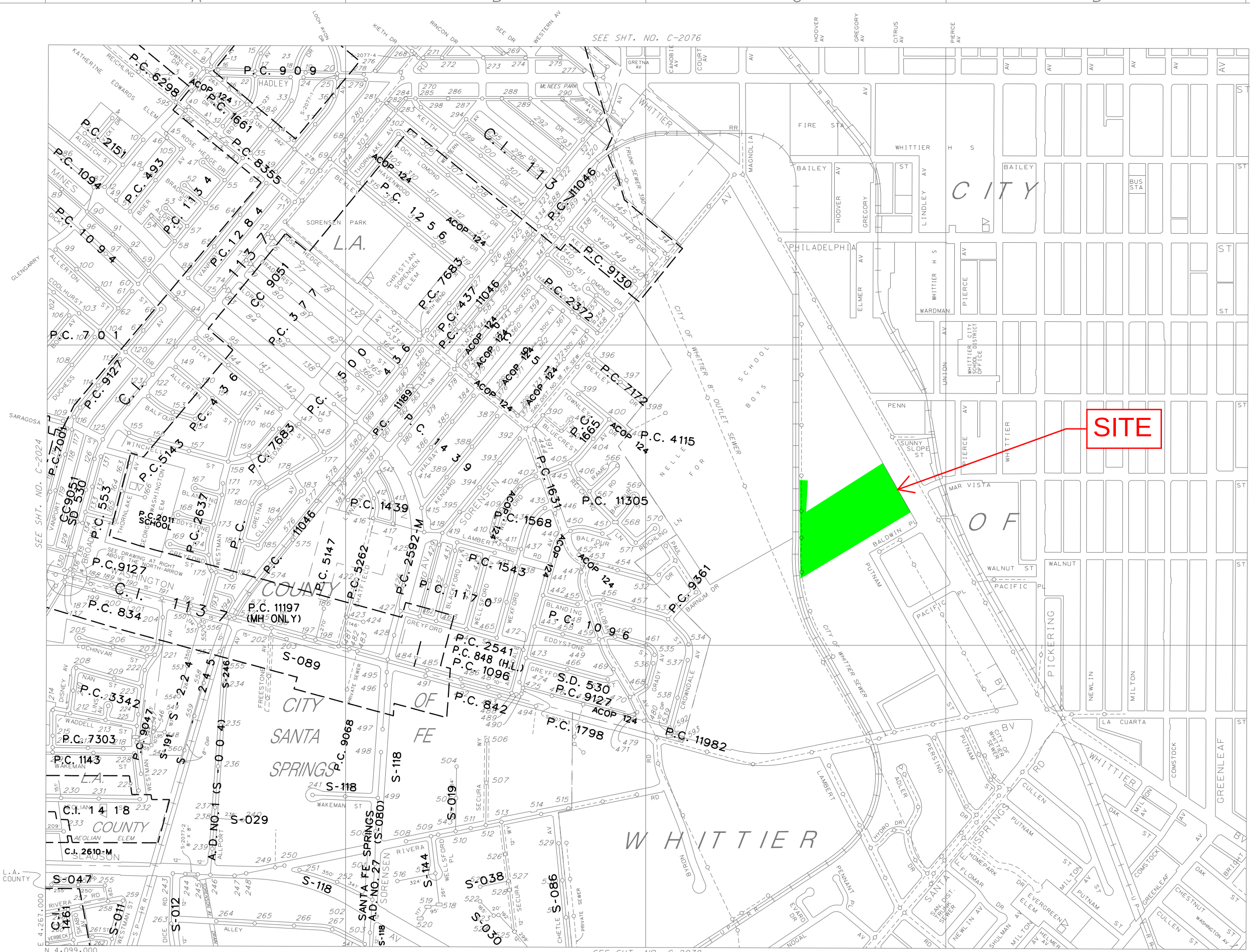
DETAIL  
(FROM GRID A2)



LEGEND

- CLAY SEWERS, MAINTAINED BY SMD, 8" UNLESS OTHERWISE NOTED
- PLASTIC SEWERS
- CONCRETE SEWERS
- CLAY SEWERS, LINED
- CEMENT SEWERS, LINED
- FORCE MAINS
- SEWERS NOT MAINTAINED BY SMD
- TRUNK SEWERS
- CITY BOUNDARY
- STANDARD MANHOLE
- DROP MANHOLE
- SHALLOW MANHOLE
- TRAP MANHOLE
- WEIR MANHOLE
- CLEANOUT
- LAMP HOLE
- PUMP STATION

TOTAL MH'S THIS MAP: 595



MAP REV.  
01-12-11

MAP REV  
12-08-15  
DATA BASE REV  
05-09-90



American Contractors Inc  
404 W. Blueridge Ave.  
Orange, CA 92865  
Ph: 714-282-5700  
Fax: 714-282-5710

May 12, 2022

Re: Whittier Blvd Business Park Waste/Water Calculations

To Whom It May Concern:

- Domestic Water Meter Size: 2" Water Meter
- For an estimated 159 occupants/employees, the estimated daily water demand is 1,056 Gallons.

| Average Daily Flow           |     |                |                    |                 |                 |
|------------------------------|-----|----------------|--------------------|-----------------|-----------------|
|                              | QTY | PER PERSON USE | TOTAL USES PER DAY | FIXTURE GPF/GPM | GALLONS PER DAY |
| Water Closet (Female)        | 80  | 3              | 239                | 1.28            | 305             |
| Water Closet (Male)          | 80  | 1              | 80                 | 1.28            | 102             |
| Urinal                       | 80  | 2              | 159                | 0.125           | 20              |
| Lavatory                     | 159 | 3              | 477                | 0.5             | 79              |
| Drinking Fountain            | 159 | 2              | 318                | 0.5             | 80              |
| Breakroom Sink               | 60  | 1              | 60                 | 1.5             | 450             |
| Mop Sink                     | 1   | 1              | 1                  | 1               | 10              |
| Hose Bibb                    | 1   | 1              | 1                  | 1               | 10              |
| ESTIMATED DAILY WATER DEMAND |     |                |                    |                 | 1056            |
|                              |     |                |                    |                 | GALLONS         |

- The average daily water demand for (1) 8 hour shift is 2.2 GPM ( $1056 / 480 = 2.2$  GPM)
- The estimated water peak GPM is 52 GPM.

|                                  | QTY | WSFU | TOTAL WSFU |
|----------------------------------|-----|------|------------|
| Water Closet                     | 6   | 5    | 30         |
| Urinal                           | 1   | 4    | 4          |
| Lavatory                         | 7   | 1    | 7          |
| Breakroom Sink                   | 2   | 2    | 4          |
| Drinking Fountain                | 1   | 1    | 1          |
| Mop Sink                         | 1   | 3    | 3          |
| Hose Bibb                        | 1   | 2.5  | 2.5        |
| TOTAL WATER SUPPLY FIXTURE UNITS |     |      | 51.5       |
| Peak GPM                         |     |      | 52         |



- The total estimated drainage fixture units are 53 DFU's.

|                              | QTY | DRAINAGE FIXTURE UNIT | TOTAL DFU'S |
|------------------------------|-----|-----------------------|-------------|
| Water Closet                 | 6   | 4                     | 24          |
| Urinal                       | 1   | 2                     | 2           |
| Lavatory                     | 7   | 1                     | 7           |
| Breakroom Sink               | 2   | 2                     | 4           |
| Drinking Fountain            | 1   | 1                     | 1           |
| Mop Sink                     | 1   | 3                     | 3           |
| Floor Drains                 | 6   | 2                     | 12          |
|                              |     |                       |             |
|                              |     |                       |             |
| TOTAL DRAINAGE FIXTURE UNITS |     |                       | 53          |



Thank you,

Gilbert Wiggam  
President