

**City of Molalla  
Clackamas County, Oregon**

**I/I FLOW MAPPING**

OCTOBER 2018



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Project No. 100.26

**City of Molalla**  
**Clackamas County, Oregon**

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EXPIRES: 12/31/2018



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SECTION 1:  
**EXECUTIVE SUMMARY**

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# SECTION 1: EXECUTIVE SUMMARY

## **1.1 Executive Summary**

The following report summarizes a wastewater collection system study performed for the City of Molalla (City). Continuous strain upon the City's wastewater treatment system has prompted this study to alleviate specific problems within the collection system. Findings identified can assist the City in locating and isolating deficiencies that when repaired will result in a reduction of infiltration and inflow (I/I) problems occurring within the collection system.

The following report is the culmination of a detailed investigation of I/I in the City of Molalla's wastewater collection system. The project included the following investigative efforts that are summarized within this report:

- Preliminary investigation,
- Flow field survey (flow measurements in manholes),
- Flow mapping,
- Analysis and report.

There was a wide range of deficiencies found in the City of Molalla. These problems burden the City's wastewater treatment plant by increasing hydraulic loading. If gone unchecked, the wastewater collection system will continue to degrade, I/I will increase and thereby occupying valuable WWTP capacity, increasing treatment cost and cause increasing wear on wastewater process equipment.

SECTION 2:  
**INTRODUCTION**

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## **SECTION 2: INTRODUCTION**

### **2.1 General**

Infiltration and inflow (I/I) is an ongoing problem affecting many Oregon communities, including the City of Molalla. Infiltration and inflow, which is defined as groundwater and rainwater that enters a sanitary sewer collection system, creates many wastewater related problems. Rain induced sewer flows can hydraulically overload a wastewater treatment plant or pump station, increase the cost of operations, potentially cause a discharge of inadequately treated effluent, and lead to regulatory compliance issues. Wastewater collection systems continue to degrade over time, if gone unchecked I/I will increase. In addition, I/I can cause flows to exceed the capacity of the pipes, compromising the collection system and overloading a wastewater treatment plant.

### **2.2 Scope of Study**

This report is intended to assist the City of Molalla's ongoing maintenance of the collection system for the reduction of I/I.

#### **Field Survey**

Field surveys were performed to identify I/I by taking instantaneous flow measurements at selected manholes within the collection system. Each manhole at the flow measuring locations was inspected for defects leading to ground water infiltration and surface inflow.

#### **Flow Mapping**

The results from the flow mapping were utilized to determine potential areas with significant sources of I/I.

#### **Conclusions and Recommendations**

Conclusions and recommendations were developed that identify portions of the City of Molalla's sewer collection system that need improvement work or further investigation. Television inspection of these areas is anticipated to provide confirmation and exact locations of these additional sources of I/I.

SECTION 3:  
**EXISTING CONDITIONS**

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## SECTION 3: EXISTING CONDITIONS

### 3.1 Field Investigation

Field investigations were performed on January 29, 2018 to determine the quantity and sources of extraneous water that enters Molalla's sewer collection system. Potential sources of infiltration include: manhole joint failure, manhole channel defects, cracks in pipes, pipe joint failures, leaking pipe penetrations, and root intrusions. Potential sources of inflow include storm drains, roof drains, and contributions from manhole lids or open clean-outs.

Flow measurements consisted of instantaneous water depth recording using "Flow Poke" equipment at incoming pipe segments within manholes as well as general observations. Flow measurements were conducted by two crews of two persons each, including one person from City staff. Crews moved from manhole to manhole in as short a time as possible between 10:30 P.M. and 5:00 A.M., when domestic and commercial sewage contributions were minimal.

Flow measurements were taken at selected manholes by using portable Flow Poke equipment. These meters allowed the flow mapping team to take instantaneous measurements without physically entering the manhole. The flow meter measures water depth across a V-notch weir and can be used for pipes up to 12-inches in diameter. Accuracy is plus or minus five percent for flows up to 640 gallons per minute (gpm). This accuracy is considerably higher than having to physically measure the water depth, as was done prior to the invention of the portable flow 'flow poke equipment.' When flows were encountered that were less than 5 gpm, no further investigation was performed in the upstream collection system.

By determining the relative increases in measured flow between manhole sections, problem areas can be identified and prioritized. The flow poking indicated a number of deficiencies that need to be addressed. The findings are summarized as follows:

#### Flow Poking Findings

- Excess flow of 24 gpm along Fenton Avenue from TL\_B\_19 to TL\_B\_22, and including TL\_B\_21 to TL\_B\_24 along Kimberly Court.
- Excess flow of 32 gpm along Patrol St. from TL\_B\_2 to TL\_B\_27.
- Manhole TL\_B\_2 has leakage.
- Excess flow of 80 gpm from TL\_5 to TLA\_48 along Grange Avenue, from TL\_A\_48 to TL\_A\_30 along E Main Street, and along Lola Avenue from TL\_A\_33 to TL\_A\_22.
- Manhole TL\_A\_30 has leakage.
- Excess flow of 14 gpm from TL\_A\_22 on East 2<sup>nd</sup> to TL\_A\_18 on Eckerd Avenue.
- Excess flow of 18 gpm from TL\_A\_18 to TL\_A\_16 along Eckerd Avenue.
- Excess flow of 14 gpm along S. Swiegle from BC\_A3\_17 to BC\_A3\_7.
- Excess flow of 10 gpm along Berkley Avenue from BC\_A3\_12 to clean-out located south of BC\_A3\_14 near East 5<sup>th</sup> St.
- Excess flow of 18 gpm from BC\_A3\_18 on East Main Street, to BC\_A3\_12 on Berkley Avenue.
- Excess flow of 38 gpm from TL\_A\_28 to TL\_A\_26 along East Main Street.
- Excess flow of 23 gpm beginning at the S. Molalla Pump Station, continuing to manhole BC\_A1\_2, and terminating at the clean-out located east of manhole BC\_A1\_3. Additional smoke testing and TVing is recommended. A portion of this sewer line extends into an abandoned subdivision that presents a higher risk of infiltration and inflow.

- Excess flow of 16 gpm beginning at manhole BC\_A3\_21 and continuing south on Metzler to BC\_A3\_2, terminating at clean-out at the intersection of Metzler and West 4<sup>th</sup> Street.
- Excess flow of 14 gpm beginning at BC\_A3\_20 along S. Molalla Avenue, and continuing to BC\_A3\_3, and terminating at a clean-out located in the City Park. Includes service laterals extending east on 2<sup>nd</sup> Street.
- Excess flow of 12 gpm beginning at TL\_A2\_6, continuing south on S. Cole Avenue until TL\_A2\_4, and then continuing east on East 7<sup>th</sup> Street until TL\_A2\_3.
- Excess flow of 11 gpm starting at TL\_A2\_3 and terminating at the clean-out east of manhole TL\_A2\_5.
- Manhole TL\_A2\_6 has leakage.
- Excess flow of 10 gpm beginning at TL\_B\_2 along North Cole Avenue, and terminating at the clean-out south of TL\_B\_31, including TL\_B\_29 along Garden Court until TL\_B\_4.
- Excess flow of 15 gpm beginning at TL\_B\_8 along Oak Street, and continuing to clean-out east of TL\_B\_12.
- Excess flow of 10 gpm beginning at TL\_B\_8 on East Heintz Street to TL\_B\_9, continuing to TL\_B\_10 on East Park Avenue.
- Manhole TL\_C\_6 has leakage.
- Manhole TL\_C\_4 has leakage.
- Excess flow of 10 gpm beginning at BC\_B\_1 along South Molalla Forest Road to BC\_B\_18. Includes 8" sewer line extending west to BC\_B\_10.
- Excess flow of 10 gpm beginning at BC\_C\_71 along Meadowlawn Place to BC\_C\_59.
- Manhole TL\_50 has leakage.
- Manhole TL\_28 has leakage.
- Manhole TL\_F\_22 has leakage.
- Manhole BC\_A\_47 has leakage.
- Manhole BC\_A\_39 has leakage.
- Excess flow of 10 gpm beginning at TL\_A1\_5, continuing to TL\_A1\_1 on East 8<sup>th</sup> Street, continuing east on East 8<sup>th</sup> Street until TL\_A1\_6, and then terminating at the clean-out at the end of Mathias Court. Additional inspections and TVing is required in subbasin TL\_A1 to determine deficiencies.
- Manhole BC\_A\_45 has leakage.
- Excess flow of 10 gpm beginning at TL\_C2\_11 along Explorer Avenue, continuing to TL\_C2\_6 along Escort Street, continuing to TL\_C2\_5 along Bronco Avenue, and continuing along Glory Ln to TL\_C2\_1. Includes TL\_C2\_15 along Probe Street terminating at TL\_C2\_16. Additional inspections and TVing is required in subbasin TL\_C2 to identify and isolate deficiencies.

Based on visual inspections of numerous manholes, excess flow was present on the Bear Creek main, from manhole TL\_40 to BC\_A\_45. Excess flow was also identified on the Toliver main, from manhole TL\_46 continuing to TL\_39 to TL\_20 along Toliver Road, from TL\_20 to TL\_19 along Kennel Avenue, and from TL\_19 to TL\_2 along East Heintz Street. These lines require TV viewing to identify deficiencies.

### **3.2 Flow Mapping**

Flow mapping results, using the City's existing collection system map, are provided in the Appendices. Appendix A is a Key Map indexing the locations of the flow maps provided in Appendix B. Appendix B includes Figures A, B, C, and D. Line segments have been color coded to illustrate the approximate I/I flow that was measured and recorded.

SECTION 4:

**CONCLUSIONS AND RECOMMENDATIONS**

## SECTION 4: CONCLUSIONS AND RECOMMENDATIONS

### **4.1 Summary**

Infiltration and inflow is a major problem with the City's collection system. Several areas with high infiltration and inflow were identified during field investigations. High infiltration rates will likely require subsequent investigations performed by the City (i.e. television inspection), and smoke testing of select areas to refine the scope of work related to each I/I repair project. Field investigations also revealed several manholes that were leaking. Manhole repairs can be performed without further investigation.

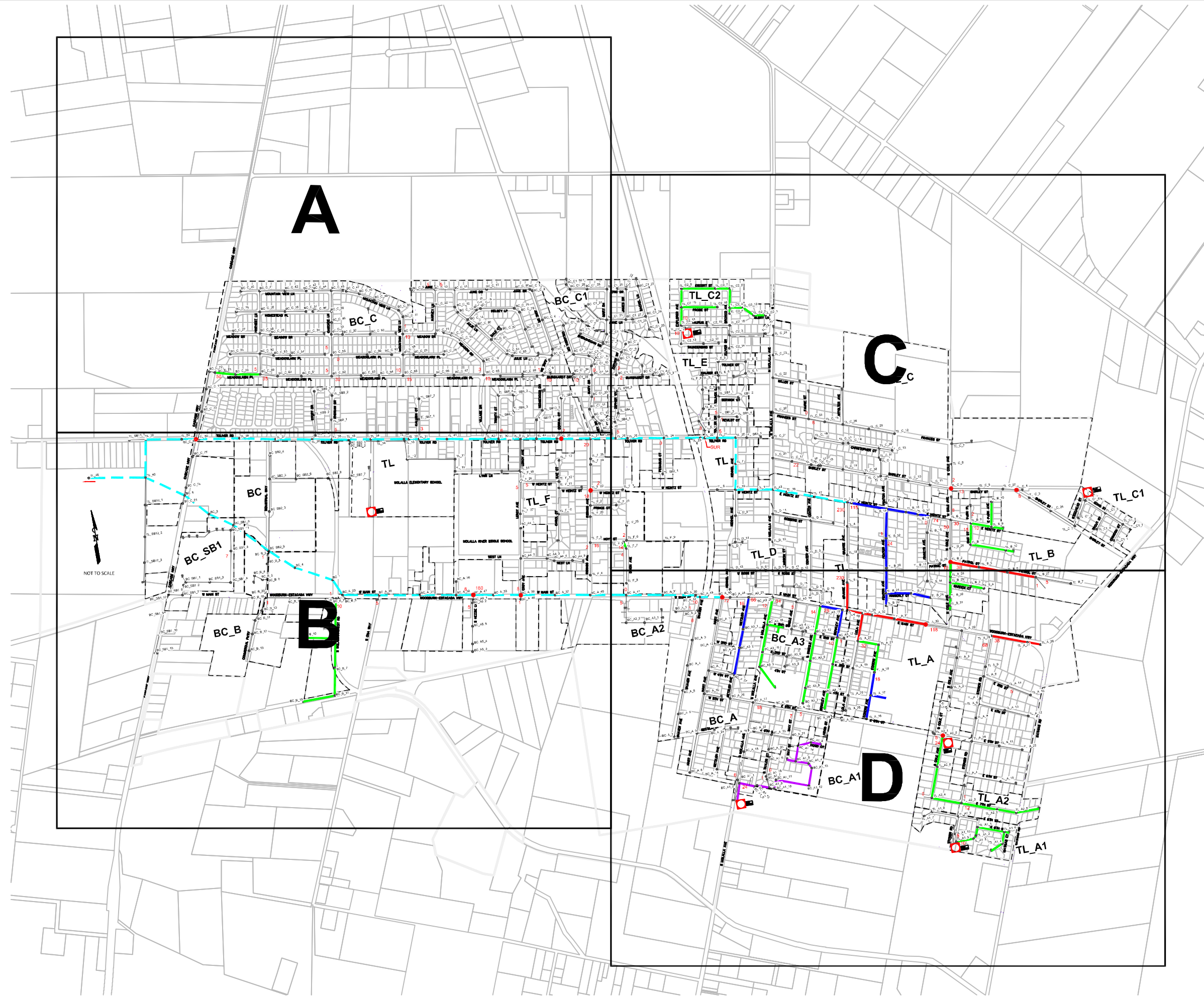
Cost estimates will be provided in the City's Wastewater Facility and Collection System Master Plan for high priority areas. Conservatively, cost estimates will be based on full main line and manhole replacement. However, prior to design, each area should be further investigated to determine the best approach to addressing each collection system deficiency and mitigating infiltration and inflow.

# **APPENDICES**

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**APPENDIX A: KEY MAP**

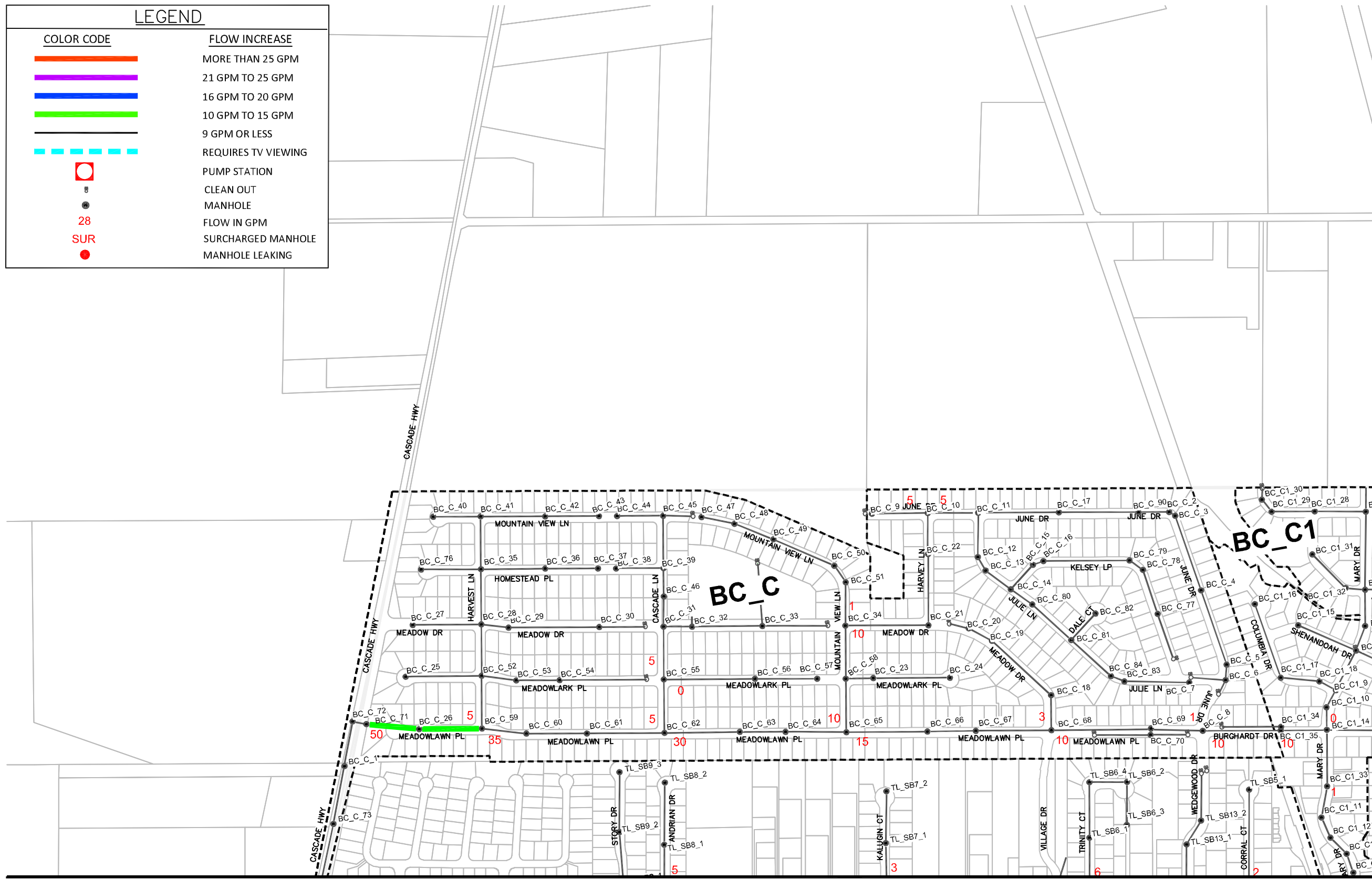
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## **APPENDIX B: I/I Flow Mapping (Figures A, B, C, and D)**



LEGEND	
COLOR CODE	FLOW INCREASE
	MORE THAN 25 GPM
	21 GPM TO 25 GPM
	16 GPM TO 20 GPM
	10 GPM TO 15 GPM
	9 GPM OR LESS
	REQUIRES TV VIEWING
	PUMP STATION
	CLEAN OUT
	MANHOLE
	FLOW IN GPM
	SURCHARGED MANHOLE
	MANHOLE LEAKING



MATCHLINE - SEE SHEET B FOR CONT

MATCHLINE - SEE SHEET C FOR CONT

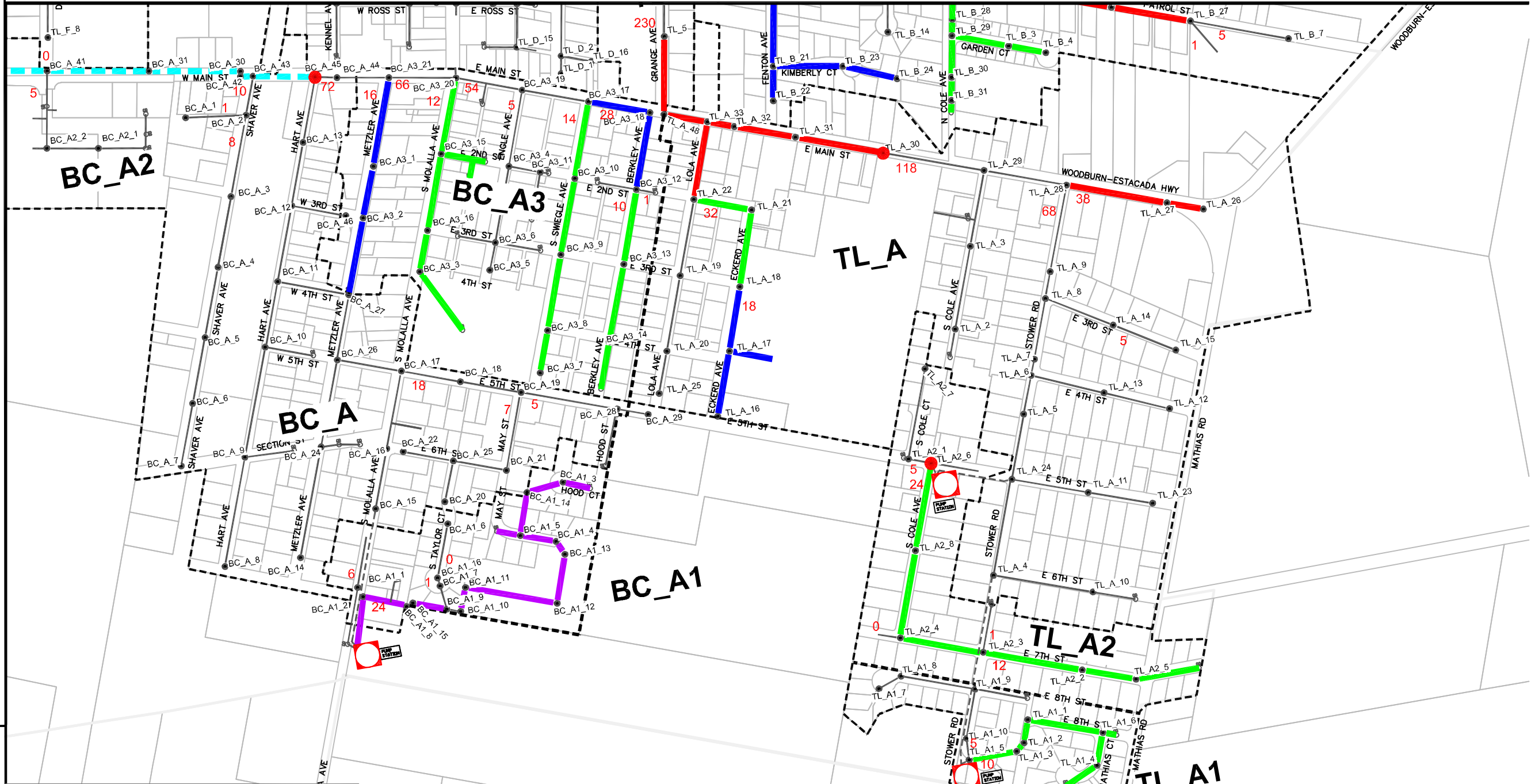
<p>THE DYER PARTNERSHIP ENGINEERS &amp; PLANNERS</p> <p>DATE: JAN., 2018</p> <p>PROJECT NO.: 100.26</p>	<p>CITY OF MOLALLA CLACKAMAS COUNTY, OREGON</p> <p>I&amp;I FLOW MAPPING</p>	<p>FIGURE NO. A</p>
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MATCHLINE - SEE SHEET B FOR CONT

MATCHLINE - SEE SHEET C FOR CONT



**LEGEND**

COLOR CODE	FLOW INCREASE
	MORE THAN 25 GPM
	21 GPM TO 25 GPM
	16 GPM TO 20 GPM
	10 GPM TO 15 GPM
	9 GPM OR LESS
	REQUIRES TV VIEWING
	PUMP STATION
	CLEAN OUT
	MANHOLE
	FLOW IN GPM
	SURCHARGED MANHOLE
	MANHOLE LEAKING

CITY OF MOLALLA  
CLACKAMAS COUNTY, OREGON  
I&I FLOW MAPPING

FIGURE NO.  
D

THE DYER PARTNERSHIP  
ENGINEERS & PLANNERS  
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