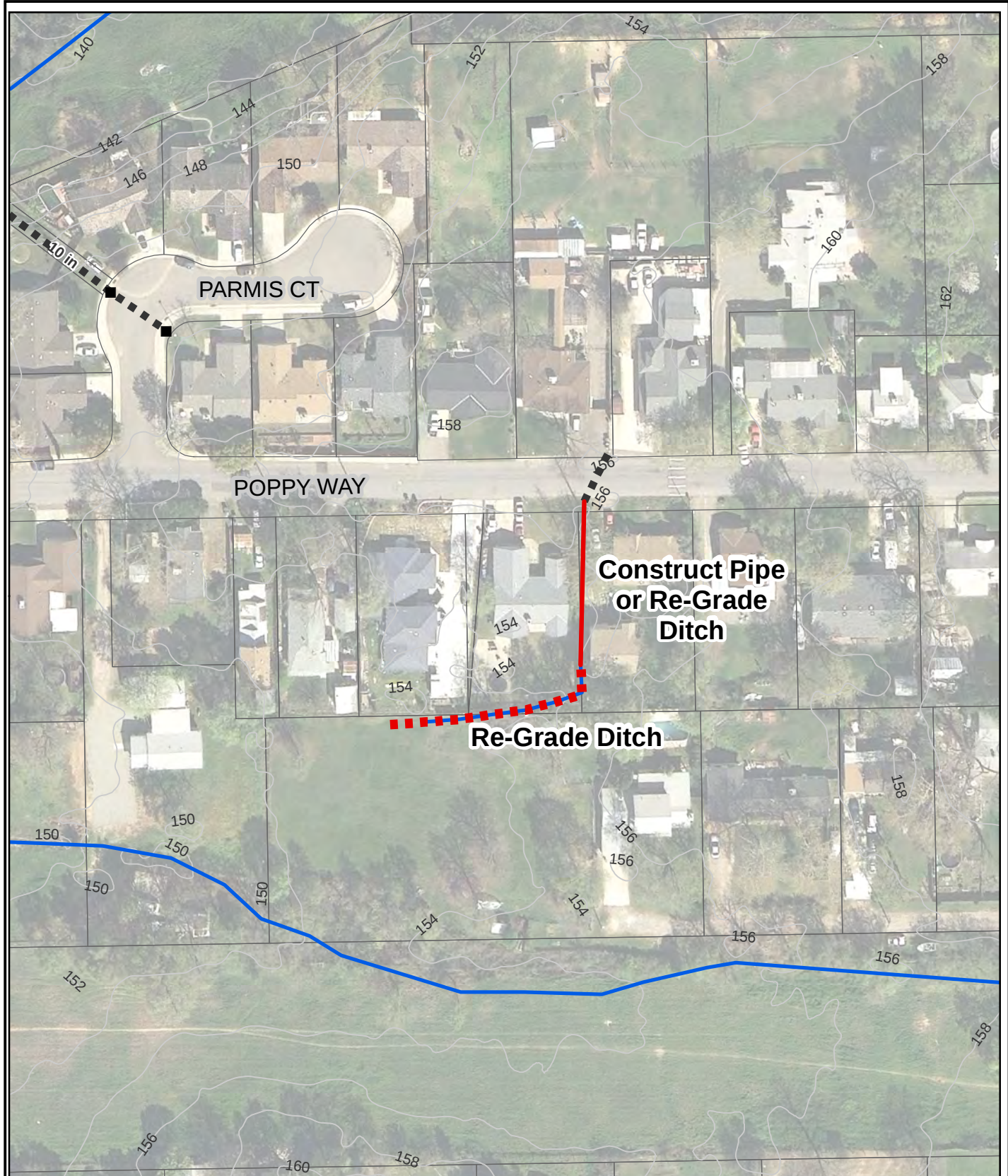
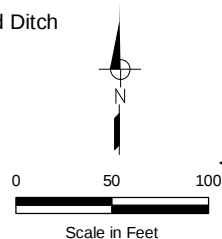




# **LEGEND**

- Stream or Channel
- - - Existing Drain Pipe
- Existing Inlet
- ▲ Existing Outfall
- Existing Manhole
- Elevation Contour (NAV88)
- Proposed Pipeline

- - - Proposed Ditch



**Figure 7-15**

**City of Citrus Heights  
Neighborhoods 6 and 7  
Drainage Master Plan Study**

**Problem Location 12  
Proposed Solution**

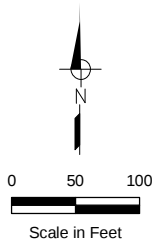




**Problem 14 -  
Poor Drainage**

**LEGEND**

- Existing Drain Pipe
- Existing Inlet
- ▲ Existing Outfall
- Existing Manhole
- Elevation Contour (NAV88)



**Figure 7-16**

**City of Citrus Heights  
Neighborhoods 6 and 7  
Drainage Master Plan Study**

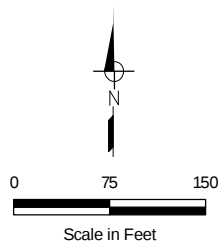
**Problem Location 14**





# **LEGEND**

- Stream or Channel
- - - - - Existing Drain Pipe
- Existing Inlet
- ▲ Existing Outfall
- Existing Manhole
- Elevation Contour (NAV88)
- Proposed Pipeline



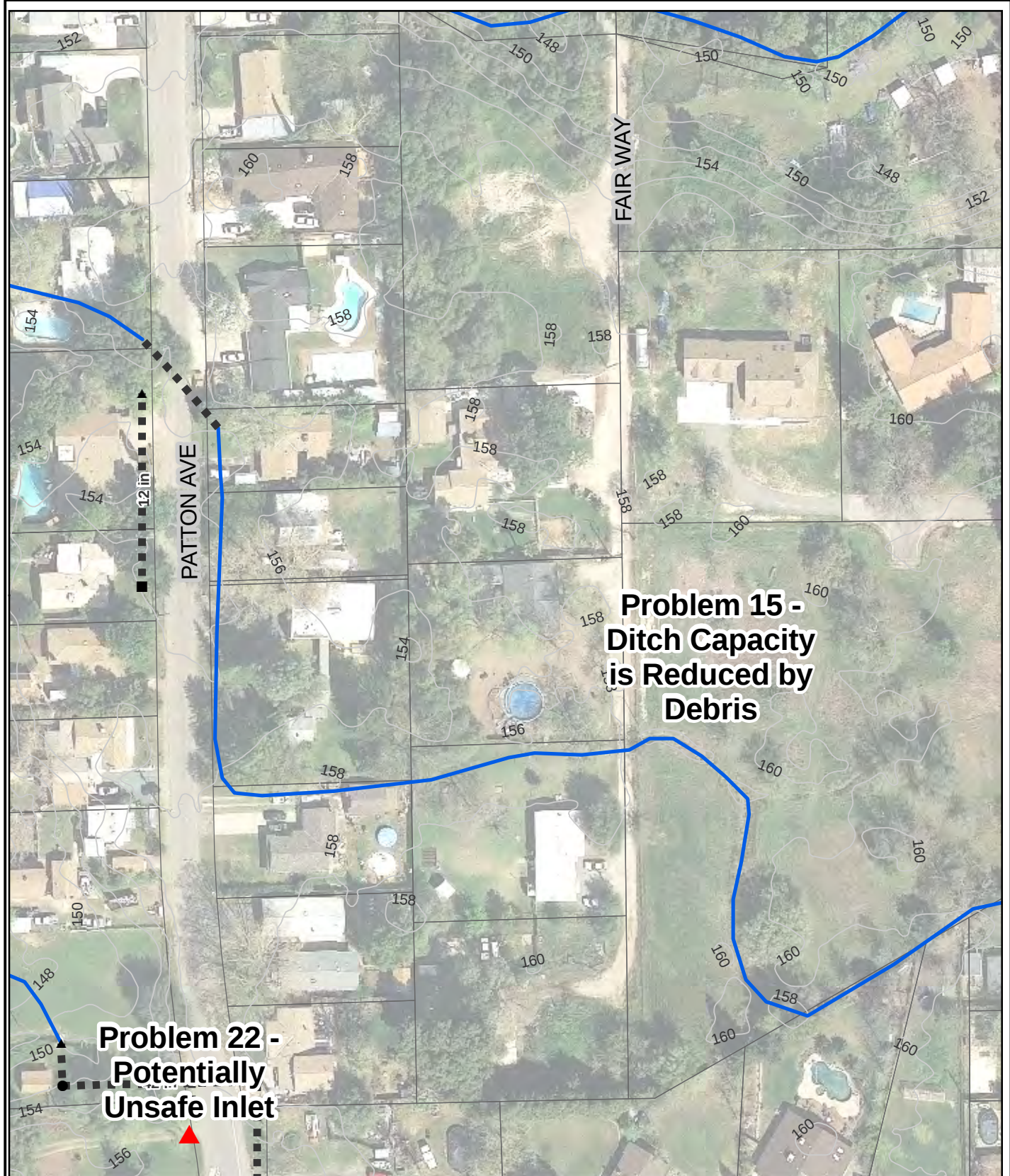
**Figure 7-17**

**City of Citrus Heights  
Neighborhoods 6 and 7  
Drainage Master Plan Study**

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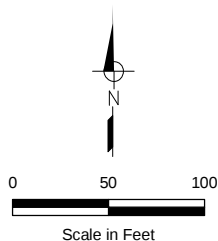
**Problem Location 14  
Proposed Solution**





# **LEGEND**

- Stream or Channel
- - - - - Existing Drain Pipe
- Existing Inlet
- ▲ Existing Outfall
- Existing Manhole
- Elevation Contour (NAV88)

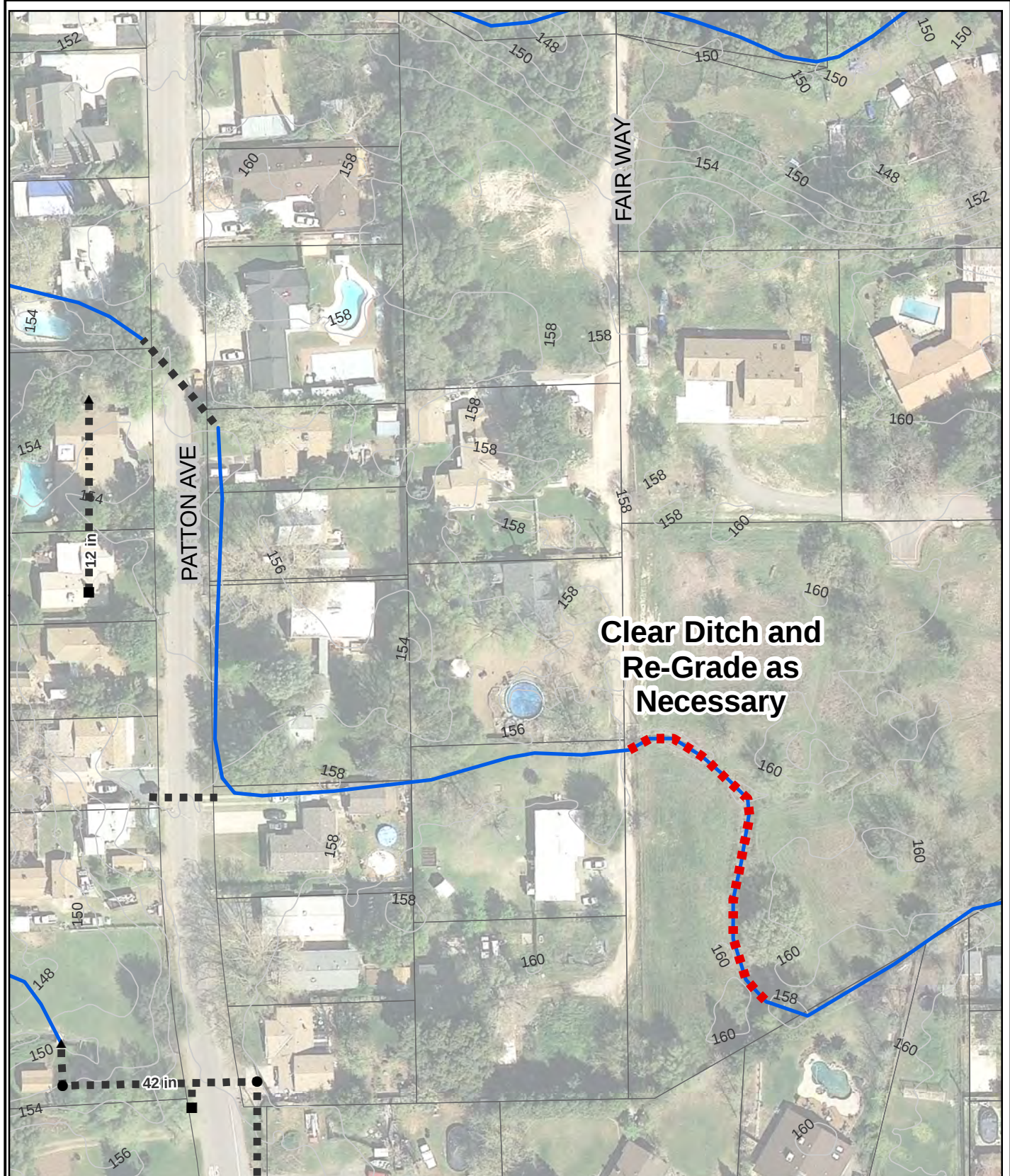


**Figure 7-18**

**City of Citrus Heights  
Neighborhoods 6 and 7  
Drainage Master Plan Study**

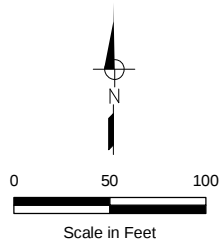
**Problem Location 15**





# **LEGEND**

- Stream or Channel
- - - - - Existing Drain Pipe
- Existing Inlet
- ▲ Existing Outfall
- Existing Manhole
- - - - - Cleared and Re-Graded Channel
- Elevation Contour (NAV88)

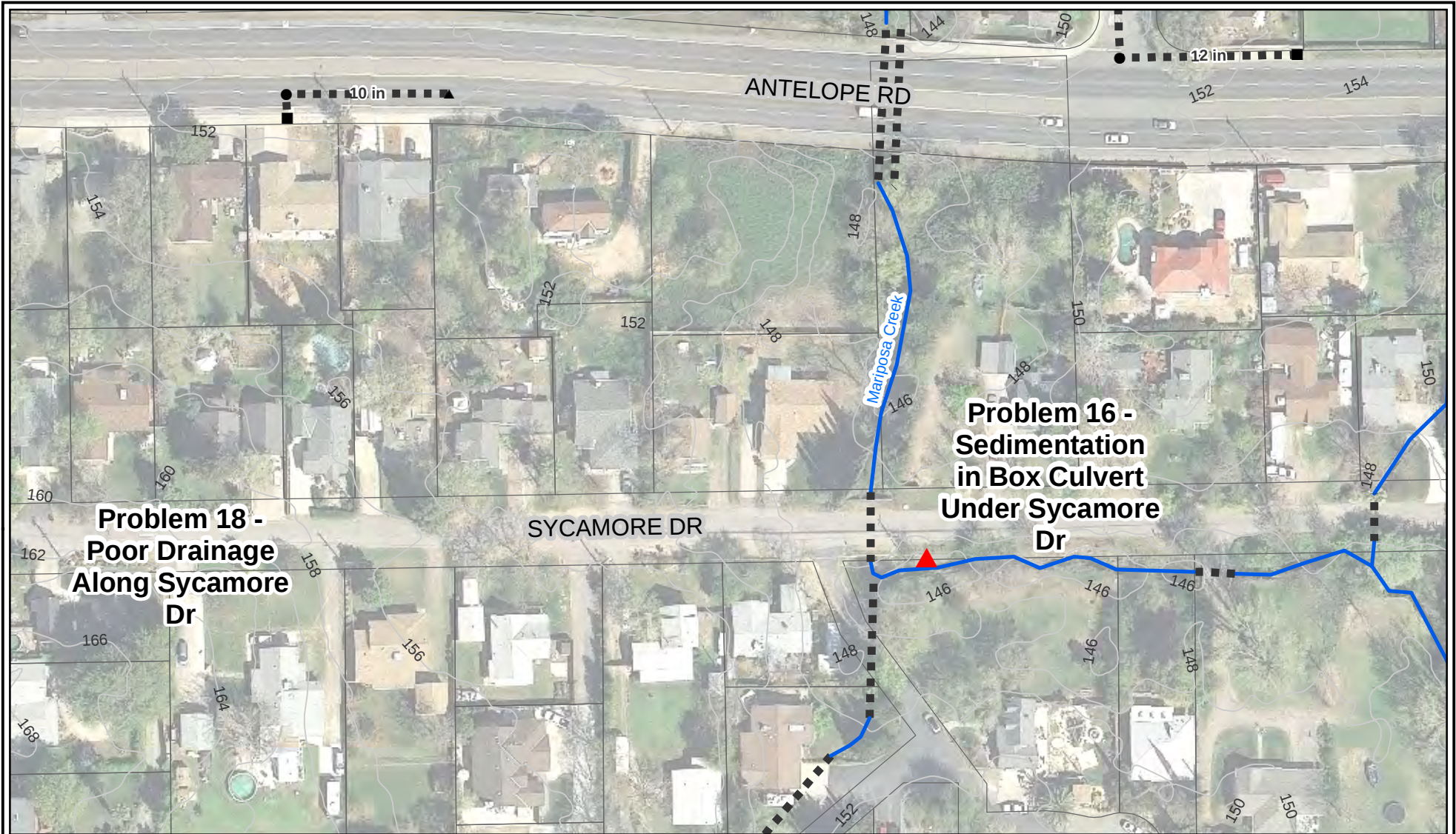


**Figure 7-19**

**City of Citrus Heights  
Neighborhoods 6 and 7  
Drainage Master Plan Study**

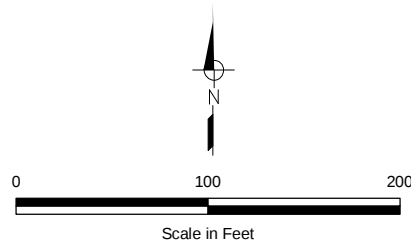
**Problem Location 15  
Proposed Solution**





# LEGEND

- Stream or Channel
- Existing Drain Pipe
- Existing Inlet
- ▲ Existing Outfall
- Existing Manhole
- Elevation Contour (NAV88)



**Figure 7-20**

**City of Citrus Heights  
Neighborhoods 6 and 7  
Drainage Master Plan Study**

**Problem Locations 16 and 18**

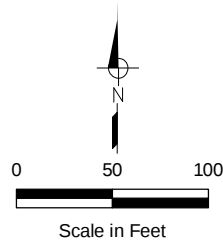


**WEST YOST  
ASSOCIATES**  
Consulting Engineers



# **LEGEND**

- Stream or Channel
- - - - - Existing Drain Pipe
- Existing Inlet
- ▲ Existing Outfall
- Existing Manhole
- Elevation Contour (NAV88)
- Proposed Stem Wall



**Figure 7-21**

**City of Citrus Heights  
Neighborhoods 6 and 7  
Drainage Master Plan Study**

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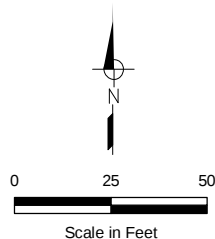
**Problem Locations 16 and 18  
Proposed Solution**





# **LEGEND**

- Existing Drain Pipe
- Existing Inlet
- ▲ Existing Outfall
- Existing Manhole
- - - Proposed Ditch
- Elevation Contour (NAV88)

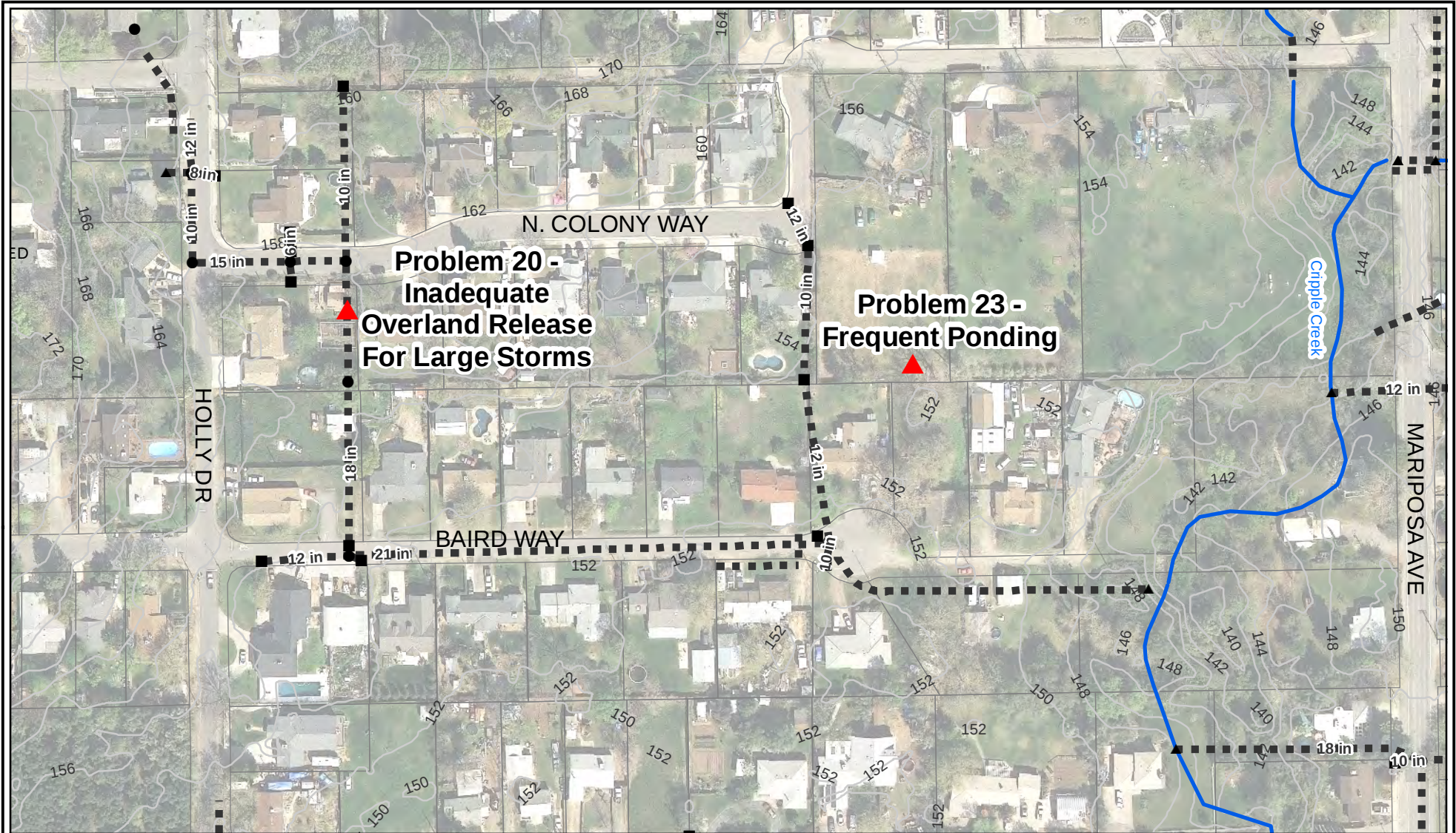


**Figure 7-22**

**City of Citrus Heights  
Neighborhoods 6 and 7  
Drainage Master Plan Study**

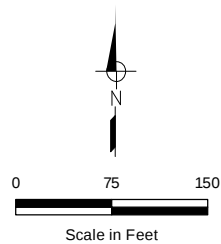
**Problem Location 19  
and Proposed Solution**





# LEGEND

- Stream or Channel
- - - - - Existing Drain Pipe
- Existing Inlet
- ▲ Existing Outfall
- Existing Manhole
- Elevation Contour (NAV88)



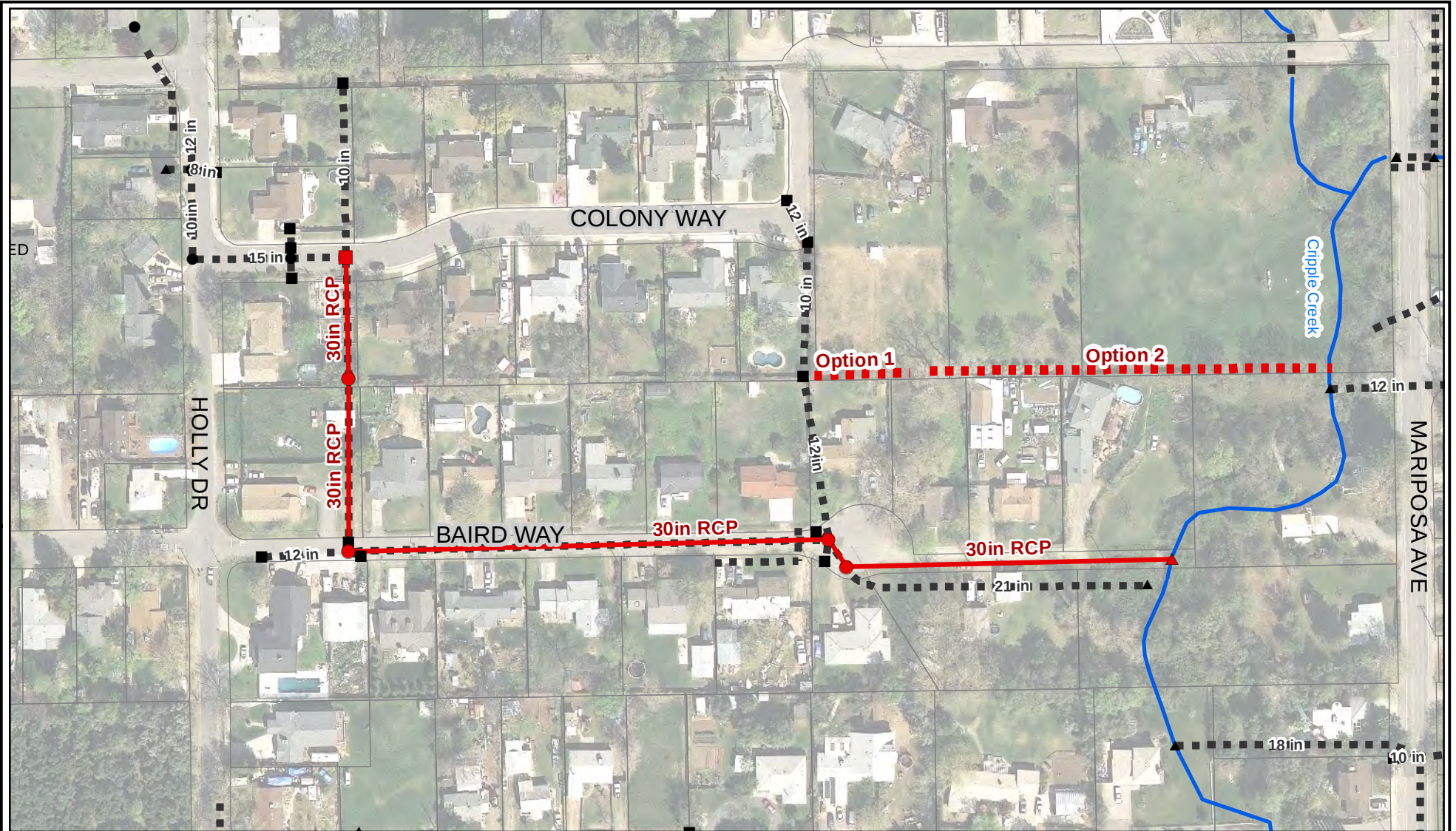
**Figure 7-23**

**City of Citrus Heights  
Neighborhoods 6 and 7  
Drainage Master Plan Study**

**Problem Locations 20 and 23**



**WEST YOST  
ASSOCIATES**  
Consulting Engineers



# LEGEND

- |  |                           |  |                   |
|--|---------------------------|--|-------------------|
|  | Stream or Channel         |  | Proposed Pipeline |
|  | Existing Drain Pipe       |  | Proposed Ditch    |
|  | Existing Inlet            |  | Proposed Inlet    |
|  | Existing Outfall          |  | Proposed Outfall  |
|  | Existing Manhole          |  | Proposed Manhole  |
|  | Elevation Contour (NAV88) |  |                   |

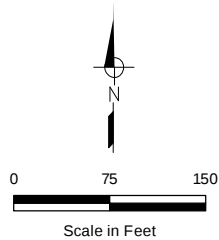


Figure 7-24

City of Citrus Heights  
Neighborhoods 6 and 7  
Drainage Master Plan Study

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Problem Locations 20 and 23  
Proposed Solutions



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12/14/2011 9:43 AM mkubik

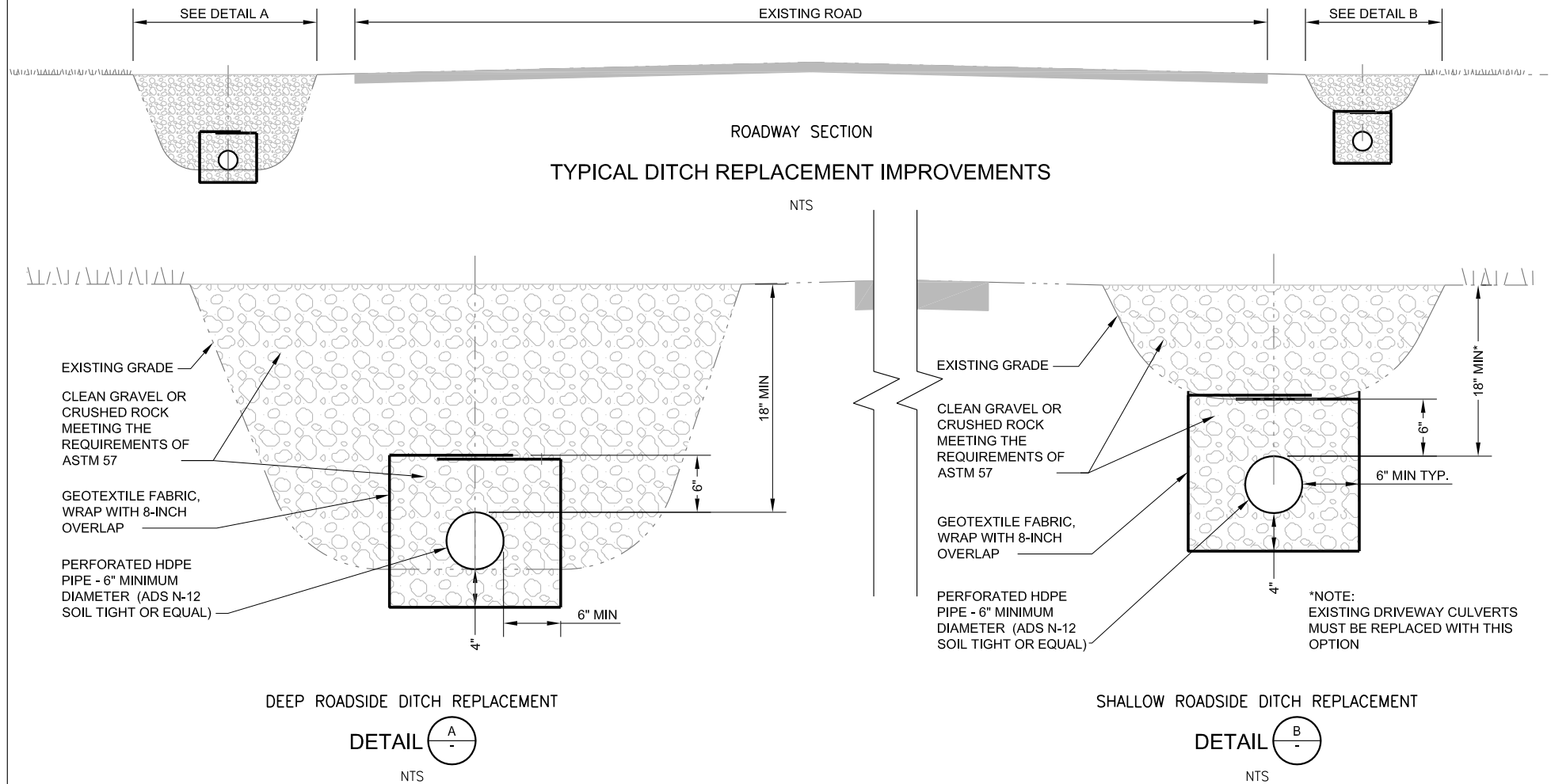


Figure 7-25

City of Citrus Heights  
Neighborhoods 6 and 7 Drainage Master Plan Study  
Ditch Replacement Detail



## **CHAPTER 8**

### **Capital Improvement Program**

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The flooding and drainage problems and recommended improvements have been described in previous chapters. This chapter provides a summary of the recommended improvements, the cost of the improvements, and the priorities for the implementation of the improvements based on the criteria described below.

#### **8.1 PRIORITIZATION CRITERIA**

The recommended improvements have been separated into three categories: high priority; medium priority; and low priority. The criteria used to define the priority of a given set of improvements are as follows:

##### **8.1.1 High Priority Improvements**

The high priority improvements include those that address potential structure flooding, threats to health and safety, serious traffic hazards, and those that have a very high benefit to cost ratio. The benefit-cost ratios were determined qualitatively; formal determinations of damages and benefits were not performed.

##### **8.1.2 Medium Priority Improvements**

Medium priority improvements include those that address potential flooding of lesser structures (e.g., garages, outbuildings), chronic ponding over significant areas, and problems that require excessive maintenance.

##### **8.1.3 Low Priority Improvements**

Low priority improvements include those that address minor or occasional ponding and nuisance drainage issues.

#### **8.2 CAPITAL IMPROVEMENT PROGRAM**

Costs for recommended improvements within each priority classification are presented in Table 8-1. Also shown on the table are the estimated implementation dates for the improvements. As indicated previously in this report, the cost estimates presented in the table are master planning level estimates suitable for decision making and budgeting purposes. More detailed cost estimates will be prepared to a greater level of accuracy as the projects advance to the design stage and more detailed information is developed.

| <b>Table 8-1. Summary of Implementation Dates and Costs for Proposed Solutions</b> |                                                                          |                                             |                                      |                                                   |
|------------------------------------------------------------------------------------|--------------------------------------------------------------------------|---------------------------------------------|--------------------------------------|---------------------------------------------------|
| <b>Problem Location Number</b>                                                     | <b>Solution Description</b>                                              | <b>Figure Showing Proposed Improvements</b> | <b>Estimated Implementation Date</b> | <b>Total Estimated Improvements Cost, dollars</b> |
| <b>High Priority</b>                                                               |                                                                          |                                             |                                      |                                                   |
| 1                                                                                  | Linden Avenue and Auburn Boulevard diversion pipe                        | 7-3                                         | 2012                                 | 892,000                                           |
| 2, 3, and 11                                                                       | Twin Oaks and Mariposa diversion pipe                                    | 7-5                                         | 2014                                 | 1,196,000                                         |
| 8, 9, and 13                                                                       | Watson Way 10-year pipe improvements (Option 3)                          | 7-11C                                       | 2013                                 | 980,000                                           |
| 12                                                                                 | Poppy Way side and back yard ditch and pipe improvements                 | 7-15                                        | 2012                                 | 25,400                                            |
| 22                                                                                 | Add grate to inlet along Patton Way                                      | 7-9                                         | 2012                                 | 3,500                                             |
| <b>Total Estimated Cost of High Priority Improvements</b>                          |                                                                          |                                             |                                      | <b>3,096,900</b>                                  |
| <b>Medium Priority</b>                                                             |                                                                          |                                             |                                      |                                                   |
| 4 and 21                                                                           | Side yard ditch or pipe improvements and culvert upsizing on Cedar Drive | 7-7                                         | 2012                                 | 72,000                                            |
| 5, 6, and 7                                                                        | Patton Avenue and Glenn Avenue improvements                              | 7-9                                         | 2013                                 | 501,000                                           |
| 17                                                                                 | Upsize outfall pipe at Glenn Ave. and Mariposa Ave.                      | 7-9                                         | 2012                                 | 107,000                                           |
| 14                                                                                 | Canyon Oaks Drive overland release improvements                          | 7-17                                        | 2014                                 | 274,400                                           |
| 16                                                                                 | Curb and gutter on Sycamore Drive                                        | 7-21                                        | 2012                                 | 414,800                                           |
| 18                                                                                 | Stem wall on Cripple Creek culvert at Sycamore Drive                     | 7-21                                        | 2012                                 | 26,000                                            |
| 20                                                                                 | Pipe improvements along Baird Way                                        | 7-24                                        | 2015                                 | 429,400                                           |
| 24                                                                                 | Pipe improvements along Loleta Avenue                                    | 7-24                                        | 2012                                 | 63,000                                            |
| 25                                                                                 | Drainage system improvements along Sunrise Blvd.                         | n/a                                         | 2012                                 | 53,000                                            |
| 26                                                                                 | Backyard ponding on Reno Lane                                            | 7-11C                                       | 2012                                 | 23,000                                            |
| <b>Total Estimated Cost of Medium Priority Improvements</b>                        |                                                                          |                                             |                                      | <b>1,963,600</b>                                  |
| <b>Low Priority</b>                                                                |                                                                          |                                             |                                      |                                                   |
| 10                                                                                 | Hansen Avenue and Glen Tree Drive 10-year diversion (Option 2)           | 7-13B                                       | TBD                                  | TBD                                               |
| 15                                                                                 | Ditch clearing and grading near Fair Way                                 | 7-19                                        | 2012                                 | 8,300                                             |
| 19                                                                                 | Ditch grading in lot on Twin Oaks                                        | 7-22                                        | 2012                                 | 1,700                                             |
| 23                                                                                 | Ditch grading near Colony Way (Option 1)                                 | 7-9                                         | 2013                                 | 12,100                                            |
| <b>Total Estimated Cost of Low Priority Improvements</b>                           |                                                                          |                                             |                                      | <b>22,100</b>                                     |
| <b>Total Estimated Cost of All Improvements</b>                                    |                                                                          |                                             |                                      | <b>5,082,600</b>                                  |

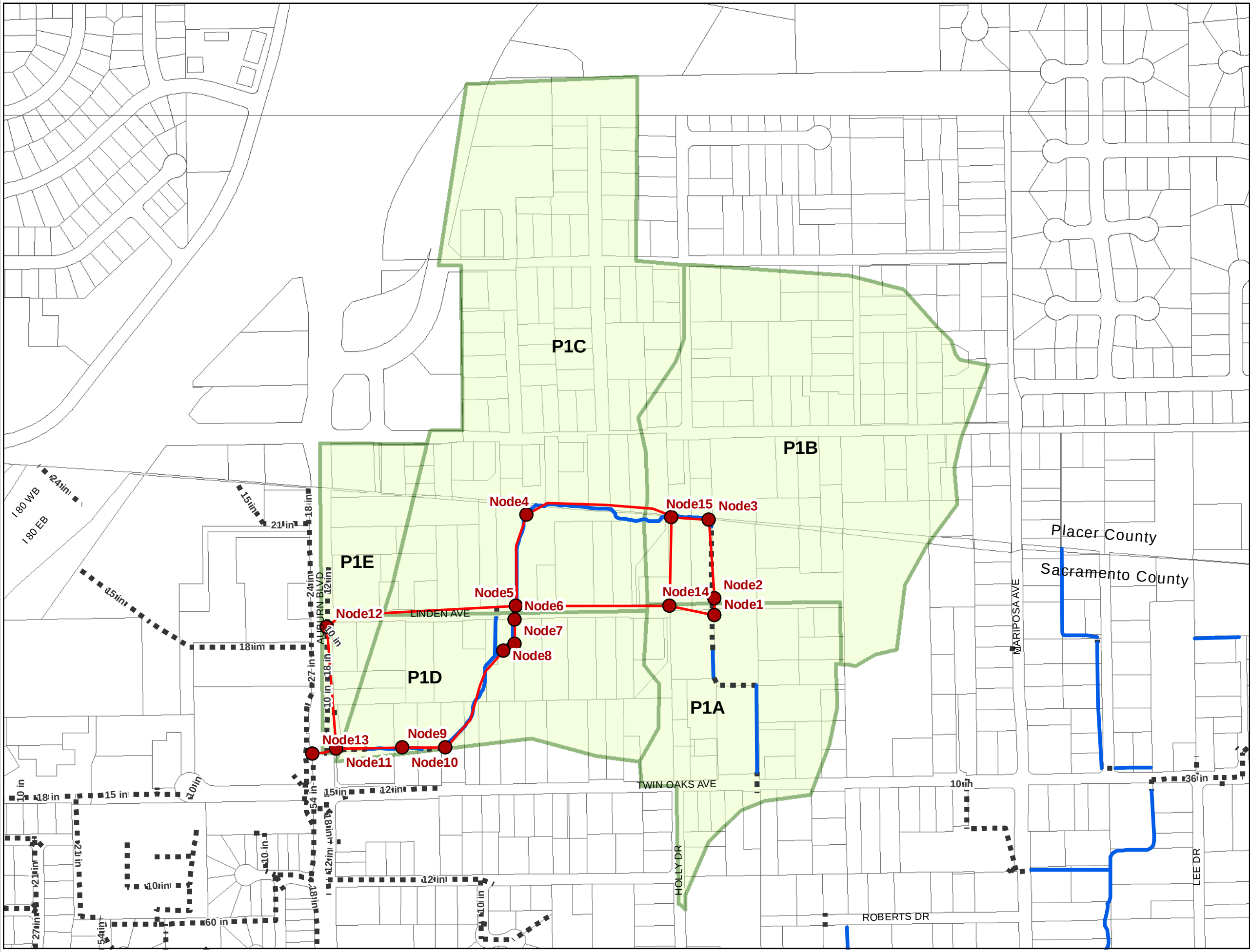
## **APPENDIX A**

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### Hydraulic Calculations for Proposed Solutions

Table A-1. Peak Flows for Problem Locations

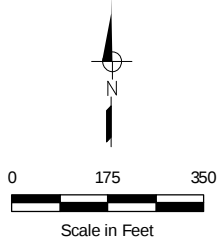
| Contributing Subshed           | Upstream Node | Downstream Node | Contributing Area (acres) by Land-Use Type and/or Percent Impervious |              |      |      |      |      |      | Subshed Total |        | Cumulative Total at Node |        |                 |                    |                     |
|--------------------------------|---------------|-----------------|----------------------------------------------------------------------|--------------|------|------|------|------|------|---------------|--------|--------------------------|--------|-----------------|--------------------|---------------------|
|                                |               |                 | Comm./ Office                                                        | Apts./ RD-20 | RD-5 | RD-4 | RD-3 | RD-2 | RD-1 | Area (acres ) | % Imp. | Area (acres)             | % Imp. | Pipe Flow (cfs) | 10-Year Flow (cfs) | 100-Year Flow (cfs) |
|                                |               |                 | 90%                                                                  | 80%          | 50%  | 40%  | 30%  | 25%  | 20%  |               |        |                          |        | Nolte Zone 1    | Sac. Method Zone 3 | Sac. Method Zone 3  |
| Problem Location 1             |               |                 |                                                                      |              |      |      |      |      |      |               |        |                          |        |                 |                    |                     |
| P1A                            | Node1         | Node3           | -                                                                    | -            | -    | -    | -    | 12.5 | -    | 12.5          | 25.0   | 12.5                     | 25.0   | 3.6             | n/a                | 22.0                |
| P1B                            | Node3         | Node4           | -                                                                    | -            | -    | -    | -    | 31.4 | -    | 31.4          | 25.0   | 43.9                     | 25.0   | 14.6            | n/a                | 62.0                |
| P1C                            | Node4         | Node9           | -                                                                    | -            | -    | -    | -    | 36.0 | -    | 36.0          | 25.0   | 79.9                     | 25.0   | 32.4            | n/a                | 99.0                |
| P1D                            | Node9         | Node11          | -                                                                    | -            | -    | -    | -    | 12.8 | -    | 12.8          | 25.0   | 92.7                     | 25.0   | 40.0            | n/a                | 115.0               |
| P1E                            | Node12        | Node11          | -                                                                    | -            | 6.1  | -    | -    | -    | -    | 6.1           | 50.0   | 6.1                      | 50.0   | 1.7             | n/a                | 13.0                |
| -                              | Node11        | Node13          | -                                                                    | -            | -    | -    | -    | -    | -    | -             | -      | 98.8                     | 26.5   | 41.7            | n/a                | 128.0               |
| Problem Locations 2, 3, and 11 |               |                 |                                                                      |              |      |      |      |      |      |               |        |                          |        |                 |                    |                     |
| SD1A                           | SD1-A1        | SD1-A           | -                                                                    | -            | -    | -    | 56.3 | -    | -    | 56.3          | 30.0   | 56.3                     | 30.0   | 20.7            | n/a                | 80.0                |
| SD1A-2                         | SD1-A         | SD1-B           | -                                                                    | -            | -    | -    | 1.6  | -    | -    | 1.6           | 30.0   | 57.9                     | 30.0   | 21.5            | n/a                | 82.0                |
| SD1-B                          | SD1-B         | J10-1           | -                                                                    | -            | -    | -    | 21.2 | -    | -    | 21.2          | 30.0   | 79.1                     | 30.0   | 32.0            | n/a                | 104.0               |
| P2C & P2D                      | J2CD          | J10-1           | -                                                                    | -            | -    | -    | -    | -    | 14.0 | 14.0          | 20.0   | 14.0                     | 20.0   | 4.0             | n/a                | 24.7                |
| P10-1                          | J10-1         | J10-2           | -                                                                    | -            | -    | -    | -    | -    | 3.8  | 3.8           | 20.0   | 96.9                     | 28.2   | 42.6            | n/a                | 117.0               |
| P2E                            | P2E           | J10-2           | -                                                                    | -            | -    | -    | -    | -    | 2.3  | 2.3           | 20.0   | 2.3                      | 20.0   | 0.6             | n/a                | 6.0                 |
| P10-2                          | J10-2         | J10-3           | -                                                                    | -            | -    | -    | -    | -    | 7.0  | 7.0           | 20.0   | 106.2                    | 27.5   | 49.8            | n/a                | 130.0               |
| P10-3                          | J10-3         | END             | -                                                                    | -            | -    | -    | -    | -    | 4.3  | 4.3           | 20.0   | 110.5                    | 27.2   | 53.5            | n/a                | 137.0               |
| P2A                            | SD2-A         | J2              | -                                                                    | -            | -    | -    | -    | -    | 9.7  | 9.7           | 20.0   | 9.7                      | 20.0   | 2.7             | n/a                | 18.0                |
| SD2B                           | J2            | SD2E            | -                                                                    | -            | -    | -    | -    | -    | 5.5  | 5.5           | 20.0   | 15.2                     | 20.0   | 4.4             | n/a                | 26.4                |
| SD2C                           | SD2E          | END             | -                                                                    | -            | -    | -    | -    | -    | 5.3  | 5.3           | 20.0   | 20.5                     | 20.0   | 5.8             | n/a                | 38.0                |
| -                              | END           | END-A           | -                                                                    | -            | -    | -    | -    | -    | -    | -             | -      | 131.0                    | 26.0   | 74.4            | n/a                | 155.0               |
| Problem Locations 4 and 21     |               |                 |                                                                      |              |      |      |      |      |      |               |        |                          |        |                 |                    |                     |
| SD5A & SD5B                    | SD5-A         | SD5-B           | -                                                                    | -            | -    | -    | -    | 5.6  | 7.8  | 13.4          | 22.1   | 13.4                     | 22.1   | 3.8             | n/a                | 26.0                |
| SD5C                           | SD5-B         | SD5-E           | -                                                                    | -            | -    | -    | -    | 1.8  | -    | 1.8           | 25.0   | 15.2                     | 25.0   | 4.4             | n/a                | 28.0                |
| SD5D                           | SD5-E         | SD5-C           | -                                                                    | -            | -    | -    | -    | -    | 10.4 | 10.4          | 20.0   | 10.4                     | 20.0   | 2.9             | n/a                | 20.0                |
| -                              | SD5-C         | SD5-D           | -                                                                    | -            | -    | -    | -    | -    | -    | 0.0           | -      | 25.6                     | 21.4   | 7.6             | n/a                | 48.0                |
| Problem Locations 6 and 7      |               |                 |                                                                      |              |      |      |      |      |      |               |        |                          |        |                 |                    |                     |
| WS6A                           | SD6-A         | SD6-B           | 6.4                                                                  | 32.2         | -    | -    | 25.7 | -    | -    | 64.3          | 61.0   | 64.3                     | 61.0   | 26.5            | n/a                | 104.0               |
| WS6B                           | SD6-B         | SD6-C           | -                                                                    | -            | -    | -    | -    | 6.6  | 6.6  | 13.2          | 22.5   | 77.5                     | 54.4   | 31.9            | n/a                | 115.0               |
| WS6-C1                         | SD6-C1        | SD6-C3          | -                                                                    | -            | 10.2 | -    | -    | 10.2 | -    | 20.3          | 37.5   | 20.3                     | 37.5   | 5.9             | n/a                | 25.0                |
| -                              | SD6C3         | SD6D            | -                                                                    | -            | -    | -    | -    | -    | -    | -             | -      | 97.8                     | 50.9   | 43.3            | n/a                | 140.0               |
| WS6D                           | SD6-D1        | SD6-DE          | -                                                                    | -            | -    | -    | 18.1 | -    | -    | 18.1          | 30.0   | 115.9                    | 47.7   | 58.9            | n/a                | 150.0               |
| P17A                           | SD6-P2        | SD6-P3          | -                                                                    | -            | -    | -    | -    | 12.0 | -    | 12.0          | 25.0   | 12.0                     | 25.0   | 3.4             | n/a                | 23.0                |
| P17B                           | SD6-P3        | SD6-P6          | -                                                                    | -            | -    | -    | -    | 1.4  | -    | 1.4           | 25.0   | 13.4                     | 25.0   | 3.8             | n/a                | 25.0                |
| P17C                           | SD6-P6        | SD6-P5          | -                                                                    | -            | -    | -    | -    | 5.2  | -    | 5.2           | 25.0   | 18.6                     | 25.0   | 5.4             | n/a                | 34.0                |
| Problem Locations 8, 9, and 13 |               |                 |                                                                      |              |      |      |      |      |      |               |        |                          |        |                 |                    |                     |
| P8A                            | P8A           | J8B             | -                                                                    | -            | -    | 4.6  | -    | -    | -    | 4.6           | 40.0   | 4.6                      | 40.0   | 1.3             | 7.0                | 11.0                |
| P8B                            | J8B           | J8C             | -                                                                    | -            | -    | 0.9  | -    | -    | -    | 0.9           | 40.0   | 5.5                      | 40.0   | 1.5             | 9.0                | 13.0                |
| P8C                            | J8C           | J8D             | -                                                                    | -            | -    | 2.5  | -    | -    | -    | 2.5           | 40.0   | 8.0                      | 40.0   | 2.2             | 12.0               | 18.0                |
| P8D                            | J8D           | J8E             | -                                                                    | -            | -    | 1.7  | -    | -    | -    | 1.7           | 40.0   | 9.7                      | 40.0   | 2.7             | 14.0               | 21.0                |
| P8E                            | J8E           | J8F             | -                                                                    | -            | -    | 1.0  | -    | -    | -    | 1.0           | 40.0   | 10.7                     | 40.0   | 3.0             | 15.5               | 22.0                |
| P8F                            | J8F           | J8G             | -                                                                    | -            | -    | 1.6  | -    | -    | -    | 1.6           | 40.0   | 12.3                     | 40.0   | 3.5             | 17.0               | 25.0                |
| P8G                            | J8G           | Outfall         | -                                                                    | -            | -    | 1.3  | -    | -    | -    | 1.3           | 40.0   | 13.6                     | 40.0   | 3.9             | 18.2               | 27.0                |
| Problem Location 10            |               |                 |                                                                      |              |      |      |      |      |      |               |        |                          |        |                 |                    |                     |
| P10A                           | P10A          | P10D            | 2.6                                                                  | -            | -    | -    | 9.4  | -    | -    | 12.0          | 43.0   | 12.0                     | 43.0   | 3.4             | 16.0               | 22.0                |
| P10B                           | P10D          | P10H            | -                                                                    | -            | -    | -    | -    | 4.3  | -    | 4.3           | 25.0   | 16.3                     | 38.3   | 4.6             | 22.5               | 32.0                |
| P10C                           | P10I          | P10H            | -                                                                    | -            | -    | -    | -    | 9.0  | -    | 9.0           | 25.0   | 9.0                      | 25.0   | 2.7             | 12.5               | 18.0                |
| P10D                           | P10H          | P10K            | -                                                                    | -            | -    | -    | -    | 9.2  | -    | 9.2           | 25.0   | 34.5                     | 31.3   | 9.1             | 47.5               | 68.0                |
| P10E                           | P10K          | P10M            | -                                                                    | -            | -    | -    | -    | 2.8  | -    | 2.8           | 25.0   | 37.3                     | 30.8   | 10.2            | 52.5               | 76.0                |
| Problem Location 12            |               |                 |                                                                      |              |      |      |      |      |      |               |        |                          |        |                 |                    |                     |
| P12A                           | P12A          | J12AB           | -                                                                    | -            | -    | 1.7  | -    | -    | -    | 1.7           | 40.0   | 1.7                      | 40.0   | 0.5             | 3.0                | 5.0                 |
| P12B                           | J12AB         | Out             | -                                                                    | -            | -    | 1.7  | -    | -    | -    | 1.7           | 40.0   | 3.4                      | 40.0   | 1.0             | 6.0                | 9.0                 |
| Problem Location 23 - Option 1 |               |                 |                                                                      |              |      |      |      |      |      |               |        |                          |        |                 |                    |                     |
| P23A                           | 23A           | Existing 12"    | -                                                                    | -            | -    | -    | -    | -    | 0.8  | 0.8           | 20.0   | 0.8                      | 20.0   | 0.4             | 2.0                | 3.2                 |
| Problem Location 23 - Option 2 |               |                 |                                                                      |              |      |      |      |      |      |               |        |                          |        |                 |                    |                     |
| P23A                           | 23A           | 23B             | -                                                                    | -            | -    | -    | -    | 2.3  | 2.3  | 20.0          | 2.3    | 20.0                     | 0.7    | 4.1             | 6.1                |                     |
| P23B                           | 23B           | Out             | -                                                                    | -            | -    | -    | -    | -    | 1.0  | 1.0           | 20.0   | 3.3                      | 20.0   | 0.9             | 5.8                | 8.0                 |
| Problem Location 24            |               |                 |                                                                      |              |      |      |      |      |      |               |        |                          |        |                 |                    |                     |
| P24A                           | P24A          | P24B            | -                                                                    | -            | -    | -    | -    | 1.4  | -    | 1.4           | 25.0   | 1.4                      | 25.0   | 0.5             | 3.5                | 4.5                 |
| P24B                           | P24B          | Existing 18"    | -                                                                    | -            | -    | -    | -    | 2.3  | -    | 2.3           | 25.0   | 3.7                      | 25.0   | 1.1             | 6.0                | 8.3                 |



**FIGURE A1**

**City of Citrus Heights  
Neighborhoods 6 and 7  
Drainage Master Plan Study**

**PROBLEM LOCATION 1  
SUBSHEDS AND  
XPSWMM MODEL LAYOUT**



- LEGEND**
- Modeled Node
  - Modeled Link
  - Stream or Channel
  - Existing Drain Pipe
  - Subshed Boundary



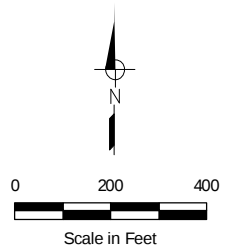
**Table A-2. Problem Location 1 XPSWMM Node Data and Results**

| Node Name | Existing Conditions                 |                                     |                                          |                                             | Proposed Solution                   |                                     |                                          |                                             | Change in Water Surface Elevation |          |
|-----------|-------------------------------------|-------------------------------------|------------------------------------------|---------------------------------------------|-------------------------------------|-------------------------------------|------------------------------------------|---------------------------------------------|-----------------------------------|----------|
|           | Modeled Ground Elevation (ft, NAVD) | Modeled Invert Elevation (ft, NAVD) | Nolte Water Surface Elevation (ft, NAVD) | 100-Year Water Surface Elevation (ft, NAVD) | Modeled Ground Elevation (ft, NAVD) | Modeled Invert Elevation (ft, NAVD) | Nolte Water Surface Elevation (ft, NAVD) | 100-Year Water Surface Elevation (ft, NAVD) | Nolte                             | 100-Year |
| Node1     | 164.20                              | 160.10                              | 164.01                                   | 164.37                                      | 164.20                              | 155.50                              | 158.31                                   | 164.24                                      | -5.70                             | -0.13    |
| Node2     | 163.00                              | 160.00                              | 163.14                                   | 163.57                                      | 163.00                              | 160.00                              | 160.00                                   | 160.96                                      | -3.14                             | -2.61    |
| Node3     | 162.10                              | 158.10                              | 160.41                                   | 161.04                                      | 162.10                              | 158.10                              | 159.83                                   | 160.96                                      | -0.58                             | -0.09    |
| Node4     | 159.40                              | 155.40                              | 157.70                                   | 159.11                                      | 159.40                              | 155.40                              | 157.51                                   | 159.01                                      | -0.19                             | -0.10    |
| Node5     | 157.80                              | 153.80                              | 156.52                                   | 157.32                                      | 157.80                              | 151.00                              | 154.48                                   | 157.20                                      | -2.04                             | -0.12    |
| Node6     | 156.10                              | 152.10                              | 155.82                                   | 156.27                                      | 156.10                              | 152.10                              | 154.47                                   | 156.03                                      | -1.36                             | -0.24    |
| Node7     | 156.10                              | 152.10                              | 155.79                                   | 156.21                                      | 156.10                              | 152.10                              | 154.46                                   | 155.99                                      | -1.34                             | -0.22    |
| Node8     | 156.10                              | 152.10                              | 155.61                                   | 156.12                                      | 156.10                              | 152.10                              | 154.42                                   | 155.86                                      | -1.19                             | -0.26    |
| Node9     | 154.70                              | 151.00                              | 154.43                                   | 154.72                                      | 154.70                              | 151.00                              | 154.25                                   | 154.57                                      | -0.19                             | -0.15    |
| Node10    | 153.50                              | 150.80                              | 153.87                                   | 154.41                                      | 153.50                              | 150.80                              | 153.62                                   | 154.24                                      | -0.25                             | -0.18    |
| Node11    | 154.00                              | 150.00                              | 153.36                                   | 153.97                                      | 154.00                              | 150.00                              | 153.36                                   | 153.97                                      | 0.00                              | 0.00     |
| Node12    | 156.44                              | 152.93                              | 153.72                                   | 155.70                                      | 156.44                              | 150.50                              | 153.75                                   | 155.61                                      | 0.04                              | -0.09    |
| Node13    | 153.05                              | 147.55                              | 152.48                                   | 152.98                                      | 153.05                              | 147.55                              | 152.48                                   | 152.98                                      | 0.00                              | 0.00     |
| Node14    | 164.10                              | 151.00                              | 163.13                                   | 163.55                                      | 164.10                              | 155.00                              | 157.70                                   | 163.27                                      | -5.43                             | -0.28    |
| Node15    | 162.10                              | 157.50                              | 159.82                                   | 160.60                                      | 162.10                              | 157.50                              | 159.29                                   | 160.39                                      | -0.53                             | -0.21    |

**Table A-3. Problem Location 1 XPSWMM Link Data and Results**

| Name                       | Link Name | Upstream Node Name | Downstream Node Name | Shape       | Diameter (Height) ft | Length ft | Upstream Invert Elevation (ft, NAVD) | Downstream Invert Elevation (ft, NAVD) | Manning's Roughness | Max Nolte Flow cfs | Max Nolte Velocity ft/s | Max 100-Year Flow cfs | Max 100-Year Velocity ft/s |
|----------------------------|-----------|--------------------|----------------------|-------------|----------------------|-----------|--------------------------------------|----------------------------------------|---------------------|--------------------|-------------------------|-----------------------|----------------------------|
| <b>Existing Conditions</b> |           |                    |                      |             |                      |           |                                      |                                        |                     |                    |                         |                       |                            |
| 203.1                      | Link1     | Node1              | Node2                | Circular    | 1.17                 | 50        | 160.10                               | 160.00                                 | 0.024               | 3.6                | 3.3                     | 3.4                   | 3.1                        |
| LINDolr                    | Link13    | Node1              | Node14               | Trapezoidal | 0.00                 | 180       | 164.00                               | 163.11                                 | 0.025               | 0.0                | 0.2                     | 18.6                  | 1.8                        |
| Link2                      | Link2     | Node2              | Node3                | Circular    | 1.25                 | 256       | 160.00                               | 158.10                                 | 0.024               | 3.6                | 2.9                     | 3.4                   | 2.8                        |
| PLCchn                     | Link15    | Node3              | Node15               | Natural     | 0.00                 | 154       | 158.10                               | 157.50                                 | 0.014               | 14.6               | 0.8                     | 43.4                  | 0.8                        |
| Link4                      | Link4     | Node4              | Node5                | Natural     | 0.00                 | 356       | 155.40                               | 153.80                                 | 0.014               | 32.4               | 2.6                     | 99.0                  | 1.7                        |
| Link5A                     | Link5     | Node5              | Node6                | Special     | 2.50                 | 51        | 153.80                               | 152.10                                 | 0.024               | 32.4               | 4.6                     | 39.8                  | 5.7                        |
| Link5B                     | Link5     | Node5              | Node6                | Trapezoidal | 0.00                 | 51        | 157.10                               | 155.10                                 | 0.020               | 0.0                | 0.0                     | 59.2                  | 3.1                        |
| Link6                      | Link6     | Node6              | Node7                | Natural     | 0.00                 | 93        | 152.10                               | 152.10                                 | 0.014               | 32.4               | 0.5                     | 99.0                  | 0.9                        |
| Link7A                     | Link7     | Node7              | Node8                | Circular    | 3.00                 | 50        | 152.10                               | 152.10                                 | 0.024               | 17.2               | 2.4                     | 11.5                  | 1.6                        |
| Link7B                     | Link7     | Node7              | Node8                | Trapezoidal | 0.00                 | 50        | 155.60                               | 155.40                                 | 0.020               | 15.2               | 1.5                     | 87.5                  | 2.3                        |
| Link8                      | Link8     | Node8              | Node9                | Natural     | 0.00                 | 432       | 152.10                               | 151.00                                 | 0.014               | 32.4               | 0.8                     | 99.0                  | 1.1                        |
| Link9A                     | Link9     | Node9              | Node10               | Circular    | 2.50                 | 167       | 151.00                               | 150.80                                 | 0.024               | 11.9               | 2.4                     | 8.9                   | 1.8                        |
| Link9B                     | Link9     | Node9              | Node10               | Trapezoidal | 0.00                 | 167       | 154.20                               | 153.00                                 | 0.020               | 28.1               | 1.6                     | 106.1                 | 2.7                        |
| Link10                     | Link10    | Node10             | Node11               | Natural     | 0.00                 | 244       | 150.80                               | 150.73                                 | 0.014               | 40.0               | 0.6                     | 115.0                 | 1.0                        |
| N11pi                      | Link12    | Node11             | Node13               | Circular    | 3.50                 | 170       | 150.00                               | 147.55                                 | 0.024               | 41.7               | 4.4                     | 42.2                  | 4.2                        |
| N11olr                     | Link12    | Node11             | Node13               | Trapezoidal | 0.00                 | 170       | 153.50                               | 152.00                                 | 0.025               | 0.0                | 0.0                     | 85.8                  | 2.7                        |
| N12pi                      | Link11    | Node12             | Node11               | Circular    | 1.50                 | 466       | 152.93                               | 150.00                                 | 0.015               | 1.7                | 1.7                     | 5.6                   | 3.1                        |
| N12olr                     | Link11    | Node12             | Node11               | Trapezoidal | 0.00                 | 466       | 155.53                               | 153.24                                 | 0.015               | 0.0                | 0.0                     | 7.4                   | 1.2                        |
| LINDchn                    | Link14    | Node14             | Node15               | Trapezoidal | 0.00                 | 339       | 163.11                               | 160.00                                 | 0.014               | 0.0                | 0.6                     | 18.6                  | 3.7                        |
| 207.1                      | Link3     | Node15             | Node4                | Natural     | 0.00                 | 552       | 157.50                               | 155.40                                 | 0.014               | 14.6               | 0.8                     | 62.0                  | 0.8                        |
| <b>Proposed Solution</b>   |           |                    |                      |             |                      |           |                                      |                                        |                     |                    |                         |                       |                            |
| 203.1                      | Link1     | Node1              | Node2                | Circular    | 1.17                 | 50        | 160.10                               | 160.00                                 | 0.024               | 0.0                | -0.5                    | 3.2                   | 3.0                        |
| LINDolr                    | Link13    | Node1              | Node14               | Trapezoidal | 0.00                 | 180       | 164.00                               | 163.11                                 | 0.025               | 0.0                | 0.0                     | 7.0                   | 1.2                        |
| LINDpi                     | Link13    | Node1              | Node14               | Circular    | 2.00                 | 172       | 157.50                               | 157.00                                 | 0.015               | 3.6                | 3.1                     | 15.0                  | 4.7                        |
| Link2                      | Link2     | Node2              | Node3                | Circular    | 1.25                 | 256       | 160.00                               | 158.10                                 | 0.024               | 0.0                | 0.0                     | 0.0                   | 0.0                        |
| PLCchn                     | Link15    | Node3              | Node15               | Natural     | 0.00                 | 154       | 158.10                               | 157.50                                 | 0.014               | 11.0               | 1.1                     | 40.0                  | 0.8                        |
| Link4                      | Link4     | Node4              | Node5                | Natural     | 0.00                 | 356       | 155.40                               | 153.80                                 | 0.014               | 28.8               | 2.8                     | 78.7                  | 1.6                        |
| Link5A                     | Link5     | Node5              | Node6                | Special     | 2.50                 | 51        | 153.80                               | 152.10                                 | 0.024               | 6.9                | 2.9                     | 42.0                  | 6.0                        |
| Link5B                     | Link5     | Node5              | Node6                | Trapezoidal | 0.00                 | 51        | 157.10                               | 155.10                                 | 0.020               | 0.0                | 0.0                     | 15.9                  | 1.4                        |
| N5pi                       | Link17    | Node5              | Node12               | Circular    | 3.50                 | 721       | 152.00                               | 150.50                                 | 0.015               | 25.5               | 3.4                     | 41.1                  | 4.3                        |
| Link6                      | Link6     | Node6              | Node7                | Natural     | 0.00                 | 93        | 152.10                               | 152.10                                 | 0.014               | 6.9                | 0.4                     | 57.9                  | 0.7                        |
| Link7A                     | Link7     | Node7              | Node8                | Circular    | 3.00                 | 50        | 152.10                               | 152.10                                 | 0.024               | 6.9                | 1.2                     | 13.6                  | 1.9                        |
| Link7B                     | Link7     | Node7              | Node8                | Trapezoidal | 0.00                 | 50        | 155.60                               | 155.40                                 | 0.020               | 0.0                | 0.0                     | 44.3                  | 1.9                        |
| Link8                      | Link8     | Node8              | Node9                | Natural     | 0.00                 | 432       | 152.10                               | 151.00                                 | 0.014               | 6.9                | 0.5                     | 57.9                  | 0.9                        |
| Link9A                     | Link9     | Node9              | Node10               | Circular    | 2.50                 | 167       | 151.00                               | 150.80                                 | 0.024               | 12.7               | 2.6                     | 9.2                   | 1.9                        |
| Link9B                     | Link9     | Node9              | Node10               | Trapezoidal | 0.00                 | 167       | 154.20                               | 153.00                                 | 0.020               | 1.8                | 0.3                     | 64.7                  | 2.3                        |
| Link10                     | Link10    | Node10             | Node11               | Natural     | 0.00                 | 244       | 150.80                               | 150.73                                 | 0.014               | 14.5               | 0.4                     | 73.9                  | 0.7                        |
| N11pi                      | Link12    | Node11             | Node13               | Circular    | 3.50                 | 170       | 150.00                               | 147.55                                 | 0.024               | 41.7               | 4.4                     | 42.2                  | 4.2                        |
| N11olr                     | Link12    | Node11             | Node13               | Trapezoidal | 0.00                 | 170       | 153.50                               | 152.00                                 | 0.025               | 0.0                | 0.0                     | 85.8                  | 2.7                        |
| N12pi                      | Link11    | Node12             | Node11               | Circular    | 3.50                 | 466       | 150.50                               | 150.00                                 | 0.015               | 27.2               | 2.9                     | 52.0                  | 5.4                        |
| N12olr                     | Link11    | Node12             | Node11               | Trapezoidal | 0.00                 | 466       | 155.53                               | 153.24                                 | 0.015               | 0.0                | 0.0                     | 2.0                   | 0.5                        |
| LINDchn                    | Link14    | Node14             | Node15               | Trapezoidal | 0.00                 | 339       | 163.11                               | 160.00                                 | 0.014               | 0.0                | 0.0                     | 1.7                   | 1.5                        |
| N14pi                      | Link16    | Node14             | Node5                | Circular    | 2.00                 | 576       | 157.00                               | 154.00                                 | 0.015               | 3.6                | 3.7                     | 20.3                  | 6.4                        |
| 207.1                      | Link3     | Node15             | Node4                | Natural     | 0.00                 | 552       | 157.50                               | 155.40                                 | 0.014               | 11.0               | 1.0                     | 41.7                  | 0.7                        |

## PROBLEM LOCATIONS 2, 3, AND 11 SUBSHEDS AND XPSWMM MODEL LAYOUT



- Modeled Node
- Modeled Link
- Stream or Channel
- Subshed Boundary

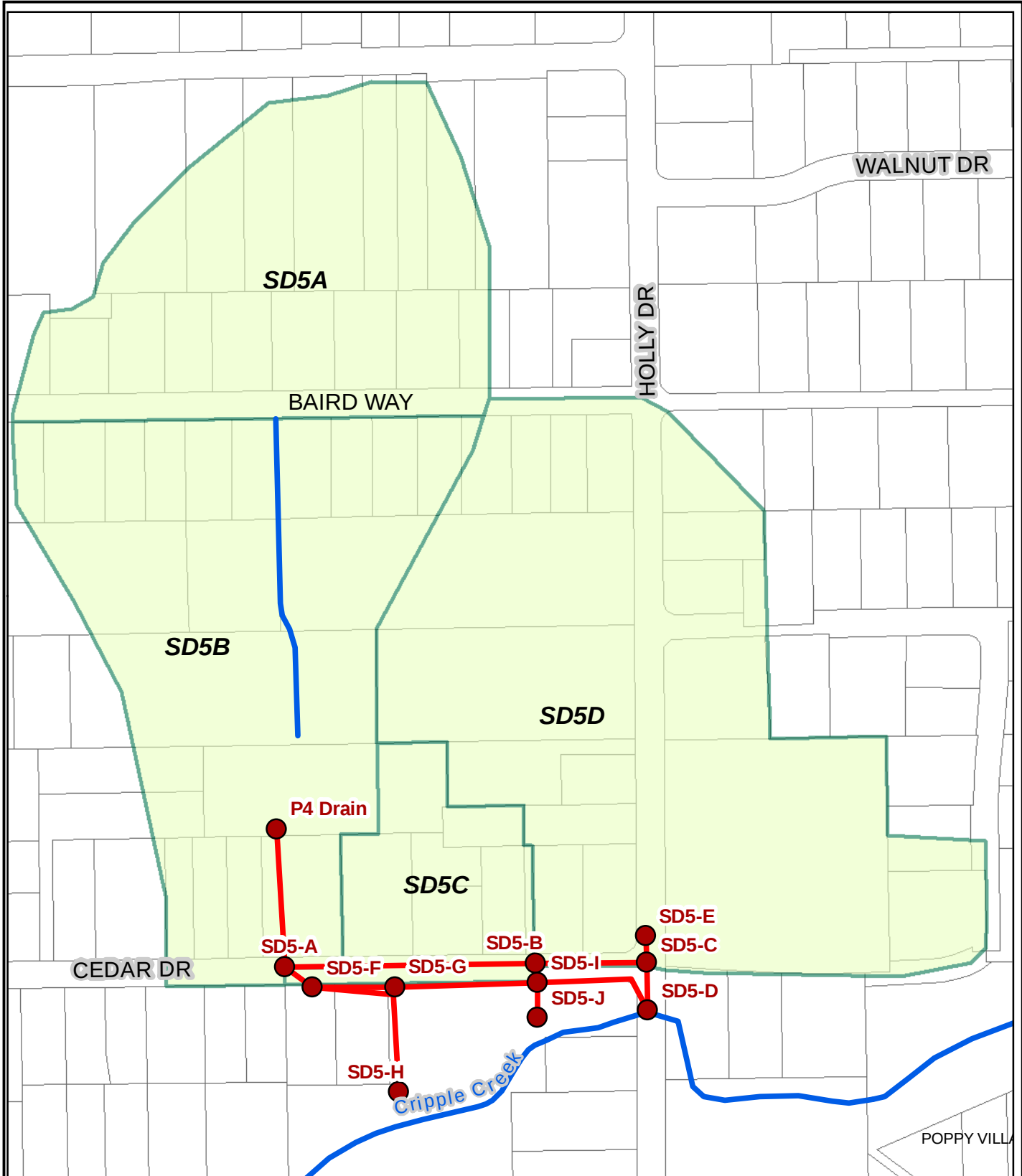


**Table A-4. Problem Locations 2, 3, and 11 XPSWMM Node Data and Results**

| Node Name | Existing Conditions                 |                                     |                                          |                                             | Proposed Solution                   |                                     |                                          |                                             | Change in Water Surface Elevation |          |
|-----------|-------------------------------------|-------------------------------------|------------------------------------------|---------------------------------------------|-------------------------------------|-------------------------------------|------------------------------------------|---------------------------------------------|-----------------------------------|----------|
|           | Modeled Ground Elevation (ft, NAVD) | Modeled Invert Elevation (ft, NAVD) | Nolte Water Surface Elevation (ft, NAVD) | 100-Year Water Surface Elevation (ft, NAVD) | Modeled Ground Elevation (ft, NAVD) | Modeled Invert Elevation (ft, NAVD) | Nolte Water Surface Elevation (ft, NAVD) | 100-Year Water Surface Elevation (ft, NAVD) | Nolte                             | 100-Year |
| SD1-A1    | 161.20                              | 153.85                              | 159.66                                   | 160.13                                      | 161.20                              | 153.85                              | 157.46                                   | 160.13                                      | -2.20                             | 0.00     |
| SD1-A     | 160.12                              | 153.82                              | 159.40                                   | 159.95                                      | 160.12                              | 153.82                              | 157.19                                   | 159.95                                      | -2.21                             | 0.00     |
| SD1-B     | 159.34                              | 153.75                              | 158.67                                   | 159.07                                      | 159.34                              | 153.75                              | 156.50                                   | 158.99                                      | -2.17                             | -0.09    |
| SD1-C     | 158.64                              | 153.35                              | 158.64                                   | 158.99                                      | 158.64                              | 153.35                              | 155.41                                   | 158.87                                      | -3.22                             | -0.12    |
| Node21    | 158.64                              | 153.20                              | 155.07                                   | 155.65                                      | 158.64                              | 153.20                              | 154.57                                   | 155.26                                      | -0.50                             | -0.39    |
| J10-1     | 157.66                              | 154.20                              | 154.98                                   | 155.42                                      | 157.66                              | 154.20                              | 154.57                                   | 155.05                                      | -0.41                             | -0.38    |
| J10-2     | 153.02                              | 149.66                              | 150.82                                   | 151.69                                      | 153.02                              | 149.66                              | 150.27                                   | 150.70                                      | -0.55                             | -0.99    |
| J10-3     | 150.60                              | 147.00                              | 150.53                                   | 151.45                                      | 150.60                              | 147.00                              | 148.24                                   | 149.61                                      | -2.29                             | -1.84    |
| J10-3A    | 149.15                              | 145.00                              | 147.60                                   | 148.26                                      | 149.15                              | 145.00                              | 147.67                                   | 148.29                                      | 0.07                              | 0.03     |
| Node22    | 150.00                              | 147.00                              | 147.83                                   | 148.46                                      | 150.00                              | 146.00                              | 147.61                                   | 148.75                                      | -0.22                             | 0.28     |
| J10-3B    | 145.58                              | 141.32                              | 144.82                                   | 147.31                                      | 145.58                              | 141.32                              | 144.82                                   | 147.31                                      | 0.00                              | 0.00     |
| J2CD      | 158.97                              | 152.00                              | 158.59                                   | 158.88                                      | 158.97                              | 150.00                              | 151.81                                   | 156.40                                      | -6.78                             | -2.48    |
| P2E       | 157.23                              | 147.00                              | 156.72                                   | 156.94                                      | 157.23                              | 147.50                              | 149.49                                   | 153.75                                      | -7.23                             | -3.19    |
| SD2-A     | 163.26                              | 157.91                              | 159.01                                   | 162.16                                      | 163.26                              | 157.91                              | 159.17                                   | 162.16                                      | 0.16                              | 0.00     |
| J2        | 163.00                              | 157.65                              | 158.72                                   | 161.84                                      | 163.00                              | 157.65                              | 158.96                                   | 161.84                                      | 0.24                              | 0.00     |

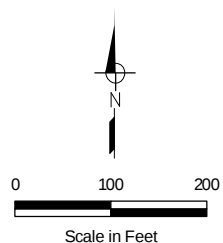
Table A-5. Problem Locations 2, 3, and 11 XPSWMM Link Data and Results

| Name                       | Link Name | Upstream Node Name | Downstream Node Name | Shape       | Diameter (Height) ft | Length ft | Upstream Invert Elevation (ft, NAVD) | Downstream Invert Elevation (ft, NAVD) | Manning's Roughness | Max Nolte Flow cfs | Max Nolte Velocity ft/s | Max 100-Year Flow cfs | Max 100-Year Velocity ft/s |
|----------------------------|-----------|--------------------|----------------------|-------------|----------------------|-----------|--------------------------------------|----------------------------------------|---------------------|--------------------|-------------------------|-----------------------|----------------------------|
| <b>Existing Conditions</b> |           |                    |                      |             |                      |           |                                      |                                        |                     |                    |                         |                       |                            |
| SD1-A1Pi                   | Link41    | SD1-A1             | SD1-A                | Circular    | 3.00                 | 92        | 153.85                               | 153.82                                 | 0.024               | 19.5               | 2.7                     | 16.2                  | 2.3                        |
| SD1-A1Rd                   | Link41    | SD1-A1             | SD1-A                | Trapezoidal | 0.00                 | 98        | 159.25                               | 159.40                                 | 0.025               | -1.2               | -0.5                    | -63.8                 | -1.6                       |
| SD1-ALPi                   | Link42    | SD1-A              | SD1-B                | Circular    | 3.00                 | 216       | 153.82                               | 153.75                                 | 0.024               | 21.1               | 3.0                     | 23.2                  | 3.3                        |
| SD1-ALRd                   | Link42    | SD1-A              | SD1-B                | Trapezoidal | 0.00                 | 224       | 159.40                               | 157.95                                 | 0.025               | 0.0                | 0.0                     | 61.8                  | 2.4                        |
| SD1-BLPI                   | Link43    | SD1-B              | SD1-C                | Circular    | 3.00                 | 125       | 153.75                               | 153.35                                 | 0.024               | 5.9                | 0.8                     | 9.5                   | 1.3                        |
| SD1-BLRd                   | Link43    | SD1-B              | SD1-C                | Trapezoidal | 0.00                 | 128       | 157.95                               | 157.52                                 | 0.025               | 26.2               | 0.8                     | 94.5                  | 1.5                        |
| SD1-Cpi                    | Link22    | SD1-C              | Node21               | Circular    | 3.00                 | 50        | 153.35                               | 153.20                                 | 0.024               | 15.3               | 8.6                     | 14.8                  | 8.3                        |
| SD1-Colr                   | Link22    | SD1-C              | Node21               | Trapezoidal | 0.00                 | 50        | 158.40                               | 157.40                                 | 0.025               | 16.7               | 2.9                     | 89.2                  | 5.1                        |
| SD1CCh                     | Link11    | Node21             | J10-1                | Trapezoidal | 0.00                 | 373       | 153.20                               | 154.20                                 | 0.040               | -32.0              | -0.4                    | -104.0                | -0.8                       |
| J10-1chn                   | Link12    | J10-1              | J10-2                | Trapezoidal | 0.00                 | 520       | 154.20                               | 149.66                                 | 0.040               | 42.6               | 2.0                     | 117.0                 | 2.4                        |
| J10-2chn                   | Link13    | J10-2              | J10-3                | Trapezoidal | 0.00                 | 331       | 149.66                               | 148.00                                 | 0.040               | 49.8               | 1.0                     | 147.7                 | 1.2                        |
| J10-3pi                    | Link14    | J10-3              | Node22               | Circular    | 2.00                 | 115       | 148.00                               | 147.00                                 | 0.015               | 21.9               | 7.4                     | 27.9                  | 9.0                        |
| J10-3olr                   | Link14    | J10-3              | Node22               | Trapezoidal | 0.00                 | 115       | 149.70                               | 149.00                                 | 0.050               | 31.6               | 1.9                     | 126.8                 | 3.5                        |
| JESSChn                    | Link29    | Node22             | J10-3A               | Trapezoidal | 0.00                 | 100       | 147.00                               | 146.00                                 | 0.040               | 53.5               | 1.5                     | 154.7                 | 1.9                        |
| J10-3Api                   | Link15    | J10-3A             | J10-3B               | Circular    | 3.50                 | 260       | 145.00                               | 141.50                                 | 0.024               | 53.5               | 6.8                     | 34.5                  | 3.7                        |
| J10-3Aolr                  | Link15    | J10-3A             | J10-3B               | Trapezoidal | 0.00                 | 250       | 147.60                               | 144.50                                 | 0.025               | 0.0                | 0.0                     | 120.2                 | 2.4                        |
| J10-3Bbrdg                 | Link16    | J10-3B             | END                  | Rectangular | 4.00                 | 70        | 141.32                               | 141.11                                 | 0.015               | 53.5               | 0.3                     | 154.7                 | 0.9                        |
| ENDCh                      | Link17    | END                | END-A                | Trapezoidal | 0.00                 | 351       | 141.11                               | 143.00                                 | 0.040               | -74.4              | -0.4                    | -155.0                | -0.3                       |
| J2CD Ch                    | J2CD Ch   | J2CD               | J10-1                | Trapezoidal | 0.00                 | 303       | 158.37                               | 154.20                                 | 0.025               | 4.0                | 1.2                     | 24.7                  | 2.3                        |
| SD2-Api                    | Link44    | SD2-A              | J2                   | Circular    | 1.50                 | 218       | 157.91                               | 157.65                                 | 0.015               | 2.7                | 2.0                     | 3.4                   | 1.9                        |
| SD2-Aolr                   | Link44    | SD2-A              | J2                   | Trapezoidal | 0.00                 | 218       | 162.00                               | 161.08                                 | 0.060               | 0.0                | 0.0                     | 14.6                  | 0.3                        |
| SD2-Bpi                    | Link45    | J2                 | SD2-C                | Circular    | 1.50                 | 186       | 157.65                               | 157.12                                 | 0.015               | 4.4                | 3.3                     | 7.3                   | 4.1                        |
| SD2-Bolr                   | Link45    | J2                 | SD2-C                | Trapezoidal | 0.00                 | 186       | 161.08                               | 160.43                                 | 0.025               | 0.0                | 0.0                     | 19.1                  | 1.7                        |
| SD2-Crd                    | Link21    | SD2-C              | P2E                  | Trapezoidal | 0.00                 | 346       | 160.43                               | 156.69                                 | 0.025               | 0.0                | 0.0                     | 17.7                  | 2.2                        |
| P2ECh                      | P2ECh     | P2E                | J10-2                | Trapezoidal | 0.00                 | 207       | 156.69                               | 149.66                                 | 0.025               | 0.6                | 0.1                     | 23.7                  | 1.3                        |
| SD2-CL                     | Link46    | SD2-C              | SD2-D                | Circular    | 1.50                 | 219       | 156.72                               | 156.24                                 | 0.015               | 4.4                | 3.5                     | 8.7                   | 5.4                        |
| SD2-CO                     | Link46    | SD2-C              | SD2-D                | Trapezoidal | 0.00                 | 219       | 161.40                               | 157.90                                 | 0.025               | 0.0                | 0.0                     | 0.0                   | 0.0                        |
| SD2-EL                     | Link51    | SD2-D              | SD2-E                | Trapezoidal | 0.00                 | 236       | 156.24                               | 152.00                                 | 0.030               | 4.4                | 1.8                     | 8.7                   | 2.1                        |
| SD2Eolr                    | Link18    | SD2-E              | END                  | Trapezoidal | 0.00                 | 350       | 152.00                               | 147.20                                 | 0.025               | 5.8                | 2.0                     | 20.3                  | 2.9                        |
| <b>Proposed Solution</b>   |           |                    |                      |             |                      |           |                                      |                                        |                     |                    |                         |                       |                            |
| SD1-A1Pi                   | Link41    | SD1-A1             | SD1-A                | Circular    | 3.0                  | 92        | 153.85                               | 153.82                                 | 0.024               | 20.7               | 2.8                     | 16.3                  | 2.3                        |
| SD1-A1Rd                   | Link41    | SD1-A1             | SD1-A                | Trapezoidal | 0.0                  | 98        | 159.25                               | 159.40                                 | 0.025               | 0.0                | 0.0                     | -63.7                 | -1.6                       |
| SD1-ALPi                   | Link42    | SD1-A              | SD1-B                | Circular    | 3.0                  | 216       | 153.82                               | 153.75                                 | 0.024               | 21.1               | 2.9                     | 24.2                  | 3.4                        |
| SD1-ALRd                   | Link42    | SD1-A              | SD1-B                | Trapezoidal | 0.0                  | 224       | 159.40                               | 157.95                                 | 0.025               | 0.0                | 0.0                     | 60.8                  | 2.4                        |
| SD1-BLPI                   | Link43    | SD1-B              | SD1-C                | Circular    | 3.0                  | 125       | 153.75                               | 153.35                                 | 0.024               | 32.0               | 4.8                     | 11.2                  | 1.6                        |
| SD1-BLRd                   | Link43    | SD1-B              | SD1-C                | Trapezoidal | 0.0                  | 128       | 157.95                               | 157.52                                 | 0.025               | 0.0                | 0.0                     | 92.8                  | 1.7                        |
| SD1-Cpi                    | Link22    | SD1-C              | Node21               | Circular    | 1.0                  | 50        | 153.35                               | 153.20                                 | 0.024               | 2.5                | 3.2                     | 5.3                   | 6.6                        |
| SD1-Colr                   | Link22    | SD1-C              | Node21               | Trapezoidal | 0.0                  | 50        | 157.52                               | 157.40                                 | 0.025               | 0.0                | 0.0                     | 57.6                  | 4.2                        |
| SD1CCh                     | Link11    | Node21             | J10-1                | Trapezoidal | 0.0                  | 373       | 153.20                               | 154.20                                 | 0.040               | -2.5               | -0.1                    | -62.8                 | -0.7                       |
| J10-1chn                   | Link12    | J10-1              | J10-2                | Trapezoidal | 0.0                  | 520       | 154.20                               | 149.66                                 | 0.040               | 9.1                | 1.3                     | 51.1                  | 2.2                        |
| J10-2chn                   | Link13    | J10-2              | J10-3                | Trapezoidal | 0.0                  | 331       | 149.66                               | 148.00                                 | 0.040               | 15.6               | 1.2                     | 58.1                  | 1.6                        |
| J10-3pi                    | Link14    | J10-3              | Node22               | Circular    | 3.5                  | 100       | 147.00                               | 146.00                                 | 0.015               | 19.4               | 6.1                     | 65.1                  | 8.4                        |
| J10-3olr                   | Link14    | J10-3              | Node22               | Trapezoidal | 0.0                  | 100       | 149.70                               | 149.00                                 | 0.050               | 0.0                | 0.0                     | 0.0                   | 0.0                        |
| JESSChn                    | Link29    | Node22             | J10-3A               | Trapezoidal | 0.0                  | 100       | 149.00                               | 146.00                                 | 0.040               | 0.0                | 0.0                     | 0.0                   | 0.0                        |
| J10-3Api                   | Link15    | J10-3A             | J10-3B               | Circular    | 3.5                  | 260       | 145.00                               | 141.50                                 | 0.024               | 55.4               | 6.9                     | 35.0                  | 3.7                        |
| J10-3Aolr                  | Link15    | J10-3A             | J10-3B               | Trapezoidal | 0.0                  | 260       | 147.60                               | 144.50                                 | 0.025               | 2.4                | 0.7                     | 128.4                 | 2.5                        |
| J10-3Bbrdg                 | Link16    | J10-3B             | END                  | Rectangular | 4.0                  | 70        | 141.32                               | 141.11                                 | 0.015               | 57.8               | 0.4                     | 163.4                 | 0.9                        |
| ENDCh                      | Link17    | END                | END-A                | Trapezoidal | 0.0                  | 351       | 141.11                               | 143.00                                 | 0.040               | -74.3              | -0.4                    | -155.0                | -0.3                       |
| J2CD Ch                    | J2CD Ch   | J2CD               | J10-1                | Trapezoidal | 0.0                  | 303       | 158.37                               | 154.20                                 | 0.025               | 0.0                | 0.0                     | 0.0                   | 0.0                        |
| SD2-Api                    | Link44    | SD2-A              | J2                   | Circular    | 1.5                  | 218       | 157.91                               | 157.65                                 | 0.015               | 2.7                | 1.7                     | 3.4                   | 1.9                        |
| SD2-Aolr                   | Link44    | SD2-A              | J2                   | Trapezoidal | 0.0                  | 218       | 162.00                               | 161.08                                 | 0.060               | 0.0                | 0.0                     | 14.6                  | 0.3                        |
| SD2-Bpi                    | Link45    | J2                 | SD2-C                | Circular    | 1.5                  | 186       | 157.65                               | 157.12                                 | 0.015               | 4.4                | 2.6                     | 7.4                   | 4.1                        |
| SD2-Bolr                   | Link45    | J2                 | SD2-C                | Trapezoidal | 0.0                  | 186       | 161.08                               | 160.43                                 | 0.025               | 0.0                | 0.0                     | 19.0                  | 1.7                        |
| SD2-Crd                    | Link21    | SD2-C              | P2E                  | Trapezoidal | 0.0                  | 346       | 160.43                               | 156.69                                 | 0.025               | 0.0                | 0.0                     | 13.6                  | 1.9                        |
| P2ECh                      | P2ECh     | P2E                | J10-2                | Trapezoidal | 0.0                  | 207       | 156.69                               | 149.66                                 | 0.025               | 0.0                | 0.0                     | 0.0                   | 0.0                        |
| SD2-CL                     | Link46    | SD2-C              | SD2-D                | Circular    | 1.5                  | 219       | 156.72                               | 156.24                                 | 0.015               | 4.4                | 3.4                     | 8.8                   | 5.4                        |
| SD2-CO                     | Link46    | SD2-C              | SD2-D                | Trapezoidal | 0.0                  | 219       | 161.40                               | 157.90                                 | 0.025               | 0.0                | 0.0                     | 0.0                   | 0.0                        |
| SD2-EL                     | Link51    | SD2-D              | SD2-E                | Trapezoidal | 0.0                  | 236       | 156.24                               | 152.00                                 | 0.030               | 0.0                | 0.0                     | 0.0                   | 0.0                        |
| SD2Eolr                    | Link18    | SD2-E              | END                  | Trapezoidal | 0.0                  | 350       | 152.00                               | 147.20                                 | 0.025               | 1.5                | 1.2                     | 11.6                  | 2.4                        |
| P2Epi                      | Link27    | P2E                | J10-3A               | Circular    | 3.5                  | 440       | 147.50                               | 145.00                                 | 0.015               | 38.4               | 6.5                     | 98.3                  | 10.2                       |
| JESSpi                     | Link29    | Node22             | J10-3A               | Circular    | 3.5                  | 100       | 146.00                               | 145.00                                 | 0.015               | 19.4               | 4.1                     | 65.1                  | 7.9                        |
| TOatMpi                    | Link25    | TOatM              | J2CD                 | Circular    | 3.5                  | 343       | 152.00                               | 150.00                                 | 0.015               | 31.5               | 6.7                     | 55.5                  | 5.7                        |
| P2Cpi                      | Link28    | P2C                | TOatM                | Circular    | 1.5                  | 206       | 160.00                               | 158.00                                 | 0.015               | 2.0                | 4.1                     | 14.3                  | 8.0                        |
| SD2-cpi                    | Link21    | SD2-C              | P2E                  | Circular    | 1.5                  | 350       | 158.00                               | 150.00                                 | 0.015               | 4.4                | 6.9                     | 12.9                  | 7.2                        |
| SD-1Cpi                    | Link24    | SD1-C              | TOatM                | Circular    | 3.5                  | 492       | 153.35                               | 152.00                                 | 0.015               | 29.5               | 5.1                     | 41.2                  | 4.3                        |
| J2CDpi                     | Link26    | J2CD               | P2E                  | Circular    | 3.5                  | 470       | 150.00                               | 147.50                                 | 0.015               | 33.4               | 6.6                     | 65.9                  | 6.8                        |



# **LEGEND**

- Subshed Boundary
- Stream or Channel
- Modeled Node
- Modeled Link



**Figure A3**  
**City of Citrus Heights**  
**Neighborhoods 6 and 7**  
**Drainage Master Plan Study**  
**PROBLEM LOCATIONS 4 and 21**  
**SUBSHEDS AND**  
**XPSWMM MODEL LAYOUT**



**Table A-6. Problem Locations 4 and 21 XPSWMM Node Data and Results**

| Node Name | Existing Conditions                 |                                     |                                          |                                             | Proposed Solution                   |                                     |                                          |                                             | Change in Water Surface Elevation |          |
|-----------|-------------------------------------|-------------------------------------|------------------------------------------|---------------------------------------------|-------------------------------------|-------------------------------------|------------------------------------------|---------------------------------------------|-----------------------------------|----------|
|           | Modeled Ground Elevation (ft, NAVD) | Modeled Invert Elevation (ft, NAVD) | Nolte Water Surface Elevation (ft, NAVD) | 100-Year Water Surface Elevation (ft, NAVD) | Modeled Ground Elevation (ft, NAVD) | Modeled Invert Elevation (ft, NAVD) | Nolte Water Surface Elevation (ft, NAVD) | 100-Year Water Surface Elevation (ft, NAVD) | Nolte                             | 100-Year |
| SD5-A     | 148.00                              | 140.55                              | 141.22                                   | 147.27                                      | 148.00                              | 140.55                              | 141.22                                   | 147.27                                      | 0.00                              | 0.00     |
| SD5-B     | 142.00                              | 135.88                              | 137.40                                   | 139.24                                      | 142.00                              | 135.88                              | 137.40                                   | 139.27                                      | 0.00                              | 0.03     |
| SD5-C     | 142.00                              | 135.56                              | 137.37                                   | 139.24                                      | 142.00                              | 135.56                              | 137.37                                   | 139.27                                      | 0.00                              | 0.03     |
| SD5-D     | 142.00                              | 135.00                              | 136.50                                   | 136.22                                      | 142.00                              | 135.00                              | 136.50                                   | 136.22                                      | 0.00                              | 0.00     |
| SD5-E     | 139.80                              | 136.91                              | 138.05                                   | 139.83                                      | 139.80                              | 136.91                              | 138.05                                   | 139.83                                      | 0.00                              | 0.00     |
| SD5-F     | 148.00                              | 142.20                              | n/a                                      | 145.95                                      | 148.00                              | 142.20                              | n/a                                      | 145.70                                      | n/a                               | -0.25    |
| SD5-G     | 144.00                              | 142.00                              | n/a                                      | 140.71                                      | 144.00                              | 140.30                              | 140.30                                   | 141.08                                      | n/a                               | 0.36     |
| SD5-H     | 147.29                              | 145.29                              | n/a                                      | 139.14                                      | 147.29                              | 145.29                              | 145.29                                   | 138.87                                      | n/a                               | -0.27    |
| SD5-I     | 142.00                              | 136.10                              | 137.05                                   | 139.21                                      | 142.00                              | 136.10                              | 137.05                                   | 139.25                                      | 0.00                              | 0.04     |
| SD5-J     | 142.00                              | 135.91                              | 136.86                                   | 137.91                                      | 142.00                              | 135.91                              | 136.86                                   | 137.91                                      | 0.00                              | 0.00     |

**Table A-7. Problem Locations 4 and 21 XPSWMM Link Data and Results**

| Name                       | Link Name | Upstream Node Name | Downstream Node Name | Shape       | Diameter (Height) ft | Length ft | Upstream Invert Elevation (ft, NAVD) | Downstream Invert Elevation (ft, NAVD) | Manning's Roughness | Max Nolte Flow cfs | Max Nolte Velocity ft/s | Max 100-Year Flow cfs | Max 100-Year Velocity ft/s |
|----------------------------|-----------|--------------------|----------------------|-------------|----------------------|-----------|--------------------------------------|----------------------------------------|---------------------|--------------------|-------------------------|-----------------------|----------------------------|
| <b>Existing Conditions</b> |           |                    |                      |             |                      |           |                                      |                                        |                     |                    |                         |                       |                            |
| PAB1                       | SD5AB     | SD5-A              | SD5-B                | Circular    | 1.5                  | 365       | 140.55                               | 136.80                                 | 0.015               | 3.8                | 5.0                     | 13.7                  | 7.6                        |
| PAF1                       | SD5AF     | SD5-A              | SD5-F                | Trapezoidal | 1.0                  | 50        | 147.00                               | 145.52                                 | 0.020               | 0.0                | 0.0                     | 12.3                  | 2.9                        |
| PBC1                       | SD5BC     | SD5-B              | SD5-C                | Circular    | 2.0                  | 160       | 136.60                               | 135.56                                 | 0.015               | 2.2                | 1.7                     | -0.8                  | -0.3                       |
| CBC1                       | SD5BC     | SD5-B              | SD5-C                | Trapezoidal | 1.0                  | 160       | 138.00                               | 137.50                                 | 0.020               | 0.0                | 0.0                     | -9.2                  | -0.2                       |
| CB11                       | SD5BI     | SD5-B              | SD5-I                | Trapezoidal | 0.5                  | 35        | 139.00                               | 138.50                                 | 0.020               | 0.0                | 0.0                     | 25.1                  | 1.6                        |
| PBI1                       | SD5BI     | SD5-B              | SD5-I                | Circular    | 0.8                  | 30        | 136.50                               | 136.10                                 | 0.015               | 2.1                | 3.8                     | 0.6                   | 1.1                        |
| PCD1                       | SD5CD     | SD5-C              | SD5-D                | Circular    | 1.5                  | 73        | 135.56                               | 135.00                                 | 0.028               | 5.5                | 3.0                     | 10.0                  | 5.7                        |
| CCD1                       | SD5CD     | SD5-C              | SD5-D                | Trapezoidal | 1.0                  | 73        | 139.50                               | 138.00                                 | 0.020               | 0.0                | 0.0                     | 0.0                   | 0.0                        |
| PEC1                       | SD5EC     | SD5-E              | SD5-C                | Circular    | 1.5                  | 176       | 136.91                               | 135.56                                 | 0.028               | 2.9                | 2.0                     | 2.9                   | 1.6                        |
| OEC1                       | SD5EC     | SD5-E              | SD5-C                | Trapezoidal | 0.5                  | 176       | 139.30                               | 139.00                                 | 0.020               | 0.0                | 0.0                     | 17.1                  | 1.3                        |
| PFG1                       | SD5FG     | SD5-F              | SD5-G                | Circular    | 0.7                  | 120       | 142.20                               | 142.00                                 | 0.015               | 0.0                | 0.0                     | 2.1                   | 6.0                        |
| CFH1                       | SD5H      | SD5-F              | SD5-H                | Trapezoidal | 2.0                  | 300       | 145.52                               | 145.29                                 | 0.020               | 0.0                | 0.0                     | 10.2                  | 1.2                        |
| CGI1                       | SD5GI     | SD5-G              | SD5-I                | Trapezoidal | 2.0                  | 207       | 142.00                               | 136.10                                 | 0.040               | 0.0                | 0.0                     | 2.1                   | 0.7                        |
| PIJ1                       | SD5IJ     | SD5-I              | SD5-J                | Circular    | 2.0                  | 95        | 136.10                               | 135.91                                 | 0.028               | 2.1                | 1.5                     | 12.3                  | 3.9                        |
| CID1                       | SD5ID     | SD5-I              | SD5-D                | Trapezoidal | 2.0                  | 233       | 136.10                               | 139.50                                 | 0.040               | 0.0                | 0.0                     | 0.0                   | 0.0                        |
| <b>Proposed Solution</b>   |           |                    |                      |             |                      |           |                                      |                                        |                     |                    |                         |                       |                            |
| PAB1                       | SD5AB     | SD5-A              | SD5-B                | Circular    | 1.5                  | 365       | 140.55                               | 136.80                                 | 0.015               | 3.8                | 5.0                     | 13.7                  | 7.6                        |
| PAF1                       | SD5AF     | SD5-A              | SD5-F                | Trapezoidal | 1.0                  | 50        | 147.00                               | 145.52                                 | 0.020               | 0.0                | 0.0                     | 12.3                  | 3.4                        |
| PBC1                       | SD5BC     | SD5-B              | SD5-C                | Circular    | 2.0                  | 160       | 136.60                               | 135.56                                 | 0.015               | 2.2                | 1.7                     | -0.8                  | -0.3                       |
| CBC1                       | SD5BC     | SD5-B              | SD5-C                | Trapezoidal | 1.0                  | 160       | 138.00                               | 137.50                                 | 0.020               | 0.0                | 0.0                     | -9.1                  | -0.2                       |
| CB11                       | SD5BI     | SD5-B              | SD5-I                | Trapezoidal | 0.5                  | 35        | 139.00                               | 138.50                                 | 0.020               | 0.0                | 0.0                     | 25.2                  | 1.4                        |
| PBI1                       | SD5BI     | SD5-B              | SD5-I                | Circular    | 0.8                  | 30        | 136.50                               | 136.10                                 | 0.015               | 2.1                | 3.8                     | 0.4                   | 0.8                        |
| PCD1                       | SD5CD     | SD5-C              | SD5-D                | Circular    | 1.5                  | 73        | 135.56                               | 135.00                                 | 0.028               | 5.5                | 3.0                     | 10.1                  | 5.7                        |
| CCD1                       | SD5CD     | SD5-C              | SD5-D                | Trapezoidal | 1.0                  | 73        | 139.50                               | 138.00                                 | 0.020               | 0.0                | 0.0                     | 0.0                   | 0.0                        |
| PEC1                       | SD5EC     | SD5-E              | SD5-C                | Circular    | 1.5                  | 176       | 136.91                               | 135.56                                 | 0.028               | 2.9                | 2.0                     | 2.8                   | 1.6                        |
| OEC1                       | SD5EC     | SD5-E              | SD5-C                | Trapezoidal | 0.5                  | 176       | 139.30                               | 139.00                                 | 0.020               | 0.0                | 0.0                     | 17.2                  | 1.3                        |
| PFG1                       | SD5FG     | SD5-F              | SD5-G                | Circular    | 0.7                  | 120       | 142.20                               | 140.30                                 | 0.015               | 0.0                | 0.0                     | 10.2                  | 8.6                        |
| CFH1                       | SD5H      | SD5-F              | SD5-H                | Trapezoidal | 2.0                  | 300       | 145.52                               | 145.29                                 | 0.020               | 0.0                | 0.0                     | 2.1                   | 0.6                        |
| CGI1                       | SD5GI     | SD5-G              | SD5-I                | Trapezoidal | 2.0                  | 207       | 140.30                               | 136.10                                 | 0.040               | 0.0                | 0.0                     | 7.0                   | 1.7                        |
| PIJ1                       | SD5IJ     | SD5-I              | SD5-J                | Circular    | 2.0                  | 95        | 136.10                               | 135.91                                 | 0.028               | 2.1                | 1.5                     | 12.5                  | 4.0                        |
| CID1                       | SD5ID     | SD5-I              | SD5-D                | Trapezoidal | 2.0                  | 233       | 136.10                               | 139.50                                 | 0.040               | 0.0                | 0.0                     | 0.0                   | 0.0                        |
| P4Pipe                     | Link46    | P4 Drain           | SD5-A                | Circular    | 1.0                  | 205       | 147.50                               | 144.00                                 | 0.015               | 3.8                | 5.8                     | 7.3                   | 5.9                        |

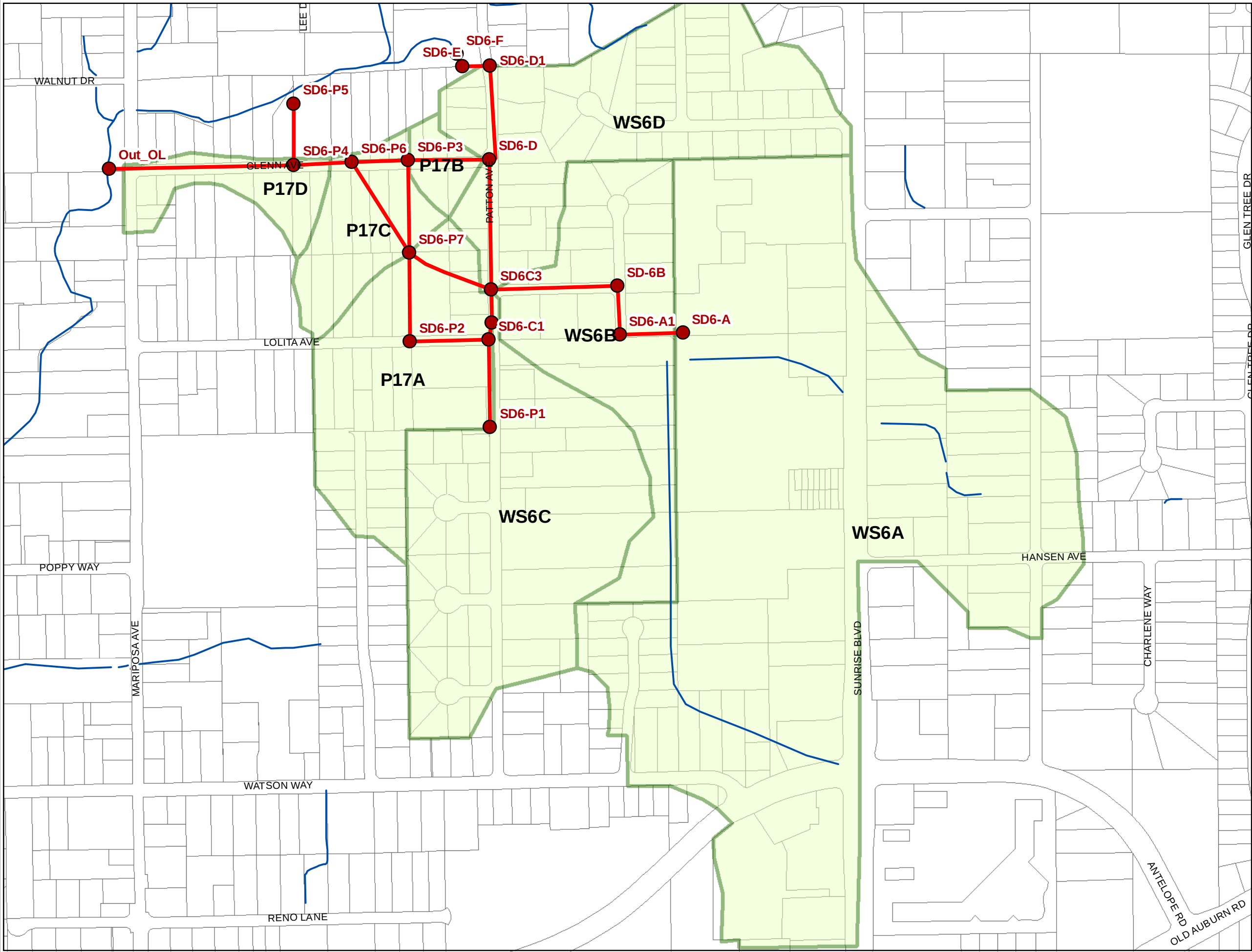
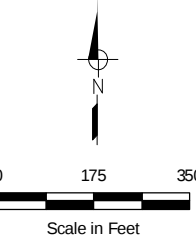


FIGURE A4

City of Citrus Heights  
Neighborhoods 6 and 7  
Drainage Master Plan Study

PROBLEM LOCATIONS  
6 AND 7 SUBSHEDS AND  
XPSWMM MODEL LAYOUT



- LEGEND
- Modeled Node
  - Modeled Link
  - Stream or Channel
  - Subshed Boundary



**Table A-8. Problem Locations 6 and 7 XPSWMM Node Data and Results**

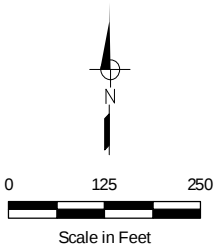
| Node Name | Existing Conditions                 |                                     |                                          |                                             | Proposed Solution                   |                                     |                                          |                                             | Change in Water Surface Elevation |          |
|-----------|-------------------------------------|-------------------------------------|------------------------------------------|---------------------------------------------|-------------------------------------|-------------------------------------|------------------------------------------|---------------------------------------------|-----------------------------------|----------|
|           | Modeled Ground Elevation (ft, NAVD) | Modeled Invert Elevation (ft, NAVD) | Nolte Water Surface Elevation (ft, NAVD) | 100-Year Water Surface Elevation (ft, NAVD) | Modeled Ground Elevation (ft, NAVD) | Modeled Invert Elevation (ft, NAVD) | Nolte Water Surface Elevation (ft, NAVD) | 100-Year Water Surface Elevation (ft, NAVD) | Nolte                             | 100-Year |
| SD6-A     | 170.00                              | 160.50                              | 162.05                                   | 166.60                                      | 170.00                              | 160.50                              | 162.05                                   | 166.59                                      | 0.00                              | 0.00     |
| SD6-A1    | 163.10                              | 157.51                              | 159.64                                   | 164.09                                      | 163.10                              | 157.51                              | 159.64                                   | 164.09                                      | 0.00                              | 0.00     |
| SD-6B     | 163.30                              | 157.00                              | 159.07                                   | 164.02                                      | 163.30                              | 157.00                              | 159.07                                   | 164.01                                      | 0.00                              | 0.00     |
| SD6-C1    | 162.95                              | 157.73                              | 158.84                                   | 163.06                                      | 162.95                              | 157.73                              | 158.84                                   | 163.02                                      | 0.00                              | -0.04    |
| SD6-C2    | 162.59                              | 157.22                              | 158.21                                   | 162.99                                      | 162.59                              | 157.22                              | 158.21                                   | 162.95                                      | 0.00                              | -0.04    |
| SD6C3     | 163.20                              | 154.84                              | 156.81                                   | 162.96                                      | 163.20                              | 154.84                              | 156.80                                   | 162.93                                      | 0.00                              | -0.04    |
| SD6-D     | 158.10                              | 151.49                              | 153.73                                   | 156.14                                      | 158.10                              | 151.49                              | 153.70                                   | 155.81                                      | -0.03                             | -0.33    |
| SD6-D1    | 158.90                              | 149.02                              | 151.46                                   | 153.03                                      | 158.90                              | 149.02                              | 151.23                                   | 152.61                                      | -0.23                             | -0.42    |
| SD6-E     | 153.20                              | 148.11                              | 150.53                                   | 151.55                                      | 153.20                              | 148.11                              | 150.30                                   | 151.43                                      | -0.23                             | -0.13    |
| SD6-F     | 151.90                              | 147.90                              | 150.32                                   | 151.26                                      | 151.90                              | 147.90                              | 150.09                                   | 151.16                                      | -0.23                             | -0.10    |

**Table A-9. Problem Locations 6 and 7 XPSWMM Link Data and Results**

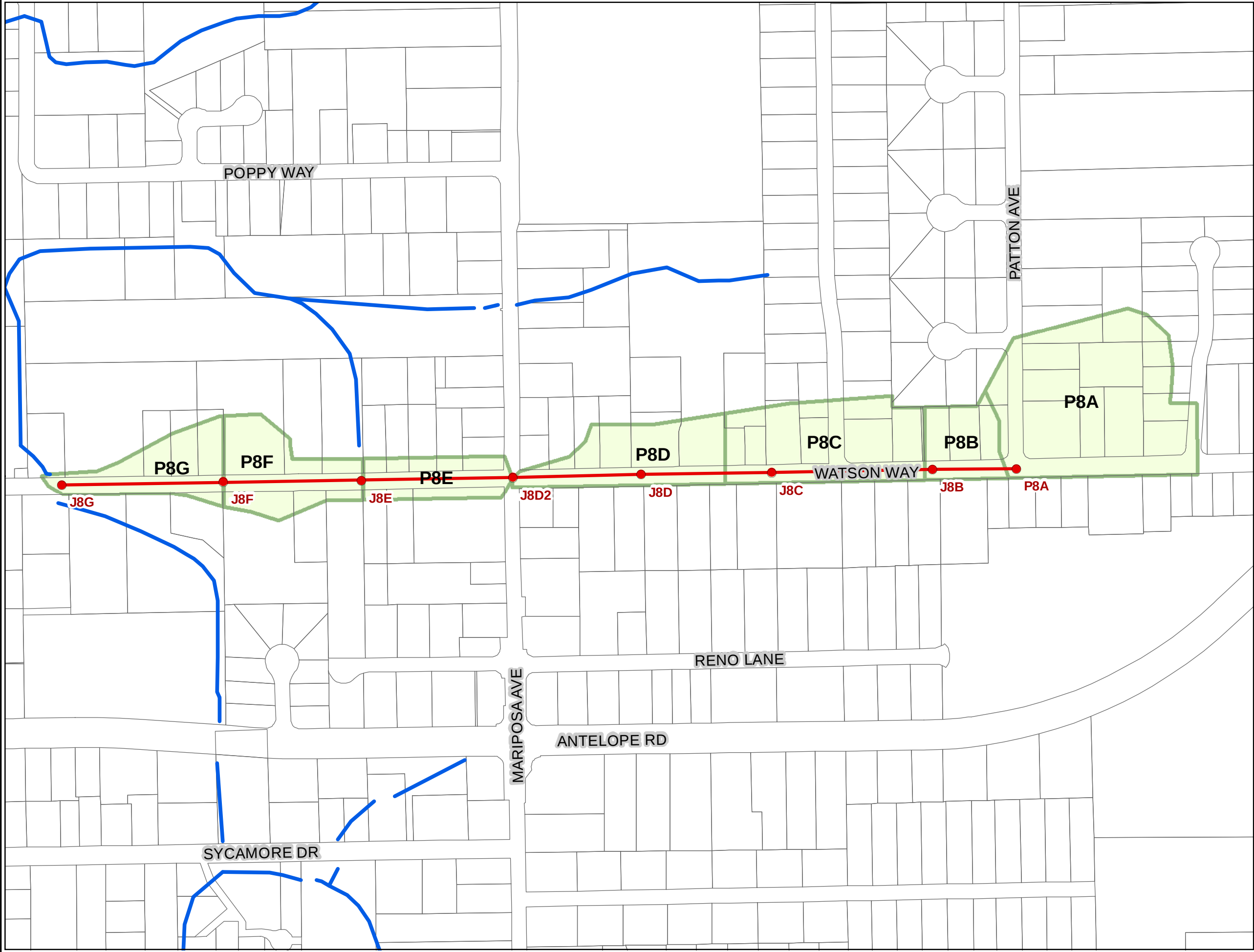
| Name                       | Link Name | Upstream Node Name | Downstream Node Name | Shape       | Diameter (Height) ft | Length ft | Upstream Invert Elevation (ft, NAVD) | Downstream Invert Elevation (ft, NAVD) | Manning's Roughness | Max Nolte Flow cfs | Max Nolte Velocity ft/s | Max 100-Year Flow cfs | Max 100-Year Velocity ft/s |
|----------------------------|-----------|--------------------|----------------------|-------------|----------------------|-----------|--------------------------------------|----------------------------------------|---------------------|--------------------|-------------------------|-----------------------|----------------------------|
| <b>Existing Conditions</b> |           |                    |                      |             |                      |           |                                      |                                        |                     |                    |                         |                       |                            |
| SD6-AL                     | Link14    | SD6-A              | SD6-A1               | Circular    | 2.5                  | 235       | 160.50                               | 157.51                                 | 0.015               | 26.5               | 8.0                     | 37.1                  | 7.5                        |
| SD6-OL                     | Link14    | SD6-A              | SD6-A1               | Trapezoidal | 0.0                  | 235       | 166.20                               | 162.60                                 | 0.060               | 0.0                | 0.0                     | 66.9                  | 1.2                        |
| SD6-A1L                    | Link12    | SD6-A1             | SD-6B                | Circular    | 3.0                  | 186       | 157.51                               | 157.00                                 | 0.015               | 26.5               | 5.0                     | 11.6                  | 1.6                        |
| SD6-A1O                    | Link12    | SD6-A1             | SD-6B                | Trapezoidal | 0.5                  | 186       | 162.60                               | 162.80                                 | 0.025               | 0.0                | 0.0                     | -92.4                 | -0.9                       |
| SD6-BL1                    | LINK23    | SD-6B              | SD6C3                | Circular    | 3.0                  | 472       | 157.00                               | 154.84                                 | 0.015               | 31.9               | 6.2                     | 27.5                  | 3.9                        |
| SD6-BO.1                   | LINK23    | SD-6B              | SD6C3                | Trapezoidal | 0.5                  | 472       | 162.80                               | 162.70                                 | 0.025               | 0.0                | 0.0                     | 87.5                  | 1.3                        |
| SD6-C1L                    | Link13    | SD6-C1             | SD6-C2               | Circular    | 1.5                  | 65        | 157.73                               | 157.47                                 | 0.015               | 5.9                | 4.3                     | 2.9                   | 1.6                        |
| SD6-C1O1                   | Link13    | SD6-C1             | SD6-C2               | Trapezoidal | 0.5                  | 65        | 162.45                               | 162.09                                 | 0.025               | 0.0                | 0.0                     | 22.1                  | 1.1                        |
| SD6-C2L.1                  | SD6-C2L   | SD6-C2             | SD6-C2               | Circular    | 1.8                  | 127       | 157.22                               | 156.59                                 | 0.015               | 5.9                | 4.2                     | 2.1                   | 0.9                        |
| SD6-C2O                    | SD6-C2L   | SD6-C2             | SD6C3                | Trapezoidal | 0.5                  | 127       | 162.00                               | 162.20                                 | 0.025               | 0.0                | 0.0                     | -22.9                 | -0.5                       |
| SD6-CL1                    | SD6-C3L   | SD6C3              | SD6-D                | Circular    | 3.5                  | 487       | 154.84                               | 151.49                                 | 0.015               | 43.3               | 7.7                     | 103.9                 | 10.7                       |
| SD6-CO1                    | SD6-C3L   | SD6C3              | SD6-D                | Trapezoidal | 0.5                  | 487       | 162.30                               | 157.60                                 | 0.025               | 0.0                | 0.0                     | 11.5                  | 1.8                        |
| SD6-CL.1                   | SD6-CL    | SD6-D              | SD6-D1               | Circular    | 4.0                  | 384       | 151.49                               | 149.02                                 | 0.015               | 58.9               | 8.1                     | 115.3                 | 8.8                        |
| SD6-DL.1                   | SD6-DL    | SD6-D1             | SD6-E                | Circular    | 4.0                  | 143       | 149.02                               | 148.11                                 | 0.015               | 68.9               | 8.6                     | 125.3                 | 10.1                       |
| SD6-DO.1                   | SD6-DL    | SD6-D1             | SD6-E                | Trapezoidal | 0.2                  | 143       | 157.90                               | 152.20                                 | 0.035               | 0.0                | 0.0                     | 0.0                   | 0.0                        |
| SD6-EL.1                   | SD6-EL    | SD6-E              | SD6-F                | Circular    | 4.0                  | 31        | 148.11                               | 147.90                                 | 0.015               | 68.9               | 8.7                     | 125.3                 | 10.9                       |
| SD6-BO.2                   | Link10    | SD6C3              | SD6-P6               | Trapezoidal | 0.5                  | 635       | 162.20                               | 156.70                                 | 0.060               | 0.0                | 0.0                     | 24.7                  | 1.0                        |
| SD6-CO.2                   | Link11    | SD6-D              | SD6-P6               | Trapezoidal | 0.5                  | 375       | 157.60                               | 156.70                                 | 0.025               | 0.0                | 0.0                     | 0.0                   | 0.0                        |
| OL1-O                      | Link8     | SD6-P6             | Out_OL               | Trapezoidal | 0.5                  | 910       | 156.70                               | 146.20                                 | 0.025               | 0.0                | 0.0                     | 24.7                  | 2.4                        |
| <b>Proposed Solution</b>   |           |                    |                      |             |                      |           |                                      |                                        |                     |                    |                         |                       |                            |
| SD6-AL                     | Link14    | SD6-A              | SD6-A1               | Circular    | 2.50                 | 235       | 160.50                               | 157.51                                 | 0.015               | 26.5               | 8.0                     | 37.1                  | 7.5                        |
| SD6-AO                     | Link14    | SD6-A              | SD6-A1               | Trapezoidal | 0.50                 | 235       | 166.20                               | 162.60                                 | 0.060               | 0.0                | 0.0                     | 66.9                  | 1.2                        |
| SD6-A1L                    | Link12    | SD6-A1             | SD-6B                | Circular    | 3.00                 | 186       | 157.51                               | 157.00                                 | 0.015               | 26.5               | 5.0                     | 11.7                  | 1.6                        |
| SD6-A1O                    | Link12    | SD6-A1             | SD-6B                | Trapezoidal | 0.50                 | 186       | 162.60                               | 162.80                                 | 0.025               | 0.0                | 0.0                     | -92.3                 | -0.9                       |
| SD6-BL1                    | LINK23    | SD-6B              | SD6C3                | Circular    | 3.00                 | 472       | 157.00                               | 154.84                                 | 0.015               | 31.9               | 6.2                     | 27.8                  | 3.9                        |
| SD6-BO.1                   | LINK23    | SD-6B              | SD6C3                | Trapezoidal | 0.50                 | 472       | 162.80                               | 162.60                                 | 0.025               | 0.0                | 0.0                     | 87.2                  | 1.3                        |
| SD6-P1F                    | Link15    | SD6-P1             | SD6-C1               | Circular    | 1.50                 | 330       | 159.38                               | 157.73                                 | 0.015               | 5.9                | 4.1                     | 6.9                   | 3.8                        |
| SD6-P1O                    | Link15    | SD6-P1             | SD6-C1               | Trapezoidal | 0.50                 | 330       | 164.30                               | 162.45                                 | 0.025               | 0.0                | 0.0                     | 29.1                  | 1.9                        |
| SD6-C1L                    | Link13    | SD6-C1             | SD6-C2               | Circular    | 1.50                 | 65        | 157.73                               | 157.47                                 | 0.015               | 5.9                | 4.3                     | 2.8                   | 1.6                        |
| SD6-C1O1                   | Link13    | SD6-C1             | SD6-C2               | Trapezoidal | 0.50                 | 65        | 162.45                               | 162.09                                 | 0.025               | 0.0                | 0.0                     | 18.3                  | 1.0                        |
| SD6-C2L.1                  | SD6-C2L   | SD6-C2             | SD6C3                | Circular    | 1.75                 | 127       | 157.22                               | 156.59                                 | 0.015               | 5.9                | 4.2                     | 1.9                   | 0.8                        |
| SD6-C2O                    | SD6-C2L   | SD6-C2             | SD6C3                | Trapezoidal | 0.50                 | 127       | 162.00                               | 162.20                                 | 0.025               | 0.0                | 0.0                     | -19.2                 | -0.4                       |
| SD6-CL1                    | SD6-C3L   | SD6C3              | SD6-D                | Circular    | 3.50                 | 487       | 154.84                               | 151.49                                 | 0.015               | 43.3               | 7.7                     | 103.5                 | 10.7                       |
| SD6-CO1                    | SD6-C3L   | SD6C3              | SD6-D                | Trapezoidal | 0.50                 | 487       | 162.60                               | 157.60                                 | 0.025               | 0.0                | 0.0                     | 9.4                   | 1.7                        |
| SD6-DL1                    | SD6-CL    | SD6-D              | SD6-D1               | Circular    | 4.00                 | 384       | 151.49                               | 149.02                                 | 0.015               | 58.9               | 8.3                     | 122.3                 | 9.4                        |
| SD6-DO                     | SD6-CL    | SD6-D              | SD6-D1               | Trapezoidal | 0.50                 | 384       | 157.60                               | 157.90                                 | 0.025               | 0.0                | 0.0                     | 0.0                   | 0.0                        |
| SD6-D1L                    | SD6-DL    | SD6-D1             | SD6-E                | Circular    | 4.00                 | 143       | 149.02                               | 148.11                                 | 0.015               | 58.9               | 8.3                     | 122.3                 | 10.1                       |
| SD6-EL.1                   | SD6-EL    | SD6-E              | SD6-F                | Circular    | 4.00                 | 31        | 148.11                               | 147.90                                 | 0.015               | 58.9               | 8.4                     | 122.3                 | 10.8                       |
| SD6-P2O                    | Link22    | SD6-P2             | SD6-P7               | Trapezoidal | 0.50                 | 334       | 162.00                               | 159.00                                 | 0.060               | 0.0                | 0.0                     | 32.7                  | 1.1                        |
| SD6-P2F1                   | Link22    | SD6-P2             | SD6-P7               | Circular    | 1.25                 | 334       | 159.00                               | 156.80                                 | 0.015               | 3.4                | 3.2                     | 5.1                   | 4.1                        |
| SD6-P2F2                   | Link18    | SD6-P7             | SD6-P3               | Circular    | 1.25                 | 344       | 156.80                               | 154.63                                 | 0.015               | 3.4                | 2.8                     | 2.2                   | 1.8                        |
| SD6-P7O                    | Link24    | SD6-P7             | SD6-P6               | Trapezoidal | 0.50                 | 381       | 159.00                               | 156.40                                 | 0.060               | 0.0                | 0.0                     | 58.9                  | 1.2                        |
| SD6-CO.2                   | Link11    | SD6-P3             | SD6-P6               | Trapezoidal | 0.50                 | 206       | 159.00                               | 156.40                                 | 0.025               | 0.0                | 0.0                     | 0.9                   | 0.4                        |
| SD6-P3F3                   | Link11    | SD6-P3             | SD6-P6               | Circular    | 1.25                 | 206       | 151.19                               | 149.35                                 | 0.015               | 3.8                | 3.0                     | 6.0                   | 4.7                        |
| SD6-P6F4                   | Link25    | SD6-P6             | SD6-P4               | Circular    | 1.25                 | 218       | 149.35                               | 147.40                                 | 0.015               | 9.7                | 7.7                     | 9.7                   | 7.6                        |
| SD6-P6O                    | Link25    | SD6-P6             | SD6-P4               | Trapezoidal | 0.50                 | 217       | 156.40                               | 150.00                                 | 0.025               | 2.1                | 1.4                     | 64.0                  | 3.9                        |
| SD6-P4L                    | Link20    | SD6-P4             | SD6-P5               | Circular    | 1.25                 | 212       | 147.40                               | 145.00                                 | 0.015               | 7.0                | 5.7                     | 7.5                   | 6.1                        |
| SD6-P4O                    | Link8     | SD6-P4             | Out_OL               | Trapezoidal | 0.50                 | 689       | 150.00                               | 146.20                                 | 0.025               | 6.3                | 1.3                     | 68.0                  | 2.3                        |
| SD6-C1O.2                  | Link28    | SD6-C1             | SD6-P2               | Trapezoidal | 0.50                 | 313       | 162.45                               | 162.00                                 | 0.025               | 0.0                | 0.0                     | 14.9                  | 0.9                        |
| SD6-DL.2                   | Link21    | SD6-D              | SD6-P3               | Circular    | 0.05                 | 10        | 0.05                                 | 0.00                                   | 0.014               | -3.0               | -2.4                    | -3.0                  | -2.4                       |
| SD6-DO.2                   | Link21    | SD6-D              | SD6-P3               | Trapezoidal | 0.50                 | 305       | 157.60                               | 159.00                                 | 0.025               | 0.0                | 0.0                     | 0.4                   | 0.5                        |
| SD6-C3O.2                  | Link10    | SD6C3              | SD6-P7               | Trapezoidal | 0.50                 | 338       | 162.60                               | 159.00                                 | 0.060               | 0.0                | 0.0                     | 23.2                  | 1.0                        |

**Figure A5**  
**City of Citrus Heights**  
**Neighborhoods 6 and 7**  
**Drainage Master Plan Study**

**SUBSHED MAP FOR**  
**WATSON WAY PIPE**  
**PRPBLEM LOCATIONS**  
**8, 9, AND 13**

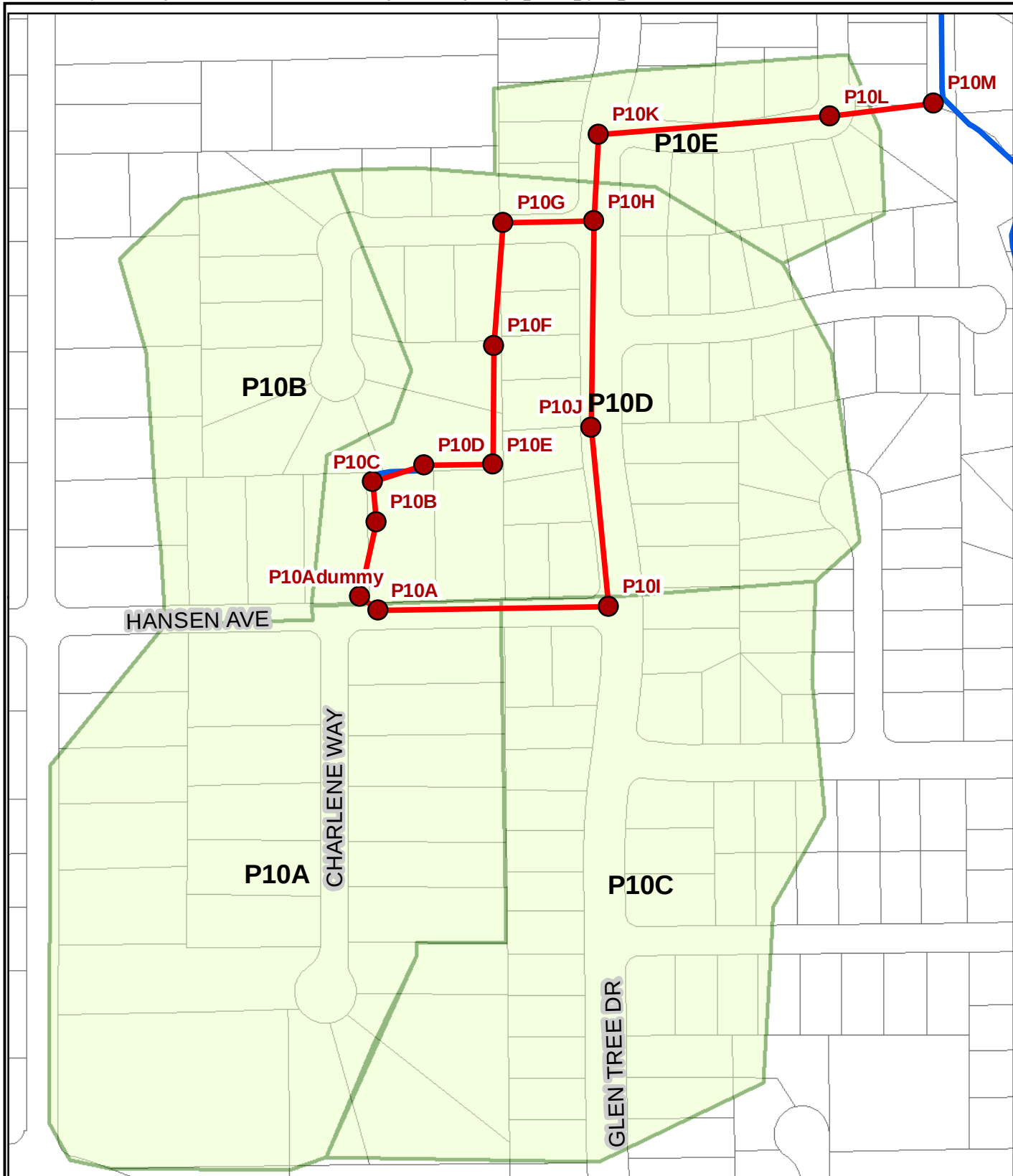


- LEGEND**
- Stream or Channel
  - Subshed Boundary
  - Proposed Pipeline
  - Proposed Inlet
  - Proposed Outfall
  - Proposed Manhole



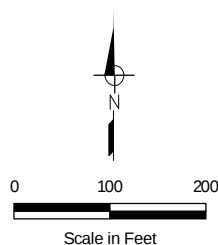
**Table A-10. Problem Locations 8, 9, and 13 Hydraulic Data for Proposed Solution (Option 3)**

| Reach No. | Upstream Node | Downstream Node | Design Flow - 10-Year (cfs) | Pipe Diameter (in.) | Manning's Roughness | Length (ft) | Approximate Slope (ft/ft) | Flow Depth (ft) | Flow Velocity (ft/s) |
|-----------|---------------|-----------------|-----------------------------|---------------------|---------------------|-------------|---------------------------|-----------------|----------------------|
| 1         | P8A           | J8B             | 7                           | 18                  | 0.015               | 240         | 0.0059                    | 1.23            | 4.51                 |
| 2         | J8B           | J8C             | 9                           | 21                  | 0.015               | 395         | 0.0043                    | 1.43            | 4.27                 |
| 3         | J8C           | J8D             | 12                          | 24                  | 0.015               | 355         | 0.0037                    | 1.65            | 4.33                 |
| 4         | J8D           | J8D2            | 14                          | 24                  | 0.015               | 340         | 0.0050                    | 1.66            | 5.03                 |
| 5         | J8D2          | J8E             | 14                          | 24                  | 0.015               | 390         | 0.0159                    | 1.08            | 8.11                 |
| 6         | J8E           | J8F             | 15.5                        | 24                  | 0.015               | 370         | 0.0135                    | 1.21            | 7.80                 |
| 7         | J8F           | J8G             | 17                          | 24                  | 0.015               | 425         | 0.0240                    | 1.07            | 9.94                 |



# **LEGEND**

- Stream or Channel
- Subshed Boundary
- Modeled Node
- Modeled Link



**Figure A6**  
**City of Citrus Heights**  
**Neighborhoods 6 and 7**  
**Drainage Master Plan Study**  
**PROBLEM LOCATION 10**  
**SUBSHEDS AND XPSWMM**  
**MODEL LAYOUT**

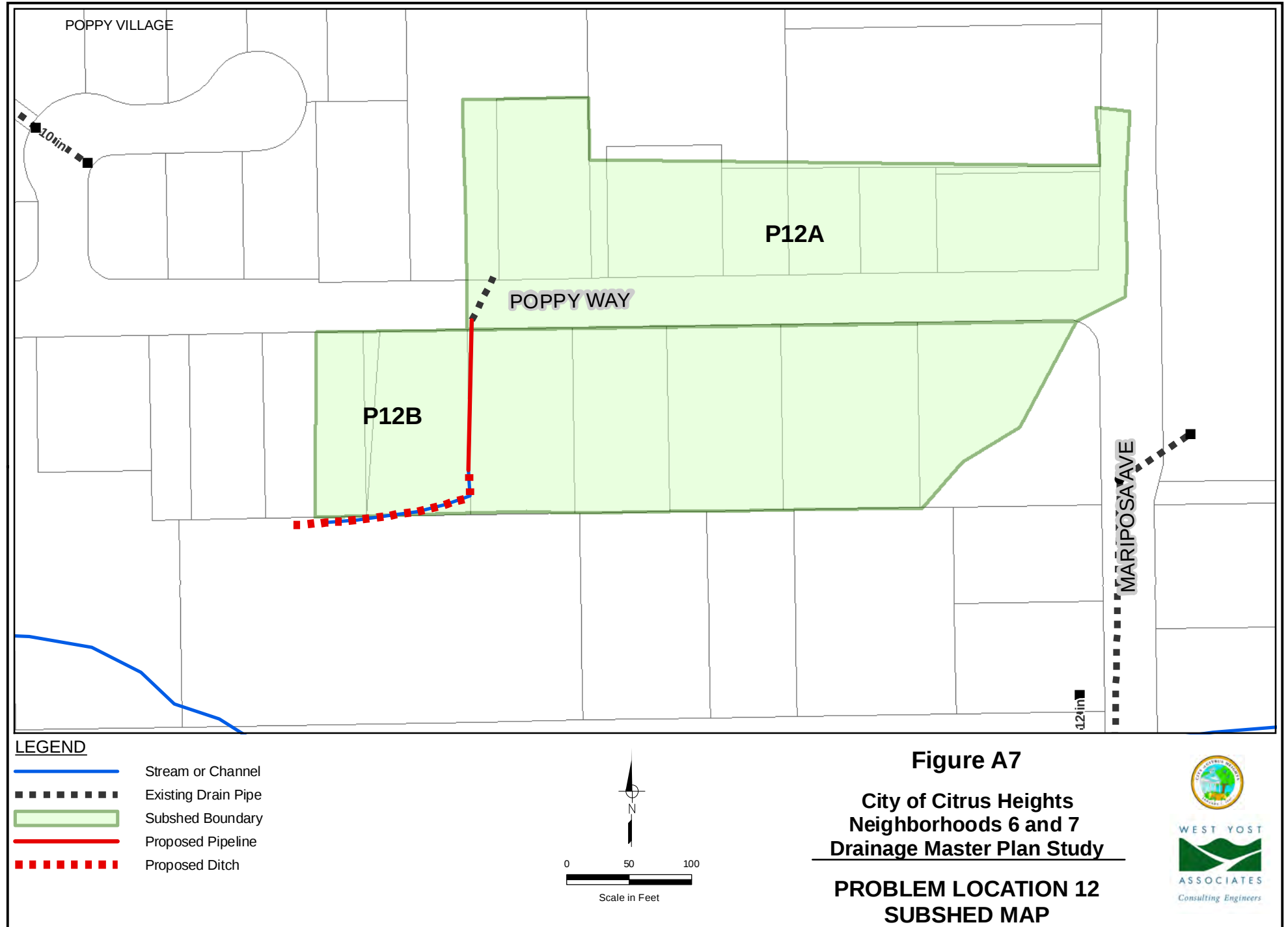


**Table A-11. Problem Location 10 XPSWMM Node Data and Results**

| Node Name | Existing Conditions                 |                                     |                                          |                                            |                                             | Proposed Solution                   |                                     |                                          |                                            |                                             | Change in Water Surface Elevation |         |          |
|-----------|-------------------------------------|-------------------------------------|------------------------------------------|--------------------------------------------|---------------------------------------------|-------------------------------------|-------------------------------------|------------------------------------------|--------------------------------------------|---------------------------------------------|-----------------------------------|---------|----------|
|           | Modeled Ground Elevation (ft, NAVD) | Modeled Invert Elevation (ft, NAVD) | Nolte Water Surface Elevation (ft, NAVD) | 10-Year Water Surface Elevation (ft, NAVD) | 100-Year Water Surface Elevation (ft, NAVD) | Modeled Ground Elevation (ft, NAVD) | Modeled Invert Elevation (ft, NAVD) | Nolte Water Surface Elevation (ft, NAVD) | 10-Year Water Surface Elevation (ft, NAVD) | 100-Year Water Surface Elevation (ft, NAVD) | Nolte                             | 10-Year | 100-Year |
| P10A      | 184.00                              | 180.17                              | 181.07                                   | 182.66                                     | 182.86                                      | 184.00                              | 176.35                              | 176.99                                   | 178.05                                     | 181.12                                      | -4.08                             | -4.60   | -1.74    |
| P10B      | 183.00                              | 178.72                              | 180.00                                   | 181.27                                     | 181.45                                      | 183.00                              | 178.72                              | 178.72                                   | 178.72                                     | 180.06                                      | -1.28                             | -2.55   | -1.39    |
| P10C      | 182.12                              | 178.45                              | 179.71                                   | 180.39                                     | 180.50                                      | 182.12                              | 178.45                              | 178.45                                   | 178.45                                     | 180.06                                      | -1.26                             | -1.94   | -0.44    |
| P10D      | 181.70                              | 174.45                              | 176.24                                   | 180.29                                     | 180.43                                      | 181.70                              | 174.45                              | 175.45                                   | 179.00                                     | 180.06                                      | -0.78                             | -1.30   | -0.37    |
| P10E      | 181.66                              | 174.57                              | 175.34                                   | 179.95                                     | 180.04                                      | 181.66                              | 174.57                              | 174.93                                   | 177.61                                     | 179.77                                      | -0.41                             | -2.33   | -0.27    |
| P10F      | 177.40                              | 172.27                              | 173.10                                   | 177.72                                     | 177.82                                      | 177.40                              | 172.27                              | 172.65                                   | 175.39                                     | 177.54                                      | -0.45                             | -2.33   | -0.28    |
| P10G      | 175.30                              | 170.17                              | 171.14                                   | 176.08                                     | 176.19                                      | 175.30                              | 170.17                              | 170.59                                   | 172.99                                     | 175.81                                      | -0.55                             | -3.09   | -0.38    |
| P10H      | 174.30                              | 169.17                              | 170.15                                   | 174.24                                     | 174.33                                      | 174.30                              | 169.17                              | 169.91                                   | 171.24                                     | 174.15                                      | -0.23                             | -3.01   | -0.18    |
| P10I      | 180.00                              | 174.87                              | 176.85                                   | 179.87                                     | 179.93                                      | 180.00                              | 174.87                              | 175.79                                   | 177.22                                     | 179.85                                      | -1.06                             | -2.65   | -0.08    |
| P10J      | 178.85                              | 173.72                              | 174.28                                   | 178.43                                     | 178.50                                      | 178.85                              | 173.72                              | 174.36                                   | 175.23                                     | 177.91                                      | 0.09                              | -3.20   | -0.59    |

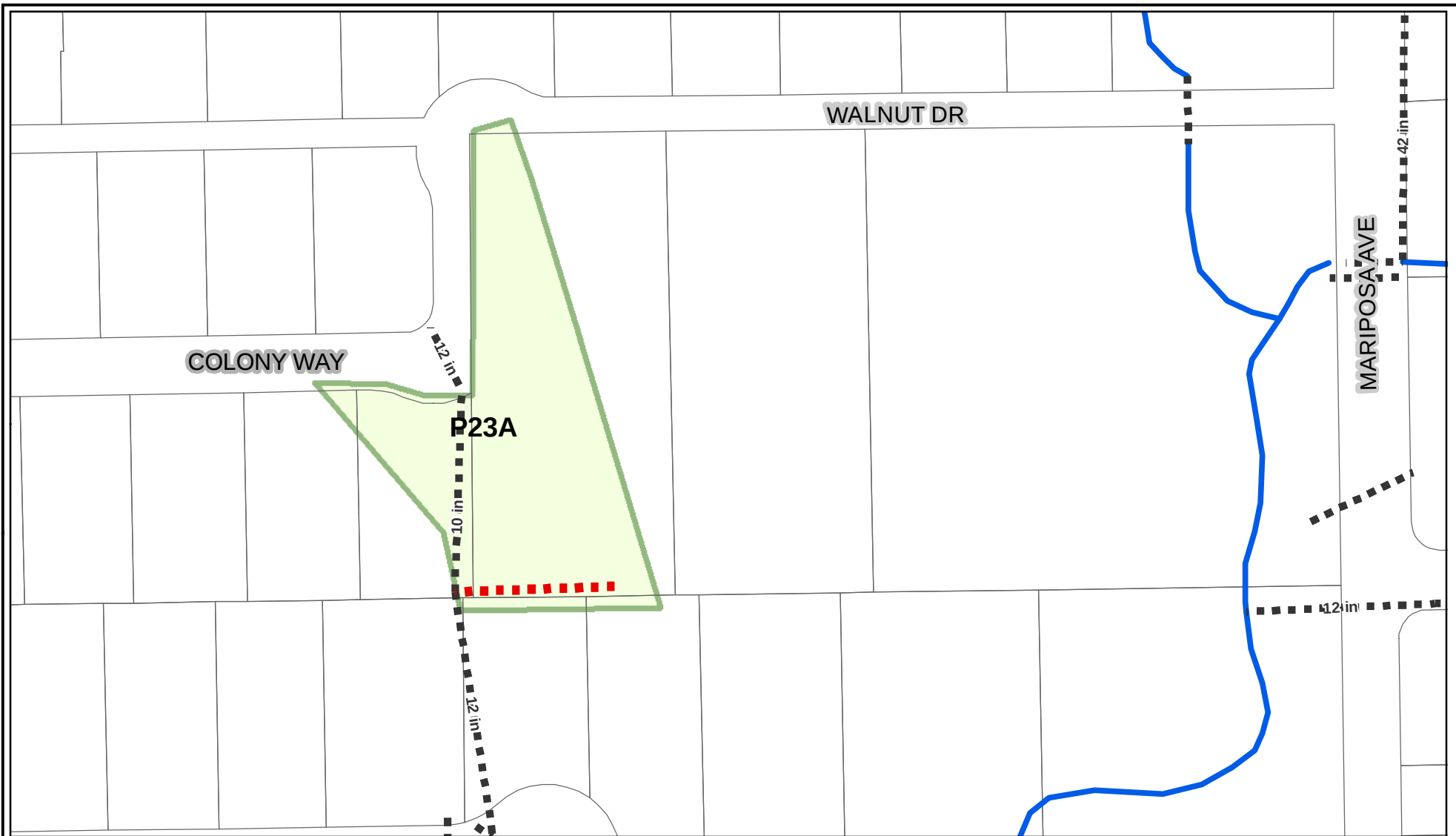
Table A-12. Problem Location 10 XPSWMM Link Data and Results

| Name                       | Link Name | Upstream Node Name | Downstream Node Name | Shape       | Diameter (Height) ft | Length ft | Upstream Invert Elevation (ft, NAVD) | Downstream Invert Elevation (ft, NAVD) | Manning's Roughness | Max Nolte Flow cfs | Max Nolte Velocity ft/s | Max 10-Year Flow cfs | Max 10-Year Velocity ft/s | Max 10-Year Flow cfs | Max 100-Year Velocity ft/s |
|----------------------------|-----------|--------------------|----------------------|-------------|----------------------|-----------|--------------------------------------|----------------------------------------|---------------------|--------------------|-------------------------|----------------------|---------------------------|----------------------|----------------------------|
| <b>Existing Conditions</b> |           |                    |                      |             |                      |           |                                      |                                        |                     |                    |                         |                      |                           |                      |                            |
| PAB1                       | P10AB     | P10A               | P10B                 | Circular    | 1.25                 | 130       | 180.2                                | 179.5                                  | 0.015               | 3.4                | 3.8                     | 5.8                  | 4.7                       | 5.9                  | 4.7                        |
| CAB1                       | P10AB     | P10A               | P10B                 | Trapezoidal | 2                    | 130       | 182                                  | 181                                    | 0.04                | 0.0                | 0.0                     | 10.2                 | 2.0                       | 16.1                 | 2.4                        |
| PBC1                       | P10BC     | P10B               | P10C                 | Circular    | 1.5                  | 50        | 179.2                                | 179                                    | 0.015               | 3.4                | 3.6                     | 12.2                 | 6.9                       | 12.6                 | 7.1                        |
| CBC1                       | P10BC     | P10B               | P10C                 | Trapezoidal | 1.5                  | 50        | 181                                  | 180.8                                  | 0.02                | 0.0                | 0.0                     | 3.8                  | 1.9                       | 9.4                  | 2.7                        |
| PCD1                       | P10CD     | P10C               | P10D                 | Rectangular | 1.25                 | 78        | 179                                  | 178.6                                  | 0.02                | 3.4                | 3.0                     | 2.8                  | 1.3                       | 2.4                  | 1.1                        |
| CCD1                       | P10CD     | P10C               | P10D                 | Trapezoidal | 2                    | 78        | 180.12                               | 179.7                                  | 0.02                | 0.0                | 0.0                     | 13.2                 | 1.4                       | 19.6                 | 1.6                        |
| PDE1                       | P10DE     | P10D               | P10E                 | Circular    | 1.25                 | 105       | 174.9                                | 174.6                                  | 0.015               | 4.6                | 3.7                     | 3.3                  | 2.6                       | 3.5                  | 2.8                        |
| CDE1                       | P10DE     | P10D               | P10E                 | Trapezoidal | 2                    | 105       | 179.7                                | 179.66                                 | 0.04                | 0.0                | 0.0                     | 19.2                 | 1.1                       | 28.5                 | 1.4                        |
| PEF1                       | P10EF     | P10E               | P10F                 | Circular    | 1.25                 | 168       | 174.57                               | 172.27                                 | 0.015               | 4.6                | 5.7                     | 6.6                  | 5.3                       | 6.6                  | 5.2                        |
| CEF1                       | P10EF     | P10E               | P10F                 | Trapezoidal | 2                    | 168       | 179.66                               | 177.4                                  | 0.04                | 0.0                | 0.0                     | 15.9                 | 1.8                       | 25.4                 | 2.2                        |
| PFG1                       | P10FG     | P10F               | P10G                 | Circular    | 1.25                 | 181       | 172.27                               | 170.17                                 | 0.015               | 4.6                | 5.3                     | 5.5                  | 4.3                       | 5.4                  | 4.3                        |
| CFG1                       | P10FG     | P10F               | P10G                 | Trapezoidal | 2                    | 181       | 177.4                                | 175.5                                  | 0.04                | 0.0                | 0.0                     | 17.0                 | 1.6                       | 26.6                 | 2.0                        |
| PGH1                       | P10GH     | P10G               | P10H                 | Circular    | 1.25                 | 132       | 170.17                               | 169.17                                 | 0.015               | 4.6                | 4.5                     | 6.7                  | 5.4                       | 6.8                  | 5.4                        |
| CGH1                       | P10GH     | P10G               | P10H                 | Trapezoidal | 0.5                  | 132       | 175.5                                | 173.8                                  | 0.04                | 0.0                | 0.0                     | 15.8                 | 1.6                       | 25.2                 | 1.9                        |
| PHK1                       | P10HK     | P10H               | P10K                 | Circular    | 1.5                  | 130       | 169.17                               | 166.9                                  | 0.015               | 9.1                | 7.4                     | 12.2                 | 6.8                       | 12.2                 | 6.8                        |
| CHK1                       | P10HK     | P10H               | P10K                 | Trapezoidal | 0.5                  | 130       | 173.8                                | 171.5                                  | 0.02                | 0.0                | 0.0                     | 35.3                 | 3.6                       | 55.8                 | 4.0                        |
| PIJ1                       | P10IJ     | P10I               | P10J                 | Circular    | 1                    | 260       | 174.87                               | 173.72                                 | 0.015               | 2.7                | 3.6                     | 2.4                  | 2.9                       | 2.3                  | 2.9                        |
| CIJ1                       | P10IJ     | P10I               | P10J                 | Trapezoidal | 0.5                  | 260       | 179.5                                | 178.15                                 | 0.02                | 0.0                | 0.0                     | 10.2                 | 1.6                       | 15.7                 | 1.7                        |
| PJH1                       | P10JH     | P10J               | P10H                 | Circular    | 1.25                 | 300       | 173.72                               | 169.5                                  | 0.015               | 2.7                | 5.0                     | 6.7                  | 5.4                       | 6.7                  | 5.4                        |
| CJH1                       | P10JH     | P10J               | P10H                 | Trapezoidal | 0.5                  | 300       | 178.2                                | 173.8                                  | 0.02                | 0.0                | 0.0                     | 5.8                  | 1.7                       | 11.3                 | 2.1                        |
| PKL1                       | P10KL     | P10K               | P10L                 | Circular    | 1.75                 | 340       | 166.9                                | 162.2                                  | 0.015               | 10.2               | 7.0                     | 16.3                 | 6.7                       | 16.3                 | 6.7                        |
| CKL1                       | P10KL     | P10K               | P10L                 | Trapezoidal | 0.5                  | 340       | 171.5                                | 166.8                                  | 0.02                | 0.0                | 0.0                     | 36.2                 | 3.3                       | 59.7                 | 3.7                        |
| PLM1                       | P10LM     | P10L               | P10M                 | Circular    | 1.75                 | 150       | 162.2                                | 160.9                                  | 0.015               | 10.2               | 5.9                     | 24.3                 | 10.0                      | 24.6                 | 10.1                       |
| CLM1                       | P10LM     | P10L               | P10M                 | Trapezoidal | 0.5                  | 150       | 166.8                                | 165.5                                  | 0.02                | 0.0                | 0.0                     | 28.2                 | 2.6                       | 51.4                 | 3.1                        |
| <b>Proposed Solution</b>   |           |                    |                      |             |                      |           |                                      |                                        |                     |                    |                         |                      |                           |                      |                            |
| PAB1                       | P10AB     | P10ADummy          | P10B                 | Circular    | 1.25                 | 130       | 180.2                                | 179.5                                  | 0.015               | 0.0                | 0.0                     | 0.0                  | 0.0                       | 0.0                  | 0.0                        |
| CAB1                       | P10AB     | P10ADummy          | P10B                 | Trapezoidal | 2                    | 130       | 182                                  | 181                                    | 0.04                | 0.0                | 0.0                     | 0.0                  | 0.0                       | 0.0                  | 0.0                        |
| PBC1                       | P10BC     | P10B               | P10C                 | Circular    | 1.5                  | 50        | 179.2                                | 179                                    | 0.015               | 0.0                | 0.0                     | 0.0                  | 0.0                       | 0.0                  | 0.0                        |
| PCD1                       | P10CD     | P10C               | P10D                 | Rectangular | 1.25                 | 78        | 179                                  | 178.6                                  | 0.02                | 0.0                | 0.0                     | 0.0                  | 0.0                       | 0.0                  | 0.0                        |
| CCD1                       | P10CD     | P10C               | P10D                 | Trapezoidal | 2                    | 78        | 180.12                               | 179.7                                  | 0.02                | 0.0                | 0.0                     | 0.0                  | 0.0                       | 0.0                  | 0.0                        |
| PDE1                       | P10DE     | P10D               | P10E                 | Circular    | 1.25                 | 105       | 174.9                                | 174.6                                  | 0.015               | 6.5                | 5.2                     | 6.5                  | 5.2                       | 3.0                  | 2.4                        |
| CDE1                       | P10DE     | P10D               | P10E                 | Trapezoidal | 0                    | 105       | 179.7                                | 179.66                                 | 0.04                | 0.0                | 0.0                     | 0.0                  | 0.0                       | 7.0                  | 0.7                        |
| PEF1                       | P10EF     | P10E               | P10F                 | Circular    | 1.25                 | 168       | 174.57                               | 172.27                                 | 0.015               | 6.5                | 5.2                     | 6.5                  | 5.2                       | 6.6                  | 5.3                        |
| PFG1                       | P10FG     | P10F               | P10G                 | Circular    | 1.25                 | 181       | 172.27                               | 170.17                                 | 0.015               | 6.5                | 5.2                     | 6.5                  | 5.2                       | 5.6                  | 4.5                        |
| PGH1                       | P10GH     | P10G               | P10H                 | Circular    | 1.25                 | 132       | 170.17                               | 169.17                                 | 0.015               | 6.5                | 5.3                     | 6.5                  | 5.3                       | 6.4                  | 5.1                        |
| PHK1                       | P10HK     | P10H               | P10K                 | Circular    | 2.5                  | 130       | 169.17                               | 166.9                                  | 0.015               | 47.5               | 11.0                    | 47.5                 | 11.0                      | 49.4                 | 10.0                       |
| CHK1                       | P10HK     | P10H               | P10K                 | Trapezoidal | 0.5                  | 130       | 173.8                                | 171.5                                  | 0.02                | 0.0                | 0.0                     | 0.0                  | 0.0                       | 18.6                 | 3.1                        |
| PIJ1                       | P10IJ     | P10I               | P10J                 | Circular    | 2.5                  | 260       | 174.87                               | 173.72                                 | 0.015               | 28.5               | 6.2                     | 28.5                 | 6.2                       | 30.9                 | 6.3                        |
| CIJ1                       | P10IJ     | P10I               | P10J                 | Trapezoidal | 0.5                  | 260       | 179.5                                | 178.15                                 | 0.02                | 0.0                | 0.0                     | 0.0                  | 0.0                       | 9.1                  | 1.5                        |
| PJH1                       | P10JH     | P10J               | P10H                 | Circular    | 2.5                  | 300       | 173.72                               | 169.5                                  | 0.015               | 28.5               | 9.0                     | 28.5                 | 9.0                       | 40.0                 | 8.1                        |
| CJH1                       | P10JH     | P10J               | P10H                 | Trapezoidal | 0.5                  | 300       | 178.2                                | 173.8                                  | 0.02                | 0.0                | 0.0                     | 0.0                  | 0.0                       | 0.0                  | 0.0                        |
| PKL1                       | P10KL     | P10K               | P10L                 | Circular    | 3                    | 340       | 166.9                                | 162.2                                  | 0.015               | 52.5               | 10.2                    | 52.5                 | 10.2                      | 73.7                 | 10.4                       |
| CKL1                       | P10KL     | P10K               | P10L                 | Trapezoidal | 0.5                  | 340       | 171.5                                | 166.8                                  | 0.02                | 0.0                | 0.0                     | 0.0                  | 0.0                       | 2.3                  | 1.7                        |
| PLM1                       | P10LM     | P10L               | P10M                 | Circular    | 3                    | 150       | 162.2                                | 160.9                                  | 0.015               | 52.5               | 8.7                     | 52.5                 | 8.7                       | 76.0                 | 10.8                       |
| CLM1                       | P10LM     | P10L               | P10M                 | Trapezoidal | 0.5                  | 150       | 166.8                                | 165.5                                  | 0.02                | 0.0                | 0.0                     | 0.0                  | 0.0                       | 0.0                  | 0.0                        |



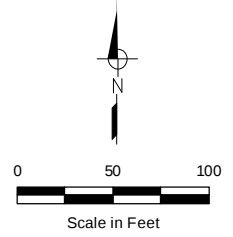
**Table A-13. Problem Location 12 Hydraulic Data**

| Reach No. | Description                                                  | Design Flow<br>100-Year<br>(cfs) | Manning's<br>Roughness | Length<br>(ft) | Available<br>Slope<br>(ft/ft) | Pipe<br>Diameter<br>(in.) | Channel<br>Bottom<br>Width (ft) | Channel<br>Side<br>Slope<br>(H:V) | Channel<br>Depth (ft) | Top<br>Width<br>(ft) | Flow<br>Depth (ft) | Flow<br>Velocity<br>(ft/s) |
|-----------|--------------------------------------------------------------|----------------------------------|------------------------|----------------|-------------------------------|---------------------------|---------------------------------|-----------------------------------|-----------------------|----------------------|--------------------|----------------------------|
| 1         | Pipe along west side yard from Poppy Way to south end of lot | 5                                | 0.015                  | 130            | 0.01                          | 15                        | n/a                             | n/a                               | n/a                   | n/a                  | 0.92               | 5.16                       |
| 2         | Channel along south side of lot                              | 9                                | 0.035                  | 140            | 0.0027                        | n/a                       | 3                               | 5:1                               | 1                     | 13                   | 0.86               | 1.45                       |



**LEGEND**

- ■ ■ Proposed Ditch
- ■ ■ Existing Drain Pipe
- Stream or Channel
- ▭ Subshed Boundary



**FIGURE A8A**

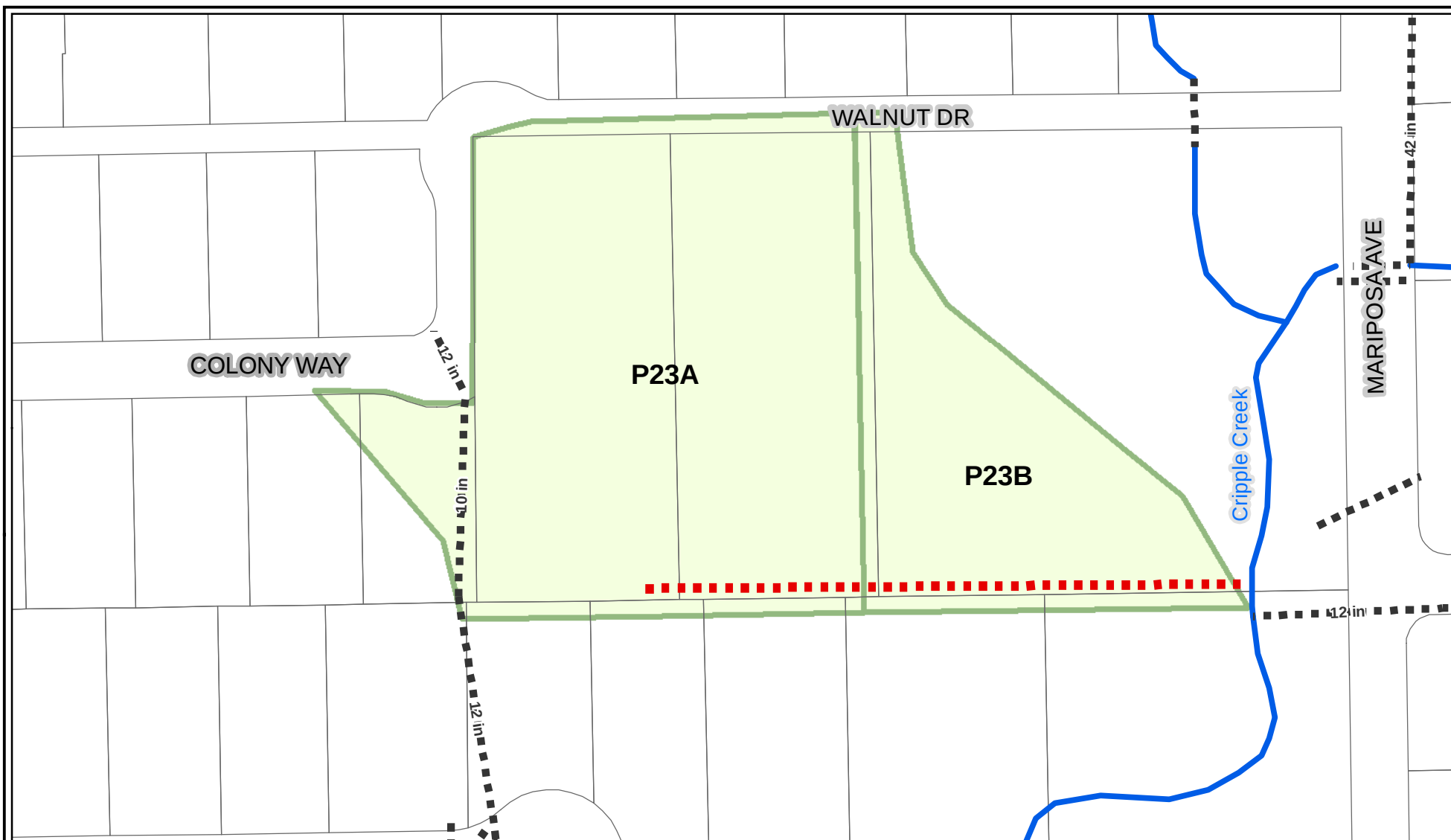
**City of Citrus Heights  
Neighborhoods 6 and 7  
Drainage Master Plan Study**

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**PROBLEM LOCATION 23  
SUBSHED MAP - OPTION 1**

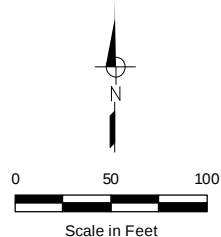


1 inch = 100 feet



# **LEGEND**

- ■ ■ Proposed Ditch
- ■ ■ Existing Drain Pipe
- Stream or Channel
- Subshed Boundary



**FIGURE A8B**

**City of Citrus Heights  
Neighborhoods 6 and 7  
Drainage Master Plan Study**

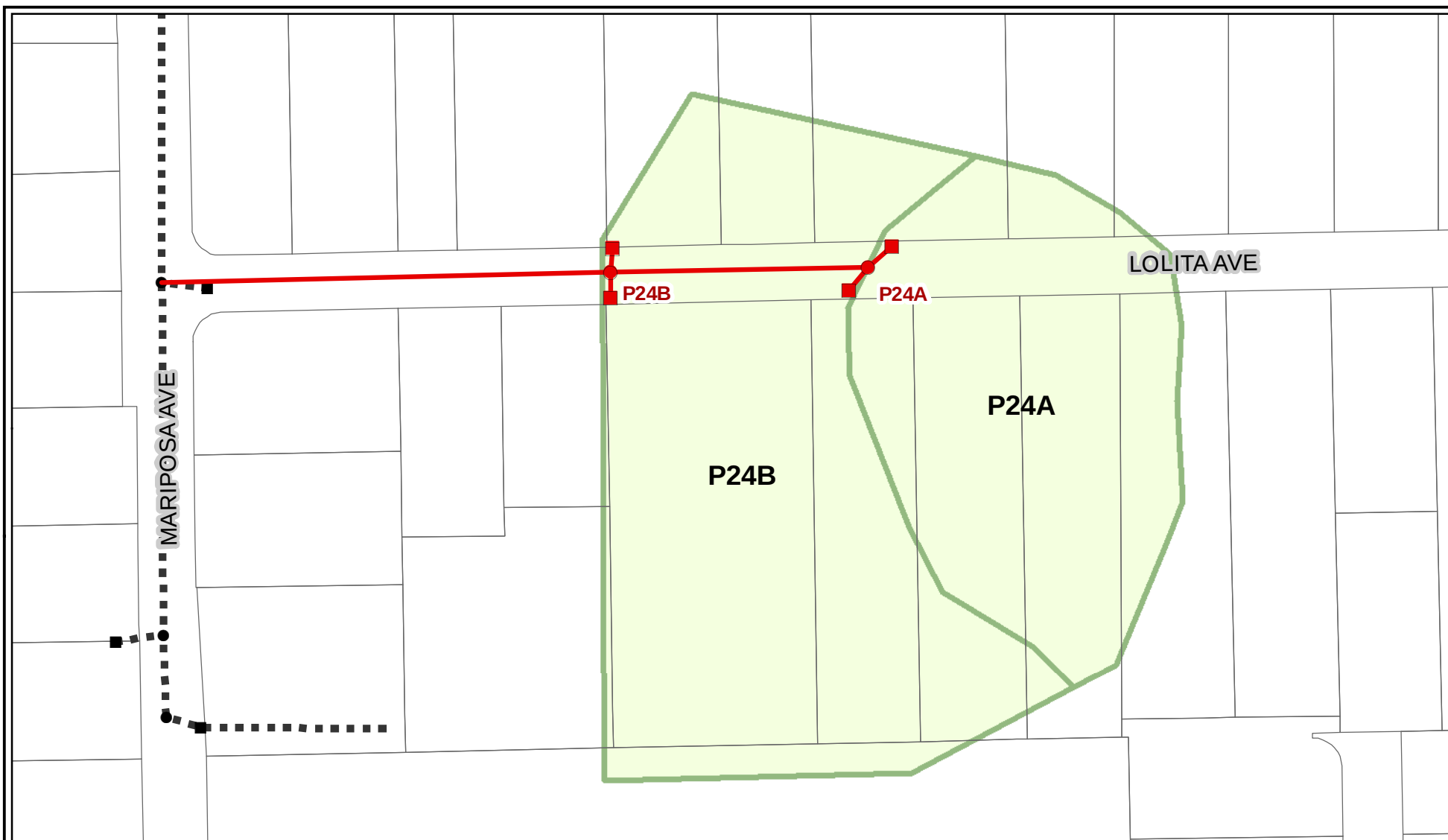
**PROBLEM LOCATION 23  
SUBSHED MAP - OPTION 2**



1 inch = 100 feet

**Table A-14. Problem Location 23 Hydraulic Data**

| Reach No.                                                                                                                                                                                                                                          | Description                                              | Design Flow <sup>1</sup> | Manning's Roughness | Length (ft) | Approximate Slope (ft/ft) | Pipe Diameter (in.) | Channel Bottom Width (ft) | Channel Side Slope (H:V) | Channel Depth (ft) | Top Width (ft) | Flow Depth (ft) | Flow Velocity (ft/s) |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|--------------------------|---------------------|-------------|---------------------------|---------------------|---------------------------|--------------------------|--------------------|----------------|-----------------|----------------------|
| <b>Option 1</b>                                                                                                                                                                                                                                    |                                                          |                          |                     |             |                           |                     |                           |                          |                    |                |                 |                      |
| 1-1                                                                                                                                                                                                                                                | Ditch from low area to existing 12-inch pipe to the west | 0.4                      | 0.04                | 140         | 0.0015                    | n/a                 | V-Ditch                   | 2:1                      | 1                  | 6              | 0.6             | 0.6                  |
| <b>Option 2</b>                                                                                                                                                                                                                                    |                                                          |                          |                     |             |                           |                     |                           |                          |                    |                |                 |                      |
| 2-1                                                                                                                                                                                                                                                | Ditch from low area to second property line to the east  | 6.1                      | 0.04                | 180         | 0.0015                    | n/a                 | 2                         | 2:1                      | 1.5                | 8              | 1.2             | 1.2                  |
| 2-2                                                                                                                                                                                                                                                | Ditch from second property line to Cripple Creek         | 8.0                      | 0.04                | 260         | 0.0307                    | n/a                 | 2                         | 2:1                      | 1                  | 6              | 0.6             | 3.7                  |
| Notes:<br>1. For Option 1 the design storm is the Nolte storm due to capacity limitations in the existing downstream system.<br>For Option 2, the design storm is the 100-year storm to insure protection of existing homes adjacent to the ditch. |                                                          |                          |                     |             |                           |                     |                           |                          |                    |                |                 |                      |



# LEGEND

- |                                                                                                                                            |                                                                                                                                |
|--------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| <span style="display:inline-block; width:15px; height:10px; border:1px solid green; background-color:lightgreen;"></span> Subshed Boundary | <span style="display:inline-block; width:10px; height:10px; background-color:red;"></span> Proposed Inlet                      |
| <span style="display:inline-block; width:10px; height:10px; background-color:black;"></span> Existing Inlet                                | <span style="display:inline-block; width:10px; height:10px; border:1px solid red;"></span> Proposed Outfall                    |
| <span style="display:inline-block; width:10px; height:10px; border:1px solid black;"></span> Existing Outfall                              | <span style="display:inline-block; width:10px; height:10px; background-color:red; border-radius:50%;"></span> Proposed Manhole |
| <span style="display:inline-block; width:10px; height:10px; border:1px solid black; border-radius:50%;"></span> Existing Manhole           | <span style="display:inline-block; width:20px; height:2px; background-color:red;"></span> Proposed Pipeline                    |
| <span style="display:inline-block; width:20px; border-bottom:2px dashed black;"></span> Existing Drain Pipe                                |                                                                                                                                |

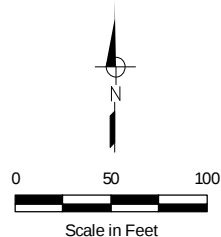


FIGURE A9

City of Citrus Heights  
Neighborhoods 6 and 7  
Drainage Master Plan Study

Subshed Map for  
Problem Location 24



1 inch = 100 feet

**Table A-15. Problem Location 24 Hydraulic Data for Proposed Solution**

| Reach No. | Upstream Node | Downstream Node   | Design Flow - Nolte (cfs) | Pipe Diameter (in.) | Manning's Roughness | Length (ft) | Approximate Slope (ft/ft) | Flow Depth (ft) | Flow Velocity (ft/s) |
|-----------|---------------|-------------------|---------------------------|---------------------|---------------------|-------------|---------------------------|-----------------|----------------------|
| 1         | 24A           | 24B               | 0.5                       | 12                  | 0.015               | 185         | 0.0249                    | 0.22            | 4.00                 |
| 2         | 24B           | Existing 18" Pipe | 1.1                       | 12                  | 0.015               | 310         | 0.0206                    | 0.34            | 4.68                 |