Larson Creek Basin Plan

Prepared for

City of Medford, Oregon

November 2015

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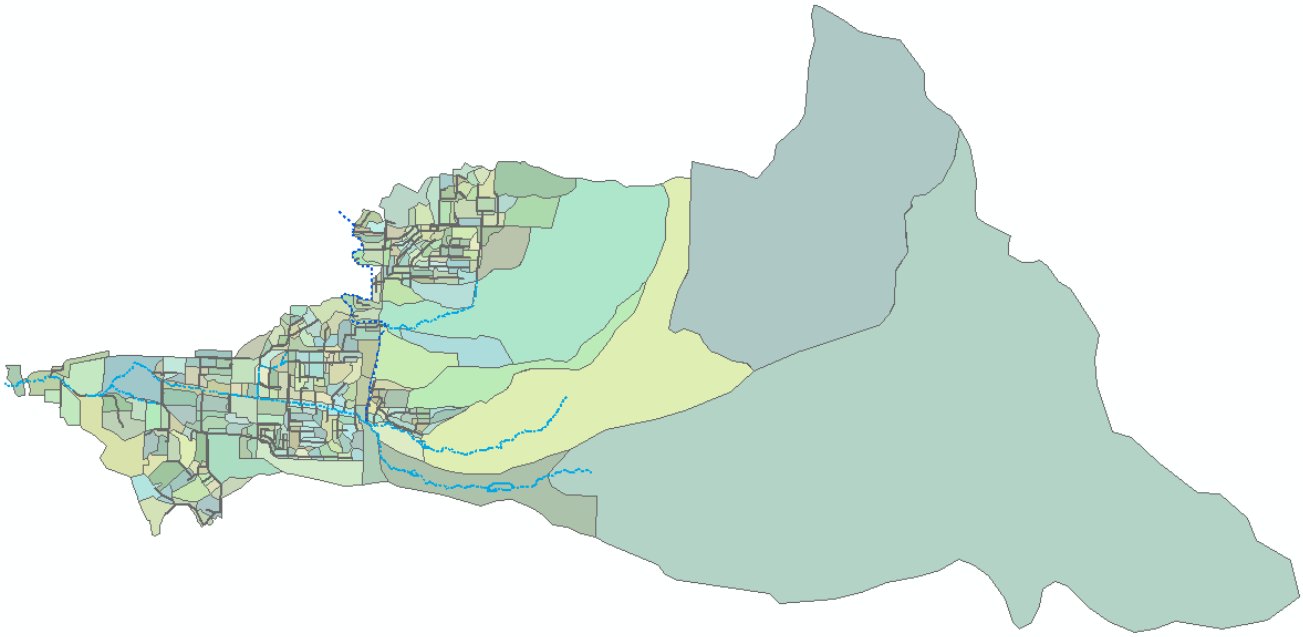

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List of Abbreviations

Basin Plan	Larson Creek Basin Plan
BC	Brown and Caldwell
BOD	biochemical oxygen demand
cfs	cubic foot/feet per second
CIP	capital improvement project
City	City of Medford
CM	Commercial
DMP	Drainage Master Plan
EPA	U.S. Environmental Protection Agency
FEMA	Federal Emergency Management Agency
FIS	Flood Insurance Study
ft^3	cubic foot/feet
GI	General Industrial
GIS	geographic information system
GLUP	General Land Use Plan
HDPE	high-density polyethylene
H/H	hydrologic and hydraulic
HI	Heavy Industrial
HSG	hydrologic soil grouping
ID	identifier
LF	linear foot/feet
LiDAR	light detection and ranging
MID	Medford Irrigation District
MS4	municipal separate storm sewer system
NAD83	North American Datum of 1983
NAVD88	North American Vertical Datum of 1988
NGVD29	National Geodetic Vertical Datum of 1929
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
PS	Parks and Schools
PVC	polyvinyl chloride
SC	Service Commercial
SCS	U.S. Department of Agriculture Soil Conservation Service
SWMM	Surface Water Management Model
SWMP	Stormwater Management Plan
TMDL	Total Maximum Daily Load
UGB	urban growth boundary
UH	Urban High Density
UM	Urban Medium Density
UR	Urban Residential

Section 1

Introduction

This Larson Creek Basin Plan (Basin Plan) documents the methods and results of the stormwater quality and storm system capacity evaluation for the Larson Creek study area. The watershed area for Larson Creek comprises land within the City of Medford's (City's) urban growth boundary (UGB) and Jackson County land upstream of the UGB. The study area is the portion of the watershed within Medford's UGB. This section provides a summary of the need for the Basin Plan, the Basin Plan objectives, a description of the approach for preparing the Basin Plan, and a summary of how the Basin Plan is organized.

1.1 Plan Objectives

The objectives of this Basin Plan are as follows:

- Use hydrologic and hydraulic (H/H) modeling to evaluate system capacity and identify potential deficiencies within the system.
- Identify capital improvement projects (CIPs) to address deficiencies (to meet future demands).
- Review CIPs and evaluate the potential to address stormwater quality treatment needs.
- Develop a capital improvement program for the basin to address water quantity and quality needs.

This Basin Plan does not comprehensively meet citywide requirements to comply with municipal separate storm sewer system (MS4) National Pollutant Discharge Elimination System (NPDES) permit conditions or Total Maximum Daily Load (TMDL) implementation plan conditions, but the overall basin CIPs are influenced and will help address these program goals. This Basin Plan also does not attempt to incorporate the basin CIPs into the overall citywide stormwater capital improvement program. City staff will integrate the recommendations contained within this Basin Plan into the citywide program.

1.2 Authorization

In April 2013, the City contracted with Brown and Caldwell (BC) to develop this Basin Plan. The Basin Plan is based on information compiled from existing geographic information system (GIS) stormwater maps, the 1981 and 1996 Drainage Master Plans (DMPs), the 2005 MS4 NPDES Stormwater Management Plan (SWMP), field reconnaissance at selected sites, a review of City ordinances, and staff input.

1.3 Approach

This Basin Plan addresses both water quality and water quantity elements of stormwater management and is intended to guide the City in the development of a 10-year stormwater capital improvement program for the Larson Creek Basin. The data collection, evaluation, and improvement strategies were conducted as follows:

1. The City's storm drain GIS data were reviewed to develop the extents of the stormwater H/H model and associated model attributes such as sub-basin drainage areas, land uses, soils, and topography. Existing water quantity and quality control facilities were also reviewed.

2. An H/H model was developed for existing and future conditions using the PC Surface Water Management Model (SWMM).
3. Field visits were conducted at selected sites by BC and City staff.
4. City staff were interviewed to determine how the existing stormwater program and facilities were operating and to compile information regarding known opportunities for improvement.
5. Capacity deficiencies were identified for a 10-year, 24-hour design storm and sized for projected build-out conditions.
6. Alternatives were developed for improvements to the stormwater infrastructure to address capacity deficiencies.
7. Improvements were evaluated with City staff to determine the best alternatives for incorporation into the City's CIP.
8. CIPs were reviewed to identify the ability to also address water quality.
9. An overall schedule for the implementation of improvements was developed.
10. The approach was documented in this Basin Plan to provide information in a clear and easy-to-use format.

1.4 Plan Organization

In addition to this introductory section, this Basin Plan is organized as follows:

- Section 2 includes a description of study area characteristics and associated mapping.
- Section 3 describes the modeling methods used and results of the storm system capacity evaluation.
- Section 4 describes capital measures to address the City's storm system capacity and water quality needs.
- Section 5 describes the recommended CIP prioritization and selection to address storm system capacity and water quality issues identified for the Larson Creek Basin over the next 10 years.
- Appendices A through D provide supporting and technical information used in the development of this Basin Plan.

Section 2

Study Area Characteristics

This section includes an overview of study area characteristics including location, topography, soils, land use, climate and rainfall, drainage system characteristics, and current stormwater quality conditions.

2.1 Location

The city of Medford is located in the Rogue Valley of southwestern Oregon. The Larson Creek Basin is in the southeastern portion of the city. Medford is located along the Interstate 5 corridor and is bordered by the city of Central Point to the north and west and unincorporated Jackson County to the south and east. The area of Medford is approximately 25.8 square miles. Approximately 2.9 square miles of the Larson Creek Basin are located within the city limits and the remaining 6.5 square miles are located within unincorporated lands of Jackson County.

Figure 2-1 shows the location of the Larson Creek Basin with respect to the city of Medford.

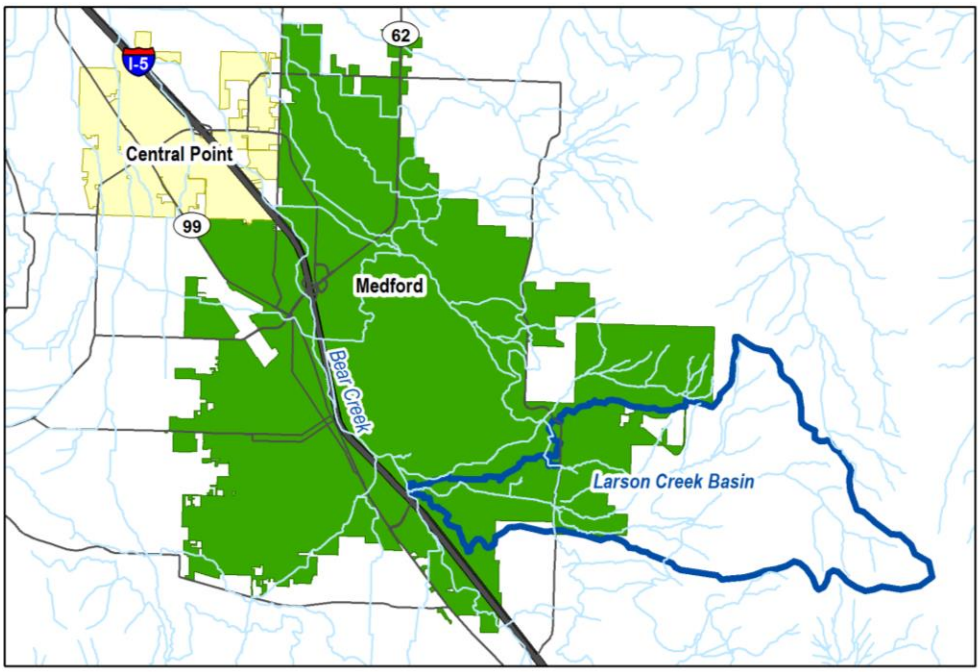
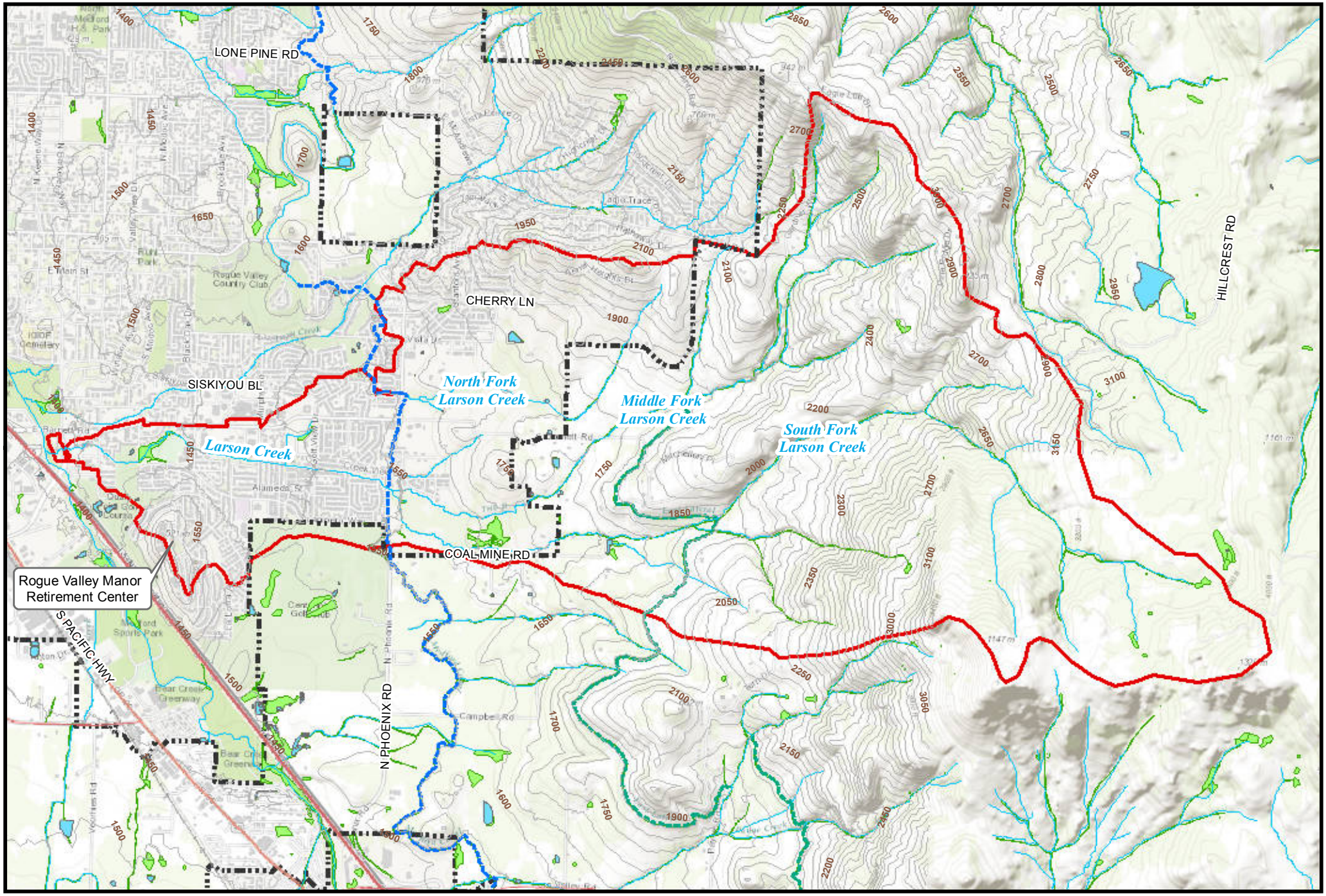


Figure 2-1. Vicinity map

2.2 Topography

Topographic information was compiled using 2012 aerial imagery and 2009 light detection and ranging (LiDAR) data on the unadjusted National Geodetic Vertical Datum of 1929 (NGVD29). Anecdotal information from City staff and two field visits by BC staff were used to supplement these data (see Figure 2-2).



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CITY OF MEDFORD
LARSON CREEK BASIN PLAN
FIGURE 2-2
TOPOGRAPHIC MAP

WATERWAY
EAST LATERAL (TID)
MEDFORD CANAL (MID)
CONTOURS
NATIONAL WETLANDS INVENTORY
URBAN GROWTH BOUNDARY (UGB)
LARSON CREEK BASIN

The upper reaches of the Larson Creek Basin above N. Phoenix Road and the Medford Canal are characterized by steep slopes. The average slope of modeled sub-basins in the upper reaches of the basin is 8 percent and reaches a 30 percent slope. The ground elevation in the upper reaches ranges from 1,560 to 3,020 feet. The average slope of modeled sub-basins in the lower reaches of the basin is 3.6 percent and the ground elevation ranges from 1,380 to 1,560 feet. There is one area of steep slopes in the lower basin near the Rogue Valley Manor Retirement Community in the southwestern portion of the basin.

2.3 Drainage System

The Larson Creek Basin is approximately 6,000 acres and ranges in elevation from 3,020 feet at the highest point to 1,380 feet at the confluence with Bear Creek. A summary map of the drainage system is shown in Figure 2-3, and detailed maps of the drainage system are provided in Appendix A.

Runoff from the upper basin, east of N. Phoenix Road, is conveyed in the three forks of Larson Creek as shown in Figure 2-3. The north fork intersects the Medford Irrigation District (MID) Canal at N. Phoenix Road and either continues downstream to Larson Creek or enters the MID Canal, as described below. The flow that continues downstream to the main stem of Larson Creek is conveyed in 42- and 48-inch-diameter reinforced concrete pipe to the intersection of Barnett Road and Golf View Drive, where the Creek daylights into a channel that conveys flow to the main stem.

The middle and south forks join Larson Creek upstream of the N. Phoenix Road Bridge and continue downstream through a natural channel with bridges or culverts at each roadway crossing.

Stormwater runoff within the basin is typically collected at curb inlets and catch basins and piped to the nearest reach of Larson Creek. There are 23 storm drain connections that were modeled draining to the main stem of Larson Creek between N. Phoenix Road and the confluence with Bear Creek. There are also nine storm drain systems modeled that are directly connected to the MID Canal, the most substantial connections being the 36-inch-diameter pipe on Greystone Court and the 27-inch-diameter pipe on Karges Way. In total, approximately 18 miles of storm drain pipe and 2 miles of culverts are located within the Larson Creek Basin.

Main irrigation canals within the basin include the MID Canal and the East Lateral. The MID Canal is owned by the MID and is aligned in a north–south direction parallel to N Phoenix Road. This canal is conveyed through a combination of culverts and open channels and crosses the main stem of Larson Creek in a siphon south of the intersection of N. Phoenix Road and Creek View Drive. The MID estimated the capacity of the siphon to be between 60 and 70 cubic feet per second (cfs). The canal also crosses the north fork of Larson Creek north of the intersection of N. Phoenix Road and E Barnett Road. This crossing is an open four-way intersection between the Creek and canal during winter. During the irrigation season, the Creek upstream of N. Phoenix Road is directed to the MID Canal by way of two 2-by-12-inch boards that are placed in the downstream portion of the crossing to prevent water from flowing from the canal into the Creek. The MID provided information that the canal flows south at an estimated slope of 0.5 foot per mile, unless a survey of existing culverts indicates otherwise. For instance, per survey data, the culverted section of the canal north of Greystone Court flows north and discharges into Lazy Creek.

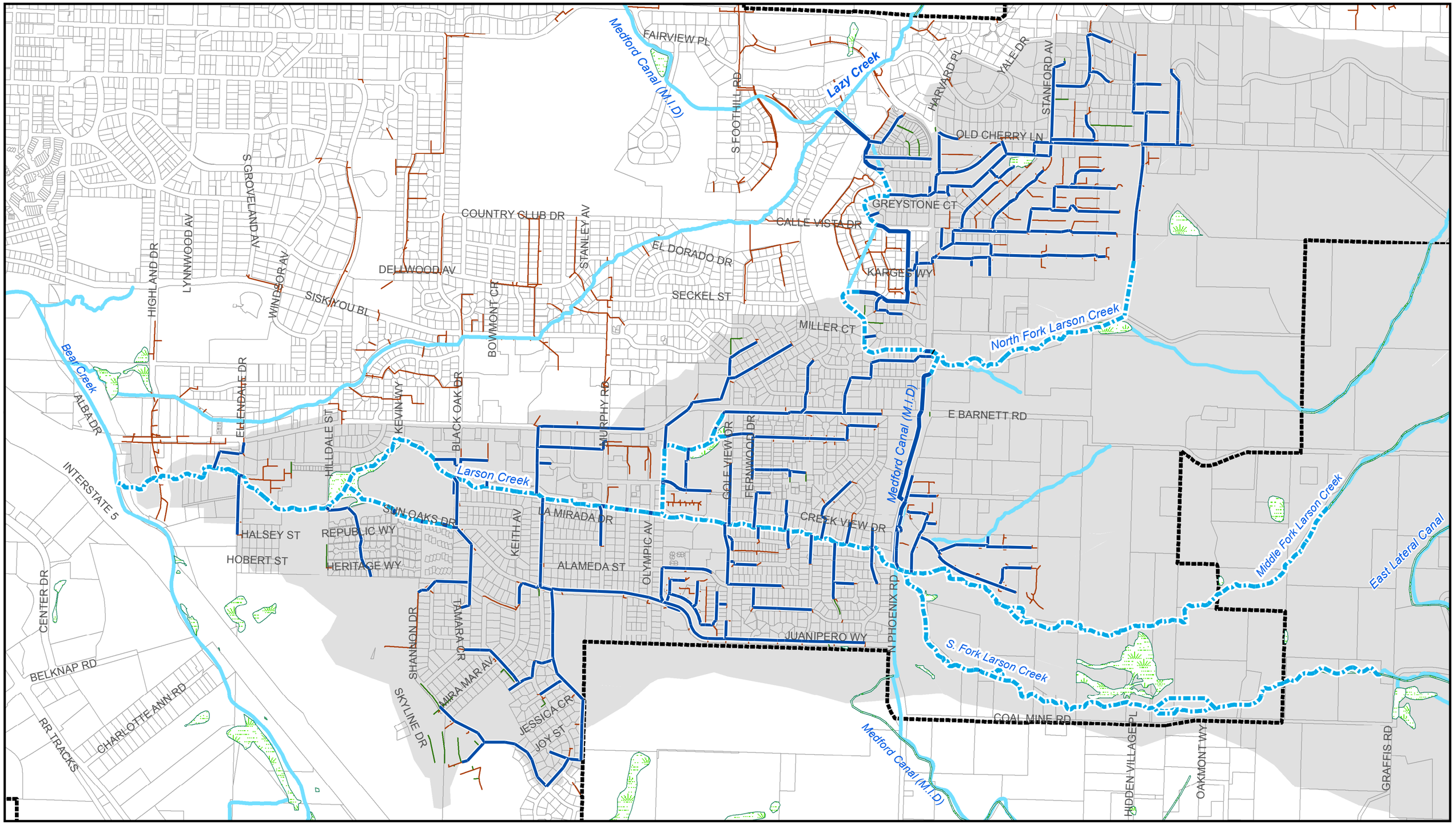
The East Lateral (see Figure 2-4 for location) is smaller than the MID Canal and is located in the upper portion of the basin. The East Lateral is operated by the Talent Irrigation District and is open at crossings with the middle and south forks of Larson Creek. This canal terminates at the upper portion of the middle fork of Larson Creek and discharges any remaining water into this reach.

2.4 Soils

Soil classification is an important characteristic to consider when evaluating runoff flow rates and volumes. Soil types within the study area were identified using data from the Natural Resources Conservation Service (NRCS) Soil Survey. Soil information is based upon data obtained from a 1993 publication from the U.S. Department of Agriculture Soil Conservation Service (SCS) titled *Soil Survey of Jackson County Area, Oregon*, *Parts of Jackson and Klamath Counties*. The SCS hydrologic soil grouping (HSG) is the parameter within the soil survey that describes runoff potential within the basin. The SCS HSG ranges from Type A (highest infiltration rate) to Type D (lowest infiltration rate). Soils within the Larson Creek Basin are dominated by Type D soils with very slow infiltration rates. There are also some small areas of Type C soils with slow infiltration rates. As reported in the 2005 SWMP, bedrock is less than 10 feet deep in the basin, which is also a limiting factor to infiltration potential. Table 2-1 lists soil types, their associated characteristics, and distribution within the basin. Soils listed in Table 2-1 are illustrated within the study area in Figure 2-4.

Table 2-1. Larson Creek Basin Soil Characteristics

NRCS map unit name	NRCS map symbol	HSG	Percent coverage in UGB
Brader-Debenger loams, 1% to 15% slopes	17C	D	8.2
Brader-Debenger loams, 15% to 40% slopes	17E	D	2.1
Bybee-Tatouche complex, 12% to 35% north slopes	19E	D	< 1
Carney clay, 1% to 5% slopes	27B	D	6.7
Carney clay, 5% to 20% slopes	27D	D	18.3
Carney cobbly clay, 5% to 20% slopes	28D	D	4.8
Carney cobbly clay, 20% to 35% slopes	28E	D	17.2
Carney cobbly clay, high precipitation, 5% to 20% slopes	29D	D	5.2
Carney cobbly clay, high precipitation, 20% to 35% slopes	29E	D	1.0
Coker clay, 0% to 3% slopes	33A	D	9.5
Coker clay, 3% to 12% slopes	33C	D	2.0
Cove clay, 0% to 3% slopes	35A	D	< 1
Darow silty clay loam, 1% to 5% slopes	43B	D	< 1
Darow silty clay loam, 5% to 20% slopes	43D	D	< 1
Heppsie clay, 35% to 70% north slopes	81G	D	1.0
Heppsie-McMullin complex, 35% to 70% south slopes	82G	D	5.0
McMullin gravelly loam, 3% to 35% slopes	110E	D	< 1
McMullin-Rock outcrop complex, 3% to 35% slopes	113E	D	4.2
McMullin-Rock outcrop complex, 35% to 60% slopes	113G	D	1.6
McNull-McMullin complex, 35% to 60% north slopes	117G	D	1.6
McNull-Medco complex, high precipitation, 12% to 50% slopes	119F	D	5.5
Medco cobbly clay loam, 12% to 50% south slopes	122E	D	< 1
Medco clay loam, high precipitation, 12% to 50% north slopes	123F	D	< 1
Medford silty clay loam, 0% to 3% slopes	127A	C	< 1
Padigan clay, 0% to 3% slopes	139A	D	1.7
Tatouche gravelly loam, 12% to 35% north slopes	190E	C	< 1
Tatouche gravelly loam, 35% to 65% north slopes	190G	C	< 1



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LARSON CREEK BASIN PLAN

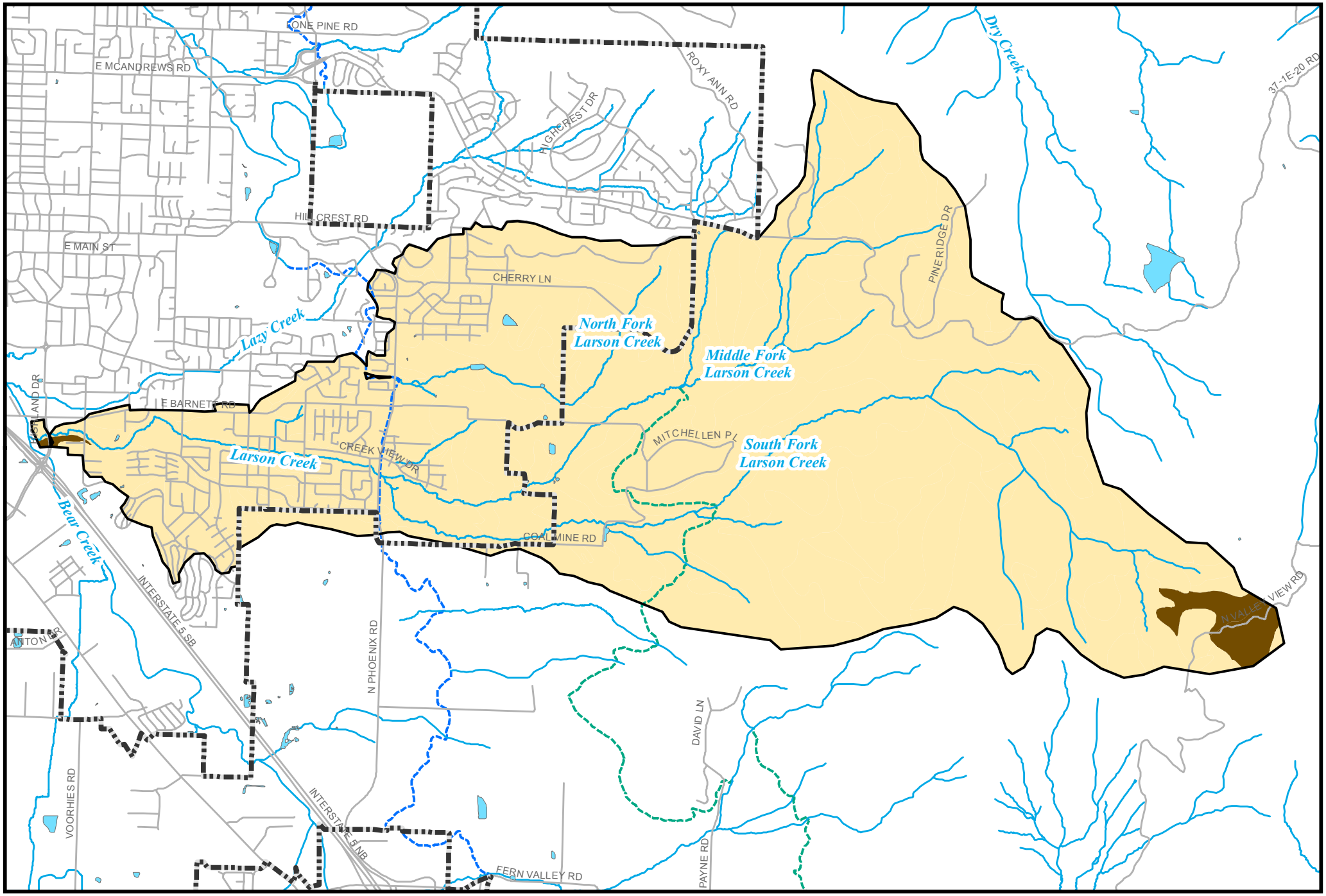
FIGURE 2-3

SUMMARY DRAINAGE SYSTEM MAP

- MODELED CONDUITS
- MODELED OPEN CHANNELS
- OTHER OPEN CHANNELS
- OTHER CONDUITS
- URBAN GROWTH BOUNDARY (UGB)
- JACKSON CO. WETLANDS
- TAXLOTS
- LARSON CREEK BASIN

NORTH

0 500 1,000 2,000 Feet



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LARSON CREEK BASIN PLAN

FIGURE 2-4
SOILS MAP

HYDROLOGIC SOIL GROUP C
HYDROLOGIC SOIL GROUP D
LARSON CREEK BASIN
URBAN GROWTH BOUNDARY (UGB)
STREETS
WATERWAY
EAST LATERAL (TID)
MEDFORD CANAL (MID)

2.5 Land Use

Medford's 2012 population was reported as 76,462 by the U.S. Census Bureau. The land within the basin between N. Phoenix Road and the UGB has been a targeted area for development in recent years, and residential and commercial development is expected to continue in this area.

To reflect the existing system land use conditions for modeling purposes, imperviousness was estimated from 2012 aerial imagery.

The future land use condition was based upon the City's General Land Use Plan (GLUP) and the Southeast Plan. The GLUP, adopted in 2009, provides planned land use categories for areas within the City's UGB. The Southeast Plan, adopted in March 2013, provides a more detailed land use plan for future development areas east of N. Phoenix Road. The 69.4 percent of the basin in unincorporated Jackson County was assumed to be unchanged in the future condition. Table 2-2 provides impervious percentages assigned to each of the land uses for modeling.

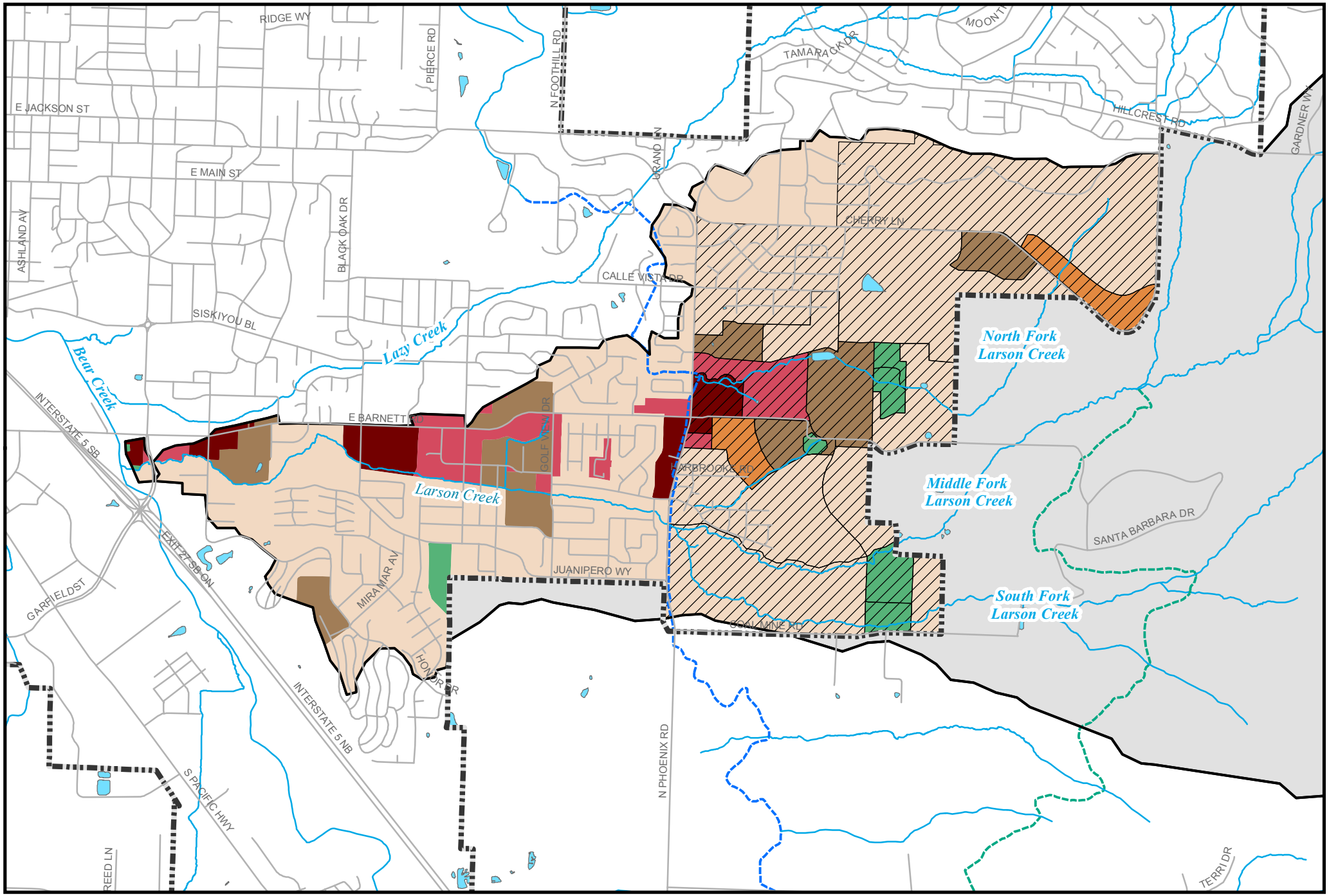
Table 2-2. Larson Creek Land Use Classification

GLUP classification	Estimated Impervious percentage per GLUP classification, %	Percentage of Larson Creek Basin per GLUP classification, %
Commercial (CM)	80	1.1
Parks and Schools (PS)	40	0.9
Service Commercial (SC)	80	1.6
Urban High Density (UH)	70	3.0
Urban Medium Density (UM)	55	0.8
Urban Residential (UR)	50	23.2
Outside of GLUP (unincorporated Jackson Co.)	Existing	69.4

According to the GLUP and Southeast Plan, most development is anticipated to occur in the upper reaches of the basin.

Percent changes of impervious cover anticipated in the future along with other existing and future land use parameters for each sub-basin are provided in Section 3.

Figure 2-5 illustrates future land use according to the GLUP and the Southeast Plan within the basin.



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LARSON CREEK BASIN PLAN
FIGURE 2-5
GENERAL LAND USE PLAN AND SOUTHEAST PLAN

- COMMERCIAL (CM)
- PARKS AND SCHOOLS (PS)
- SERVICE COMMERCIAL (SC)
- URBAN HIGH DENSITY RESIDENTIAL (UH)
- URBAN MEDIUM DENSITY RESIDENTIAL (UM)
- URBAN RESIDENTIAL (UR)
- SOUTHEAST PLAN
- LARSON CREEK BASIN
- URBAN GROWTH BOUNDARY (UGB)
- STREETS
- WATERWAY
- EAST LATERAL (TID)
- MEDFORD CANAL (MID)

2.6 Climate and Rainfall

Climate data were obtained from the National Weather Service 66-year record for Medford.

Medford experiences relatively warm, dry summers and mild, wet winters. The normal daily high temperatures range from approximately 90 degrees Fahrenheit in August to 44 degrees in December. Normal daily low temperatures range from approximately 55 degrees in August to 30 degrees in January.

The average annual precipitation is approximately 19 inches. Most of the precipitation in this area falls between October and May; however, short, intense summertime storms contribute to annual rainfall. The actual rainfall depths used for modeling are discussed in Section 3, along with how the depths were distributed for modeling purposes. Although "rain on snow" events occur in the Medford area, these events are infrequent and snow accumulation is generally low enough to avoid a great increase in the total runoff volume during such an event. Therefore, instead of accounting for snowpack in the model, the curve number was elevated to account for saturated conditions.

Reference: www.wrh.noaa.gov/pqr/climate/mfr_clisummary.php

2.7 Riparian Conditions and Wetlands

The riparian condition and wetlands along Larson Creek were assessed by Wetlands Consulting in 2002 and summarized in the 2005 SWMP as follows:

> *This basin contains Larson Creek and a number of tributaries in the upper portion of the basin. The lower reaches and some upper reaches are perennial due to irrigation return flows; all other reaches are intermittent. Almost all of the streams and riparian areas in the basin have been extensively modified by human activity, including placement of long stream segments in underground pipes, stream channelization, placement of stream segments in concrete channels, removal of woody vegetation, residential development, orchards, grazing, haying, golf course development and mowing for fire control. The highest reaches in the basin have had the least amount of human impact and include reaches of relatively undisturbed stream channels and riparian areas with intact native Oregon white oak savanna plant communities (Wetlands Consulting, 2002a).*

Table 2-3 summarizes inventoried riparian conditions in the basin as reported in the 2005 SWMP (Table 2-14 and Figure 2-8). Locations referenced in the 2005 SWMP have been modified to reference conveyance system nomenclature adopted for this Basin Plan in Table 2-3.

Table 2-4 summarizes the 2002 inventory of wetlands, as reported in the 2005 SWMP (Table 2-15).

Figure 2- illustrates wetlands within the basin, as delineated in Jackson County's GIS data.

Of significant note is the large wetland shown between the middle and south forks of Larson Creek to the east of N. Phoenix Road (LA-WO5 from Table 2-4). This should be noted given the imminent development that is slated for this area.

Table 2-3. Larson Creek Riparian Conditions Summary

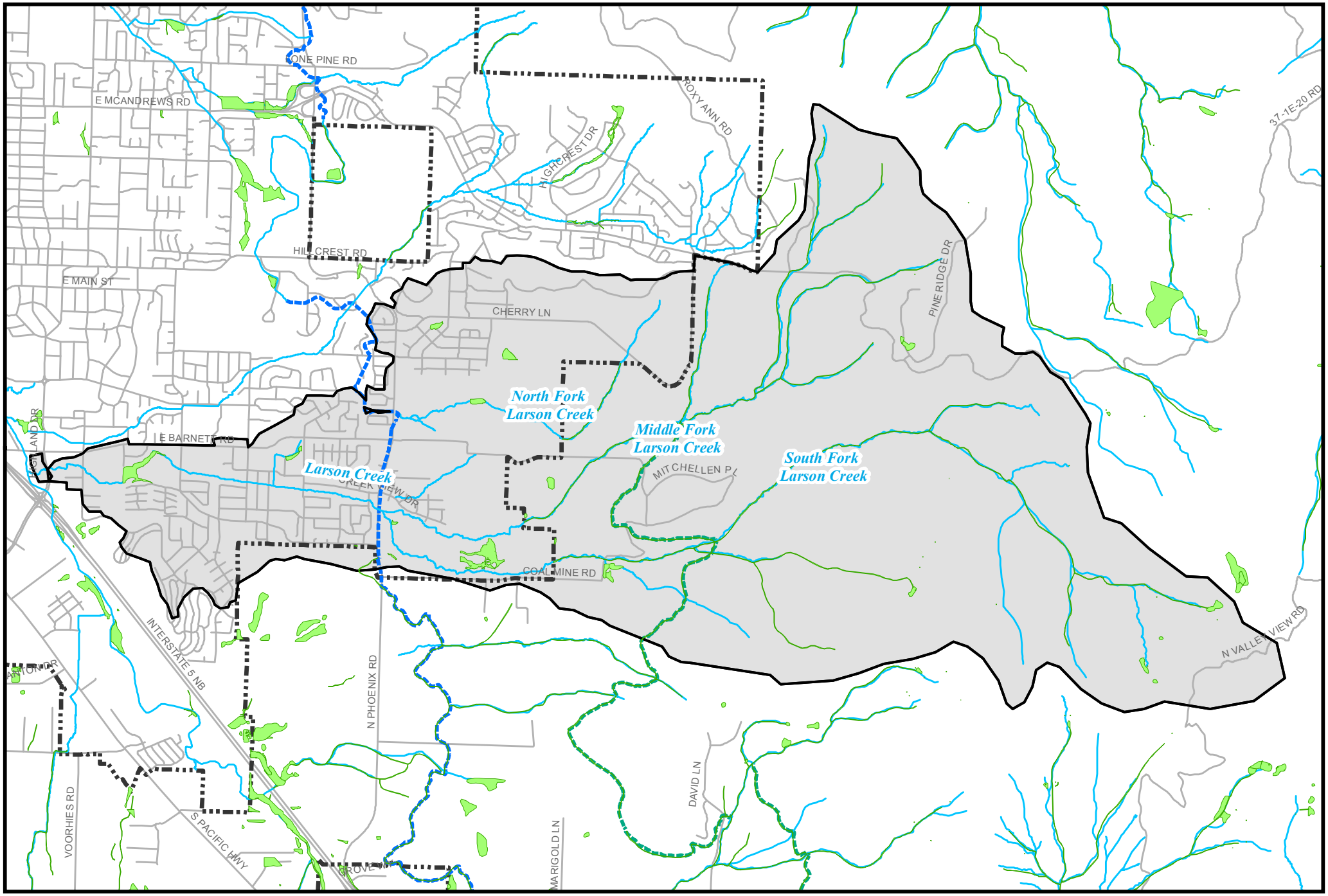
Location (2005 SWMP)	Location (2015 Larson Creek Basin Plan)	Condition*	Restoration needs/ recommendations[a]	Deficiency problem from Section 3, Table 3-7 that coincides with this site
All reaches upstream of N Phoenix Road	All reaches upstream of N. Phoenix Road	Undeveloped portion of the basin, riparian area tree, and understory cover moderate to high.	Protect riparian and stream habitat	11
LA-09 at Larson Creek Drive	Larson Creek, downstream of Golf View Drive	Steep slopes. Moderate tree and understory cover moderate on right bank, no vegetation on left bank. Left bank is steeper than right bank. Drainage pipes from private residences flow into Creek on left bank.	Vegetate banks, re-grade to a more stable slope condition, and remove residential drainage pipes	NA
LA-09 at Golf View Drive	Larson Creek, upstream of Golf View Drive	Concrete causing ponding, riparian area tree, and understory cover moderate to high.	Vegetation enhancement	NA
LA-07 at Golf View Drive	Larson Creek, downstream of Golf View Drive	Riparian area tree and understory cover moderate to high.	Vegetation enhancement	NA
LA-21	Channel no longer exists due to construction	No vegetation. There is not a clear distinction between Creek flow and canal flow at the intersection of Larson Creek and the MID East Main Canal.	Separate the flow in Larson Creek from East Main Canal	NA
LA-08	North fork of Larson Creek, downstream of Golf View Drive	Locally significant wetland (LA-W02).	Preserve wetland	NA
LA-08 N Larson Creek and State Street	North fork of Larson Creek, upstream of State Street	No buffer with development. Natural bottom culvert.	Investigate ways to maintain Creek buffer	9
LA-06	Larson Creek, between Olympic Avenue and Murphy Road	Two blocks of concrete-lined channel between Olympic Avenue and Murphy Road.	Investigate restoring to natural channel	NA
LA-05	Larson Creek, between Black Oak Drive and Murphy Road	Riparian area cover is moderate to high.	None needed	NA
LA-05 at Black Oak Drive	Larson Creek, at Black Oak Drive	A concrete retaining wall in poor condition is located on the left bank. Low to moderate tree and understory cover on banks.	Work with the high school to repair this section of the Creek	8
LA-04	Tributary to Larson Creek, at Sun Oaks Drive	Need containment where campers are parked on edge of wetland/Creek.	Provide buffer or filtration between parking and Creek	NA
LA-03	Larson Creek, upstream of Ellendale Road	Grass at the retirement community is maintained up to Creek bank with no buffer.	Work with retirement community to provide a buffer to the stream	NA
LA-02	Larson Creek, at Ellendale Road	Culvert appears to be smaller than culverts found upstream, fish attraction chute.	Culvert improvement project: Ellendale Fish Passage	10

a. As reported in the 2005 Stormwater Management Plan.

Table 2-4. Larson Creek Wetlands Summary

Location (2005 SWMP)	Location (2015 Larson Creek Basin Plan)	Area (acres)*	Category*	Ecological functions as defined by Oregon Freshwater Wetland Assessment Methodology*	Comments[a]	Deficiency problem from Section 3, Table 3-7 that coincides with this site
LA-W01	Larson Creek, upstream of Ellendale Road	5.6	Locally significant	• Habitat for some species • Intact water quality function • Intact hydrologic control	• Within 1/4 mile of a water quality limited stream (Larson Creek) • Connects to salmon habitat (Larson Creek)	NA
LA-W02	North fork of Larson Creek, downstream of Golf View Drive	1.0	Locally significant	Habitat for some species	• Within 1/4 mile of a water quality limited stream (Larson Creek)	NA
LA-W05	Between the middle and south forks of Larson Creek, near Hidden Village Place	8.2	Locally significant	Habitat for some species	• Within 1/4 mile of a water quality limited stream (Larson Creek) • Connects to salmon habitat (Larson Creek)	11
LA-W06	Wetland not seen on aerial	0.9	NA	NA	NA	NA
LA-W07	Wetland not seen on aerial	1.7	Excavated pond	NA	NA	NA
LA-W08	Wetland not seen on aerial	1.2	Excavated pond	NA	NA	NA

a. As reported in the 2005 Stormwater Management Plan.



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CITY OF MEDFORD
LARSON CREEK BASIN PLAN
FIGURE 2-6
LARSON CREEK WETLANDS

JACKSON CO. WETLANDS
WATERWAY
EAST LATERAL (TID)
MEDFORD CANAL (MID)
URBAN GROWTH BOUNDARY (UGB)
LARSON CREEK BASIN
STREETS

2.8 Stormwater Quality and Quantity Controls

The City owns several stormwater quality and quantity control facilities throughout the study area, and several private facilities have also been constructed. An inventory of known information on existing facilities is documented in Table 2-5.

The City decided to include the Summerfield detention pond in the model due to its large size. Other detention pipes were included when available in the City's GIS data.

Table 2-5. Stormwater Quality and Quantity Controls

Facility name	Facility ID	Ownership	Facility type	Included in model? (Y/N)	Drainage area, as estimated for inclusion in the SWMM model (acres)	Facility size (GIS)
East Gate	-	Public	Swale	N	-	-
Cherry Lane Estates Subdivision, Phase 4	28-56	Public	Detention pipes	N	-	-
Cherry Lane Estates Subdivision, Phase 5	28-57	Public	Detention pipes	N	-	-
Summerfield at South East Park, Phase 1	28-64	Private	Detention pond	Y	65.0	112,690 ft^3
Summerfield at South East Park, Phase 2	29-52	Private	Water quality facility (no detention)	N	-	-
Fordyce Heights	29-53	Public	Detention pipes	N	-	-
Harbrooke Court	32-61	Private	Detention pipes	N	-	-
Whitney Place	32-65	Public	Detention pipes	N	-	-
Stonegate Estates Condominium	33-59	Public	Pollution control structure	N	-	-
Clarkview Terrace	33-73	Public	Detention pipes	N	-	-
Asante Court	33-80	Public	Detention pipes	Y	2.9	353 LF of 15" detention pipe
Summerfield, Phase 11 (proposed)	P-14	Public	Detention pond	N	-	-
Summerfield, Phases 12A and 13 (proposed)	P-17	Private	Detention pond	N	-	-
Juanipero Way	S-07	Public	Detention pipes	Y	65.1[a]	150 LF of (4) 30" detention pipes

a. This detention structure provides off-line storage for the 24" stormwater pipe located on Jaunipero Way. The calculated drainage area is associated with the area contributing flow to the upstream piped system.

2.9 Water Quality

There are two major federal programs under the Clean Water Act that apply to stormwater quality in Medford. The first is the total maximum daily load program (TMDL) and the second is the municipal separate storm sewer system (MS4) national pollutant discharge elimination system (NPDES) permitting program.

2.9.1 TMDL Program

If water quality data are collected and indicate that water quality standards are being exceeded instream, then pollutant loads are restricted and allocated to designated dischargers to ensure water quality standards will be met. As a first step in the TMDL process, the Oregon Department of Environmental Quality (DEQ) will place the water body on what is known as the 303(d) list for the parameter of concern. This list indicates that a TMDL is needed. Once a TMDL is developed, the water body, for the parameter of concern is removed from the list.

Larson Creek is located within the Bear Creek watershed. In 1992 a TMDL was developed for the Bear Creek watershed for total phosphorus, ammonia and biochemical oxygen demand (BOD). The purpose of restricting loads for these parameters was to address problems associated with algae, dissolved oxygen and ph. In 2007, another TMDL was developed for the Bear Creek watershed to address elevated water temperatures and elevated levels of bacteria and sedimentation. Since the 2007 TMDL was developed, Larson Creek has been added to the most recent 303(d) list (dated 2010 and approved by EPA in 2012) for temperature (to meet temperature criteria for rearing year round) and dissolved oxygen (to meet cold water criteria of >8 mg/L). The 303(d) list states that a TMDL is needed for these parameters.

As a result, when developing projects to address capacity deficiencies, these water quality issues should be considered. Relative to this basin plan, the TMDL management plan specifically recommends water quality measures such as: reducing impervious surfaces, controlling erosion, requiring treatment of runoff from new development, maintaining stream and wetland buffer areas, providing shade over streams, and installing stormwater quality treatment facilities.

2.9.2 MS4 NPDES Permit

The City of Medford holds a Phase II MS4 Permit for their stormwater discharges. A stormwater management plan was developed by the City to comply with the permit. The stormwater management plan is required to include programmatic measures to address stormwater quality for the following six categories of activities: public education and outreach; public involvement and participation; illicit discharge detection and elimination; construction site runoff control; post-construction stormwater management; and pollution prevention in municipal operations. The measures required by the permit are programmatic in nature and the permit does not currently require any capital projects.

Section 3

Stormwater System Capacity Evaluation

To identify potential flooding problems, the Larson Creek stormwater drainage system was evaluated using an H/H model under both existing and anticipated future development scenarios. This section provides a description of H/H modeling methods used for the system capacity evaluation and provides a summary of results.

3.1 Model Development

PC SWMM 2012 v. 5.0.022 (created by Computational Hydraulics International) was used to develop an H/H model for the City's storm system. PC SWMM 2012 provides a graphical interface for the U.S. Environmental Protection Agency (EPA) SWMM5 engine. The PC SWMM interface is integrated with Esri ArcGIS. Files transferred to the City will be in EPA SWMM5 format, which may be used by the City for internal modeling after completion of this Basin Plan.

The model of the City's storm drain system includes City-owned storm drainage pipes that are 12 inches and larger in diameter and major open-channel conveyance systems. Inlet leads, pipes smaller than 12 inches in diameter, and pipes not owned by the City were not included in this effort. System mapping completed for the model development is shown in Appendix A.

Model development requires input of meteorological data, sub-basin hydrology, and surface water system hydraulic input parameters. Precipitation data were input as design storms to evaluate conveyance. Input parameters associated with sub-basin hydrology and surface water system hydraulics were developed through use of the City's GIS data. Gaps in City GIS data were filled using City field verifications and 2009 LiDAR data developed by the Oregon Department of Geology and Mineral Industries. The following subsections provide detail regarding these input data.

3.1.1 Horizontal and Vertical Datum

All reported elevations and coordinates in this study are measured in feet and use the City of Medford vertical datum (NGVD29, unadjusted) and the North American Datum of 1983 (NAD83) state plane coordinate system, respectively.

3.1.2 Meteorological Data

Historical precipitation data were not used to compare modeling results with conditions from past flood events within the city due to the lack of monitored or observed flow data from Larson Creek.

3.1.3 Design Storms

Traditional design storms are synthetic rainfall events used to evaluate the capacity of storm drainage systems and design CIPs for the desired level of flood protection.

Four statistical design storms were used to evaluate the surface water system conveyance. Design storms included the 24-hour, 10-, 25-, 100-, and 500-year recurrence intervals. The 24-hour, 100- and 500-year recurrence interval storms were evaluated to obtain flows as input data for the concurrent flood study modeling. Higher rainfall design depths were incorporated for the east portion of the basin due to orographic effects. Figure 3-1 depicts which sub-basins were included in the east and west rainfall zones.

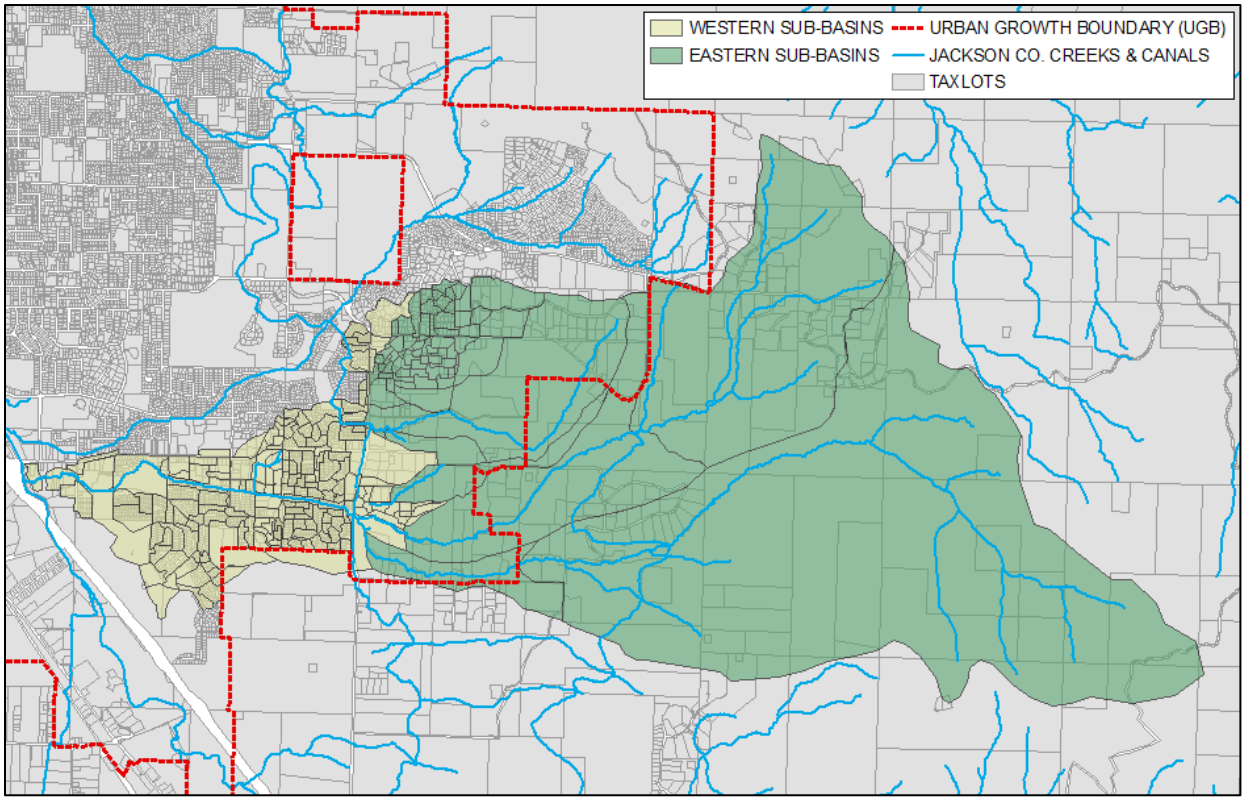


Figure 3-1. Sub-basin rainfall distribution

Table 3-1 lists the precipitation depths for each design storm used in the model, with the rainfall amounts for the west and east designated separately.

The rainfall depths for the 24-hour design storms were based on isopluvial maps published in the National Oceanic and Atmospheric Administration Atlas 2, Volume X. The rainfall distribution for these design storms is based on the SCS 24-hour, Type IA distribution, which is applicable to western Oregon, Washington, and northwestern California.

Table 3-1. Design Storm Depths

Storm event/recurrence interval	Season/storm duration	Rainfall depth (west/east), inches
10-year	24-hour	3.10/3.40
25-year	24-hour	3.30/3.60
100-year	24-hour	3.90/4.20
500-year	24-hour	5.00/6.00

Figures 3-2 and 3-3 illustrate the distribution of rainfall depths for each modeled storm event listed in Table 3-1. Rainfall model files are stored as text files and can be exported to a table for future use.

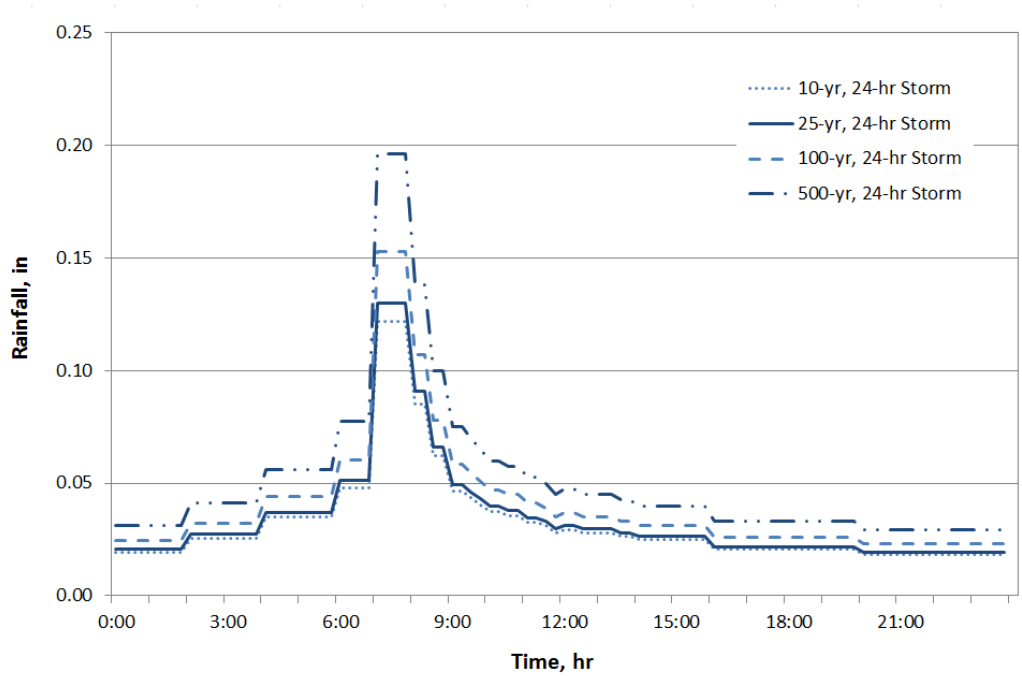


Figure 3-2. 24-hour design storm rainfall distribution, west

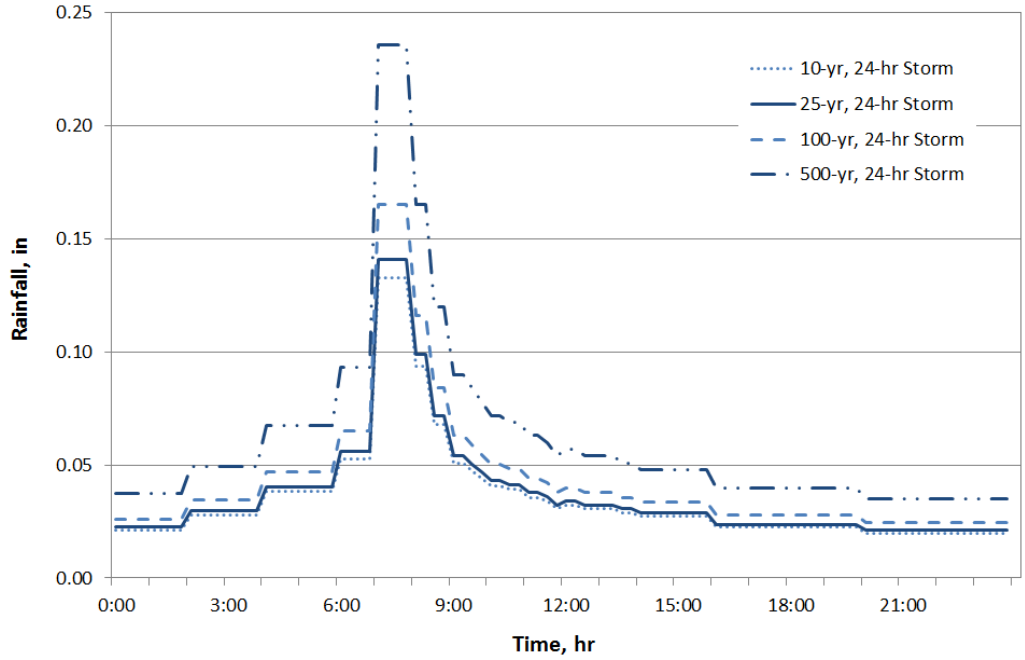


Figure 3-3. 24-hour design storm rainfall distribution, east

3.1.4 Hydrologic Data

This section includes a summary of sub-basin delineations and model input parameters used to define the hydrologic characteristics of the sub-basins. The key map in Appendix A illustrates the location of the detailed maps within the study area. Detailed maps including location of each of the modeled stormwater systems with named sub-basins and model inlet nodes are also located in Appendix A.

Table 3-2 identifies and describes model attributes associated with each of the sub-basins.

Table 3-2. Sub-Basin Model Attributes

Model attribute	Value
Name	Sub-basin name assigned to correlate with the name of the sub-basin outlet node.
Rain gauge	The following design storms were entered for the following rain gauge attributes: • SCS_24h_Type_IA_3.1in: 10-year, 24-hour winter storm (west) • SCS_24h_Type_IA_3.3in: 25-year, 24-hour winter storm (west) • SCS_24h_Type_IA_3.4in: 10-year, 24-hour winter storm (east) • SCS_24h_Type_IA_3.6in: 25-year, 24-hour winter storm (east) • SCS_24h_Type_IA_3.9in: 100-year, 24-hour winter storm (west) • SCS_24h_Type_IA_4.2in: 100-year, 24-hour winter storm (east) • SCS_24h_Type_IA_5in: 500-year, 24-hour winter storm (west) • SCS_24h_Type_IA_6in: 500-year, 24-hour winter storm (east)
Area	Area of the sub-basin in acres
Width	Typical width of the overland flow path for sheet flow in feet
Length	Maximum length of overland sheet flow in feet, based on typical width
Slope	Average percent slope of the sub-basin
Imperv	Percent of land area that is directly connected impervious area
Nimperv	Manning's *n* for overland flow over the impervious portion of the sub-basin (value range = 0.010 – 0.012)
Nperv	Manning's *n* for overland flow over the pervious portion of the sub-basin (value range = 0.06 – 0.10)
Dstore-Imperv	Depth of depression storage on the impervious portion of the sub-basin (default value = 0.05 inches)
Dstore-Perv	Depth of depression storage on the pervious portion of the sub-basin (value range = 0.05 - 0.15 inches)
ZeroImperv	Percent of the impervious area with no depression storage (default value = 25)
Routing	Assigned to be OUTLET mode and therefore runoff from pervious and impervious areas routes to a node within the storm drain system
PctRouted	Percent of runoff routed between sub-basins (default value = 100)
Groundwater	NO: Groundwater routing was not included for this plan
CurveNo	SCS pervious curve number calculated as an area-weighted average for pervious area based on the hydrologic soil group within each sub-basin
DryTime	Time in days for a fully saturated soil to completely dry (default value = 4)

The curve number method was used to model runoff characteristics. Because some sub-basins contained multiple soil types, an area-weighted curve number was calculated for each sub-basin in the existing and future system scenarios. For the 100- and 500-year events, the curve numbers were

raised by 7 to account for more saturated antecedent conditions. The area-weighted curve number method is documented in EPA's *Technical Release 55*.

Appendix B, Table B-1, provides hydrologic information regarding model parameters and peak flows for each sub-basin and modeled design storm. Table B-2 in Appendix B provides hydraulic information regarding model parameters and peak flows for each conduit and modeled design storm.

3.1.5 Hydraulic Data

System hydraulics are based on 2013 GIS data provided by the City. Where needed, GIS data were supplemented with site visits, field surveys, as-builts, and aerial imagery. Hydraulic components developed from these data and imported to the model included conduits and junctions. The model was developed with the intent of including all conduits larger than 12 inches as well as many of the 12-inch-diameter conduits that were identified as an important part of the conveyance system. A description of hydraulic components is provided in the following subsections.

3.1.5.1 Junctions

Model junctions include storm drain utility manholes and other relevant connection points or locations where a conduit change occurs. Model junctions have the attributes listed in Table 3-3.

Table 3-3. Junction Model Attributes

Attribute	Value			
ID	The ID is based on the reach, stem, and unique identifier as listed below.			
	Reach	Stem	Unique identifier	Sample ID
	MID Canal LR (main stem of Larson Creek) MLR (middle fork of Larson Creek) NLR (north fork of Larson Creek) SLR (south fork of Larson Creek)	A (main stem) B-Z (tributary)	4–5-digit number	SLRA0001
Invert elevation	Invert elevation of the junction in feet			
Depth	Depth (feet) = rim elevation – invert elevation			
Ponded area	Area anticipated to be occupied by ponded water atop the junction after flooding occurs, in square feet. For modeling, this allows ponded water to be stored and subsequently returned to the drainage system when capacity exists.			

Appendix B, Table B-2, provides model parameters and peak flows for each modeled junction.

3.1.5.2 Conduits

Model conduits include pipes, culverts, and channels. Model conduits have the model attributes as shown in Table 3-4.

Table 3-4. Conduit Model Attributes	
Attribute	**Value**
ID	Upstream Node ID_Downstream Node ID
Length	Length between upstream and downstream junctions in feet
Roughness	Manning's *n* roughness coefficient: • Concrete pipe: 0.013 • Corrugated metal pipe: 0.024 • HDPE: 0.0125 • PVC: 0.0125 • Open channel: 0.05
Cross-section	Circular, arch, or trapezoidal
Inlet elevation	Elevation of conduit inlet in feet
Outlet elevation	Elevation of conduit outlet in feet
Geom1	Circular: diameter in feet Arch: max depth in feet Trapezoidal: max depth in feet
Geom2	Arch: max width in feet Trapezoidal: bottom width in feet
Geom3	Trapezoidal: left slope (horizontal/vertical)
Geom4	Trapezoidal: right slope (horizontal/vertical)
Barrels	One for single pipe, two or more for parallel pipes

Table B-2 in Appendix B provides model parameters, 10- and 25-year recurrence interval peak flows, and the calculated hydraulic capacity for each modeled conduit. Custom cross-sections were developed by merging survey data with the City's LiDAR data. Cross-sections for irregular channels are called "transects" in PC SWMM and can be found in the model files.

3.1.5.3 Storage

Storage was included as a point feature in the model representing detention facilities and their associated stage-storage curves. This storage feature was also used at the location of a flow split or where storage occurs upstream of a culvert. One detention pond and two detention pipes were included in the Larson Creek model. The storage curve for the detention pond facility is available in the model files.

3.1.5.4 Outfalls

The model includes three outfalls in the existing and future system scenarios. All outfalls were modeled as fixed-stage discharges. In other words, the stage of the receiving water body was set at a fixed elevation for each model run/design storm. Table 3-5 provides a description for each modeled outfall.

Table 3-5. Outfall Model Attributes	
Name	**Description**
LRA0001	Discharges to Bear Creek at a fixed stage of 1,384.6 feet, 1,389.9 feet, 1,391.8 feet, and 1,396.0 feet for the 10-, 25-, 100-, and 500-year design storms, respectively. These elevations were obtained from the Bear Creek Flood Profile in the 2011 Flood Insurance Study for Jackson County, Oregon (41029V000A), and converted to the City's datum using NAVD88 – NGVD29 (unadjusted) = 3.95 feet.
MIDA0001	The MID Canal discharges to the south at the N Phoenix Road siphon crossing at a fixed stage of 1,538.71 feet (i.e., top of pipe).
MIDA9001	The MID Canal discharges into the Lazy Creek watershed to the north at a fixed stage of 1,550.32 feet (i.e., top of pipe).

3.2 Model Validation

Sufficient monitoring data were not available to provide adequate information to calibrate the results of the Larson Creek PC SWMM model due to the limited extent and duration of data collected. No major storm events were observed over the monitoring period.

Given the lack of stream flow data for Larson Creek, data for small gauged streams in the Medford area were used to compare discharge results according to the following steps:

11. An estimated peak flow was calculated for various return periods using standard methodology (i.e., Bulletin 17B
12. An average discharge-per-unit-area was calculated from the three best local stream gauges (i.e., west fork Ashland Creek, Star Gulch, and Powell Creek).
13. Results were scaled up for the Larson Creek Basin.
14. Results were compared with model results for model validation.

The calculations are provided in electronic files as Appendix D.

In addition, a regression equation for small drainage areas was obtained from the 2011 Flood Insurance Study (FIS) for Jackson County, Oregon (41029V000A). This regression equation was considered applicable to the Larson Creek Basin; it was developed for small drainage areas (under 100 square miles). This regression equation was used in the 2011 FIS to determine the current effective discharge from Larson Creek.

Table 3-6 provides the 24-hour, 100-year current condition PC SWMM model results alongside the results of the regression equation, the current effective FIS, and the stream flow analysis.

Table 3-6. Model Results Validation					
Discharge return period	Scaled Larson Creek discharge, cfs	Small drainage areas (Under 100 mi^2) regression equation, cfs	Current effective FIS discharge, cfs	Current conditions SWMM model results, cfs	Percent difference
10-year, 24-hour	436	516	455	638	19%–32%
25-year, 24-hour	666	-	-	714	7%
100-year, 24-hour	1,415	1,545	1,392	1,311	-6%– -18%
500-year, 24-hour	2,457	2,779	2,514	2,238	-10%– -24%

Note: (-) indicates not provided.

The current-condition PC SWMM model results are relatively close to the compared discharge values. The 10- and 25-year, 24-hour storm events are generating higher peak discharges in the PC SWMM model than the compared discharge values. On the other hand, the 100- and 500-year, 24-hour storm events are generating slightly lower peak discharges than the compared discharge values. The results are closest to the current effective FIS discharges, with a percent difference ranging from 6 to 29 percent. Overall, the percent difference of the compared values ranges from 6 to 32 percent.

3.3 Design Standards

For the modeling effort in this study, flooding was identified under the following conditions:

- flow elevations exceeded bank elevations for open channels
- flows overtopped roadway elevations at culverts
- flows emerged from manholes and onto the roads in piped systems

The 25-year, 24-hour design storm was used to identify areas of flooding and to develop future CIPs where the peak flow rates were 200 cfs or greater. For other areas, runoff from the 10-year, 24-hour design storm was used to identify flooding issues and develop future projects.

The *Rogue Valley Stormwater Quality Design Manual* was adopted by the City in 2009 to guide the design, operation, and maintenance of stormwater facilities for new developments. This document was consulted while preparing CIP alternatives for the City. The document is available online at www.rvss.us/Documents/Stormwater/DesignManual.pdf.

3.4 Model Results

PC SWMM v. 2012 was used to simulate peak flows for the 10- and 25-year design storms for current and future development conditions and the 100- and 500-year design storms for current development conditions.

Results of the H/H simulations are tabulated in Appendix B (Table B-1 for hydrologic results and Table B-2 for hydraulic results). For reporting purposes, the hydrologic results reflect all simulated design storms, and the hydraulic results reflect the 10- and 25-year flows used to identify capacity deficiencies and to size CIPs.

The hydrologic results table (Table B-1) is sorted by location and sub-basin name. The table includes the sub-basin name, modeled outlet node (i.e., junction) identifier (ID), sub-basin area, impervious area, curve number, and associated design flow. The hydraulic results table (Table B-2) is sorted by location and US node (i.e., junction ID). The table includes the US/DS nodes, conduit name, geometry, length, slope, invert and rim elevations, and the modeled scenario peak flows and water surface elevations.

Based on the hydraulic model results summarized in Table B-2, conduits experiencing backwater conditions that resulted in flooding were identified. Flooding of the upstream manhole is indicated by the loss of runoff volume in the closed conduit system. For open channel segments, flooding was identified by water overtopping the banks.

Table 3-7 summarizes the identified flooding problem area by street location, number of flooded manholes, flooding duration (surcharging was not considered in calculating flooding duration), existing-to-future flow increase, design storm and scenario, source of the capacity deficiency, and whether flooding has been observed in the field.

Figures 3-3 and 3-4 provide a mapped illustration of model-predicted flooding problems for existing and future conditions, respectively. Problems 1 through 12 are labeled on the figures.

Table 3-7. Flooding Problem Areas

Problem	Location	Number of MHs flooded	Hours flooded[a]	Existing impervious, %	Future impervious, %	Existing-to-future % flow increase[b]	Design storm and conditions scenario	Source of capacity deficiency	Modeled flooding observed in the field?	City feedback
1	Mary Bee Lane	10	0.21–2.33	7	50	18.4	10-year current	• 299 feet of negatively sloped and undersized 1.25-foot-diameter pipe • 932 feet of undersized 1-foot-diameter pipe	No	This system was recently constructed. The drainage area may not be representative of anticipated future development, without including additional conveyance to the east.
2	Honor Drive	6	1.10–2.29	52	59	2.9	10-year current	1,124 feet of undersized 1-foot-diameter pipe	No	Unobserved capacity problem.
3	Constitution Drive	3	0.60–1.24	45	50	0.4	10-year current	572 feet of undersized 1-foot-diameter pipe	No	Unobserved capacity problem.
4	E. Barnett Road	3	0.64–1.46	52	74	12.3	10-year current	294 feet of undersized 1-foot-diameter pipe	No	Unobserved capacity problem.
5	Juanipero Way	1	0.30	43	46	0.2	10-year future	335 feet of undersized 2-foot-diameter pipe	No	Unobserved capacity problem.
6	La Loma Drive	1	0.77	47	51	2.3	10-year current	78 feet of undersized 1-foot-diameter pipe	No	Unobserved capacity problem.
7	Karges Way	1	0.27–1.04	38	56	12.8	10-year current	• 103 feet of undersized 2-foot-diameter pipe • 82 feet of undersized 2.25-foot-diameter pipe	Yes	Minor capacity problem.
8	La Loma Drive Outfall	0	0	44	49	3.1	10-year current	298 feet of undersized 3-foot-diameter pipe	No	Eliminate pipe restriction. Currently going from a 48-inch to 36-inch pipe.
9	Black Oak Drive	Open-channel flooding	NA[c]	9	17	9.9	25-year current	Undersized culvert and channel	No	Unobserved capacity problem.

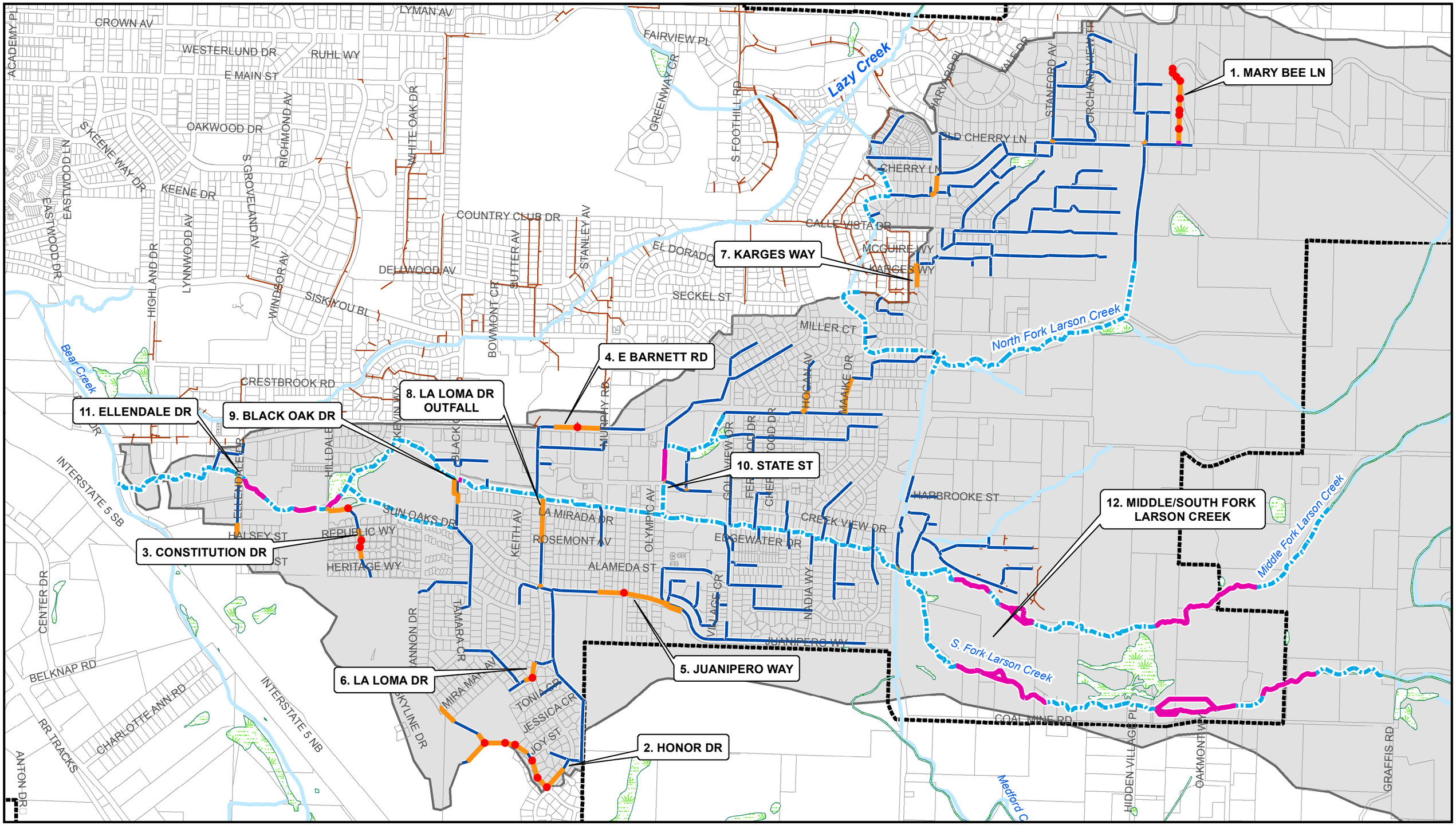
Table 3-7. Flooding Problem Areas

Problem	Location	Number of MHs flooded	Hours flooded[a]	Existing impervious, %	Future impervious, %	Existing-to-future % flow increase[b]	Design storm and conditions scenario	Source of capacity deficiency	Modeled flooding observed in the field?	City feedback
10	State Street	Open-channel flooding	Unavailable	19	51	55.7	25-year current	Undersized culvert and upstream channel	No	Unobserved capacity problem. The flooding may be overestimated because the model does not account for all upstream detention facilities.
11	Ellendale Drive	Open-channel flooding	Unavailable	10	18	5.4	25-year current	Undersized channel	Yes	The Ellendale Road crossing experiences issues with water flowing into the upstream apartment complex's parking lot.
12	Middle/south fork Larson Creek	Open-channel flooding	Unavailable	2	5	1.7	25-year current	Undersized channel	No	This region of the city is currently scoped for development.

a. Hours flooded is based on design storm (i.e., 10- or 25-year) future-conditions simulation. This attribute is unavailable for open-channel flooding scenarios.

b. Existing-to-future percent flow increase is based on the design storm (i.e., 10- or 25-year) peak flow increase from the contributing drainage area between the existing and future land use scenarios.

c. Flooding was identified in the concurrent flood study conducted for Larson Creek that includes a more detailed hydraulic model for the open-channel system. No flooding was identified in the PC SWMM model.



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CITY OF MEDFORD

LARSON CREEK BASIN PLAN

FIGURE 3-4

EXISTING SCENARIO FLOODING

- CLOSED CONVEYANCE FLOODING (10-YR, 24-HR)
- CLOSED CONVEYANCE SURCHARGING (10-YR, 24-HR)
- OVERBANK FLOW (25-YR, 24-HR)
- MODELED CONDUITS
- MODELED OPEN CHANNELS
- OTHER OPEN CHANNELS
- OTHER CONDUITS
- URBAN GROWTH BOUNDARY (UGB)
- JACKSON CO. WETLANDS
- TAXLOTS
- LARSON CREEK BASIN

NORTH

0 500 1,000 2,000 Feet

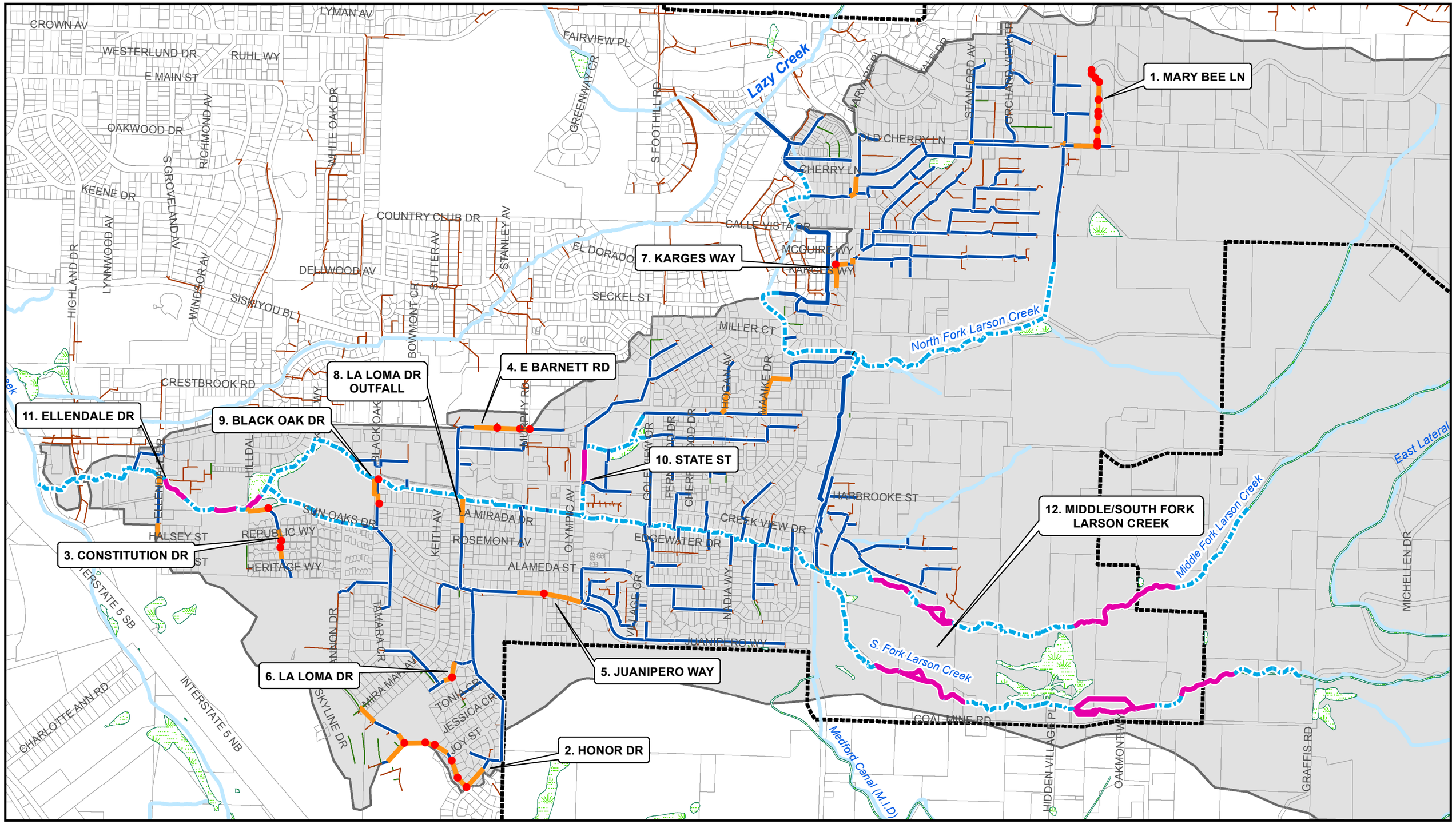

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FIGURE 3-5
FUTURE SCENARIO FLOODING

- CLOSED CONVEYANCE FLOODING (10-YR, 24-HR)
- CLOSED CONVEYANCE SURCHARGING (10-YR, 24-HR)
- OVERBANK FLOW (25-YR, 24-HR)
- MODELED CONDUITS
- MODELED OPEN CHANNELS
- JACKSON CO. WETLANDS
- OTHER OPEN CHANNELS
- URBAN GROWTH BOUNDARY (UGB)
- OTHER CONDUITS
- TAXLOTS
- LARSON CREEK BASIN

NORTH

0 500 1,000 2,000 Feet

Section 4

Capital Improvement Projects Alternatives Evaluation

This section provides a description of the alternatives evaluation and rationale for selection of recommended CIP alternatives. The evaluation process relied on modeling information and techniques described in Section 3 of this Basin Plan.

As a first step in the alternatives evaluation, the CIPs from the 1996 DMP and 2005 SWMP were reviewed. Projects recommended in these plans were reconsidered based on current model results for both the 10-year and 25-year, 24-hour design storms for future land use conditions. Additional projects were developed where the current model showed flooding during the selected design storm. To address water quality, the potential for water quality improvements in conjunction with flood control CIPs was considered.

Following identification of areas within the basin needing capital improvements, BC staff met with the City to review and develop a list of projects to meet hydraulic and water quality needs of the system. The projects developed and selected as a result of this meeting are presented in Sections 4.1 (alternatives to address hydraulic capacity) and 4.3 (alternatives to improve water quality).

Selection of alternatives was based on the hydraulic effectiveness of the alternative and costs. Initial planning-level cost estimates of the preferred alternatives were developed and are presented in Chapter 5. The cost estimates are based on planning-level unit costs for CIPs and include a 30 percent markup for construction contingencies and site-specific adjustments of alternatives. Also included in the cost estimates is a 25 - 35 percent markup for engineering (depending on permitting requirements for the project), administration, and construction administration. The markups for contingencies and engineering/administration are line items included in the project cost estimates. Costs for land acquisition were not included in cost estimates.

4.1 Alternatives to Address Hydraulic Capacity

The following summarizes the alternatives evaluated to alleviate flooding for deficiencies identified in the problem areas as listed in Table 3-7. For many of the problem areas, one preferred alternative was selected without identification of additional alternatives. In this case, the rationale for identifying one alternative is provided.

1. Mary Bee Lane

The model indicated flooding along Mary Bee Lane in the area just north of Cherry Lane. To date, the City has not observed flooding in this area. After discussing this identified deficiency with the City, a decision was made not to propose a CIP for this site at this time. The recommendation is to observe this area, especially as upstream development occurs. In addition to the fact that flooding has not been observed at this location, the model is expected to be conservative for this area. The modeled sub-basin upstream of Mary Bee Lane is relatively large and was directed/routed into the piped system on Mary Bee Lane for modeling purposes. When development occurs, this area will likely be broken into smaller drainage sub-basins, some of which may drain to separate piped systems that discharge downstream of Mary Bee Lane. Therefore, the model is likely over-predicting future flows for this system.

2. Honor Drive

Flooding was identified in the model along Honor Drive. Given the existing density of development in this area, pipe size increases (rather than surface storage/detention) were evaluated in the model to relieve the predicted flooding problem. As a result of modeling, in an attempt to optimize a potential CIP, five existing 12-inch-diameter pipes were upsized to pipes with diameters of 15 to 18 inches to correct the problem. Flooding has not been observed in this location and flows are expected to increase by approximately 3 percent for future conditions. While carried forward to the CIP list for future reference, it would be worthwhile to observe this location over time prior to implementing a CIP.

3. Constitution Drive (Private)

Flooding was identified in the model along Constitution Drive. Given the existing density of development in this area, pipe size increases (rather than surface storage/detention) were evaluated in the model to relieve the predicted flooding problem. Three 12-inch-diameter pipes are estimated to be undersized for future conditions. As a result of modeling, in an attempt to optimize a CIP, these pipes would need to be upsized to 15-inch-diameter pipes to correct the model-predicted problem. Flooding has not been observed in this location and flows are expected to increase by less than 1 percent for future conditions. While carried forward to the CIP list for future reference, it would be worthwhile to observe this location over time prior to implementing a CIP.

4. East Barnett Road

Flooding was identified in the model along E Barnett Road. A pipe size increase was evaluated to relieve the predicted flooding problem. To correct the problem, one existing 294-foot-long, 12-inch-diameter pipe would need to be upsized to a 15-inch-diameter pipe. Flooding has not been observed in this location and flows are expected to increase by approximately 12 percent for future conditions. While carried forward to the CIP list for future reference, it would be worthwhile to observe this location over time prior to implementing a CIP.

5. Juanipero Way

The Larson Creek existing- and future-conditions flooding figures (3-1 and 3-2) show minor flooding in the model at Juanipero Way (at Murphy Road). However, because the flooding (1) has not been observed, (2) is anticipated to be minor, (3) is not expected to substantially increase in the future (i.e., approximately <1 percent), and (4) is estimated to occur for less than 30 minutes (for the design storm), we recommend that this area be observed over time. If flooding is reported/observed, a project could be developed and put forward for consideration at that time.

6. La Loma Drive

Flooding was identified in the model along La Loma Drive. One existing 78-foot-long, 12-inch-diameter pipe is recommended to be upsized to a 15-inch-diameter pipe to correct the problem. Flooding has not been observed in this location and flows are expected to increase by approximately 2 percent for future conditions. While carried forward to the CIP list for future reference, it would be worthwhile to observe this location over time prior to implementing a CIP.

7. Karges Way

The existing system along Karges Way has been identified through modeling efforts and reports from City staff as an area with flooding issues. As a result of modeling, in an attempt to optimize a potential CIP, one existing 87-foot-long, 24-inch-diameter pipe is recommended to be upsized to a 27-inch-diameter pipe to correct the problem. In addition to being a reported problem, flows are estimated to increase by approximately 13 percent under future buildout conditions.

8. La Loma Drive Outfall

Surcharging was identified in the model at the La Loma Drive outfall to Larson Creek. The City has implemented a CIP project upstream of the identified location; however, the extents of the project did not include the creek outfall. Therefore, the 48-inch pipe drains to a 36-inch outfall pipe. As a result of modeling, 276' of 36-inch diameter pipe would be upsized to 48-inch diameter pipes to address the problem. Outfall improvements would include plantings to improve the condition of the riparian area, provide cover for shade and increase bank stability.

9. Black Oak Drive

Flooding was identified in the model at the Black Oak Drive crossing consistent with the previous 2005 SWMP. To date, the City has not observed flooding at this location. However, the model predicts the peak flow to increase by approximately 10 percent for future conditions. As a result of modeling, and in an attempt to optimize a potential CIP, two 48-inch diameter pipes were included (one on each side of the channel) to address the problem. It is recommended that this area be observed over time and as upstream development occurs before a CIP is developed and implemented. If a project is undertaken at this location, the previous master plan included a project to work with the high school to restore a portion of the Creek where a concrete retaining wall is in poor condition (left bank) (see Table 2-3 of this Basin Plan). Restoration would include plantings to improve the condition of the riparian area, provide cover for shade and increase bank stability.

10. State Street

Flooding was identified in the model north of State Street in the north fork of Larson Creek. While flooding has not been observed in this area, peak flows (for the design event) are estimated to increase by approximately 56 percent as a result of future buildout. Two alternatives were evaluated to address this problem: (1) upsizing the channel, and (2) installing a detention pond upstream of the flooding to alleviate the peak flow and provide an added water quality benefit. The 2005 SWMP (see Table 2-3 of this Basin Plan) also recommended investigating ways to maintain a buffer from development along the Creek at this location. This should be accommodated through the City's Riparian Corridor Ordinance which requires a 50 foot buffer.

11. Ellendale Drive

The City has observed flooding upstream of the Ellendale Drive crossing, where water enters the parking lot of the apartment complex located along the right bank of the main stem of Larson Creek. Two alternatives were evaluated to alleviate flooding: (1) stream restoration work to widen the constricted portion of the channel, and (2) construction of an upstream vegetated surface storage facility to alleviate downstream flows and provide an additional water quality benefit.

With respect to both project locations 9 and 10, excavation would be required for a surface storage facility. Two factors could inhibit the use of this type of facility at these sites: (1) previous reports have stated that areas of Medford are projected to be underlain with a shallow rock layer, and (2) due to the perennial baseflow in Larson Creek, groundwater will likely be high in the vicinity of the Creek (during significant storm events), making excavation adjacent to the channel potentially limited for the purposes of providing additional storage during high flow periods. Should the City wish to further evaluate these options, additional field assessment would be necessary to confirm or negate these factors and determine feasibility.

While the SWMM model did not show flooding at the culvert downstream of this location, the 2005 SWMP suggested culvert improvements for fish passage. This should be considered for inclusion when this project is designed for construction (see Table 2-3 of this Basin Plan).

12. Middle/South Fork Larson Creek

The middle and south forks of Larson Creek are projected to experience significant overbank flooding. Currently this is not an issue as development is not located in this area. However, a high level of development is currently planned and imminent for this area.

It is recommended that the City submit its current, 2015 preliminary flood study to the Federal Emergency Management Agency (FEMA) to ensure that this area is included in FEMA's official floodplain maps. This will ensure that any development will occur within the standard practices of floodplain construction and that flood insurance will be required.

In addition, the City could consider other potential projects for this area. Some additional drawbacks/considerations are associated with each of these options as noted below:

- Protect, or both protect and enhance the existing wetland located between the middle and south forks of Larson Creek to maintain current storage capacities and provide additional storage during large storm events. This is a locally significant high quality wetland (see Table 2-4 of this Basin Plan). Wetland permitting would also be required if excavation occurs for enhancement. This could potentially result in the need for additional wetland mitigation. Also, development would be restricted in the wetland area. The City's Planning Commission will need to be involved in decision making regarding potential conflicting uses with the wetland as required under the Comprehensive Plan (Goal 5).
- Incorporate detention facilities upstream of the planned development. Detention facilities would need to be significant and property acquisition would be necessary.
- Undergo stream restoration work to provide additional channel capacity along the middle and south forks of Larson Creek. In-stream work of this sort would require a significant permitting effort and the potential need for mitigation. From review of aerial maps, the riparian areas appear to include a fair amount of mature vegetation and may currently be in fair to good condition. Protecting what is in place and preventing degradation is a preferred option over reconstruction and replanting of the channel.
- Develop buffer requirements adjacent to the Creek (along the floodplain boundaries developed as part of the preliminary flood study) where development would be restricted (beyond what is already required in the City's Riparian Corridor Ordinance). This option is consistent with recommendations from the 2005 SWMP (see Table 2-3 of this Basin Plan). This option would likely require significant administrative work and stakeholder involvement to develop the enhanced buffer requirements.
- Acquire land within the floodplain. This would be a high-cost option. However, depending on how development occurs, and depending on the occurrence of significant events, costs could eventually be comparable to potential flood damages. Further evaluation would be needed to make this determination.

In summary, while several capacity deficiencies were identified through modeling (#1 through #11), capital project solutions are not recommended to address each of these model-predicted problems. For the most part, problems have not been observed at these locations and future development is not anticipated to increase flows significantly. In addition, the model is estimated to be conservative as flows from future development are assumed to be uncontrolled. Medford has development standards in place that will require developers to control flows from future development. In addition, the model validation showed that modeled peak flows were high when compared to results from regression equations (for the 10-year storm), suggesting model conservatism. Lastly, design storms are inherently conservative in terms of peak intensities.

4.2 Capacity CIPs from the Previous Master Plans

The 2005 CIPs for the Larson Creek Basin along with cost estimates are presented in Table 4-1. These CIPs were reviewed in conjunction with the projects evaluated and listed in Section 4.1 as described below.

Table 4-1. Capacity CIPs from 2005 SWMP

Larson Creek CIPs	Phase 1 (Years 1–5)	Phase 2 (Years 6–10)	Phase 3 (Years 11–15)	Phase 4 (Years 15–20)
Murphy Road Bypass: Juanipero to Larson Creek	$250,000	-	-	-
North Fork Project	$1,198,400	-	-	-
Larson Central Drainage Project	-	-	$594,600	-
Black Oak Drainage Project	-	-	-	$299,300

Note: All costs are in 2005 dollars, as reported in the 2005 SWMP.

The **Murphy Road Bypass: Juanipero to Larson Creek Drainage Project** is a piped drainage system that flows directly into Larson Creek. This project has already been constructed by the City, and therefore does not need to be included on a CIP list for this basin. The Juanipero project listed in Section 4.1 is to address unrelated capacity deficiencies upstream of the 2005 SWMP project.

The **North Fork Drainage Project** was identified in the 1996 DMP as the construction of 3,363 feet of pipe ranging from 21 inches to a box culvert. As suggested in the 2005 SWMP, the project was revisited by the City to determine if daylighting the piped portions of the North Fork Larson Creek would be possible As part of this 2015 study, capacity deficiencies were not identified for this piped system. Therefore, this CIP should not be included in an updated list. However, it should be noted that a significant portion of flows from upstream are diverted to the MID Canal. If the canal is ever physically separated from the Creek system, addition flows would enter this piped system and capacity would need to be reevaluated.

The **Larson Central Drainage Project** was first identified in the 1996 DMP. The work included the construction of 795 feet of 36-inch-diameter pipe along Juanipero Way and the replacement of four culverts along the main branch of Larson Creek. This project can be removed from the capital improvement program based on the new evaluation conducted and the new project developed (#5) as part of this study and results of the current modeling effort.

The **Black Oak Drainage Project** was identified in the 1996 DMP. The project consists of the construction of 254 feet of 27-inch-diameter pipe and two box culverts at Black Oak Drive. The Black Oak Culvert was recently retrofitted to allow for fish passage. The current modeling efforts also demonstrate capacity constraints in the culvert; therefore, this project is being carried forward into this Basin Plan and replaced/updated with the new project at this location for this Basin Plan (#8).

4.3 Alternatives to Improve Water Quality

Alternatives for water quality improvements were not quantitatively evaluated as part of this Basin Plan. Instead, water quality projects were considered as added features to existing projects identified to address capacity issues.

Three general types of projects are included in the potential CIP list: (1) increased pipe sizes, (2) increased channel capacity, and (3) detention.

With respect to projects that include increased pipe sizes, water quality could be addressed in a couple of ways. One way would be to add underground water quality treatment vaults in the newly constructed system. A second way would be to include street-side planters where runoff from small, frequent events could be treated in a vegetated facility before overflowing back into the piped system. Ongoing maintenance of vaults or planters should be considered prior to implementation.

With respect to projects that increase channel capacity, water quality could be addressed through planned riparian plantings of native vegetation to ensure shading of the channel, enhanced bank stability, and filtration of overland flows.

With respect to detention, these storage facilities could be designed to detain and treat flows associated with small frequent events (i.e., a water quality design storm). Water quality can typically be incorporated into detention pond design without much additional effort or cost.

For projects in the CIP list (Section 5), the options above were considered and included as appropriate.

4.4 Water Quality CIPs from the 2005 SWMP

The 2005 CIPs for the Larson Creek Basin along with the cost estimates are presented in Table 4-2. These CIPs were reviewed in conjunction with the projects evaluated and listed in Section 4.1 as described below.

Table 4-2. Water Quality and Restoration/Protection Area CIPs from 2005 SWMP

Larson Creek CIPs	Phase 1 (Years 1–5)	Phase 2 (Years 6–10)	Phase 3 (Years 11–15)	Phase 4 (Years 15–20)
Water quality projects				
Regional detention/water quality facility upstream of North Phoenix Road	-	$500,000	-	-
Restoration/protection areas				
Restore Creek between Olympic Avenue and Murphy Road	-	-	$250,000	-
Separate between East Main Canal and Larson Creek	-	-	-	$100,000

Note: All costs are in 2005 dollars, as reported in the 2005 SWMP.

The **Regional Detention/Water Quality Facility Upstream of North Phoenix Road** involves implementing two smaller detention/water quality facilities on the north and main branches of Larson Creek. The water quality facilities would include low-flow channels and the detention facilities would be located in a dedicated up-land area where flow from the 1-year storm would back up. These projects were developed with the intention that the City would work with developers to determine site-specific designs and share the cost of the projects. It was stated in the plan that the proposed cost listed was an estimate of the City's cost share. This project should be maintained on the CIP list for future reference. However, given limited funding, one of the goals of this Basin Plan was to address water quality treatment in conjunction with projects that address capacity deficiencies. In addition, in 2009, since the previous master plan was developed, developers are now required to address water quality for development that includes >5000ft^2 of impervious surface.

The **Restoration of the Creek between Olympic Avenue and Murphy Road** was identified in the 2005 SWMP to restore the concrete lined portion of Larson Creek to a natural stream system. Similar to the project above, this project should be maintained on the CIP list for future reference. However, given limited funding, and the goal of addressing water quality treatment in conjunction with flood control projects, this project would be low priority.

The **Separation between the East Main Canal and Larson Creek** is a proposed CIP from the 2005 SWMP. Separating the canal from the Creek would provide water quality benefits. This project should be carried forward and maintained on the CIP list for future reference. As with the previous two projects, it does not coincide with a project to address capacity deficiencies, which was a goal of this Basin Plan.

Section 5

CIP Implementation

This section provides a summary of the CIPs recommended for the Larson Creek Basin. This Basin Plan has been developed to address both existing and future stormwater issues within the basin. This Basin Plan does not attempt to coordinate CIPs from this plan with the overall citywide stormwater capital program. Three subsections are provided below to present the selection of CIP alternatives, CIP priorities, and CIP implementation.

5.1 CIP Alternatives

Out of the CIPs developed and described in Section 4, two of the locations included multiple alternatives: Ellendale Drive and State Street.

For the Ellendale Drive improvements, the two alternatives included increasing channel capacity and providing offline surface storage. From a modeling standpoint, both options were shown to be feasible. However, for the offline surface storage option, additional field assessments would be needed to evaluate feasibility. Approximately 220,000 cubic feet (ft^3) of excavation would be necessary to provide the required storage. Sufficient conditions would be needed for this type of excavation so that it would serve the intended purpose of providing additional storage. Conditions that could potentially inhibit the success of excavation include shallow bedrock, high groundwater, and topography. An additional cost of $20,000 was included for the surface storage option to conduct a feasibility study. When comparing the planning-level costs for these alternatives, the channel upsizing alternative was estimated to be significantly less cost than implementing detention (see the CIP fact sheets at the end of this section). Given the significant cost difference, and the uncertainty in the suitability of the site for surface storage, the channel enhancement was carried forward to the CIP list.

For the State Street location, the two alternatives included detention and increasing channel capacity. From a modeling standpoint, both options were shown to be feasible. As with the Ellendale project described above, additional field assessments would be needed to evaluate the feasibility of excavation for detention. Approximately 132,000 cubic feet (ft^3) of excavation would be necessary to provide the required storage. An additional cost of $20,000 was included for the surface storage option to conduct a feasibility study. When comparing the planning-level costs for these alternatives, the channel upsizing alternative was estimated to be lower cost (see the CIP fact sheets at the end of this section). Given this cost difference, and the uncertainty in the suitability of the site for surface storage, the channel enhancement was carried forward to the CIP list.

5.2 CIP Priorities

A comprehensive list of projects was provided in Section 4. These projects were identified and developed through a review of old plans, updated basin modeling, and discussing basin conditions and flooding with City staff. From the modeling effort outlined in Section 3 and discussions with City staff, the Larson Creek Basin is not projected to have significant flooding issues. Mostly minor capacity issues were identified. Given the expected conservative nature of the modeling results, many of the locations with predicted problems should be observed over time to see if flooding occurs prior to implementation of capital projects.

For the purpose of selecting CIPs for implementation, priority rankings were placed on the projects identified in Section 4 (including the alternatives selected in Section 5.1). Priority rankings assigned were either “high,” “low,” or “remove from CIP list” as follows.

High-priority rankings were assigned to projects that address existing, observed flooding problems. If successful implementation of a high-priority project was also dependent on implementation of another CIP, then that CIP would also be ranked as high priority.

Low-priority rankings were assigned to projects where a capacity deficiency was identified through modeling, but flooding problems have not been observed and the increase in flow expected as a result of future development is not significant (i.e., less than 5 percent). In modeling future buildout conditions, future flows were assumed to be uncontrolled. In reality, the City has development standards in place that require flows to be controlled through detention of runoff from new development. While these CIPs are not recommended for implementation at this time, these projects were left on the list for future reference and in case future flood issues are observed at these locations. Based on City objectives, low-priority rankings were also assigned to water quality projects that are single-objective projects and not associated with a project developed to address an identified capacity deficiency.

Remove from CIP list rankings were assigned to projects where deficiencies were identified, but the duration of flooding shown in the model was minimal (i.e., less than 30 minutes), or, the model was anticipated to be highly conservative based on modeling specific assumptions for the sub-basin.

Table 5-1 shows the comprehensive project list from Section 4 (and Section 5.1) and the rankings assigned.

Table 5-1. CIP Priorities

Project	Number from Table 3-7	Project type	Recommend to observe during rain event to inform need	Priority ranking
Mary Bee Lane	1	NA	-	Remove from CIP list
Honor Drive improvements	2	Upsize pipes	Yes	Low
Constitution Drive improvements	3	Upsize pipes	Yes	Low
East Barnett Road improvements	4	Upsize pipes	Yes	Low
Juanipero Way	5	NA	Yes	Remove from CIP list
La Loma Drive improvements	6	Upsize pipes	Yes	Low
Karges Way improvements	7	Upsize pipes	-	High
La Loma Drive outfall improvements	8	Upsize pipes	-	Low
Black Oak Drive	9	New culverts	Yes	Low
State Street improvements	10	Upsize channel	-	Low
Ellendale Drive improvements	11	Upsize channel	-	High
Middle/south fork Larson Creek Floodplain/Wetland Protection	12	Submit floodplain mapping to FEMA	-	High
Murphy Road Bypass: Juanipero to Larson Creek	NA[a]	Upsize pipes (already constructed)	-	Remove from CIP list

Table 5-1. CIP Priorities

Project	Number from Table 3-7	Project type	Recommend to observe during rain event to inform need	Priority ranking
North Fork drainage project	NA[a]	Upsize pipes or daylight Creek	-	Remove from CIP list[b]
Larson Central drainage project	NA[a]	Upsize pipes	-	Remove from CIP list
Black Oak drainage project	NA[a]	Upsize pipes	-	NA[c]
Regional detention/water quality facility upstream of North Phoenix Road	NA[a]	Water quality facility	-	Low
Restore Creek between Olympic Avenue and Murphy Road	NA[a]	Channel restoration	-	Low
Separate between East Main Canal and Larson Creek	NA[a]	Canal separation from Creek	-	Low

a. These projects were pulled for reference and reconsideration from the 2005 SWMP.

b. If the Medford Canal is ever separated from the North Fork Larson Creek at this location, this CIP would then be needed and would likely need to be moved to high priority.

c. This project is being replaced with #9 in the table.

5.3 CIP Implementation

Three high priority projects are included in the CIP list for implementation:

- Ellendale Drive Improvements
- The Middle/South Fork Larson Creek Floodplain/Wetland Protection
- Karges Way Pipe Replacement/Upsizing

While the projects on the CIP list are focused on addressing flooding and conveyance, these projects include elements to address water quality. Given that the remaining projects are low priority and not recommended for implementation at this time, an evaluation of how these projects should incorporate water quality treatment was not conducted and additional water-quality-related costs were not included. If these projects are implemented in the future, water quality elements should be considered as discussed in Section 4.3 and costs should be included (including consideration of ongoing operations and maintenance costs). Significant cost efficiencies can be achieved when constructing water quality facilities in conjunction with planned flood control CIPs as compared to constructing single-objective water quality projects on their own.

The CIP list and project costs are provided in Table 5-2 for both the high- and low-priority projects. Project locations are shown on Figure 5-1. Additional details for the projects are provided in the CIP fact sheets following Figure 5-1 (with the exception of the three projects that were carried over from the 2005 SWMP). Costs for the three CIPs from the 2005 SWMP were taken from that plan and have been escalated to 2015 dollars. Detailed CIP cost estimates for the newly proposed CIPs are provided in Appendix C.

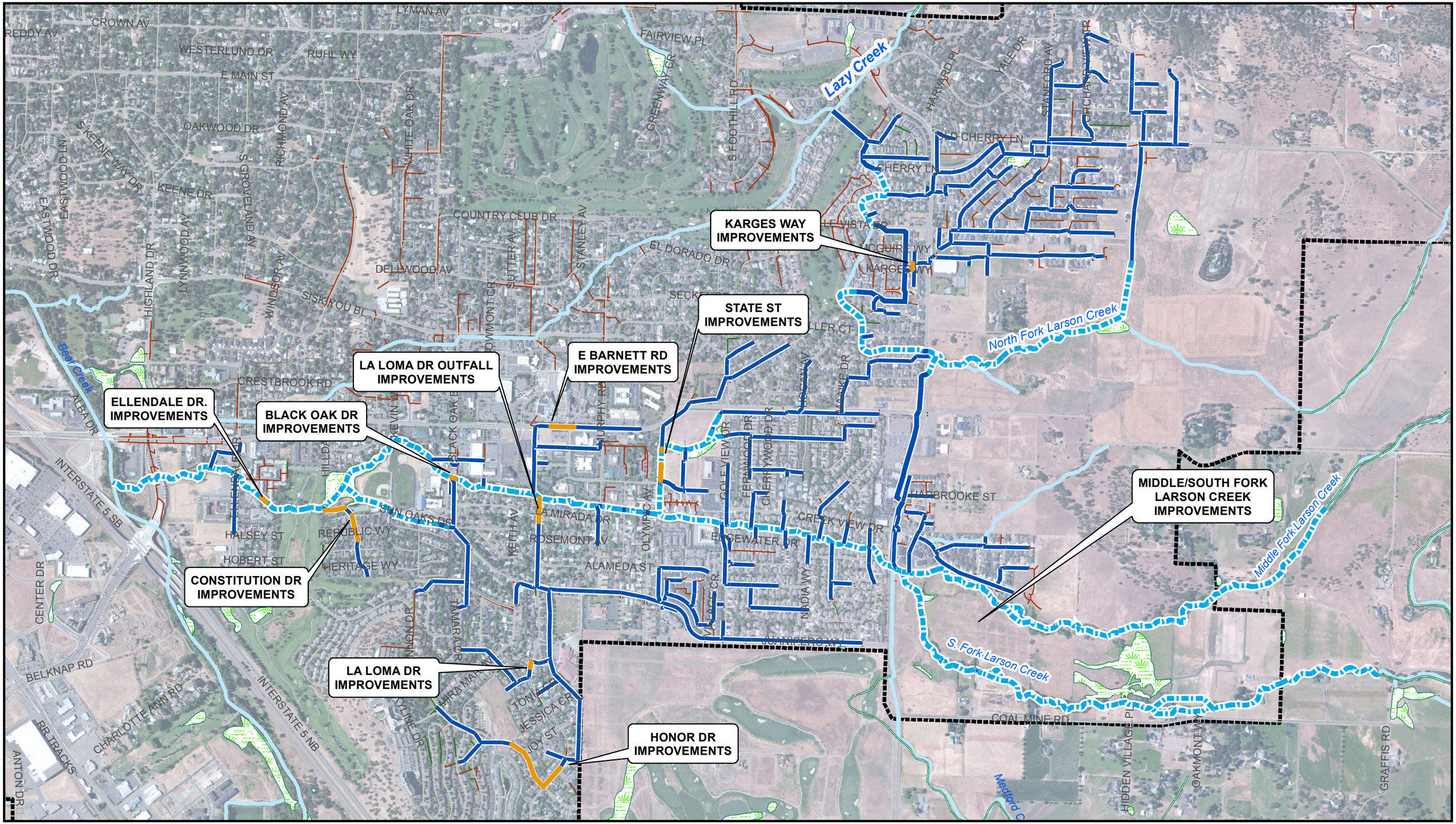
Table 5-2. CIP List

Project	Number from Table 3-7	Project type	Project priority	Project cost (2015 dollars)[a]
Honor Drive improvements	2	Upsize pipes	Low	$362,000
Constitution Drive improvements	3	Upsize pipes	Low	$217,000
East Barnett Road improvements	4	Upsize pipes	Low	$102,000
La Loma Drive improvements	6	Upsize pipes	Low	$51,000
Karges Way improvements	7	Upsize pipes	High	$97,000
La Loma Drive Outfall Improvements	8	Upsize pipes	Low	$256,000
Black Oak Drive improvements	9	New culverts	Low	$260,000
State Street improvements	10	Upsize channel	Low	$387,000
Ellendale Drive improvements	11	Upsize channel	High	$156,000
Middle/South Fork Larson Creek improvements	12	Submit floodplain mapping to FEMA, protect floodplain and wetland (LA-WO5) as feasible.	High	$20,000[c]
Regional detention/water quality facility upstream of North Phoenix Road	NA[b]	Water quality facility	Low	$682,000
Restore Creek between Olympic Avenue and Murphy Road	NA[b]	Channel restoration	Low	$341,000
Separate between East Main Canal and Larson Creek	NA[b]	Canal separation from Creek	Low	$136,000
Total CIP costs				$3,067,000
Total CIP costs for high priority projects				$273,000

a. Costs have been rounded to the nearest $1,000.

b. These projects were pulled for reference and reconsideration from the 2005 SWMP.

c. An estimate of $20,000 was included as a place holder for administrative costs related to submittal of the preliminary flood study and consideration of enhanced floodplain and wetland protection for CIP #12. This cost will likely need to be refined as the City decides how to proceed with development in this area.



Brown AND Caldwell

NOVEMBER 2015

CITY OF MEDFORD

LARSON CREEK BASIN PLAN

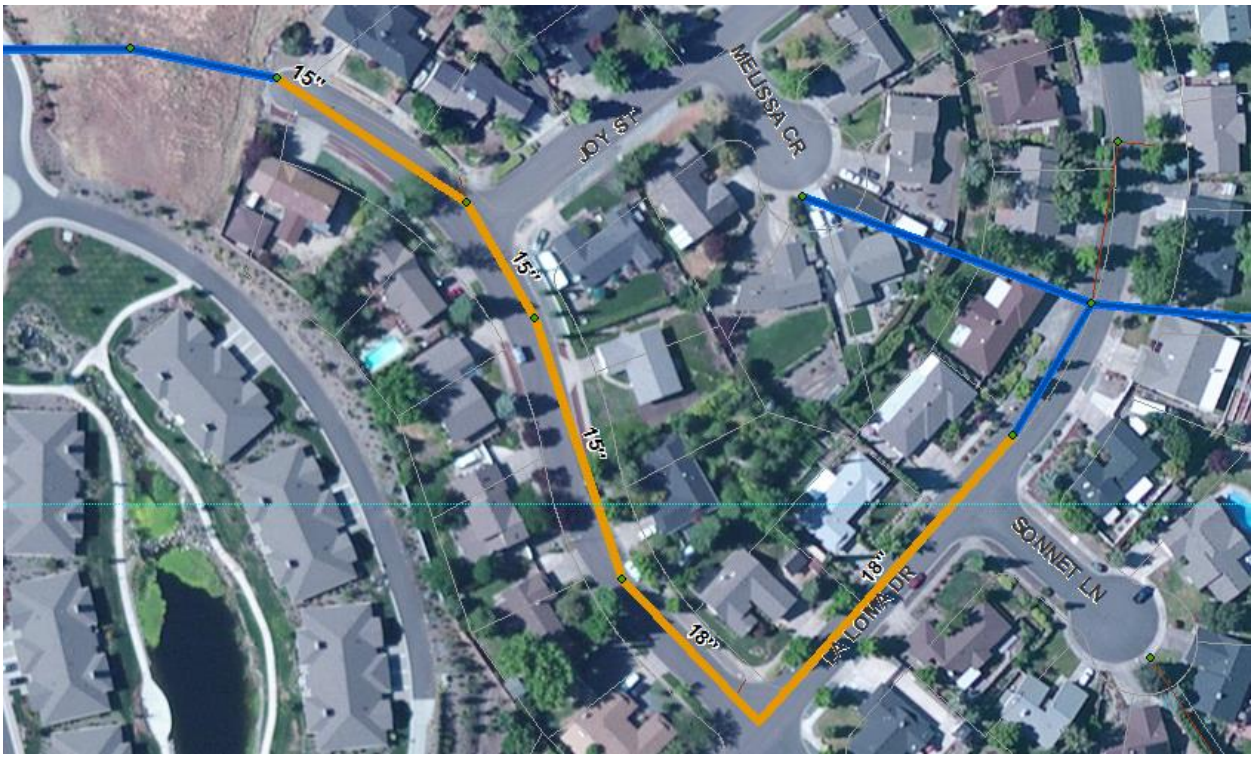
FIGURE 5-1

CIP OVERVIEW MAP

CIP PROJECTS
MODELED CONDUITS
OTHER CONDUITS
MODELED OPEN CHANNELS
OTHER OPEN CHANNELS
URBAN GROWTH BOUNDARY (UGB)
JACKSON CO. WETLANDS

NORTH

0 500 1,000 2,000 Feet



CIP Project	Honor Drive Improvements
Priority ranking	Low
Contributing drainage area	28 acres
Associated modeled pipes/conduits	10643 to 10147
Objective(s) addressed	Flood control

Project Description

The model predicts flow is currently limited by five undersized 12" diameter pipes that restrict flow from upstream pipes. Hydraulic modeling shows overflow from manholes during the 10-year existing and future flow events. Downstream pipe segments are 18" diameter and have capacity for current and future 10-year flow events.

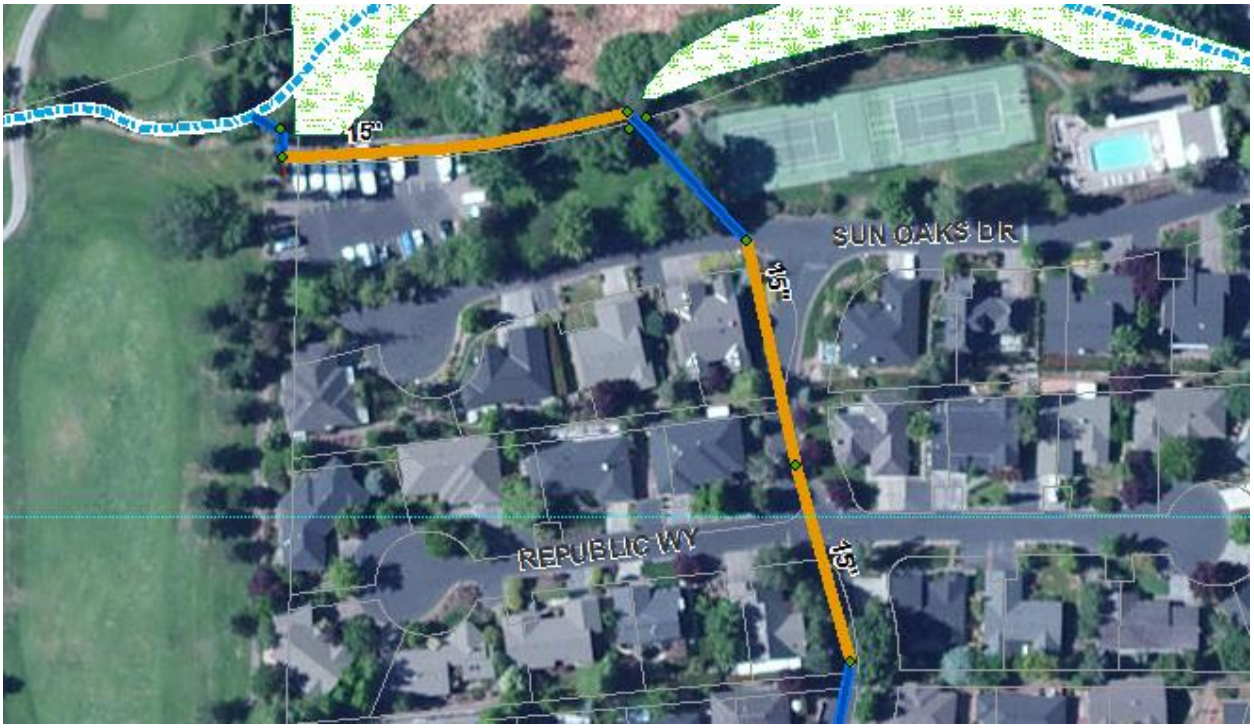
Upsize existing stormwater pipes to 15" – 18" to convey existing and future flows.

Estimated Planning Cost (2015 dollars)

ITEM	QUANTITY	UNIT	ESTIMATED COST
CAPITAL EXPENSE SUB-TOTAL (SEE APPENDIX C FOR DETAILS)			$195,210
Mobilization/demobilization	10%	LS	$19,520
Traffic control/utility relocation	2%	LS	$3,900
Erosion control	2%	LS	$3,900
CONSTRUCTION COST SUB-TOTAL			$222,530
Construction contingency	30%	LS	$66,760
CAPITAL EXPENSE TOTAL			$289,290
Engineering and permitting	20%	LS	$57,860
Construction administration	5%	LS	$14,460
Capital Project Implementation Cost Total			**$ 361,610**
Existing to Future % Flow Increase[a]			**3%**

Design Assumptions: N/A

[a] *Existing to future percent flow increase is based on the 10-year percent peak flow increase from the contributing drainage area between the existing and future land use scenarios for each CIP.*



Project Name	Constitution Drive Improvements
Priority ranking	Low
Contributing drainage area	22 acres
Associated modeled pipes/conduits	10157, 10326, and 10165
Objective(s) addressed	Flood control

Project Description

The model predicts current flows to be limited by three undersized 12" diameter pipes that restrict flow from upstream pipes. Hydraulic modeling shows overflow from manholes during the 10-year existing and future flow events. Downstream pipe segments are 15" diameter and have capacity for current and future 10-year flow events.

Upsize existing stormwater pipes to 15" to convey existing and future flows.

Estimated Planning Cost (2015 dollars)

ITEM	QUANTITY	UNIT	ESTIMATED COST
CAPITAL EXPENSE SUB-TOTAL (SEE APPENDIX C FOR DETAILS)			$116,980
Mobilization/demobilization	10%	LS	$11,700
Traffic control/utility relocation	2%	LS	$2,340
Erosion control	2%	LS	$2,340
CONSTRUCTION COST SUB-TOTAL			$133,360
Construction contingency	30%	LS	$40,010
CAPITAL EXPENSE TOTAL			$173,370
Engineering and permitting	20%	LS	$34,670
Construction administration	5%	LS	$8,670
Capital Project Implementation Cost Total			**$216,710**
Existing to Future % Flow Increase[a]			**<1%**

Design Assumptions: N/A

[a] *Existing to future percent flow increase is based on the 10-year percent peak flow increase from the contributing drainage area between the existing and future land use scenarios for each CIP.*

Project Name	East Barnett Road Improvements
Priority ranking	Low
Contributing drainage area	13 acres
Associated modeled pipes/conduits	C66389
Objective(s) addressed	Flood control

Project Description

The model predicts that flow is currently limited by one undersized 12" diameter pipe that restricts flow from upstream pipes. Hydraulic modeling shows overflow from manholes during the 10-year existing and future flow events. Downstream pipe segments are 18" diameter and have capacity for current and future 10-year flow events.

Upsize existing stormwater pipe to 15" to convey existing and future flows.

Estimated Planning Cost (2015 Dollars)

ITEM	QUANTITY	UNIT	ESTIMATED COST
CAPITAL EXPENSE SUB-TOTAL (SEE APPENDIX C FOR DETAILS)			$55,290
Mobilization/demobilization	10%	LS	$5,530
Traffic control/utility relocation	2%	LS	$1,110
Erosion control	2%	LS	$1,110
CONSTRUCTION COST SUB-TOTAL			$63,040
Construction contingency	30%	LS	$18,910
CAPITAL EXPENSE TOTAL			$81,950
Engineering and permitting	20%	LS	$16,390
Construction administration	5%	LS	$4,100
Capital Project Implementation Cost Total			**$ 102,440**
Existing to Future % Flow Increase[a]			**12%**

Design Assumptions : N/A

[a] *Existing to future percent flow increase is based on the 10-year percent peak flow increase from the contributing drainage area between the existing and future land use scenarios for each CIP.*

Project Name	La Loma Drive Improvements
Priority ranking	Low
Contributing drainage area	22 acres
Associated modeled pipes/conduits	10310
Objective(s) addressed	Flood control

Project Description

The model predicts flow is currently limited by one undersized 12" diameter pipe that restricts flow from upstream pipes. Hydraulic modeling shows overflow from manholes during the 10-year existing and future flow events. Downstream pipe segments are 18" diameter and have capacity for current and future 10-year flow events.

Upsize existing stormwater pipe to 15" to convey existing and future flows.

Estimated Planning Cost (2015 Dollars)

ITEM	QUANTITY	UNIT	ESTIMATED COST
CAPITAL EXPENSE SUB-TOTAL (SEE APPENDIX C FOR DETAILS)			$27,320
Mobilization/demobilization	10%	LS	$2,730
Traffic control/utility relocation	2%	LS	$550
Erosion control	2%	LS	$550
CONSTRUCTION COST SUB-TOTAL			$31,150
Construction contingency	30%	LS	$9,350
CAPITAL EXPENSE TOTAL			$40,500
Engineering and permitting	20%	LS	$8,100
Construction administration	5%	LS	$2,030
Capital Project Implementation Cost Total			**$ 50,630**
Existing to Future % Flow Increase[a]			**2%**

Design Assumptions: N/A

[a] *Existing to future percent flow increase is based on the 10-year percent peak flow increase from the contributing drainage area between the existing and future land use scenarios for each CIP.*

Project Name	Karges Way Improvements
Priority ranking	High
Contributing drainage area	107 acres
Associated modeled pipes/conduits	10725
Objective(s) addressed	Flood control and water quality

Project Description

The model predicts flow is currently limited by one undersized 24" diameter pipe that restricts flow from upstream pipes. Flooding has been identified in this location by City staff. Hydraulic modeling shows overflow from manholes during the 10-year existing and future flow events. Downstream pipe segments are 27" diameter and have capacity for existing and future 10-year flow events.

Upsize existing stormwater pipes to 27" to convey existing and future flows. Project cost includes the installation of a stormwater planter for a water quality benefit. If space is limited, a water quality vault could be constructed as an alternative.

Estimated Planning Cost (2015 dollars)

ITEM	QUANTITY	UNIT	ESTIMATED COST
CAPITAL EXPENSE SUB-TOTAL (SEE APPENDIX C FOR DETAILS)			$52,450
Mobilization/demobilization	10%	LS	$5,250
Traffic control/utility relocation	2%	LS	$1,050
Erosion control	2%	LS	$1,050
CONSTRUCTION COST SUB-TOTAL			$59,800
Construction contingency	30%	LS	$17,940
CAPITAL EXPENSE TOTAL			$77,740
Engineering and permitting	20%	LS	$15,550
Construction administration	5%	LS	$3,890
Capital Project Implementation Cost Total			**$97,180**
Existing to Future % Flow Increase[a]			**13%**

Design Assumptions: N/A

[a] *Existing to future percent flow increase is based on the 10-year percent peak flow increase from the contributing drainage area between the existing and future land use scenarios for each CIP.*

Project Name	La Loma Drive Outfall Improvements
Priority ranking	Low
Contributing drainage area	226 acres
Associated modeled pipes/conduits	11309, 10641
Objective(s) addressed	Eliminate pipe restriction

Project Description

The model predicts flow is currently limited by two undersized 36" diameter pipes that restrict flow from upstream 48" diameter pipe. Hydraulic modeling shows surcharging from manholes during the 10-year existing and future flow events.

Upsize existing stormwater pipes to 48" to convey existing and future flows.

Estimated Planning Cost (2015 dollars)

ITEM	QUANTITY	UNIT	ESTIMATED COST
CAPITAL EXPENSE SUB-TOTAL (SEE APPENDIX C FOR DETAILS)			$128,190
Mobilization/demobilization	10%	LS	$12,820
Traffic control/utility relocation	2%	LS	$2,560
Erosion control	2%	LS	$2,560
CONSTRUCTION COST SUB-TOTAL			$146,130
Construction contingency	30%	LS	$43,840
CAPITAL EXPENSE TOTAL			$189,970
Engineering and permitting	20%	LS	$56,990
Construction administration	5%	LS	$9,500
Capital Project Implementation Cost Total			**$256,460**
Existing to Future % Flow Increase[a]			**3%**

Design Assumptions:

Additional engineering costs have been added (30% as opposed to 20%) to allow for the hydraulic analysis and permitting required for stream restoration work.

[a] *Existing to future percent flow increase is based on the 10-year percent peak flow increase from the contributing drainage area between the existing and future land use scenarios for each CIP.*

Project Name	Black Oak Drive Improvements
Priority ranking	Low
Contributing drainage area	5,720 acres
Associated modeled pipes/conduits	1085
Objective(s) addressed	Flood control and water quality

Project Description

The model predicts current flows to be limited by two undersized 4' x 12.5' box culverts which restrict flow from the upstream channel. Hydraulic modeling shows overbank flooding during the 25-year existing/future flow events. These results are consistent with the findings in the 1996 DMP. The channel downstream has capacity for existing and future 25-year flow events.

Add two 48" culverts to the existing box culverts to convey the 25-year existing and future flows. Stream restoration efforts were extended downstream of the culvert to address identified channel segments with low to moderate condition riparian coverage (See Table 2-3).

Estimated Planning Cost (2015 dollars)

ITEM	QUANTITY	UNIT	ESTIMATED COST
CAPITAL EXPENSE SUB-TOTAL (SEE APPENDIX C FOR DETAILS)			$140,490
Mobilization/demobilization	10%	LS	$14,050
Traffic control/utility relocation	2%	LS	$2,810
Erosion control	2%	LS	$2,810
CONSTRUCTION COST SUB-TOTAL			$160,160
Construction contingency	30%	LS	$48,050
CAPITAL EXPENSE TOTAL			$208,210
Engineering and permitting	20%	LS	$41,640
Construction administration	5%	LS	$10,410
Capital Project Implementation Cost Total			**$260,260**
Existing to Future % Flow Increase[a]			**10%**

Design Assumptions

There is a retaining wall identified to be in poor condition downstream of the Black Oak Drive culvert (See Table 2-3). The current project does not include the restoration of the retaining wall; however, it is recommended that the City evaluate combining the projects to reduce costs.

[a] *Existing to future percent flow increase is based on the 25-year percent peak flow increase from the contributing drainage area between the existing and future land use scenarios for each CIP.*

Project Name	State Street Improvements: Alternative A - Detention
Priority ranking	Low
Contributing drainage area	917 acres
Associated modeled pipes/conduits	CJ469.3682, CJ829.0988
Objective(s) addressed	Flood control and water quality

Project Description

The model predicts flow is limited by the channel upstream of the State St culvert. Hydraulic modeling shows flow overtopping the banks during the 10-year existing flow event. Downstream channel/culvert segments have capacity for existing and future 10-year flow events, although they produce backwater effects upstream.

There are two proposed alternatives for this CIP. The costs below are associated with adding a detention basin adjacent to the channel to alleviate flow from the downstream channel and provide water quality benefits.

Estimated Planning Cost (2015 dollars)

ITEM	QUANTITY	UNIT	ESTIMATED COST
CAPITAL EXPENSE SUB-TOTAL (SEE APPENDIX C FOR DETAILS)			$214,190
Mobilization/demobilization	10%	LS	$21,420
Traffic control/utility relocation	2%	LS	$4,280
Erosion control	2%	LS	$4,280
CONSTRUCTION COST SUB-TOTAL			$244,170
Construction contingency	30%	LS	$73,250
CAPITAL EXPENSE TOTAL			$317,420
Engineering and permitting	30%	LS	$95,230
Construction administration	5%	LS	$15,870
Capital Project Implementation Cost Total			**$428,520**
Existing to Future % Flow Increase[a]			**56%**

Design Assumptions

Additional engineering costs have been added (30% as opposed to 20%) to allow for the hydraulic analysis and permitting required for stream restoration work. Current design is based on LiDAR data. In addition, $20,000 was added to capital costs to conduct a feasibility study for this project (e.g., investigate bedrock and high groundwater).

Land acquisition was not included in the cost estimate.

[a] *Existing to future percent flow increase is based on the 10-year percent peak flow increase from the contributing drainage area between the existing and future land use scenarios for each CIP.*

Project Name	State Street Improvements: Alternative B – Channel Upsizing
Priority ranking	Low
Contributing drainage area	917 acres
Associated modeled pipes/conduits	CJ469.3682, CJ829.0988
Objective(s) addressed	Flood control and water quality

Project Description

The model predicts that flow is currently limited by the channel upstream of the State St culvert. Hydraulic modeling shows flow overtopping the banks during the 10-year existing flow event. Downstream channel/culvert segments have capacity for existing and future 10-year flow events, although they produce backwater effects upstream.

There are two proposed alternatives for this CIP. The costs below are associated with providing restoration work to add capacity and a riparian buffer to the channel.

Estimated Planning Cost (2015 dollars)

ITEM	QUANTITY	UNIT	ESTIMATED COST
CAPITAL EXPENSE SUB-TOTAL (SEE APPENDIX C FOR DETAILS)			$193,490
Mobilization/demobilization	10%	LS	$19,350
Traffic control/utility relocation	2%	LS	$3,870
Erosion control	2%	LS	$3,870
CONSTRUCTION COST SUB-TOTAL			$220,580
Construction contingency	30%	LS	$66,170
CAPITAL EXPENSE TOTAL			$286,750
Engineering and permitting	30%	LS	$86,030
Construction administration	5%	LS	$14,340
Capital Project Implementation Cost Total			**$387,120**
Existing to Future % Flow Increase[a]			**56%**

Design Assumptions

Additional engineering costs have been added (30% as opposed to 20%) to allow for the hydraulic analysis and permitting required for stream restoration work. Current design is based on LiDAR data.

[a] *Existing to future percent flow increase is based on the 10-year percent peak flow increase from the contributing drainage area between the existing and future land use scenarios for each CIP.*

Project Name	Ellendale Drive Improvements: Alternative A – Channel Upsizing
Priority ranking	High
Contributing drainage area	5,882 acres
Associated modeled pipes/conduits	CJ2783.417
Objective(s) addressed	Flood control and water quality

Project Description

Capacity is limited in the channel upstream of Ellendale Drive and problems have been observed in this area. This is an area of concern for the City. Hydraulic modeling shows flooding along the right bank during the 25-year existing and future flow events. The downstream culvert has capacity for current and future 25-year flow events.

Two alternatives have been proposed to eliminate the overbank flooding occurring along this portion of the channel. This fact sheet provides details for Alternative A, upsizing the channel to convey existing and future 25-year flows.

Estimated Planning Cost (2015 dollars)

ITEM	QUANTITY	UNIT	ESTIMATED COST
CAPITAL EXPENSE SUB-TOTAL (SEE APPENDIX C FOR DETAILS)			$77,910
Mobilization/demobilization	10%	LS	$7,790
Traffic control/utility relocation	2%	LS	$1,560
Erosion control	2%	LS	$1,560
CONSTRUCTION COST SUB-TOTAL			$88,820
Construction contingency	30%	LS	$26,650
CAPITAL EXPENSE TOTAL			$115,470
Engineering and permitting	30%	LS	$34,640
Construction administration	5%	LS	$5,770
Capital Project Implementation Cost Total			**$155,880**
Existing to Future % Flow Increase[a]			**5%**

Design Assumptions

Additional engineering costs (30% as opposed to 20%) have been added to allow for the hydraulic analysis and permitting required for stream restoration work. Current design is based on LiDAR data.

Cost does not include potential bank stabilization efforts.

[a] *Existing to future percent flow increase is based on the 25-year percent peak flow increase from the contributing drainage area between the existing and future land use scenarios for each CIP.*

Project Name	Ellendale Drive Improvements: Alternative B – Bio-retention
Priority ranking	High
Contributing drainage area	5,882 acres
Associated modeled pipes/conduits	CJ2783.417
Objective(s) addressed	Flood control

Project Description

Capacity is limited in the channel upstream of Ellendale Drive and problems have been observed in this area. This is an area of concern for the City. Hydraulic modeling shows flooding along the right bank during the 25-year existing and future flow events. The downstream culvert has capacity for current and future 25-year flow events.

Two alternatives have been proposed to eliminate the overbank flooding occurring along this portion of the channel. This fact sheet provides details for Alternative B, converting adjacent property to a bio-retention cell to alleviate the existing and future 25-year flows from the downstream channel.

Estimated Planning Cost (2015 dollars)

ITEM	QUANTITY	UNIT	ESTIMATED COST
CAPITAL EXPENSE SUB-TOTAL (SEE APPENDIX C FOR DETAILS)			$398,940
Mobilization/demobilization	10%	LS	$39,890
Traffic control/utility relocation	2%	LS	$7,980
Erosion control	2%	LS	$7,980
CONSTRUCTION COST SUB-TOTAL			$454,790
Construction contingency	30%	LS	$136,440
CAPITAL EXPENSE TOTAL			$591,230
Engineering and permitting	30%	LS	$177,370
Construction administration	5%	LS	$29,560
Capital Project Implementation Cost Total			**$798,160**
Existing to Future % Flow Increase[a]			**5%**

Design Assumptions

Additional engineering costs have been added to allow for the hydraulic analysis and permitting required for stream restoration work. Current design is based on LiDAR data. In addition, $20,000 was added to capital costs to conduct a feasibility study for this project (e.g., investigate bedrock and high groundwater).

Land acquisition was not included in the cost estimate.

[a] *Existing to future percent flow increase is based on the 25-year percent peak flow increase from the contributing drainage area between the existing and future land use scenarios for each CIP.*

Section 6

Limitations

This document was prepared solely for the City of Medford (City) in accordance with professional standards at the time the services were performed and in accordance with the contract between the City and Brown and Caldwell, dated September 18, 2013. This document is governed by the specific scope of work authorized by the City; it is not intended to be relied upon by any other party except for regulatory authorities contemplated by the scope of work. We have relied on information or instructions provided by the City and other parties and, unless otherwise expressly indicated, have made no independent investigation as to the validity, completeness, or accuracy of such information.

Section 7

References

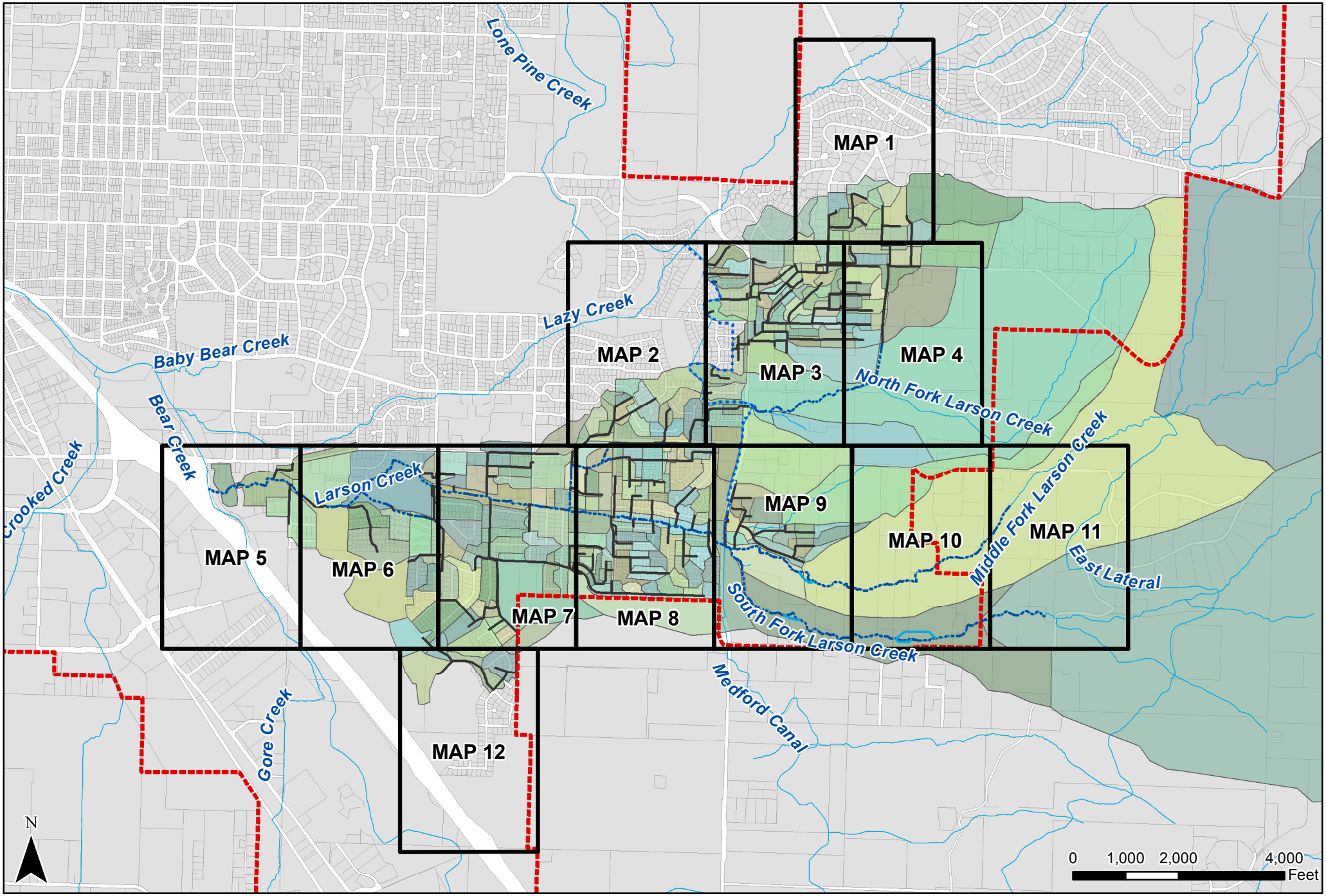
Brown and Caldwell, *Comprehensive Medford Area Drainage Master Plan*, Prepared for the City of Medford, Oregon, 1996.

Rogue Valley Sewer Service, *Rogue Valley Stormwater Design Manual*, September, 2008.

Tetra Tech/KCM, *Stormwater Management Plan*, Prepared for the City of Medford, Oregon, 2005.

United States Department of Agriculture, Soil Conservation Service, *Soil Survey of Jackson County Area, Oregon, Parts of Jackson and Klamath Counties,* 1993.

Appendix A: Larson Creek Maps



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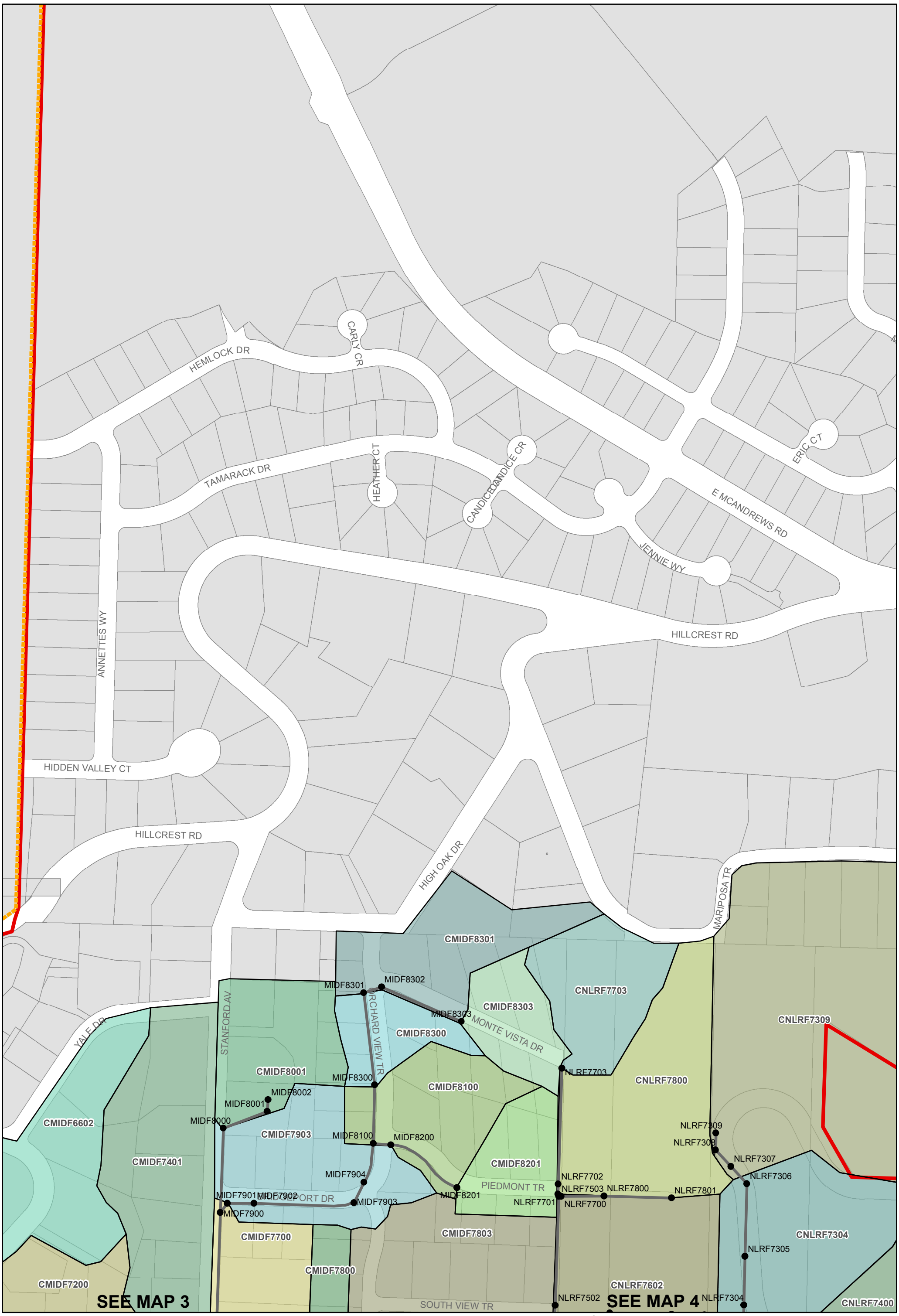
NOVEMBER 2015

CITY OF MEDFORD
LARSON CREEK BASIN PLAN
APPENDIX A
EXISTING SYSTEM KEY MAP

- MAP VIEW
- SUB-BASINS
- TAXLOTS
- JACKSON CO. CREEKS & CANALS
- URBAN GROWTH BOUNDARY (UGB)
- MODELED CONDUIT
- MODELED OPEN CHANNEL
- MODELED OVERLAND FLOW PATH
- MODELED CANAL



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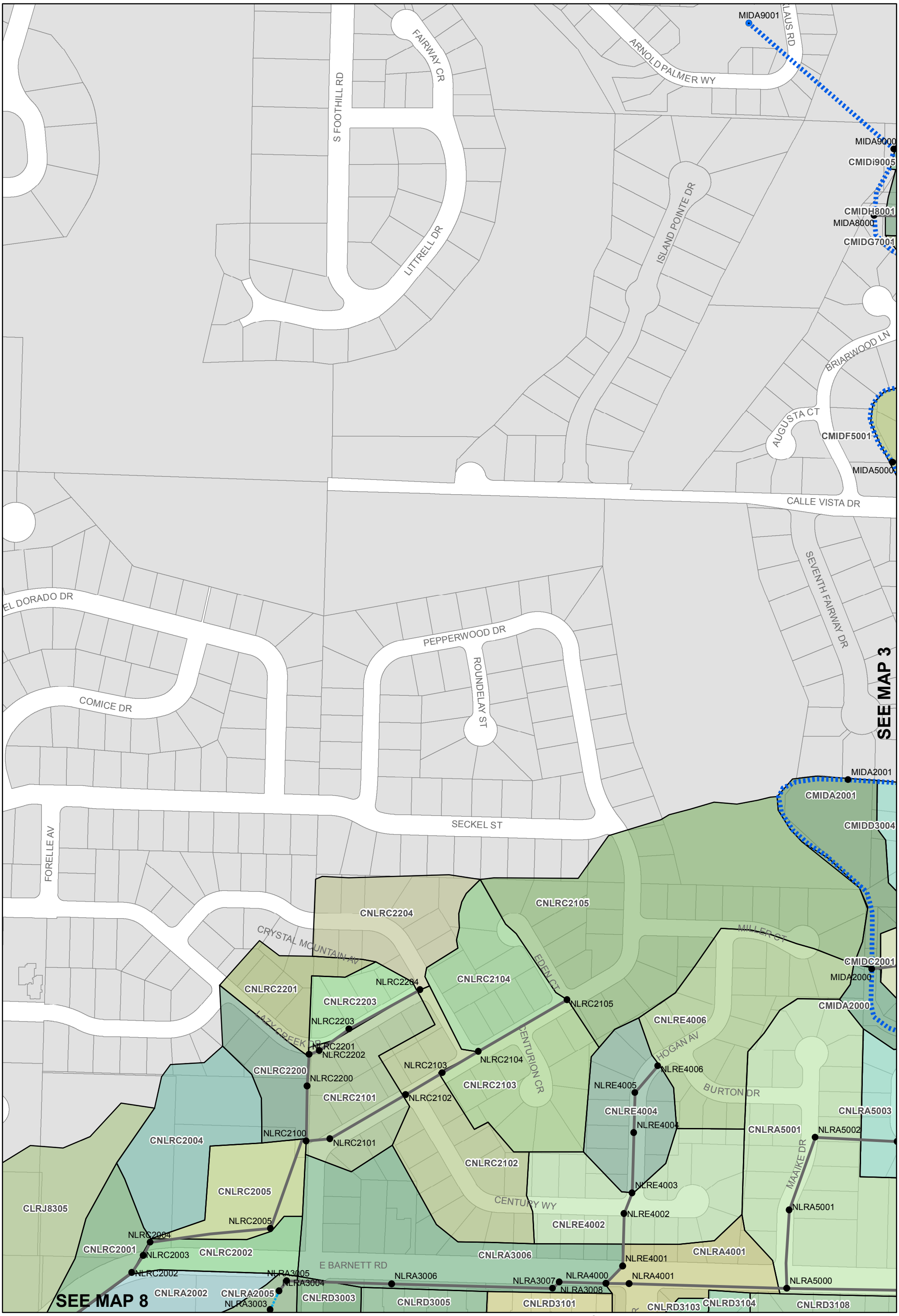
CITY OF MEDFORD
LARSON CREEK BASIN PLAN

APPENDIX A
EXISTING SYSTEM MAP 1

MODELED CONDUIT
MODELED OPEN CHANNEL
MODELED OVERLAND FLOW PATH
MODELED CANAL
MEDFORD UGB
MEDFORD CITY LIMITS
MODEL JUNCTION
MODEL STORAGE
MODEL OUTFALL
SUB-BASIN BOUNDARY
TAXLOTS

NORTH

1 inch = 250 feet



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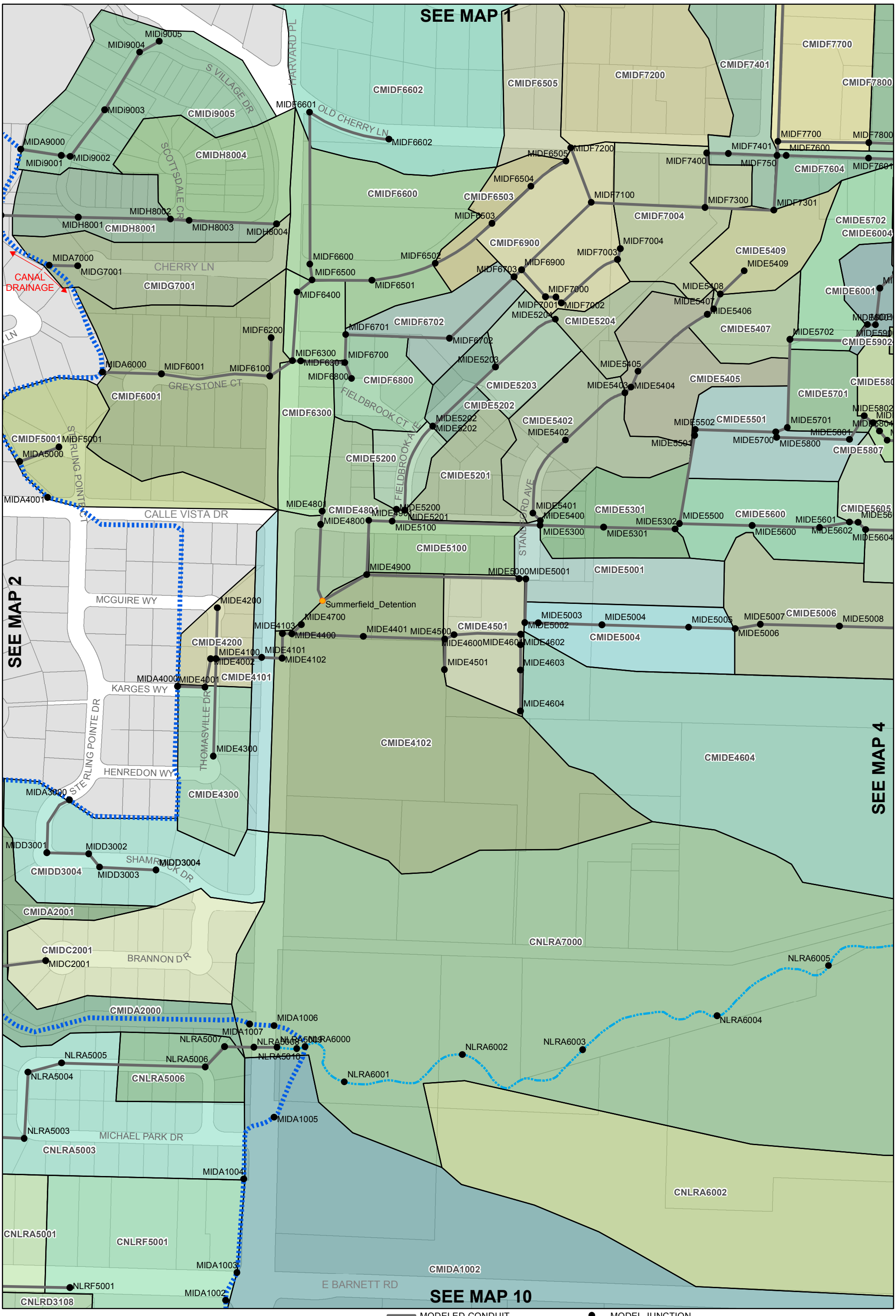
CITY OF MEDFORD
LARSON CREEK BASIN PLAN

APPENDIX A
EXISTING SYSTEM MAP 2

MODELED CONDUIT
MODELED OPEN CHANNEL
MODELED OVERLAND FLOW PATH
MODELED CANAL
MEDFORD UGB
MEDFORD CITY LIMITS
MODEL JUNCTION
MODEL STORAGE
MODEL OUTFALL
SUB-BASIN BOUNDARY
TAXLOTS

NORTH

1 inch = 250 feet



CITY OF MEDFORD
LARSON CREEK BASIN PLAN

APPENDIX A
EXISTING SYSTEM MAP 3

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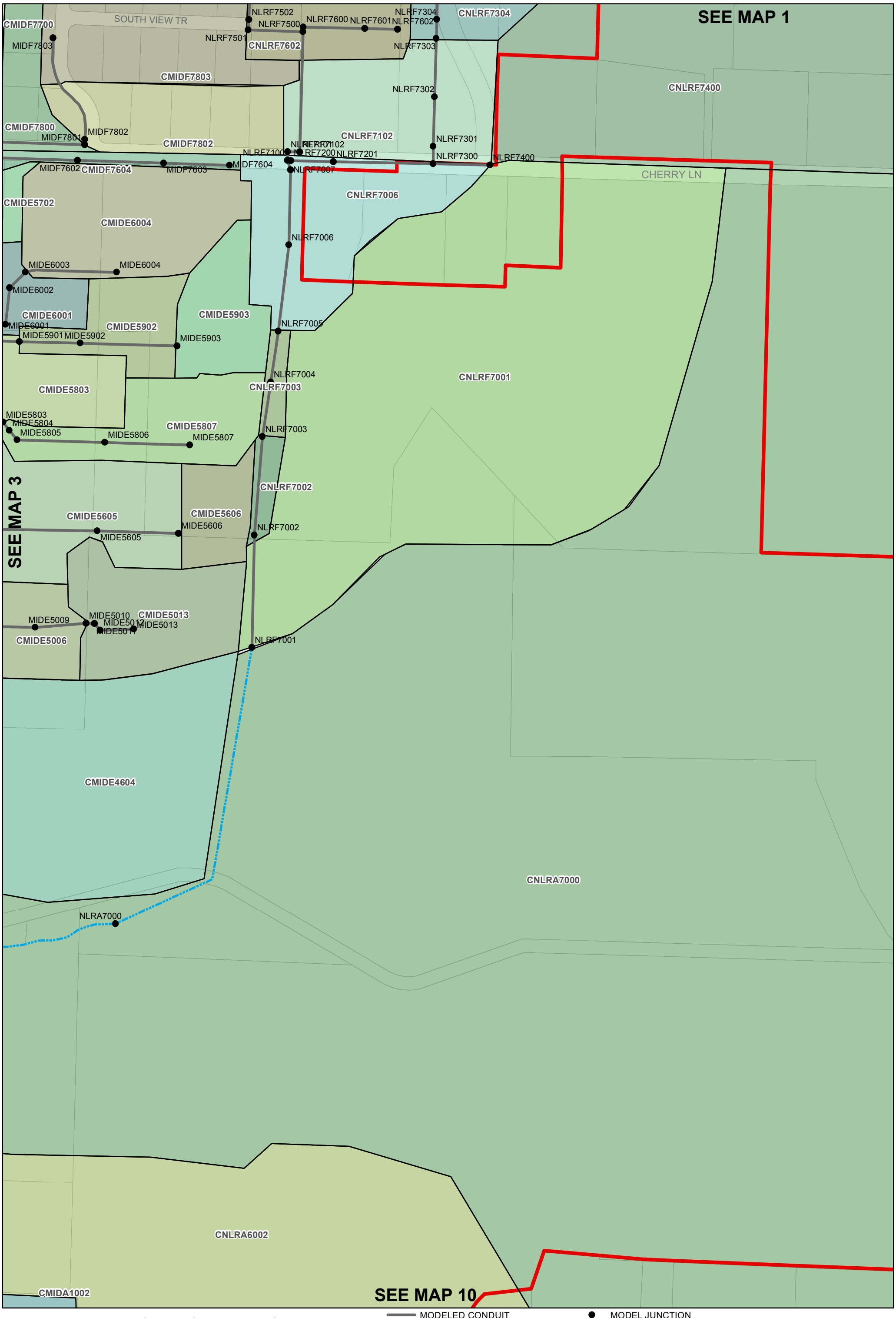
MODELED CONDUIT
MODELED OPEN CHANNEL
MODELED OVERLAND FLOW PATH
MODELED CANAL
MEDFORD UGB
MEDFORD CITY LIMITS
MODEL JUNCTION
MODEL STORAGE
MODEL OUTFALL
SUB-BASIN BOUNDARY
TAXLOTS

NORTH

1 inch = 250 feet



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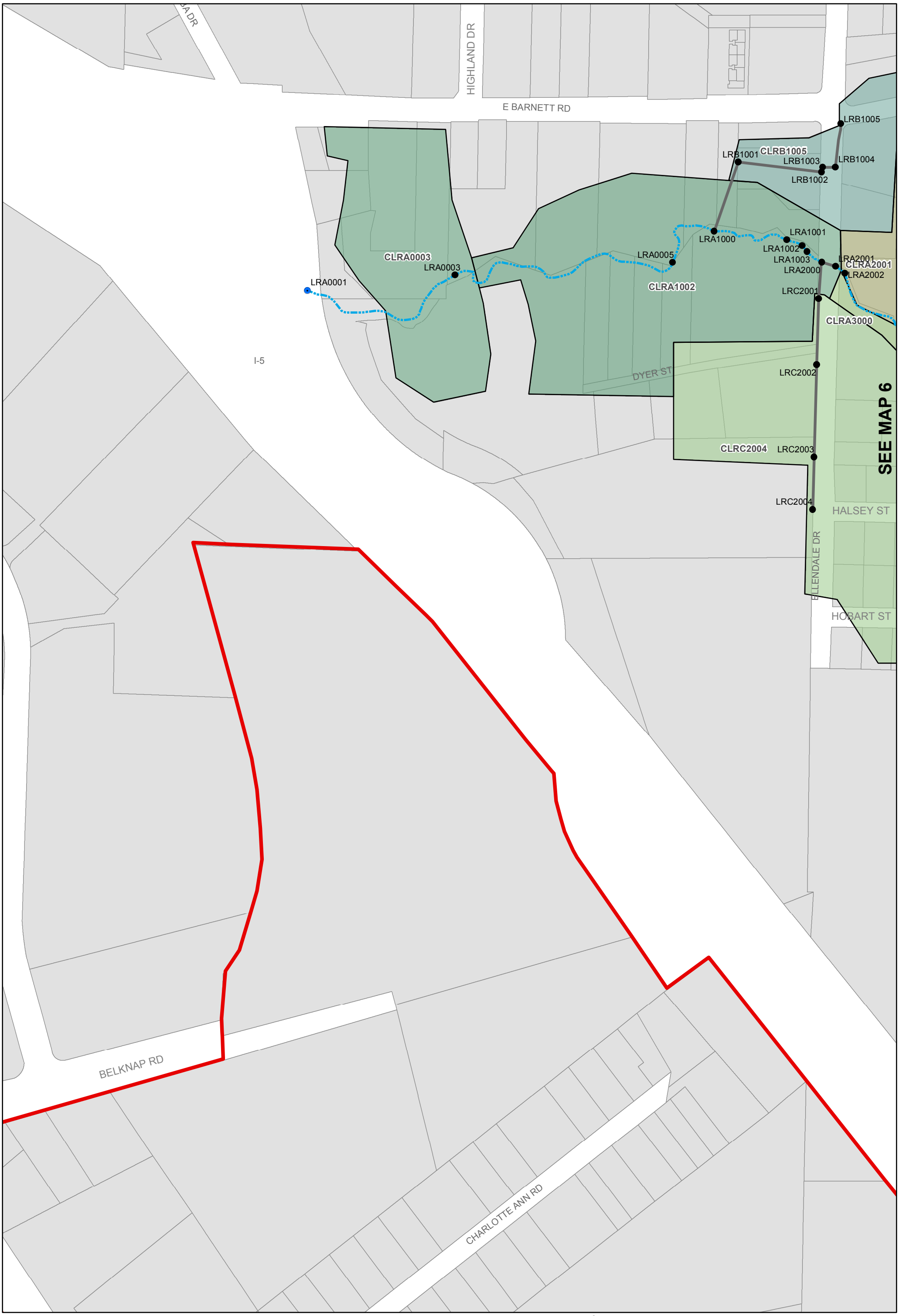
CITY OF MEDFORD
LARSON CREEK BASIN PLAN

APPENDIX A
EXISTING SYSTEM MAP 4

MODELED CONDUIT
MODELED OPEN CHANNEL
MODELED OVERLAND FLOW PATH
MODELED CANAL
MEDFORD UGB
MEDFORD CITY LIMITS
MODEL JUNCTION
MODEL STORAGE
MODEL OUTFALL
SUB-BASIN BOUNDARY
TAXLOTS

NORTH

1 inch = 250 feet



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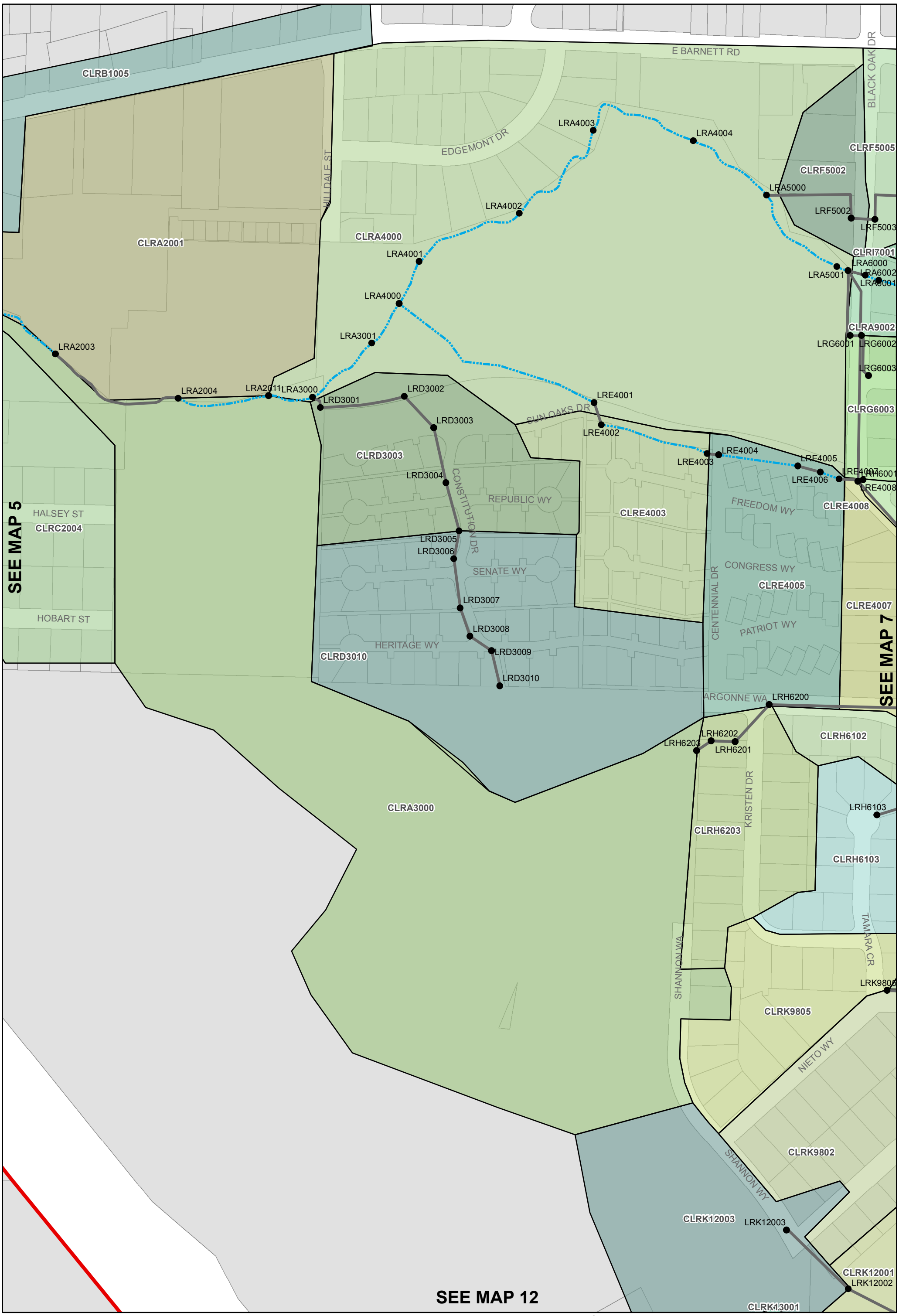
CITY OF MEDFORD
LARSON CREEK BASIN PLAN

APPENDIX A
EXISTING SYSTEM MAP 5

MODELED CONDUIT
MODELED OPEN CHANNEL
MODELED OVERLAND FLOW PATH
MODELED CANAL
MEDFORD UGB
MEDFORD CITY LIMITS
MODEL JUNCTION
MODEL STORAGE
MODEL OUTFALL
SUB-BASIN BOUNDARY
TAXLOTS

NORTH

1 inch = 250 feet



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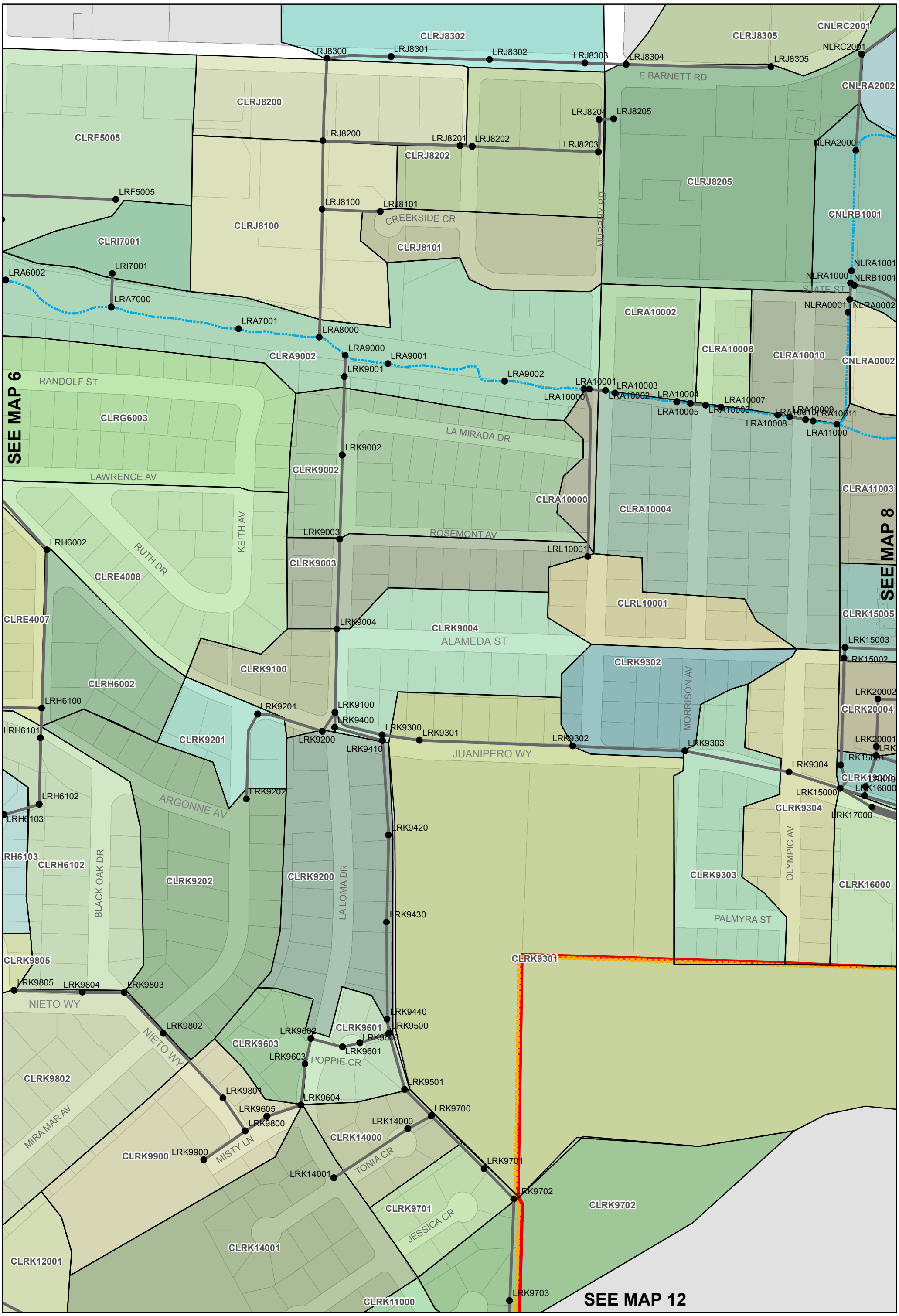
CITY OF MEDFORD
LARSON CREEK BASIN PLAN

APPENDIX A
EXISTING SYSTEM MAP 6

MODELED CONDUIT
MODELED OPEN CHANNEL
MODELED OVERLAND FLOW PATH
MODELED CANAL
MEDFORD UGB
MEDFORD CITY LIMITS
MODEL JUNCTION
MODEL STORAGE
MODEL OUTFALL
SUB-BASIN BOUNDARY
TAXLOTS

NORTH

1 inch = 250 feet



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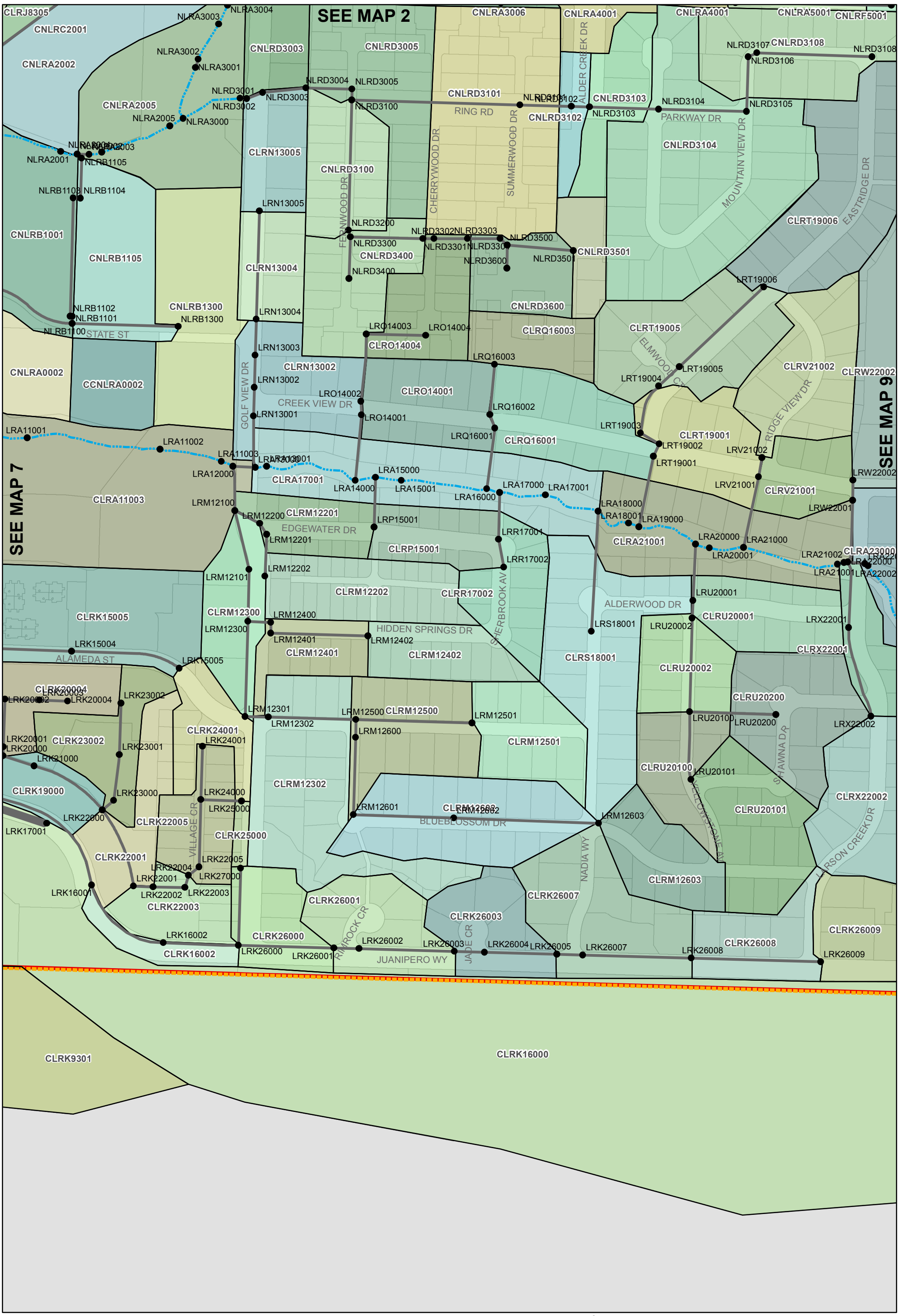
CITY OF MEDFORD
LARSON CREEK BASIN PLAN

APPENDIX A
EXISTING SYSTEM MAP 7

MODELED CONDUIT
MODELED OPEN CHANNEL
MODELED OVERLAND FLOW PATH
MODELED CANAL
MEDFORD UGB
MEDFORD CITY LIMITS
MODEL JUNCTION
MODEL STORAGE
MODEL OUTFALL
SUB-BASIN BOUNDARY
TAXLOTS

NORTH

1 inch = 250 feet



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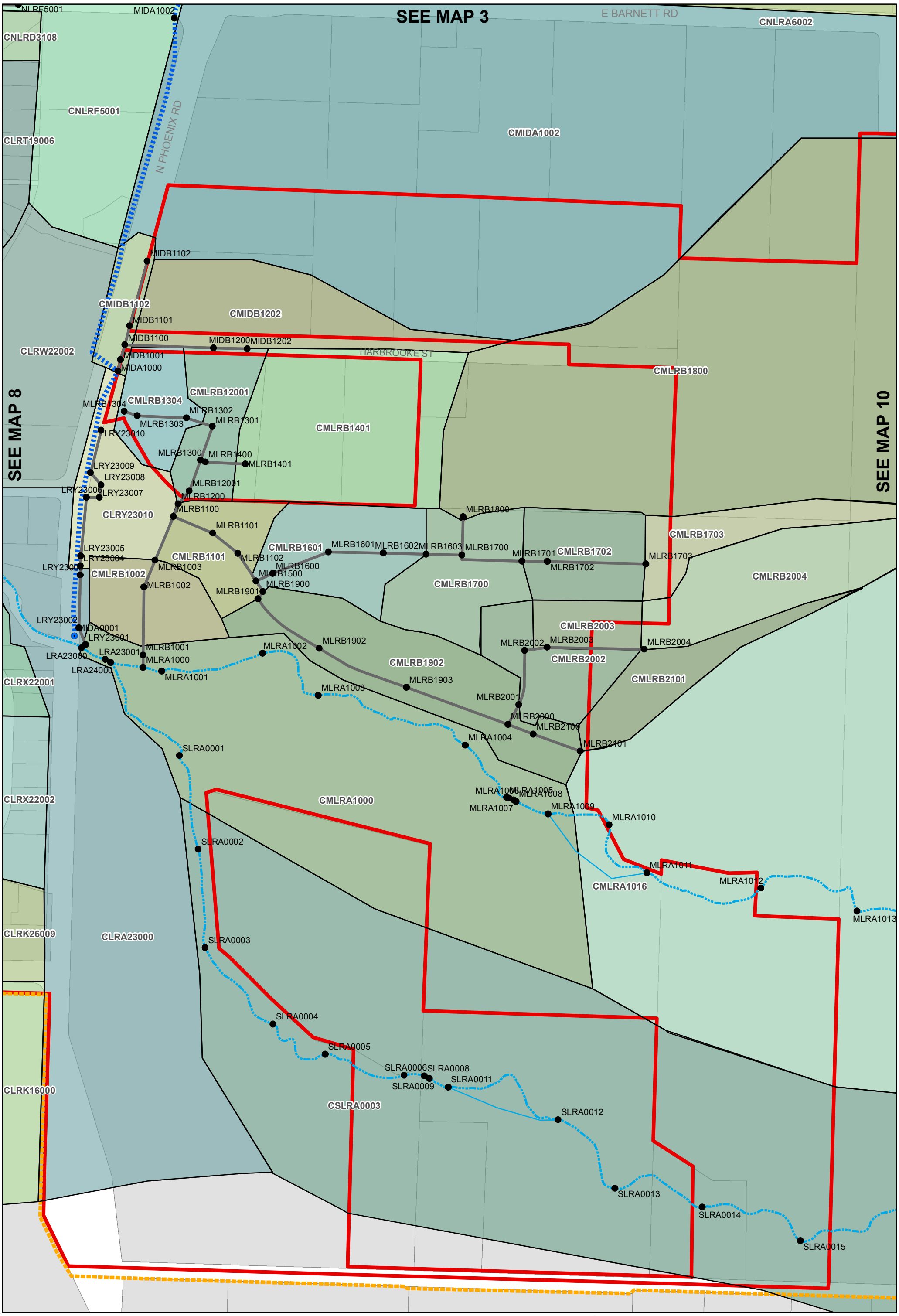
CITY OF MEDFORD
LARSON CREEK BASIN PLAN

APPENDIX A
EXISTING SYSTEM MAP 8

- MODELED CONDUIT
- MODELED OPEN CHANNEL
- MODELED OVERLAND FLOW PATH
- MODELED CANAL
- MEDFORD UGB
- MEDFORD CITY LIMITS
- MODEL JUNCTION
- MODEL STORAGE
- MODEL OUTFALL
- SUB-BASIN BOUNDARY
- TAXLOTS

NORTH

1 inch = 250 feet



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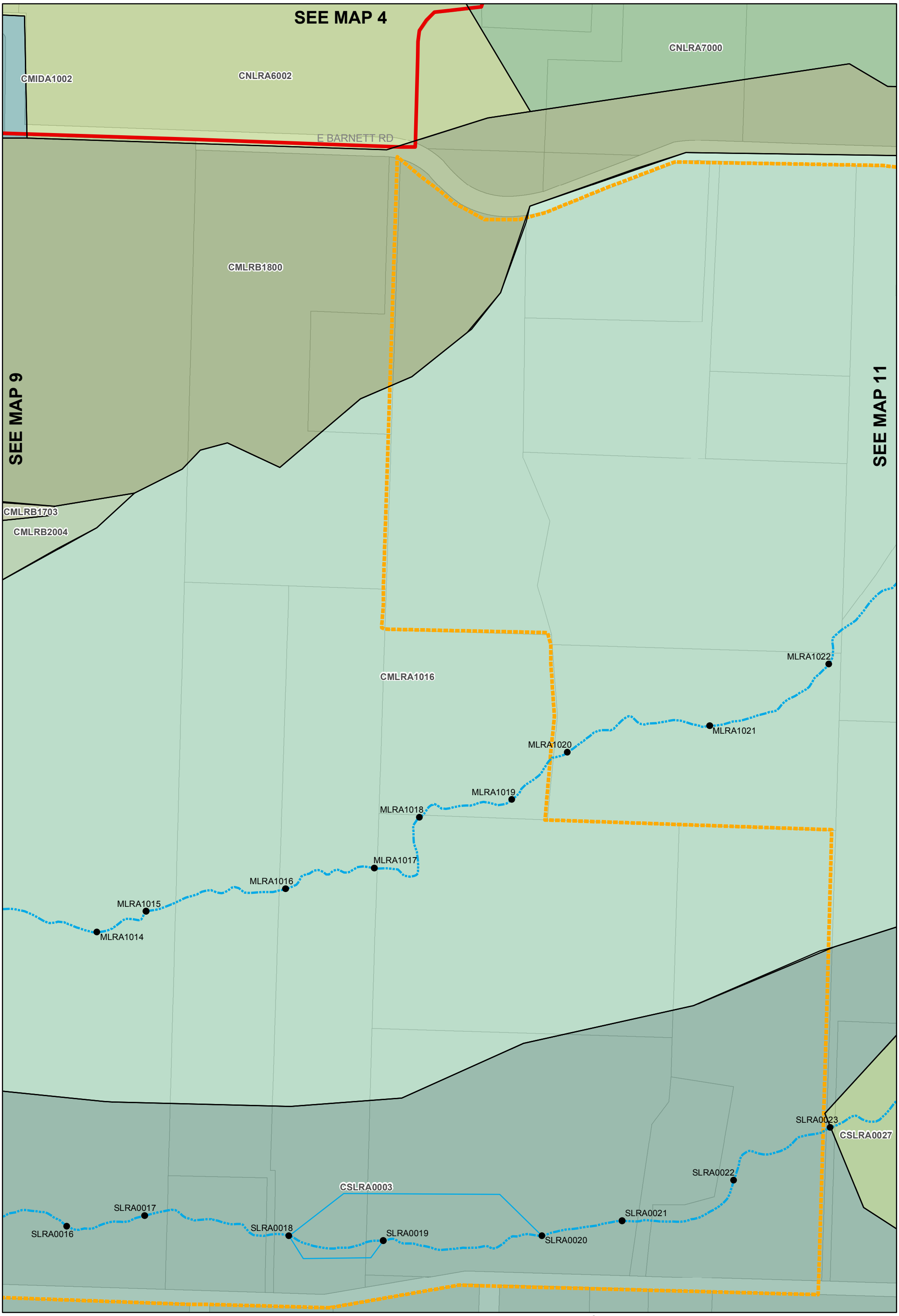
CITY OF MEDFORD
LARSON CREEK BASIN PLAN

APPENDIX A
EXISTING SYSTEM MAP 9

MODELED CONDUIT
MODELED OPEN CHANNEL
MODELED OVERLAND FLOW PATH
MODELED CANAL
MEDFORD UGB
MEDFORD CITY LIMITS
MODEL JUNCTION
MODEL STORAGE
MODEL OUTFALL
SUB-BASIN BOUNDARY
TAXLOTS

NORTH

1 inch = 250 feet



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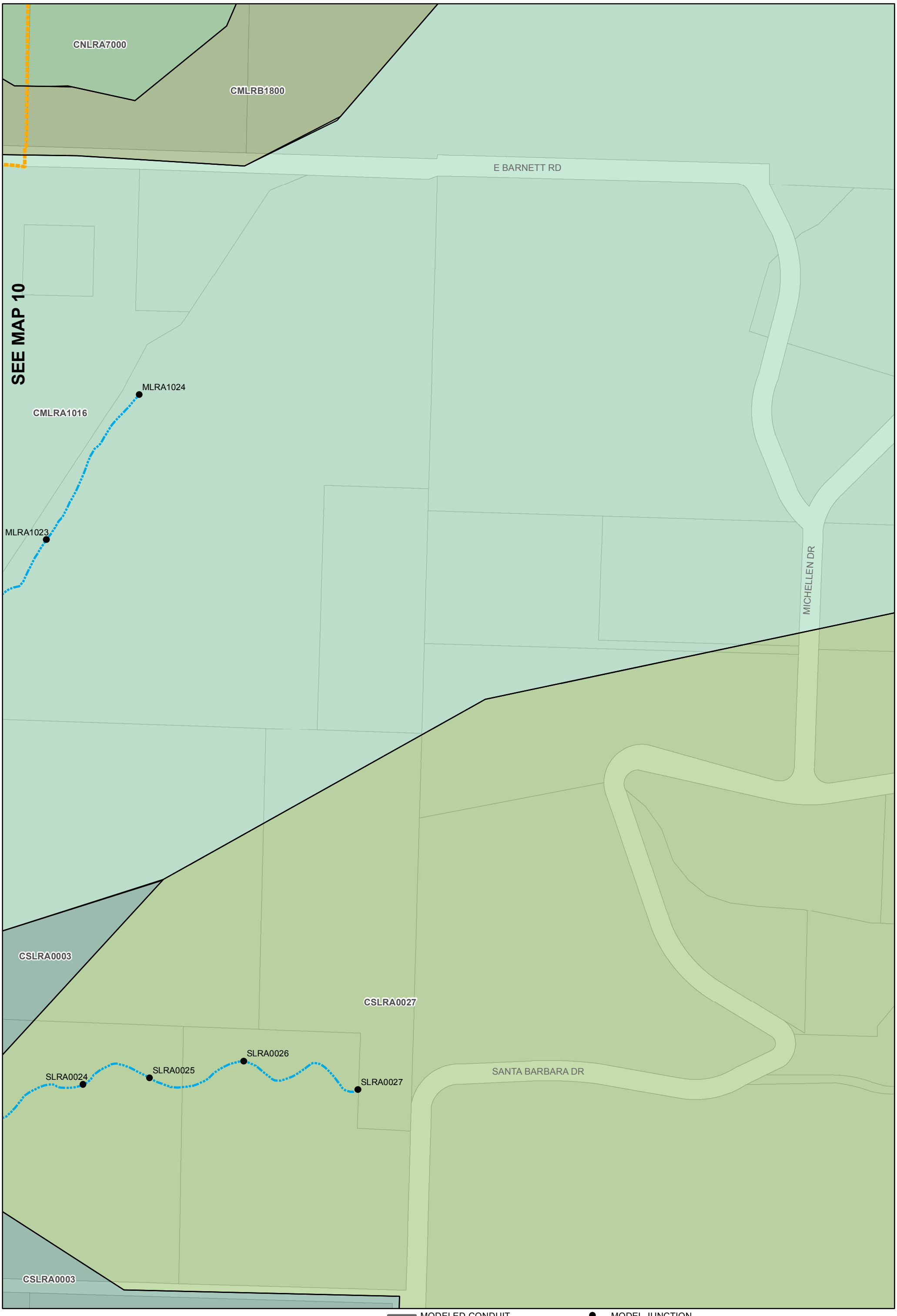
CITY OF MEDFORD
LARSON CREEK BASIN PLAN

APPENDIX A
EXISTING SYSTEM MAP 10

MODELED CONDUIT
MODELED OPEN CHANNEL
MODELED OVERLAND FLOW PATH
MODELED CANAL
MEDFORD UGB
MEDFORD CITY LIMITS
MODEL JUNCTION
MODEL STORAGE
MODEL OUTFALL
SUB-BASIN BOUNDARY
TAXLOTS

NORTH

1 inch = 250 feet



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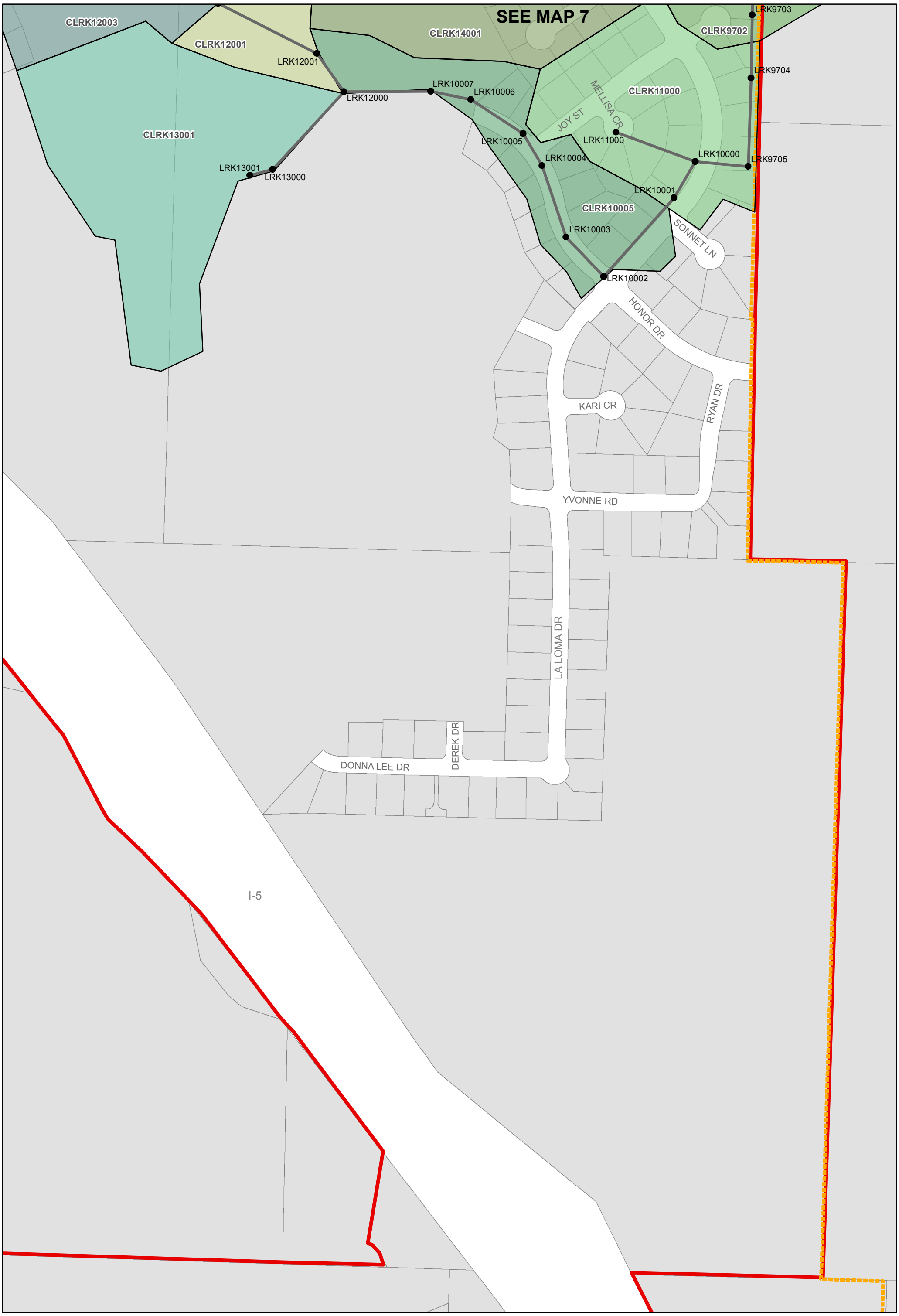
CITY OF MEDFORD
LARSON CREEK BASIN PLAN

APPENDIX A
EXISTING SYSTEM MAP 11

MODELED CONDUIT
MODELED OPEN CHANNEL
MODELED OVERLAND FLOW PATH
MODELED CANAL
MEDFORD UGB
MEDFORD CITY LIMITS
MODEL JUNCTION
MODEL STORAGE
MODEL OUTFALL
SUB-BASIN BOUNDARY
TAXLOTS

NORTH

1 inch = 250 feet



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CITY OF MEDFORD
LARSON CREEK BASIN PLAN

APPENDIX A
EXISTING SYSTEM MAP 12

MODELED CONDUIT
MODELED OPEN CHANNEL
MODELED OVERLAND FLOW PATH
MODELED CANAL
MEDFORD UGB
MEDFORD CITY LIMITS
MODEL JUNCTION
MODEL STORAGE
MODEL OUTFALL
SUB-BASIN BOUNDARY
TAXLOTS

NORTH

1 inch = 250 feet

Appendix B: Modeling Results

Table B-1. Sub-Basin Model Parameters and Results

Sub-Basin Name	Outlet Node	Sub-Basin Area (acres)	Impervious Area			Pervious Curve Number		Average Sub-Basin Slope (%)	Existing Sub-Basin Peak Flows (cfs)		Future Sub-Basin Peak Flows (cfs)	
			Existing Land Use (%)	Future Land Use (%)	Increase	Normal Conditions	Antecendent Conditions		10-yr, 24-hr	25-yr, 24-hr	10-yr, 24-hr	25-yr, 24-hr
Larson Creek - Main Stem from Confluence to North Fork Appendix A, Maps # 5, 6 & 7												
CLRA0003	LRA0003	6.0	55.0	69.0	25.5%	79	86	1.1	2.3	2.5	2.5	2.7
CLRA10000	LRA10000	0.8	80.0	80.0	0.0%	80	87	0.6	0.4	0.4	0.4	0.4
CLRA10002	LRA10002	2.2	25.0	73.0	192.0%	80	87	1.0	0.7	0.8	1.0	1.0
CLRA10004	LRA10004	5.0	25.0	50.0	100.0%	80	87	0.5	1.3	1.5	1.8	1.9
CLRA10006	LRA10006	1.3	60.0	67.0	11.7%	80	87	0.2	0.5	0.5	0.5	0.6
CLRA10010	LRA10010	2.6	60.0	67.0	11.7%	80	87	0.2	1.0	1.1	1.1	1.2
CLRA1002	LRA1002	11.3	25.0	58.0	132.0%	77	84	4.5	3.5	3.8	4.4	4.8
CLRA2001	LRA2001	19.2	45.0	63.0	40.0%	80	87	3.0	7.1	7.7	7.9	8.5
CLRA3000	LRA3000	41.5	26.0	53.0	103.8%	80	87	22.3	12.5	13.8	15.8	17.0
CLRA4000	LRA4000	38.6	40.0	52.0	30.0%	80	87	2.5	13.5	14.7	14.7	15.9
CLRA9002	LRA9002	11.5	20.0	62.0	210.0%	80	87	10.7	3.6	4.0	4.7	5.0
Stormdrains Contributing to Larson Creek from Confluence to North Fork Appendix A, Maps # 2, 5, 6, 7, 8, 9 & 12												
CLRB1005	LRB1005	6.4	85.0	85.0	0.0%	80	87	0.3	3.0	3.2	3.0	3.2
CLRC2004	LRC2004	13.9	40.0	50.0	25.0%	80	87	2.3	5.0	5.4	5.3	5.7
CLRD3003	LRD3003	7.1	45.0	50.0	11.1%	80	87	6.4	2.6	2.9	2.7	2.9
CLRD3010	LRD3010	15.0	45.0	50.0	11.1%	80	87	15.4	5.6	6.0	5.7	6.2
CLRE4003	LRE4003	5.5	45.0	50.0	11.1%	80	87	14.9	2.1	2.2	2.1	2.3
CLRE4005	LRE4005	7.3	45.0	50.0	11.1%	80	87	15.0	2.7	2.9	2.8	3.0
CLRE4007	LRE4007	3.2	25.0	50.0	100.0%	80	87	0.5	0.8	0.9	1.1	1.2
CLRE4008	LRE4008	7.5	45.0	50.0	11.1%	80	87	5.8	2.8	3.0	2.9	3.1
CLRF5002	LRF5002	2.3	95.0	95.0	0.0%	80	87	1.2	1.1	1.2	1.1	1.2
CLRF5005	LRF5005	7.0	95.0	95.0	0.0%	80	87	3.1	3.4	3.6	3.4	3.6
CLRG6003	LRG6003	8.8	50.0	50.0	0.0%	80	87	0.8	3.4	3.6	3.4	3.6
CLRH6002	LRH6002	3.1	35.0	50.0	42.9%	80	87	15.0	1.1	1.2	1.2	1.3
CLRH6102	LRH6102	6.7	60.0	60.0	0.0%	80	87	9.0	2.7	2.9	2.7	2.9
CLRH6103	LRH6103	3.3	60.0	60.0	0.0%	80	87	10.5	1.3	1.4	1.3	1.4
CLRH6203	LRH6203	5.2	55.0	55.0	0.0%	80	87	9.9	2.1	2.2	2.1	2.2
CLRI7001	LRI7001	2.1	98.0	98.0	0.0%	80	87	0.2	1.0	1.1	1.0	1.1
CLRJ8100	LRJ8100	6.7	90.0	90.0	0.0%	80	87	0.2	3.2	3.4	3.2	3.4
CLRJ8101	LRJ8101	3.1	90.0	90.0	0.0%	80	87	0.2	1.5	1.6	1.5	1.6
CLRJ8200	LRJ8200	4.5	55.0	80.0	45.5%	80	87	2.9	1.8	1.9	2.0	2.2
CLRJ8202	LRJ8202	5.0	90.0	90.0	0.0%	80	87	1.1	2.4	2.5	2.4	2.5
CLRJ8205	LRJ8205	10.1	80.0	80.0	0.0%	80	87	5.0	4.5	4.9	4.5	4.9
CLRJ8302	LRJ8302	4.9	55.0	80.0	45.5%	80	87	1.5	1.9	2.1	2.2	2.4
CLRJ8305	LRJ8305	8.1	50.0	71.0	42.0%	80	87	5.0	3.1	3.3	3.5	3.7
CLRK10005	LRK10005	5.7	50.0	50.0	0.0%	80	87	2.8	2.2	2.3	2.2	2.3
CLRK11000	LRK11000	6.9	60.0	60.0	0.0%	80	87	1.1	2.8	3.0	2.8	3.0
CLRK12001	LRK12001	3.2	50.0	50.0	0.0%	80	87	14.4	1.2	1.3	1.2	1.3
CLRK12003	LRK12003	8.5	45.0	66.0	46.7%	80	87	14.6	3.2	3.4	3.6	3.8
CLRK13001	LRK13001	10.9	60.0	60.0	0.0%	80	87	13.0	4.4	4.8	4.4	4.8
CLRK14000	LRK14000	2.1	60.0	60.0	0.0%	80	87	6.9	0.8	0.9	0.8	0.9
CLRK14001	LRK14001	9.1	40.0	50.0	25.0%	80	87	6.7	3.3	3.5	3.5	3.8
CLRK15005	LRK15005	4.7	90.0	90.0	0.0%	80	87	4.0	2.2	2.4	2.2	2.4
CLRK16000	LRK16000	33.9	10.0	17.0	70.0%	80	87	2.0	9.5	10.4	10.1	11.1

Table B-1. Sub-Basin Model Parameters and Results

Sub-Basin Name	Outlet Node	Sub-Basin Area (acres)	Impervious Area			Pervious Curve Number		Average Sub-Basin Slope (%)	Existing Sub-Basin Peak Flows (cfs)		Future Sub-Basin Peak Flows (cfs)	
			Existing Land Use (%)	Future Land Use (%)	Increase	Normal Conditions	Antecendent Conditions		10-yr, 24-hr	25-yr, 24-hr	10-yr, 24-hr	25-yr, 24-hr
CLRK16002	LRK16002	0.8	25.0	50.0	100.0%	80	87	2.5	0.3	0.3	0.3	0.3
CLRK19000	LRK19000	1.5	90.0	90.0	0.0%	80	87	0.4	0.7	0.7	0.7	0.7
CLRK20004	LRK20004	2.2	90.0	90.0	0.0%	80	87	1.0	1.0	1.1	1.0	1.1
CLRK22001	LRK22001	1.9	75.0	75.0	0.0%	80	87	1.3	0.8	0.9	0.8	0.9
CLRK22003	LRK22003	1.4	90.0	90.0	0.0%	80	87	3.1	0.7	0.7	0.7	0.7
CLRK22005	LRK22005	1.7	90.0	90.0	0.0%	80	87	4.3	0.8	0.8	0.8	0.8
CLRK23002	LRK23002	1.9	75.0	75.0	0.0%	80	87	1.3	0.8	0.9	0.8	0.9
CLRK24001	LRK24001	1.4	90.0	90.0	0.0%	80	87	1.4	0.7	0.7	0.7	0.7
CLRK25000	LRK25000	0.2	90.0	90.0	0.0%	80	87	2.0	0.1	0.1	0.1	0.1
CLRK26000	LRK26000	1.7	50.0	50.0	0.0%	80	87	3.2	0.6	0.7	0.6	0.7
CLRK26001	LRK26001	2.3	50.0	50.0	0.0%	80	87	3.5	0.9	1.0	0.9	1.0
CLRK26003	LRK26003	2.0	50.0	50.0	0.0%	80	87	1.7	0.8	0.8	0.8	0.8
CLRK26007	LRK26007	3.6	45.0	50.0	11.1%	80	87	4.2	1.3	1.4	1.4	1.5
CLRK26008	LRK26008	1.9	65.0	65.0	0.0%	80	87	4.9	0.8	0.8	0.8	0.8
CLRK26009	LRK26009	2.1	65.0	65.0	0.0%	80	87	2.3	0.9	1.0	0.9	1.0
CLRK9002	LRK9002	7.7	60.0	60.0	0.0%	80	87	0.9	3.1	3.3	3.1	3.3
CLRK9003	LRK9003	3.6	60.0	60.0	0.0%	80	87	1.7	1.5	1.6	1.5	1.6
CLRK9004	LRK9004	5.2	60.0	60.0	0.0%	80	87	0.6	2.1	2.2	2.1	2.2
CLRK9100	LRK9100	2.1	60.0	60.0	0.0%	80	87	9.5	0.9	0.9	0.9	0.9
CLRK9200	LRK9200	6.1	60.0	60.0	0.0%	80	87	5.0	2.5	2.7	2.5	2.7
CLRK9201	LRK9201	1.9	60.0	60.0	0.0%	80	87	15.0	0.8	0.9	0.8	0.9
CLRK9202	LRK9202	8.1	50.0	50.0	0.0%	80	87	5.5	3.1	3.3	3.1	3.3
CLRK9301	LRK9301	34.3	25.0	37.0	48.0%	80	87	3.4	11.0	12.0	12.0	13.0
CLRK9302	LRK9302	3.5	65.0	65.0	0.0%	80	87	3.9	1.5	1.6	1.5	1.6
CLRK9303	LRK9303	4.5	60.0	60.0	0.0%	80	87	2.5	1.8	2.0	1.8	2.0
CLRK9304	LRK9304	4.7	65.0	65.0	0.0%	80	87	3.0	2.0	2.1	2.0	2.1
CLRK9601	LRK9601	1.7	60.0	60.0	0.0%	80	87	5.0	0.7	0.7	0.7	0.7
CLRK9603	LRK9603	1.6	60.0	60.0	0.0%	80	87	2.5	0.6	0.7	0.6	0.7
CLRK9701	LRK9701	2.0	60.0	60.0	0.0%	80	87	1.8	0.8	0.9	0.8	0.9
CLRK9702	LRK9702	6.9	20.0	27.0	35.0%	80	87	3.1	2.2	2.4	2.3	2.5
CLRK9802	LRK9802	10.0	50.0	50.0	0.0%	80	87	11.0	3.8	4.1	3.8	4.1
CLRK9805	LRK9805	5.0	50.0	50.0	0.0%	80	87	12.6	1.9	2.1	1.9	2.1
CLRK9900	LRK9900	5.5	35.0	50.0	42.9%	80	87	6.5	1.9	2.1	2.1	2.3
CLRL10001	LRL10001	2.9	55.0	55.0	0.0%	80	87	2.6	1.1	1.2	1.1	1.2
Larson Creek - North Fork Appendix A, Maps # 2, 3, 4, 7, 8, 9, 10 & 11												
CNLRA0002	NLRA0002	1.8	95.0	95.0	0.0%	80	87	0.5	1.6	1.7	1.6	1.7
CNLRA2002	NLRA2002	3.6	2.0	80.0	3900.0%	80	87	3.2	1.0	1.1	1.6	1.8
CNLRA2005	NLRA2005	5.0	1.0	76.0	7500.0%	80	87	5.0	1.4	1.5	2.2	2.4
CNLRA3006	NLRA3006	5.1	55.0	56.0	1.8%	80	87	3.1	2.0	2.2	2.0	2.2
CNLRA4001	NLRA4001	2.2	40.0	50.0	25.0%	80	87	3.1	0.8	0.9	0.9	0.9
CNLRA5001	NLRA5001	7.8	55.0	59.0	7.3%	80	87	5.1	3.1	3.3	3.2	3.4
CNLRA5003	NLRA5003	5.7	60.0	60.0	0.0%	80	87	1.8	2.3	2.5	2.3	2.5
CNLRA5006	NLRA5006	1.7	60.0	60.0	0.0%	80	87	1.1	0.7	0.8	0.7	0.8
CNLRA6002	NLRA6002	37.8	1.0	68.0	6700.0%	80	87	4.0	5.6	6.4	16.2	17.4
CNLRA7000	NLRA7000	414.6	2.0	45.0	2150.0%	80	87	10.0	69.4	78.3	141.5	154.1

Table B-1. Sub-Basin Model Parameters and Results

Sub-Basin Name	Outlet Node	Sub-Basin Area (acres)	Impervious Area			Pervious Curve Number		Average Sub-Basin Slope (%)	Existing Sub-Basin Peak Flows (cfs)		Future Sub-Basin Peak Flows (cfs)	
			Existing Land Use (%)	Future Land Use (%)	Increase	Normal Conditions	Antecendent Conditions		10-yr, 24-hr	25-yr, 24-hr	10-yr, 24-hr	25-yr, 24-hr
Larson Creek - Stormdrains Contributing to the North Fork Appendix A, Maps # 1, 2, 3, 4, 7, 8 & 9												
CCNLRA0002	CNLRA0002	1.5	95.0	95.0	0.0%	80	87	0.5	0.7	0.8	0.7	0.8
CNLRB1001	NLRB1001	5.0	20.0	70.0	250.0%	80	87	2.5	1.6	1.7	2.1	2.3
CNLRB1105	NLRB1105	2.9	15.0	70.0	366.7%	80	87	3.7	0.9	1.0	1.2	1.3
CNLRB1300	NLRB1300	4.0	95.0	95.0	0.0%	80	87	1.0	1.9	2.0	1.9	2.0
CNLRC2001	NLRC2001	1.5	35.0	72.0	105.7%	80	87	1.5	0.5	0.6	0.7	0.7
CNLRC2002	NLRC2002	1.2	65.0	72.0	10.8%	80	87	1.0	0.5	0.5	0.5	0.6
CNLRC2004	NLRC2004	3.2	1.0	68.0	6700.0%	80	87	1.6	0.8	0.9	1.3	1.4
CNLRC2005	NLRC2005	1.9	80.0	80.0	0.0%	80	87	2.3	0.8	0.9	0.8	0.9
CNLRC2101	NLRC2101	2.7	55.0	55.0	0.0%	80	87	1.1	1.1	1.1	1.1	1.1
CNLRC2102	NLRC2102	3.8	55.0	55.0	0.0%	80	87	2.0	1.5	1.6	1.5	1.6
CNLRC2103	NLRC2103	3.1	55.0	55.0	0.0%	80	87	2.8	1.2	1.3	1.2	1.3
CNLRC2104	NLRC2104	2.5	55.0	55.0	0.0%	80	87	1.9	1.0	1.1	1.0	1.1
CNLRC2105	NLRC2105	9.8	40.0	50.0	25.0%	80	87	4.0	3.5	3.8	3.8	4.1
CNLRC2200	NLRC2200	1.5	35.0	55.0	57.1%	80	87	1.0	0.5	0.6	0.6	0.6
CNLRC2201	NLRC2201	1.4	45.0	50.0	11.1%	80	87	1.0	0.5	0.6	0.5	0.6
CNLRC2203	NLRC2203	1.1	50.0	50.0	0.0%	80	87	0.9	0.4	0.4	0.4	0.4
CNLRC2204	NLRC2204	2.7	40.0	50.0	25.0%	80	87	4.5	1.0	1.0	1.0	1.1
CNLRD3003	NLRD3003	1.2	90.0	90.0	0.0%	80	87	2.0	0.6	0.6	0.6	0.6
CNLRD3005	NLRD3005	3.5	70.0	70.0	0.0%	80	87	3.6	1.5	1.6	1.5	1.6
CNLRD3100	NLRD3100	2.2	70.0	70.0	0.0%	80	87	2.0	0.9	1.0	0.9	1.0
CNLRD3101	NLRD3101	6.0	65.0	65.0	0.0%	80	87	0.1	2.5	2.7	2.5	2.7
CNLRD3102	NLRD3102	0.7	45.0	64.0	42.2%	80	87	1.6	0.3	0.3	0.3	0.3
CNLRD3103	NLRD3103	1.6	45.0	58.0	28.9%	80	87	5.1	0.6	0.7	0.7	0.7
CNLRD3104	NLRD3104	7.8	65.0	65.0	0.0%	80	87	1.3	3.2	3.5	3.2	3.5
CNLRD3108	NLRD3108	3.5	70.0	70.0	0.0%	80	87	1.2	1.5	1.6	1.5	1.6
CNLRD3400	NLRD3400	2.4	70.0	70.0	0.0%	80	87	3.8	1.0	1.1	1.0	1.1
CNLRD3501	NLRD3501	1.0	40.0	76.0	90.0%	80	87	2.0	0.3	0.4	0.4	0.5
CNLRD3600	NLRD3600	1.6	90.0	90.0	0.0%	80	87	0.9	0.8	0.8	0.8	0.8
CNLRE4002	NLRE4002	3.8	55.0	55.0	0.0%	80	87	4.6	1.5	1.6	1.5	1.6
CNLRE4004	NLRE4004	2.3	55.0	55.0	0.0%	80	87	1.9	0.9	1.0	0.9	1.0
CNLRE4006	NLRE4006	4.4	50.0	50.0	0.0%	80	87	0.5	1.7	1.8	1.7	1.8
CNLRF5001	NLRF5001	9.9	70.0	80.0	14.3%	80	87	2.6	4.2	4.5	4.4	4.7
CNLRF7001	NLRF7001	29.7	5.0	50.0	900.0%	80	87	10.0	9.4	10.3	12.6	13.5
CNLRF7002	NLRF7002	0.5	40.0	50.0	25.0%	80	87	5.1	0.2	0.2	0.2	0.2
CNLRF7003	NLRF7003	0.5	50.0	50.0	0.0%	80	87	7.0	0.2	0.2	0.2	0.2
CNLRF7006	NLRF7006	5.0	15.0	50.0	233.3%	80	87	10.3	1.7	1.9	2.1	2.3
CNLRF7102	NLRF7102	4.6	5.0	50.0	900.0%	80	87	12.0	1.5	1.6	2.0	2.1
CNLRF7304	NLRF7304	5.1	10.0	50.0	400.0%	80	87	24.0	1.7	1.8	2.2	2.3
CNLRF7309	NLRF7309	36.6	7.0	50.0	614.3%	80	87	22.0	11.9	13.0	15.5	16.7
CNLRF7400	NLRF7400	23.4	7.0	50.0	614.3%	80	87	15.0	7.6	8.3	9.9	10.6
CNLRF7602	NLRF7602	5.0	45.0	50.0	11.1%	80	87	12.5	2.1	2.2	2.1	2.3
CNLRF7703	NLRF7703	3.0	20.0	50.0	150.0%	80	87	25.0	1.1	1.2	1.3	1.4
CNLRF7800	NLRF7801	5.6	15.0	50.0	233.3%	80	87	17.0	1.9	2.1	2.4	2.6
Larson Creek - Main Stem from North Fork to N. Phoenix Road Appendix A, Maps # 7, 8 & 9												

Table B-1. Sub-Basin Model Parameters and Results

Sub-Basin Name	Outlet Node	Sub-Basin Area (acres)	Impervious Area			Pervious Curve Number		Average Sub-Basin Slope (%)	Existing Sub-Basin Peak Flows (cfs)		Future Sub-Basin Peak Flows (cfs)	
			Existing Land Use (%)	Future Land Use (%)	Increase	Normal Conditions	Antecendent Conditions		10-yr, 24-hr	25-yr, 24-hr	10-yr, 24-hr	25-yr, 24-hr
CLRA11003	LRA11003	7.9	65.0	70.0	7.7%	80	87	15.5	3.3	3.5	3.4	3.6
CLRA17001	LRA17001	4.6	15.0	50.0	233.3%	80	87	4.1	1.4	1.5	1.8	1.9
CLRA21001	LRA21001	4.2	15.0	50.0	233.3%	80	87	4.1	1.3	1.4	1.6	1.7
CLRA23000	LRA23000	18.8	5.0	50.0	900.0%	80	87	2.0	5.0	5.5	7.1	7.7
Larson Creek - Storm Drains Contributing to the Main Stem from North Fork to N. Phoenix Road Appendix A, Maps # 8 & 9												
CLRM12201	LRM12201	1.4	80.0	80.0	0.0%	80	87	7.0	0.6	0.7	0.6	0.7
CLRM12202	LRM12202	2.5	80.0	80.0	0.0%	80	87	3.4	1.1	1.2	1.1	1.2
CLRM12300	LRM12300	2.0	90.0	90.0	0.0%	80	87	0.7	0.9	1.0	0.9	1.0
CLRM12302	LRM12302	4.5	50.0	50.0	0.0%	80	87	0.5	1.7	1.9	1.7	1.9
CLRM12401	LRM12401	1.3	60.0	60.0	0.0%	80	87	4.1	0.5	0.6	0.5	0.6
CLRM12402	LRM12402	1.6	60.0	60.0	0.0%	80	87	4.2	0.7	0.7	0.7	0.7
CLRM12500	LRM12500	2.6	60.0	60.0	0.0%	80	87	2.1	1.1	1.1	1.1	1.1
CLRM12501	LRM12501	2.1	60.0	60.0	0.0%	80	87	0.5	0.8	0.9	0.8	0.9
CLRM12602	LRM12602	3.7	65.0	65.0	0.0%	80	87	1.0	1.5	1.7	1.5	1.7
CLRM12603	LRM12603	1.9	60.0	60.0	0.0%	80	87	2.5	0.8	0.8	0.8	0.8
CLRN13002	LRN13002	2.6	60.0	65.0	8.3%	80	87	2.8	1.0	1.1	1.1	1.2
CLRN13004	LRN13004	1.5	90.0	90.0	0.0%	80	87	2.1	0.7	0.7	0.7	0.7
CLRN13005	LRN13005	1.6	90.0	90.0	0.0%	80	87	2.2	0.8	0.8	0.8	0.8
CLRO14001	LRO14001	2.3	55.0	55.0	0.0%	80	87	2.3	0.9	1.0	0.9	1.0
CLRO14004	LRO14004	1.9	70.0	70.0	0.0%	80	87	3.4	0.8	0.9	0.8	0.9
CLRP15001	LRP15001	1.5	80.0	80.0	0.0%	80	87	4.7	0.7	0.7	0.7	0.7
CLRQ16001	LRQ16001	2.7	60.0	60.0	0.0%	80	87	4.6	1.1	1.2	1.1	1.2
CLRQ16003	LRQ16003	1.4	90.0	90.0	0.0%	80	87	1.6	0.7	0.7	0.7	0.7
CLRR17002	LRR17002	1.8	75.0	75.0	0.0%	80	87	5.1	0.8	0.8	0.8	0.8
CLRS18001	LRS18001	4.4	60.0	60.0	0.0%	80	87	0.5	1.8	1.9	1.8	1.9
CLRT19001	LRT19001	2.3	60.0	60.0	0.0%	80	87	5.0	0.9	1.0	0.9	1.0
CLRT19005	LRT19005	3.6	70.0	70.0	0.0%	80	87	1.9	1.5	1.7	1.5	1.7
CLRT19006	LRT19006	4.5	70.0	70.0	0.0%	80	87	4.2	1.9	2.1	1.9	2.1
CLRU20001	LRU20001	2.0	60.0	60.0	0.0%	80	87	1.7	0.8	0.9	0.8	0.9
CLRU20002	LRU20002	1.7	60.0	60.0	0.0%	80	87	0.9	0.7	0.8	0.7	0.8
CLRU20100	LRU20100	1.7	60.0	60.0	0.0%	80	87	1.7	0.7	0.7	0.7	0.7
CLRU20101	LRU20101	2.9	60.0	60.0	0.0%	80	87	2.3	1.2	1.3	1.2	1.3
CLRU20200	LRU20200	2.9	55.0	55.0	0.0%	80	87	0.5	1.1	1.2	1.1	1.2
CLRV21001	LRV21001	1.4	75.0	75.0	0.0%	80	87	2.3	0.6	0.6	0.6	0.6
CLRV21002	LRV21002	2.9	70.0	70.0	0.0%	80	87	3.1	1.3	1.4	1.3	1.4
CLRW22002	LRW22002	6.0	90.0	90.0	0.0%	80	87	3.0	2.8	3.0	2.8	3.0
CLRX22001	LRX22001	1.4	55.0	55.0	0.0%	80	87	3.3	0.6	0.6	0.6	0.6
CLRX22002	LRX22002	3.2	50.0	50.0	0.0%	80	87	1.0	1.2	1.3	1.2	1.3
CLRY23010	LRY23010	2.5	40.0	50.0	25.0%	80	87	10.3	0.9	1.0	0.9	1.0
Larson Creek - Middle Fork Appendix A, Maps # 9, 10 & 11												
CMLRA1000	MLRA1000	18.2	1.0	50.0	4900.0%	80	87	1.5	4.0	4.6	6.8	7.4
CMLRA1016	MLRA1016	466.9	2.0	17.0	750.0%	80	87	10.0	84.8	96.5	105.9	119.0
CMLRA1024	MLRA1024	964.7	5.0	5.0	0.0%	80	87	2.5	121.7	137.6	121.7	137.6
Larson Creek - Storm Drains Contributing to the Middle Fork Appendix A, Maps # 9, 10 & 11												

Table B-1. Sub-Basin Model Parameters and Results

Sub-Basin Name	Outlet Node	Sub-Basin Area (acres)	Impervious Area			Pervious Curve Number		Average Sub-Basin Slope (%)	Existing Sub-Basin Peak Flows (cfs)		Future Sub-Basin Peak Flows (cfs)	
			Existing Land Use (%)	Future Land Use (%)	Increase	Normal Conditions	Antecendent Conditions		10-yr, 24-hr	25-yr, 24-hr	10-yr, 24-hr	25-yr, 24-hr
CMLRB1002	MLRB1002	1.9	85.0	85.0	0.0%	80	87	0.7	0.9	1.0	0.9	1.0
CMLRB1101	MLRB1101	1.9	60.0	60.0	0.0%	80	87	0.2	0.7	0.8	0.7	0.8
CMLRB12001	MLRB12001	1.9	45.0	50.0	11.1%	80	87	2.6	0.7	0.8	0.7	0.8
CMLRB1304	MLRB1304	1.5	35.0	50.0	42.9%	80	87	2.5	0.5	0.6	0.6	0.6
CMLRB1401	MLRB1401	6.5	5.0	50.0	900.0%	80	87	5.0	1.8	2.0	2.5	2.7
CMLRB1601	MLRB1601	2.8	55.0	55.0	0.0%	80	87	3.3	1.1	1.2	1.1	1.2
CMLRB1700	MLRB1700	2.8	50.0	50.0	0.0%	80	87	2.7	1.1	1.2	1.1	1.2
CMLRB1702	MLRB1702	2.2	50.0	50.0	0.0%	80	87	2.8	0.9	0.9	0.9	0.9
CMLRB1703	MLRB1703	2.0	5.0	50.0	900.0%	80	87	3.1	0.6	0.6	0.8	0.8
CMLRB1800	MLRB1800	85.1	1.0	34.0	3300.0%	80	87	10.0	10.6	12.1	21.5	23.6
CMLRB1902	MLRB1902	4.8	50.0	50.0	0.0%	80	87	3.2	1.8	2.0	1.8	2.0
CMLRB2002	MLRB2002	2.0	50.0	50.0	0.0%	80	87	3.5	0.8	0.8	0.8	0.8
CMLRB2003	MLRB2003	1.1	50.0	50.0	0.0%	80	87	3.9	0.4	0.5	0.4	0.5
CMLRB2004	MLRB2004	4.5	5.0	50.0	900.0%	80	87	6.3	1.2	1.4	1.7	1.8
CMLRB2101	MLRB2101	2.0	25.0	50.0	100.0%	80	87	0.5	0.6	0.6	0.7	0.8
Larson Creek - South Fork Appendix A, Maps # 9, 10 & 11												
CSLRA0003	SLRA0003	125.1	5.0	32.0	540.0%	80	87	3.5	26.8	30.0	39.8	43.6
CSLRA0027	SLRA0027	2674.3	1.0	1.0	0.0%	79	86	6.0	275.6	310.5	275.6	310.5
Medford Irrigation Canal - Greystone Court stormdrains Appendix A, Maps # 1, 3 & 4												
CMIDF6001	MIDF6001	6.8	50.0	50.0	0.0%	80	87	2.4	2.6	2.8	2.6	2.8
CMIDF6300	MIDF6300	2.7	55.0	55.0	0.0%	80	87	2.8	1.1	1.1	1.1	1.1
CMIDF6503	MIDF6503	1.1	65.0	65.0	0.0%	80	87	13.2	0.5	0.5	0.5	0.5
CMIDF6505	MIDF6505	2.0	40.0	50.0	25.0%	80	87	9.2	0.8	0.9	0.8	0.9
CMIDF6600	MIDF6600	4.8	45.0	50.0	11.1%	80	87	3.2	1.8	1.9	1.9	2.0
CMIDF6602	MIDF6602	21.4	40.0	50.0	25.0%	80	87	10.0	7.7	8.3	8.2	8.8
CMIDF6702	MIDF6702	1.8	45.0	50.0	11.1%	80	87	2.5	0.7	0.8	0.8	0.8
CMIDF6800	MIDF6800	1.6	55.0	55.0	0.0%	80	87	2.8	0.7	0.7	0.7	0.7
CMIDF6900	MIDF6900	3.3	55.0	55.0	0.0%	80	87	2.9	1.4	1.5	1.4	1.5
CMIDF7004	MIDF7004	3.1	50.0	50.0	0.0%	80	87	3.1	1.3	1.4	1.3	1.4
CMIDF7200	MIDF7200	5.5	40.0	50.0	25.0%	80	87	9.3	2.2	2.4	2.3	2.5
CMIDF7401	MIDF7401	7.7	35.0	50.0	42.9%	80	87	16.0	3.0	3.2	3.3	3.5
CMIDF7604	MIDF7604	1.5	55.0	55.0	0.0%	80	87	3.0	0.6	0.7	0.6	0.7
CMIDF7700	MIDF7700	4.4	40.0	50.0	25.0%	80	87	6.9	1.8	1.9	1.9	2.0
CMIDF7800	MIDF7800	2.0	60.0	60.0	0.0%	80	87	10.6	0.9	0.9	0.9	0.9
CMIDF7802	MIDF7802	3.2	50.0	50.0	0.0%	80	87	14.0	1.4	1.5	1.4	1.5
CMIDF7803	MIDF7803	6.9	25.0	50.0	100.0%	80	87	16.0	2.5	2.7	2.9	3.1
CMIDF7903	MIDF7903	4.2	45.0	50.0	11.1%	80	87	6.0	1.7	1.9	1.8	1.9
CMIDF8001	MIDF8002	3.1	40.0	50.0	25.0%	80	87	10.1	1.3	1.4	1.3	1.4
CMIDF8100	MIDF8100	3.2	45.0	50.0	11.1%	80	87	21.1	1.3	1.4	1.4	1.5
CMIDF8201	MIDF8201	2.0	45.0	50.0	11.1%	80	87	20.0	0.8	0.9	0.9	0.9
CMIDF8300	MIDF8300	1.6	55.0	55.0	0.0%	80	87	18.2	0.7	0.8	0.7	0.8
CMIDF8301	MIDF8301	3.5	35.0	50.0	42.9%	80	87	22.8	1.4	1.5	1.5	1.6
CMIDF8303	MIDF8303	1.9	25.0	50.0	100.0%	80	87	27.1	0.7	0.8	0.8	0.9
Medford Irrigation Canal - Cherry Lane stormdrains Appendix A, Maps # 2 & 3												

Table B-1. Sub-Basin Model Parameters and Results

Sub-Basin Name	Outlet Node	Sub-Basin Area (acres)	Impervious Area			Pervious Curve Number		Average Sub-Basin Slope (%)	Existing Sub-Basin Peak Flows (cfs)		Future Sub-Basin Peak Flows (cfs)	
			Existing Land Use (%)	Future Land Use (%)	Increase	Normal Conditions	Antecendent Conditions		10-yr, 24-hr	25-yr, 24-hr	10-yr, 24-hr	25-yr, 24-hr
CMIDG7001	MIDG7001	3.1	55.0	55.0	0.0%	80	87	2.3	1.2	1.3	1.2	1.3
Medford Irrigation Canal - South Village Drive stormdrains Appendix A, Maps # 2 & 3												
CMIDH8001	MIDH8001	2.4	65.0	65.0	0.0%	80	87	3.0	1.0	1.1	1.0	1.1
CMIDH8004	MIDH8004	3.0	65.0	65.0	0.0%	80	87	2.4	1.3	1.4	1.3	1.4
CMIDi9005	MIDi9005	4.6	60.0	60.0	0.0%	80	87	2.4	1.9	2.0	1.9	2.0
Medford Irrigation Canal - Primary flow direction to the south from Greystone Court. Model ends at siphon. Appendix A, Maps # 2, 3, 4, 9 & 10												
CMIDA1002	MIDA1002	49.6	5.0	66.0	1220.0%	80	87	7.0	9.4	10.7	20.1	21.7
CMIDA2000	MIDA2000	2.1	25.0	50.0	100.0%	80	87	0.1	0.7	0.8	0.8	0.9
CMIDA2001	MIDA2001	2.5	25.0	50.0	100.0%	80	87	0.5	0.7	0.7	0.9	1.0
Medford Irrigation Canal - Sterling Point Court stormdrain Appendix A, Maps # 2 & 3												
CMIDF5001	MIDF5001	3.1	50.0	50.0	0.0%	80	87	2.4	1.2	1.3	1.2	1.3
Medford Irrigation Canal - Karges Way stormdrain Appendix A, Maps # 3 & 4												
CMIDE4101	MIDE4101	1.4	95.0	95.0	0.0%	80	87	2.9	0.7	0.7	0.7	0.7
CMIDE4102	MIDE4102	13.5	35.0	59.0	68.6%	80	87	7.0	5.3	5.7	6.0	6.4
CMIDE4200	MIDE4200	1.3	60.0	60.0	0.0%	80	87	2.9	0.5	0.6	0.5	0.6
CMIDE4300	MIDE4300	2.3	54.0	54.0	0.0%	80	87	2.4	0.9	1.0	0.9	1.0
CMIDE4501	MIDE4501	2.1	1.0	50.0	4900.0%	80	87	6.0	0.7	0.7	0.9	0.9
CMIDE4604	MIDE4604	21.1	5.0	52.0	940.0%	80	87	6.0	6.6	7.3	9.0	9.7
CMIDE4801	MIDE4801	2.6	45.0	50.0	11.1%	80	87	2.2	1.1	1.2	1.1	1.2
CMIDE5001	MIDE5001	2.1	30.0	50.0	66.7%	80	87	4.2	0.8	0.9	0.9	1.0
CMIDE5004	MIDE5004	2.6	5.0	50.0	900.0%	80	87	3.6	0.8	0.9	1.1	1.2
CMIDE5006	MIDE5006	5.0	35.0	50.0	42.9%	80	87	0.6	2.0	2.1	2.1	2.3
CMIDE5013	MIDE5013	3.7	5.0	50.0	900.0%	80	87	4.6	1.2	1.3	1.6	1.7
CMIDE5100	MIDE5100	1.6	55.0	55.0	0.0%	80	87	0.4	0.7	0.8	0.7	0.8
CMIDE5200	MIDE5200	0.9	55.0	55.0	0.0%	80	87	1.0	0.4	0.4	0.4	0.4
CMIDE5201	MIDE5201	1.7	55.0	55.0	0.0%	80	87	1.0	0.7	0.8	0.7	0.8
CMIDE5202	MIDE5202	0.8	60.0	60.0	0.0%	80	87	7.6	0.4	0.4	0.4	0.4
CMIDE5203	MIDE5203	1.4	60.0	60.0	0.0%	80	87	4.6	0.6	0.7	0.6	0.7
CMIDE5204	MIDE5204	1.0	55.0	55.0	0.0%	80	87	3.5	0.4	0.5	0.4	0.5
CMIDE5301	MIDE5301	2.3	55.0	55.0	0.0%	80	87	2.0	1.0	1.1	1.0	1.1
CMIDE5402	MIDE5402	3.2	60.0	60.0	0.0%	80	87	1.1	1.5	1.6	1.5	1.6
CMIDE5405	MIDE5405	2.7	70.0	70.0	0.0%	80	87	4.0	1.3	1.3	1.3	1.3
CMIDE5407	MIDE5407	1.3	70.0	70.0	0.0%	80	87	2.4	0.6	0.7	0.6	0.7
CMIDE5409	MIDE5409	1.8	70.0	70.0	0.0%	80	87	6.4	0.9	0.9	0.9	0.9
CMIDE5501	MIDE5501	2.5	70.0	70.0	0.0%	80	87	1.2	1.2	1.2	1.2	1.2
CMIDE5600	MIDE5600	2.6	50.0	50.0	0.0%	80	87	2.0	1.1	1.2	1.1	1.2
CMIDE5605	MIDE5605	4.6	50.0	50.0	0.0%	80	87	7.8	1.9	2.1	1.9	2.1
CMIDE5606	MIDE5606	1.5	5.0	50.0	900.0%	80	87	9.5	0.5	0.5	0.6	0.7
CMIDE5701	MIDE5701	1.2	70.0	70.0	0.0%	80	87	0.6	0.6	0.6	0.6	0.6
CMIDE5702	MIDE5702	2.0	50.0	50.0	0.0%	80	87	9.1	0.9	0.9	0.9	0.9
CMIDE5803	MIDE5803	2.1	60.0	60.0	0.0%	80	87	1.2	0.9	1.0	0.9	1.0
CMIDE5807	MIDE5807	3.3	25.0	50.0	100.0%	80	87	6.7	1.2	1.3	1.4	1.5

Table B-1. Sub-Basin Model Parameters and Results

Sub-Basin Name	Outlet Node	Sub-Basin Area (acres)	Impervious Area			Pervious Curve Number		Average Sub-Basin Slope (%)	Existing Sub-Basin Peak Flows (cfs)		Future Sub-Basin Peak Flows (cfs)	
			Existing Land Use (%)	Future Land Use (%)	Increase	Normal Conditions	Antecendent Conditions		10-yr, 24-hr	25-yr, 24-hr	10-yr, 24-hr	25-yr, 24-hr
CMIDE5902	MIDE5902	2.1	70.0	70.0	0.0%	80	87	8.9	1.0	1.0	1.0	1.0
CMIDE5903	MIDE5903	2.2	65.0	65.0	0.0%	80	87	8.6	1.0	1.1	1.0	1.1
CMIDE6001	MIDE6001	1.5	70.0	70.0	0.0%	80	87	9.3	0.7	0.8	0.7	0.8
CMIDE6004	MIDE6004	4.7	55.0	55.0	0.0%	80	87	11.5	2.1	2.2	2.1	2.2
Medford Irrigation Canal - Sharmrock Drive stormdrain Appendix A, Maps # 2 & 3												
CMIDD3004	MIDD3004	4.4	55.0	55.0	0.0%	80	87	5.2	1.7	1.9	1.7	1.9
Medford Irrigation Canal - Brannon Drive stormdrain Appendix A, Maps # 2 & 3												
CMIDC2001	MIDC2001	4.3	55.0	55.0	0.0%	80	87	0.7	1.7	1.8	1.7	1.8
Medford Irrigation Canal - Harbrooke Road stormdrain Appendix A, Map # 9												
CMIDB1102	MIDB1102	1.0	90.0	90.0	0.0%	80	87	3.0	0.5	0.5	0.5	0.5
CMIDB1202	MIDB1202	4.2	45.0	50.0	11.1%	80	87	3.3	1.6	1.7	1.6	1.7

Table B-2. Hydraulic Model Parameters and Results

Conduit			Conduit Attributes							Conduit Capacity (cfs)****	Peak flow values (cfs)				Invert elevation (ft)		Rim/Bank elevation (ft)		Maximum Hydraulic Grade Line (ft)							
											Existing		Future						Existing Conditions				Future Conditions			
																			10-yr, 24-hr		25-yr, 24-hr		10-yr, 24-hr		25-yr, 24-hr	
US node	DS node	Name	Type	Diameter (in)/ Width (ft)	Height (ft)	Left Channel Slope (H:V)	Right Channel Slope (H:V)	Conduit Length (ft)	Slope (%)		10-yr	25-yr	10-yr	25-yr	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
Larson Creek - Main Stem from Confluence to North Fork																										
Appendix A, Maps # 5, 6 & 7																										
Confluence with Bear Creek																										
LRA0003	LRA0001	CJ534.2917	IRREGULAR	See model for channel cross-section				534	0.8%	-	638.0	714.2	692.9	778.9	1,379.8	1,375.7	1,396.5	1,392.4	1,392.5	1,384.6	1,392.5	1,389.9	1,392.5	1,384.6	1,392.5	1,389.9
LRA0005	LRA0003	CJ927.6681	IRREGULAR	See model for channel cross-section				775	1.2%	-	637.3	713.9	692.2	781.8	1,388.8	1,379.8	1,398.6	1,396.5	1,393.5	1,392.5	1,393.8	1,392.5	1,393.7	1,392.5	1,394.0	1,392.5
LRA1000	LRA0005	CJ1780.987_2	IRREGULAR	See model for channel cross-section				233	1.0%	-	637.3	713.9	692.2	781.9	1,391.0	1,388.8	1,400.8	1,398.6	1,397.2	1,393.5	1,397.5	1,393.8	1,397.4	1,393.7	1,397.8	1,394.0
LRA1001	LRA1000	CJ1780.987_1	IRREGULAR	See model for channel cross-section				239	1.0%	-	636.3	713.2	691.1	780.7	1,393.4	1,391.0	1,402.1	1,400.8	1,399.5	1,397.2	1,399.9	1,397.5	1,399.8	1,397.4	1,400.2	1,397.8
LRA1002	LRA1001	CJ1830.383	IRREGULAR	See model for channel cross-section				49	3.6%	-	636.3	717.4	693.8	780.8	1,395.2	1,393.4	1,403.2	1,402.1	1,399.4	1,399.5	1,399.7	1,399.9	1,399.6	1,399.8	1,399.9	1,400.2
LRA1003	LRA1002	CJ1853.302	IRREGULAR	See model for channel cross-section				23	1.2%	-	635.0	712.7	689.8	778.9	1,395.4	1,395.2	1,403.4	1,403.2	1,399.7	1,399.4	1,400.0	1,399.7	1,399.9	1,399.6	1,400.2	1,399.9
LRA2000	LRA1003	CJ1883.542	IRREGULAR	See model for channel cross-section				55	0.7%	-	635.0	715.1	691.2	778.9	1,395.8	1,395.4	1,406.1	1,403.4	1,400.1	1,399.7	1,400.4	1,400.0	1,400.3	1,399.9	1,400.6	1,400.2
LRA2001	LRA2000	1081	BOX	12'	5'	-	-	42	3.1%	1,862.4	633.2	711.2	688.0	776.5	1,399.4	1,398.1	1,406.1	1,406.1	1,401.4	1,400.1	1,401.6	1,400.4	1,401.6	1,400.3	1,401.8	1,400.6
LRA2002	LRA2001	CJ1985.722	IRREGULAR	See model for channel cross-section				35	-3.5%	-	630.7	706.9	683.6	773.1	1,398.2	1,399.4	1,408.2	1,406.1	1,404.9	1,401.4	1,405.2	1,401.6	1,405.1	1,401.6	1,403.9	1,401.8
LRA2003	LRA2002	CJ2355.478	IRREGULAR	See model for channel cross-section				370	1.5%	-	630.8	706.6	683.2	773.5	1,403.7	1,398.2	1,415.7	1,408.2	1,408.5	1,404.9	1,408.6	1,405.2	1,408.5	1,405.1	1,408.7	1,403.9
LRA2004	LRA2003	CJ2783.417	IRREGULAR	See model for channel cross-section				428	0.8%	-	630.8	706.6	683.3	773.8	1,407.1	1,403.7	1,419.1	1,415.7	1,412.5	1,408.5	1,413.1	1,408.6	1,412.7	1,408.5	1,413.3	1,408.7
LRA2011	LRA2004	CJ2984.5	IRREGULAR	See model for channel cross-section				278	1.3%	-	631.0	718.3	683.6	775.2	1,410.6	1,407.1	1,418.2	1,419.1	1,417.2	1,412.5	1,417.2	1,413.1	1,417.2	1,412.7	1,417.2	1,413.3
LRA3000	LRA2011	CJ3196.488	IRREGULAR	See model for channel cross-section				135	2.2%	-	630.8	713.1	683.4	774.1	1,413.6	1,410.6	1,424.3	1,418.2	1,419.6	1,417.2	1,419.8	1,417.2	1,419.7	1,417.2	1,419.9	1,417.2
LRA3001	LRA3000	CJ3440.758	IRREGULAR	See model for channel cross-section				244	1.1%	-	622.3	702.4	670.8	762.5	1,416.2	1,413.6	1,420.8	1,424.3	1,421.0	1,419.6	1,421.1	1,419.8	1,421.1	1,419.7	1,421.1	1,419.9
LRA4000	LRA3001	CJ3726.875_2	IRREGULAR	See model for channel cross-section				145	0.2%	-	622.3	702.4	670.8	762.5	1,416.5	1,416.2	1,421.8	1,420.8	1,422.4	1,421.0	1,422.6	1,421.1	1,422.6	1,421.1	1,422.8	1,421.1
LRA4001	LRA4000	CJ3726.875_1	IRREGULAR	See model for channel cross-section				141	0.2%	-	613.7	691.2	658.9	750.6	1,416.8	1,416.5	1,422.8	1,421.8	1,423.3	1,422.4	1,423.4	1,422.6	1,423.4	1,422.6	1,423.6	1,422.8
LRA4002	LRA4001	CJ4074.13	IRREGULAR	See model for channel cross-section				347	1.2%	-	613.7	691.3	658.9	751.0	1,421.0	1,416.8	1,426.7	1,422.8	1,425.8	1,423.3	1,426.1	1,423.4	1,426.0	1,423.4	1,426.2	1,423.6
LRA4003	LRA4002	CJ4446.421	IRREGULAR	See model for channel cross-section				372	1.3%	-	613.8	691.4	658.9	751.1	1,425.9	1,421.0	1,432.4	1,426.7	1,430.9	1,425.8	1,431.2	1,426.1	1,431.0	1,426.0	1,431.3	1,426.2
LRA4004	LRA4003	CJ4829.951	IRREGULAR	See model for channel cross-section				384	1.5%	-	613.9	691.5	659.0	751.5	1,431.5	1,425.9	1,440.8	1,432.4	1,436.1	1,430.9	1,436.3	1,431.2	1,436.2	1,431.0	1,436.5	1,431.3
LRA5000	LRA4004	CJ5110.067	IRREGULAR	See model for channel cross-section				280	1.3%	-	614.0	691.7	659.2	752.1	1,435.1	1,431.5	1,445.5	1,440.8	1,439.2	1,436.1	1,439.5	1,436.3	1,439.4	1,436.2	1,439.6	1,436.5
LRA5001	LRA5000	CJ5428.555	IRREGULAR	See model for channel cross-section				318	1.4%	-	612.3	689.6	656.9	750.4	1,439.6	1,435.1	1,445.8	1,445.5	1,444.5	1,439.2	1,444.8	1,439.5	1,444.7	1,439.4	1,445.0	1,439.6
LRA6000	LRA5001	CJ5469.564	IRREGULAR	See model for channel cross-section				36	1.9%	-	612.3	689.6	656.9	752.0	1,440.3	1,439.6	1,445.9	1,445.8	1,445.2	1,444.5	1,445.5	1,444.8	1,445.4	1,444.7	1,445.7	1,445.0
LRA6001	LRA6000	1085	BOX**	12.5'	4'	-	-	53	0.1%	341.8	608.4	684.4	651.6	746.5	1,442.1	1,442.1	1,445.9	1,445.9	1,445.3	1,445.2	1,445.6	1,445.5	1,445.5	1,445.4	1,445.8	1,445.7
LRA6002	LRA6001	CJ5560.718	IRREGULAR	See model for channel cross-section				43	2.3%	-	608.4	684.4	651.6	746.5	1,442.3	1,441.3	1,450.3	1,445.9	1,446.1	1,445.3	1,445.9	1,445.6	1,446.2	1,445.5	1,446.5	1,445.8
LRA7000	LRA6002	CJ5923.67	IRREGULAR	See model for channel cross-section				348	1.0%	-	608.5	684.4	651.6	747.1	1,445.7	1,442.3	1,454.0	1,450.3	1,449.6	1,446.1	1,449.8	1,445.9	1,449.7	1,446.2	1,449.9	1,446.5
LRA7001	LRA7000	CJ6295.875	IRREGULAR	See model for channel cross-section				387	0.8%	-	608.2	684.1	651.1	747.9	1,448.6	1,445.7	1,459.4	1,454.0	1,452.2	1,449.6	1,452.4	1,449.8	1,452.3	1,449.7	1,452.5	1,449.9
LRA8000	LRA7001	CJ6767.599_1	IRREGULAR	See model for channel cross-section				245	1.6%	-	608.6	684.5	651.1	749.1	1,452.5	1,448.6	1,462.5	1,459.4	1,455.6	1,452.2	1,455.7	1,452.4	1,455.7	1,452.3	1,455.8	1,452.5
LRA9000	LRA8000	CJ6767.599_2	IRREGULAR	See model for channel cross-section				96	1.6%	-	607.3	675.2	641.5	740.5	1,454.1	1,452.5	1,463.8	1,462.5	1,457.1	1,455.6	1,457.3	1,455.7	1,457.2	1,455.7	1,457.4	1,455.8
LRA9001	LRA9000	CJ6767.599_3	IRREGULAR	See model for channel cross-section				131	1.6%	-	570.5	640.1	600.9	693.6	1,456.1	1,454.1	1,465.4	1,463.8	1,459.2	1,457.1	1,459.3	1,457.3	1,459.2	1,457.2	1,459.4	1,457.4
LRA9002	LRA9001	CJ7147.444	IRREGULAR	See model for channel cross-section				380	1.2%	-	572.2	643.8	600.9	702.9	1,460.5	1,456.1	1,471.2	1,465.4	1,463.3	1,459.2	1,463.4	1,459.3	1,463.4	1,459.2	1,463.5	1,459.4
LRA10000	LRA9002	CJ7388.013	IRREGULAR	See model for channel cross-section				241	1.9%	-	574.2	651.6	599.0	728.8	1,465.2	1,460.5	1,473.5	1,471.2	1,467.6	1,463.3	1,467.8	1,463.4	1,467.6	1,463.4	1,468.0	1,463.5
LRA10001	LRA10000	CJ7402.879	IRREGULAR	See model for channel cross-section				15	3.6%	-	580.8	653.4	598.4	735.1	1,465.7	1,465.2	1,472.5	1,473.5	1,468.0	1,467.6	1,468.2	1,467.8	1,468.0	1,467.6	1,468.3	1,468.0
LRA10002	LRA10001	MurphyRdBox	BOX	16'	5'	-	-	55	1.5%	441.2	578.0	651.5	598.4	735.1	1,466.5	1,465.7	1,472.5	1,472.5	1,470.2	1,468.0	1,470.4	1,468.2	1,470.2	1,468.0	1,470.7	1,468.3
LRA10003	LRA10002	CJ7480.538	IRREGULAR	See model for channel cross-section				23	1.3%	-	575.0	650.6	598.1	731.9	1,468.1	1,467.8	1,473.6	1,472.5	1,471.0	1,470.2	1,471.2	1,470.4	1,471.0	1,470.2	1,471.4	1,470.7
LRA10004	LRA10003	CJ7667.681	IRREGULAR	See model for channel cross-section				187	0.6%	-	581.6	653.7	598.2	733.3	1,469.2	1,468.1	1,477.3	1,473.6	1,473.8	1,471.0	1,474.1	1,471.2	1,473.9	1,471.0	1,474.3	1,471.4
LRA10005	LRA10004	CJ7703.858	IRREGULAR	See model for channel cross-section				41	3.1%	-	603.4	663.7	608.2	758.5	1,470.4	1,469.2	1,477.2	1,477.3	1,474.3	1,473.8	1,474.5	1,474.1	1,474.3	1,473.9	1,474.8	1,474.3
LRA10006	LRA10005	1003	BOX	12'	5'	-	-	46	0.2%	467.7	622.0	701.7	652.2	867.0	1,470.5	1,470.4	1,478.6	1,477.2	1,474.9	1,474.3	1,475.3	1,474.5	1,475.1	1,474.3	1,476.0	1,474.8
LRA10007	LRA10006	CJ7801.337	IRREGULAR	See model for channel cross-section				47	0.4%	-	578.9	654.8	598.5	747.6	1,470.7	1,470.5	1,480.6	1,478.6	1,475.2	1,474.9	1,475.5	1,475.3	1,475.3	1,475.1	1,475.9	1,476.0
LRA10008	LRA10007	CJ7971.428	IRREGULAR	See model for channel cross-section				170	1.1%	-	566.9	646.6	597.1	692.8	1,472.6	1,470.7	1,482.4	1,480.6	1,476.7	1,475.2	1,477.0	1,475.5	1,476.8	1,475.3	1,477.2	1,475.9
LRA10009	LRA10008	CJ8003.284	IRREGULAR	See model for channel cross-section				36	0.4%	-	566.6	675.3	597.1	709.0	1,472.7	1,472.6	1,481.9	1,482.4	1,476.9	1,476.7	1,477.4	1,477.0	1,477.0	1,476.8	1,477.5	1,477.2
LRA10010	LRA10009	1094	BOX**	6'	5'	-	-	49	0.1%	271.0	566.5	652.7	597.1	698.5	1,472.8	1,472.7	1,484.8	1,481.9	1,477.2	1,476.9	1,477.6	1,477.4	1,477.2	1,477.0	1,477.8	1,477.5
LRA10011	LRA10010	CJ8079.411	IRREGULAR	See model for channel cross-section				23	6.3%	-	566.0	641.6	596.6	686.4	1,474.2	1,472.8	1,484.8	1,484.8	1,477.3	1,477.2	1,477.6	1,477.6	1,477.4	1,477.2	1,477.7	1,477.8
LRA11000	LRA10011	C1	IRREGULAR	See model for channel cross-section				133	0.6%	-	566.0	634.1	596.6	678.9	1,475.0	1,474.2	1,488.4	1,484.8	1,478.5	1,477.3	1,478.7	1,477.6	1,478.6	1,477.4	1,478.9	1,477.7
Stormdrains Contributing to Larson Creek from Confluence to North Fork																										
Appendix A, Maps # 2, 5, 6, 7, 8, 9 & 12																										
LRB1001	LRA1000	1036	CIRCULAR	36"	-	-	-	206	0.0%	14.8	3.0	3.2	3.0	3.2	1,396.1	1,396.0	1,401.4	1,400.8	1,397.2	1,397.2	1,397.5	1,397.5	1,397.4	1,397.4	1,397.8	1,397.8
LRB1002	LRB1001	11328	CIRCULAR	24"	-	-	-	250	0.8%	19.7	3.0	3.2	3.0	3.2	1,398.0	1,396.1	1,401.9	1,401.4	1,398.6	1,397.2	1,398.6	1,397.5	1,398.6	1,397.4	1,398.6	1,397.8

Table B-2. Hydraulic Model Parameters and Results

Conduit			Conduit Attributes							Conduit Capacity (cfs)****	Peak flow values (cfs)				Invert elevation (ft)		Rim/Bank elevation (ft)		Maximum Hydraulic Grade Line (ft)							
											Existing		Future						Existing Conditions				Future Conditions			
																			10-yr, 24-hr		25-yr, 24-hr		10-yr, 24-hr		25-yr, 24-hr	
US node	DS node	Name	Type	Diameter (in)/ Width (ft)	Height (ft)	Left Channel Slope (H:V)	Right Channel Slope (H:V)	Conduit Length (ft)	Slope (%)		10-yr	25-yr	10-yr	25-yr	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
LRB1003	LRB1002	10159	CIRCULAR	15"	-	-	-	15	0.6%	5.1	3.0	3.2	3.0	3.2	1,398.3	1,398.2	1,401.4	1,401.9	1,399.0	1,398.6	1,399.0	1,398.6	1,399.0	1,398.6	1,399.0	1,398.6
LRB1004	LRB1003	10484	CIRCULAR	15"	-	-	-	38	1.0%	6.3	3.0	3.2	3.0	3.2	1,398.7	1,398.3	1,402.4	1,401.4	1,399.3	1,399.0	1,399.3	1,399.0	1,399.3	1,399.0	1,399.3	1,399.0
LRB1005	LRB1004	11172	CIRCULAR	15"	-	-	-	131	1.8%	8.7	3.0	3.2	3.0	3.2	1,401.0	1,398.7	1,403.4	1,402.4	1,401.5	1,399.3	1,401.5	1,399.3	1,401.5	1,399.3	1,401.5	1,399.3
LRC2001	LRA2000	1070	CIRCULAR	12"	-	-	-	105	0.5%	2.7	5.0	5.4	5.3	5.7	1,400.8	1,400.3	1,404.4	1,406.1	1,404.4	1,400.1	1,403.4	1,400.4	1,404.4	1,400.3	1,404.3	1,400.6
LRC2002	LRC2001	11329	CIRCULAR	12"	-	-	-	197	3.5%	6.9	5.0	5.4	5.3	5.7	1,407.7	1,400.8	1,410.7	1,404.4	1,408.3	1,404.4	1,408.4	1,403.4	1,408.3	1,404.4	1,408.4	1,404.3
LRC2003	LRC2002	10328	CIRCULAR	12"	-	-	-	275	5.2%	8.5	5.0	5.4	5.3	5.7	1,421.8	1,407.7	1,425.3	1,410.7	1,422.4	1,408.3	1,422.4	1,408.4	1,422.4	1,408.3	1,422.4	1,408.4
LRC2004	LRC2003	11334	CIRCULAR	12"	-	-	-	157	1.4%	4.4	5.0	5.4	5.3	5.7	1,425.0	1,422.8	1,429.5	1,425.3	1,427.8	1,422.4	1,428.5	1,422.4	1,428.3	1,422.4	1,429.5	1,422.4
LRD3001	LRA3000	1025	CIRCULAR	15"	-	-	-	21	4.8%	14.2	6.8	7.1	6.8	7.1	1,417.0	1,416.0	1,421.1	1,424.3	1,419.7	1,419.6	1,419.9	1,419.8	1,419.9	1,419.7	1,420.1	1,419.9
LRD3002	LRD3001	10157	CIRCULAR	12"	-	-	-	254	2.2%	5.3	6.8	7.1	6.8	7.1	1,422.7	1,417.0	1,427.7	1,421.1	1,427.7	1,419.7	1,428.2	1,419.9	1,428.3	1,419.9	1,428.7	1,420.1
LRD3003	LRD3002	10158	CIRCULAR	15"	-	-	-	128	6.4%	8.8	6.8	7.0	6.9	7.0	1,432.0	1,423.9	1,435.0	1,427.7	1,432.9	1,427.7	1,433.0	1,428.2	1,433.0	1,428.3	1,433.0	1,428.7
LRD3004	LRD3003	10326	CIRCULAR	12"	-	-	-	168	3.3%	3.5	4.1	4.2	4.2	4.2	1,437.5	1,432.0	1,440.0	1,435.0	1,440.2	1,432.9	1,440.2	1,433.0	1,440.2	1,433.0	1,440.2	1,433.0
LRD3005	LRD3004	10165	CIRCULAR	12"	-	-	-	149	5.0%	4.3	5.4	5.8	5.6	5.9	1,445.0	1,437.5	1,447.7	1,440.0	1,451.8	1,440.2	1,453.5	1,440.2	1,452.6	1,440.2	1,454.1	1,440.2
LRD3006	LRD3005	10166	CIRCULAR	12"	-	-	-	85	4.1%	7.3	5.5	5.8	5.6	5.9	1,448.5	1,445.0	1,451.3	1,447.7	1,453.8	1,451.8	1,455.7	1,453.5	1,454.7	1,452.6	1,456.4	1,454.1
LRD3007	LRD3006	11176	CIRCULAR	12"	-	-	-	148	5.1%	8.0	5.5	5.9	5.7	6.0	1,456.0	1,448.5	1,458.8	1,451.3	1,456.9	1,453.8	1,459.7	1,455.7	1,458.8	1,454.7	1,460.6	1,456.4
LRD3008	LRD3007	10663	CIRCULAR	12"	-	-	-	90	6.1%	8.8	5.6	6.0	5.7	6.2	1,461.5	1,456.0	1,463.2	1,458.8	1,462.1	1,456.9	1,462.3	1,459.7	1,462.1	1,458.8	1,463.2	1,460.6
LRD3009	LRD3008	10334	CIRCULAR	12"	-	-	-	78	3.9%	7.0	5.6	6.0	5.7	6.3	1,464.5	1,461.5	1,467.2	1,463.2	1,465.2	1,462.1	1,465.2	1,462.3	1,465.2	1,462.1	1,465.3	1,463.2
LRD3010	LRD3009	1084	CIRCULAR	12"	-	-	-	108	8.9%	10.7	5.6	6.0	5.7	6.2	1,474.0	1,464.5	1,476.1	1,467.2	1,474.5	1,465.2	1,474.5	1,465.2	1,474.5	1,465.2	1,474.6	1,465.3
LRE4001	LRA4000	6_SunOaks	TRAPEZOIDAL	4'	2'	1	1	659	2.7%	82.4	8.2	8.9	8.8	9.5	1,435.5	1,418.0	1,437.5	1,421.8	1,436.0	1,422.4	1,436.1	1,422.6	1,436.1	1,422.6	1,436.1	1,422.8
LRE4002	LRE4001	C1_SunOaks	CATENARY	24"	-	-	-	70	0.6%	4.7	8.2	8.9	8.8	9.5	1,435.9	1,435.5	1,438.9	1,437.5	1,438.2	1,436.0	1,438.5	1,436.1	1,438.4	1,436.1	1,438.7	1,436.1
LRE4003	LRE4002	C2_SunOaks	TRAPEZOIDAL	4'	3'	0.67	0.67	330	1.1%	92.7	8.3	9.0	8.9	9.6	1,439.4	1,435.9	1,442.4	1,438.9	1,440.1	1,438.2	1,440.1	1,438.5	1,440.1	1,438.4	1,440.2	1,438.7
LRE4004	LRE4003	Culvert_Centennial	CATENARY	24"	-	-	-	34	2.7%	10.3	6.3	6.8	6.8	7.3	1,440.3	1,439.4	1,443.3	1,442.4	1,441.3	1,440.1	1,441.4	1,440.1	1,441.4	1,440.1	1,441.4	1,440.2
LRE4005	LRE4004	C4_SunOaks	TRAPEZOIDAL	2'	2.5'	0.8	0.8	239	1.5%	52.5	6.3	6.8	6.8	7.3	1,444.0	1,440.3	1,446.5	1,443.3	1,444.8	1,441.3	1,444.8	1,441.4	1,444.8	1,441.4	1,444.8	1,441.4
LRE4006	LRE4005	C5_SunOaks	CATENARY	25.2"	-	-	-	70	0.4%	4.3	3.6	3.9	4.0	4.3	1,444.2	1,444.0	1,446.7	1,446.5	1,445.4	1,444.8	1,445.5	1,444.8	1,445.5	1,444.8	1,445.6	1,444.8
LRE4007	LRE4006	C63911	TRAPEZOIDAL	2'	2.3'	1	1	60	6.1%	90.0	3.6	3.9	4.0	4.3	1,447.8	1,444.2	1,451.3	1,446.7	1,448.2	1,445.4	1,448.2	1,445.5	1,448.2	1,445.5	1,448.3	1,445.6
LRE4008	LRE4007	1073	CIRCULAR	36"	-	-	-	72	0.3%	23.2	2.8	3.0	2.9	3.1	1,448.0	1,447.8	1,451.2	1,451.3	1,448.8	1,448.2	1,448.8	1,448.2	1,448.8	1,448.2	1,448.8	1,448.3
LRF5002	LRA5000	11169	CIRCULAR	30"	-	-	-	322	0.5%	29.9	4.5	4.8	4.5	4.7	1,437.1	1,435.4	1,445.2	1,445.5	1,439.4	1,439.2	1,439.6	1,439.5	1,439.6	1,439.4	1,439.9	1,439.6
LRF5003	LRF5002	11324	CIRCULAR	36"	-	-	-	71	0.9%	66.1	5.3	5.9	7.9	8.5	1,437.8	1,437.1	1,446.7	1,445.2	1,439.3	1,439.4	1,439.5	1,439.6	1,439.5	1,439.6	1,439.8	1,439.9
LRF5005	LRF5003	11326	CIRCULAR	18"	-	-	-	414	1.8%	14.1	3.4	3.6	3.4	3.6	1,446.0	1,438.8	1,453.7	1,446.7	1,446.5	1,439.3	1,446.5	1,439.5	1,446.5	1,439.5	1,446.5	1,439.8
LRG6001	LRA6000	10835	CIRCULAR	12"	-	-	-	196	0.4%	2.4	3.4	3.6	3.3	3.5	1,443.2	1,442.3	1,447.0	1,445.9	1,446.2	1,445.2	1,446.7	1,445.5	1,446.7	1,445.4	1,447.1	1,445.7
LRG6002	LRG6001	10995	CIRCULAR	12"	-	-	-	34	1.1%	3.7	3.4	3.6	3.3	3.6	1,443.6	1,443.2	1,447.1	1,447.0	1,446.5	1,446.2	1,447.0	1,446.7	1,447.0	1,446.7	1,447.5	1,447.1
LRG6003	LRG6002	10653	CIRCULAR	12"	-	-	-	128	1.1%	3.7	3.4	3.6	3.3	3.6	1,444.9	1,443.6	1,447.6	1,447.1	1,447.6	1,446.5	1,448.3	1,447.0	1,448.0	1,447.0	1,448.7	1,447.5
LRH6001	LRA6000	10996	CIRCULAR	18"	-	-	-	635	1.3%	11.8	7.2	7.7	7.3	7.8	1,448.9	1,440.8	1,456.3	1,445.9	1,449.7	1,445.2	1,449.8	1,445.5	1,449.8	1,445.4	1,449.8	1,445.7
LRH6002	LRH6001	10836	CIRCULAR	18"	-	-	-	277	5.5%	24.8	7.2	7.7	7.3	7.8	1,464.3	1,449.0	1,470.0	1,456.3	1,464.8	1,449.7	1,464.9	1,449.8	1,464.9	1,449.8	1,464.9	1,449.8
LRH6100	LRH6002	10838	CIRCULAR	18"	-	-	-	473	8.8%	30.5	6.1	6.6	6.1	6.6	1,505.8	1,464.3	1,512.3	1,470.0	1,506.3	1,464.8	1,506.3	1,464.9	1,506.3	1,464.9	1,506.3	1,464.9
LRH6200	LRH6100	10149	CIRCULAR	15"	-	-	-	435	7.1%	17.1	2.1	2.2	2.1	2.2	1,536.7	1,505.8	1,543.5	1,512.3	1,536.9	1,506.3	1,537.0	1,506.3	1,536.9	1,506.3	1,537.0	1,506.3
LRH6201	LRH6200	11168	CIRCULAR	15"	-	-	-	151	3.3%	12.1	2.1	2.2	2.1	2.2	1,541.7	1,536.7	1,555.8	1,543.5	1,542.0	1,536.9	1,542.0	1,537.0	1,542.0	1,536.9	1,542.0	1,537.0
LRH6202	LRH6201	10148	CIRCULAR	18"	-	-	-	72	1.0%	10.3	2.1	2.2	2.1	2.2	1,542.4	1,541.7	1,549.9	1,555.8	1,542.8	1,542.0	1,542.8	1,542.0	1,542.8	1,542.0	1,542.8	1,542.0
LRH6203	LRH6202	10665	CIRCULAR	12"	-	-	-	52	3.0%	6.2	2.1	2.2	2.1	2.2	1,543.9	1,542.4	1,550.8	1,549.9	1,544.3	1,542.8	1,544.4	1,542.8	1,544.3	1,542.8	1,544.4	1,542.8
LRH6101	LRH6100	10837	CIRCULAR	12"	-	-	-	89	9.3%	10.9	4.1	4.4	4.1	4.4	1,516.3	1,508.0	1,519.7	1,512.3	1,516.7	1,506.3	1,516.7	1,506.3	1,516.7	1,506.3	1,516.7	1,506.3
LRH6102	LRH6101	10829	CIRCULAR	12"	-	-	-	198	5.7%	8.4	4.1	4.4	4.1	4.4	1,527.5	1,516.3	1,531.0	1,519.7	1,528.0	1,516.7	1,528.0	1,516.7	1,528.0	1,516.7	1,528.0	1,516.7
LRH6103	LRH6102	10144	CIRCULAR	12"	-	-	-	110	14.2%	13.3	1.3	1.4	1.3	1.4	1,543.0	1,527.5	1,546.9	1,531.0	1,543.2	1,528.0	1,543.2	1,528.0	1,543.2	1,528.0	1,543.2	1,528.0
LRI7001	LRA7000	10998	CIRCULAR	12"	-	-	-	83	1.1%	3.7	1.0	1.1	1.0	1.1	1,449.5	1,448.6	1,452.1	1,454.0	1,449.9	1,449.6	1,449.9	1,449.8	1,449.9	1,449.7	1,449.9	1,449.9
LRJ8100	LRA8000	10822	CIRCULAR	42"	-	-	-	343	0.3%	52.0	18.2	19.4	19.0	20.2	1,455.3	1,454.4	1,461.5	1,462.5	1,456.7	1,455.6	1,456.7	1,455.7	1,456.7	1,455.7	1,456.8	1,455.8
LRJ8200	LRJ8100	11306	CIRCULAR	42"	-	-	-	205	0.3%	52.3	13.6	14.5	14.4	15.3	1,455.9	1,455.4	1,462.7	1,461.5	1,457.2	1,456.7	1,457.2	1,456.7	1,457.2	1,456.7	1,457.2	1,456.8
LRJ8300	LRJ8200	C66317	CIRCULAR	17.76"	-	-	-	246	3.3%	18.3	4.9	5.2	5.5	5.8	1,464.1	1,456.0	1,469.2	1,462.7	1,464.6	1,457.2	1,464.6	1,457.2	1,464.7	1,457.2	1,464.7	1,457.2
LRJ8301	LRJ8300	C66388	CIRCULAR	18"	-	-	-	193	1.4%	12.4	4.9	5.2	5.5	5.8	1,466.8	1,464.1	1,470.2	1,469.2	1,467.5	1,464.6	1,467.5	1,464.6	1,467.5	1,464.7	1,467.6	1,464.7
LRJ8302	LRJ8301	C66389	CIRCULAR	12"	-	-	-	294	0.6%	2.7	4.9	5.2	5.5	5.8	1,468.5	1,466.8	1,472.3	1,470.2	1,473.8	1,467.5	1,474.5	1,467.5	1,475.2	1,467.5	1,476.0	1,467.6
LRJ8303	LRJ8302	C66390	CIRCULAR	12"	-	-	-	285	1.7%	4.6	3.1	3.3	3.4	3.6	1,473.3	1,468.5	1,476.7	1,472.3	1,475.9	1,473.8	1,476.9	1,474.5	1,477.7	1,475.2	1,478.8	1,476.0
LRJ8304	LRJ8303	C66313	CIRCULAR	12"	-	-	-	123	1.7%	4.7	3.1	3.8	3.8	3.9	1,476.4	1,474.3	1,478.1	1,476.7	1,477.0	1,475.9	1,478.1	1,476.9	1,478.8	1,477.7	1,480.0	1,478.8
LRJ8305	LRJ8304	11083	CIRCULAR	12"	-	-	-	433	2.0%	5.0	3.1	3.3	3.5	3.7	1,485.0	1,476.4	1,487.9	1,478.1	1,485.6	1,477.0	1,485.6	1,478.1	1,485.6	1,478.8	1,485.7	1,480.0

Table B-2. Hydraulic Model Parameters and Results

Conduit			Conduit Attributes							Conduit Capacity (cfs)****	Peak flow values (cfs)				Invert elevation (ft)		Rim/Bank elevation (ft)		Maximum Hydraulic Grade Line (ft)							
											Existing		Future						Existing Conditions				Future Conditions			
																			10-yr, 24-hr		25-yr, 24-hr		10-yr, 24-hr		25-yr, 24-hr	
US node	DS node	Name	Type	Diameter (in)/ Width (ft)	Height (ft)	Left Channel Slope (H:V)	Right Channel Slope (H:V)	Conduit Length (ft)	Slope (%)		10-yr	25-yr	10-yr	25-yr	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
LRJ8101	LRJ8100	10305	CIRCULAR	12"	-	-	-	175	0.7%	3.0	1.5	1.6	1.5	1.6	1,461.0	1,459.8	1,464.2	1,461.5	1,461.5	1,456.7	1,461.5	1,456.7	1,461.5	1,456.7	1,461.5	1,456.8
LRJ8201	LRJ8200	11307	CIRCULAR	24"	-	-	-	410	1.1%	23.7	6.9	7.4	6.9	7.4	1,462.5	1,458.0	1,466.9	1,462.7	1,463.2	1,457.2	1,463.3	1,457.2	1,463.2	1,457.2	1,463.3	1,457.2
LRJ8202	LRJ8201	11155	CIRCULAR	24"	-	-	-	35	0.7%	19.1	6.9	7.4	6.9	7.4	1,462.8	1,462.5	1,466.5	1,466.9	1,463.6	1,463.2	1,463.6	1,463.3	1,463.6	1,463.2	1,463.6	1,463.3
LRJ8203	LRJ8202	10758	CIRCULAR	24"	-	-	-	377	0.7%	18.9	4.5	4.9	4.5	4.9	1,465.4	1,462.8	1,472.0	1,466.5	1,466.1	1,463.6	1,466.1	1,463.6	1,466.1	1,463.6	1,466.1	1,463.6
LRJ8204	LRJ8203	11082	CIRCULAR	24"	-	-	-	98	0.3%	12.2	4.5	4.9	4.5	4.9	1,465.9	1,465.6	1,472.2	1,472.0	1,466.7	1,466.1	1,466.7	1,466.1	1,466.7	1,466.1	1,466.7	1,466.1
LRJ8205	LRJ8204	10397	CIRCULAR	36"	-	-	-	43	0.5%	45.3	4.5	4.9	4.5	4.9	1,466.1	1,465.9	1,472.7	1,472.2	1,466.8	1,466.7	1,466.8	1,466.7	1,466.8	1,466.7	1,466.8	1,466.7
LRK9001	LRA9000	10641	CIRCULAR	36"	-	-	-	42	1.4%	79.6	79.6	87.4	81.4	88.7	1,454.8	1,454.2	1,465.0	1,463.8	1,458.1	1,457.1	1,461.8	1,457.3	1,460.5	1,457.2	1,461.4	1,457.4
LRK9002	LRK9001	11309	CIRCULAR	36"	-	-	-	234	0.4%	42.5	79.5	87.4	81.4	88.7	1,455.8	1,454.8	1,463.3	1,465.0	1,460.8	1,458.1	1,461.6	1,461.8	1,461.0	1,460.5	1,462.1	1,461.4
LRK9003	LRK9002	11151	CIRCULAR	48"	-	-	-	252	0.8%	129.7	76.5	84.2	78.4	85.6	1,457.8	1,455.8	1,464.3	1,463.3	1,461.3	1,460.8	1,462.4	1,461.6	1,461.7	1,461.0	1,463.0	1,462.1
LRK9004	LRK9003	10825	CIRCULAR	48"	-	-	-	268	0.5%	101.7	75.3	82.6	77.1	84.1	1,459.1	1,457.8	1,465.0	1,464.3	1,461.9	1,461.3	1,463.3	1,462.4	1,462.1	1,461.7	1,463.8	1,463.0
LRK9100	LRK9004	10306	CIRCULAR	42"	-	-	-	248	1.0%	100.6	73.4	80.5	75.2	82.0	1,461.6	1,459.1	1,469.7	1,465.0	1,463.9	1,461.9	1,464.5	1,463.3	1,464.0	1,462.1	1,465.5	1,463.8
LRK9300	LRK9100	10640	CIRCULAR	36"	-	-	-	165	0.7%	57.3	37.2	42.1	38.3	43.1	1,463.0	1,461.8	1,469.5	1,469.7	1,464.9	1,463.9	1,465.1	1,464.5	1,464.9	1,464.0	1,466.2	1,465.5
LRK9301	LRK9300	11310	CIRCULAR	36"	-	-	-	113	0.4%	44.5	37.9	42.2	38.9	43.3	1,463.5	1,463.0	1,470.6	1,469.5	1,465.5	1,464.9	1,465.7	1,465.1	1,465.6	1,464.9	1,466.6	1,466.2
LRK9302	LRK9301	11154	CIRCULAR	30"	-	-	-	458	1.3%	47.8	26.3	30.3	26.4	30.8	1,470.4	1,464.3	1,474.4	1,470.6	1,471.7	1,465.5	1,471.9	1,465.7	1,471.7	1,465.6	1,471.9	1,466.6
LRK9303	LRK9302	10600	CIRCULAR	24"	-	-	-	335	0.8%	20.1	24.9	28.8	26.4	29.3	1,473.3	1,470.7	1,477.7	1,474.4	1,477.7	1,471.7	1,477.8	1,471.9	1,477.7	1,471.7	1,477.9	1,471.9
LRK9304	LRK9303	11122	CIRCULAR	24"	-	-	-	318	1.2%	25.3	23.3	26.8	24.7	27.5	1,477.3	1,473.3	1,482.7	1,477.7	1,479.7	1,477.7	1,482.7	1,477.8	1,482.7	1,477.7	1,482.7	1,477.9
LRK15000	LRK9304	10951	CIRCULAR	24"	-	-	-	160	0.8%	20.2	21.6	24.7	23.3	25.5	1,478.5	1,477.3	1,485.0	1,482.7	1,481.2	1,479.7	1,484.2	1,482.7	1,482.4	1,482.7	1,485.0	1,482.7
LRK9200	LRK9100	10823	CIRCULAR	24"	-	-	-	68	3.8%	45.3	6.3	6.8	6.3	6.8	1,465.0	1,462.4	1,470.2	1,469.7	1,465.5	1,463.9	1,465.5	1,464.5	1,465.5	1,464.0	1,465.5	1,465.5
LRK9201	LRK9200	10821	CIRCULAR	24"	-	-	-	201	1.6%	29.7	3.9	4.2	3.9	4.2	1,468.5	1,465.2	1,472.2	1,470.2	1,469.0	1,465.5	1,469.0	1,465.5	1,469.0	1,465.5	1,469.0	1,465.5
LRK9202	LRK9201	11163	CIRCULAR	18"	-	-	-	261	6.0%	25.6	3.1	3.3	3.1	3.3	1,484.6	1,469.0	1,488.5	1,472.2	1,484.9	1,469.0	1,484.9	1,469.0	1,484.9	1,469.0	1,484.9	1,469.0
LRK9400	LRK9100	C24	CIRCULAR	30"	-	-	-	20	0.6%	32.8	29.2	31.4	30.0	32.1	1,461.7	1,461.6	1,469.8	1,469.7	1,464.0	1,463.9	1,464.6	1,464.5	1,464.1	1,464.0	1,465.6	1,465.5
LRK9410	LRK9400	C23	CIRCULAR	30"	-	-	-	148	1.0%	40.5	29.2	31.4	29.9	32.1	1,463.2	1,461.7	1,469.9	1,469.8	1,464.8	1,464.0	1,465.3	1,464.6	1,464.9	1,464.1	1,466.5	1,465.6
LRK9420	LRK9410	10985_1	CIRCULAR	30"	-	-	-	283	2.6%	66.3	29.2	31.2	29.9	31.9	1,471.5	1,464.1	1,478.8	1,469.9	1,472.6	1,464.8	1,472.7	1,465.3	1,472.6	1,464.9	1,472.7	1,466.5
LRK9430	LRK9420	10475	CIRCULAR	30"	-	-	-	260	2.6%	66.5	29.3	31.2	29.9	31.9	1,478.2	1,471.5	1,486.5	1,478.8	1,479.3	1,472.6	1,479.4	1,472.7	1,479.3	1,472.6	1,479.4	1,472.7
LRK9440	LRK9430	11314	CIRCULAR	30"	-	-	-	290	0.6%	30.9	29.3	31.2	29.9	31.9	1,479.8	1,478.2	1,493.8	1,486.5	1,481.7	1,479.3	1,481.7	1,479.4	1,481.7	1,479.3	1,481.8	1,479.4
LRK9500	LRK9440	10143	CIRCULAR	30"	-	-	-	42	0.6%	31.8	29.3	31.2	29.9	31.9	1,480.1	1,479.8	1,494.4	1,493.8	1,481.9	1,481.7	1,482.0	1,481.7	1,481.9	1,481.7	1,482.0	1,481.8
LRK9600	LRK9500	11158	CIRCULAR	18"	-	-	-	92	4.5%	22.2	8.9	9.5	9.1	9.7	1,491.1	1,487.0	1,497.3	1,494.4	1,491.8	1,481.9	1,491.8	1,482.0	1,491.8	1,481.9	1,491.8	1,482.0
LRK9601	LRK9600	10474	CIRCULAR	18"	-	-	-	53	5.2%	23.9	8.9	9.5	9.1	9.7	1,493.9	1,491.1	1,499.2	1,497.3	1,494.5	1,491.8	1,494.5	1,491.8	1,494.5	1,491.8	1,494.5	1,491.8
LRK9602	LRK9601	10142	CIRCULAR	18"	-	-	-	97	1.7%	13.6	8.2	8.8	8.4	8.9	1,495.5	1,493.9	1,501.3	1,499.2	1,496.4	1,494.5	1,496.4	1,494.5	1,496.4	1,494.5	1,496.4	1,494.5
LRK9603	LRK9602	10310	CIRCULAR	12"	-	-	-	78	0.8%	3.2	8.2	8.8	8.4	8.9	1,498.6	1,498.0	1,504.0	1,501.3	1,503.1	1,496.4	1,503.8	1,496.4	1,503.3	1,496.4	1,503.9	1,496.4
LRK9604	LRK9603	11320	CIRCULAR	12"	-	-	-	123	3.5%	6.6	7.6	8.2	7.8	8.3	1,502.9	1,498.6	1,507.8	1,504.0	1,508.6	1,503.1	1,510.2	1,503.8	1,509.1	1,503.3	1,510.5	1,503.9
LRK9605	LRK9604	11167	CIRCULAR	18"	-	-	-	107	2.8%	17.7	7.6	8.2	7.8	8.3	1,506.1	1,503.1	1,510.8	1,507.8	1,509.2	1,508.6	1,510.8	1,510.2	1,509.7	1,509.1	1,511.2	1,510.5
LRK9800	LRK9605	11166	CIRCULAR	18"	-	-	-	77	5.4%	24.5	7.6	8.2	7.8	8.4	1,510.3	1,506.1	1,514.9	1,510.8	1,510.9	1,509.2	1,511.3	1,510.8	1,511.0	1,509.7	1,511.6	1,511.2
LRK9801	LRK9800	11319	CIRCULAR	18"	-	-	-	119	0.7%	9.1	5.7	6.2	5.7	6.2	1,511.2	1,510.3	1,515.7	1,514.9	1,512.1	1,510.9	1,512.1	1,511.3	1,512.1	1,511.0	1,512.1	1,511.6
LRK9802	LRK9801	10645	CIRCULAR	18"	-	-	-	263	0.8%	9.2	5.7	6.2	5.7	6.2	1,513.2	1,511.2	1,516.9	1,515.7	1,514.1	1,512.1	1,514.1	1,512.1	1,514.1	1,512.1	1,514.1	1,512.1
LRK9803	LRK9802	11160	CIRCULAR	12"	-	-	-	168	5.0%	8.0	1.9	2.1	1.9	2.1	1,521.8	1,513.4	1,523.1	1,516.9	1,522.1	1,514.1	1,522.1	1,514.1	1,522.1	1,514.1	1,522.1	1,514.1
LRK9804	LRK9803	10647	CIRCULAR	12"	-	-	-	125	8.2%	10.1	1.9	2.1	1.9	2.1	1,532.0	1,521.8	1,533.4	1,523.1	1,532.3	1,522.1	1,532.3	1,522.1	1,532.3	1,522.1	1,532.3	1,522.1
LRK9805	LRK9804	10828	CIRCULAR	12"	-	-	-	204	10.2%	11.2	1.9	2.1	1.9	2.1	1,552.8	1,532.0	1,554.1	1,533.4	1,553.1	1,532.3	1,553.1	1,532.3	1,553.1	1,532.3	1,553.1	1,532.3
LRK9900	LRK9800	1082	CIRCULAR	12"	-	-	-	151	3.4%	6.6	1.9	2.1	2.1	2.3	1,518.4	1,513.3	1,523.4	1,514.9	1,518.8	1,510.9	1,518.8	1,511.3	1,518.8	1,511.0	1,518.8	1,511.6
LRK9501	LRK9500	11312	CIRCULAR	30"	-	-	-	174	0.4%	25.4	20.3	21.7	20.9	22.2	1,480.7	1,480.1	1,494.8	1,494.4	1,482.5	1,481.9	1,482.6	1,482.0	1,482.5	1,481.9	1,482.6	1,482.0
LRK9700	LRK9501	10990	CIRCULAR	30"	-	-	-	112	0.4%	26.4	20.3	21.7	20.9	22.2	1,481.2	1,480.7	1,493.8	1,494.8	1,482.9	1,482.5	1,483.0	1,482.6	1,482.9	1,482.5	1,483.0	1,482.6
LRK14000	LRK9700	10831	CIRCULAR	12"	-	-	-	80	3.5%	6.7	4.1	4.4	4.3	4.6	1,484.0	1,481.2	1,492.1	1,493.8	1,484.6	1,482.9	1,484.7	1,483.0	1,484.6	1,482.9	1,484.7	1,483.0
LRK14001	LRK14000	10478	CIRCULAR	12"	-	-	-	265	3.4%	6.5	3.3	3.5	3.5	3.8	1,493.0	1,484.0	1,501.8	1,492.1	1,493.5	1,484.6	1,493.6	1,484.7	1,493.6	1,484.6	1,493.6	1,484.7
LRK9701	LRK9700	10832	CIRCULAR	30"	-	-	-	223	0.4%	25.7	16.2	17.3	16.6	17.6	1,482.1	1,481.2	1,493.0	1,493.8	1,483.5	1,482.9	1,483.6	1,483.0	1,483.5	1,482.9	1,483.6	1,483.0
LRK9702	LRK9701	10317	CIRCULAR	24"	-	-	-	127	0.4%	14.4	15.4	16.4	15.8	16.7	1,483.1	1,482.6	1,493.4	1,493.0	1,484.7	1,483.5	1,484.8	1,483.6	1,484.7	1,483.5	1,484.8	1,483.6
LRK9703	LRK9702	10993	CIRCULAR	24"	-	-	-	304	0.4%	14.4	13.2	14.0	13.5	14.3	1,484.3	1,483.1	1,493.2	1,493.4	1,485.8	1,484.7	1,485.9	1,484.8	1,485.8	1,484.7	1,485.9	1,484.8
LRK9704	LRK9703	10992	CIRCULAR	24"	-	-	-	188	0.6%	18.1	9.4	9.6	9.4	9.6	1,485.5	1,484.3	1,493.6	1,493.2	1,486.5	1,485.8	1,486.5	1,485.9	1,486.5	1,485.8	1,486.5	1,485.9
LRK9705	LRK9704	10983	CIRCULAR	24"	-	-	-	265	0.2%	10.6	9.4	9.6	9.4	9.6	1,486.1	1,485.5	1,490.0	1,493.6	1,487.5	1,486.5	1,487.5	1,486.5	1,487.5	1,486.5	1,487.5	1,486.5
LRK10000	LRK9705	10644	CIRCULAR	24"	-	-	-	158	1.1%	23.0	9.4	9.6	9.4	9.6	1,488.0	1,486.3	1,497.7	1,490.0	1,488.9	1,487.5	1,488.9	1,487.5	1,488.9	1,487.5	1,488.9	1,487.5
LRK11000	LRK10000	10826	CIRCULAR	12"	-	-	-	252	4.3%	7.4	2.8	3.0	2.8	3.0	1,503.8	1,492.9	1,507.0	1,497.7	1,504.2	1,488.9	1,504.2	1,488.9	1,504.2	1,488.9	1,504.2	1,488.9

Table B-2. Hydraulic Model Parameters and Results

Conduit			Conduit Attributes							Conduit Capacity (cfs)****	Peak flow values (cfs)				Invert elevation (ft)		Rim/Bank elevation (ft)		Maximum Hydraulic Grade Line (ft)							
											Existing		Future						Existing Conditions				Future Conditions			
																			10-yr, 24-hr		25-yr, 24-hr		10-yr, 24-hr		25-yr, 24-hr	
US node	DS node	Name	Type	Diameter (in)/ Width (ft)	Height (ft)	Left Channel Slope (H:V)	Right Channel Slope (H:V)	Conduit Length (ft)	Slope (%)		10-yr	25-yr	10-yr	25-yr	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
LRK10001	LRK10000	10827	CIRCULAR	18"	-	-	-	126	0.5%	7.4	6.6	6.6	6.6	6.6	1,488.9	1,488.3	1,498.4	1,497.7	1,490.0	1,488.9	1,490.0	1,488.9	1,490.0	1,488.9	1,490.0	1,488.9
LRK10002	LRK10001	10643	CIRCULAR	12"	-	-	-	315	0.6%	2.7	6.6	6.6	6.6	6.6	1,490.8	1,488.9	1,496.0	1,498.4	1,500.9	1,490.0	1,500.9	1,490.0	1,500.9	1,490.0	1,500.9	1,490.0
LRK10003	LRK10002	10309	CIRCULAR	12"	-	-	-	163	0.1%	1.0	6.7	6.7	6.7	6.8	1,490.9	1,490.8	1,504.2	1,496.0	1,506.5	1,500.9	1,506.5	1,500.9	1,506.5	1,500.9	1,506.5	1,500.9
LRK10004	LRK10003	11311	CIRCULAR	12"	-	-	-	226	8.0%	10.0	7.1	7.1	7.1	7.1	1,508.8	1,490.9	1,513.4	1,504.2	1,514.3	1,506.5	1,514.3	1,506.5	1,514.3	1,506.5	1,514.3	1,506.5
LRK10005	LRK10004	10642	CIRCULAR	12"	-	-	-	111	3.2%	6.4	7.2	7.2	7.2	7.2	1,512.3	1,508.8	1,517.7	1,513.4	1,518.1	1,514.3	1,518.2	1,514.3	1,518.1	1,514.3	1,518.2	1,514.3
LRK10006	LRK10005	10147	CIRCULAR	12"	-	-	-	186	3.5%	6.7	8.3	8.8	8.7	9.1	1,518.9	1,512.3	1,523.9	1,517.7	1,528.3	1,518.1	1,529.5	1,518.2	1,529.1	1,518.1	1,530.2	1,518.2
LRK10007	LRK10006	10650	CIRCULAR	12"	-	-	-	123	4.6%	7.6	8.4	8.8	8.7	9.1	1,524.5	1,518.9	1,530.3	1,523.9	1,535.1	1,528.3	1,537.1	1,529.5	1,536.4	1,529.1	1,538.1	1,530.2
LRK12000	LRK10007	11164	CIRCULAR	12"	-	-	-	259	6.4%	9.0	8.4	8.9	8.8	9.2	1,541.0	1,524.5	1,546.7	1,530.3	1,549.5	1,535.1	1,553.2	1,537.1	1,552.1	1,536.4	1,555.1	1,538.1
LRK12001	LRK12000	10988	CIRCULAR	12"	-	-	-	140	6.1%	8.8	4.6	4.7	5.0	5.3	1,549.5	1,541.0	1,554.9	1,546.7	1,554.9	1,549.5	1,555.4	1,553.2	1,554.9	1,552.1	1,557.6	1,555.1
LRK12002	LRK12001	10146	CIRCULAR	12"	-	-	-	331	9.1%	10.9	3.2	3.4	3.6	3.8	1,579.5	1,549.5	1,586.5	1,554.9	1,579.9	1,554.9	1,579.9	1,555.4	1,579.9	1,554.9	1,579.9	1,557.6
LRK12003	LRK12002	10145	CIRCULAR	12"	-	-	-	257	0.4%	2.3	3.2	3.4	3.6	3.8	1,580.5	1,579.5	1,585.8	1,586.5	1,585.8	1,579.9	1,585.8	1,579.9	1,585.8	1,579.9	1,585.8	1,579.9
LRK13000	LRK12000	10141	CIRCULAR	12"	-	-	-	314	4.3%	7.3	4.4	4.8	4.5	4.7	1,554.5	1,541.0	1,561.7	1,546.7	1,555.2	1,549.5	1,561.7	1,553.2	1,561.7	1,552.1	1,561.7	1,555.1
LRK13001	LRK13000	10652	CIRCULAR	12"	-	-	-	71	11.0%	11.9	4.4	4.8	4.5	4.7	1,562.3	1,554.5	1,567.7	1,561.7	1,562.7	1,555.2	1,562.8	1,561.7	1,562.7	1,561.7	1,562.9	1,561.7
LRK15001	LRK15000	10269	CIRCULAR	12"	-	-	-	78	8.3%	5.5	2.2	2.4	2.2	2.7	1,485.0	1,478.5	1,488.6	1,485.0	1,485.4	1,481.2	1,485.5	1,484.2	1,485.4	1,482.4	1,485.7	1,485.0
LRK15002	LRK15001	11272	CIRCULAR	12"	-	-	-	320	1.9%	4.9	2.2	2.4	2.2	2.4	1,491.1	1,485.0	1,493.7	1,488.6	1,491.5	1,485.4	1,491.6	1,485.5	1,491.5	1,485.4	1,491.6	1,485.7
LRK15003	LRK15002	11123	CIRCULAR	12"	-	-	-	32	0.5%	2.5	2.2	2.4	2.2	2.4	1,491.4	1,491.3	1,494.4	1,493.7	1,492.1	1,491.5	1,492.1	1,491.6	1,492.1	1,491.5	1,492.1	1,491.6
LRK15004	LRK15003	10958	CIRCULAR	12"	-	-	-	297	1.3%	4.2	2.2	2.4	2.2	2.4	1,495.6	1,491.6	1,499.3	1,494.4	1,496.1	1,492.1	1,496.2	1,492.1	1,496.1	1,492.1	1,496.2	1,492.1
LRK15005	LRK15004	11127	CIRCULAR	12"	-	-	-	331	1.8%	4.8	2.2	2.4	2.2	2.4	1,501.8	1,495.8	1,505.0	1,499.3	1,502.3	1,496.1	1,502.3	1,496.2	1,502.3	1,496.1	1,502.3	1,496.2
LRK16000	LRK15000	10275	CIRCULAR	24"	-	-	-	76	1.6%	28.8	20.2	22.5	21.7	23.1	1,479.8	1,478.5	1,485.9	1,485.0	1,481.6	1,481.2	1,485.3	1,484.2	1,482.1	1,482.4	1,485.9	1,485.0
LRK16001	LRK16000	11278	CIRCULAR	24"	-	-	-	432	1.8%	30.6	5.5	5.9	5.6	6.0	1,487.6	1,479.8	1,492.2	1,485.9	1,488.1	1,481.6	1,488.2	1,485.3	1,488.1	1,482.1	1,488.2	1,485.9
LRK16002	LRK16001	10437	CIRCULAR	24"	-	-	-	296	2.1%	32.4	5.5	5.9	5.6	6.0	1,493.7	1,487.6	1,499.3	1,492.2	1,494.3	1,488.1	1,494.3	1,488.2	1,494.3	1,488.1	1,494.3	1,488.2
LRK26000	LRK16002	10113	CIRCULAR	24"	-	-	-	224	1.9%	31.0	5.3	5.7	5.3	5.7	1,497.9	1,493.7	1,502.7	1,499.3	1,498.4	1,494.3	1,498.5	1,494.3	1,498.4	1,494.3	1,498.5	1,494.3
LRK26001	LRK26000	10443	CIRCULAR	18"	-	-	-	285	2.1%	15.4	4.6	5.0	4.7	5.0	1,504.0	1,498.1	1,508.0	1,502.7	1,504.6	1,498.4	1,504.6	1,498.5	1,504.6	1,498.4	1,504.6	1,498.5
LRK26002	LRK26001	10115	CIRCULAR	18"	-	-	-	74	1.5%	13.4	3.8	4.0	3.8	4.1	1,505.1	1,504.0	1,509.3	1,508.0	1,505.7	1,504.6	1,505.7	1,504.6	1,505.7	1,504.6	1,505.7	1,504.6
LRK26003	LRK26002	11284	CIRCULAR	18"	-	-	-	285	1.6%	13.9	3.8	4.0	3.8	4.1	1,509.7	1,505.1	1,515.0	1,509.3	1,510.2	1,505.7	1,510.2	1,505.7	1,510.2	1,505.7	1,510.2	1,505.7
LRK26004	LRK26003	10612	CIRCULAR	15"	-	-	-	91	5.0%	15.0	3.0	3.2	3.0	3.3	1,514.2	1,509.7	1,518.0	1,515.0	1,514.6	1,510.2	1,514.6	1,510.2	1,514.6	1,510.2	1,514.6	1,510.2
LRK26005	LRK26004	10963	CIRCULAR	15"	-	-	-	216	1.0%	6.6	3.0	3.2	3.0	3.3	1,516.4	1,514.2	1,521.9	1,518.0	1,517.0	1,514.6	1,517.0	1,514.6	1,517.0	1,514.6	1,517.0	1,514.6
LRK26007	LRK26005	10444	CIRCULAR	12"	-	-	-	77	1.9%	5.1	3.0	3.2	3.0	3.3	1,517.8	1,516.4	1,522.9	1,521.9	1,518.4	1,517.0	1,518.4	1,517.0	1,518.4	1,517.0	1,518.4	1,517.0
LRK26008	LRK26007	10964	CIRCULAR	12"	-	-	-	324	1.4%	4.3	1.7	1.8	1.7	1.8	1,522.5	1,517.8	1,527.2	1,522.9	1,522.9	1,518.4	1,522.9	1,518.4	1,522.9	1,518.4	1,522.9	1,518.4
LRK26009	LRK26008	10119	CIRCULAR	12"	-	-	-	387	2.5%	5.9	0.9	1.0	0.9	1.0	1,532.3	1,522.5	1,536.9	1,527.2	1,532.5	1,522.9	1,532.5	1,522.9	1,532.5	1,522.9	1,532.5	1,522.9
LRK27000	LRK26000	10442	CIRCULAR	12"	-	-	-	230	0.6%	N/A*	0.0	0.0	0.0	0.0	1,499.2	1,497.9	1,501.8	1,502.7	1,499.2	1,498.4	1,499.2	1,498.5	1,499.2	1,498.4	1,499.2	1,498.5
LRK17000	LRK15000	10112	CIRCULAR	18"	-	-	-	110	0.6%	8.8	3.7	2.9	3.7	2.8	1,479.3	1,478.5	1,486.3	1,485.0	1,481.2	1,481.2	1,484.2	1,484.2	1,481.5	1,482.4	1,485.8	1,485.0
LRK17001	LRK17000	10435	CIRCULAR	30"	-	-	-	154	0.2%	9.8	0.5	0.7	0.5	0.7	1,479.5	1,479.3	1,488.7	1,486.3	1,481.2	1,481.2	1,484.2	1,484.2	1,481.5	1,481.5	1,485.9	1,485.8
LRK17001	LRK17000	10799	CIRCULAR	30"	-	-	-	154	0.2%	9.8	0.5	0.7	0.5	0.7	1,479.5	1,479.3	1,488.7	1,486.3	1,481.2	1,481.2	1,484.2	1,484.2	1,481.5	1,481.5	1,485.9	1,485.8
LRK17001	LRK17000	10436	CIRCULAR	30"	-	-	-	154	0.2%	10.0	0.5	0.7	0.5	0.7	1,479.5	1,479.3	1,488.7	1,486.3	1,481.2	1,481.2	1,484.2	1,484.2	1,481.5	1,481.5	1,485.9	1,485.8
LRK17001	LRK17000	11129	CIRCULAR	30"	-	-	-	154	0.2%	9.4	0.5	0.6	0.5	0.6	1,479.5	1,479.3	1,488.7	1,486.3	1,481.2	1,481.2	1,484.2	1,484.2	1,481.5	1,481.5	1,485.9	1,485.8
LRK19000	LRK16000	10109	CIRCULAR	15"	-	-	-	27	0.0%	0.4	5.6	6.1	5.6	6.1	1,482.0	1,482.0	1,492.5	1,485.9	1,483.2	1,481.6	1,485.3	1,485.3	1,483.2	1,482.1	1,486.3	1,485.9
LRK20000	LRK19000	10790	CIRCULAR	15"	-	-	-	97	4.1%	13.6	4.9	5.3	4.9	5.4	1,486.0	1,482.0	1,491.3	1,492.5	1,486.5	1,483.2	1,486.6	1,485.3	1,486.5	1,483.2	1,486.6	1,486.3
LRK20001	LRK20000	11274	CIRCULAR	12"	-	-	-	27	0.6%	2.8	1.0	1.1	1.0	1.1	1,487.9	1,487.8	1,491.2	1,491.3	1,488.3	1,486.5	1,488.3	1,486.6	1,488.3	1,486.5	1,488.3	1,486.6
LRK20002	LRK20001	10603	CIRCULAR	12"	-	-	-	142	1.5%	4.5	1.0	1.1	1.0	1.1	1,490.2	1,488.1	1,495.1	1,491.2	1,490.5	1,488.3	1,490.6	1,488.3	1,490.5	1,488.3	1,490.6	1,488.3
LRK20003	LRK20002	10434	CIRCULAR	12"	-	-	-	103	2.2%	5.4	1.0	1.1	1.0	1.1	1,492.7	1,490.4	1,497.3	1,495.1	1,493.0	1,490.5	1,493.0	1,490.6	1,493.0	1,490.5	1,493.0	1,490.6
LRK20004	LRK20003	10798	CIRCULAR	12"	-	-	-	85	2.5%	5.7	1.0	1.1	1.0	1.1	1,495.0	1,492.9	1,498.8	1,497.3	1,495.3	1,493.0	1,495.3	1,493.0	1,495.3	1,493.0	1,495.3	1,493.0
LRK21000	LRK20000	11273	CIRCULAR	15"	-	-	-	97	0.8%	6.2	3.9	4.2	3.9	4.2	1,487.0	1,486.2	1,492.1	1,491.3	1,487.7	1,486.5	1,487.7	1,486.6	1,487.7	1,486.5	1,487.7	1,486.6
LRK23000	LRK22000	10800	CIRCULAR	12"	-	-	-	44	0.5%	2.6	0.8	0.9	0.8	0.9	1,490.3	1,490.1	1,494.3	1,493.7	1,490.7	1,489.6	1,490.7	1,489.7	1,490.7	1,489.6	1,490.7	1,489.7
LRK23001	LRK23000	10953	CIRCULAR	12"	-	-	-	138	1.6%	4.7	0.8	0.9	0.8	0.9	1,492.7	1,490.5	1,497.6	1,494.3	1,493.0	1,490.7	1,493.0	1,490.7	1,493.0	1,490.7	1,493.0	1,490.7
LRK23002	LRK23001	10272	CIRCULAR	12"	-	-	-	154	3.0%	6.5	0.8	0.9	0.8	0.9	1,497.6	1,492.9	1,502.2	1,497.6	1,497.8	1,493.0	1,497.8	1,493.0	1,497.8	1,493.0	1,497.8	1,493.0
LRK22000	LRK21000	10604	CIRCULAR	15"	-	-	-	247	0.7%	5.5	3.9	4.2	3.9	4.2	1,488.9	1,487.2	1,493.7	1,492.1	1,489.6	1,487.7	1,489.7	1,487.7	1,489.6	1,487.7	1,489.7	1,487.7
LRK22001	LRK22000	10438	CIRCULAR	12"	-	-	-	249	1.0%	3.7	3.0	3.3	3.0	3.3	1,491.5	1,489.1	1,496.6	1,493.7	1,492.2	1,489.6	1,492.3	1,489.7	1,492.2	1,489.6	1,492.3	1,489.7
LRK22002	LRK22001	10801	CIRCULAR	12"	-	-	-	58	0.7%	3.1	2.2	2.4	2.2	2.4	1,492.1	1,491.7	1,498.7	1,496.6	1,492.8	1,492.2	1,492.8	1,492.3	1,492.8	1,492.2	1,492.8	1,492.3
LRK22003	LRK22002	10440	CIRCULAR	12"	-	-	-	96	1.2%	4.2	2.2	2.4	2.2	2.4	1,493.7	1,492.5	1,499.4	1,498.7	1,494.2	1,492.8	1,494.2	1,492.8	1,494.2	1,492.8	1,494.2	1,492.8

Table B-2. Hydraulic Model Parameters and Results

Conduit			Conduit Attributes							Conduit Capacity (cfs)****	Peak flow values (cfs)				Invert elevation (ft)		Rim/Bank elevation (ft)		Maximum Hydraulic Grade Line (ft)							
											Existing		Future						Existing Conditions				Future Conditions			
																			10-yr, 24-hr		25-yr, 24-hr		10-yr, 24-hr		25-yr, 24-hr	
US node	DS node	Name	Type	Diameter (in)/ Width (ft)	Height (ft)	Left Channel Slope (H:V)	Right Channel Slope (H:V)	Conduit Length (ft)	Slope (%)		10-yr	25-yr	10-yr	25-yr	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
LRK22004	LRK22003	11130	CIRCULAR	12"	-	-	-	39	1.0%	3.8	1.5	1.6	1.5	1.6	1,494.1	1,493.7	1,499.8	1,499.4	1,494.5	1,494.2	1,494.6	1,494.2	1,494.5	1,494.2	1,494.6	1,494.2
LRK22005	LRK22004	11131	CIRCULAR	12"	-	-	-	40	0.5%	2.6	1.5	1.6	1.5	1.6	1,494.5	1,494.3	1,499.9	1,499.8	1,495.0	1,494.5	1,495.0	1,494.6	1,495.0	1,494.5	1,495.0	1,494.6
LRK24000	LRK22005	11281	CIRCULAR	12"	-	-	-	201	0.5%	2.6	0.8	0.8	0.8	0.8	1,495.7	1,494.7	1,500.9	1,499.9	1,496.1	1,495.0	1,496.1	1,495.0	1,496.1	1,495.0	1,496.1	1,495.0
LRK24001	LRK24000	10793	CIRCULAR	12"	-	-	-	160	2.5%	6.0	0.7	0.7	0.7	0.7	1,499.8	1,495.9	1,503.8	1,500.9	1,500.1	1,496.1	1,500.1	1,496.1	1,500.1	1,496.1	1,500.1	1,496.1
LRK25000	LRK24000	10441	CIRCULAR	12"	-	-	-	122	0.9%	3.3	0.1	0.1	0.1	0.1	1,497.0	1,495.9	1,504.6	1,500.9	1,497.1	1,496.1	1,497.1	1,496.1	1,497.1	1,496.1	1,497.1	1,496.1
LRL10001	LRA10000	C63888	CIRCULAR	12"	-	-	-	492	0.6%	2.7	1.1	1.2	1.1	1.2	1,470.1	1,467.3	1,472.3	1,473.5	1,470.6	1,467.6	1,470.6	1,467.8	1,470.6	1,467.6	1,470.6	1,468.0
Larson Creek - North Fork Appendix A, Maps # 2, 3, 4, 7, 8, 9, 10 & 11																										
NLRA0001	LRA11000	CJ345.1151	IRREGULAR	See model for channel cross-section				690	0.4%	-	89.0	95.6	135.7	146.8	1,478.1	1,475.0	1,485.3	1,488.4	1,483.0	1,478.5	1,483.1	1,478.7	1,484.0	1,478.6	1,484.2	1,478.9
NLRA0002	NLRA0001	CJ371.2904	IRREGULAR	See model for channel cross-section				38	1.1%	-	88.7	95.1	135.5	146.4	1,478.5	1,478.1	1,484.6	1,485.3	1,483.0	1,483.0	1,483.1	1,483.1	1,484.0	1,484.0	1,484.2	1,484.2
NLRA1000	NLRA0002	1044	BOX	12'	4'	-	-	49	0.8%	624.4	87.4	93.6	134.1	145.0	1,478.8	1,478.5	1,484.6	1,484.6	1,483.0	1,483.0	1,483.1	1,483.1	1,484.1	1,484.0	1,484.2	1,484.2
NLRA1001	NLRA1000	CJ469.3682	IRREGULAR	See model for channel cross-section				37	0.4%	-	84.1	90.1	129.9	140.3	1,479.0	1,478.8	1,484.7	1,484.6	1,483.1	1,483.0	1,483.2	1,483.1	1,484.1	1,484.1	1,484.2	1,484.2
NLRA2000	NLRA1001	CJ829.0988	IRREGULAR	See model for channel cross-section				360	1.1%	-	87.6	94.1	133.7	142.7	1,482.8	1,479.0	1,485.4	1,484.7	1,484.6	1,483.1	1,484.6	1,483.2	1,484.8	1,484.1	1,484.9	1,484.2
NLRA2001	NLRA2000	CJ1093.512	IRREGULAR	See model for channel cross-section				264	0.0%	-	75.5	80.2	119.7	128.4	1,482.8	1,482.8	1,490.6	1,485.4	1,486.5	1,484.6	1,486.6	1,484.6	1,487.1	1,484.8	1,487.2	1,484.9
NLRA2002	NLRA2001	CJ1128.797	IRREGULAR	See model for channel cross-section				51	1.6%	-	75.6	80.7	119.8	128.5	1,483.6	1,482.8	1,493.5	1,490.6	1,486.5	1,486.5	1,486.6	1,486.6	1,487.1	1,487.1	1,487.2	1,487.2
NLRA2003	NLRA2002	C2	BOX	12'	4'	-	-	36	1.2%	831.0	74.8	79.7	118.3	127.1	1,484.0	1,483.6	1,494.2	1,493.5	1,486.5	1,486.5	1,486.5	1,486.6	1,487.1	1,487.1	1,487.2	1,487.2
NLRA2004	NLRA2003	CJ1219.909	IRREGULAR	See model for channel cross-section				38	0.7%	-	74.8	79.8	118.3	127.1	1,484.3	1,484.0	1,489.5	1,494.2	1,487.3	1,486.5	1,487.3	1,486.5	1,487.8	1,487.1	1,487.9	1,487.2
NLRA2005	NLRA2004	CJ1439.6	IRREGULAR	See model for channel cross-section				220	2.3%	-	74.9	80.0	118.4	127.2	1,489.4	1,484.3	1,492.7	1,489.5	1,490.8	1,487.3	1,490.8	1,487.3	1,491.1	1,487.8	1,491.2	1,487.9
NLRA3000	NLRA2005	CJ1797.38_2	IRREGULAR	See model for channel cross-section				46	2.2%	-	73.7	78.6	116.3	125.2	1,490.4	1,489.4	1,494.9	1,492.7	1,493.2	1,490.8	1,493.2	1,490.8	1,493.6	1,491.1	1,493.7	1,491.2
NLRA3001	NLRA3000	CJ1797.38_4	IRREGULAR	See model for channel cross-section				163	1.9%	-	61.4	64.8	103.1	112.6	1,493.6	1,490.4	1,501.8	1,494.9	1,496.4	1,493.2	1,496.4	1,493.2	1,497.0	1,493.6	1,497.1	1,493.7
NLRA3002	NLRA3001	J5_J4	CIRCULAR	48"	-	-	-	27	4.2%	161.6	61.4	64.9	103.1	112.6	1,494.7	1,493.6	1,504.3	1,501.8	1,496.8	1,496.4	1,496.9	1,496.4	1,497.5	1,497.0	1,497.7	1,497.1
NLRA3003	NLRA3002	CJ1797.38_1	IRREGULAR	See model for channel cross-section				121	2.3%	-	61.4	64.9	103.1	112.7	1,497.5	1,494.7	1,510.2	1,504.3	1,500.2	1,496.8	1,500.3	1,496.9	1,500.8	1,497.5	1,500.9	1,497.7
NLRA3004	NLRA3003	CJ1854.735	IRREGULAR	See model for channel cross-section				63	1.1%	-	61.4	65.0	103.1	112.7	1,498.2	1,497.5	1,503.5	1,510.2	1,502.1	1,500.2	1,502.1	1,500.3	1,502.5	1,500.8	1,502.6	1,500.9
NLRA3005	NLRA3004	10063	CIRCULAR	48"	-	-	-	37	5.0%	323.4	61.4	65.0	103.1	112.7	1,500.0	1,498.2	1,514.2	1,503.5	1,501.6	1,502.1	1,501.7	1,502.1	1,502.5	1,502.5	1,502.7	1,502.6
NLRA3006	NLRA3005	10394	CIRCULAR	48"	-	-	-	314	1.5%	175.6	61.5	65.1	103.1	112.9	1,504.7	1,500.0	1,515.6	1,514.2	1,506.4	1,501.6	1,506.4	1,501.7	1,506.9	1,502.5	1,507.1	1,502.7
NLRA3007	NLRA3006	10564	CIRCULAR	48"	-	-	-	480	0.6%	110.7	59.8	63.3	101.2	112.4	1,507.6	1,504.7	1,519.0	1,515.6	1,509.7	1,506.4	1,509.8	1,506.4	1,510.6	1,506.9	1,510.8	1,507.1
NLRA3008	NLRA3007	11077	CIRCULAR	42"	-	-	-	28	5.8%	239.1	59.8	63.1	101.2	110.9	1,509.7	1,508.1	1,517.5	1,519.0	1,510.9	1,509.7	1,511.0	1,509.8	1,511.5	1,510.6	1,511.6	1,510.8
NLRA4000	NLRA3008	10239	CIRCULAR	42"	-	-	-	139	1.8%	132.8	59.8	63.1	101.2	110.9	1,512.3	1,509.8	1,518.4	1,517.5	1,513.9	1,510.9	1,514.0	1,511.0	1,514.6	1,511.5	1,514.7	1,511.6
NLRA4001	NLRA4000	10067	CIRCULAR	42"	-	-	-	70	1.4%	119.1	56.0	59.1	97.2	107.2	1,513.3	1,512.3	1,518.7	1,518.4	1,514.9	1,513.9	1,515.0	1,514.0	1,515.7	1,514.6	1,515.9	1,514.7
NLRA5000	NLRA4001	10916	CIRCULAR	42"	-	-	-	471	1.8%	131.8	55.4	58.6	96.5	106.4	1,521.5	1,513.3	1,527.8	1,518.7	1,523.1	1,514.9	1,523.2	1,515.0	1,523.7	1,515.7	1,523.9	1,515.9
NLRA5001	NLRA5000	10057	CIRCULAR	42"	-	-	-	234	0.4%	66.2	51.6	54.8	92.4	102.6	1,522.6	1,521.6	1,527.7	1,527.8	1,524.9	1,523.1	1,525.0	1,523.2	1,526.6	1,523.7	1,527.2	1,523.9
NLRA5002	NLRA5001	10058	CIRCULAR	42"	-	-	-	230	0.4%	64.7	49.1	54.1	89.7	99.9	1,523.6	1,522.6	1,529.9	1,527.7	1,525.9	1,524.9	1,526.0	1,525.0	1,528.4	1,526.6	1,529.4	1,527.2
NLRA5003	NLRA5002	10236	CIRCULAR	42"	-	-	-	245	1.4%	119.6	49.1	54.3	89.7	99.9	1,527.5	1,524.0	1,536.4	1,529.9	1,529.1	1,525.9	1,529.2	1,526.0	1,530.2	1,528.4	1,531.8	1,529.4
NLRA5004	NLRA5003	10235	CIRCULAR	42"	-	-	-	199	1.3%	112.3	47.2	52.7	87.9	97.9	1,530.0	1,527.5	1,537.8	1,536.4	1,531.6	1,529.1	1,531.7	1,529.2	1,532.4	1,530.2	1,533.7	1,531.8
NLRA5005	NLRA5004	10401	CIRCULAR	42"	-	-	-	105	1.2%	112.2	47.1	52.1	87.8	98.0	1,532.3	1,531.0	1,538.9	1,537.8	1,533.9	1,531.6	1,534.0	1,531.7	1,534.6	1,532.4	1,534.9	1,533.7
NLRA5006	NLRA5005	10077	CIRCULAR	42"	-	-	-	431	1.1%	104.7	47.1	51.8	87.8	98.1	1,537.2	1,532.5	1,545.4	1,538.9	1,538.8	1,533.9	1,538.9	1,534.0	1,539.6	1,534.6	1,539.9	1,534.9
NLRA5007	NLRA5006	11090	CIRCULAR	42"	-	-	-	83	3.6%	194.4	46.7	52.3	88.0	99.0	1,541.0	1,538.0	1,547.7	1,545.4	1,542.2	1,538.8	1,542.3	1,538.9	1,542.7	1,539.6	1,542.8	1,539.9
NLRA5008	NLRA5007	10737	CIRCULAR	42"	-	-	-	88	1.4%	119.6	46.6	52.0	88.3	98.5	1,543.3	1,542.0	1,553.6	1,547.7	1,544.8	1,542.2	1,544.9	1,542.3	1,545.6	1,542.7	1,545.7	1,542.8
NLRA5009	NLRA5008	1002	CIRCULAR	72"	-	-	-	69	1.4%	274.4	46.7	51.5	101.2	112.3	1,544.2	1,543.3	1,554.5	1,553.6	1,545.9	1,544.8	1,546.0	1,544.9	1,546.8	1,545.6	1,547.0	1,545.7
NLRA5010	NLRA5009	CJ5144.649	IRREGULAR	See model for channel cross-section				59	4.6%	-	46.7	51.6	107.5	122.0	1,546.9	1,544.2	1,552.4	1,554.5	1,550.2	1,545.9	1,550.3	1,546.0	1,551.4	1,546.8	1,551.6	1,547.0
NLRA6000	NLRA5010	CJ5155.223	IRREGULAR	See model for channel cross-section				26	9.4%	-	47.1	55.0	237.2	277.8	1,549.4	1,546.9	1,552.1	1,552.4	1,550.5	1,550.2	1,550.6	1,550.3	1,551.0	1,551.4	1,551.2	1,551.6
NLRA6001	NLRA6000	CJ5370.063	IRREGULAR	See model for channel cross-section				200	1.7%	-	90.7	103.1	162.9	184.5	1,552.7	1,549.4	1,554.3	1,552.1	1,554.4	1,550.5	1,554.5	1,550.6	1,554.6	1,551.0	1,554.6	1,551.2
NLRA6002	NLRA6001	CJ5757.312	IRREGULAR	See model for channel cross-section				387	1.9%	-	104.2	117.3	199.7	215.7	1,560.0	1,552.7	1,566.7	1,554.3	1,562.4	1,554.4	1,562.5	1,554.5	1,563.2	1,554.6	1,563.4	1,554.6
NLRA6003	NLRA6002	CJ6202.531	IRREGULAR	See model for channel cross-section				445	4.2%	-	99.0	111.1	184.5	199.5	1,578.7	1,560.0	1,582.5	1,566.7	1,579.8	1,562.4	1,579.8	1,562.5	1,580.1	1,563.2	1,580.2	1,563.4
NLRA6004	NLRA6003	CJ6654.351	IRREGULAR	See model for channel cross-section				452	4.4%	-	99.0	111.1	184.5	199.6	1,598.5	1,578.7	1,604.0	1,582.5	1,601.6	1,579.8	1,601.8	1,579.8	1,602.5	1,580.1	1,602.6	1,580.2
NLRA6005	NLRA6004	CJ7053.981	IRREGULAR	See model for channel cross-section				400	4.0%	-	99.7	111.7	185.4	200.5	1,614.6	1,598.5	1,618.6	1,604.0	1,616.2	1,601.6	1,616.2	1,601.8	1,616.4	1,602.5	1,616.5	1,602.6
NLRA7000	NLRA6005	CJ7442.33	IRREGULAR	See model for channel cross-section				388	3.1%	-	99.8	111.8	185.7	200.9	1,626.6	1,614.6	1,630.3	1,618.6	1,627.8	1,616.2	1,627.8	1,616.2	1,628.2	1,616.4	1,628.2	1,616.5
Larson Creek - Stormdrains Contributing to the North Fork Appendix A, Maps # 1, 2, 3, 4, 7, 8 & 9																										
NLRB1001	NLRA1000	11248	CIRCULAR	12"	-	-	-	12	1.0%	3.7	4.3	4.7	5.2	5.5	1,480.1	1,480.0	1,484.1	1,484.6	1,483.1	1,483.0	1,483.2	1,483.1	1,484.2	1,484.1	1,484.4	1,484.2

Table B-2. Hydraulic Model Parameters and Results

Conduit			Conduit Attributes							Conduit Capacity (cfs)****	Peak flow values (cfs)				Invert elevation (ft)		Rim/Bank elevation (ft)		Maximum Hydraulic Grade Line (ft)							
											Existing		Future						Existing Conditions				Future Conditions			
																			10-yr, 24-hr		25-yr, 24-hr		10-yr, 24-hr		25-yr, 24-hr	
US node	DS node	Name	Type	Diameter (in)/ Width (ft)	Height (ft)	Left Channel Slope (H:V)	Right Channel Slope (H:V)	Conduit Length (ft)	Slope (%)		10-yr	25-yr	10-yr	25-yr	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
NLRB1100	NLRB1001	11243	CIRCULAR	12"	-	-	-	301	1.1%	3.9	2.8	3.0	3.1	3.3	1,485.1	1,481.7	1,489.0	1,484.1	1,485.8	1,483.1	1,485.8	1,483.2	1,486.0	1,484.2	1,486.6	1,484.4
NLRB1300	NLRB1100	10403	CIRCULAR	12"	-	-	-	263	1.9%	5.2	1.9	2.0	1.9	2.0	1,490.4	1,485.3	1,493.3	1,489.0	1,490.9	1,485.8	1,490.9	1,485.8	1,490.9	1,486.0	1,490.9	1,486.6
NLRB1101	NLRB1100	10247	CIRCULAR	12"	-	-	-	21	0.5%	2.5	0.9	0.9	1.2	1.3	1,485.4	1,485.3	1,488.6	1,489.0	1,485.8	1,485.8	1,485.8	1,485.8	1,486.0	1,486.0	1,486.6	1,486.6
NLRB1102	NLRB1101	11095	CIRCULAR	15"	-	-	-	7	0.2%	2.6	0.9	0.9	1.2	1.3	1,485.4	1,485.4	1,488.9	1,488.6	1,485.8	1,485.8	1,485.9	1,485.8	1,486.0	1,486.0	1,486.6	1,486.6
NLRB1103	NLRB1102	10922	CIRCULAR	15"	-	-	-	353	0.2%	3.0	0.9	0.9	1.2	1.3	1,486.2	1,485.5	1,490.8	1,488.9	1,486.7	1,485.8	1,486.7	1,485.9	1,486.8	1,486.0	1,486.8	1,486.6
NLRB1104	NLRB1103	11244	CIRCULAR	12"	-	-	-	22	0.5%	2.6	0.9	1.0	1.2	1.3	1,487.4	1,487.3	1,490.8	1,490.8	1,487.8	1,486.7	1,487.8	1,486.7	1,487.8	1,486.8	1,487.9	1,486.8
NLRB1105	NLRB1104	C75162	CIRCULAR	12"	-	-	-	119	2.3%	5.4	0.9	1.0	1.2	1.3	1,490.4	1,487.7	1,492.1	1,490.8	1,490.7	1,487.8	1,490.7	1,487.8	1,490.8	1,487.8	1,490.8	1,487.9
NLRC2001	NLRA2000	1045	CIRCULAR	24"	-	-	-	185	6.8%	57.8	13.3	14.4	14.4	15.5	1,494.7	1,482.2	1,498.2	1,485.4	1,495.4	1,484.6	1,495.4	1,484.6	1,495.4	1,484.8	1,495.4	1,484.9
NLRC2002	NLRC2001	10061	CIRCULAR	24"	-	-	-	339	1.2%	24.6	12.8	13.8	13.7	14.8	1,498.6	1,494.7	1,502.8	1,498.2	1,499.7	1,495.4	1,499.8	1,495.4	1,499.8	1,495.4	1,499.8	1,495.4
NLRC2003	NLRC2002	11072	CIRCULAR	24"	-	-	-	62	0.9%	21.5	12.3	13.3	13.2	14.2	1,499.2	1,498.6	1,504.6	1,502.8	1,500.3	1,499.7	1,500.3	1,499.8	1,500.3	1,499.8	1,500.4	1,499.8
NLRC2004	NLRC2003	11073	CIRCULAR	24"	-	-	-	44	0.9%	21.5	12.3	13.3	13.2	14.2	1,499.6	1,499.2	1,505.7	1,504.6	1,500.7	1,500.3	1,500.7	1,500.3	1,500.7	1,500.3	1,500.8	1,500.4
NLRC2005	NLRC2004	10392	CIRCULAR	24"	-	-	-	362	1.6%	28.8	11.5	12.4	11.9	12.8	1,505.4	1,499.6	1,511.8	1,505.7	1,506.2	1,500.7	1,506.3	1,500.7	1,506.3	1,500.7	1,506.3	1,500.8
NLRC2100	NLRC2005	10746	CIRCULAR	22.8"	-	-	-	291	0.7%	16.9	10.7	11.5	11.0	11.9	1,507.5	1,505.4	1,513.7	1,511.8	1,508.6	1,506.2	1,508.7	1,506.3	1,508.6	1,506.3	1,508.7	1,506.3
NLRC2200	NLRC2100	10232	CIRCULAR	18"	-	-	-	164	0.2%	5.0	2.4	2.6	2.5	2.7	1,507.9	1,507.5	1,514.0	1,513.7	1,508.7	1,508.6	1,508.8	1,508.7	1,508.8	1,508.6	1,508.8	1,508.7
NLRC2201	NLRC2200	10901	CIRCULAR	12"	-	-	-	95	0.3%	1.8	1.9	2.0	2.0	2.1	1,508.1	1,507.9	1,512.2	1,514.0	1,509.0	1,508.7	1,509.1	1,508.8	1,509.0	1,508.8	1,509.1	1,508.8
NLRC2202	NLRC2201	11231	CIRCULAR	12"	-	-	-	32	0.2%	1.8	1.4	1.5	1.4	1.5	1,508.2	1,508.1	1,511.8	1,512.2	1,509.0	1,509.0	1,509.1	1,509.1	1,509.1	1,509.0	1,509.2	1,509.1
NLRC2203	NLRC2202	10903	CIRCULAR	12"	-	-	-	110	0.3%	1.9	1.4	1.5	1.4	1.5	1,508.5	1,508.2	1,512.3	1,511.8	1,509.2	1,509.0	1,509.3	1,509.1	1,509.2	1,509.1	1,509.3	1,509.2
NLRC2204	NLRC2203	10560	CIRCULAR	12"	-	-	-	243	0.6%	2.8	1.0	1.0	1.0	1.1	1,511.5	1,510.0	1,514.5	1,512.3	1,511.9	1,509.2	1,511.9	1,509.3	1,511.9	1,509.2	1,511.9	1,509.3
NLRC2101	NLRC2100	10558	CIRCULAR	18"	-	-	-	71	3.1%	18.8	8.3	8.9	8.5	9.2	1,509.7	1,507.5	1,513.0	1,513.7	1,510.4	1,508.6	1,510.5	1,508.7	1,510.5	1,508.6	1,510.5	1,508.7
NLRC2102	NLRC2101	10233	CIRCULAR	18"	-	-	-	262	1.1%	10.8	7.2	7.8	7.5	8.0	1,512.5	1,509.7	1,518.0	1,513.0	1,513.4	1,510.4	1,513.5	1,510.5	1,513.4	1,510.5	1,513.5	1,510.5
NLRC2103	NLRC2102	10907	CIRCULAR	18"	-	-	-	127	1.7%	14.0	5.7	6.2	6.0	6.4	1,514.7	1,512.5	1,520.1	1,518.0	1,515.4	1,513.4	1,515.4	1,513.5	1,515.4	1,513.4	1,515.4	1,513.5
NLRC2104	NLRC2103	10908	CIRCULAR	18"	-	-	-	126	1.2%	11.6	4.5	4.9	4.7	5.1	1,517.0	1,515.5	1,521.2	1,520.1	1,517.7	1,515.4	1,517.7	1,515.4	1,517.7	1,515.4	1,517.7	1,515.4
NLRC2105	NLRC2104	10562	CIRCULAR	15"	-	-	-	307	0.5%	4.6	3.5	3.8	3.8	4.1	1,518.6	1,517.0	1,523.0	1,521.2	1,519.4	1,517.7	1,519.4	1,517.7	1,519.4	1,517.7	1,519.5	1,517.7
NLRD3001	NLRA3000	C3	TRAPEZOIDAL	10'	2'	1	1	186	4.7%	263.8	13.2	14.2	13.4	14.4	1,500.2	1,491.4	1,503.2	1,494.9	1,500.5	1,493.2	1,500.5	1,493.2	1,500.5	1,493.6	1,500.5	1,493.7
NLRD3002	NLRD3001	10064	CIRCULAR	36"	-	-	-	20	0.5%	47.6	13.3	14.3	13.5	14.5	1,500.3	1,500.2	1,505.7	1,503.2	1,501.3	1,500.5	1,501.4	1,500.5	1,501.4	1,500.5	1,501.4	1,500.5
NLRD3003	NLRD3002	10395	CIRCULAR	36"	-	-	-	51	0.3%	39.1	13.7	14.7	13.9	14.9	1,500.4	1,500.3	1,505.7	1,505.7	1,501.6	1,501.3	1,501.7	1,501.4	1,501.6	1,501.4	1,501.7	1,501.4
NLRD3004	NLRD3003	10747	CIRCULAR	36"	-	-	-	130	0.3%	39.4	12.6	13.5	12.8	13.7	1,500.9	1,500.4	1,506.0	1,505.7	1,502.0	1,501.6	1,502.1	1,501.7	1,502.1	1,501.6	1,502.1	1,501.7
NLRD3005	NLRD3004	11075	CIRCULAR	36"	-	-	-	138	0.9%	63.0	12.6	13.5	12.8	13.7	1,502.1	1,500.9	1,507.2	1,506.0	1,503.0	1,502.0	1,503.0	1,502.1	1,503.0	1,502.1	1,503.0	1,502.1
NLRD3100	NLRD3005	10911	CIRCULAR	36"	-	-	-	33	0.7%	58.5	11.1	11.9	11.3	12.1	1,502.3	1,502.1	1,507.7	1,507.2	1,503.2	1,503.0	1,503.2	1,503.0	1,503.2	1,503.0	1,503.3	1,503.0
NLRD3101	NLRD3100	10767	CIRCULAR	24"	-	-	-	502	2.0%	32.2	8.1	8.7	8.1	8.7	1,512.4	1,502.3	1,517.2	1,507.7	1,513.1	1,503.2	1,513.1	1,503.2	1,513.1	1,503.2	1,513.1	1,503.3
NLRD3102	NLRD3101	10912	CIRCULAR	30"	-	-	-	153	0.5%	29.4	5.6	6.0	5.7	6.1	1,514.9	1,514.1	1,520.0	1,517.2	1,515.6	1,513.1	1,515.7	1,513.1	1,515.6	1,513.1	1,515.7	1,513.1
NLRD3103	NLRD3102	10913	CIRCULAR	24"	-	-	-	54	1.4%	26.6	5.3	5.7	5.4	5.8	1,515.7	1,514.9	1,520.8	1,520.0	1,516.3	1,515.6	1,516.3	1,515.7	1,516.3	1,515.6	1,516.3	1,515.7
NLRD3104	NLRD3103	10915	CIRCULAR	24"	-	-	-	207	1.8%	29.4	4.7	5.1	4.7	5.1	1,519.3	1,515.7	1,526.2	1,520.8	1,519.9	1,516.3	1,519.9	1,516.3	1,519.9	1,516.3	1,519.9	1,516.3
NLRD3105	NLRD3104	10569	CIRCULAR	24"	-	-	-	262	1.8%	29.6	1.5	1.6	1.5	1.6	1,524.1	1,519.3	1,530.8	1,526.2	1,524.4	1,519.9	1,524.4	1,519.9	1,524.4	1,519.9	1,524.4	1,519.9
NLRD3106	NLRD3105	10756	CIRCULAR	18"	-	-	-	164	1.2%	11.4	1.5	1.6	1.5	1.6	1,526.4	1,524.4	1,533.2	1,530.8	1,526.7	1,524.4	1,526.8	1,524.4	1,526.7	1,524.4	1,526.8	1,524.4
NLRD3107	NLRD3106	11081	CIRCULAR	18"	-	-	-	29	0.5%	7.8	1.5	1.6	1.5	1.6	1,526.5	1,526.4	1,533.7	1,533.2	1,527.0	1,526.7	1,527.0	1,526.8	1,527.0	1,526.7	1,527.0	1,526.8
NLRD3108	NLRD3107	10073	CIRCULAR	18"	-	-	-	344	2.1%	14.8	1.5	1.6	1.5	1.6	1,533.6	1,526.5	1,539.3	1,533.7	1,534.0	1,527.0	1,534.0	1,527.0	1,534.0	1,527.0	1,534.0	1,527.0
NLRD3200	NLRD3100	10411	CIRCULAR	24"	-	-	-	390	0.7%	19.4	2.1	2.3	2.2	2.4	1,505.0	1,502.3	1,508.6	1,507.7	1,505.4	1,503.2	1,505.5	1,503.2	1,505.5	1,503.2	1,505.5	1,503.3
NLRD3300	NLRD3200	10928	CIRCULAR	18"	-	-	-	20	2.0%	15.3	2.1	2.3	2.2	2.4	1,505.4	1,505.0	1,508.8	1,508.6	1,505.8	1,505.4	1,505.8	1,505.5	1,505.8	1,505.5	1,505.8	1,505.5
NLRD3301	NLRD3300	10412	CIRCULAR	18"	-	-	-	217	2.1%	15.9	1.1	1.2	1.2	1.3	1,510.0	1,505.4	1,515.1	1,508.8	1,510.3	1,505.8	1,510.3	1,505.8	1,510.3	1,505.8	1,510.3	1,505.8
NLRD3302	NLRD3301	11250	CIRCULAR	18"	-	-	-	33	1.3%	12.3	1.1	1.2	1.2	1.3	1,512.4	1,512.0	1,515.2	1,515.1	1,512.8	1,510.3	1,512.8	1,510.3	1,512.8	1,510.3	1,512.8	1,510.3
NLRD3303	NLRD3302	10085	CIRCULAR	18"	-	-	-	100	0.9%	10.1	1.1	1.2	1.2	1.3	1,513.3	1,512.4	1,518.6	1,515.2	1,513.7	1,512.8	1,513.7	1,512.8	1,513.7	1,512.8	1,513.7	1,512.8
NLRD3304	NLRD3303	11251	CIRCULAR	18"	-	-	-	98	0.9%	10.1	1.1	1.2	1.2	1.3	1,514.2	1,513.3	1,520.0	1,518.6	1,514.6	1,513.7	1,514.6	1,513.7	1,514.6	1,513.7	1,514.6	1,513.7
NLRD3500	NLRD3304	10768	CIRCULAR	18"	-	-	-	28	7.2%	27.8	1.1	1.2	1.2	1.3	1,516.3	1,514.2	1,520.5	1,520.0	1,516.5	1,514.6	1,516.5	1,514.6	1,516.5	1,514.6	1,516.5	1,514.6
NLRD3501	NLRD3500	11100	CIRCULAR	12"	-	-	-	199	2.1%	4.9	0.3	0.4	0.4	0.5	1,520.4	1,516.3	1,523.4	1,520.5	1,520.5	1,516.5	1,520.5	1,516.5	1,520.6	1,516.5	1,520.6	1,516.5
NLRD3400	NLRD3300	10766	CIRCULAR	18"	-	-	-	125	1.3%	11.4	1.0	1.1	1.0	1.1	1,507.0	1,505.4	1,509.5	1,508.8	1,507.3	1,505.8	1,507.3	1,505.8	1,507.3	1,505.8	1,507.3	1,505.8
NLRD3600	NLRD3500	11252	CIRCULAR	12"	-	-	-	69	2.9%	5.8	0.8	0.8	0.8	0.8	1,518.3	1,516.3	1,520.6	1,520.5	1,518.5	1,516.5	1,518.5	1,516.5	1,518.5	1,516.5	1,518.5	1,516.5
NLRE4001	NLRA4000	10752	CIRCULAR	12"	-	-	-	72	1.6%	4.4	4.1	4.4	4.1	4.4	1,514.2	1,513.1	1,518.7	1,518.4	1,515.0	1,513.9	1,515.0	1,514.0	1,515.8	1,514.6	1,516.3	1,514.7
NLRE4002	NLRE4001	10905	CIRCULAR	12"	-	-	-	157	0.4%	2.2	4.1	4.4	4.1	4.4	1,514.8	1,514.2	1,519.0	1,518.7	1,517.4	1,515.0	1,518.0	1,515.0	1,518.2	1,515.8	1,518.3	1,516.3
NLRE4003	NLRE4002	10740	CIRCULAR	12"	-	-	-	67	2.5%	5.7	2.6	2.8	2.6	2.8	1,516.5	1,514.8	1,522.8	1,519.0	1,517.4	1,517.4	1,517.9	1,518.0	1,518.6	1,518.2	1,519.1	1,518.3

Table B-2. Hydraulic Model Parameters and Results

Conduit			Conduit Attributes							Conduit Capacity (cfs)****	Peak flow values (cfs)				Invert elevation (ft)		Rim/Bank elevation (ft)		Maximum Hydraulic Grade Line (ft)							
											Existing		Future						Existing Conditions				Future Conditions			
																			10-yr, 24-hr		25-yr, 24-hr		10-yr, 24-hr		25-yr, 24-hr	
US node	DS node	Name	Type	Diameter (in)/ Width (ft)	Height (ft)	Left Channel Slope (H:V)	Right Channel Slope (H:V)	Conduit Length (ft)	Slope (%)		10-yr	25-yr	10-yr	25-yr	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
NLRE4004	NLRE4003	11233	CIRCULAR	12"	-	-	-	180	6.1%	8.7	2.6	2.8	2.6	2.8	1,527.5	1,516.5	1,532.7	1,522.8	1,527.9	1,517.4	1,527.9	1,517.9	1,527.9	1,518.6	1,527.9	1,519.1
NLRE4005	NLRE4004	10741	CIRCULAR	12"	-	-	-	119	0.5%	2.4	1.7	1.8	1.7	1.8	1,528.1	1,527.5	1,532.6	1,532.7	1,528.7	1,527.9	1,528.7	1,527.9	1,528.7	1,527.9	1,528.7	1,527.9
NLRE4006	NLRE4005	10561	CIRCULAR	12"	-	-	-	105	0.4%	2.3	1.7	1.8	1.7	1.8	1,528.5	1,528.1	1,532.0	1,532.6	1,529.1	1,528.7	1,529.2	1,528.7	1,529.1	1,528.7	1,529.2	1,528.7
NLRF5001	NLRA5000	10571	CIRCULAR	12"	-	-	-	467	2.5%	5.6	4.2	4.5	4.4	4.7	1,534.8	1,523.2	1,538.3	1,527.8	1,535.4	1,523.1	1,535.4	1,523.2	1,535.4	1,523.7	1,535.5	1,523.9
NLRF7001	NLRA7000	C5	TRAPEZOIDAL	10'	2'	0.3	0.5	780	4.3%	221.4	37.6	40.2	44.8	47.3	1,660.0	1,626.6	1,663.5	1,630.3	1,660.7	1,627.8	1,660.7	1,627.8	1,660.7	1,628.2	1,660.8	1,628.2
NLRF7002	NLRF7001	10723	CIRCULAR	42"	-	-	-	337	0.6%	76.6	28.3	30.1	32.6	34.2	1,662.0	1,660.0	1,671.3	1,663.5	1,663.5	1,660.7	1,663.6	1,660.7	1,663.6	1,660.7	1,663.7	1,660.8
NLRF7003	NLRF7002	10545	CIRCULAR	36"	-	-	-	296	4.4%	76.0	28.1	29.9	32.4	34.0	1,677.0	1,664.0	1,686.5	1,671.3	1,678.3	1,663.5	1,678.3	1,663.6	1,678.4	1,663.6	1,678.4	1,663.7
NLRF7004	NLRF7003	11044	CIRCULAR	36"	-	-	-	166	4.8%	79.8	27.9	29.7	32.3	33.8	1,687.0	1,679.0	1,694.5	1,686.5	1,688.2	1,678.3	1,688.3	1,678.3	1,688.3	1,678.4	1,688.4	1,678.4
NLRF7005	NLRF7004	10200	CIRCULAR	36"	-	-	-	154	3.9%	71.6	27.9	29.7	32.3	33.8	1,695.0	1,689.0	1,705.5	1,694.5	1,696.3	1,688.2	1,696.4	1,688.3	1,696.4	1,688.3	1,696.5	1,688.4
NLRF7006	NLRF7005	10703	CIRCULAR	30"	-	-	-	261	4.1%	45.0	27.9	29.7	32.4	33.9	1,707.5	1,696.8	1,713.0	1,705.5	1,708.9	1,696.3	1,709.0	1,696.4	1,709.1	1,696.4	1,709.1	1,696.5
NLRF7007	NLRF7006	11288	CIRCULAR	30"	-	-	-	225	1.6%	53.7	26.3	28.3	30.9	32.7	1,711.1	1,707.5	1,719.3	1,713.0	1,712.4	1,708.9	1,712.4	1,709.0	1,712.5	1,709.1	1,712.5	1,709.1
NLRF7100	NLRF7007	10616	CIRCULAR	30"	-	-	-	30	0.2%	20.6	30.9	33.4	35.6	37.8	1,711.2	1,711.1	1,719.0	1,719.3	1,713.3	1,712.4	1,713.4	1,712.4	1,713.5	1,712.5	1,713.5	1,712.5
NLRF7200	NLRF7100	11287	CIRCULAR	18"	-	-	-	10	2.0%	15.5	20.0	22.5	24.0	25.0	1,711.4	1,711.2	1,719.4	1,719.0	1,713.5	1,713.3	1,713.6	1,713.4	1,713.7	1,713.5	1,713.8	1,713.5
NLRF7201	NLRF7200	11289	CIRCULAR***	60"	-	-	-	128	1.8%	1,972.0	19.7	20.6	22.4	23.0	1,713.8	1,711.4	1,726.3	1,719.4	1,714.4	1,713.5	1,714.4	1,713.6	1,714.4	1,713.7	1,714.4	1,713.8
NLRF7400	NLRF7300	10121	CIRCULAR	15"	-	-	-	171	8.1%	19.0	7.6	8.3	9.9	10.6	1,764.8	1,751.1	1,768.6	1,753.1	1,765.4	1,751.8	1,765.4	1,751.9	1,765.5	1,756.5	1,765.6	1,758.8
NLRF7300	NLRF7201	10968	CIRCULAR	15"	-	-	-	299	9.5%	20.8	19.7	20.6	22.4	23.0	1,750.9	1,722.6	1,753.1	1,726.3	1,751.8	1,714.4	1,751.9	1,714.4	1,756.5	1,714.4	1,758.8	1,714.4
NLRF7301	NLRF7300	11290	CIRCULAR	12"	-	-	-	52	-1.8%	5.0	8.1	8.2	8.2	8.3	1,750.1	1,751.1	1,754.3	1,753.1	1,754.6	1,751.8	1,754.6	1,751.9	1,756.5	1,756.5	1,758.9	1,758.8
NLRF7302	NLRF7301	11136	CIRCULAR	12"	-	-	-	148	7.9%	10.5	12.2	12.6	14.0	14.7	1,761.8	1,750.1	1,765.7	1,754.3	1,770.7	1,754.6	1,771.6	1,754.6	1,776.1	1,756.5	1,779.2	1,758.9
NLRF7303	NLRF7302	10123	CIRCULAR	12"	-	-	-	175	13.0%	13.3	12.3	12.6	14.0	14.4	1,784.6	1,762.0	1,788.4	1,765.7	1,789.9	1,770.7	1,791.9	1,771.6	1,800.8	1,776.1	1,805.5	1,779.2
NLRF7304	NLRF7303	11137	CIRCULAR	12"	-	-	-	57	10.8%	12.2	12.4	12.7	14.0	14.4	1,791.0	1,784.8	1,794.7	1,788.4	1,796.1	1,789.9	1,798.5	1,791.9	1,808.9	1,800.8	1,814.2	1,805.5
NLRF7305	NLRF7304	11293	CIRCULAR	12"	-	-	-	146	9.2%	11.2	10.9	11.3	12.5	12.9	1,804.5	1,791.2	1,808.2	1,794.7	1,808.6	1,796.1	1,812.0	1,798.5	1,825.4	1,808.9	1,831.5	1,814.2
NLRF7306	NLRF7305	10971	CIRCULAR	12"	-	-	-	217	7.7%	10.3	10.9	11.4	13.0	13.4	1,821.4	1,804.7	1,825.4	1,808.2	1,827.4	1,808.6	1,832.3	1,812.0	1,850.8	1,825.4	1,858.4	1,831.5
NLRF7307	NLRF7306	10623	CIRCULAR	12"	-	-	-	70	4.6%	7.9	11.1	11.8	13.7	14.4	1,824.8	1,821.6	1,828.5	1,825.4	1,833.5	1,827.4	1,839.0	1,832.3	1,859.4	1,850.8	1,867.7	1,858.4
NLRF7308	NLRF7307	10625	CIRCULAR	12"	-	-	-	67	6.8%	9.6	11.4	12.2	14.3	15.2	1,829.6	1,825.0	1,833.3	1,828.5	1,839.5	1,833.5	1,845.7	1,839.0	1,868.3	1,859.4	1,877.3	1,867.7
NLRF7309	NLRF7308	11294	CIRCULAR	12"	-	-	-	51	11.4%	12.5	11.6	12.6	15.0	16.0	1,835.5	1,829.8	1,839.2	1,833.3	1,844.3	1,839.5	1,851.1	1,845.7	1,875.6	1,868.3	1,885.4	1,877.3
NLRF7101	NLRF7100	10965	CIRCULAR	12"	-	-	-	26	0.8%	3.3	6.6	7.1	7.8	8.3	1,715.7	1,715.5	1,718.8	1,719.0	1,717.5	1,713.3	1,717.6	1,713.4	1,717.8	1,713.5	1,717.9	1,713.5
NLRF7102	NLRF7101	10617	CIRCULAR	12"	-	-	-	36	1.6%	4.5	6.6	7.1	7.8	8.3	1,716.3	1,715.7	1,720.1	1,718.8	1,718.6	1,717.5	1,719.3	1,717.6	1,719.4	1,717.8	1,719.8	1,717.9
NLRF7500	NLRF7102	10621	CIRCULAR	12"	-	-	-	361	10.0%	11.8	5.1	5.5	5.8	6.2	1,752.0	1,716.3	1,760.7	1,720.1	1,752.5	1,718.6	1,752.5	1,719.3	1,752.5	1,719.4	1,752.5	1,719.8
NLRF7501	NLRF7500	10293	CIRCULAR	12"	-	-	-	165	0.9%	3.5	3.0	3.3	3.7	3.9	1,753.6	1,752.2	1,759.4	1,760.7	1,754.4	1,752.5	1,754.4	1,752.5	1,754.5	1,752.5	1,754.9	1,752.5
NLRF7502	NLRF7501	10128	CIRCULAR	12"	-	-	-	31	9.7%	11.6	3.0	3.3	3.7	3.9	1,756.7	1,753.6	1,760.2	1,759.4	1,757.0	1,754.4	1,757.0	1,754.4	1,757.0	1,754.5	1,757.1	1,754.9
NLRF7503	NLRF7502	11296	CIRCULAR	12"	-	-	-	326	12.4%	13.1	3.0	3.3	3.7	3.9	1,796.9	1,756.9	1,804.5	1,760.2	1,797.3	1,757.0	1,797.3	1,757.0	1,797.3	1,757.0	1,797.3	1,757.1
NLRF7700	NLRF7503	C74662	CIRCULAR	12"	-	-	-	8	6.4%	9.2	3.0	3.3	3.7	3.9	1,797.7	1,797.2	1,805.6	1,804.5	1,798.1	1,797.3	1,798.1	1,797.3	1,798.2	1,797.3	1,798.2	1,797.3
NLRF7701	NLRF7700	10811	CIRCULAR	12"	-	-	-	12	24.0%	18.0	1.1	1.2	1.3	1.4	1,800.1	1,797.4	1,804.5	1,805.6	1,800.3	1,798.1	1,800.3	1,798.1	1,800.3	1,798.2	1,800.3	1,798.2
NLRF7702	NLRF7701	11143	CIRCULAR	12"	-	-	-	30	2.7%	6.0	1.1	1.2	1.3	1.4	1,801.1	1,800.3	1,805.3	1,804.5	1,801.4	1,800.3	1,801.4	1,800.3	1,801.4	1,800.3	1,801.4	1,800.3
NLRF7703	NLRF7702	11206	CIRCULAR	12"	-	-	-	346	15.2%	15.4	1.1	1.2	1.3	1.4	1,853.4	1,801.3	1,856.9	1,805.3	1,853.6	1,801.4	1,853.6	1,801.4	1,853.6	1,801.4	1,853.6	1,801.4
NLRF7600	NLRF7500	11138	CIRCULAR	12"	-	-	-	14	0.7%	3.1	2.1	2.2	2.1	2.3	1,752.8	1,752.7	1,760.6	1,760.7	1,753.4	1,752.5	1,753.4	1,752.5	1,753.4	1,752.5	1,753.4	1,752.5
NLRF7601	NLRF7600	10809	CIRCULAR	12"	-	-	-	184	5.9%	9.0	2.1	2.2	2.1	2.3	1,766.6	1,755.7	1,770.7	1,760.6	1,767.0	1,753.4	1,767.0	1,753.4	1,767.0	1,753.4	1,767.0	1,753.4
NLRF7602	NLRF7601	10287	CIRCULAR	12"	-	-	-	98	8.2%	10.4	2.1	2.2	2.1	2.3	1,774.8	1,766.8	1,780.0	1,770.7	1,775.1	1,767.0	1,775.2	1,767.0	1,775.1	1,767.0	1,775.2	1,767.0
NLRF7800	NLRF7700	10622	CIRCULAR	60"	-	-	-	128	0.2%	38.8	1.9	2.1	2.4	2.6	1,797.5	1,797.3	1,810.5	1,805.6	1,798.2	1,798.1	1,798.3	1,798.1	1,798.3	1,798.2	1,798.3	1,798.2
NLRF7801	NLRF7800	10290	CIRCULAR	12"	-	-	-	201	1.9%	5.1	1.9	2.1	2.4	2.6	1,810.8	1,807.0	1,814.3	1,810.5	1,811.3	1,798.2	1,811.3	1,798.3	1,811.3	1,798.3	1,811.3	1,798.3
Larson Creek - Main Stem from North Fork to N. Phoenix Road Appendix A, Maps # 7, 8 & 9																										
LRA11001	LRA11000	CJ8346.087	IRREGULAR	See model for channel cross-section				533	0.5%	-	507.4	574.0	515.0	582.6	1,477.6	1,475.0	1,491.0	1,488.4	1,482.9	1,478.5	1,483.2	1,478.7	1,483.0	1,478.6	1,483.2	1,478.9
LRA11002	LRA11001	CJ8750.255	IRREGULAR	See model for channel cross-section				404	2.0%	-	507.3	574.1	514.7	582.4	1,485.6	1,477.6	1,497.4	1,491.0	1,488.9	1,482.9	1,489.1	1,483.2	1,488.9	1,483.0	1,489.1	1,483.2
LRA11003	LRA11002	CJ8939.298	IRREGULAR	See model for channel cross-section				189	0.9%	-	507.3	574.1	514.7	582.4	1,487.3	1,485.6	1,497.9	1,497.4	1,491.4	1,488.9	1,491.5	1,489.1	1,491.4	1,488.9	1,491.6	1,489.1
LRA12000	LRA11003	CJ8959.519	IRREGULAR	See model for channel cross-section				38	-2.3%	-	506.2	572.9	513.5	581.1	1,486.4	1,487.3	1,497.0	1,497.9	1,492.1	1,491.4	1,492.3	1,491.5	1,492.1	1,491.4	1,492.3	1,491.6
LRA13000	LRA12000	GolfViewCulvert	BOX	20'	5'	-	-	67	5.6%	1,397.4	503.1	569.3	510.0	577.4	1,490.2	1,486.4	1,498.0	1,497.0	1,492.2	1,492.1	1,492.5	1,492.3	1,492.2	1,492.1	1,492.5	1,492.3
LRA13001	LRA13000	CJ9076.355	IRREGULAR	See model for channel cross-section				34	-1.4%	-	502.3	568.4	509.2	576.5	1,489.7	1,490.2	1,500.3	1,498.0	1,493.7	1,492.2	1,493.9	1,492.5	1,493.8	1,492.2	1,494.0	1,492.5
LRA14000	LRA13001	CJ9498.722_2	IRREGULAR	See model for channel cross-section				283	1.8%	-	502.3	568.4	509.2	576.5	1,494.8	1,489.7	1,507.8	1,500.3	1,497.9	1,493.7	1,498.0	1,493.9	1,497.9	1,493.8	1,498.1	1,494.0
LRA15000	LRA14000	CJ9498.722_4	IRREGULAR	See model for channel cross-section				61	1.8%	-	501.7	567.8	508.5	575.9	1,495.8	1,494.8	1,509.4	1,507.8	1,498.9	1,497.9	1,499.1	1,498.0	1,499.0	1,497.9	1,499.1	1,498.1

Table B-2. Hydraulic Model Parameters and Results

Conduit			Conduit Attributes							Conduit Capacity (cfs)****	Peak flow values (cfs)				Invert elevation (ft)		Rim/Bank elevation (ft)		Maximum Hydraulic Grade Line (ft)							
											Existing		Future						Existing Conditions				Future Conditions			
																			10-yr, 24-hr		25-yr, 24-hr		10-yr, 24-hr		25-yr, 24-hr	
US node	DS node	Name	Type	Diameter (in)/ Width (ft)	Height (ft)	Left Channel Slope (H:V)	Right Channel Slope (H:V)	Conduit Length (ft)	Slope (%)		10-yr	25-yr	10-yr	25-yr	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
LRA15001	LRA15000	CJ9498.722_3	IRREGULAR	See model for channel cross-section				79	1.8%	-	501.5	567.6	508.3	575.6	1,497.2	1,495.8	1,511.5	1,509.4	1,500.3	1,498.9	1,500.5	1,499.1	1,500.4	1,499.0	1,500.5	1,499.1
LRA16000	LRA15001	CJ9936.033_2	IRREGULAR	See model for channel cross-section				258	1.7%	-	501.5	567.6	508.3	575.6	1,501.6	1,497.2	1,514.4	1,511.5	1,505.7	1,500.3	1,506.0	1,500.5	1,505.8	1,500.4	1,506.1	1,500.5
LRA17000	LRA16000	CJ9936.033_4	IRREGULAR	See model for channel cross-section				40	1.7%	-	501.0	567.0	507.7	575.0	1,502.3	1,501.6	1,514.9	1,514.4	1,506.4	1,505.7	1,506.7	1,506.0	1,506.4	1,505.8	1,506.7	1,506.1
LRA17001	LRA17000	CJ9936.033_3	IRREGULAR	See model for channel cross-section				139	1.7%	-	500.7	566.7	507.5	574.7	1,504.7	1,502.3	1,516.5	1,514.9	1,508.8	1,506.4	1,509.0	1,506.7	1,508.8	1,506.4	1,509.1	1,506.7
LRA18000	LRA17001	CJ10222.18_2	IRREGULAR	See model for channel cross-section				169	1.8%	-	500.2	566.1	506.9	574.0	1,507.7	1,504.7	1,522.7	1,516.5	1,511.9	1,508.8	1,512.2	1,509.0	1,512.0	1,508.8	1,512.2	1,509.1
LRA18001	LRA18000	CJ10222.18_1	IRREGULAR	See model for channel cross-section				117	1.8%	-	499.7	565.5	506.3	573.3	1,509.9	1,507.7	1,523.7	1,522.7	1,514.1	1,511.9	1,514.3	1,512.2	1,514.1	1,512.0	1,514.3	1,512.2
LRA19000	LRA18001	CJ10486.28_4	IRREGULAR	See model for channel cross-section				33	2.4%	-	499.7	565.5	506.3	573.3	1,510.6	1,509.9	1,524.2	1,523.7	1,514.8	1,514.1	1,515.1	1,514.3	1,514.8	1,514.1	1,515.1	1,514.3
LRA20000	LRA19000	CJ10486.28_3	IRREGULAR	See model for channel cross-section				188	2.4%	-	498.3	563.9	504.9	571.7	1,515.2	1,510.6	1,526.9	1,524.2	1,519.3	1,514.8	1,519.6	1,515.1	1,519.3	1,514.8	1,519.6	1,515.1
LRA20001	LRA20000	CJ10486.28_1	IRREGULAR	See model for channel cross-section				44	2.4%	-	496.8	562.3	503.4	570.0	1,516.2	1,515.2	1,527.5	1,526.9	1,520.3	1,519.3	1,520.6	1,519.6	1,520.4	1,519.3	1,520.6	1,519.6
LRA21000	LRA20001	CJ10880.7_2	IRREGULAR	See model for channel cross-section				104	0.7%	-	496.8	562.3	503.4	570.0	1,516.9	1,516.2	1,529.4	1,527.5	1,522.2	1,520.3	1,522.5	1,520.6	1,522.2	1,520.4	1,522.5	1,520.6
LRA21001	LRA21000	CJ10880.7_1	IRREGULAR	See model for channel cross-section				291	0.7%	-	496.2	561.6	502.8	569.3	1,519.0	1,516.9	1,534.6	1,529.4	1,524.8	1,522.2	1,525.1	1,522.5	1,524.9	1,522.2	1,525.2	1,522.5
LRA21002	LRA21001	CJ10901.17	IRREGULAR	See model for channel cross-section				20	8.3%	-	495.8	561.1	502.3	568.7	1,520.7	1,519.0	1,534.7	1,534.6	1,524.4	1,524.8	1,524.7	1,525.1	1,524.5	1,524.9	1,524.8	1,525.2
LRA22000	LRA21002	64020	IRREGULAR	See model for channel cross-section				12	0.0%	-	495.8	561.1	502.3	568.7	1,520.7	1,520.7	1,532.8	1,534.7	1,524.7	1,524.4	1,525.0	1,524.7	1,524.8	1,524.5	1,525.1	1,524.8
LRA22001	LRA22000	CJ10963.82	BOX	8'	5'	-	-	51	-0.7%	520.3	494.3	559.4	500.8	567.0	1,520.3	1,520.7	1,535.0	1,532.8	1,525.0	1,524.7	1,525.3	1,525.0	1,525.1	1,524.8	1,525.4	1,525.1
LRA22002	LRA22001	CJ10974.94	IRREGULAR	See model for channel cross-section				11	8.7%	-	494.3	559.4	500.8	567.0	1,521.3	1,520.3	1,534.4	1,535.0	1,524.9	1,525.0	1,525.2	1,525.3	1,525.0	1,525.1	1,525.2	1,525.4
LRA23000	LRA22002	CJ11439.39_2	IRREGULAR	See model for channel cross-section				372	2.5%	-	494.3	559.4	500.8	567.0	1,530.6	1,521.3	1,539.8	1,534.4	1,534.5	1,524.9	1,534.7	1,525.2	1,534.5	1,525.0	1,534.7	1,525.2
LRA23001	LRA23000	CJ11439.39_1	IRREGULAR	See model for channel cross-section				79	2.9%	-	492.0	556.7	498.1	563.8	1,532.9	1,530.6	1,541.2	1,539.8	1,536.7	1,534.5	1,536.9	1,534.7	1,536.7	1,534.5	1,536.9	1,534.7
LRA24000	LRA23001	C4	IRREGULAR	See model for channel cross-section				95	1.1%	-	492.0	556.7	498.1	563.8	1,533.9	1,532.9	1,545.6	1,541.2	1,538.4	1,536.7	1,538.6	1,536.9	1,538.4	1,536.7	1,538.7	1,536.9
Larson Creek - Storm Drains Contributing to the Main Stem from North Fork to N. Phoenix Road Appendix A, Maps # 8 & 9																										
LRM12100	LRA12000	1018	CIRCULAR	24"	-	-	-	133	1.7%	30.7	9.8	10.6	9.8	10.6	1,492.3	1,490.0	1,497.7	1,497.0	1,493.1	1,492.1	1,493.1	1,492.3	1,493.1	1,492.1	1,493.1	1,492.3
LRM12101	LRM12100	10959	CIRCULAR	24"	-	-	-	181	0.6%	18.3	8.1	8.7	8.1	8.7	1,493.4	1,492.3	1,498.7	1,497.7	1,494.3	1,493.1	1,494.4	1,493.1	1,494.3	1,493.1	1,494.4	1,493.1
LRM12300	LRM12101	11276_2	CIRCULAR	24"	-	-	-	156	2.6%	38.3	8.1	8.7	8.1	8.7	1,497.4	1,493.4	1,502.0	1,498.7	1,498.0	1,494.3	1,498.1	1,494.4	1,498.0	1,494.3	1,498.1	1,494.4
LRM12301	LRM12300	11276_1	CIRCULAR	24"	-	-	-	283	2.6%	37.1	5.9	6.4	5.9	6.4	1,504.7	1,497.4	1,509.0	1,502.0	1,505.3	1,498.0	1,505.3	1,498.1	1,505.3	1,498.0	1,505.3	1,498.1
LRM12302	LRM12301	10942	CIRCULAR	18"	-	-	-	69	2.0%	15.2	5.9	6.4	5.9	6.4	1,506.1	1,504.7	1,510.0	1,509.0	1,506.8	1,505.3	1,506.8	1,505.3	1,506.8	1,505.3	1,506.8	1,505.3
LRM12500	LRM12302	11283	CIRCULAR	18"	-	-	-	262	1.5%	13.5	4.2	4.5	4.2	4.5	1,510.2	1,506.1	1,515.1	1,510.0	1,510.7	1,506.8	1,510.8	1,506.8	1,510.7	1,506.8	1,510.8	1,506.8
LRM12600	LRM12500	10610	CIRCULAR	15"	-	-	-	54	1.1%	7.2	2.3	2.5	2.3	2.5	1,510.8	1,510.2	1,514.6	1,515.1	1,511.3	1,510.7	1,511.3	1,510.8	1,511.3	1,510.7	1,511.3	1,510.8
LRM12601	LRM12600	10802	CIRCULAR	15"	-	-	-	230	1.3%	7.7	2.3	2.5	2.3	2.5	1,513.7	1,510.8	1,517.0	1,514.6	1,514.2	1,511.3	1,514.2	1,511.3	1,514.2	1,511.3	1,514.2	1,511.3
LRM12602	LRM12601	10803	CIRCULAR	15"	-	-	-	300	1.2%	7.2	2.3	2.5	2.3	2.5	1,517.3	1,513.7	1,521.0	1,517.0	1,517.7	1,514.2	1,517.8	1,514.2	1,517.7	1,514.2	1,517.8	1,514.2
LRM12603	LRM12602	11133	CIRCULAR	12"	-	-	-	433	1.6%	4.5	0.8	0.8	0.8	0.8	1,524.0	1,517.3	1,527.2	1,521.0	1,524.3	1,517.7	1,524.3	1,517.8	1,524.3	1,517.7	1,524.3	1,517.8
LRM12200	LRM12100	10595	CIRCULAR	15"	-	-	-	83	1.4%	7.7	1.8	1.9	1.8	1.9	1,494.1	1,493.0	1,497.3	1,497.7	1,494.5	1,493.1	1,494.6	1,493.1	1,494.5	1,493.1	1,494.6	1,493.1
LRM12201	LRM12200	10424	CIRCULAR	15"	-	-	-	39	1.1%	6.8	1.8	1.9	1.8	1.9	1,494.6	1,494.1	1,497.6	1,497.3	1,495.0	1,494.5	1,495.0	1,494.6	1,495.0	1,494.5	1,495.0	1,494.6
LRM12202	LRM12201	10264	CIRCULAR	12"	-	-	-	125	1.5%	4.5	1.1	1.2	1.1	1.2	1,496.4	1,494.6	1,499.2	1,497.6	1,496.8	1,495.0	1,496.8	1,495.0	1,496.8	1,495.0	1,496.8	1,495.0
LRM12400	LRM12300	10943	CIRCULAR	15"	-	-	-	68	0.9%	6.3	1.2	1.3	1.2	1.3	1,499.4	1,498.7	1,502.3	1,502.0	1,499.7	1,498.0	1,499.7	1,498.1	1,499.7	1,498.0	1,499.7	1,498.1
LRM12401	LRM12400	10777	CIRCULAR	15"	-	-	-	32	2.8%	10.9	1.2	1.3	1.2	1.3	1,500.3	1,499.4	1,503.3	1,502.3	1,500.5	1,499.7	1,500.5	1,499.7	1,500.5	1,499.7	1,500.5	1,499.7
LRM12402	LRM12401	10775	CIRCULAR	12"	-	-	-	291	1.9%	4.7	0.7	0.7	0.7	0.7	1,506.2	1,500.8	1,508.7	1,503.3	1,506.4	1,500.5	1,506.5	1,500.5	1,506.4	1,500.5	1,506.5	1,500.5
LRM12501	LRM12500	10611	CIRCULAR	12"	-	-	-	347	1.9%	4.9	0.8	0.9	0.8	0.9	1,516.7	1,510.2	1,520.4	1,515.1	1,517.0	1,510.7	1,517.0	1,510.8	1,517.0	1,510.7	1,517.0	1,510.8
LRN13001	LRA13000	1032	CIRCULAR	24"	-	-	-	136	1.7%	31.1	2.5	2.7	2.5	2.7	1,492.5	1,490.2	1,496.8	1,498.0	1,492.9	1,492.2	1,492.9	1,492.5	1,492.9	1,492.2	1,492.9	1,492.5
LRN13002	LRN13001	11277	CIRCULAR	24"	-	-	-	86	0.6%	17.8	2.5	2.7	2.5	2.7	1,493.0	1,492.5	1,497.3	1,496.8	1,493.5	1,492.9	1,493.5	1,492.9	1,493.5	1,492.9	1,493.5	1,492.9
LRN13003	LRN13002	11097	CIRCULAR	24"	-	-	-	96	3.1%	36.3	1.5	1.6	1.5	1.6	1,496.0	1,493.0	1,499.4	1,497.3	1,496.3	1,493.5	1,496.3	1,493.5	1,496.3	1,493.5	1,496.3	1,493.5
LRN13004	LRN13003	11249	CIRCULAR	15"	-	-	-	108	1.9%	9.1	1.5	1.6	1.5	1.6	1,498.0	1,496.0	1,501.9	1,499.4	1,498.4	1,496.3	1,498.4	1,496.3	1,498.4	1,496.3	1,498.4	1,496.3
LRN13005	LRN13004	10083	CIRCULAR	12"	-	-	-	324	0.7%	2.9	0.8	0.8	0.8	0.8	1,500.5	1,498.3	1,503.6	1,501.9	1,500.9	1,498.4	1,500.9	1,498.4	1,500.9	1,498.4	1,500.9	1,498.4
LRO14001	LRA14000	C64114	CIRCULAR	12"	-	-	-	153	2.3%	5.4	1.7	1.8	1.7	1.8	1,505.5	1,502.0	1,508.5	1,507.8	1,505.9	1,497.9	1,505.9	1,498.0	1,505.9	1,497.9	1,505.9	1,498.1
LRO14002	LRO14001	11098	CIRCULAR	12"	-	-	-	40	0.5%	2.5	0.8	0.9	0.8	0.9	1,505.7	1,505.5	1,508.3	1,508.5	1,506.1	1,505.9	1,506.1	1,505.9	1,506.1	1,505.9	1,506.1	1,505.9
LRO14003	LRO14002	1005	CIRCULAR	12"	-	-	-	202	1.1%	3.8	0.8	0.9	0.8	0.9	1,508.0	1,505.7	1,511.6	1,508.3	1,508.3	1,506.1	1,508.3	1,506.1	1,508.3	1,506.1	1,508.3	1,506.1
LRO14004	LRO14003	10414	CIRCULAR	12"	-	-	-	178	1.1%	3.8	0.8	0.9	0.8	0.9	1,510.0	1,508.0	1,513.2	1,511.6	1,510.3	1,508.3	1,510.3	1,508.3	1,510.3	1,508.3	1,510.3	1,508.3
LRP15001	LRA15000	10103	CIRCULAR	12"	-	-	-	139	3.4%	6.7	0.7	0.7	0.7	0.7	1,502.3	1,497.5	1,504.9	1,509.4	1,502.5	1,498.9	1,502.5	1,499.1	1,502.5	1,499.0	1,502.5	1,499.1
LRQ16001	LRA16000	1046	CIRCULAR	12"	-	-	-	148	2.3%	5.6	1.7	1.9	1.7	1.9	1,511.4	1,508.0	1,514.5	1,514.4	1,511.8	1,505.7	1,511.8	1,506.0	1,511.8	1,505.8	1,511.8	1,506.1
LRQ16002	LRQ16001	10779	CIRCULAR	15"	-	-	-	43	0.6%	5.1	0.7	0.7	0.7	0.7	1,511.7	1,511.4	1,513.9	1,514.5	1,512.0	1,511.8	1,512.0	1,511.8	1,512.0	1,511.8	1,512.0	1,511.8
LRQ16003	LRQ16002	1096	CIRCULAR	12"	-	-	-	151	5.2%	8.3	0.7	0.7	0.7	0.7	1,519.5	1,511.7	1,522.0	1,513.9	1,519.7	1,512.0	1,519.7	1,512.0	1,519.7	1,512.0	1,519.7	1,512.0

Table B-2. Hydraulic Model Parameters and Results

Conduit			Conduit Attributes							Conduit Capacity (cfs)****	Peak flow values (cfs)				Invert elevation (ft)		Rim/Bank elevation (ft)		Maximum Hydraulic Grade Line (ft)							
											Existing		Future						Existing Conditions				Future Conditions			
																			10-yr, 24-hr		25-yr, 24-hr		10-yr, 24-hr		25-yr, 24-hr	
US node	DS node	Name	Type	Diameter (in)/ Width (ft)	Height (ft)	Left Channel Slope (H:V)	Right Channel Slope (H:V)	Conduit Length (ft)	Slope (%)		10-yr	25-yr	10-yr	25-yr	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
LRR17001	LRA17000	11266	CIRCULAR	12"	-	-	-	131	2.8%	5.9	0.8	0.8	0.8	0.8	1,508.2	1,504.5	1,510.9	1,514.9	1,508.4	1,506.4	1,508.4	1,506.7	1,508.4	1,506.4	1,508.4	1,506.7
LRR17002	LRR17001	10102	CIRCULAR	12"	-	-	-	85	1.0%	3.5	0.8	0.8	0.8	0.8	1,509.0	1,508.2	1,511.7	1,510.9	1,509.3	1,508.4	1,509.4	1,508.4	1,509.3	1,508.4	1,509.4	1,508.4
LRS18001	LRA18000	1019	CIRCULAR	15"	-	-	-	328	2.5%	10.5	1.8	1.9	1.8	1.9	1,515.3	1,507.0	1,520.2	1,522.7	1,515.7	1,511.9	1,515.7	1,512.2	1,515.7	1,512.0	1,515.7	1,512.2
LRT19001	LRA19000	1007	CIRCULAR	12"	-	-	-	187	2.1%	5.4	4.4	4.7	4.4	4.7	1,519.0	1,515.0	1,521.4	1,524.2	1,519.7	1,514.8	1,519.7	1,515.1	1,519.7	1,514.8	1,519.7	1,515.1
LRT19002	LRT19001	10104	CIRCULAR	15"	-	-	-	41	0.4%	4.3	3.5	3.7	3.5	3.7	1,519.2	1,519.0	1,521.7	1,521.4	1,519.9	1,519.7	1,520.0	1,519.7	1,519.9	1,519.7	1,520.0	1,519.7
LRT19003	LRT19002	10425	CIRCULAR	15"	-	-	-	65	0.6%	5.0	3.5	3.7	3.5	3.7	1,519.6	1,519.2	1,523.1	1,521.7	1,520.3	1,519.9	1,520.4	1,520.0	1,520.3	1,519.9	1,520.4	1,520.0
LRT19004	LRT19003	10265	CIRCULAR	12"	-	-	-	156	3.6%	6.8	3.5	3.7	3.5	3.7	1,525.2	1,519.6	1,527.3	1,523.1	1,525.7	1,520.3	1,525.7	1,520.4	1,525.7	1,520.3	1,525.7	1,520.4
LRT19005	LRT19004	10257	CIRCULAR	12"	-	-	-	84	2.1%	5.2	3.5	3.7	3.5	3.7	1,527.0	1,525.2	1,529.0	1,527.3	1,527.6	1,525.7	1,527.6	1,525.7	1,527.6	1,525.7	1,527.6	1,525.7
LRT19006	LRT19005	10092	CIRCULAR	12"	-	-	-	347	2.0%	5.1	1.9	2.1	1.9	2.1	1,534.0	1,527.0	1,536.6	1,529.0	1,534.4	1,527.6	1,534.4	1,527.6	1,534.4	1,527.6	1,534.4	1,527.6
LRU20001	LRA20000	1021	CIRCULAR	15"	-	-	-	143	4.1%	13.6	4.5	4.8	4.5	4.8	1,521.9	1,516.0	1,524.5	1,526.9	1,522.4	1,519.3	1,522.4	1,519.6	1,522.4	1,519.3	1,522.4	1,519.6
LRU20002	LRU20001	10937	CIRCULAR	18"	-	-	-	53	0.6%	8.0	3.7	4.0	3.7	4.0	1,522.2	1,521.9	1,524.8	1,524.5	1,522.9	1,522.4	1,523.0	1,522.4	1,522.9	1,522.4	1,523.0	1,522.4
LRU20100	LRU20002	10093	CIRCULAR	18"	-	-	-	280	0.6%	8.5	3.0	3.2	3.0	3.2	1,523.9	1,522.2	1,526.5	1,524.8	1,524.5	1,522.9	1,524.5	1,523.0	1,524.5	1,522.9	1,524.5	1,523.0
LRU20200	LRU20100	10094	CIRCULAR	12"	-	-	-	258	1.2%	4.0	1.1	1.2	1.1	1.2	1,527.3	1,524.2	1,530.0	1,526.5	1,527.7	1,524.5	1,527.7	1,524.5	1,527.7	1,524.5	1,527.7	1,524.5
LRU20101	LRU20100	10804	CIRCULAR	15"	-	-	-	203	1.2%	7.3	1.2	1.3	1.2	1.3	1,526.4	1,523.9	1,529.0	1,526.5	1,526.7	1,524.5	1,526.8	1,524.5	1,526.7	1,524.5	1,526.8	1,524.5
LRV21001	LRA21000	1097	CIRCULAR	12"	-	-	-	197	1.2%	4.0	1.9	2.0	1.9	2.0	1,524.3	1,522.0	1,526.7	1,529.4	1,524.8	1,522.2	1,524.8	1,522.5	1,524.8	1,522.2	1,524.8	1,522.5
LRV21002	LRV21001	11257	CIRCULAR	12"	-	-	-	58	0.7%	3.0	1.3	1.4	1.3	1.4	1,524.7	1,524.3	1,527.2	1,526.7	1,525.2	1,524.8	1,525.2	1,524.8	1,525.2	1,524.8	1,525.2	1,524.8
LRW22001	LRA22000	1048	CIRCULAR	15"	-	-	-	166	3.6%	12.8	2.8	3.0	2.8	3.0	1,529.0	1,523.0	1,531.5	1,532.8	1,529.4	1,524.7	1,529.4	1,525.0	1,529.4	1,524.8	1,529.4	1,525.1
LRW22002	LRW22001	11111	CIRCULAR	18"	-	-	-	59	0.8%	9.7	2.8	3.0	2.8	3.0	1,529.5	1,529.0	1,532.0	1,531.5	1,530.1	1,529.4	1,530.1	1,529.4	1,530.1	1,529.4	1,530.1	1,529.4
LRX22001	LRA22000	1008	CIRCULAR	12"	-	-	-	171	0.1%	1.3	1.8	1.9	1.8	1.9	1,531.2	1,531.0	1,533.5	1,532.8	1,532.1	1,524.7	1,532.2	1,525.0	1,532.1	1,524.8	1,532.2	1,525.1
LRX22002	LRX22001	10259	CIRCULAR	12"	-	-	-	276	0.7%	3.0	1.2	1.3	1.2	1.3	1,533.0	1,531.2	1,535.5	1,533.5	1,533.5	1,532.1	1,533.5	1,532.2	1,533.5	1,532.1	1,533.5	1,532.2
LRY23001	LRA23000	a	CIRCULAR	12"	-	-	-	6	4.3%	7.5	3.2	3.2	3.2	3.3	1,532.4	1,532.1	1,537.4	1,539.8	1,534.5	1,534.5	1,534.8	1,534.7	1,534.6	1,534.5	1,534.8	1,534.7
LRY23002	LRY23001	11262	CIRCULAR	12"	-	-	-	54	4.3%	8.0	0.9	1.0	0.9	1.0	1,534.7	1,532.4	1,540.7	1,537.4	1,534.9	1,534.5	1,534.9	1,534.8	1,534.9	1,534.6	1,534.9	1,534.8
LRY23003	LRY23002	11115	CIRCULAR	12"	-	-	-	157	0.4%	2.3	0.9	1.0	0.9	1.0	1,535.5	1,534.9	1,539.7	1,540.7	1,535.9	1,534.9	1,536.0	1,534.9	1,536.0	1,534.9	1,536.0	1,534.9
LRY23004	LRY23003	10262	CIRCULAR	12"	-	-	-	28	0.4%	2.3	0.9	1.0	0.9	1.0	1,535.8	1,535.7	1,539.7	1,539.7	1,536.2	1,535.9	1,536.3	1,536.0	1,536.3	1,536.0	1,536.3	1,536.0
LRY23005	LRY23004	10594	CIRCULAR	12"	-	-	-	30	0.4%	2.1	0.9	1.0	0.9	1.0	1,536.1	1,536.0	1,539.7	1,539.7	1,536.6	1,536.2	1,536.6	1,536.3	1,536.6	1,536.3	1,536.6	1,536.3
LRY23006	LRY23005	10931	CIRCULAR	12"	-	-	-	175	0.5%	2.5	0.9	1.0	0.9	1.0	1,537.8	1,536.9	1,541.0	1,539.7	1,538.2	1,536.6	1,538.2	1,536.6	1,538.2	1,536.6	1,538.2	1,536.6
LRY23007	LRY23006	10253	CIRCULAR	12"	-	-	-	39	0.5%	2.5	0.9	1.0	0.9	1.0	1,538.2	1,538.0	1,541.2	1,541.0	1,538.6	1,538.2	1,538.6	1,538.2	1,538.6	1,538.2	1,538.6	1,538.2
LRY23008	LRY23007	11107	CIRCULAR	12"	-	-	-	38	2.1%	5.2	0.9	1.0	0.9	1.0	1,539.2	1,538.4	1,542.2	1,541.2	1,539.5	1,538.6	1,539.5	1,538.6	1,539.5	1,538.6	1,539.5	1,538.6
LRY23009	LRY23008	10769	CIRCULAR	12"	-	-	-	48	0.4%	2.3	0.9	1.0	0.9	1.0	1,539.6	1,539.4	1,543.4	1,542.2	1,540.0	1,539.5	1,540.0	1,539.5	1,540.0	1,539.5	1,540.0	1,539.5
LRY23010	LRY23009	10416	CIRCULAR	12"	-	-	-	130	3.9%	7.4	0.9	1.0	0.9	1.0	1,544.8	1,539.8	1,548.8	1,543.4	1,545.1	1,540.0	1,545.1	1,540.0	1,545.1	1,540.0	1,545.1	1,540.0
Larson Creek - Middle Fork Appendix A, Maps # 9, 10 & 11																										
MLRA1000	LRA24000	74332	IRREGULAR	See model for channel cross-section				99	0.6%	-	217.3	239.9	230.5	260.5	1,534.5	1,533.9	1,544.5	1,545.6	1,538.8	1,538.4	1,539.1	1,538.6	1,538.9	1,538.4	1,539.1	1,538.7
MLRA1001	MLRA1000	CJ11614.48	IRREGULAR	See model for channel cross-section				58	1.6%	-	198.5	219.3	206.2	229.5	1,535.4	1,534.5	1,544.9	1,544.5	1,539.1	1,538.8	1,539.3	1,539.1	1,539.1	1,538.9	1,539.3	1,539.1
MLRA1002	MLRA1001	CJ11928.12	IRREGULAR	See model for channel cross-section				314	3.1%	-	198.6	219.4	206.3	229.7	1,545.3	1,535.4	1,554.1	1,544.9	1,547.8	1,539.1	1,548.0	1,539.3	1,547.9	1,539.1	1,548.0	1,539.3
MLRA1003	MLRA1002	CJ12185.4	IRREGULAR	See model for channel cross-section				257	2.1%	-	198.6	219.4	206.3	229.7	1,550.8	1,545.3	1,557.4	1,554.1	1,555.0	1,547.8	1,555.1	1,548.0	1,555.1	1,547.9	1,555.2	1,548.0
MLRA1004	MLRA1003	CJ12682.99	IRREGULAR	See model for channel cross-section				498	2.5%	-	198.8	219.9	207.5	230.7	1,563.2	1,550.8	1,565.6	1,557.4	1,564.6	1,555.0	1,564.7	1,555.1	1,564.6	1,555.1	1,564.7	1,555.2
MLRA1005	MLRA1004	CJ12895.84	IRREGULAR	See model for channel cross-section				213	0.8%	-	198.8	219.9	207.8	230.8	1,565.0	1,563.2	1,570.2	1,565.6	1,568.7	1,564.6	1,569.0	1,564.7	1,569.0	1,564.6	1,569.0	1,564.7
MLRA1006	MLRA1005	CJ12904.84	IRREGULAR	See model for channel cross-section				9	5.6%	-	198.8	219.9	207.8	230.8	1,565.5	1,565.0	1,568.7	1,570.2	1,569.0	1,568.7	1,569.1	1,569.0	1,569.0	1,569.0	1,569.1	1,569.0
MLRA1007	MLRA1006	CJ12918.44	IRREGULAR	See model for channel cross-section				14	-2.9%	-	198.8	219.9	207.8	230.8	1,565.1	1,565.5	1,570.1	1,568.7	1,569.5	1,569.0	1,569.6	1,569.1	1,569.6	1,569.0	1,569.6	1,569.1
MLRA1008	MLRA1007	CJ12926.37	IRREGULAR	See model for channel cross-section				8	6.3%	-	198.8	219.9	207.8	230.8	1,565.6	1,565.1	1,571.8	1,570.1	1,569.6	1,569.5	1,569.7	1,569.6	1,569.7	1,569.6	1,569.7	1,569.6
MLRA1009	MLRA1008	CJ13030.25	IRREGULAR	See model for channel cross-section				104	3.1%	-	198.8	219.9	207.9	230.8	1,568.8	1,565.6	1,571.8	1,571.8	1,570.8	1,569.6	1,570.8	1,569.7	1,570.8	1,569.7	1,570.9	1,569.7
MLRA1010	MLRA1009	CJ13228.24	IRREGULAR	See model for channel cross-section				198	1.7%	-	198.8	220.0	208.0	230.9	1,572.0	1,568.8	1,574.1	1,571.8	1,574.5	1,570.8	1,574.6	1,570.8	1,574.5	1,570.8	1,574.6	1,570.9
MLRA1011	MLRA1009	C22**	IRREGULAR	See model for channel cross-section				380	2.7%	-	0.0	0.0	0.0	0.0	1,579.0	1,568.8	1,580.5	1,571.8	1,578.0	1,570.8	1,578.1	1,570.8	1,578.0	1,570.8	1,578.2	1,570.9
MLRA1011	MLRA1010	CJ13458.65	IRREGULAR	See model for channel cross-section				380	0.8%	-	198.8	220.0	208.1	230.9	1,573.9	1,572.0	1,580.5	1,574.1	1,578.0	1,574.5	1,578.1	1,574.6	1,578.0	1,574.5	1,578.2	1,574.6
MLRA1012	MLRA1011	CJ13834.72	IRREGULAR	See model for channel cross-section				376	1.6%	-	198.8	220.1	208.1	230.9	1,579.8	1,573.9	1,585.5	1,580.5	1,583.4	1,578.0	1,583.6	1,578.1	1,583.5	1,578.0	1,583.6	1,578.2
MLRA1013	MLRA1012	CJ14209.23	IRREGULAR	See model for channel cross-section				375	1.5%	-	198.8	220.1	208.2	231.0	1,585.3	1,579.8	1,593.0	1,585.5	1,588.1	1,583.4	1,588.3	1,583.6	1,588.2	1,583.5	1,588.3	1,583.6
MLRA1014	MLRA1013	CJ14562.27	IRREGULAR	See model for channel cross-section				353	2.1%	-	198.8	220.1	208.3	231.0	1,592.6	1,585.3	1,601.1	1,593.0	1,596.2	1,588.1	1,596.4	1,588.3	1,596.3	1,588.2	1,596.5	1,588.3
MLRA1015	MLRA1014	CJ14734.64	IRREGULAR	See model for channel cross-section				172	6.9%	-	198.8	220.2	208.3	231.0	1,604.4	1,592.6	1,610.0	1,601.1	1,606.5	1,596.2	1,606.6	1,596.4	1,606.5	1,596.3	1,606.6	1,596.5
MLRA1016	MLRA1015	CJ15175.41	IRREGULAR	See model for channel cross-section				441	5.6%	-	198.8	220.2	208.3	231.1	1,629.1	1,604.4	1,634.9	1,610.0	1,632.0	1,606.5	1,632.1	1,606.6	1,632.0	1,606.5	1,632.2	1,606.6

Table B-2. Hydraulic Model Parameters and Results

Conduit			Conduit Attributes							Conduit Capacity (cfs)****	Peak flow values (cfs)				Invert elevation (ft)		Rim/Bank elevation (ft)		Maximum Hydraulic Grade Line (ft)							
											Existing		Future						Existing Conditions				Future Conditions			
																			10-yr, 24-hr		25-yr, 24-hr		10-yr, 24-hr		25-yr, 24-hr	
US node	DS node	Name	Type	Diameter (in)/ Width (ft)	Height (ft)	Left Channel Slope (H:V)	Right Channel Slope (H:V)	Conduit Length (ft)	Slope (%)		10-yr	25-yr	10-yr	25-yr	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
MLRA1017	MLRA1016	CJ15476.41	IRREGULAR	See model for channel cross-section				301	2.0%	-	121.3	136.2	121.3	136.2	1,635.3	1,629.1	1,638.3	1,634.9	1,637.7	1,632.0	1,637.8	1,632.1	1,637.7	1,632.0	1,637.8	1,632.2
MLRA1018	MLRA1017	CJ15792.6	IRREGULAR	See model for channel cross-section				316	1.5%	-	121.3	136.2	121.3	136.2	1,640.1	1,635.3	1,643.8	1,638.3	1,642.7	1,637.7	1,643.3	1,637.8	1,642.7	1,637.7	1,643.3	1,637.8
MLRA1019	MLRA1018	CJ16097.65	IRREGULAR	See model for channel cross-section				305	2.0%	-	121.3	136.4	121.3	136.4	1,646.0	1,640.1	1,650.0	1,643.8	1,648.0	1,642.7	1,648.0	1,643.3	1,648.0	1,642.7	1,648.0	1,643.3
MLRA1020	MLRA1019	CJ16323.18	IRREGULAR	See model for channel cross-section				226	1.7%	-	121.3	136.4	121.3	136.4	1,649.8	1,646.0	1,654.8	1,650.0	1,651.9	1,648.0	1,652.0	1,648.0	1,651.9	1,648.0	1,652.0	1,648.0
MLRA1021	MLRA1020	CJ16796.31	IRREGULAR	See model for channel cross-section				473	1.3%	-	121.3	136.4	121.3	136.4	1,655.8	1,649.8	1,658.3	1,654.8	1,658.4	1,651.9	1,658.4	1,652.0	1,658.4	1,651.9	1,658.4	1,652.0
MLRA1022	MLRA1021	CJ17214.79	IRREGULAR	See model for channel cross-section				418	1.8%	-	121.4	136.5	121.4	136.5	1,663.5	1,655.8	1,666.6	1,658.3	1,665.3	1,658.4	1,665.4	1,658.4	1,665.3	1,658.4	1,665.4	1,658.4
MLRA1023	MLRA1022	CJ17694.29	IRREGULAR	See model for channel cross-section				480	1.7%	-	121.4	136.7	121.4	136.7	1,671.7	1,663.5	1,682.6	1,666.6	1,674.5	1,665.3	1,674.6	1,665.4	1,674.5	1,665.3	1,674.6	1,665.4
MLRA1024	MLRA1023	CJ18109.96	IRREGULAR	See model for channel cross-section				416	4.5%	-	121.5	137.4	121.5	137.4	1,690.4	1,671.7	1,694.0	1,682.6	1,691.5	1,674.5	1,691.5	1,674.6	1,691.5	1,674.5	1,691.5	1,674.6
Larson Creek - Storm Drains Contributing to the Middle Fork Appendix A, Maps # 9, 10 & 11																										
MLRB1001	MLRA1000	10261	CIRCULAR	42"	-	-	-	30	0.6%	79.0	19.7	22.3	35.9	39.2	1,535.6	1,535.4	1,542.6	1,544.5	1,538.8	1,538.8	1,539.1	1,539.1	1,538.9	1,538.9	1,539.1	1,539.1
MLRB1002	MLRB1001	11112	CIRCULAR	42"	-	-	-	203	0.7%	83.0	19.9	22.4	36.0	39.3	1,537.5	1,536.1	1,544.5	1,542.6	1,538.8	1,538.8	1,539.0	1,539.1	1,539.2	1,538.9	1,539.3	1,539.1
MLRB1003	MLRB1002	10774	CIRCULAR	42"	-	-	-	87	1.0%	100.4	19.1	21.5	35.2	38.3	1,538.4	1,537.5	1,544.6	1,544.5	1,539.4	1,538.8	1,539.5	1,539.0	1,539.9	1,539.2	1,540.0	1,539.3
MLRB1100	MLRB1003	10932	CIRCULAR	36"	-	-	-	142	2.2%	100.4	19.1	21.5	35.2	38.3	1,542.0	1,538.9	1,549.8	1,544.6	1,542.9	1,539.4	1,543.0	1,539.5	1,543.2	1,539.9	1,543.3	1,540.0
MLRB1101	MLRB1100	10090	CIRCULAR	36"	-	-	-	128	1.2%	73.0	16.1	18.2	31.4	34.3	1,544.2	1,542.7	1,551.6	1,549.8	1,545.2	1,542.9	1,545.2	1,543.0	1,545.6	1,543.2	1,545.7	1,543.3
MLRB1102	MLRB1101	10091	CIRCULAR	36"	-	-	-	95	1.2%	73.7	15.5	17.6	30.7	33.5	1,545.6	1,544.4	1,552.8	1,551.6	1,546.5	1,545.2	1,546.6	1,545.2	1,546.9	1,545.6	1,547.0	1,545.7
MLRB1200	MLRB1100	10585	CIRCULAR	15"	-	-	-	40	3.9%	13.1	3.0	3.3	3.8	4.1	1,546.1	1,544.5	1,551.0	1,549.8	1,546.5	1,542.9	1,546.5	1,543.0	1,546.5	1,543.2	1,546.5	1,543.3
MLRB12001	MLRB1200	10254	CIRCULAR	15"	-	-	-	51	1.4%	7.9	3.0	3.3	3.8	4.1	1,546.7	1,546.0	1,552.8	1,551.0	1,547.3	1,546.5	1,547.3	1,546.5	1,547.4	1,546.5	1,547.4	1,546.5
MLRB1300	MLRB12001	10584	CIRCULAR	48"	-	-	-	96	0.3%	46.2	2.3	2.5	3.1	3.3	1,547.1	1,546.8	1,556.2	1,552.8	1,547.8	1,547.3	1,547.8	1,547.3	1,547.9	1,547.4	1,547.9	1,547.4
MLRB1301	MLRB1300	10417	CIRCULAR	48"	-	-	-	109	0.3%	54.0	0.5	0.6	0.6	0.6	1,547.5	1,547.1	1,560.5	1,556.2	1,547.8	1,547.8	1,547.9	1,547.8	1,547.9	1,547.9	1,547.9	1,547.9
MLRB1302	MLRB1301	10087	CIRCULAR	42"	-	-	-	83	0.3%	26.5	0.5	0.6	0.6	0.6	1,547.7	1,547.5	1,560.8	1,560.5	1,548.0	1,547.8	1,548.1	1,547.9	1,548.1	1,547.9	1,548.1	1,547.9
MLRB1303	MLRB1302	11102	CIRCULAR	42"	-	-	-	147	0.3%	27.0	0.5	0.6	0.6	0.6	1,548.2	1,547.7	1,554.8	1,560.8	1,548.5	1,548.0	1,548.5	1,548.1	1,548.5	1,548.1	1,548.5	1,548.1
MLRB1304	MLRB1303	10086	CIRCULAR	12"	-	-	-	41	0.5%	2.7	0.5	0.6	0.6	0.6	1,549.4	1,549.2	1,553.1	1,554.8	1,549.7	1,548.5	1,549.7	1,548.5	1,549.7	1,548.5	1,549.7	1,548.5
MLRB1400	MLRB1300	11103	CIRCULAR	12"	-	-	-	16	1.0%	3.8	1.8	2.0	2.5	2.7	1,548.3	1,548.1	1,556.1	1,556.2	1,548.8	1,547.8	1,548.8	1,547.8	1,548.9	1,547.9	1,548.9	1,547.9
MLRB1401	MLRB1400	11254	CIRCULAR	12"	-	-	-	120	1.0%	3.7	1.8	2.0	2.5	2.7	1,549.5	1,548.3	1,555.6	1,556.1	1,550.0	1,548.8	1,550.0	1,548.8	1,550.1	1,548.9	1,550.1	1,548.9
MLRB1500	MLRB1102	10097	CIRCULAR	36"	-	-	-	99	1.2%	73.7	15.5	17.6	30.6	33.5	1,547.0	1,545.8	1,554.1	1,552.8	1,547.9	1,546.5	1,548.0	1,546.6	1,548.3	1,546.9	1,548.4	1,547.0
MLRB1600	MLRB1500	10423	CIRCULAR	36"	-	-	-	55	1.3%	76.9	12.3	14.1	25.2	27.6	1,547.8	1,547.2	1,553.8	1,554.1	1,548.7	1,547.9	1,548.7	1,548.0	1,549.0	1,548.3	1,549.1	1,548.4
MLRB1601	MLRB1600	10099	CIRCULAR	36"	-	-	-	179	1.1%	72.4	12.3	14.0	25.2	27.6	1,550.1	1,548.0	1,556.5	1,553.8	1,550.9	1,548.7	1,551.0	1,548.7	1,551.3	1,549.0	1,551.4	1,549.1
MLRB1602	MLRB1601	10587	CIRCULAR	30"	-	-	-	163	1.7%	53.3	11.7	13.4	24.1	26.4	1,553.3	1,550.6	1,559.7	1,556.5	1,554.1	1,550.9	1,554.2	1,551.0	1,554.5	1,551.3	1,554.6	1,551.4
MLRB1603	MLRB1602	11255	CIRCULAR	30"	-	-	-	129	1.8%	55.8	11.7	13.4	24.1	26.4	1,555.8	1,553.5	1,562.8	1,559.7	1,556.6	1,554.1	1,556.6	1,554.2	1,557.0	1,554.5	1,557.0	1,554.6
MLRB1700	MLRB1603	11271	CIRCULAR	30"	-	-	-	107	2.9%	68.9	11.7	13.4	24.1	26.4	1,559.1	1,556.0	1,566.3	1,562.8	1,559.8	1,556.6	1,559.8	1,556.6	1,560.1	1,557.0	1,560.1	1,557.0
MLRB1701	MLRB1700	10266	CIRCULAR	12"	-	-	-	194	4.3%	7.8	1.4	1.5	1.6	1.7	1,569.4	1,561.1	1,573.9	1,566.3	1,569.7	1,559.8	1,569.7	1,559.8	1,569.7	1,560.1	1,569.7	1,560.1
MLRB1702	MLRB1701	10782	CIRCULAR	12"	-	-	-	76	5.3%	8.8	1.4	1.5	1.6	1.7	1,573.6	1,569.6	1,577.5	1,573.9	1,573.9	1,569.7	1,573.9	1,569.7	1,573.9	1,569.7	1,573.9	1,569.7
MLRB1703	MLRB1702	11270	CIRCULAR	12"	-	-	-	294	4.7%	8.0	0.6	0.6	0.8	0.8	1,587.6	1,573.8	1,591.5	1,577.5	1,587.7	1,573.9	1,587.8	1,573.9	1,587.8	1,573.9	1,587.8	1,573.9
MLRB1800	MLRB1700	10785	CIRCULAR	30"	-	-	-	114	4.1%	81.8	10.6	12.1	21.5	23.6	1,563.9	1,559.3	1,567.2	1,566.3	1,564.5	1,559.8	1,564.6	1,559.8	1,564.8	1,560.1	1,564.9	1,560.1
MLRB1900	MLRB1500	10592	CIRCULAR	24"	-	-	-	38	3.3%	43.4	4.8	5.2	5.4	5.8	1,549.2	1,548.0	1,554.6	1,554.1	1,549.7	1,547.9	1,549.7	1,548.0	1,549.7	1,548.3	1,549.7	1,548.4
MLRB1901	MLRB1900	10422	CIRCULAR	24"	-	-	-	26	1.2%	25.1	4.8	5.2	5.4	5.8	1,549.7	1,549.4	1,554.7	1,554.6	1,550.3	1,549.7	1,550.3	1,549.7	1,550.3	1,549.7	1,550.4	1,549.7
MLRB1902	MLRB1901	10590	CIRCULAR	18"	-	-	-	238	1.3%	12.6	4.8	5.2	5.4	5.8	1,553.3	1,550.2	1,557.7	1,554.7	1,553.9	1,550.3	1,554.0	1,550.3	1,554.0	1,550.3	1,554.0	1,550.4
MLRB1903	MLRB1902	10420	CIRCULAR	18"	-	-	-	286	1.4%	12.9	3.0	3.2	3.6	3.9	1,557.6	1,553.5	1,562.3	1,557.7	1,558.1	1,553.9	1,558.1	1,554.0	1,558.1	1,554.0	1,558.2	1,554.0
MLRB2000	MLRB1903	11268	CIRCULAR	18"	-	-	-	323	1.5%	13.5	3.0	3.2	3.6	3.9	1,562.7	1,557.8	1,568.2	1,562.3	1,563.2	1,558.1	1,563.2	1,558.1	1,563.2	1,558.1	1,563.3	1,558.2
MLRB2001	MLRB2000	10105	CIRCULAR	18"	-	-	-	67	2.5%	17.1	2.4	2.6	2.9	3.1	1,564.6	1,562.9	1,568.7	1,568.2	1,564.9	1,563.2	1,565.0	1,563.2	1,565.0	1,563.2	1,565.0	1,563.3
MLRB2002	MLRB2001	11269	CIRCULAR	15"	-	-	-	164	3.2%	12.0	2.4	2.6	2.9	3.1	1,570.1	1,564.8	1,574.3	1,568.7	1,570.5	1,564.9	1,570.5	1,565.0	1,570.5	1,565.0	1,570.6	1,565.0
MLRB2003	MLRB2002	10947	CIRCULAR	15"	-	-	-	67	2.0%	9.6	1.6	1.8	2.1	2.3	1,571.7	1,570.3	1,575.9	1,574.3	1,572.0	1,570.5	1,572.0	1,570.5	1,572.1	1,570.5	1,572.1	1,570.6
MLRB2004	MLRB2003	10597	CIRCULAR	12"	-	-	-	291	4.2%	7.6	1.2	1.4	1.7	1.8	1,584.1	1,571.9	1,588.1	1,575.9	1,584.4	1,572.0	1,584.4	1,572.0	1,584.4	1,572.1	1,584.5	1,572.1
MLRB2100	MLRB2000	11119	CIRCULAR	12"	-	-	-	82	2.5%	5.7	0.6	0.6	0.7	0.8	1,566.0	1,563.9	1,570.5	1,568.2	1,566.2	1,563.2	1,566.2	1,563.2	1,566.2	1,563.2	1,566.2	1,563.3
MLRB2101	MLRB2100	10596	CIRCULAR	12"	-	-	-	149	2.2%	5.7	0.6	0.6	0.7	0.8	1,569.4	1,566.2	1,573.1	1,570.5	1,569.6	1,566.2	1,569.6	1,566.2	1,569.6	1,566.2	1,569.6	1,566.2
Larson Creek - South Fork Appendix A, Maps # 9, 10 & 11																										
SLRA0001	LRA24000	CJ379.8021	IRREGULAR	See model for channel cross-section				730	0.7%	-	290.2	327.1	290.8	327.8	1,538.9	1,533.9	1,550.6	1,545.6	1,541.4	1,538.4	1,541.5	1,538.6	1,541.4	1,538.4	1,541.5	1,538.7
SLRA0002	SLRA0001	CJ670.9626	IRREGULAR	See model for channel cross-section				291	1.1%	-	290.2	327.1	290.8	327.8	1,542.2	1,538.9	1,550.9	1,550.6	1,545.0	1,541.4	1,545.1	1,541.5	1,545.0	1,541.4	1,545.1	1,541.5

Table B-2. Hydraulic Model Parameters and Results

Conduit			Conduit Attributes							Conduit Capacity (cfs)****	Peak flow values (cfs)				Invert elevation (ft)		Rim/Bank elevation (ft)		Maximum Hydraulic Grade Line (ft)							
											Existing		Future						Existing Conditions				Future Conditions			
																			10-yr, 24-hr		25-yr, 24-hr		10-yr, 24-hr		25-yr, 24-hr	
US node	DS node	Name	Type	Diameter (in)/ Width (ft)	Height (ft)	Left Channel Slope (H:V)	Right Channel Slope (H:V)	Conduit Length (ft)	Slope (%)		10-yr	25-yr	10-yr	25-yr	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
SLRA0003	SLRA0002	CJ967.8643	IRREGULAR	See model for channel cross-section				297	1.4%	-	290.2	327.1	290.8	327.8	1,546.4	1,542.2	1,553.7	1,550.9	1,548.9	1,545.0	1,549.0	1,545.1	1,548.9	1,545.0	1,549.0	1,545.1
SLRA0004	SLRA0003	CJ1285.212	IRREGULAR	See model for channel cross-section				317	1.0%	-	275.2	310.2	275.2	310.2	1,549.5	1,546.4	1,558.9	1,553.7	1,554.4	1,548.9	1,554.7	1,549.0	1,554.4	1,548.9	1,554.7	1,549.0
SLRA0005	SLRA0004	CJ1521.414	IRREGULAR	See model for channel cross-section				236	2.8%	-	275.2	310.2	275.2	310.2	1,556.1	1,549.5	1,562.6	1,558.9	1,558.6	1,554.4	1,558.7	1,554.7	1,558.6	1,554.4	1,558.7	1,554.7
SLRA0006	SLRA0005	CJ1777.868	IRREGULAR	See model for channel cross-section				256	2.4%	-	275.2	310.2	275.2	310.2	1,562.3	1,556.1	1,565.3	1,562.6	1,564.6	1,558.6	1,564.7	1,558.7	1,564.6	1,558.6	1,564.7	1,558.7
SLRA0008	SLRA0006	CJ1817.423	IRREGULAR	See model for channel cross-section				61	-1.7%	-	275.3	310.3	275.3	310.3	1,561.3	1,562.3	1,567.8	1,565.3	1,566.1	1,564.6	1,566.1	1,564.7	1,566.1	1,564.6	1,566.1	1,564.7
SLRA0009	SLRA0008	J16	CIRCULAR	72"	-	-	-	18	0.5%	161.9	275.2	310.3	275.2	310.3	1,561.4	1,561.3	1,569.9	1,567.8	1,566.4	1,566.1	1,566.4	1,566.1	1,566.4	1,566.1	1,566.4	1,566.1
SLRA0011	SLRA0009	CJ1918.646	IRREGULAR	See model for channel cross-section				62	4.5%	-	275.2	310.3	275.2	310.3	1,564.2	1,561.4	1,571.2	1,569.9	1,566.2	1,566.4	1,566.3	1,566.4	1,566.2	1,566.4	1,566.3	1,566.4
SLRA0012	SLRA0011	CJ2334.842	IRREGULAR	See model for channel cross-section				416	1.9%	-	263.2	296.0	263.2	296.0	1,572.2	1,564.2	1,574.4	1,571.2	1,574.3	1,566.2	1,574.3	1,566.3	1,574.3	1,566.2	1,574.3	1,566.3
SLRA0012	SLRA0011	CJ2334.842_F	IRREGULAR	See model for channel cross-section				416	2.6%	-	12.1	14.3	12.1	14.3	1,573.6	1,564.7	1,574.4	1,571.2	1,574.3	1,566.2	1,574.3	1,566.3	1,574.3	1,566.2	1,574.3	1,566.3
SLRA0013	SLRA0012	CJ2625.337	IRREGULAR	See model for channel cross-section				291	0.8%	-	275.3	310.3	275.3	310.3	1,574.6	1,572.2	1,582.8	1,574.4	1,577.8	1,574.3	1,577.9	1,574.3	1,577.8	1,574.3	1,577.9	1,574.3
SLRA0014	SLRA0013	CJ2929.584	IRREGULAR	See model for channel cross-section				304	1.0%	-	275.3	310.3	275.3	310.3	1,577.7	1,574.6	1,588.4	1,582.8	1,581.4	1,577.8	1,581.7	1,577.9	1,581.4	1,577.8	1,581.7	1,577.9
SLRA0015	SLRA0014	CJ3279.067	IRREGULAR	See model for channel cross-section				349	1.8%	-	275.3	310.3	275.3	310.3	1,584.0	1,577.7	1,594.4	1,588.4	1,587.3	1,581.4	1,587.5	1,581.7	1,587.3	1,581.4	1,587.5	1,581.7
SLRA0016	SLRA0015	CJ3749.159	IRREGULAR	See model for channel cross-section				470	1.7%	-	275.3	310.3	275.3	310.3	1,591.8	1,584.0	1,602.1	1,594.4	1,594.3	1,587.3	1,594.4	1,587.5	1,594.3	1,587.3	1,594.4	1,587.5
SLRA0017	SLRA0016	CJ3990.644	IRREGULAR	See model for channel cross-section				241	3.7%	-	275.3	310.3	275.3	310.3	1,600.8	1,591.8	1,606.8	1,602.1	1,602.8	1,594.3	1,602.9	1,594.4	1,602.8	1,594.3	1,602.9	1,594.4
SLRA0018	SLRA0017	CJ4449.317	IRREGULAR	See model for channel cross-section				459	3.8%	-	275.3	310.3	275.3	310.3	1,618.0	1,600.8	1,624.7	1,606.8	1,621.7	1,602.8	1,621.8	1,602.9	1,621.7	1,602.8	1,621.8	1,602.9
SLRA0019	SLRA0018	4741.644_F	IRREGULAR	See model for channel cross-section				344	2.7%	-	13.1	25.4	13.1	25.4	1,633.2	1,624.0	1,633.4	1,624.7	1,633.7	1,621.7	1,633.9	1,621.8	1,633.7	1,621.7	1,633.9	1,621.8
SLRA0019	SLRA0018	CJ4741.644	IRREGULAR	See model for channel cross-section				344	4.5%	-	154.6	154.6	154.6	154.6	1,631.3	1,618.0	1,633.4	1,624.7	1,633.7	1,621.7	1,633.9	1,621.8	1,633.7	1,621.7	1,633.9	1,621.8
SLRA0020	SLRA0019	CJ5238.936	IRREGULAR	See model for channel cross-section				497	1.0%	-	166.0	178.6	166.0	178.6	1,636.1	1,631.3	1,641.1	1,633.4	1,639.9	1,633.7	1,640.0	1,633.9	1,639.9	1,633.7	1,640.0	1,633.9
SLRA0020	SLRA0018	CJ5238.936_F	IRREGULAR	See model for channel cross-section				497	1.8%	-	109.4	131.8	109.4	131.8	1,639.0	1,624.0	1,641.1	1,624.7	1,639.9	1,621.7	1,640.0	1,621.8	1,639.9	1,621.7	1,640.0	1,621.8
SLRA0021	SLRA0020	CJ5483.074	IRREGULAR	See model for channel cross-section				244	1.9%	-	275.5	310.4	275.5	310.4	1,640.7	1,636.1	1,644.0	1,641.1	1,643.9	1,639.9	1,644.1	1,640.0	1,643.9	1,639.9	1,644.1	1,640.0
SLRA0022	SLRA0021	CJ5876.208	IRREGULAR	See model for channel cross-section				393	2.0%	-	275.5	310.4	275.5	310.4	1,648.6	1,640.7	1,660.3	1,644.0	1,651.3	1,643.9	1,651.5	1,644.1	1,651.3	1,643.9	1,651.5	1,644.1
SLRA0023	SLRA0022	CJ6246.914	IRREGULAR	See model for channel cross-section				371	4.1%	-	275.5	310.4	275.5	310.4	1,663.9	1,648.6	1,670.4	1,660.3	1,667.1	1,651.3	1,667.1	1,651.5	1,667.1	1,651.3	1,667.1	1,651.5
SLRA0024	SLRA0023	CJ6677.995	IRREGULAR	See model for channel cross-section				431	1.8%	-	275.5	310.4	275.5	310.4	1,671.5	1,663.9	1,678.0	1,670.4	1,674.7	1,667.1	1,674.8	1,667.1	1,674.7	1,667.1	1,674.8	1,667.1
SLRA0025	SLRA0024	CJ6907.96	IRREGULAR	See model for channel cross-section				230	1.9%	-	275.5	310.5	275.5	310.5	1,675.9	1,671.5	1,680.9	1,678.0	1,678.9	1,674.7	1,679.1	1,674.8	1,678.9	1,674.7	1,679.1	1,674.8
SLRA0026	SLRA0025	CJ7215.26	IRREGULAR	See model for channel cross-section				307	1.6%	-	275.6	310.5	275.6	310.5	1,680.7	1,675.9	1,688.6	1,680.9	1,684.0	1,678.9	1,684.2	1,679.1	1,684.0	1,678.9	1,684.2	1,679.1
SLRA0027	SLRA0026	CJ7526.55	IRREGULAR	See model for channel cross-section				311	2.7%	-	275.6	310.5	275.6	310.5	1,689.1	1,680.7	1,696.7	1,688.6	1,691.2	1,684.0	1,691.4	1,684.2	1,691.2	1,684.0	1,691.4	1,684.2
Medford Irrigation Canal - Primary flow direction to the north (Lazy Creek) from Greystone Court Appendix A, Maps # 2 & 3																										
MIDA7000	MIDA8000	C7	BOX	8'	4'	-	-	367	0.2%	64.4	38.7	41.9	44.7	48.4	1,549.1	1,548.6	1,556.2	1,556.8	1,551.4	1,551.0	1,551.5	1,551.1	1,551.6	1,551.1	1,551.7	1,551.2
MIDA7000	MIDA6000	C10	TRAPEZOIDAL	10'	3.8'	0.6	0.6	367	0.0%	31.1	37.6	40.7	43.6	47.3	1,549.1	1,549.0	1,556.2	1,556.6	1,551.4	1,551.6	1,551.5	1,551.7	1,551.6	1,551.8	1,551.7	1,551.9
MIDA8000	MIDA9000	C8	BOX	8'	4'	-	-	209	0.2%	64.7	40.8	44.1	46.7	50.7	1,548.6	1,548.2	1,556.8	1,555.2	1,551.0	1,550.6	1,551.1	1,550.6	1,551.1	1,550.6	1,551.2	1,550.7
MIDA9000	MIDA9001	C6	SEMICIRCULAR	60"	-	-	-	584	0.5%	141.7	42.5	45.9	48.5	52.5	1,548.2	1,545.3	1,555.2	1,545.3	1,550.6	1,550.3	1,550.6	1,550.3	1,550.6	1,550.3	1,550.7	1,550.3
Medford Irrigation Canal - Greystone Court stormdrains Appendix A, Maps # 1, 3 & 4																										
MIDF6001	MIDA6000	1030	CIRCULAR	36"	-	-	-	158	0.6%	53.0	38.7	41.6	40.4	43.6	1,553.0	1,552.0	1,557.5	1,556.6	1,554.9	1,551.6	1,555.0	1,551.7	1,555.0	1,551.8	1,555.1	1,551.9
MIDF6100	MIDF6001	10551	CIRCULAR	30"	-	-	-	328	4.3%	84.0	36.1	38.9	37.8	40.8	1,567.0	1,553.0	1,572.0	1,557.5	1,568.1	1,554.9	1,568.2	1,555.0	1,568.2	1,555.0	1,568.2	1,555.1
MIDF6200	MIDF6100	11207	CIRCULAR	36"	-	-	-	115	0.9%	N/A*	0.1	0.2	0.2	0.2	1,568.0	1,567.0	1,572.8	1,572.0	1,568.1	1,568.1	1,568.2	1,568.2	1,568.2	1,568.2	1,568.2	1,568.2
MIDF6300	MIDF6100	1016	CIRCULAR	30"	-	-	-	82	1.7%	29.1	36.1	38.8	37.9	40.8	1,568.4	1,567.0	1,572.6	1,572.0	1,570.6	1,568.1	1,571.3	1,568.2	1,571.2	1,568.2	1,571.7	1,568.2
MIDF6301	MIDF6300	10362	CIRCULAR	30"	-	-	-	24	0.4%	26.2	24.4	26.2	26.2	27.8	1,568.5	1,568.4	1,575.0	1,572.6	1,570.7	1,570.6	1,571.4	1,571.3	1,571.3	1,571.2	1,571.8	1,571.7
MIDF6400	MIDF6300	11208	CIRCULAR	18"	-	-	-	206	1.3%	12.3	10.7	11.6	11.2	12.2	1,571.1	1,568.5	1,578.4	1,572.6	1,572.3	1,570.6	1,573.7	1,571.3	1,573.4	1,571.2	1,574.3	1,571.7
MIDF6500	MIDF6400	10191	CIRCULAR	15"	-	-	-	58	1.4%	7.7	10.7	11.6	11.2	12.2	1,571.9	1,571.1	1,578.4	1,578.4	1,573.9	1,572.3	1,575.5	1,573.7	1,575.1	1,573.4	1,576.3	1,574.3
MIDF6501	MIDF6500	10872	CIRCULAR	15"	-	-	-	179	6.3%	15.9	1.3	1.4	1.3	1.4	1,585.8	1,574.5	1,589.5	1,578.4	1,586.0	1,573.9	1,586.0	1,575.5	1,586.0	1,575.1	1,586.0	1,576.3
MIDF6502	MIDF6501	11040	CIRCULAR	15"	-	-	-	198	2.7%	10.6	1.3	1.4	1.3	1.4	1,591.0	1,585.8	1,595.8	1,589.5	1,591.3	1,586.0	1,591.3	1,586.0	1,591.3	1,586.0	1,591.3	1,586.0
MIDF6503	MIDF6502	10135	CIRCULAR	15"	-	-	-	208	7.9%	18.1	1.3	1.4	1.3	1.4	1,607.5	1,591.0	1,611.1	1,595.8	1,607.7	1,591.3	1,607.7	1,591.3	1,607.7	1,591.3	1,607.7	1,591.3
MIDF6504	MIDF6503	10461	CIRCULAR	12"	-	-	-	161	7.2%	9.9	0.8	0.9	0.8	0.9	1,619.0	1,607.5	1,622.5	1,611.1	1,619.2	1,607.7	1,619.2	1,607.7	1,619.2	1,607.7	1,619.2	1,607.7
MIDF6505	MIDF6504	10979	CIRCULAR	12"	-	-	-	130	3.6%	7.2	0.8	0.9	0.8	0.9	1,623.6	1,619.0	1,628.5	1,622.5	1,623.9	1,619.2	1,623.9	1,619.2	1,623.9	1,619.2	1,623.9	1,619.2
MIDF6600	MIDF6500	11039	CIRCULAR	15"	-	-	-	48	3.0%	11.1	9.5	10.2	10.0	10.8	1,575.9	1,574.5	1,579.4	1,578.4	1,576.8	1,573.9	1,576.9	1,575.5	1,576.9	1,575.1	1,577.7	1,576.3
MIDF6601	MIDF6600	10303	CIRCULAR	12"	-	-	-	455	6.0%	9.0	7.7	8.3	8.2	8.8	1,603.0	1,575.9	1,608.0	1,579.4	1,603.7	1,576.8	1,603.8	1,576.9	1,603.7	1,576.9	1,603.8	1,577.7
MIDF6602	MIDF6601	10465	CIRCULAR	12"	-	-	-	254	6.1%	9.1	7.7	8.3	8.2	8.8	1,618.5	1,603.0	1,622.0	1,608.0	1,619.2	1,603.7	1,619.3	1,603.8	1,619.2	1,603.7	1,619.3	1,603.8
MIDF6700	MIDF6301	10525	CIRCULAR	60"	-	-	-	133	0.2%	62.5	24.4	26.2	25.6	27.6	1,568.8	1,568.5	1,578.0	1,575.0	1,571.0	1,570.7	1,571.6	1,571.4	1,571.4	1,571.3	1,571.9	1,571.8

Table B-2. Hydraulic Model Parameters and Results

Conduit			Conduit Attributes							Conduit Capacity (cfs)****	Peak flow values (cfs)				Invert elevation (ft)		Rim/Bank elevation (ft)		Maximum Hydraulic Grade Line (ft)							
											Existing		Future						Existing Conditions				Future Conditions			
																			10-yr, 24-hr		25-yr, 24-hr		10-yr, 24-hr		25-yr, 24-hr	
US node	DS node	Name	Type	Diameter (in)/ Width (ft)	Height (ft)	Left Channel Slope (H:V)	Right Channel Slope (H:V)	Conduit Length (ft)	Slope (%)		10-yr	25-yr	10-yr	25-yr	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
MIDF6701	MIDF6700	10873	CIRCULAR	30"	-	-	-	84	3.5%	41.6	23.7	25.5	25.1	26.9	1,573.7	1,570.8	1,579.0	1,578.0	1,575.0	1,571.0	1,575.1	1,571.6	1,575.1	1,571.4	1,575.2	1,571.9
MIDF6702	MIDF6701	10023	CIRCULAR	30"	-	-	-	311	3.8%	79.1	23.7	25.5	25.1	26.9	1,585.4	1,573.7	1,590.0	1,579.0	1,586.3	1,575.0	1,586.3	1,575.1	1,586.3	1,575.1	1,586.4	1,575.2
MIDF6703	MIDF6702	11041	CIRCULAR	30"	-	-	-	267	5.0%	92.0	23.0	24.7	24.3	26.1	1,598.7	1,585.4	1,604.6	1,590.0	1,599.6	1,586.3	1,599.6	1,586.3	1,599.6	1,586.3	1,599.7	1,586.4
MIDF6800	MIDF6700	11209	CIRCULAR	12"	-	-	-	51	2.9%	6.3	0.7	0.7	0.7	0.7	1,576.1	1,574.6	1,579.5	1,578.0	1,576.3	1,571.0	1,576.3	1,571.6	1,576.3	1,571.4	1,576.3	1,571.9
MIDF6900	MIDF6703	10193	CIRCULAR	30"	-	-	-	31	5.1%	92.0	23.0	24.7	24.3	26.1	1,600.3	1,598.7	1,605.6	1,604.6	1,601.2	1,599.6	1,601.2	1,599.6	1,601.2	1,599.6	1,601.2	1,599.7
MIDF7000	MIDF6900	10194	CIRCULAR	15"	-	-	-	108	0.7%	5.5	1.3	1.4	1.3	1.4	1,601.1	1,600.3	1,603.9	1,605.6	1,601.5	1,601.2	1,601.5	1,601.2	1,601.5	1,601.2	1,601.5	1,601.2
MIDF7001	MIDF7000	10697	CIRCULAR	12"	-	-	-	31	1.9%	4.9	1.3	1.4	1.3	1.4	1,601.7	1,601.1	1,604.5	1,603.9	1,602.0	1,601.5	1,602.1	1,601.5	1,602.0	1,601.5	1,602.1	1,601.5
MIDF7002	MIDF7001	10364	CIRCULAR	12"	-	-	-	24	2.1%	5.3	1.3	1.4	1.3	1.4	1,602.2	1,601.7	1,605.3	1,604.5	1,602.5	1,602.0	1,602.5	1,602.1	1,602.5	1,602.0	1,602.5	1,602.1
MIDF7003	MIDF7002	10527	CIRCULAR	12"	-	-	-	215	5.5%	8.9	1.3	1.4	1.3	1.4	1,614.0	1,602.2	1,617.3	1,605.3	1,614.3	1,602.5	1,614.3	1,602.5	1,614.3	1,602.5	1,614.3	1,602.5
MIDF7004	MIDF7003	10026	CIRCULAR	12"	-	-	-	34	1.0%	3.6	1.3	1.4	1.3	1.4	1,614.4	1,614.0	1,617.1	1,617.3	1,614.8	1,614.3	1,614.8	1,614.3	1,614.8	1,614.3	1,614.8	1,614.3
MIDF7100	MIDF6900	10134	CIRCULAR	24"	-	-	-	291	4.1%	47.1	20.2	21.8	21.6	23.1	1,612.7	1,600.9	1,618.0	1,605.6	1,613.6	1,601.2	1,613.7	1,601.2	1,613.7	1,601.2	1,613.7	1,601.2
MIDF7200	MIDF7100	10462	CIRCULAR	18"	-	-	-	175	7.7%	31.4	2.2	2.4	2.3	2.5	1,627.5	1,614.0	1,631.0	1,618.0	1,627.8	1,613.6	1,627.8	1,613.7	1,627.8	1,613.7	1,627.8	1,613.7
MIDF7300	MIDF7100	10819	CIRCULAR	24"	-	-	-	341	4.3%	48.8	18.1	19.4	19.2	20.6	1,628.0	1,613.5	1,632.5	1,618.0	1,628.8	1,613.6	1,628.9	1,613.7	1,628.9	1,613.7	1,628.9	1,613.7
MIDF7301	MIDF7300	10132	CIRCULAR	24"	-	-	-	206	5.3%	53.8	15.1	16.2	16.0	17.1	1,639.5	1,628.5	1,648.0	1,632.5	1,640.2	1,628.8	1,640.3	1,628.9	1,640.2	1,628.9	1,640.3	1,628.9
MIDF7400	MIDF7300	10457	CIRCULAR	15"	-	-	-	163	4.3%	13.6	3.0	3.2	3.3	3.5	1,637.3	1,630.3	1,645.3	1,632.5	1,637.7	1,628.8	1,637.7	1,628.9	1,637.7	1,628.9	1,637.7	1,628.9
MIDF7401	MIDF7400	10975	CIRCULAR	15"	-	-	-	65	2.4%	10.0	3.0	3.2	3.3	3.5	1,638.9	1,637.3	1,646.7	1,645.3	1,639.4	1,637.7	1,639.4	1,637.7	1,639.4	1,637.7	1,639.4	1,637.7
MIDF750	MIDF7301	10298	CIRCULAR	18"	-	-	-	165	7.3%	29.5	15.1	16.2	16.0	17.1	1,651.5	1,639.5	1,658.0	1,648.0	1,652.3	1,640.2	1,652.3	1,640.3	1,652.3	1,640.2	1,652.3	1,640.3
MIDF750	MIDF7401	10459	CIRCULAR	15"	-	-	-	165	8.8%	N/A*	0.0	0.0	0.0	0.0	1,652.6	1,641.2	1,658.0	1,646.7	1,652.3	1,639.4	1,652.3	1,639.4	1,652.3	1,639.4	1,652.3	1,639.4
MIDF7600	MIDF750	10458	CIRCULAR	12"	-	-	-	28	16.6%	16.0	0.6	0.7	0.6	0.7	1,656.0	1,651.5	1,659.8	1,658.0	1,656.1	1,652.3	1,656.1	1,652.3	1,656.1	1,652.3	1,656.1	1,652.3
MIDF7601	MIDF7600	10129	CIRCULAR	12"	-	-	-	246	9.6%	10.7	0.6	0.7	0.6	0.7	1,679.5	1,656.0	1,683.3	1,659.8	1,679.7	1,656.1	1,679.7	1,656.1	1,679.7	1,656.1	1,679.7	1,656.1
MIDF7602	MIDF7601	10294	CIRCULAR	12"	-	-	-	237	5.5%	9.1	0.6	0.7	0.6	0.7	1,692.5	1,679.5	1,695.8	1,683.3	1,692.7	1,679.7	1,692.7	1,679.7	1,692.7	1,679.7	1,692.7	1,679.7
MIDF7603	MIDF7602	10295	CIRCULAR	12"	-	-	-	259	3.5%	7.1	0.6	0.7	0.6	0.7	1,701.6	1,692.5	1,705.5	1,695.8	1,701.8	1,692.7	1,701.8	1,692.7	1,701.8	1,692.7	1,701.8	1,692.7
MIDF7604	MIDF7603	10131	CIRCULAR	12"	-	-	-	197	4.0%	7.1	0.6	0.7	0.6	0.7	1,709.5	1,701.6	1,713.0	1,705.5	1,709.7	1,701.8	1,709.7	1,701.8	1,709.7	1,701.8	1,709.7	1,701.8
MIDF7700	MIDF750	10817_2	CIRCULAR	15"	-	-	-	42	4.4%	13.6	14.4	15.5	15.4	16.5	1,653.4	1,651.5	1,657.5	1,658.0	1,654.5	1,652.3	1,655.1	1,652.3	1,655.0	1,652.3	1,656.6	1,652.3
MIDF7800	MIDF7700	10631	CIRCULAR	15"	-	-	-	273	9.5%	19.9	4.8	5.1	5.2	5.5	1,679.0	1,653.4	1,682.4	1,657.5	1,679.4	1,654.5	1,679.4	1,655.1	1,679.4	1,655.0	1,679.5	1,656.6
MIDF7801	MIDF7800	11300	CIRCULAR	15"	-	-	-	258	5.6%	15.6	3.9	4.2	4.3	4.6	1,693.5	1,679.0	1,699.7	1,682.4	1,693.9	1,679.4	1,694.0	1,679.4	1,694.0	1,679.4	1,694.0	1,679.5
MIDF7802	MIDF7801	10973	CIRCULAR	12"	-	-	-	16	12.6%	12.6	3.9	4.2	4.3	4.6	1,695.5	1,693.5	1,697.8	1,699.7	1,695.9	1,693.9	1,695.9	1,694.0	1,695.9	1,694.0	1,695.9	1,694.0
MIDF7803	MIDF7802	10632	CIRCULAR	12"	-	-	-	336	5.7%	8.8	2.5	2.7	2.9	3.1	1,714.6	1,695.5	1,717.4	1,697.8	1,715.0	1,695.9	1,715.0	1,695.9	1,715.0	1,695.9	1,715.0	1,695.9
MIDF7900	MIDF7700	10817_1	CIRCULAR	15"	-	-	-	641	4.6%	13.9	7.9	8.5	8.3	8.9	1,682.5	1,653.4	1,690.5	1,657.5	1,683.2	1,654.5	1,683.2	1,655.1	1,683.2	1,655.0	1,683.2	1,656.6
MIDF7901	MIDF7900	C66664	CIRCULAR	18"	-	-	-	35	2.9%	18.0	6.7	7.2	7.0	7.5	1,683.5	1,682.5	1,690.5	1,690.5	1,684.1	1,683.2	1,684.2	1,683.2	1,684.2	1,683.2	1,684.2	1,683.2
MIDF7902	MIDF7901	10976	CIRCULAR	18"	-	-	-	80	1.3%	11.7	6.7	7.2	7.0	7.5	1,684.5	1,683.5	1,687.3	1,690.5	1,685.3	1,684.1	1,685.4	1,684.2	1,685.3	1,684.2	1,685.4	1,684.2
MIDF7903	MIDF7902	10448	CIRCULAR	15"	-	-	-	300	11.8%	22.2	6.7	7.2	7.0	7.5	1,719.5	1,684.5	1,722.7	1,687.3	1,720.0	1,685.3	1,720.0	1,685.4	1,720.0	1,685.3	1,720.0	1,685.4
MIDF7904	MIDF7903	10292	CIRCULAR	12"	-	-	-	68	13.3%	13.0	5.0	5.3	5.2	5.6	1,728.5	1,719.5	1,732.6	1,722.7	1,728.9	1,720.0	1,729.0	1,720.0	1,729.0	1,720.0	1,729.0	1,720.0
MIDF8000	MIDF7900	C66658	CIRCULAR	15"	-	-	-	252	6.4%	15.8	1.3	1.4	1.3	1.4	1,698.5	1,682.5	1,706.8	1,690.5	1,698.7	1,683.2	1,698.7	1,683.2	1,698.7	1,683.2	1,698.8	1,683.2
MIDF8001	MIDF8000	10977	CIRCULAR	15"	-	-	-	140	1.3%	7.4	1.3	1.4	1.3	1.4	1,700.3	1,698.5	1,706.1	1,706.8	1,700.7	1,698.7	1,700.7	1,698.7	1,700.7	1,698.7	1,700.7	1,698.8
MIDF8002	MIDF8001	10630	CIRCULAR	15"	-	-	-	35	1.3%	7.4	1.3	1.4	1.3	1.4	1,700.8	1,700.3	1,707.8	1,706.1	1,701.2	1,700.7	1,701.2	1,700.7	1,701.2	1,700.7	1,701.2	1,700.7
MIDF8100	MIDF7904	10125	CIRCULAR	12"	-	-	-	120	12.2%	12.4	5.0	5.3	5.2	5.6	1,743.1	1,728.5	1,745.4	1,732.6	1,743.6	1,728.9	1,743.6	1,729.0	1,743.6	1,729.0	1,743.6	1,729.0
MIDF8200	MIDF8100	10126	CIRCULAR	12"	-	-	-	53	7.0%	9.1	0.8	0.9	0.9	0.9	1,746.8	1,743.1	1,749.9	1,745.4	1,747.0	1,743.6	1,747.0	1,743.6	1,747.0	1,743.6	1,747.0	1,743.6
MIDF8201	MIDF8200	10450	CIRCULAR	12"	-	-	-	242	11.9%	11.7	0.8	0.9	0.9	0.9	1,775.5	1,746.8	1,778.6	1,749.9	1,775.7	1,747.0	1,775.7	1,747.0	1,775.7	1,747.0	1,775.7	1,747.0
MIDF8300	MIDF8100	11144	CIRCULAR	15"	-	-	-	175	3.6%	12.1	2.8	3.0	3.0	3.2	1,749.4	1,743.1	1,751.6	1,745.4	1,749.8	1,743.6	1,749.8	1,743.6	1,749.8	1,743.6	1,749.8	1,743.6
MIDF8301	MIDF8300	11297	CIRCULAR	12"	-	-	-	277	4.7%	7.7	2.1	2.2	2.3	2.5	1,762.3	1,749.4	1,765.0	1,751.6	1,762.7	1,749.8	1,762.7	1,749.8	1,762.7	1,749.8	1,762.7	1,749.8
MIDF8302	MIDF8301	11299	CIRCULAR	12"	-	-	-	56	8.6%	9.9	0.7	0.8	0.8	0.9	1,767.1	1,762.3	1,770.5	1,765.0	1,767.3	1,762.7	1,767.3	1,762.7	1,767.3	1,762.7	1,767.3	1,762.7
MIDF8303	MIDF8302	11298	CIRCULAR	12"	-	-	-	260	15.8%	13.8	0.7	0.8	0.8	0.9	1,807.6	1,767.1	1,810.9	1,770.5	1,807.7	1,767.3	1,807.7	1,767.3	1,807.7	1,767.3	1,807.7	1,767.3
Medford Irrigation Canal - Cherry Lane stormdrains Appendix A, Maps # 2 & 3																										
MIDG7001	MIDA7000	1028	CIRCULAR	12"	-	-	-	85	4.5%	7.6	1.2	1.3	1.2	1.3	1,553.8	1,550.0	1,556.7	1,556.2	1,554.1	1,551.4	1,554.1	1,551.5	1,554.1	1,551.6	1,554.1	1,551.7
Medford Irrigation Canal - South Village Drive stormdrains Appendix A, Maps # 2 & 3																										
MIDH8001	MIDA8000	C66513	CIRCULAR	12"	-	-	-	231	1.9%	5.0	2.3	2.4	2.3	2.4	1,556.0	1,551.5	1,560.4	1,556.8	1,556.5	1,551.0	1,556.5	1,551.1	1,556.5	1,551.1	1,556.5	1,551.2
MIDH8002	MIDH8001	10637	CIRCULAR	12"	-	-	-	277	1.8%	5.0	1.3	1.4	1.3	1.4	1,561.0	1,556.0	1,564.8	1,560.4	1,561.3	1,556.5	1,561.4	1,556.5	1,561.3	1,556.5	1,561.4	1,556.5

Table B-2. Hydraulic Model Parameters and Results

Conduit			Conduit Attributes							Conduit Capacity (cfs)****	Peak flow values (cfs)				Invert elevation (ft)		Rim/Bank elevation (ft)		Maximum Hydraulic Grade Line (ft)							
											Existing		Future						Existing Conditions				Future Conditions			
																			10-yr, 24-hr		25-yr, 24-hr		10-yr, 24-hr		25-yr, 24-hr	
US node	DS node	Name	Type	Diameter (in)/ Width (ft)	Height (ft)	Left Channel Slope (H:V)	Right Channel Slope (H:V)	Conduit Length (ft)	Slope (%)		10-yr	25-yr	10-yr	25-yr	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
MIDH8003	MIDH8002	10980	CIRCULAR	12"	-	-	-	56	8.4%	10.4	1.3	1.4	1.3	1.4	1,565.7	1,561.0	1,568.7	1,564.8	1,565.9	1,561.3	1,565.9	1,561.4	1,565.9	1,561.3	1,565.9	1,561.4
MIDH8004	MIDH8003	10139	CIRCULAR	12"	-	-	-	261	5.4%	8.3	1.3	1.4	1.3	1.4	1,579.8	1,565.7	1,583.6	1,568.7	1,580.0	1,565.9	1,580.0	1,565.9	1,580.0	1,565.9	1,580.0	1,565.9
MIDi9001	MIDA9000	C71776	CIRCULAR	12"	-	-	-	101	1.8%	4.9	1.9	2.0	1.9	2.0	1,553.3	1,551.5	1,556.5	1,555.2	1,553.7	1,550.6	1,553.7	1,550.6	1,553.7	1,550.6	1,553.7	1,550.7
MIDi9002	MIDi9001	10638	CIRCULAR	12"	-	-	-	26	0.8%	3.1	1.9	2.0	1.9	2.0	1,553.5	1,553.3	1,557.3	1,556.5	1,554.1	1,553.7	1,554.1	1,553.7	1,554.1	1,553.7	1,554.1	1,553.7
MIDi9003	MIDi9002	10301	CIRCULAR	12"	-	-	-	174	1.4%	4.5	1.9	2.0	1.9	2.0	1,556.0	1,553.5	1,562.6	1,557.3	1,556.5	1,554.1	1,556.5	1,554.1	1,556.5	1,554.1	1,556.5	1,554.1
MIDi9004	MIDi9003	11303	CIRCULAR	12"	-	-	-	202	6.1%	9.4	1.9	2.0	1.9	2.0	1,568.3	1,556.0	1,575.0	1,562.6	1,568.6	1,556.5	1,568.6	1,556.5	1,568.6	1,556.5	1,568.6	1,556.5
MIDi9005	MIDi9004	10463	CIRCULAR	12"	-	-	-	66	13.2%	13.4	1.9	2.0	1.9	2.0	1,577.0	1,568.3	1,580.2	1,575.0	1,577.3	1,568.6	1,577.3	1,568.6	1,577.3	1,568.6	1,577.3	1,568.6
Medford Irrigation Canal - Primary flow direction to the south from Greystone Court. Model ends at siphon.																										
Appendix A, Maps # 2, 3, 4, 9 & 10																										
MIDA1000	MIDA0001	C19	BOX	8'	4'	-	-	810	1.5%	543.3	103.2	110.7	163.8	174.5	1,546.5	1,534.7	1,553.9	1,540.8	1,547.6	1,538.7	1,547.6	1,538.7	1,547.9	1,538.7	1,548.0	1,538.7
MIDA1002	MIDA1000	C18	BOX	8'	4'	-	-	1128	0.0%	47.7	102.0	109.2	162.0	172.7	1,546.6	1,546.5	1,553.7	1,553.9	1,549.5	1,547.6	1,549.6	1,547.6	1,550.1	1,547.9	1,550.2	1,548.0
MIDA1003	MIDA1002	1098	BOX	8'	4'	-	-	91	-0.3%	226.8	93.0	99.2	143.8	153.8	1,546.4	1,546.6	1,553.1	1,553.7	1,549.6	1,549.5	1,549.7	1,549.6	1,550.2	1,550.1	1,550.3	1,550.2
MIDA1004	MIDA1003	66534	BOX	8'	4'	-	-	280	0.1%	132.8	93.0	99.1	143.7	153.6	1,546.6	1,546.4	1,555.9	1,553.1	1,549.7	1,549.6	1,549.8	1,549.7	1,550.4	1,550.2	1,550.7	1,550.3
MIDA1005	MIDA1004	1042	BOX	12'	5'	-	-	240	-0.1%	258.2	93.0	99.7	143.7	153.5	1,546.5	1,546.6	1,553.3	1,555.9	1,549.8	1,549.7	1,549.9	1,549.8	1,550.5	1,550.4	1,550.7	1,550.7
MIDA1006	NLRA6000	C17	TRAPEZOIDAL	8'	4'	1	0.5	119	0.0%	68.0	37.4	39.3	43.6	45.4	1,548.6	1,548.6	1,555.0	1,552.1	1,550.6	1,550.5	1,550.6	1,550.6	1,551.1	1,551.0	1,551.2	1,551.2
MIDA1007	MIDA1006	1031	BOX	12'	5'	-	-	73	0.0%	98.9	38.6	40.3	41.7	45.8	1,548.6	1,548.6	1,555.0	1,555.0	1,550.6	1,550.6	1,550.6	1,550.6	1,551.0	1,551.1	1,551.2	1,551.2
MIDA2000	MIDA1007	C16	TRAPEZOIDAL	8'	2.3'	1.2	0.5	912	0.0%	45.7	35.2	37.9	35.0	36.3	1,548.7	1,548.6	1,551.8	1,555.0	1,550.7	1,550.6	1,550.7	1,550.6	1,551.1	1,551.0	1,551.2	1,551.2
MIDA2001	MIDA2000	C15	TRAPEZOIDAL	8'	2.3'	1.2	0.5	860	0.0%	11.4	32.9	34.4	32.7	33.7	1,548.8	1,548.7	1,553.0	1,551.8	1,551.5	1,550.7	1,551.6	1,550.7	1,551.8	1,551.1	1,551.9	1,551.2
MIDA3000	MIDA2001	C13	BOX	8'	4'	-	-	297	0.0%	42.8	32.5	34.1	32.2	33.5	1,548.8	1,548.8	1,555.0	1,553.0	1,551.6	1,551.5	1,551.7	1,551.6	1,551.8	1,551.8	1,551.9	1,551.9
MIDA4000	MIDA3000	C14	BOX	8'	4'	-	-	736	0.0%	43.3	31.2	32.7	30.9	31.9	1,548.9	1,548.8	1,555.5	1,555.0	1,551.6	1,551.6	1,551.7	1,551.7	1,551.8	1,551.8	1,551.9	1,551.9
MIDA4001	MIDA4000	C12	BOX	8'	4'	-	-	896	0.0%	41.8	5.9	6.3	5.3	6.5	1,549.0	1,548.9	1,554.7	1,555.5	1,551.6	1,551.6	1,551.7	1,551.7	1,551.8	1,551.8	1,551.9	1,551.9
MIDA5000	MIDA4001	C11	TRAPEZOIDAL	8'	3.9'	1	0.8	140	0.0%	29.3	7.9	8.3	6.2	7.4	1,549.0	1,549.0	1,555.0	1,554.7	1,551.6	1,551.6	1,551.7	1,551.7	1,551.8	1,551.8	1,551.9	1,551.9
MIDA6000	MIDA5000	C9	TRAPEZOIDAL	7'	3.1'	0.6	1	531	0.0%	16.5	8.4	8.9	8.0	9.3	1,549.0	1,549.0	1,556.6	1,555.0	1,551.6	1,551.6	1,551.7	1,551.7	1,551.8	1,551.8	1,551.9	1,551.9
NLRA6000	MIDA1005	MID_1	IRREGULAR	See model for channel cross-section				26	0.9%	-	80.3	83.4	109.5	120.1	1,548.6	1,546.5	1,552.1	1,553.3	1,550.5	1,549.8	1,550.6	1,549.9	1,551.0	1,550.5	1,551.2	1,550.7
Medford Irrigation Canal - Sterling Point Court stormdrain																										
Appendix A, Map # 3																										
MIDF5001	MIDA5000	1015	CIRCULAR	12"	-	-	-	126	6.4%	9.2	1.2	1.3	1.2	1.3	1,560.0	1,552.0	1,564.0	1,555.0	1,560.2	1,551.6	1,560.3	1,551.7	1,560.2	1,551.8	1,560.3	1,551.9
Medford Irrigation Canal - Karges Way stormdrain																										
Appendix A, Maps # 3 & 4																										
MIDE4001	MIDA4000	10230	CIRCULAR	27"	-	-	-	82	0.5%	22.1	30.6	32.1	34.3	35.9	1,550.4	1,550.0	1,556.7	1,555.5	1,552.8	1,551.6	1,552.9	1,551.7	1,552.9	1,551.8	1,553.0	1,551.9
MIDE4002	MIDE4001	10725	CIRCULAR	24"	-	-	-	87	0.5%	16.7	30.4	32.1	34.3	35.9	1,551.0	1,550.6	1,554.3	1,556.7	1,554.3	1,552.8	1,554.4	1,552.9	1,554.8	1,552.9	1,555.1	1,553.0
MIDE4100	MIDE4002	10224	CIRCULAR	24"	-	-	-	16	1.1%	24.5	30.4	32.1	34.6	35.9	1,551.4	1,551.2	1,555.3	1,554.3	1,554.7	1,554.3	1,554.8	1,554.4	1,555.1	1,554.8	1,555.4	1,555.1
MIDE4101	MIDE4100	10895	CIRCULAR	24"	-	-	-	137	2.5%	37.2	29.0	30.6	33.2	34.5	1,555.0	1,551.6	1,562.0	1,555.3	1,556.5	1,554.7	1,556.7	1,554.8	1,559.9	1,555.1	1,559.9	1,555.4
MIDE4102	MIDE4101	10383	CIRCULAR	24"	-	-	-	61	5.9%	57.6	30.5	31.7	32.5	33.8	1,558.6	1,555.0	1,564.0	1,562.0	1,559.7	1,556.5	1,559.7	1,556.7	1,559.8	1,559.9	1,560.0	1,559.9
MIDE4103	MIDE4102	10726	CIRCULAR	24"	-	-	-	75	0.4%	14.9	25.8	26.4	26.9	27.4	1,558.9	1,558.6	1,564.0	1,564.0	1,560.9	1,559.7	1,562.7	1,559.7	1,561.1	1,559.8	1,561.1	1,560.0
MIDE4200	MIDE4100	10223	CIRCULAR	12"	-	-	-	152	3.2%	6.5	0.5	0.6	0.5	0.6	1,556.3	1,551.4	1,559.0	1,555.3	1,556.5	1,554.7	1,556.5	1,554.8	1,556.5	1,555.1	1,556.5	1,555.4
MIDE4300	MIDE4100	10388	CIRCULAR	12"	-	-	-	292	0.1%	1.0	0.9	1.0	0.9	1.0	1,551.6	1,551.4	1,555.3	1,555.3	1,555.3	1,554.7	1,555.3	1,554.8	1,555.3	1,555.1	1,555.6	1,555.4
MIDE4400	MIDE4103	10733	CIRCULAR	24"	-	-	-	28	9.1%	70.1	23.1	24.3	26.2	27.4	1,561.5	1,558.9	1,566.0	1,564.0	1,562.2	1,560.9	1,562.3	1,562.7	1,562.3	1,561.1	1,562.3	1,561.1
MIDE4401	MIDE4400	10227	CIRCULAR	24"	-	-	-	215	2.3%	34.6	7.3	7.9	9.9	10.6	1,566.5	1,561.5	1,570.5	1,566.0	1,567.1	1,562.2	1,567.2	1,562.3	1,567.2	1,562.3	1,567.3	1,562.3
MIDE4500	MIDE4401	11067	CIRCULAR	24"	-	-	-	244	2.2%	34.7	7.3	8.0	9.9	10.6	1,571.8	1,566.5	1,581.0	1,570.5	1,572.4	1,567.1	1,572.4	1,567.2	1,572.5	1,567.2	1,572.5	1,567.3
MIDE4501	MIDE4500	10055	CIRCULAR	18"	-	-	-	92	5.0%	21.7	0.7	0.7	0.9	0.9	1,576.6	1,572.0	1,580.0	1,581.0	1,576.8	1,572.4	1,576.8	1,572.4	1,576.8	1,572.5	1,576.8	1,572.5
MIDE4600	MIDE4500	11068	CIRCULAR	18"	-	-	-	30	10.6%	34.9	6.6	7.2	9.0	9.7	1,576.4	1,573.2	1,581.4	1,581.0	1,576.8	1,572.4	1,576.9	1,572.4	1,576.9	1,572.5	1,576.9	1,572.5
MIDE4601	MIDE4600	10386	CIRCULAR	18"	-	-	-	200	4.4%	22.9	6.6	7.3	9.0	9.7	1,585.1	1,576.4	1,591.2	1,581.4	1,585.7	1,576.8	1,585.7	1,576.9	1,585.8	1,576.9	1,585.8	1,576.9
MIDE4602	MIDE4601	10898	CIRCULAR	24"	-	-	-	32	0.7%	19.5	6.6	7.3	9.0	9.7	1,585.3	1,585.1	1,591.7	1,591.2	1,586.1	1,585.7	1,586.2	1,585.7	1,586.3	1,585.8	1,586.3	1,585.8
MIDE4603	MIDE4602	10387	CIRCULAR	24"	-	-	-	76	1.5%	28.8	6.6	7.3	9.0	9.7	1,586.5	1,585.3	1,592.4	1,591.7	1,587.2	1,586.1	1,587.2	1,586.2	1,587.3	1,586.3	1,587.3	1,586.3
MIDE4604	MIDE4603	11229	CIRCULAR	18"	-	-	-	122	6.6%	27.7	6.6	7.3	9.0	9.7	1,594.5	1,586.5	1,598.5	1,592.4	1,595.0	1,587.2	1,595.0	1,587.2	1,595.1	1,587.3	1,595.1	1,587.3
MIDE4700	MIDE4400	10552	CIRCULAR	12"	-	-	-	40	6.7%	12.0	16.7	17.4	17.2	17.8	1,564.1	1,561.5	1,573.0	1,566.0	1,567.9	1,562.2	1,568.2	1,562.3	1,568.1	1,562.3	1,568.5	1,562.3
Location of Summerfield Detention Facility																										
MIDE4800	Summerfield_Detention	10897	CIRCULAR	12"	-	-	-	232	0.8%	3.4	1.1	1.2	1.1	1.2	1,570.5	1,568.5	1,573.6	1,569.8	1,570.8	1,567.8	1,570.9	1,568.2	1,570.8	1,568.1	1,570.9	1,568.5
MIDE4801	MIDE4800	10207	CIRCULAR	12"	-	-	-	39	1.3%	4.0	1.1	1.2	1.1	1.2	1,572.0	1,571.5	1,574.6	1,573.6	1,572.4	1,570.8	1,572.4	1,570.9	1,572.4	1,570.8	1,572.4	1,570.9

Table B-2. Hydraulic Model Parameters and Results

Conduit			Conduit Attributes							Conduit Capacity (cfs)****	Peak flow values (cfs)				Invert elevation (ft)		Rim/Bank elevation (ft)		Maximum Hydraulic Grade Line (ft)							
											Existing		Future						Existing Conditions				Future Conditions			
																			10-yr, 24-hr		25-yr, 24-hr		10-yr, 24-hr		25-yr, 24-hr	
US node	DS node	Name	Type	Diameter (in)/ Width (ft)	Height (ft)	Left Channel Slope (H:V)	Right Channel Slope (H:V)	Conduit Length (ft)	Slope (%)		10-yr	25-yr	10-yr	25-yr	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
MIDE4900	Summerfield_Detention	11227	CIRCULAR	42"	-	-	-	54	2.2%	153.2	26.1	27.9	27.3	29.2	1,567.2	1,566.0	1,573.2	1,569.8	1,568.2	1,567.8	1,568.3	1,568.2	1,568.3	1,568.1	1,568.6	1,568.5
MIDE4901	MIDE4900	10385	CIRCULAR	42"	-	-	-	162	1.6%	125.5	21.3	22.8	21.7	23.2	1,570.4	1,567.8	1,576.3	1,573.2	1,571.4	1,568.2	1,571.4	1,568.3	1,571.4	1,568.3	1,571.5	1,568.6
MIDE5000	MIDE4900	10054	CIRCULAR	18"	-	-	-	457	3.7%	21.5	4.7	5.1	5.7	6.1	1,584.9	1,567.8	1,590.4	1,573.2	1,585.4	1,568.2	1,585.4	1,568.3	1,585.4	1,568.3	1,585.4	1,568.6
MIDE5001	MIDE5000	10735	CIRCULAR	18"	-	-	-	21	3.9%	20.6	4.7	5.1	5.7	6.1	1,585.7	1,584.9	1,590.5	1,590.4	1,586.2	1,585.4	1,586.2	1,585.4	1,586.2	1,585.4	1,586.3	1,585.4
MIDE5002	MIDE5001	11055	CIRCULAR	24"	-	-	-	131	0.5%	17.1	3.9	4.3	4.8	5.1	1,586.4	1,585.7	1,591.5	1,590.5	1,587.1	1,586.2	1,587.1	1,586.2	1,587.1	1,586.2	1,587.2	1,586.3
MIDE5003	MIDE5002	10713	CIRCULAR	18"	-	-	-	40	20.8%	49.3	3.9	4.3	4.8	5.1	1,594.5	1,586.4	1,609.0	1,591.5	1,594.8	1,587.1	1,594.8	1,587.1	1,594.9	1,587.1	1,594.9	1,587.2
MIDE5004	MIDE5003	10538	CIRCULAR	18"	-	-	-	191	2.7%	17.9	3.9	4.3	4.8	5.1	1,599.7	1,594.5	1,609.0	1,609.0	1,600.2	1,594.8	1,600.3	1,594.8	1,600.3	1,594.9	1,600.3	1,594.9
MIDE5005	MIDE5004	10537	CIRCULAR	18"	-	-	-	260	1.6%	14.1	3.1	3.4	3.7	4.0	1,604.0	1,599.7	1,609.3	1,609.0	1,604.5	1,600.2	1,604.5	1,600.3	1,604.5	1,600.3	1,604.6	1,600.3
MIDE5006	MIDE5005	10050	CIRCULAR	18"	-	-	-	139	3.1%	19.4	3.1	3.4	3.7	4.0	1,608.4	1,604.2	1,615.1	1,609.3	1,608.8	1,604.5	1,608.8	1,604.5	1,608.9	1,604.5	1,608.9	1,604.6
MIDE5007	MIDE5006	10379	CIRCULAR	15"	-	-	-	77	4.7%	14.5	1.2	1.3	1.6	1.7	1,612.8	1,609.2	1,618.5	1,615.1	1,613.0	1,608.8	1,613.0	1,608.8	1,613.1	1,608.9	1,613.1	1,608.9
MIDE5008	MIDE5007	10891	CIRCULAR	12"	-	-	-	237	4.7%	8.3	1.2	1.3	1.6	1.7	1,625.1	1,613.9	1,628.8	1,618.5	1,625.4	1,613.0	1,625.4	1,613.0	1,625.4	1,613.1	1,625.4	1,613.1
MIDE5009	MIDE5008	10215	CIRCULAR	12"	-	-	-	197	2.7%	6.1	1.2	1.3	1.6	1.7	1,630.7	1,625.4	1,635.7	1,628.8	1,631.0	1,625.4	1,631.0	1,625.4	1,631.1	1,625.4	1,631.1	1,625.4
MIDE5010	MIDE5009	10374	CIRCULAR	12"	-	-	-	153	1.6%	4.6	1.2	1.3	1.6	1.7	1,634.4	1,632.0	1,640.1	1,635.7	1,634.8	1,631.0	1,634.8	1,631.0	1,634.8	1,631.1	1,634.8	1,631.1
MIDE5011	MIDE5010	10216	CIRCULAR	12"	-	-	-	25	3.8%	6.9	1.2	1.3	1.6	1.7	1,635.5	1,634.5	1,640.5	1,640.1	1,635.8	1,634.8	1,635.8	1,634.8	1,635.8	1,634.8	1,635.8	1,634.8
MIDE5012	MIDE5011	10376	CIRCULAR	12"	-	-	-	27	9.4%	11.7	1.2	1.3	1.6	1.7	1,638.0	1,635.5	1,641.6	1,640.5	1,638.2	1,635.8	1,638.2	1,635.8	1,638.3	1,635.8	1,638.3	1,635.8
MIDE5013	MIDE5012	11062	CIRCULAR	12"	-	-	-	100	4.5%	7.8	1.2	1.3	1.6	1.7	1,642.5	1,638.0	1,646.0	1,641.6	1,642.8	1,638.2	1,642.8	1,638.2	1,642.8	1,638.3	1,642.8	1,638.3
MIDE5100	MIDE4901	10734	CIRCULAR	36"	-	-	-	70	4.0%	133.3	21.3	22.8	21.7	23.2	1,573.2	1,570.4	1,578.5	1,576.3	1,574.0	1,571.4	1,574.1	1,571.4	1,574.1	1,571.4	1,574.1	1,571.5
MIDE5200	MIDE5100	10208	CIRCULAR	15"	-	-	-	38	8.5%	19.5	2.5	2.7	2.5	2.7	1,576.4	1,573.2	1,579.9	1,578.5	1,576.7	1,574.0	1,576.8	1,574.1	1,576.7	1,574.1	1,576.8	1,574.1
MIDE5201	MIDE5200	10884	CIRCULAR	15"	-	-	-	25	2.5%	10.2	2.1	2.3	2.1	2.3	1,577.1	1,576.4	1,580.9	1,579.9	1,577.4	1,576.7	1,577.5	1,576.8	1,577.4	1,576.7	1,577.5	1,576.8
MIDE5202	MIDE5201	10885	CIRCULAR	12"	-	-	-	276	2.5%	5.9	1.4	1.5	1.4	1.5	1,583.9	1,577.1	1,590.0	1,580.9	1,584.2	1,577.4	1,584.2	1,577.5	1,584.2	1,577.4	1,584.2	1,577.5
MIDE5203	MIDE5202	11052	CIRCULAR	12"	-	-	-	258	2.4%	5.5	1.1	1.1	1.1	1.1	1,590.0	1,583.9	1,593.3	1,590.0	1,590.3	1,584.2	1,590.3	1,584.2	1,590.3	1,584.2	1,590.3	1,584.2
MIDE5204	MIDE5203	10363	CIRCULAR	12"	-	-	-	232	5.0%	8.4	0.4	0.5	0.4	0.5	1,601.6	1,590.1	1,604.9	1,593.3	1,601.8	1,590.3	1,601.8	1,590.3	1,601.8	1,590.3	1,601.8	1,590.3
MIDE5300	MIDE5100	10228	CIRCULAR	36"	-	-	-	443	3.5%	129.2	18.1	19.4	18.4	19.7	1,588.8	1,573.2	1,594.4	1,578.5	1,589.5	1,574.0	1,589.6	1,574.1	1,589.5	1,574.1	1,589.6	1,574.1
MIDE5301	MIDE5300	10212	CIRCULAR	36"	-	-	-	191	4.0%	139.1	13.9	14.9	14.3	15.3	1,596.4	1,588.8	1,603.5	1,594.4	1,597.1	1,589.5	1,597.1	1,589.6	1,597.1	1,589.5	1,597.1	1,589.6
MIDE5302	MIDE5301	11220	CIRCULAR	30"	-	-	-	214	4.0%	86.2	12.9	13.9	13.3	14.2	1,605.0	1,596.5	1,612.1	1,603.5	1,605.7	1,597.1	1,605.7	1,597.1	1,605.7	1,597.1	1,605.7	1,597.1
MIDE5400	MIDE5300	10714	CIRCULAR	18"	-	-	-	14	9.3%	32.2	4.2	4.5	4.2	4.5	1,590.0	1,588.8	1,595.2	1,594.4	1,590.4	1,589.5	1,590.4	1,589.6	1,590.4	1,589.5	1,590.4	1,589.6
MIDE5401	MIDE5400	10042	CIRCULAR	18"	-	-	-	32	3.1%	19.0	4.2	4.5	4.2	4.5	1,591.0	1,590.0	1,594.6	1,595.2	1,591.5	1,590.4	1,591.5	1,590.4	1,591.5	1,590.4	1,591.5	1,590.4
MIDE5402	MIDE5401	11057	CIRCULAR	15"	-	-	-	253	3.2%	11.9	4.2	4.5	4.2	4.5	1,599.0	1,591.0	1,603.3	1,594.6	1,599.5	1,591.5	1,599.5	1,591.5	1,599.5	1,591.5	1,599.5	1,591.5
MIDE5403	MIDE5402	10717	CIRCULAR	15"	-	-	-	230	5.9%	16.1	2.7	2.9	2.7	2.9	1,612.5	1,599.0	1,616.3	1,603.3	1,612.9	1,599.5	1,612.9	1,599.5	1,612.9	1,599.5	1,612.9	1,599.5
MIDE5404	MIDE5403	10373	CIRCULAR	12"	-	-	-	25	3.0%	6.3	2.7	2.9	2.7	2.9	1,613.3	1,612.5	1,617.0	1,616.3	1,613.7	1,612.9	1,613.7	1,612.9	1,613.7	1,612.9	1,613.7	1,612.9
MIDE5405	MIDE5404	10718	CIRCULAR	12"	-	-	-	51	12.7%	13.0	2.7	2.9	2.7	2.9	1,619.7	1,613.3	1,623.0	1,617.0	1,620.0	1,613.7	1,620.0	1,613.7	1,620.0	1,613.7	1,620.0	1,613.7
MIDE5406	MIDE5405	11042	CIRCULAR	12"	-	-	-	271	4.2%	7.8	1.5	1.6	1.5	1.6	1,631.2	1,619.7	1,635.0	1,623.0	1,631.5	1,620.0	1,631.5	1,620.0	1,631.5	1,620.0	1,631.5	1,620.0
MIDE5407	MIDE5406	10032	CIRCULAR	12"	-	-	-	24	1.4%	4.5	1.5	1.6	1.5	1.6	1,631.5	1,631.2	1,635.0	1,635.0	1,631.9	1,631.5	1,631.9	1,631.5	1,631.9	1,631.5	1,631.9	1,631.5
MIDE5408	MIDE5407	10034	CIRCULAR	12"	-	-	-	49	1.9%	5.0	0.9	0.9	0.9	0.9	1,632.4	1,631.5	1,635.9	1,635.0	1,632.7	1,631.9	1,632.7	1,631.9	1,632.7	1,631.9	1,632.7	1,631.9
MIDE5409	MIDE5408	10879	CIRCULAR	12"	-	-	-	100	2.0%	5.3	0.9	0.9	0.9	0.9	1,634.5	1,632.4	1,638.1	1,635.9	1,634.7	1,632.7	1,634.7	1,632.7	1,634.7	1,632.7	1,634.7	1,632.7
MIDE5500	MIDE5302	10540	CIRCULAR	30"	-	-	-	21	3.9%	86.2	12.9	13.9	13.3	14.2	1,606.0	1,605.1	1,612.5	1,612.1	1,606.6	1,605.7	1,606.6	1,605.7	1,606.6	1,605.7	1,606.7	1,605.7
MIDE5501	MIDE5500	10549	CIRCULAR	24"	-	-	-	268	2.7%	39.3	9.4	10.1	9.6	10.3	1,614.8	1,607.5	1,619.7	1,612.5	1,615.5	1,606.6	1,615.5	1,606.6	1,615.5	1,606.6	1,615.5	1,606.7
MIDE5502	MIDE5501	10894	CIRCULAR	30"	-	-	-	17	2.9%	69.0	8.3	8.9	8.5	9.1	1,615.3	1,614.8	1,619.7	1,619.7	1,615.9	1,615.5	1,615.9	1,615.5	1,615.9	1,615.5	1,615.9	1,615.5
MIDE5600	MIDE5500	10548	CIRCULAR	18"	-	-	-	217	4.7%	23.3	3.5	3.8	3.7	3.9	1,616.4	1,606.1	1,620.9	1,612.5	1,616.7	1,606.6	1,616.8	1,606.6	1,616.8	1,606.6	1,616.8	1,606.7
MIDE5601	MIDE5600	10051	CIRCULAR	15"	-	-	-	202	3.7%	12.6	2.4	2.6	2.6	2.7	1,624.4	1,616.9	1,628.6	1,620.9	1,624.7	1,616.7	1,624.8	1,616.8	1,624.8	1,616.8	1,624.8	1,616.8
MIDE5602	MIDE5601	10892	CIRCULAR	15"	-	-	-	91	3.3%	12.0	2.4	2.6	2.6	2.7	1,627.5	1,624.5	1,631.8	1,628.6	1,627.9	1,624.7	1,627.9	1,624.8	1,627.9	1,624.8	1,627.9	1,624.8
MIDE5603	MIDE5602	10222	CIRCULAR	15"	-	-	-	26	2.7%	10.9	2.4	2.6	2.6	2.7	1,628.2	1,627.6	1,632.4	1,631.8	1,628.6	1,627.9	1,628.7	1,627.9	1,628.7	1,627.9	1,628.7	1,627.9
MIDE5604	MIDE5603	11058	CIRCULAR	15"	-	-	-	31	3.6%	12.6	2.4	2.6	2.6	2.7	1,629.5	1,628.4	1,633.7	1,632.4	1,629.9	1,628.6	1,629.9	1,628.7	1,629.9	1,628.7	1,629.9	1,628.7
MIDE5605	MIDE5604	11221	CIRCULAR	12"	-	-	-	305	4.2%	7.5	2.4	2.6	2.6	2.7	1,642.4	1,629.5	1,646.9	1,633.7	1,642.8	1,629.9	1,642.8	1,629.9	1,642.8	1,629.9	1,642.8	1,629.9
MIDE5606	MIDE5605	11061	CIRCULAR	12"	-	-	-	243	5.0%	7.8	0.5	0.5	0.6	0.7	1,654.9	1,642.8	1,658.6	1,646.9	1,655.0	1,642.8	1,655.0	1,642.8	1,655.0	1,642.8	1,655.0	1,642.8
MIDE5700	MIDE5502	11045	CIRCULAR	24"	-	-	-	241	4.1%	48.7	8.3	8.9	8.5	9.1	1,625.2	1,615.3	1,629.9	1,619.7	1,625.8	1,615.9	1,625.8	1,615.9	1,625.8	1,615.9	1,625.8	1,615.9
MIDE5701	MIDE5700	10030	CIRCULAR	24"	-	-	-	38	4.7%	51.3	6.2	6.6	6.2	6.6	1,627.0	1,625.2	1,631.5	1,629.9	1,627.5	1,625.8	1,627.5	1,625.8	1,627.5	1,625.8	1,627.5	1,625.8
MIDE5702	MIDE5701	11046	CIRCULAR	24"	-	-	-	264	2.5%	37.3	5.6	6.0	5.6	6.0	1,633.5	1,627.0	1,637.2	1,631.5	1,634.0	1,627.5	1,634.0	1,627.5	1,634.0	1,627.5	1,634.0	1,627.5
MIDE5800	MIDE5700	11066	CIRCULAR	24"	-	-	-	16	5.3%	53.3	2.1	2.3	2.3	2.5	1,626.1	1,625.2	1,629.9	1,629.9	1,626.3	1,625.8	1,626.3	1,625.8	1,626.3	1,625.8	1,626.3	1,625.8
MIDE5801	MIDE5800	11065	CIRCULAR	18"	-	-	-	219	4.6%	23.7	2.1	2.3	2.3	2.5	1,636.1	1,626.1	1,640.3	1,629.9	1,636.4	1,626.3	1,636.5	1,626.3	1,636.5	1,626.3	1,636.5	1,626.3

Table B-2. Hydraulic Model Parameters and Results

Conduit			Conduit Attributes							Conduit Capacity (cfs)****	Peak flow values (cfs)				Invert elevation (ft)		Rim/Bank elevation (ft)		Maximum Hydraulic Grade Line (ft)							
											Existing		Future						Existing Conditions				Future Conditions			
																			10-yr, 24-hr		25-yr, 24-hr		10-yr, 24-hr		25-yr, 24-hr	
US node	DS node	Name	Type	Diameter (in)/ Width (ft)	Height (ft)	Left Channel Slope (H:V)	Right Channel Slope (H:V)	Conduit Length (ft)	Slope (%)		10-yr	25-yr	10-yr	25-yr	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
MIDE5802	MIDE5801	10367	CIRCULAR	15"	-	-	-	83	4.9%	15.2	2.1	2.3	2.3	2.5	1,640.2	1,636.1	1,644.0	1,640.3	1,640.5	1,636.4	1,640.6	1,636.5	1,640.6	1,636.5	1,640.6	1,636.5
MIDE5803	MIDE5802	10708	CIRCULAR	15"	-	-	-	34	2.2%	10.1	2.1	2.3	2.3	2.5	1,641.0	1,640.2	1,644.4	1,644.0	1,641.4	1,640.5	1,641.4	1,640.6	1,641.4	1,640.6	1,641.4	1,640.6
MIDE5804	MIDE5803	10880	CIRCULAR	15"	-	-	-	32	2.0%	9.2	1.2	1.3	1.4	1.5	1,641.6	1,641.0	1,645.0	1,644.4	1,641.9	1,641.4	1,641.9	1,641.4	1,641.9	1,641.4	1,641.9	1,641.4
MIDE5805	MIDE5804	10205	CIRCULAR	12"	-	-	-	36	2.5%	6.0	1.2	1.3	1.4	1.5	1,642.5	1,641.6	1,645.8	1,645.0	1,642.8	1,641.9	1,642.8	1,641.9	1,642.8	1,641.9	1,642.8	1,641.9
MIDE5806	MIDE5805	11223	CIRCULAR	12"	-	-	-	263	4.6%	7.9	1.2	1.3	1.4	1.5	1,654.7	1,642.5	1,658.0	1,645.8	1,654.9	1,642.8	1,654.9	1,642.8	1,654.9	1,642.8	1,654.9	1,642.8
MIDE5807	MIDE5806	10889	CIRCULAR	12"	-	-	-	254	6.7%	9.9	1.2	1.3	1.4	1.5	1,671.8	1,654.8	1,675.8	1,658.0	1,672.0	1,654.9	1,672.0	1,654.9	1,672.0	1,654.9	1,672.0	1,654.9
MIDE5900	MIDE5702	10203	CIRCULAR	18"	-	-	-	190	3.4%	20.6	4.7	5.1	4.7	5.1	1,640.0	1,633.5	1,643.7	1,637.2	1,640.5	1,634.0	1,640.5	1,634.0	1,640.5	1,634.0	1,640.5	1,634.0
MIDE5901	MIDE5900	10371	CIRCULAR	15"	-	-	-	110	6.1%	16.3	2.0	2.1	2.0	2.1	1,646.6	1,640.0	1,650.5	1,643.7	1,646.9	1,640.5	1,646.9	1,640.5	1,646.9	1,640.5	1,646.9	1,640.5
MIDE5902	MIDE5901	10882	CIRCULAR	12"	-	-	-	182	6.9%	9.8	2.0	2.1	2.0	2.1	1,659.2	1,646.6	1,662.8	1,650.5	1,659.5	1,646.9	1,659.5	1,646.9	1,659.5	1,646.9	1,659.5	1,646.9
MIDE5903	MIDE5902	10197	CIRCULAR	12"	-	-	-	290	7.3%	9.9	1.0	1.1	1.0	1.1	1,680.3	1,659.2	1,683.7	1,662.8	1,680.5	1,659.5	1,680.5	1,659.5	1,680.5	1,659.5	1,680.5	1,659.5
MIDE6000	MIDE5900	10369	CIRCULAR	18"	-	-	-	65	6.2%	25.3	2.8	3.0	2.8	3.0	1,644.0	1,640.0	1,647.0	1,643.7	1,644.4	1,640.5	1,644.4	1,640.5	1,644.4	1,640.5	1,644.4	1,640.5
MIDE6001	MIDE6000	10533	CIRCULAR	18"	-	-	-	24	3.8%	19.9	2.8	3.0	2.8	3.0	1,645.0	1,644.0	1,648.4	1,647.0	1,645.3	1,644.4	1,645.4	1,644.4	1,645.3	1,644.4	1,645.4	1,644.4
MIDE6002	MIDE6001	10534	CIRCULAR	12"	-	-	-	111	3.9%	7.4	2.1	2.2	2.1	2.2	1,649.3	1,645.0	1,655.3	1,648.4	1,649.6	1,645.3	1,649.6	1,645.4	1,649.6	1,645.3	1,649.6	1,645.4
MIDE6003	MIDE6002	10039	CIRCULAR	12"	-	-	-	66	11.6%	12.9	2.1	2.2	2.1	2.2	1,656.9	1,649.3	1,660.8	1,655.3	1,657.2	1,649.6	1,657.2	1,649.6	1,657.2	1,649.6	1,657.2	1,649.6
MIDE6004	MIDE6003	10814	CIRCULAR	12"	-	-	-	274	4.8%	8.2	2.1	2.2	2.1	2.2	1,670.0	1,656.9	1,673.3	1,660.8	1,670.4	1,657.2	1,670.4	1,657.2	1,670.4	1,657.2	1,670.4	1,657.2
Medford Irrigation Canal - Sharmrock Drive stormdrain Appendix A, Maps # 2 & 3																										
MIDD3001	MIDA3000	C66235	CIRCULAR	12"	-	-	-	186	2.3%	5.4	1.7	1.9	1.7	1.9	1,555.2	1,550.9	1,559.0	1,555.0	1,555.5	1,551.6	1,555.6	1,551.7	1,555.5	1,551.8	1,555.6	1,551.9
MIDD3002	MIDD3001	10738	CIRCULAR	12"	-	-	-	126	0.9%	3.5	1.7	1.9	1.7	1.9	1,556.3	1,555.2	1,559.7	1,559.0	1,556.8	1,555.5	1,556.8	1,555.6	1,556.8	1,555.5	1,556.8	1,555.6
MIDD3003	MIDD3002	10231	CIRCULAR	12"	-	-	-	51	2.0%	5.1	1.7	1.9	1.7	1.9	1,557.3	1,556.3	1,560.0	1,559.7	1,557.7	1,556.8	1,557.8	1,556.8	1,557.7	1,556.8	1,557.8	1,556.8
MIDD3004	MIDD3003	11069	CIRCULAR	12"	-	-	-	170	0.6%	2.8	1.7	1.9	1.7	1.9	1,558.4	1,557.3	1,562.0	1,560.0	1,559.0	1,557.7	1,559.0	1,557.8	1,559.0	1,557.7	1,559.0	1,557.8
Medford Irrigation Canal - Brannon Drive stormdrain Appendix A, Maps # 2 & 3																										
MIDC2001	MIDA2000	1014	CIRCULAR	12"	-	-	-	142	2.8%	6.1	1.7	1.8	1.7	1.8	1,554.0	1,550.0	1,555.5	1,551.8	1,554.4	1,550.7	1,554.4	1,550.7	1,554.4	1,551.1	1,554.4	1,551.2
Medford Irrigation Canal - Harbrooke Road stormdrain Appendix A, Map # 9																										
MIDB1001	MIDA1000	10761	CIRCULAR	15"	-	-	-	35	0.4%	4.4	2.0	2.2	2.1	2.3	1,550.1	1,549.9	1,554.3	1,553.9	1,550.6	1,547.6	1,550.7	1,547.6	1,550.6	1,547.9	1,550.7	1,548.0
MIDB1100	MIDB1001	11237	CIRCULAR	15"	-	-	-	46	1.7%	8.9	2.0	2.2	2.1	2.3	1,551.1	1,550.3	1,555.2	1,554.3	1,551.5	1,550.6	1,551.5	1,550.7	1,551.5	1,550.6	1,551.5	1,550.7
MIDB1101	MIDB1100	11238	CIRCULAR	12"	-	-	-	58	0.9%	3.4	0.5	0.5	0.5	0.5	1,552.1	1,551.6	1,556.4	1,555.2	1,552.4	1,551.5	1,552.4	1,551.5	1,552.4	1,551.5	1,552.4	1,551.5
MIDB1102	MIDB1101	11086	CIRCULAR	12"	-	-	-	200	2.2%	5.3	0.5	0.5	0.5	0.5	1,556.8	1,552.3	1,561.0	1,556.4	1,557.0	1,552.4	1,557.0	1,552.4	1,557.0	1,552.4	1,557.0	1,552.4
MIDB1200	MIDB1100	10576	CIRCULAR	15"	-	-	-	264	2.1%	9.8	1.6	1.7	1.6	1.7	1,556.8	1,551.2	1,565.8	1,555.2	1,557.2	1,551.5	1,557.2	1,551.5	1,557.2	1,551.5	1,557.2	1,551.5
MIDB1202	MIDB1200	10917	CIRCULAR	12"	-	-	-	101	6.2%	9.2	1.6	1.7	1.6	1.7	1,565.0	1,558.8	1,569.7	1,565.8	1,565.3	1,557.2	1,565.3	1,557.2	1,565.3	1,557.2	1,565.3	1,557.2

* This is a detention pipe; conduit capacity attribute does not apply.

** This segment was modeled as a double-barrel conduit.

*** This segment was modeled as a triple-barrel conduit.

****The conduit capacity is calculated in PC SWMM using Manning's formula. The calculation is based on an assumption of steady uniform flow. Under various hydraulic circumstances (e.g. critical flow), the actual pipe capacity can exceed this reported value.

Appendix C: CIP Cost Estimates

City of Medford - Stormwater Master Plan
Capital Improvement Project
Preliminary Engineering Unit Cost

ITEM	UNIT	2015 UNIT COST ($)
Water Quality Facility Installation		
General Earthwork & Off-site removal	CY	$19
Clearing Brush	AC	$1,966
Amended Soils and Mulch	CY	$43
Jute Matting, Biodegradable	SY	$11
Pond Outflow	EA	$6,376
Stormwater Planter	SF	$39
Beehive Overflow	EA	$1,594
Water Quality Facility Plantings	SF	$3
Structure Installation		
Precast Concrete Manhole (48", 0-8' deep)	EA	$3,719
Precast Concrete Manhole (72", 0-8' deep)	EA	$7,439
Catch Basin	EA	$2,444
Connection to Existing Structure	EA	$1,063
Fish Screen	EA	$1,000
Outfall Improvements	EA	$5,313
Restoration/Resurfacing		
Riparian Planting	SF	$8
Temporary Stream Diversion	LS	$10,000
Fish Removal	LS	$3,000
Rip-Rap, Class 50	CY	$64
Stream Bed Gravel	CY	$43
Project Tools		
Feasibility Study	LS	$20,000
Mobilization/Demobilization	LS	10%
Traffic Control/Utility Relocation	LS	2%
Erosion Control	LS	2%
Construction Contingency	LS	30%
Construction Cost Estimate		
Engineering and Permitting*	LS	Varies by project (20-30%)
Construction Administration	LS	5%
Total Project Engineering and Construction Cost		

* Engineering and permitting costs will be documented in each project's write-up.

City of Medford - Stormwater Master Plan Costs
Capital Improvement Project
Pipe Installation with Asphalt

Storm Drain Pipe Installation Cost (w/ Asphalt) per Linear Foot (2015 Dollars)											
Cover Depth (feet)	Diameter (inches)										
	6	12	15	18	24	30	36	42	48	54	60
2-5	$ 68	$ 76	$ 94	$ 116	$ 151	$ 193	$ 237	$ 282	$ 325	$ 410	$ 480
5-10	$ 98	$ 105	$ 129	$ 159	$ 206	$ 261	$ 317	$ 376	$ 432	$ 529	$ 612
10-15	$ 127	$ 135	$ 165	$ 201	$ 261	$ 329	$ 398	$ 469	$ 538	$ 648	$ 744
15-20	$ 157	$ 165	$ 201	$ 243	$ 316	$ 397	$ 479	$ 563	$ 644	$ 768	$ 876

Breakdown of Linear Foot Cost											
Depth of Cover (ft)	**6**	**12**	**15**	**18**	**24**	**30**	**36**	**42**	**48**	**54**	**60**
Sub Task											
Pipe + Bed (ft)	1.0	1.5	1.8	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5
Width (ft)	2	2	2.5	3	4	5	6	7	8	9	10
Bedding (ft)	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.3	0.3	0.3	0.4
Shoring ($/lf)	$ 4	$ 4	$ 4	$ 4	$ 4	$ 4	$ 4	$ 4	$ 4	$ 4	$ 4
Sawcutting and Asphalt Removal ($/lf)	$ 18	$ 18	$ 22	$ 26	$ 33	$ 40	$ 48	$ 55	$ 63	$ 70	$ 78
Trench Excavation ($/CY)	$ 27	$ 27	$ 27	$ 27	$ 27	$ 27	$ 27	$ 27	$ 27	$ 27	$ 27
Trench Backfill ($/CY)	$ 43	$ 43	$ 43	$ 43	$ 43	$ 43	$ 43	$ 43	$ 43	$ 43	$ 43
HDPE Piping unless noted concrete ($/lf)	$ 5	$ 12	$ 14	$ 22	$ 26	$ 36	$ 46	$ 58	$ 66	$ 116	$ 149
Asphalt Restoration ($/lf)	$ 14	$ 14	$ 18	$ 21	$ 28	$ 36	$ 43	$ 50	$ 57	$ 64	$ 71
Trench Volume (CY)											
2-5	0.4	0.5	0.6	0.8	1.1	1.5	1.9	2.3	2.8	3.3	3.9
5-10	0.8	0.9	1.1	1.3	1.9	2.4	3.0	3.6	4.3	5.0	5.7
10-15	1.2	1.2	1.6	1.9	2.6	3.3	4.1	4.9	5.8	6.7	7.6
15-20	1.6	1.6	2.0	2.4	3.3	4.3	5.2	6.2	7.3	8.3	9.4
Backfill Volume (CY)											
2-5	0.4	0.4	0.5	0.6	0.7	0.9	1.1	1.3	1.5	1.7	1.9
5-10	0.7	0.7	0.9	1.1	1.5	1.9	2.2	2.6	3.0	3.3	3.7
10-15	1.1	1.1	1.4	1.7	2.2	2.8	3.3	3.9	4.4	5.0	5.6
15-20	1.5	1.5	1.9	2.2	3.0	3.7	4.4	5.2	5.9	6.7	7.4
Cost ($/LF)											
RS Means City Cost Index	98.7										
2-5	$ 68	$ 76	$ 94	$ 116	$ 151	$ 193	$ 237	$ 282	$ 325	$ 410	$ 480
5-10	$ 98	$ 105	$ 129	$ 159	$ 206	$ 261	$ 317	$ 376	$ 432	$ 529	$ 612
10-15	$ 127	$ 135	$ 165	$ 201	$ 261	$ 329	$ 398	$ 469	$ 538	$ 648	$ 744
15-20	$ 157	$ 165	$ 201	$ 243	$ 316	$ 397	$ 479	$ 563	$ 644	$ 768	$ 876

Honor Dr Improvements				
Description	Units	Quantity	Unit Price	Cost*
Capital Expenses				
HDPE Pipeline (18", 5-10' Deep)	LF	478	$159	$75,850
HDPE Pipeline (15", 5-10' Deep)	LF	523	$129	$67,720
Precast Concrete Manhole (48", 0-8' Deep)	EA	6	$3,719	$22,310
Catch Basin	EA	12	$2,444	$29,330
Capital Expense Sub-Total				$195,210
Mobilization/Demobilization	LS	10%		$19,520
Traffic Control/Utility Relocation	LS	2%		$3,900
Erosion Control	LS	2%		$3,900
Construction Cost Sub-Total				$222,530
Construction Contingency	LS	30%		$66,760
Capital Expense Total				$289,290
Administrative Expenses				
Engineering and Permitting	LS	20%		$57,860
Construction & General Administration	LS	5%		$14,460
Administrative Expense Total				$72,320
Capital Expense Cost Total (2015 Dollars)				**$361,610**

*Costs have been rounded to the nearest $10.

Constitution Dr Improvements				
Description	Units	Quantity	Unit Price	Cost*
Capital Expenses				
HDPE Pipeline (15", 5-10' Deep)	LF	571	$129	$73,940
Precast Concrete Manhole (48", 0-8' Deep)	EA	5	$3,719	$18,600
Catch Basin	EA	10	$2,444	$24,440
Capital Expense Sub-Total				$116,980
Mobilization/Demobilization	LS	10%		$11,700
Traffic Control/Utility Relocation	LS	2%		$2,340
Erosion Control	LS	2%		$2,340
Construction Cost Sub-Total				$133,360
Construction Contingency	LS	30%		$40,010
Capital Expense Total				$173,370
Administrative Expenses				
Engineering and Permitting	LS	20%		$34,670
Construction & General Administration	LS	5%		$8,670
Administrative Expense Total				$43,340
Capital Expense Cost Total (2015 Dollars)				**$216,710**

*Costs have been rounded to the nearest $10.

E Barnett Rd Improvements				
Description	Units	Quantity	Unit Price	Cost*
Capital Expenses				
HDPE Pipeline (15", 5-10' Deep)	LF	294	$129	$38,070
Precast Concrete Manhole (48", 0-8' Deep)	EA	2	$3,719	$7,440
Catch Basin	EA	4	$2,444	$9,780
Capital Expense Sub-Total				$55,290
Mobilization/Demobilization	LS	10%		$5,530
Traffic Control/Utility Relocation	LS	2%		$1,110
Erosion Control	LS	2%		$1,110
Construction Cost Sub-Total				$63,040
Construction Contingency	LS	30%		$18,910
Capital Expense Total				$81,950
Administrative Expenses				
Engineering and Permitting	LS	20%		$16,390
Construction & General Administration	LS	5%		$4,100
Administrative Expense Total				$20,490
Capital Expense Cost Total (2015 Dollars)				**$102,440**

*Costs have been rounded to the nearest $10.

La Loma Dr Improvements				
Description	Units	Quantity	Unit Price	Cost*
Capital Expenses				
HDPE Pipeline (15", 5-10' Deep)	LF	78	$129	$10,100
Precast Concrete Manhole (48", 0-8' Deep)	EA	2	$3,719	$7,440
Catch Basin	EA	4	$2,444	$9,780
Capital Expense Sub-Total				$27,320
Mobilization/Demobilization	LS	10%		$2,730
Traffic Control/Utility Relocation	LS	2%		$550
Erosion Control	LS	2%		$550
Construction Cost Sub-Total				$31,150
Construction Contingency	LS	30%		$9,350
Capital Expense Total				$40,500
Administrative Expenses				
Engineering and Permitting	LS	20%		$8,100
Construction & General Administration	LS	5%		$2,030
Administrative Expense Total				$10,130
Capital Expense Cost Total (2015 Dollars)				**$50,630**

*Costs have been rounded to the nearest $10.

Karges Way Improvements				
Description	Units	Quantity	Unit Price	Cost*
Capital Expenses				
HDPE Pipeline (30", 5-10' Deep)**	LF	87	$261	$22,720
Precast Concrete Manhole (48", 0-8' Deep)	EA	2	$3,719	$7,440
Stormwater Planter	SF	260	$39	$10,140
Water Quality Facility Plantings	SF	260	$3	$780
Beehive Overflow	EA	1	$1,594	$1,590
Catch Basin	EA	4	$2,444	$9,780
Capital Expense Sub-Total				$52,450
Mobilization/Demobilization	LS	10%		$5,250
Traffic Control/Utility Relocation	LS	2%		$1,050
Erosion Control	LS	2%		$1,050
Construction Cost Sub-Total				$59,800
Construction Contingency	LS	30%		$17,940
Capital Expense Total				$77,740
Administrative Expenses				
Engineering and Permitting	LS	20%		$15,550
Construction & General Administration	LS	5%		$3,890
Administrative Expense Total				$19,440
Capital Expense Cost Total (2015 Dollars)				**$97,180**

* Costs have been rounded to the nearest $10.

** Actual item is a 27" HDPE Pipeline. Cost was based on best available data.

La Loma Dr Outfall Improvements				
Description	Units	Quantity	Unit Price	Cost*
Capital Expenses				
HDPE Pipeline (48", 5-10' Deep)	LF	276	$432	$119,160
Precast Concrete Manhole (48", 0-8' Deep)	EA	1	$3,719	$3,720
Outfall Improvements	EA	1	$5,313	$5,310
Capital Expense Sub-Total				$128,190
Mobilization/Demobilization	LS	10%		$12,820
Traffic Control/Utility Relocation	LS	2%		$2,560
Erosion Control	LS	2%		$2,560
Construction Cost Sub-Total				$146,130
Construction Contingency	LS	30%		$43,840
Capital Expense Total				$189,970
Administrative Expenses				
Engineering and Permitting	LS	30%		$56,990
Construction & General Administration	LS	5%		$9,500
Administrative Expense Total				$66,490
Capital Expense Cost Total (2015 Dollars)				**$256,460**

*Costs have been rounded to the nearest $10.

Black Oak Dr Improvements				
Description	Units	Quantity	Unit Price	Cost*
Capital Expenses				
HDPE Pipeline (48", 5-10' Deep)	LF	110	$432	$47,490
Riparian Planting	SF	10,000	$8	$80,000
Fish Removal	LS	1	$3,000	$3,000
Temporary Stream Diversion	LS	1	$10,000	$10,000
Capital Expense Sub-Total				$140,490
Mobilization/Demobilization	LS	10%		$14,050
Traffic Control/Utility Relocation	LS	2%		$2,810
Erosion Control	LS	2%		$2,810
Construction Cost Sub-Total				$160,160
Construction Contingency	LS	30%		$48,050
Capital Expense Total				$208,210
Administrative Expenses				
Engineering and Permitting	LS	20%		$41,640
Construction & General Administration	LS	5%		$10,410
Administrative Expense Total				$52,050
Capital Expense Cost Total (2015 Dollars)				**$260,260**

*Costs have been rounded to the nearest $10.

State St. Improvements: Alternative A - Detention				
Description	Units	Quantity	Unit Price	Cost*
Capital Expenses				
Feasibility Study	LS	1	$20,000	$20,000
General Earthwork & Off-Site Removal	CY	5,552	$19	$105,490
Amended Soils and Mulch	CY	652	$43	$28,040
Jute Matting, Biodegradable	SY	1,956	$11	$21,520
Rip-Rap, Class 50	CY	32	$64	$2,070
HDPE Pipeline (15", 5-10' Deep)	LF	10	$129	$1,290
HDPE Pipeline (6", 5-10' Deep)**	LF	10	$98	$980
Fish Screen	EA	2	$1,000	$2,000
Water Quality Facility Plantings	SF	17,600	$3	$52,800
Capital Expense Sub-Total				$214,190
Mobilization/Demobilization	LS	10%		$21,420
Traffic Control/Utility Relocation	LS	2%		$4,280
Erosion Control	LS	2%		$4,280
Construction Cost Sub-Total				$244,170
Construction Contingency	LS	30%		$73,250
Capital Expense Total				$317,420
Administrative Expenses				
Engineering and Permitting	LS	30%		$95,230
Construction & General Administration	LS	5%		$15,870
Administrative Expense Total				$111,100
Capital Expense Cost Total (2015 Dollars)				**$428,520**

* Costs have been rounded to the nearest $10.

** Actual item is a 3" HDPE Pipeline. Cost was based on best available data.

State St. Improvements: Alternative B - Channel Upsizing				
Description	Units	Quantity	Unit Price	Cost*
Capital Expenses				
Temporary Stream Diversion	LS	1	$10,000	$10,000
Fish Removal	LS	1	$3,000	$3,000
General Earthwork & Off-site removal	CY	1,066	$19	$20,250
Amended Soils and Mulch	CY	549	$43	$23,610
Jute Matting, Biodegradable	SY	1,646	$11	$18,110
Riparian Planting	SF	14,815	$8	$118,520
Capital Expense Sub-Total				$193,490
Mobilization/Demobilization	LS	10%		$19,350
Traffic Control/Utility Relocation	LS	2%		$3,870
Erosion Control	LS	2%		$3,870
Construction Cost Sub-Total				$220,580
Construction Contingency	LS	30%		$66,170
Capital Expense Total				$286,750
Administrative Expenses				
Engineering and Permitting	LS	30%		$86,030
Construction & General Administration	LS	5%		$14,340
Administrative Expense Total				$100,370
Capital Expense Cost Total (2015 Dollars)				**$387,120**

*Costs have been rounded to the nearest $10.

Ellendale Dr Improvements: Alternative A - Channel Upsizing				
Description	Units	Quantity	Unit Price	Cost*
Capital Expenses				
Temporary Stream Diversion	LS	1	$10,000	$10,000
Fish Removal	LS	1	$3,000	$3,000
General Earthwork & Off-Site Removal	CY	556	$19	$10,570
Amended Soils and Mulch	CY	186	$43	$8,000
Jute Matting, Biodegradable	SY	558	$11	$6,140
Riparian Planting	SF	5,025	$8	$40,200
Capital Expense Sub-Total				$77,910
Mobilization/Demobilization	LS	10%		$7,790
Traffic Control/Utility Relocation	LS	2%		$1,560
Erosion Control	LS	2%		$1,560
Construction Cost Sub-Total				$88,820
Construction Contingency	LS	30%		$26,650
Capital Expense Total				$115,470
Administrative Expenses				
Engineering and Permitting	LS	30%		$34,640
Construction & General Administration	LS	5%		$5,770
Administrative Expense Total				$40,410
Capital Expense Cost Total (2015 Dollars)				**$155,880**

*Costs have been rounded to the nearest $10.

Ellendale Dr Improvements: Alternative B - Bio-retention				
Description	Units	Quantity	Unit Price	Cost*
Capital Expenses				
Feasibility Study	LS	1	$20,000	$20,000
General Earthwork & Off-Site Removal	CY	8,222	$19	$156,220
Amended Soils and Mulch	CY	1,370	$43	$58,910
HDPE Pipeline (6", 5-10' Deep)	LF	10	$98	$980
HDPE Pipeline (15", 5-10' Deep)	LF	10	$129	$1,290
Fish Screen	EA	2	$1,000	$2,000
Jute Matting, Biodegradable	SY	4,111	$11	$45,220
Rip-Rap, Class 50	CY	52	$64	$3,320
Water Quality Facility Plantings	SF	37,000	$3	$111,000
Capital Expense Sub-Total				$398,940
Mobilization/Demobilization	LS	10%		$39,890
Traffic Control/Utility Relocation	LS	2%		$7,980
Erosion Control	LS	2%		$7,980
Construction Cost Sub-Total				$454,790
Construction Contingency	LS	30%		$136,440
Capital Expense Total				$591,230
Administrative Expenses				
Engineering and Permitting	LS	30%		$177,370
Construction & General Administration	LS	5%		$29,560
Administrative Expense Total				$206,930
Capital Expense Cost Total (2015 Dollars)				**$798,160**

*Costs have been rounded to the nearest $10.

Appendix D: Electronic Files (CD)