Town of Loomis

DRAINAGE MASTER PLAN UPDATE

August 2008

WEST YOST ASSOCIATES

Drainage Master Plan Update

Prepared for

Town of Loomis

August 2008

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CHAPTER 1. INTRODUCTION

The Town of Loomis (Loomis), incorporated in 1984, encompasses about 6.8 square miles in western Placer County. Loomis is north of the City of Rocklin and south of the communities of Penryn and Newcastle and is bisected by Interstate 80. See Figure 1-1. The current population is about 6,699 (2006 U.S. Census) and the General Plan forecasts growth to 10,000 by 2020.

This Drainage Master Plan is an update of the 2001 Drainage Master Plan. The 2001 Drainage Master Plan was the first effort by Loomis to define its drainage infrastructure, evaluate drainage problems, and develop a capital improvement program to address these needs. Constructing a database and mapping the existing drainage system became the major effort. The updated Drainage Master Plan is based on the analyses performed for the 2001 Drainage Master Plan. The updated Drainage Master Plan includes changes to the drainage system mapping, recommended storm drain improvements, cost estimates, and the capital improvement program since the 2001 Drainage Master Plan.

The objectives of the Drainage Master Plan are to:

- Provide a documentation of the existing drainage system
- Prepare a set of storm drainage maps of Loomis
- Identify and evaluate specific areas of concern
- Recommend a capital improvement program

Flooding and drainage problems in Loomis are caused either by creek overflow or by storm drain problems. Loomis is bisected by three major streams, all part of the Dry Creek watershed. The drainage system relies in large part on natural water courses and to a lesser extent on pipe and channel storm drain systems. The Drainage Master Plan describes the natural and man-made drainage facilities. Basic data on the drainage system are shown on a series of drainage system maps that will be used by Loomis staff and residents to identify drainage facilities and respond to problems.

Loomis was divided into 15 individual shed areas. These sheds are generally in agreement with the Dry Creek Watershed Flood Control Plan (Dry Creek Plan) sponsored by the Placer County Flood Control and Water Conservation District (District). These sheds were used to subdivide Loomis into manageable areas and to report problems, findings, and proposed improvement projects for each area.

The District provided mapping from the update of the Federal Emergency Management Agency (FEMA) Flood Insurance Study (FIS) floodplains. This material assisted in the identification of properties located in the floodplain. Recommendations were made to protect properties threatened by flooding as shown on the updated FIS floodplain maps. Consideration was given to non-structural solutions to flooding problems. Flood-proofing and individual site protection may be advantageous in some situations.

Loomis has a limited number of storm drains facilities. An urban storm drain system serving the entire town would be prohibitively expensive and not compatible with its rural nature. The Drainage Master Plan focuses on small-scale improvements that address problem areas, but maintains the concept of open drainage ditches and cross culverts. The several creeks and their tributaries traversing Loomis are an important part of the drainage system. In some cases, an ultimate solution including storm drains is shown as an alternative and as a goal for the long-term future. Figure 1-1 shows Loomis' boundaries, roads, streams and major watershed boundaries.

DRAINAGE SYSTEM MAPS

A major effort of the Drainage Master Plan process was the compiling of information on the existing storm drain system and plotting the information on a base map of the Loomis. A base map of Loomis was developed and divided into 15 sub-areas. Individual maps have a scale of 1-inch equals 400 feet. The map size and scale were selected for ease of handling and reading. The system drainage maps shows the location of facilities, pipe sizes and invert elevations and are provided in Appendix C. Loomis staff will use drainage system maps to plan improvements and to respond to questions and concerns.

SURVEYING

Field surveys of stream road crossings were undertaken for the 2001 Drainage Master Plan. Channel inverts upstream and downstream of bridges were measured and bridge openings surveyed. The objective was to determine whether FEMA floodplains were based on current bridge geometry. Survey data were used in the master plan analysis.

POLICIES AND CRITERIA

Implementation of the Drainage Master Plan will include responding to the policies adopted in the General Plan and by the Town Council. Chapter 3 presents the policy statements of the Drainage Master Plan followed by a set of criteria that provides the detail to assure that policy directives are achieved.

DESCRIPTION OF DRAINAGE FACILITIES

Loomis drainage is provided by local storm drains including pipes, ditches and swales and the several streams that pass through Loomis and collect floodwater and storm runoff. The stream system serving Loomis is discussed in Chapter 4. Storm drains are discussed in Chapter 5.

EVALUATION OF AREAS OF CONCERN

Drainage problems were evaluated to determine the probable causes and to identify possible solutions. The problems and recommended improvements are summarized in Chapter 5.

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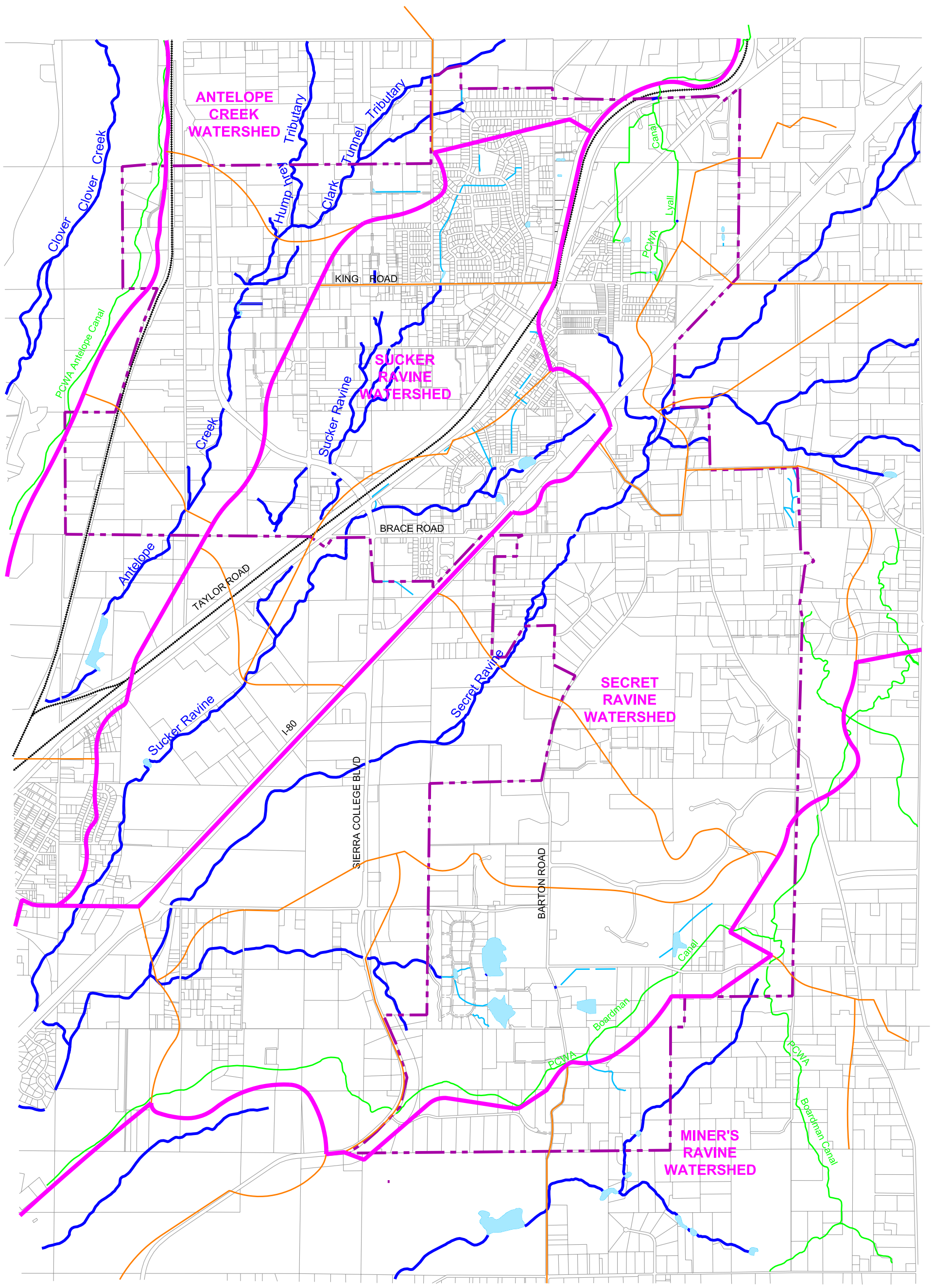


LEGEND

- STREAM/CHANNEL
- TOWN LIMITS
- MAJOR WATERSHED BOUNDARY
- SUB-WATERSHED BOUNDARY
- POND OR DETENTION BASIN
- PCWA IRRIGATION CANAL

N

0 1000 2000
SCALE IN FEET

Figure 1-1

Town of Loomis
Drainage Master Plan
STREAMS & MAJOR SHEDS MAP

WEST YOST ASSOCIATES
Consulting Engineers

MAINTENANCE PROGRAM

Maintenance activities were reviewed and recommendations were made as appropriate to Loomis' needs. The maintenance program is described in Chapter 6. This chapter also includes a summary of NPDES requirements.

RECOMMENDED CAPITAL IMPROVEMENT PROGRAM

A select list of improvement projects that address identified flooding problems is included in the recommended Capital Improvement Program (CIP), which is summarized in Chapter 7. The CIP includes planning level cost estimates.

CHAPTER 2. STUDY AREA AND BACKGROUND DATA

OVERVIEW

Situated in the rolling foothills of western Placer County (County), the Town of Loomis (Loomis) is a semi-rural community that is bisected by several streams and tributaries. It lies south of the community of Newcastle and northeast of the City of Rocklin. Interstate 80 traverses Loomis from southwest to northeast through the center of town paralleling Taylor Road, Loomis' main street. Sierra College Boulevard runs north/south near Loomis' western limits.

Elevations generally range from 200 feet in the south, to 400 feet in the north. Average rainfall is 25 inches a year falling primarily between October and April. Data collected, reviewed and used in the 2001 Drainage Master Plan was originally transmitted in Technical Memorandum No. 1 and its Appendices, which is included in Appendix A.

Streams

Loomis is situated in the Dry Creek Watershed, a 100 square mile shed in Placer and Sacramento Counties. Dry Creek's headwaters are located north of Loomis. Three tributaries flow through the study area: Antelope Creek, Sucker Ravine and Secret Ravine. Antelope Creek drains western Loomis and joins Dry Creek south of Loomis. Sucker Ravine flows into Secret Ravine downstream of Loomis. Secret Ravine flows into Miners Ravine and on to Cirby Creek in Roseville.

Several smaller tributaries feed into the streams in the Loomis area. The Secret Ravine Loomis Tributary and the Sucker Ravine Loomis Tributary are important parts of the local stream system. Loomis streams and their principal watersheds are shown in Figure 1-1.

Storm Drains

There are several storm drain systems serving subdivisions including Sunrise-Loomis, Circle Drive, St. Francis Circle and Swetzer Road. There are also several other small systems. These drains are primarily pipes with liberal use of open drainage channels. All storm drains discharge to one of the several streams that traverse the Loomis.

Natural Drainage Courses

Much of Loomis relies on natural drainage courses, overland flow, swales and roadside ditches to dispose of local runoff. These are supplemented with culverts under roads and cross culverts under driveways. Large storms often overtop these drainage ways and cause temporary local flooding.

Loomis' flooding problems are largely local and more often a nuisance rather than damaging to property. Interviews with Loomis staff and field inspections helped define the problems.

BACKGROUND DATA

In 2001, a review was made of collected data, background material and previous reports that assisted in preparation of the 2001 Drainage Master Plan. Data pertinent to the study included climate data, stream flow data and rainfall data. These data were compiled from measuring stations within Loomis and in surrounding areas.

Climate data were obtained from National Weather Service and Placer County (County) information. Stream flow data were obtained from the U.S. Geological Survey and the California Department of Water Resources. Rainfall data were obtained from the Placer County Flood Control and Water Conservation District (District).

The primary sources of information that guided the preparation of the master plan included:

1. Maps and supporting data from the Placer County Flood Insurance Study
2. Stormwater Management Manual prepared by the District
3. Dry Creek Watershed Flood Control Plan prepared for the District

PLACER COUNTY FLOOD INSURANCE STUDY

The District provided floodplain work maps and computer models used in the update of the flood insurance study in 1998. The FEMA information is based on "existing" land uses. Increases in 100-year floodplains are negligible using the General Plan buildout land use conditions.

STORMWATER MANAGEMENT MANUAL

The District's Stormwater Management Manual (Manual) is the technical basis for the hydrologic and hydraulic analyses. The District's Manual provides precipitation and runoff data organized by geographic area and elevation. Curves for unit runoff are presented along with equations for use with a rational method and procedure for rainfall-runoff modeling.

The District's Manual also includes criteria for hydraulic design of channels, storm drains, culverts and detention storage facilities. It sets the policies for hydraulic facilities and the specific criteria applicable to the County.

DRY CREEK WATERSHED FLOOD CONTROL PLAN

The Dry Creek Watershed Flood Control Plan (Dry Creek Plan) is a comprehensive study of the watershed hydrology, stream channel hydraulics and dam formulation. It was sponsored by the District and the Sacramento County Water Agency. The Dry Creek Plan presents hydrologic information applicable to Loomis and identifies actions to be taken by each community within the watershed.

The Dry Creek Plan assigns responsibilities to Loomis for continuing its capital improvement program, specifically the replacement of undersized culverts and stream crossings. The Dry Creek Plan also proposes detention basins on Secret Ravine, outside Loomis limits.

SOURCES OF DATA

Principal sources of information for development of the Drainage Master Plan include:

- Town of Loomis (Loomis)
  - Loomis furnished the draft General Plan and land use maps. Discussions with staff identified recurring drainage problems and maintenance issues as well as citizen complaints. Loomis also made available its base map, and file material on studies and design of drainage facilities.
- Placer County (County)
  - The County General Plan and Policies were provided by the Placer County Planning Department.
- Placer County Flood Control and Water Conservation District (District)
  - The District provided digital files of floodplains along the creeks, topographic mapping, and Dry Creek Flood Control Plan watershed maps.
- Placer County Water Agency (PCWA)
  - The PCWA provided base maps of the Loomis area depicting the locations of raw and treated water facilities. PCWA staff also cooperated in identifying impacts from spills from their facilities on Loomis drainage facilities.
- California Department of Water Resources (DWR)
  - The California DWR made available rainfall data for the Placer County area.
- U.S. Soil Conservation Service (SCS)
  - The SCS provided soil maps showing hydraulic characteristics of Loomis soils.

Soils

Soils in the Loomis watersheds were classified by the U.S. Department of Agriculture, Soil Conservation Service (SCS) in the Placer County Soil Survey. Soils have been classified in soil groups A, B, C, and D depending on infiltration into the soil and transmission through the soil.

The following are descriptions of each type of soil:

- A – Soils having a high infiltration rate, a high rate of water transmission and low runoff potential. These soils are often well-drained sands or gravel.
- B – Soils with moderate rates of infiltration and transmission. These soils are moderately well to well draining with fine to moderately course texture.
- C – Soils having slow rates of infiltration and slow transmission rates. These soils are moderately fine to fine textured and may have a layer that impedes downward flow.
- D – Soils having very slow infiltration rates and water transmission rates. These soils are usually clay or have a clay layer near the surface. They have a high runoff potential.

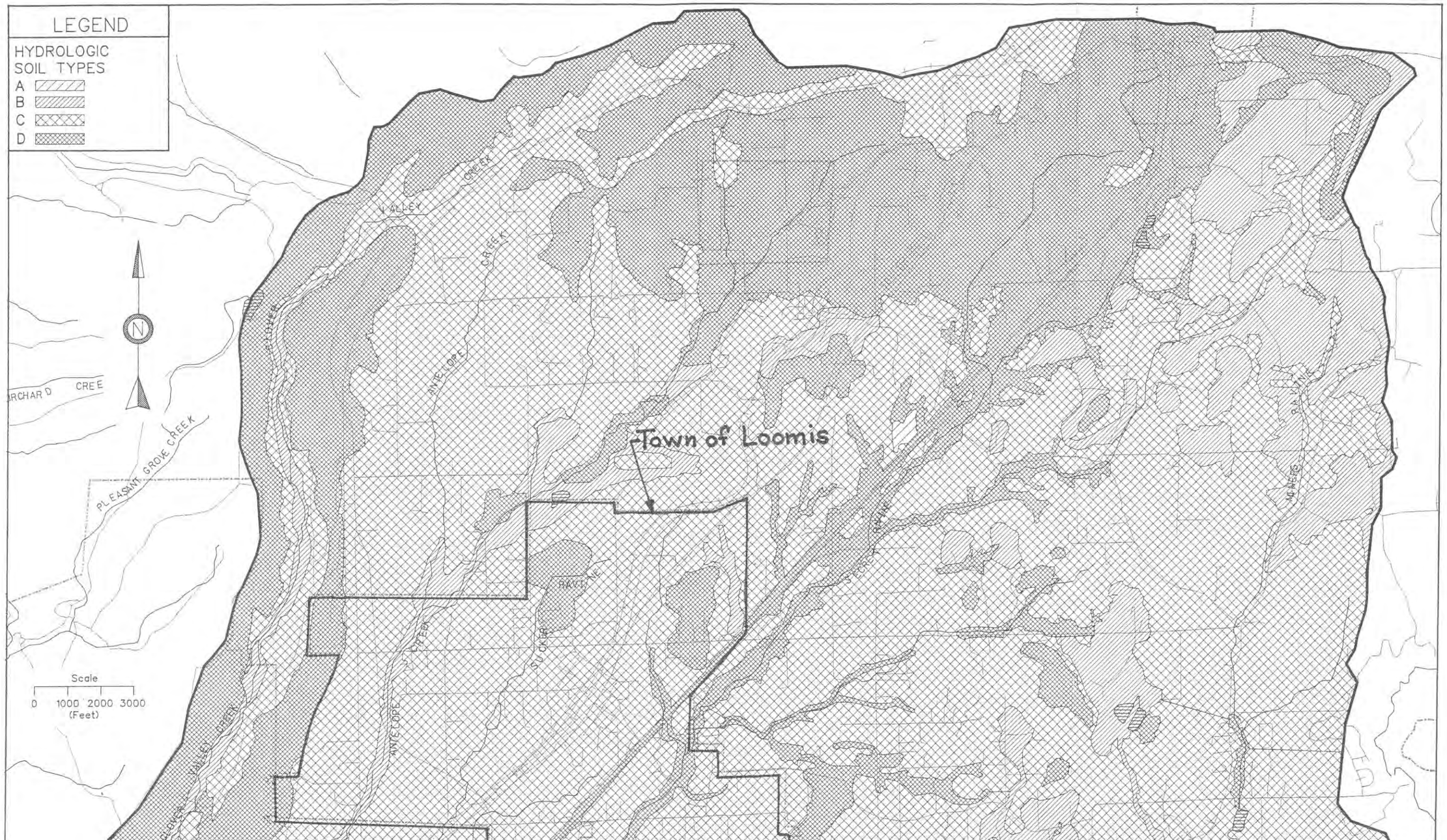
Loomis watershed soils belong primarily to groups C and D. Figure 2-1 shows soil groups for the Loomis area.

Topography

Loomis is located in the Sierra foothills. It is in hilly country with positive slopes toward the creeks. The headwaters of the watershed north of Loomis are at elevations 900 to 1,200 feet. The elevations are about 400 feet at the north limits of Loomis. The land slopes toward the south to elevations of 200 feet.

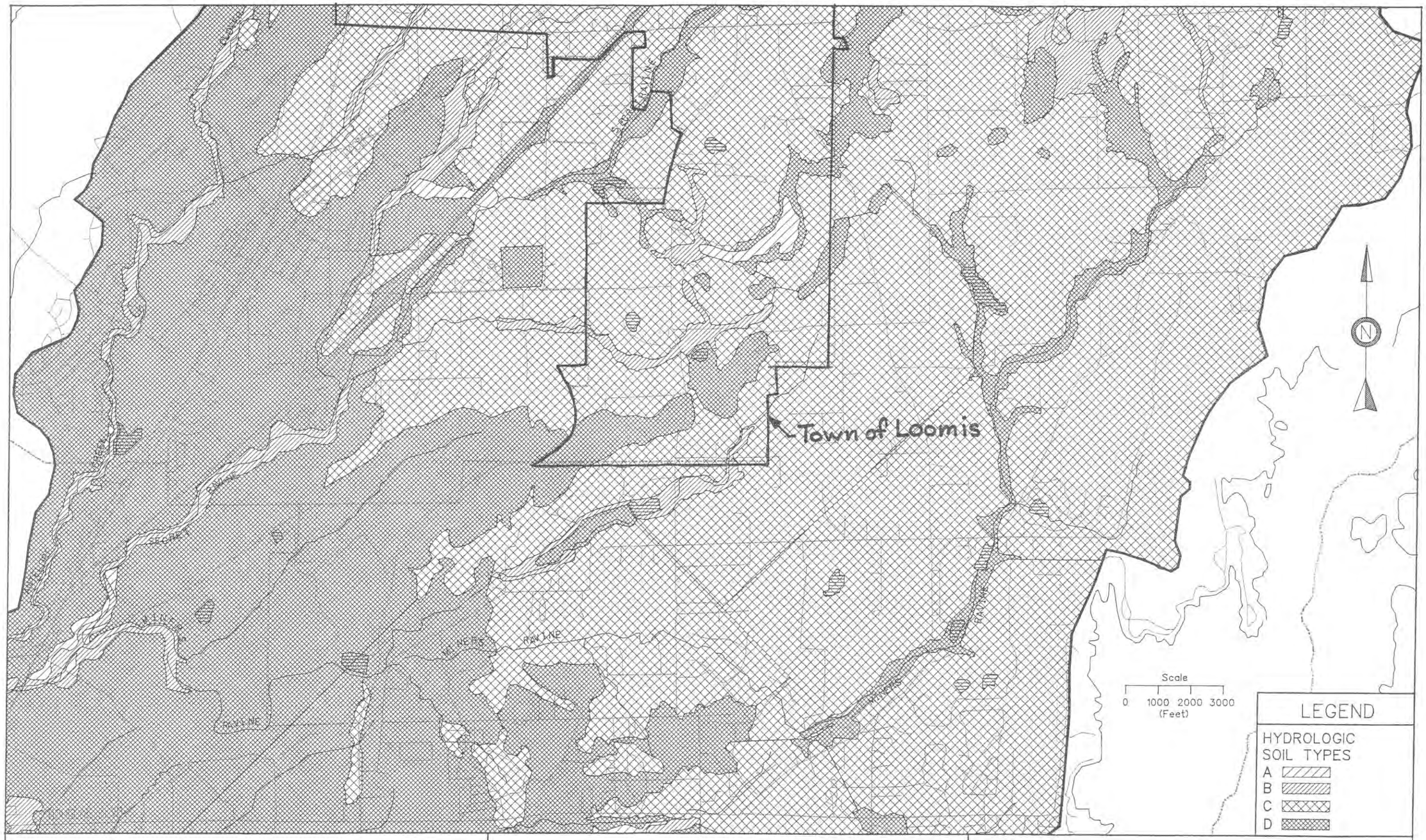
Land Use

Future land use in Loomis is based on the Town of Loomis General Plan (2001).



JMM James M. Montgomery Consulting Engineers, Inc. Sacramento, California	PLACER COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT	DRY CREEK WATERSHED HYDROLOGIC SOIL TYPES MAP A

FIGURE 1-5A



JMM James M. Montgomery
Consulting Engineers, Inc.
Sacramento, California

PLACER COUNTY FLOOD CONTROL
AND
WATER CONSERVATION DISTRICT

DRY CREEK WATERSHED
HYDROLOGIC SOIL TYPES
MAP B

FIGURE 1-5B

CHAPTER 3. POLICIES AND CRITERIA

POLICIES

Implementation of Drainage Master Plan will respond to the policies adopted in the General Plan and by the Town Council. Policy statements are presented below followed by a set of criteria that provide the detail to assure that policy directives are achieved. This section states policies, some of which have been adopted by the Town of Loomis (Loomis) in the General Plan and others proposed in the Drainage Master Plan.

Creeks and Streams

1. Loomis will enact ordinances to minimize risk to life and property from flooding of streams and creeks.
2. New residential structures or additions to existing residential structures shall be prohibited in areas identified by the Federal Flood Insurance Rate Maps (FIRMs) or the Town Engineer as being subject to inundation in a 100-year or more frequent flood event.
3. New commercial and industrial development near stream channels shall be designed to avoid reduction in stream capacity, stream bank erosion, or adverse impacts to habitat.
4. Fill will not be allowed in the floodplain if the fill causes a reduction in streamflow capacity.
5. Fill will not be allowed in the floodplain if the fill causes an increase in flow velocity that may cause high velocities or bank erosion.
6. Fill or development in the floodplain shall be avoided if it causes adverse impacts to habitat.
7. Loomis will obtain the necessary permits and clear debris and overgrowth from creeks at bridges to maintain flow area.
8. New development or fill shall be prohibited within the floodway.
9. Loomis will actively participate in the Dry Creek Watershed Flood Control Plan (Dry Creek Plan) designed to limit flood damage throughout the basin.
10. Natural creeks shall be protected from encroachment and channelization.

Drainage and Storm Runoff

11. New developments shall be required to construct a storm drainage system.
12. New development shall be required to provide for overland runoff over the storm drain capacity to at least a 100-year event.
13. New development shall be required to provide stormwater detention storage so not to cause an increase in downstream peak runoff.

14. Loomis will continue to be responsible for road drainage, culverts, and bridges and for providing flood protection or warning citizens when danger is imminent.
15. Loomis will continue to use the Placer County Flood Control and Water Conservation District (District) Stormwater Management Manual (Manual), but will develop additional and supplemental procedures applicable to Loomis.

CRITERIA

The following criteria provide specific guidance for creek and for Loomis storm drains.

Creeks and Streams

1. Floodplains will be delineated based on the 100-year storm runoff. The Federal Emergency Management Agency (FEMA) floodplain will be the basis for Loomis' floodplains.
2. Loomis will use the latest information available in addition to the FEMA floodplain when implementing floodplain management actions.
3. Loomis will make FEMA aware of new information.
4. Loomis will review and process Letter of Map Revision (LOMR) requests to FEMA and sign only those that are in conformance with Loomis policy.
5. Loomis will maintain floodplain maps and them to review submitted plans.

Drainage and Storm Drains

6. Storm drains will be designed for a 10-year storm runoff. The District's Manual shall be followed for planning and design of all storm drain facilities.
7. Overland flow release will be provided in all developments to safely pass runoff generated from a 100-year storm event.
8. Detention storage shall be provided to limit runoff to pre-development peak runoff.

Stream Hydrology

Hydrology for the streams traversing Loomis is based on the Dry Creek Plan. The Dry Creek Plan is a comprehensive analysis of the southern Placer and northern Sacramento County area and is the generally accepted flood hydrology in the region.

The adopted hydrology for the Drainage Master Plan is based on parameters and criteria from the District's Manual. A rainfall runoff model of the Dry Creek basin was developed for the County study using the Corps of Engineers HEC-1 modeling program. Hydrologic parameters from the Plan for the Loomis area streams are shown in Table 2-6 of the District's Manual, as shown in Figure 3-1. These parameters should be used in any studies undertaken in Loomis.

Peak discharges for streams in the Loomis area are discussed in the section entitled, "Loomis Stream" of Chapter 4, and are shown in Table 4-1.

TABLE 2-6

FUTURE CONDITION SUBBASIN HYDROLOGIC DATA

Basin ID	Basin Description	Basin Area (sq mi)	Chan DElev (ft)	Basin UElev (ft)	Basin Length (mi)	Basin Centrd (mi)	Basin Slope (ft/mi)	Basin Type (Tab2-4)	Basin 'n'	Basin Ct	Basin Lag (hr)	Basin Cp	Imp Area (%)	General Plan Land Use Conditions							Loss Rates (in/hr)	Soil Classification			
														Comm 0.90	HDR 0.60	MDR 0.30	LDR 0.20 (%)	RLDR 0.15	RR/RE 0.10	Open 0.02		A:.48 A:.31	B:.25 B:.16	C:.16 C:.09	D:.12 D:.07
LC1	Auburn-Folsom Road	0.57	380	460	1.14	0.64	70.4	2	0.034	0.88	0.39	0.60	32	7	2	66	12	13	0	0	0.14			75	25
LC5	Barton Road	0.95	320	380	1.10	0.53	54.6	3	0.057	1.49	0.65	0.60	16	2	2	0	2	80	0	14	0.09			65	35
LC10	Wedgewood Drive	0.25	300	320	0.64	0.19	31.1	3	0.059	1.53	0.43	0.60	15	0	0	0	0	90	10	0	0.07			15	85
LC15	Cherry Avenue	1.55	230	300	1.36	0.76	51.3	3	0.056	1.45	0.76	0.60	17	0	0	20	22	44	0	14	0.13		40		60
LC20	Walnut Avenue	0.45	220	260	0.76	0.57	52.8	2	0.036	0.95	0.37	0.60	25	0	0	65	0	35	0	0	0.17		55		45
LC25	Walnut Avenue	0.41	220	330	0.91	0.76	121.0	3	0.054	1.40	0.56	0.60	20	0	0	30	0	70	0	0	0.10		10		90
LC30	Oak Avenue	0.32	195	220	1.17	0.76	21.3	3	0.064	1.67	0.97	0.60	11	0	0	0	0	70	0	30	0.13		70		30
LC35	Oak Avenue	1.12	210	251	1.29	0.49	31.8	2	0.038	0.99	0.48	0.60	22	0	0	45	0	55	0	0	0.13		35		65
LC40	Hazel Avenue	0.87	195	230	1.48	1.14	23.7	3	0.060	1.56	1.10	0.60	14	0	0	0	0	90	0	10	0.12		50		50
LC45	Indian Creek Drive	1.18	170	220	1.44	0.49	34.7	3	0.060	1.56	0.77	0.60	14	0	0	5	0	80	0	15	0.08		5		95
LC50	Treelake Road	0.84	240	345	1.29	0.85	81.5	3	0.059	1.55	0.77	0.60	14	0	0	0	32	18	50	0	0.10			35	65
LC55	Sierra College Blvd	0.89	197	240	0.98	0.61	43.7	2	0.036	0.94	0.43	0.60	25	1	0	47	43	9	0	0	0.14		15	5	80
LC60	Linda Creek	0.30	168	197	1.17	0.68	24.7	3	0.059	1.54	0.84	0.60	14	0	0	0	0	85	15	0	0.09		20		80
LC65	Country Lake Drive	0.43	180	220	0.72	0.53	55.6	3	0.057	1.49	0.56	0.60	16	0	0	5	0	95	0	0	0.11		45		55
LC70	Old Auburn Road	0.18	168	170	0.59	0.30	3.4	3	0.058	1.52	0.70	0.60	15	0	0	0	0	100	0	0	0.07				100
LC80	Champion Oaks Drive	0.98	149	230	1.29	0.19	62.9	2	0.034	0.89	0.28	0.60	31	3	9	62	2	24	0	0	0.13		15		85
LC82	Strap Ravine	0.09	141	149	0.27	0.15	30.2	2	0.032	0.82	0.16	0.60	39	0	43	43	0	0	0	14	0.14		25		75
LC85	Rocky Ridge Drive	0.26	140	141	0.57	0.08	1.8	2	0.032	0.83	0.27	0.60	38	0	40	45	0	0	0	15	0.14		20		80
LC90	Oak Ridge Drive	0.46	133	140	0.95	0.57	7.4	2	0.032	0.84	0.49	0.60	37	0	50	20	0	0	0	30	0.14		30		70
LC95	Cirby Creek	0.16	130	133	0.42	0.23	7.2	1	0.017	0.45	0.15	0.75	69	50	40	0	0	0	0	10	0.17		40		60
CC1	Douglas Boulevard	0.38	230	260	0.87	0.38	34.4	2	0.029	0.76	0.30	0.65	49	27	32	0	17	0	24	0	0.11			5	95
CC2	Douglas Boulevard	0.25	195	220	0.49	0.38	50.8	1	0.016	0.42	0.13	0.81	83	75	25	0	0	0	0	0	0.07				100
CC5	East Roseville Parkway	0.20	195	270	0.27	0.27	282.9	1	0.018	0.46	0.08	0.71	61	47	31	0	0	0	0	22	0.13		15		85
CC10	Huntington Drive	0.24	151	190	0.42	0.08	93.6	2	0.032	0.84	0.13	0.60	36	10	15	60	0	0	0	15	0.16		35		65
CC15	Sierra Gardens Drive	0.15	150	151	0.21	0.09	4.8	1	0.018	0.47	0.10	0.69	57	10	80	0	0	0	0	10	0.13		15		85
CC20	Douglas Boulevard	0.38	151	230	0.95	0.25	83.4	1	0.016	0.41	0.12	0.85	89	98	2	0	0	0	0	0	0.13		5		95
CC25	Sierra Gardens Drive	0.05	150	151	0.27	0.15	3.8	1	0.018	0.47	0.13	0.68	56	35	40	0	0	0	0	25	0.12		5	20	75
CC30	Loretto Drive	0.15	148	150	0.27	0.27	7.5	1	0.017	0.44	0.13	0.75	71	60	20	15	0	0	0	5	0.16		35	5	60
CC35	Oak Ridge Drive	0.13	140	148	0.42	0.17	19.2	1	0.019	0.50	0.13	0.64	48	20	40	20	0	0	0	20	0.13		20		80
CC40	Linda Creek	0.16	130	140	0.53	0.23	18.9	1	0.017	0.45	0.14	0.73	66	40	50	0	0	0	0	10	0.15		25		75
CC45	Dry Creek	1.12	120	160	1.17	0.59	34.1	1	0.019	0.51	0.25	0.63	46	15	42	20	3	0	0	20	0.12		10		90
SR1	Barton Road	1.16	320	420	1.74	0.38	57.4	2	0.036	0.95	0.42	0.60	25	9	3	6	42	14	26	0	0.13			85	15
SR5	Sierra College Blvd	1.77	215	350	2.08	0.95	64.8	3	0.055	1.44	0.90	0.60	18	5	0	10	10	15	60	0	0.11	5	5	20	70
SR8	East Roseville Parkway	0.19	200	215	0.42	0.23	36.0	2	0.031	0.81	0.21	0.61	41	0	58	20	0	0	0	22	0.11				100
SR10	East Roseville Parkway	0.45	200	230	0.95	0.61	31.7	1	0.019	0.49	0.23	0.65	50	44	4	0	35	0	5	12	0.11				100
SR15	Eureka Road	0.17	190	200	0.38	0.30	26.4	2	0.032	0.84	0.24	0.60	37	0	45	30	0	0	0	25	0.11				100
SR20	McLaren Drive	0.28	150	190	0.72	0.38	55.6	2	0.031	0.79	0.27	0.62	44	10	25	65	0	0	0	0	0.15		20		80
SR25	Linda Creek	0.05	141	150	0.19	0.09	47.5	2	0.034	0.89	0.13	0.60	30	0	0	100	0	0	0	0	0.18		45		55
MR1	Rock Springs Road	0.50	740	830	0.72	0.42	125.1	3	0.066	1.72	0.52	0.60	10	0	0	0	0	0	100	0	0.13		50	50	
MR5	King Road	1.44	630	740	1.06	0.57	103.7	3	0.066	1.72	0.68	0.60	10	0	0	0	0	0	100	0	0.10		15	85	
MR10	Horseshoe Bar Road	1.05	555	630	0.95	0.61	79.2	3	0.063	1.63	0.66	0.60	12	0	0	0	20	0	80	0	0.10			95	5
MR15	Dick Cook Road	2.12	479	635	1.70	0.80	91.5	3	0.063	1.63	0.85	0.60	12	0	0	0	20	0	80	0	0.10		3	90	7
MR19	Lake Trib.	1.59	418	495	1.67	0.95	46.2	3	0.066	1.72	1.06	0.60	10	0	0	0	0	0	100	0	0.09	0	0	92	8
MR20	Conf. with MR19 Trib.	2.18	418	479	1.89	1.29	32.2	3	0.065	1.70	1.28	0.60	11	0	0	0	0	10	90	0	0.09		3	83	14

TABLE 2-6 (Continued)

Basin ID	Basin Description	Basin Area (sq mi)	Chan DElev (ft)	Basin UElev (ft)	Basin Length (mi)	Basin Centrd (mi)	Basin Slope (ft/mi)	Basin Type (Tab2-4)	Basin 'n'	Basin Ct	Basin Lag (hr)	Basin Cp	Imp Area (%)	General Plan Land Use Conditions							Loss Rates (in/hr)	Soil Classification			
														Comm 0.90	HDR 0.60	MDR 0.30	LDR 0.20 (%)	RLDR 0.15	RR/RE 0.10	Open 0.02		A:.48 A:.31	B:.25 B:.16	C:.16 C:.09	D:.12 D:.07
MR21	Cavitt Stallman Road	1.39	380	418	0.72	0.38	52.8	3	0.064	1.65	0.56	0.60	11	0	0	0	0	35	60	5	0.09			96	4
MR24	Barton Road	1.23	380	475	1.40	0.83	67.8	3	0.066	1.72	0.90	0.60	10	0	0	0	0	0	100	0	0.09		3	93	4
MR25	Sierra College Blvd	1.39	240	380	2.08	1.17	67.2	3	0.066	1.71	1.15	0.60	10	0	0	1	0	0	99	0	0.09		4	56	40
MR29	Auburn-Folsom Road	1.28	370	450	1.25	0.21	64.0	3	0.061	1.58	0.51	0.60	13	0	0	10	10	50	0	30	0.10			94	6
MR30	Barton Road	1.75	310	420	2.46	1.33	44.7	3	0.064	1.66	1.31	0.60	11	0	0	0	8	15	72	5	0.09			94	6
MR31	Sierra College Blvd	1.70	240	345	2.08	0.89	50.4	3	0.058	1.52	0.97	0.60	15	0	1	5	14	40	40	0	0.09			60	40
MR35	Boardman Trib.	1.00	182	438	2.31	1.17	110.8	3	0.056	1.45	0.93	0.60	17	0	0	20	35	0	41	4	0.10				100
MR36	Conf. w/Boardman Trib.	0.71	182	240	1.89	1.14	30.6	2	0.039	1.00	0.73	0.60	21	5	5	0	45	0	40	5	0.10		6	0	94
MR37	Conf. with Secret Rav.	0.16	160	182	0.68	0.42	32.3	2	0.030	0.79	0.29	0.62	44	28	22	0	24	0	0	26	0.14		28	0	72
MR40	Mouth of Miners Ravine	0.38	140	160	0.61	0.34	33.0	1	0.016	0.42	0.14	0.84	87	90	10	0	0	0	0	0	0.18	10	20		70
SE1	Gilardi Road	1.54	540	730	1.27	0.72	149.7	3	0.062	1.61	0.68	0.60	12	3	0	0	0	0	97	0	0.07			5	95
SE5	E. Fk Penryn at Sec. R.	0.57	495	700	1.17	0.85	174.6	3	0.061	1.58	0.67	0.60	13	2	3	0	0	0	95	0	0.09		10	20	70
SE7	Rock Springs Road	0.40	470	495	0.27	0.19	94.3	3	0.066	1.72	0.30	0.60	10	0	0	0	0	0	100	0	0.10		19	57	24
SE10	Conf. w/E. Fk Penryn Trib.	0.49	495	540	0.57	0.28	79.2	3	0.066	1.71	0.46	0.60	10	0	0	0	2	0	98	0	0.09		5	50	45
SE15	Boulder Creek Road	0.74	400	470	0.83	0.57	84.0	3	0.056	1.47	0.55	0.60	17	8	0	0	2	0	90	0	0.11	6	9	65	20
SE20	Newcastle Road	2.03	760	1200	1.52	0.91	290.4	3	0.058	1.51	0.66	0.60	15	4	2	2	6	0	86	0	0.13		45	25	30
SE25	Brennans Road	0.84	640	760	1.25	0.45	96.0	3	0.066	1.72	0.67	0.60	10	0	0	0	0	0	100	0	0.11		24	71	5
SE26	Boulder Creek Road	0.70	400	640	1.59	0.76	150.9	3	0.066	1.72	0.80	0.60	10	0	0	0	0	0	100	0	0.09		8	74	18
SE30	King Road	0.67	378	400	0.80	0.42	27.7	3	0.058	1.50	0.60	0.60	16	5	0	0	15	0	80	0	0.11		10	70	20
SE35	Conf. with King Rd. Trib.	0.34	352	378	0.76	0.42	34.3	3	0.054	1.40	0.53	0.60	20	9	3	4	0	0	84	0	0.09			55	45
SE40	Horseshoe Bar Road	1.14	351	440	1.59	1.52	55.9	2	0.035	0.91	0.63	0.60	28	18	2	12	0	0	68	0	0.11		3	76	21
SE44	King R. Trib. at Val Verde R.	0.90	438	680	1.52	0.95	159.7	3	0.066	1.72	0.84	0.60	10	0	0	0	0	0	100	0	0.10		17	70	13
SE45	King Rd. Trib. at Secret Rav.	2.27	352	438	1.14	1.14	75.7	3	0.066	1.72	0.92	0.60	10	0	0	0	0	0	100	0	0.09		7	83	10
SE50	Loomis City Boundary	1.83	319	351	0.91	0.45	35.2	3	0.061	1.59	0.66	0.60	13	0	0	10	8	0	82	0	0.10		1	82	17
SE51	Sierra College Blvd	1.03	280	319	0.76	0.38	51.5	3	0.058	1.51	0.52	0.60	15	0	0	29	11	0	40	20	0.12		5	84	11
SE52	Rocklin Road	0.47	260	280	1.29	0.76	15.5	2	0.032	0.83	0.52	0.60	37	20	5	50	5	0	0	20	0.18	3	50	3	44
SE55	Aquilar Trib., Sierra Coll. Bd.	1.11	300	355	1.40	1.14	39.2	3	0.055	1.43	0.91	0.60	18	0	5	28	0	0	67	0	0.12		8	77	15
SE56	Aguilar Trib. at Sec. Rav.	0.73	260	300	0.91	0.42	44.0	2	0.034	0.88	0.34	0.60	32	0	14	68	2	16	0	0	0.15		2	89	9
SE57	Conf. with Sucker Ravine	0.19	215	250	0.53	0.30	66.0	2	0.036	0.93	0.26	0.60	26	0	13	38	33	0	0	16	0.10			68	32
SE60	Sucker R./E. Trib., Sucker R.	0.66	280	350	1.67	1.06	42.0	1	0.019	0.49	0.32	0.66	52	45	0	35	0	0	5	15	0.16		12	88	
SE65	Sucker Rav. at King Rd.	0.34	350	415	0.76	0.23	85.8	1	0.019	0.50	0.13	0.64	48	30	0	65	5	0	0	0	0.15		0	72	28
SE66	Sucker R. at Conf. w/E. Trib.	0.97	280	340	1.93	1.33	31.1	2	0.035	0.91	0.70	0.60	28	15	0	24	23	0	30	8	0.14		3	96	1
SE70	Sucker R. at Rocklin Rd	0.70	260	280	1.14	0.76	17.6	1	0.018	0.47	0.28	0.70	59	52	3	35	0	0	0	10	0.16	8	10	22	60
SE76	Sucker Ravine at I-80	0.22	215	260	0.64	0.34	69.9	2	0.033	0.85	0.26	0.60	35	5	10	80	0	0	5	0	0.13		0	20	80
SE80	Rocklin City Boundary	0.81	180	215	1.21	0.57	28.9	2	0.035	0.91	0.46	0.60	28	5	6	45	32	0	0	12	0.13		10	5	85
SE85	Mouth of Secret Ravine	0.72	160	180	1.14	0.91	17.6	3	0.057	1.49	0.94	0.60	16	7	0	5	35	0	0	53	0.11	3	7		90
AC1	CTR Trib. at Cl. Tun. Rd	0.64	550	698	0.76	0.45	195.4	3	0.066	1.71	0.50	0.60	10	0	0	0	3	0	97	0	0.07			12	88
AC2	CTR Trib. at English Col.	1.20	490	550	1.06	0.53	56.6	3	0.061	1.58	0.67	0.60	13	3	0	0	4	0	96	0	0.08	0	0	16	84
AC4	CTR Trib. at Colwell Rd	0.45	445	490	0.57	0.38	79.2	3	0.058	1.52	0.44	0.60	15	5	0	0	10	0	85	0	0.10		12	63	25
AC5	CTR Trib. Conf. w/Humphrey	1.61	379	575	1.70	0.83	115.0	3	0.060	1.57	0.80	0.60	14	3	2	0	5	0	85	5	0.11		15	80	5
AC10	CTR Trib. Conf. w/Antel. Cr.	0.30	339	379	1.10	0.57	36.4	3	0.061	1.60	0.76	0.60	13	0	4	0	7	0	89	0	0.12		29	60	11
AC15	English Colony Road	0.58	430	475	0.42	0.42	108.0	3	0.066	1.72	0.45	0.60	10	0	0	0	0	0	100	0	0.09			75	25
AC16	Colwell Road	0.54	420	430	0.61	0.38	16.5	3	0.070	1.82	0.70	0.60	8	0	0	0	0	0	80	20	0.09			97	3
AC20	Citrus Colony Road	0.66	365	420	0.57	0.32	96.8	3	0.066	1.72	0.46	0.60	10	0	0	0	0	0	100	0	0.09		2	92	6
AC25	Conf w/Clark Tun. Rd Trib.	0.54	339	365	0.98	0.53	26.4	3	0.062	1.61	0.76	0.60	12	2	0	0	8	0	90	0	0.10		8	84	8
AC30	Delmar Avenue/Loomis	0.94	290	339	1.17	0.72	41.7	3	0.062	1.62	0.83	0.60	12	0	0	5	11	0	84	0	0.11		10	80	10
AC35	Conf w/Clover Val. Cr.	1.02	222	290	1.63	1.10	41.7	2	0.035	0.91	0.60	0.60	28	15	0	32	13	0	21	19	0.13		5	65	30

TABLE 2-6 (Continued)

Basin ID	Basin Description	Basin Area (sq mi)	Chan DElev (ft)	Basin UElev (ft)	Basin Length (mi)	Basin Centrd (mi)	Basin Slope (ft/mi)	Basin Type (Tab2-4)	Basin 'n'	Basin Ct	Basin Lag (hr)	Basin Cp	Imp Area (%)	General Plan Land Use Conditions: Comm 0.90	HDR 0.60	MDR 0.30	LDR 0.20	RLDR 0.15	RR/RE 0.10	Open 0.02	Loss Rates (in/hr)	Soil Classification: A:.48 A:.31	B:.25 B:.16	C:.16 C:.09	D:.12 D:.07
																	(%)								
AC40	Sunset Blvd	1.27	200	240	1.44	0.61	27.8	2	0.031	0.80	0.44	0.61	42	20	20	40	0	0	0	20	0.12		5		95
AC41	Rocklin City Boundary	0.75	200	205	0.98	0.66	5.1	2	0.030	0.78	0.52	0.63	45	15	30	45	0	0	0	10	0.13		8	2	90
AC45	Mouth of Antelope Cr.	0.77	140	200	2.20	1.29	27.3	2	0.035	0.91	0.74	0.60	28	13	7	25	19	0	0	36	0.11		8		92
CV1	English Colony Road	1.18	515	635	0.95	0.95	126.7	3	0.110	2.86	1.24	0.60	2	0	0	0	0	0	0	100	0.08			35	65
CV5	Wood Glen Drive	0.95	370	515	2.01	0.87	72.2	3	0.110	2.86	1.70	0.60	2	0	0	0	0	0	0	100	0.08		8	17	75
CV6	Creekwood Drive	0.95	270	370	1.97	1.14	50.8	3	0.065	1.69	1.16	0.60	11	0	0	0	47	0	1	52	0.12		13	29	58
CV10	Mouth of Clover Valley	0.54	222	270	1.25	0.98	38.4	3	0.054	1.41	0.83	0.60	19	0	0	37	36	0	0	27	0.12		8	2	90
DC4	Parry Street	0.67	130	140	0.76	0.42	13.2	1	0.017	0.45	0.20	0.73	66	45	40	0	5	0	0	10	0.14		24		76
DC5	Conf. with Cirby Cr.	0.60	120	130	1.17	0.80	8.5	1	0.017	0.45	0.31	0.74	68	35	55	10	0	0	0	0	0.15		15	15	70
DC10	Vernon Avenue	0.72	115	160	0.95	0.19	47.5	2	0.030	0.77	0.23	0.64	48	20	20	60	0	0	0	0	0.14		15		85
DC15	SPRR Bridge	0.89	114	160	1.52	0.76	30.4	1	0.018	0.48	0.28	0.68	55	34	17	45	4	0	0	0	0.12				100
DC20	Conf. with DC25/DC80 Tribs.	1.15	96	160	2.35	1.17	27.3	1	0.018	0.47	0.38	0.69	59	55	5	0	0	40	0	0	0.13		25		75
DC25	Dry Creek DC25 Trib.	1.71	96	150	2.23	1.59	24.2	2	0.032	0.82	0.74	0.60	39	20	10	25	5	40	0	0	0.15		40		60
DC35	Cook Riolo Road	0.36	89	96	0.38	0.17	18.5	3	0.058	1.52	0.38	0.60	15	0	0	0	0	100	0	0	0.09		25		75
DC40	Dry Creek DC40 Trib.	0.37	86	140	0.93	0.57	58.2	2	0.041	1.06	0.44	0.60	17	0	0	14	0	86	0	0	0.09		10		90
DC45	Conf. with DC40 Trib.	0.27	86	89	0.38	0.27	7.9	3	0.058	1.52	0.50	0.60	15	0	0	0	0	100	0	0	0.12		50		50
DC50	Conf. with DC55 Trib.	0.46	79	86	0.76	0.61	9.2	3	0.060	1.57	0.84	0.60	13	0	0	0	0	88	0	12	0.12		60		40
DC55	Dry Creek DC55 Trib.	0.69	80	130	1.10	0.64	45.5	2	0.036	0.93	0.44	0.60	27	7	5	29	5	50	0	4	0.10		10		90
DC60	Conf. with DC65 Trib.	0.87	72	79	1.46	0.57	4.8	2	0.039	1.00	0.73	0.60	21	5	8	3	26	32	0	26	0.13		35		65
DC65	Dry Creek DC65 Trib.	1.28	72	120	2.01	1.42	23.9	3	0.062	1.62	1.36	0.60	12	0	0	0	14	58	0	28	0.10		20	0	80
DC68	Cty Line Trib. at PFE Road	1.35	90	155	2.73	1.40	23.8	2	0.036	0.93	0.85	0.60	27	1	2	70	2	20	0	5	0.11				100
DC70	Cty Line Trib. at Watt Ave.	0.44	74	90	0.95	0.76	16.9	3	0.053	1.39	0.78	0.60	20	0	0	35	45	0	0	20	0.14		25	0	75
DC71	Mouth of Cty Line Trib.	0.27	69	100	0.66	0.38	46.8	2	0.035	0.92	0.31	0.60	27	10	0	40	12	0	35	3	0.12		15		85
DC75	Watt Avenue	0.68	70	150	1.14	0.64	70.4	3	0.069	1.79	0.80	0.60	9	0	0	0	20	0	40	40	0.12		40		60
DC76	Conf with Cty Line Trib.	0.42	69	110	0.83	0.47	49.2	3	0.072	1.87	0.72	0.60	8	0	0	0	5	15	35	45	0.10		30	0	70
DC80	Cook Riolo Road	1.97	96	157	2.41	1.14	25.4	1	0.019	0.49	0.40	0.65	50	46	0	0	0	54	0	0	0.10		5		95
DC85	Conf. with DC90 Trib.	0.32	64	69	0.80	0.53	8.3	3	0.061	1.59	0.88	0.60	13	5	0	12	0	24	0	59	0.14		60		40
DC90	Dry Creek DC90 Trib.	0.69	64	97	1.55	1.14	21.2	2	0.033	0.87	0.63	0.60	33	8	7	64	0	13	0	8	0.12		5		95
DC95	Sierra Cr. at Walerga Rd	0.91	105	150	1.33	0.72	33.9	2	0.033	0.86	0.48	0.60	33	5	5	85	0	0	0	5	0.12				100
DC96	Sierra Cr. at Watt Ave.	1.45	73	150	1.70	0.64	45.2	2	0.038	1.00	0.55	0.60	21	1	12	40	0	0	0	47	0.10				100
DC100	Mouth of Sierra Creek	0.54	63	73	1.33	0.64	7.5	2	0.035	0.91	0.62	0.60	28	5	10	40	0	35	0	10	0.10				100
DC105	Dry Creek DC105 Trib.	1.06	54	89	1.70	0.98	20.5	3	0.054	1.39	1.00	0.60	20	5	0	40	0	15	0	40	0.09				100
DC110	Conf with Sierra Creek	0.26	63	85	0.76	0.11	29.0	3	0.057	1.48	0.38	0.60	16	0	0	50	0	0	0	50	0.14		40		60
DC115	Conf with DC105 Trib.	0.32	54	63	0.42	0.23	21.6	3	0.056	1.46	0.40	0.60	17	0	0	40	0	28	0	32	0.13		35		65
DC120	Q Street	0.53	52	75	0.66	0.38	34.7	3	0.064	1.65	0.58	0.60	11	0	0	0	0	72	0	28	0.13				
DC125	Elkhorn Blvd	1.37	45	52	1.59	0.98	4.4	3	0.057	1.49	1.35	0.60	16	0	0	12	30	40	0	18	0.13		35		65
DC130	Rio Linda Blvd	0.91	37	45	1.17	0.83	6.8	3	0.054	1.40	1.01	0.60	19	5	0	30	10	20	0	35	0.15		55		45
DC135	Natomas E Main Drain	1.04	27	37	1.67	1.25	6.0	3	0.066	1.72	1.63	0.60	10	0	0	5	15	30	0	50	0.11		30	5	65
	TOTALS	101											22%												

HEC-1 Modeling

The District's Manual prescribes the use of HEC-1 modeling when computation of a runoff hydrograph is needed. This may occur when runoff from two or more subbasins must be combined, for routing hydrographs, when flow passes through culverts or is affected by roads or other blockages, and to analyze the impact of detention storage.

Developed by the Corps of Engineers, HEC-1 is a generalized computer program used in developing hydrologic models. The program allows the use of a variety of parameters to describe the subbasins and runoff parameters specific to the study area. The following procedure is consistent with the District's Manual with parameters specific to Loomis.

Simulation Time Step

In small subbasins where the response time is less than 10 minutes, a time step of 1 minute shall be used. For larger subbasins, a time step of 5 minutes shall be used.

Watershed runoff

The kinematic wave methodology is recommended by the District's Manual as the most appropriate representation of a watershed. The kinematic wave allows parameters that are typical of the shed and are not necessarily specific to one location. The method divides the shed into overland flow areas and channel (or pipe) representations. Detailed descriptions of the modeling procedures are beyond the scope of this Drainage Master Plan and the reader is directed to the District's Manual or to the HEC-1 user manual for detailed procedures.

Snyder unit hydrograph parameters are an alternative methodology allowed by the District's Manual and the recommended methodology used in the Dry Creek Plan. This method is preferred when working with the major creeks and the results must be compared with Placer County's Dry Creek watershed data. The procedure is based on the U. S. Bureau of Reclamation's (USBR) Flood Hydrology Manual (1989), and uses a computed basin lag time, T_p, and a peaking coefficient, C_p. The C_p coefficient is 0.60 for the Loomis area and the lag time can be calculated by the expression:

$$T_p = 26 \cdot n \cdot \left(\frac{L \cdot L_c}{S^{0.5}} \right)^{0.33}$$

where T_p = lag time, hours
L = length of the longest watercourse, miles
L_c = length along the longest watercourse to a point opposite the centroid of the subbasin, miles
S = slope, ft/mile
n = subbasin roughness parameter

Storm Drain

Design flows for storm drains are based on procedures in the District's Manual. The District's Manual provides a simplified procedure for computing peak flows in small watersheds and a HEC-1 modeling procedure for use when a runoff hydrograph is needed when analyzing detention storage needs.

Simplified Procedure - The procedure as applied to Loomis involves:

1. Determine the flow path for the subbasin having the longest response time.
2. Determine the total response time for overland flow and flow in swales, pipes and channels.
3. Determine the unit peak discharge using Figures 3-2 or 3-3 (Figures 5-3A and 5-3C of the District's Manual).
4. Determine the pervious infiltration factor using the following equation (Equation 5-5 of the District's Manual) or Figure 3-4 (Figure 5-4 of the District's Manual):

$$F_I = I\left(1+\left(\frac{1}{1.3}+0.0005\cdot E\right)\right)$$

where F_I = infiltration factor cfs/acre
I = infiltration rate, inches/hour
E = elevation, feet

5. Compute the peak discharge.

$$Q_p = qA - A_p F_I$$

where Q_p = peak flow, cfs
A = watershed area, acres
q = unit peak runoff, cfs/acre
A_p = pervious area, acres
F_I = infiltration factor, cfs/acre

STORM DRAIN FACILITIES

Design and construction of storm drain facilities shall be based on criteria presented the District's Manual.

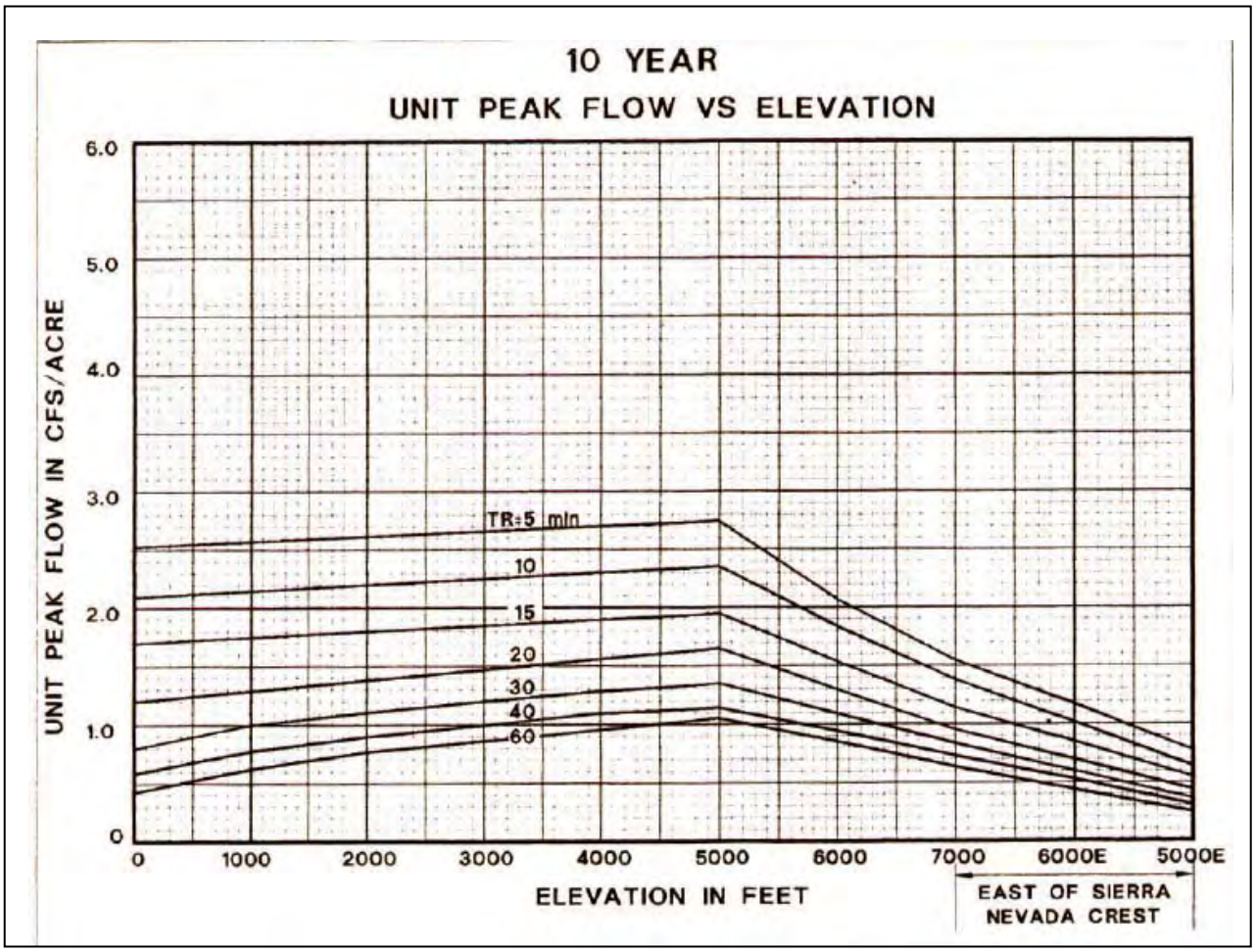


Figure 3-2. Placer County Flood Control & Water Conservation District's Stormwater Management Manual Figure 5-3A

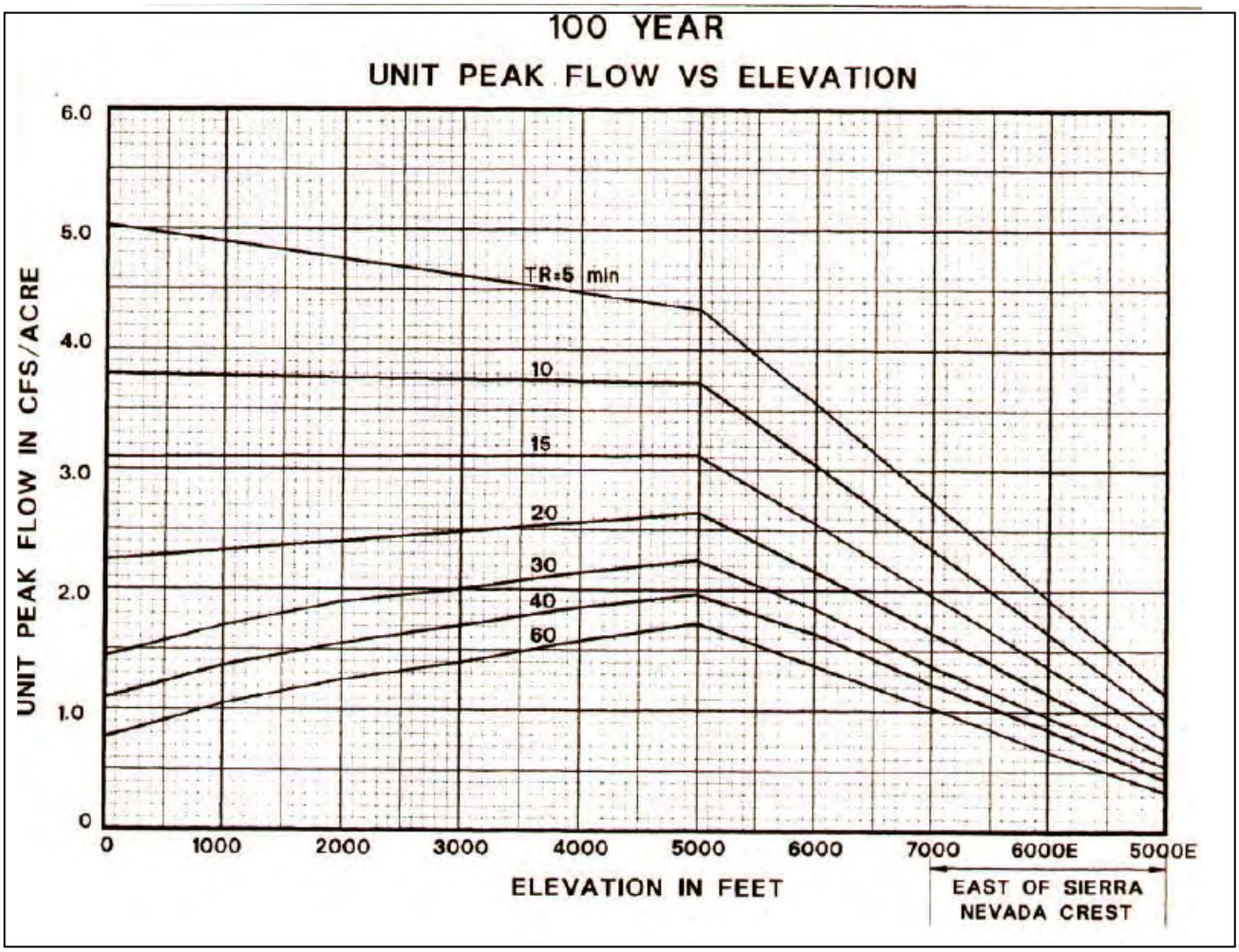


Figure 3-3. Placer County Flood Control & Water Conservation District's Stormwater Management Manual Figure 5-3C

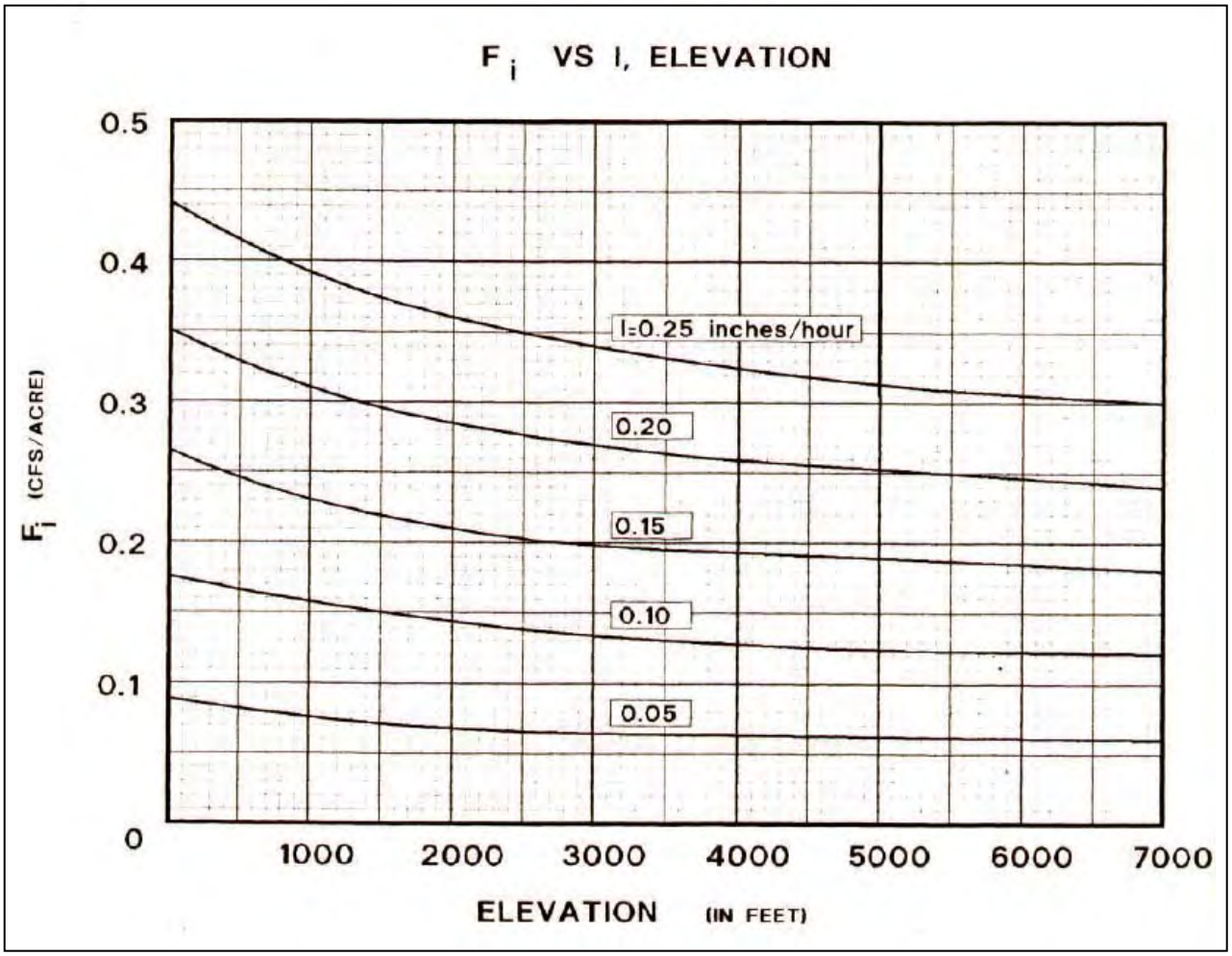


Figure 3-4. Placer County Flood Control & Water Conservation District's Stormwater Management Manual Figure 5-4

CHAPTER 4. LOOMIS STREAMS

The Town of Loomis (Loomis) is located in the upper Dry Creek watershed. Dry Creek tributaries that flow through the Loomis include Antelope Creek, Sucker Ravine and Secret Ravine. The tributaries draining Loomis combine in Roseville to form Dry Creek. Dry Creek then flows through Placer and Sacramento Counties to the Natomas East Main Drain in the City of Sacramento.

The tributaries traversing Loomis are relatively steep, incised channels. They provide good drainage and minimize the need for storm drains. Sheds range from an elevation of 400 feet at the northern Loomis limits to elevation 200 feet at the south boundary. The more than 8,700 acres that form the upstream watershed generate significant peak flows in the creeks entering Loomis. See Figure 1-1.

The primary tributaries include:

- Antelope Creek
- Sucker Ravine
- Secret Ravine

ANTELOPE CREEK

Antelope Creek and its tributaries drain 1,500 acres through the western part of Loomis. Downstream of Loomis, Antelope Creek joins with Miners Ravine to form Dry Creek. The creek is ten miles long with three miles within Loomis. Tributaries in Loomis add another two miles of stream length. The Antelope Creek headwaters north of Loomis are at an elevation of 400 feet. The creek drops to elevation 200 feet at its mouth. Within Loomis, Antelope Creek flows from an elevation of 400 feet to 200 feet with an average slope of 0.01 foot per foot.

Within Loomis, flood flows have a 100-year peak of about 2,600 cubic feet per second (cfs) and a 10-year peak of 1,200 cfs. The floodplain averages 200 feet wide through Loomis.

SUCKER RAVINE

Sucker Ravine's headwaters are in Loomis in the Swetzer Industrial Park. The creek and a minor tributary drain the Brace Road area west of Interstate 80 and join together to flow into Secret Ravine about 2.5 miles south in Rocklin. The total drainage shed is 1,100 acres and the creek and its main tributary flow about three miles through the Loomis. Flood flows at Sierra College Boulevard are about 460 cfs and 650 cfs for the 10- and 100-year storm events, respectively.

The Loomis Tributary to Sucker Ravine is located between Interstate 80. This tributary drains the downtown area from Horseshoe Bar Road to Sierra College Boulevard before joining Sucker Ravine about a mile south of Loomis limits.

SECRET RAVINE

Secret Ravine has its beginnings northeast of Loomis near Newcastle. The creek drains about 6,100 acres through Loomis and includes 2.7 miles of channel within the Loomis. A tributary to Secret Ravine drains the northeast area east of the railroad tracks.

The 100-year peak flows for Secret Ravine and the Loomis Tributary are 3,650 cfs and 700 cfs, respectively. The 10-year peak flows are 1,600 cfs and 260 cfs, respectively.

FLOOD FLOWS

Flooding can occur after storms of various sizes and duration. A mean annual flood is a flood flow expected to occur every one or two years. A moderate flood is usually a flood runoff that has a recurrence interval of five to about twenty years. The accepted measure of a major flood is usually the runoff with a one percent chance of occurrence in any one year, or a 100-year storm runoff. Larger floods used for regional planning purposes may include flows up to a 500-year event.

A comprehensive hydrologic analysis was conducted as part of the Dry Creek Watershed Flood Control Plan (Dry Creek Plan). A rainfall-runoff model was developed using the Corps of Engineers Flood Hydrograph Package, HEC-1. Existing conditions and future conditions were modeled and the results published in the Dry Creek Plan. Table 4-1 shows peak discharges for selected locations.

The Federal Emergency Management Agency's (FEMA), 1998 Flood Insurance Study (FIS), delineates floodplains based on existing conditions. The FEMA study is based on 1997 land uses. The Dry Creek Plan peak discharges and the FEMA discharges are the same for existing conditions. The Table 4-1 shows the projected increase in peak discharge between the flows used for the existing floodplain delineation and expected future flows.

Table 4-1. Peak Discharges in Loomis Area Streams

Node Number and Location[1]	Existing 100-Year, cfs [2]	Future Development [3]		
		100-Year	10-Year	2-Year
Antelope Creek				
139-Delmar Avenue	2,330	2,607	1,126	285
140-Sierra College Boulevard	2,266	2,541	1,165	279
141-King Road	2,221	2,485	1,137	275
142-Confluence – Clark Tunnel Road	2,220	2,496	1,200	273
Clark Tunnel Tributary				
144-Humphrey Road	1,155	1,537	864	178
145-Humphrey Tributary Confluence	1,136	1,510	851	174
Sucker Ravine				
263-Union Pacific Railroad	670	685	514	81

Table 4-1. Peak Discharges in Loomis Area Streams, cont'd…

Node Number and Location[1]	Existing 100-Year, cfs [2]	Future Development [3]		
		100-Year	10-Year	2-Year
264-Bankhead Road	622	661	476	74
265-Sierra College Boulevard	610	652	463	72
266-Saunders Avenue	610	651	364	73
267-King Road	626	669	364	73
Loomis Tributary				
270-Sierra College Boulevard	380	402	232	111
Secret Ravine				
233-Private Road	3,183	3,714	1,654	422
234-Private Road	3,171	3,705	1,649	421
235-Brace Road	3,090	3,649	1,611	412
236-Horseshoe Bar Road	3,088	3,684	1,581	405
237-Confluence-Loomis Tributary	3,078	3,676	1,578	404
Loomis Tributary				
278-Interstate 80	612	656	511	92
279-Thornwood Drive	577	618	497	86
280-King Road	521	579	485	81

(1) Node Destination and Location per Dry creek Watershed Flood Control Plan
(2) 1997 Land use - source: Placer County FIS/PCFC&WCD
(3) Draft General Plan land use

FLOODPLAINS

Placer County and FEMA during the update of the FEMA floodplain maps developed topographic mapping along the Loomis area streams. The mapping along with the water surface elevation computed by the hydraulic modeling was used to plot the floodplain shown on the updated FEMA floodplain maps.

The Drainage Master Plan utilized the same model to delineate floodplains expected after General Plan growth occurs. The 100-year flows at most locations will increase 5 to 7 percent between 1997 and future General Plan buildout. Secret Ravine is expected to have larger increases to 20 percent. Future development in the upper Antelope Creek watershed is expected to increase peak flows 15 to 30 percent.

The Dry Creek Plan proposes a regional detention facility on Secret Ravine upstream of Loomis and local detention basins in Loomis. The effect of this proposal will be to lower future peak runoff and mitigate a portion of the projected increase.

Floodplains are shown on the drainage system maps included in the Appendix C. They are also shown in greater detail on Figures 4-2a through 4-2t.

Crossings

There are several major road crossings of creeks in Loomis. Constrictions at bridges are a significant cause of out-of-bank flooding within Loomis. Critical crossings were identified, surveyed, as necessary, and hydraulic computations made to define insufficient capacity problems and evaluate recommended improvements.

Bridge reconstruction will have to be considered in the recommended Capital Improvement Project.

Sucker Ravine's major crossings are at King Road, Saunders Avenue, Sierra College Boulevard and Bankhead Road. The culvert at Kings Road backs floodwater and while not a high priority will need improvements in the future. At Saunders Avenue, the road is overtopped during flood flow. The depth is only a few inches but the crossing will have to be addressed in the future. Sierra College Boulevard also backs water up during flood runoff.

Secret Ravine crosses Horseshoe Bar Road, Brace Road and Gade Lane. Each of these bridges is overtopped during a 100-year event. Brace Road would be overtopped by about three feet. Each of these will have to be addressed in the future. The Brace Road Bridge is considered a priority for replacement in the Dry Creek Plan.

Antelope Creek has major crossings at King Road, Sierra College Boulevard and Delmar Avenue. Two or three homes are located in the floodplain upstream of King Road. The 100-year runoff will overtop King Road. The floodplain widens upstream of Sierra College Boulevard during a 100-year runoff event. The road is not overtopped, but there is substantial head loss and greater depths are evidenced upstream. At Delmar Road, the 100-year runoff will overtop the road; however, no homes are within the floodplain.

Table 4-2 shows creek water surface elevations and geometric data at bridge and culvert crossings.

Several bridges and culvert crossings on each of Loomis' streams constrict runoff and/or will be overtopped during a major flood event. Most of these are nuisance flooding with little damage or safety concern. Brace Road over Secret Ravine, with three feet of flooding over the road, was identified in the Dry Creek Plan as a priority replacement. Other crossings should be in a long-range Capital Improvement Plan for modification or reconstruction in the future. First priority should be given to the urban areas of Loomis.

Table 4-2. Water Surface Elevations and Geometric Data at Crossings

Location/Bridge	100-year WSEL, ft.		Bridge/ Culvert Size	Flowline Elev, ft.		Deck Elev., ft.
	Downstream	Upstream		Downstream	Upstream	
Antelope Creek						
King Road	330.4	331.0	32' W X 5' H	326.4	326.7	333.4
Sierra College Blvd.	312.1	315.2	Twin 9' X 8'	304.0	305.1	324.9
Delmar Avenue	294.4	298.6	Twin 49" X 33"	290.5	290.9	298.7
Sucker Ravine [(a)]						
King Road	355.5	360.5	Twin 5' X 2.5'	352.0	352.15	360.4
Saunders Avenue	336.5	337.0	Twin 36" X 48" Triple 38" X 57"	334.8	335.2	339.3
Sierra College Blvd.	324.0	324.5	71" X 47"	317.1	317.4	325.1
Bankhead Road	312.5	312.5	N/A	N/A	N/A	N/A
Loomis Tributary						
Sierra College Blvd.	318.0	321.5	60" CMP	313.1	313.7	325
Secret Ravine						
Horseshoe Bar Road	347.9	350.5	36' W X 11' H	340.0	342.4	351.5
Brace Road	337.5	337.6	27' W X 8' H	326.6	326.8	336.7
Gade Lane	328.1	327.9	40' W X 6' H	320.3	320.2	329.5
Private Road	325.4	325.9	30' W X 8' H	319.0	322.4	327.5
Secret Ravine Upper Ford/Loomis Tributary						
King Road	395.3	395.6	54" Drain Pipe	385.8	390.5	394.0
Thornwood Drive	390.0	390.2	54" Drain Pipe	383.3	383.5	390.0
Interstate 80	371.2	371.8	N/A	N/A	N/A	N/A

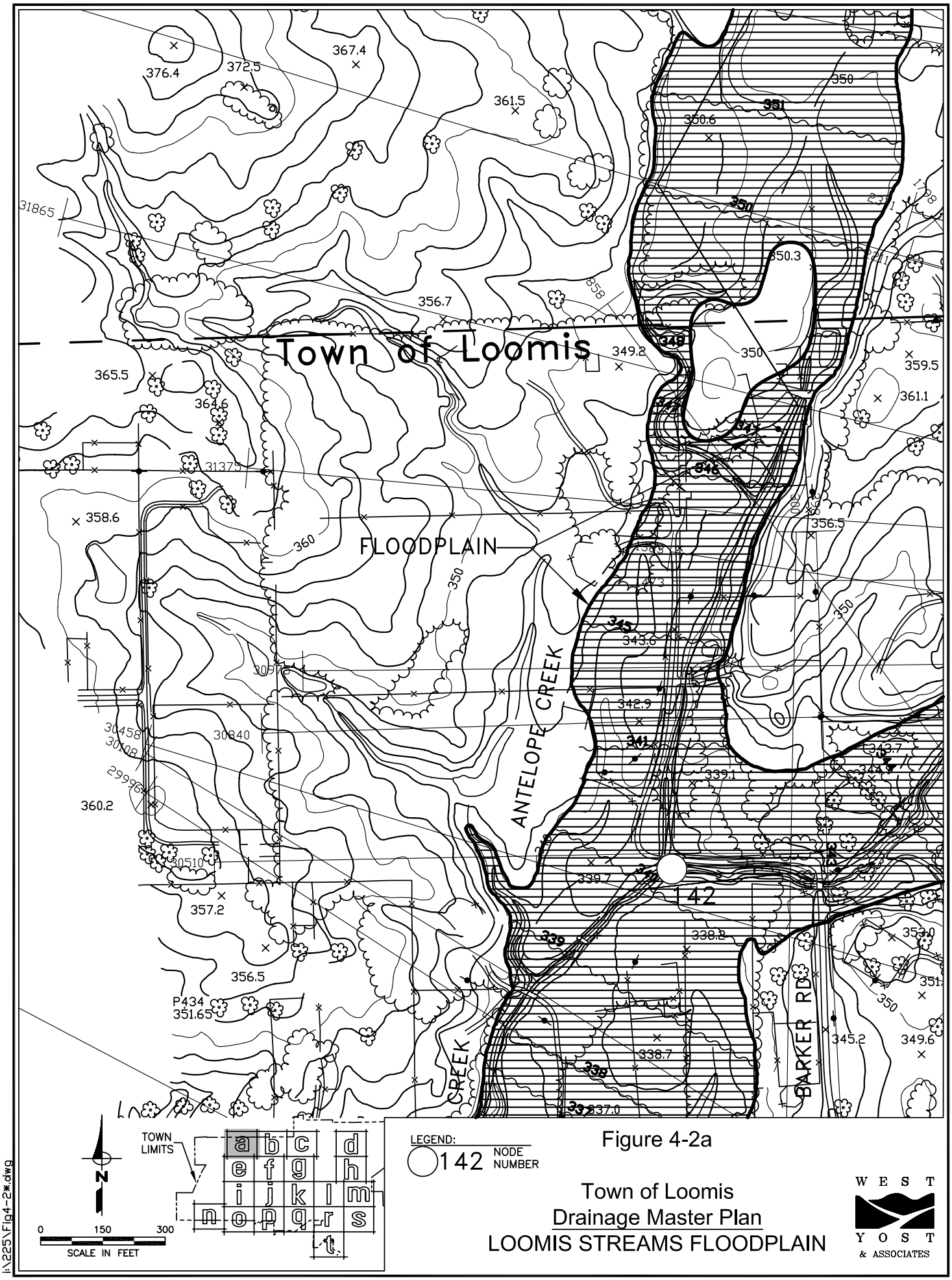


Figure 4-2a

Town of Loomis
Drainage Master Plan
LOOMIS STREAMS FLOODPLAIN

WEST YOST & ASSOCIATES

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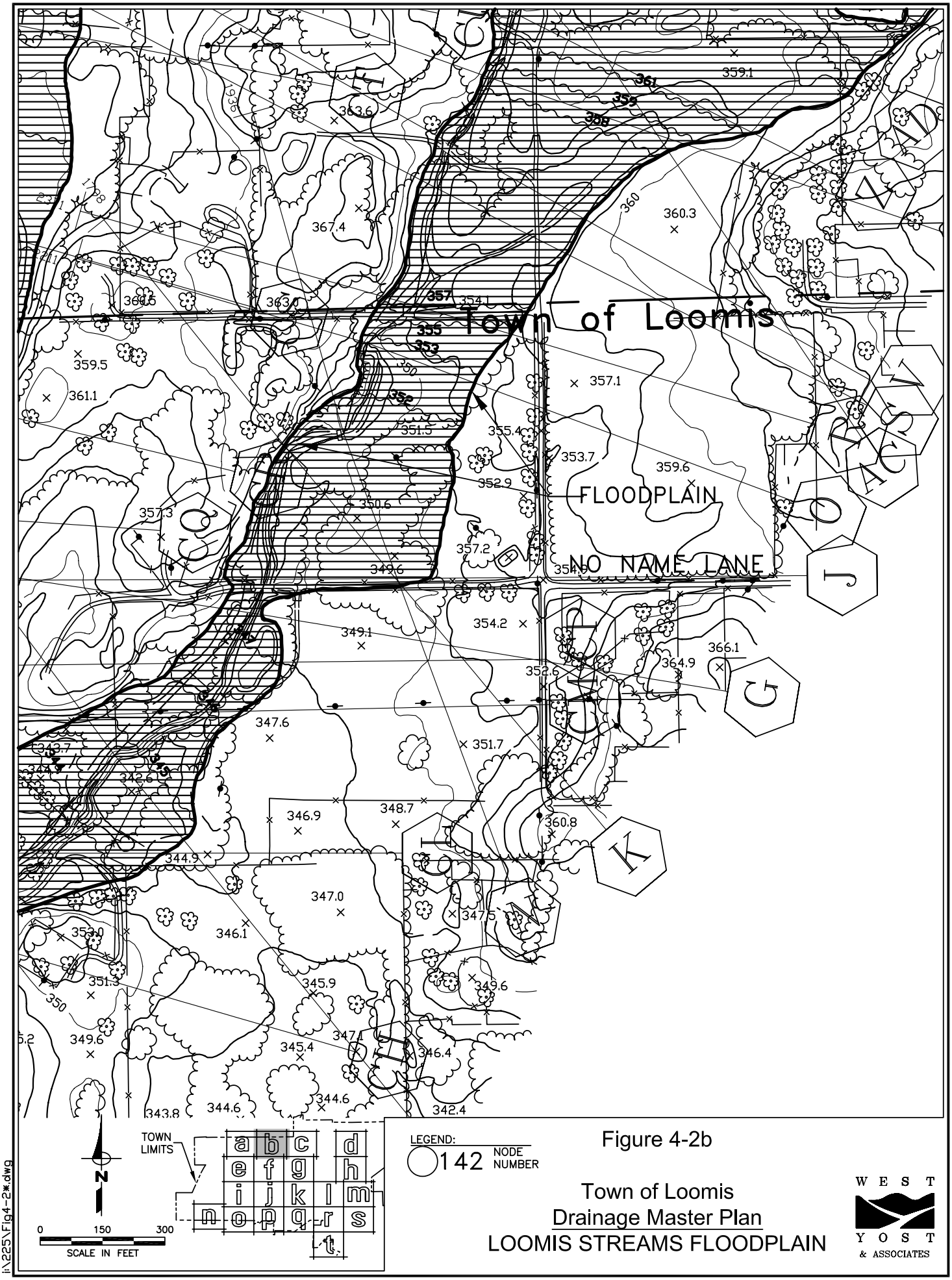

Figure 4-2b

Town of Loomis
Drainage Master Plan
LOOMIS STREAMS FLOODPLAIN

WEST YOST & ASSOCIATES

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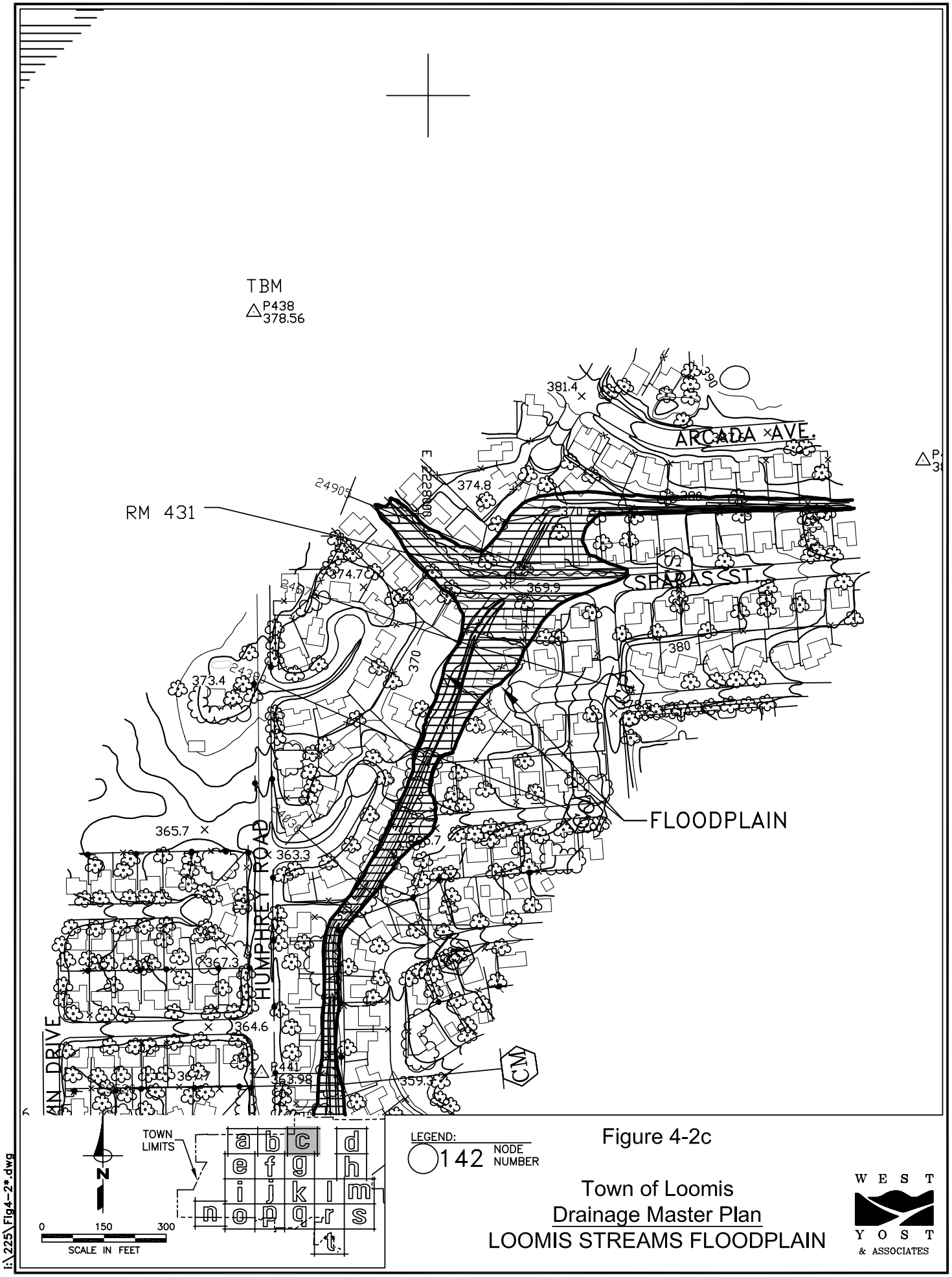

Figure 4-2c

Town of Loomis
Drainage Master Plan
LOOMIS STREAMS FLOODPLAIN

WEST YOST & ASSOCIATES

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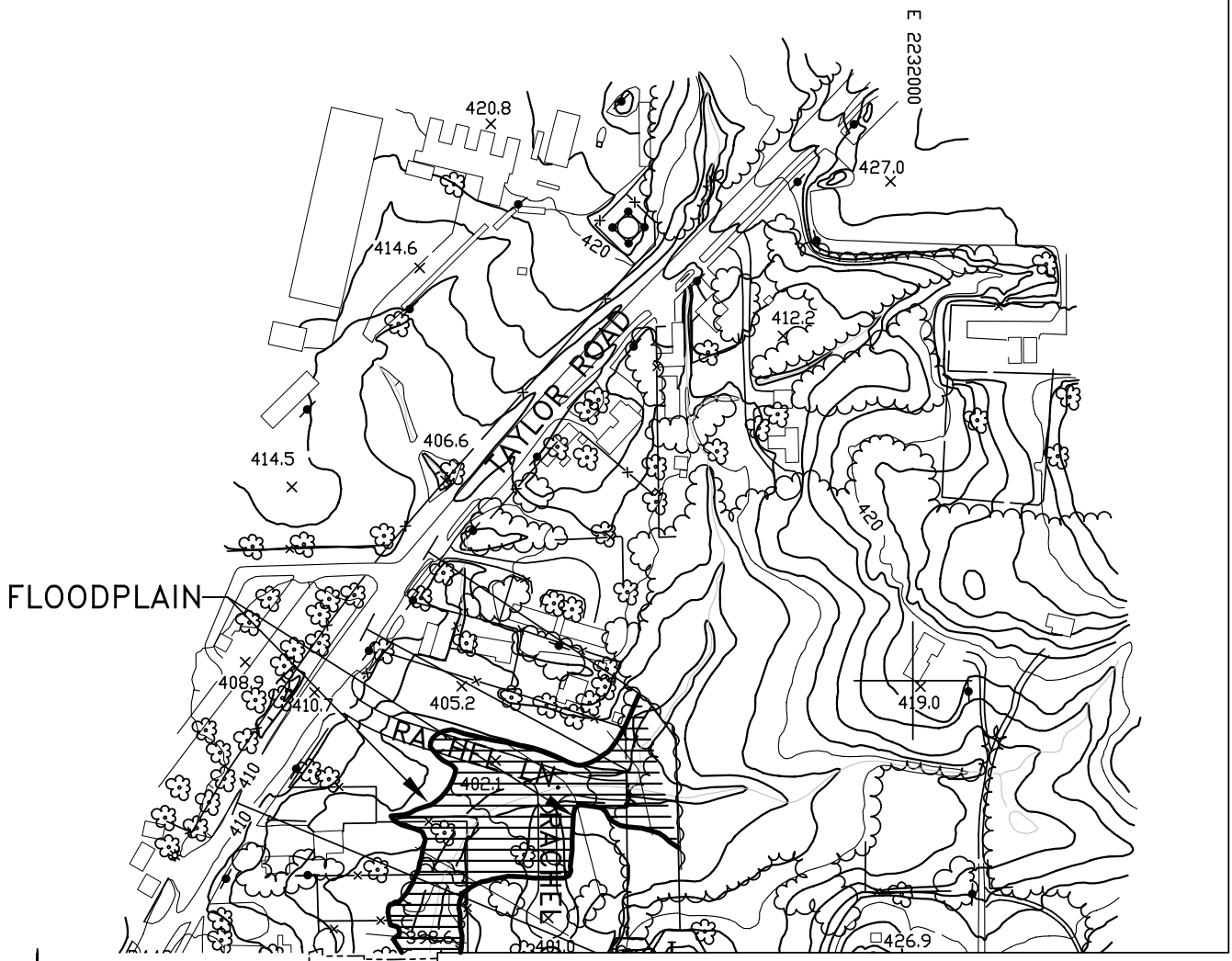

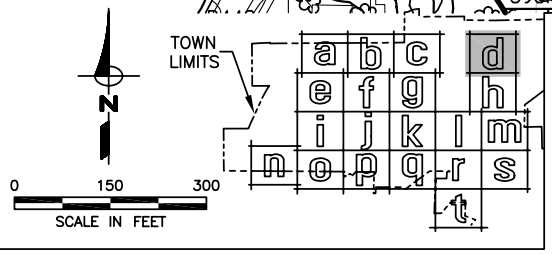

LEGEND:
142 NODE NUMBER

Figure 4-2d

Town of Loomis
Drainage Master Plan
LOOMIS STREAMS FLOODPLAIN

WEST YOST & ASSOCIATES

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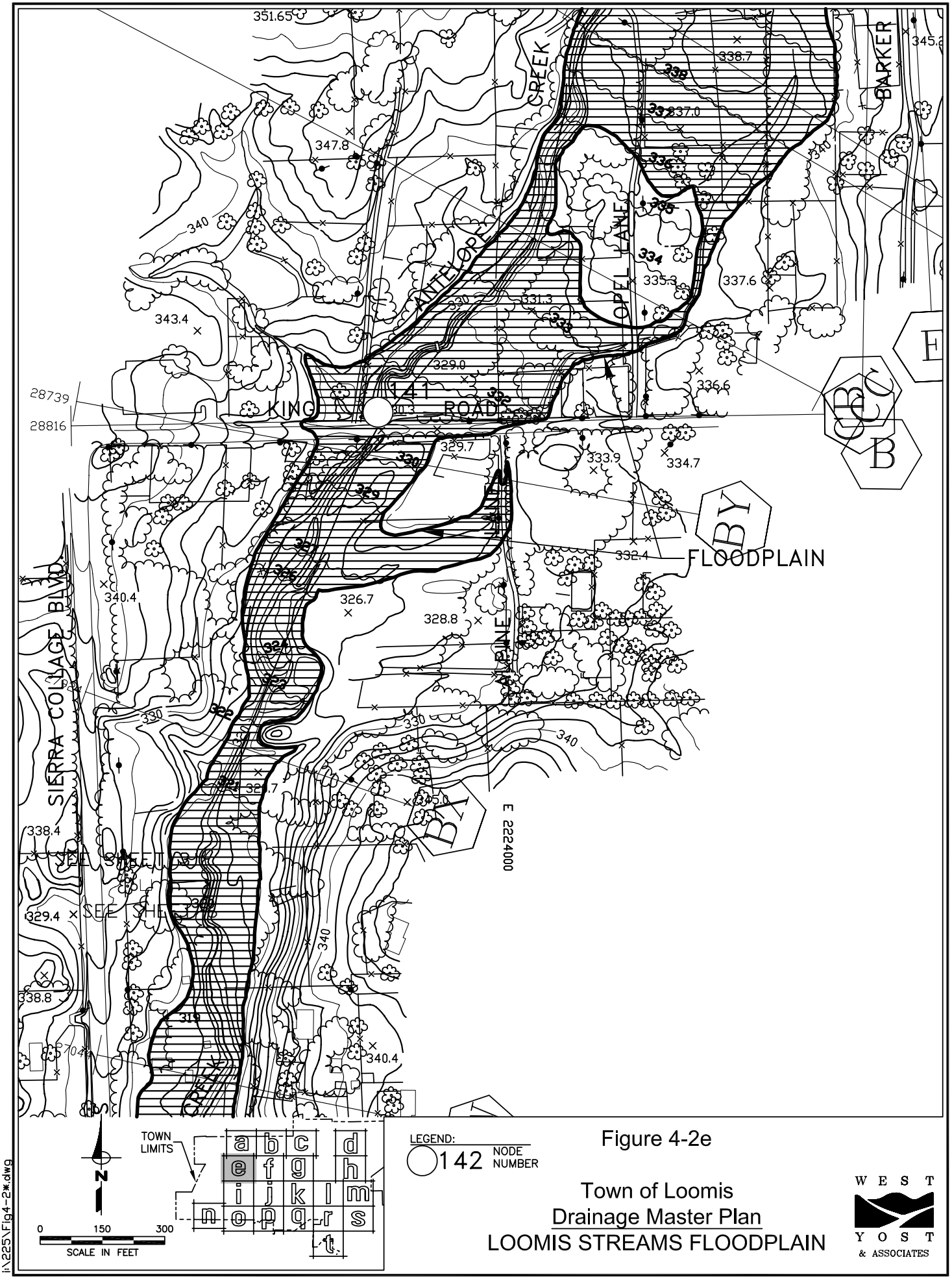

Figure 4-2e

Town of Loomis
Drainage Master Plan
LOOMIS STREAMS FLOODPLAIN

WEST YOST & ASSOCIATES

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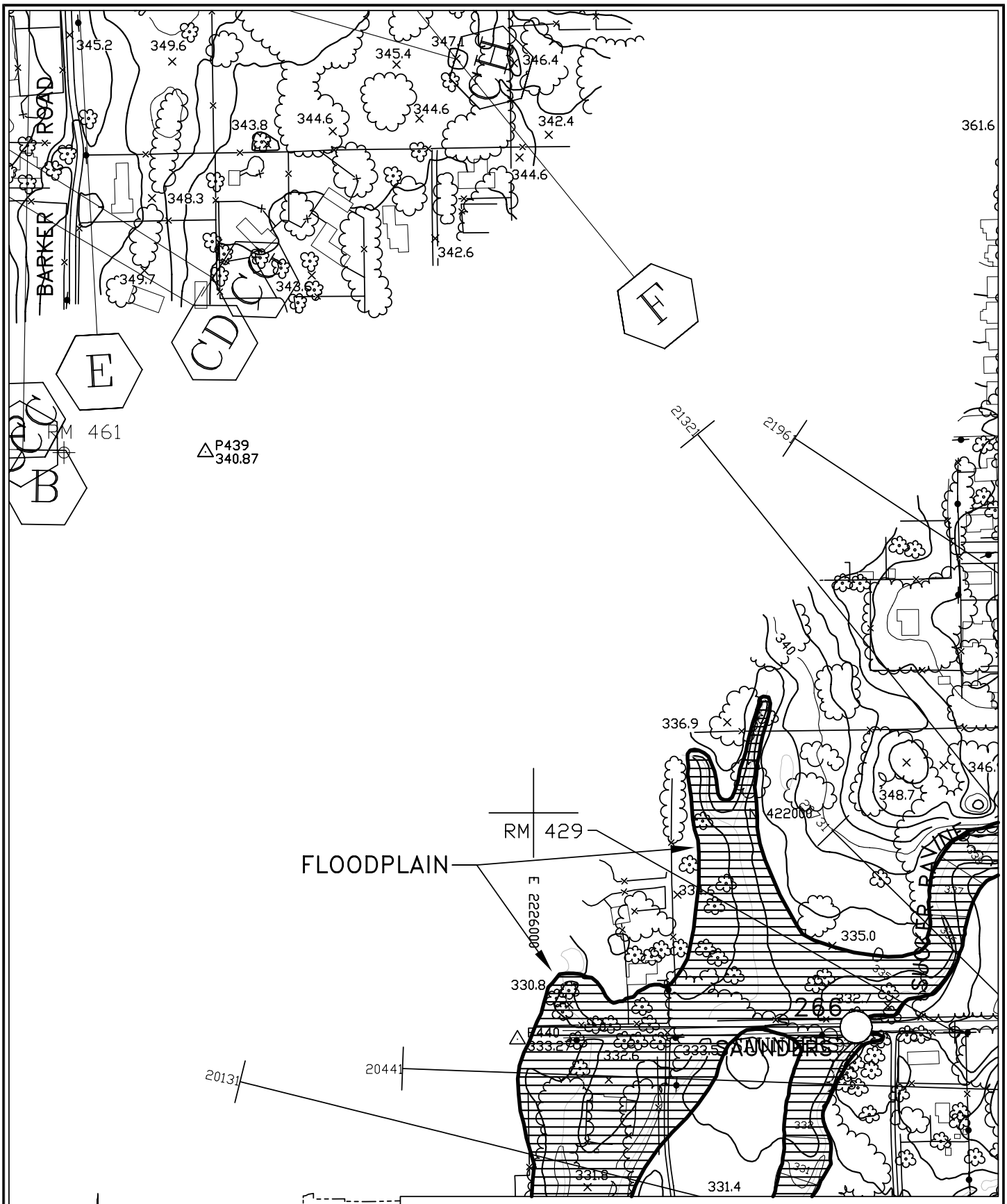

Figure 4-2f

Town of Loomis
Drainage Master Plan
LOOMIS STREAMS FLOODPLAIN

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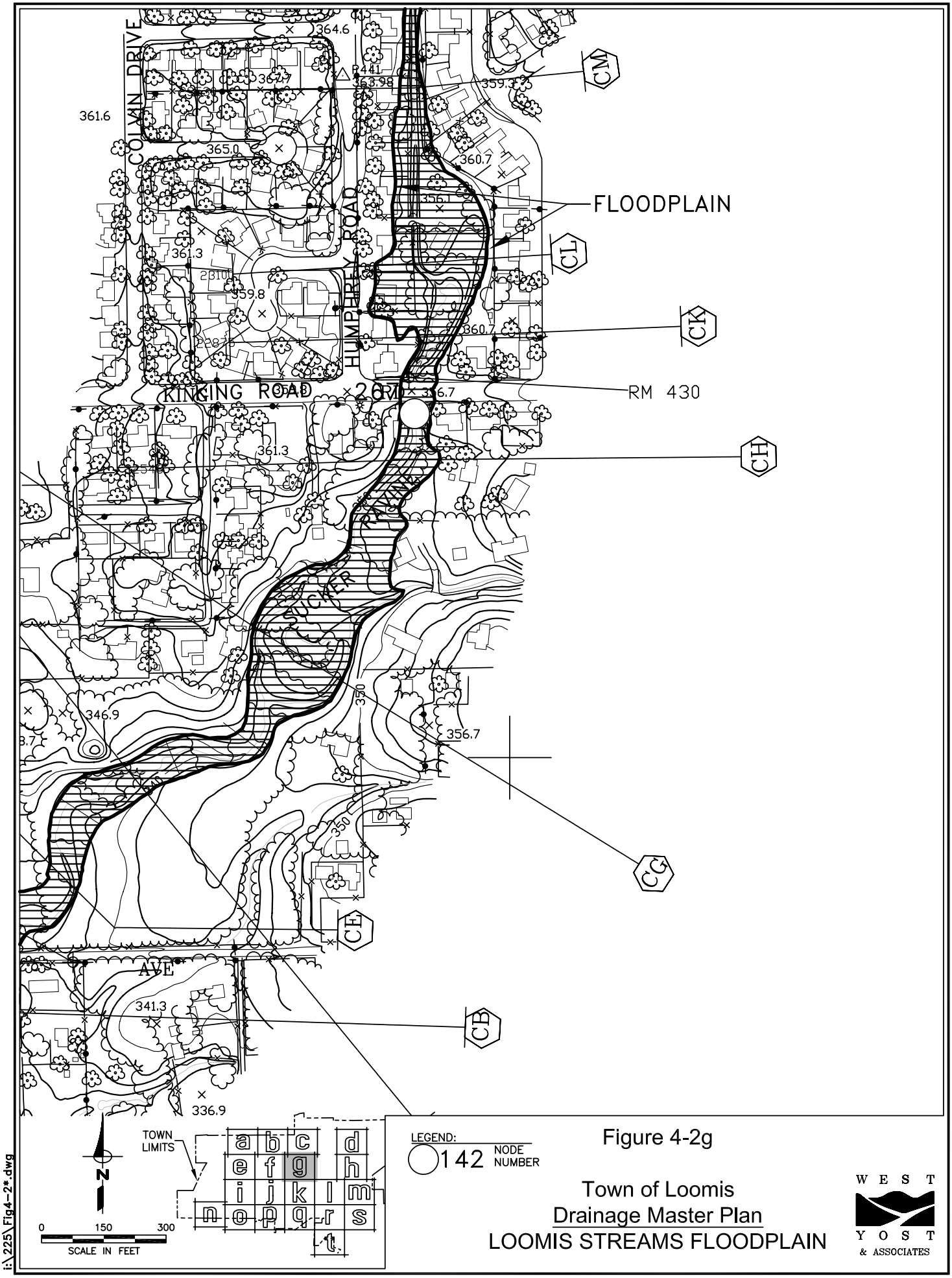

Figure 4-2g

Town of Loomis
Drainage Master Plan
LOOMIS STREAMS FLOODPLAIN

WEST YOST & ASSOCIATES

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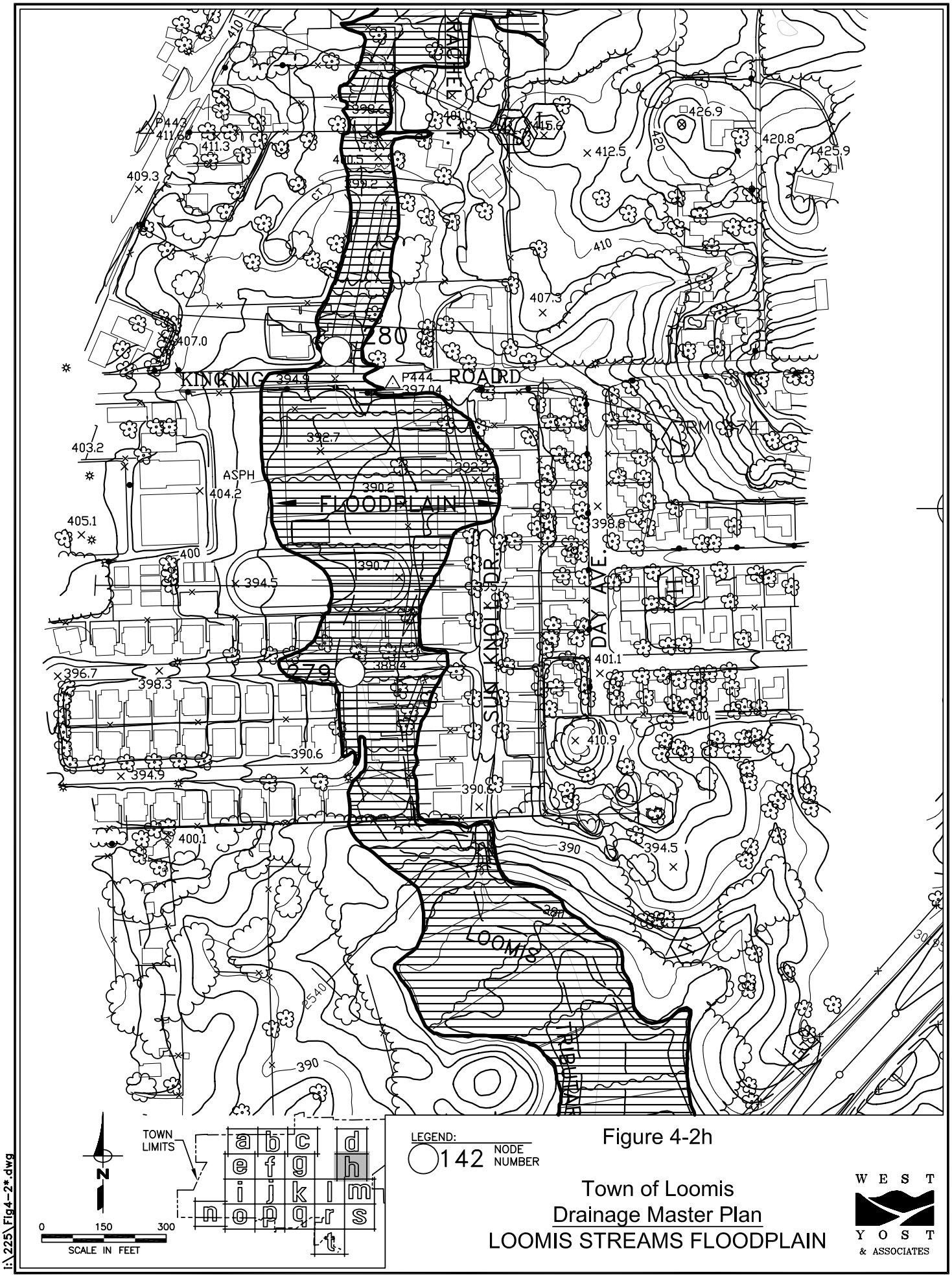

Figure 4-2h

Town of Loomis
Drainage Master Plan
LOOMIS STREAMS FLOODPLAIN

WEST YOST & ASSOCIATES

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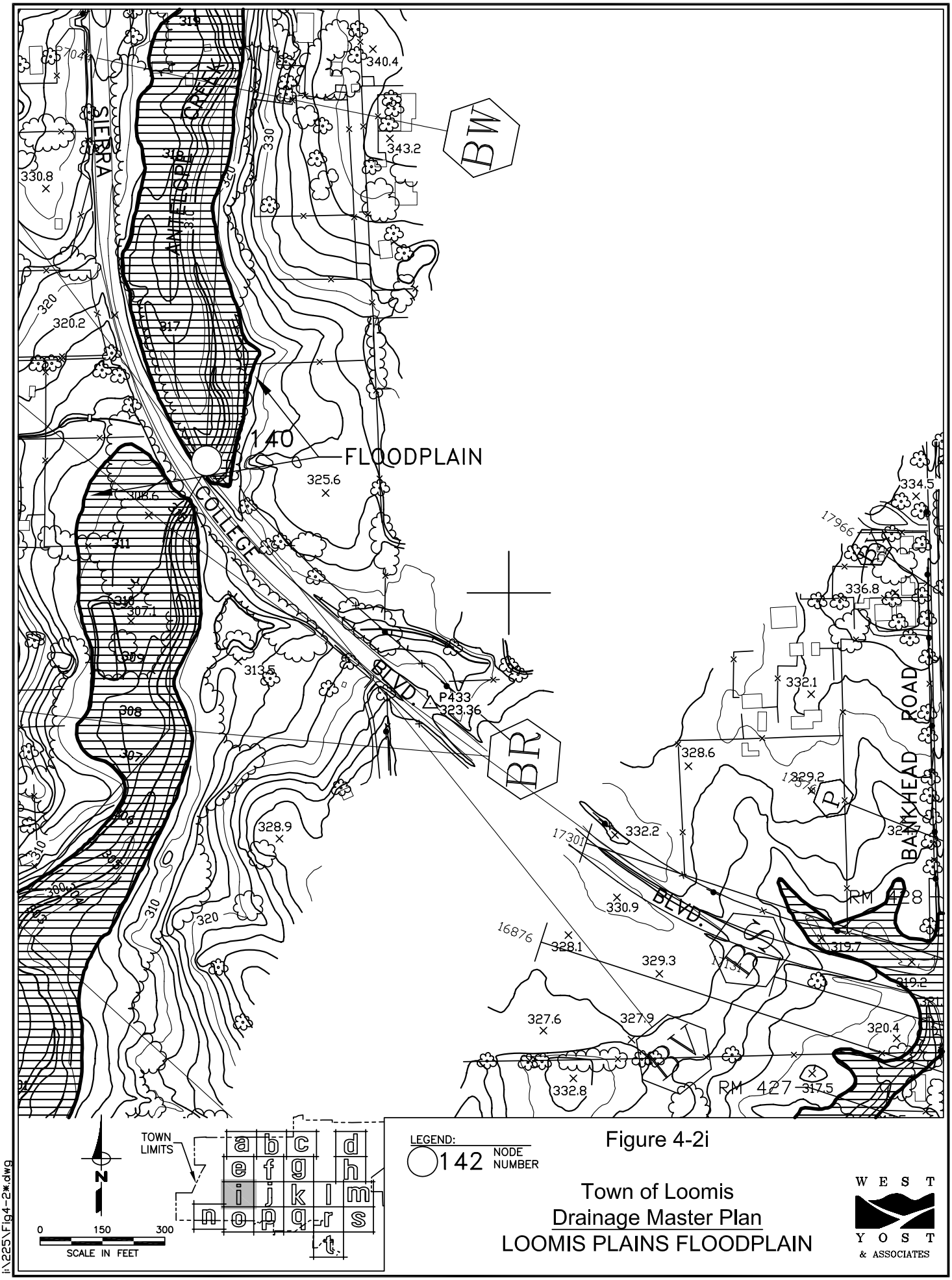

Figure 4-2i

Town of Loomis
Drainage Master Plan
LOOMIS PLAINS FLOODPLAIN

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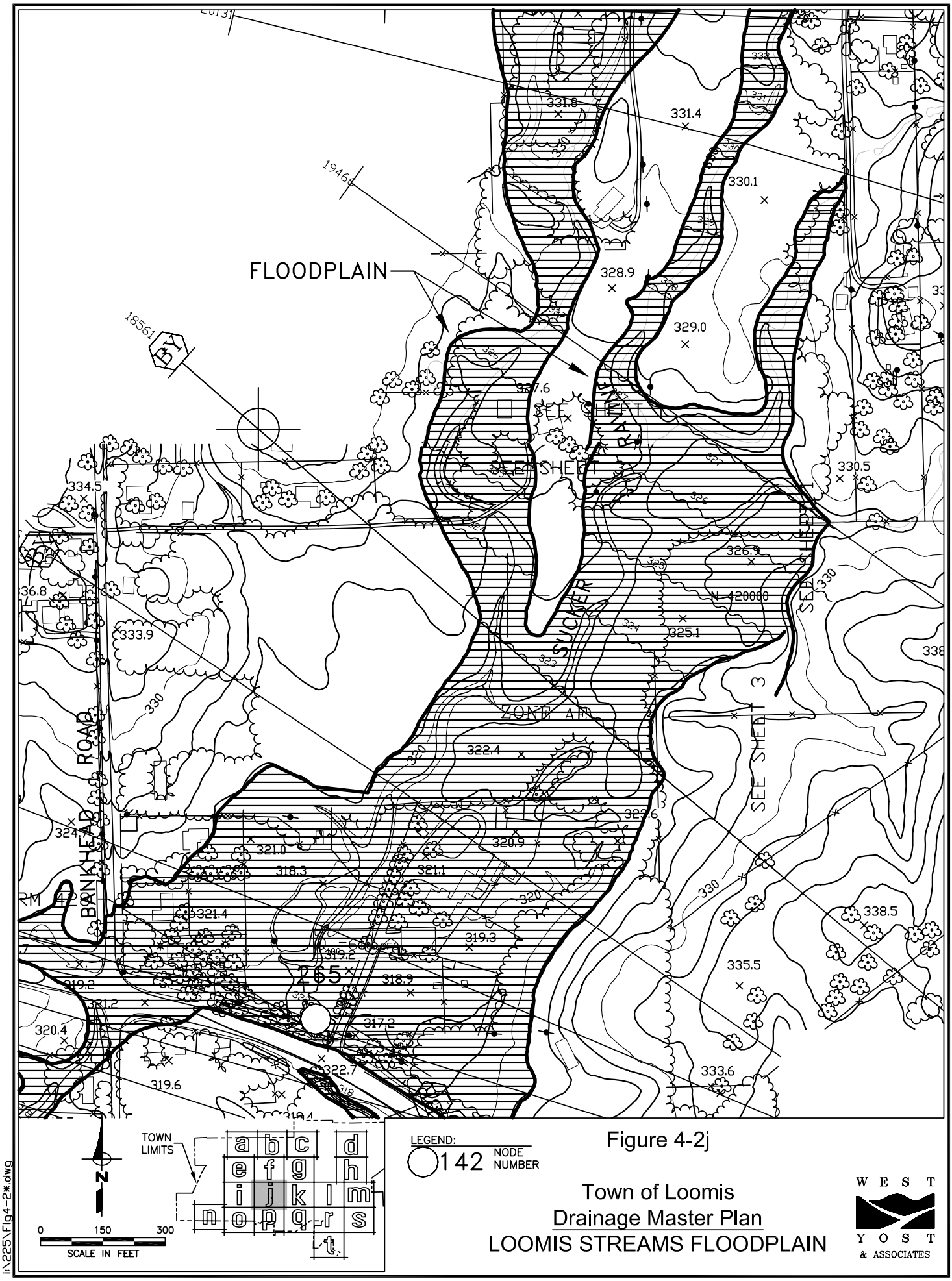

Figure 4-2j

LEGEND:
142 NODE NUMBER

TOWN LIMITS

a b c d
e f g h
i j k l m
n o p q r s
t

0 150 300
SCALE IN FEET

Town of Loomis
Drainage Master Plan
LOOMIS STREAMS FLOODPLAIN

WEST YOST & ASSOCIATES

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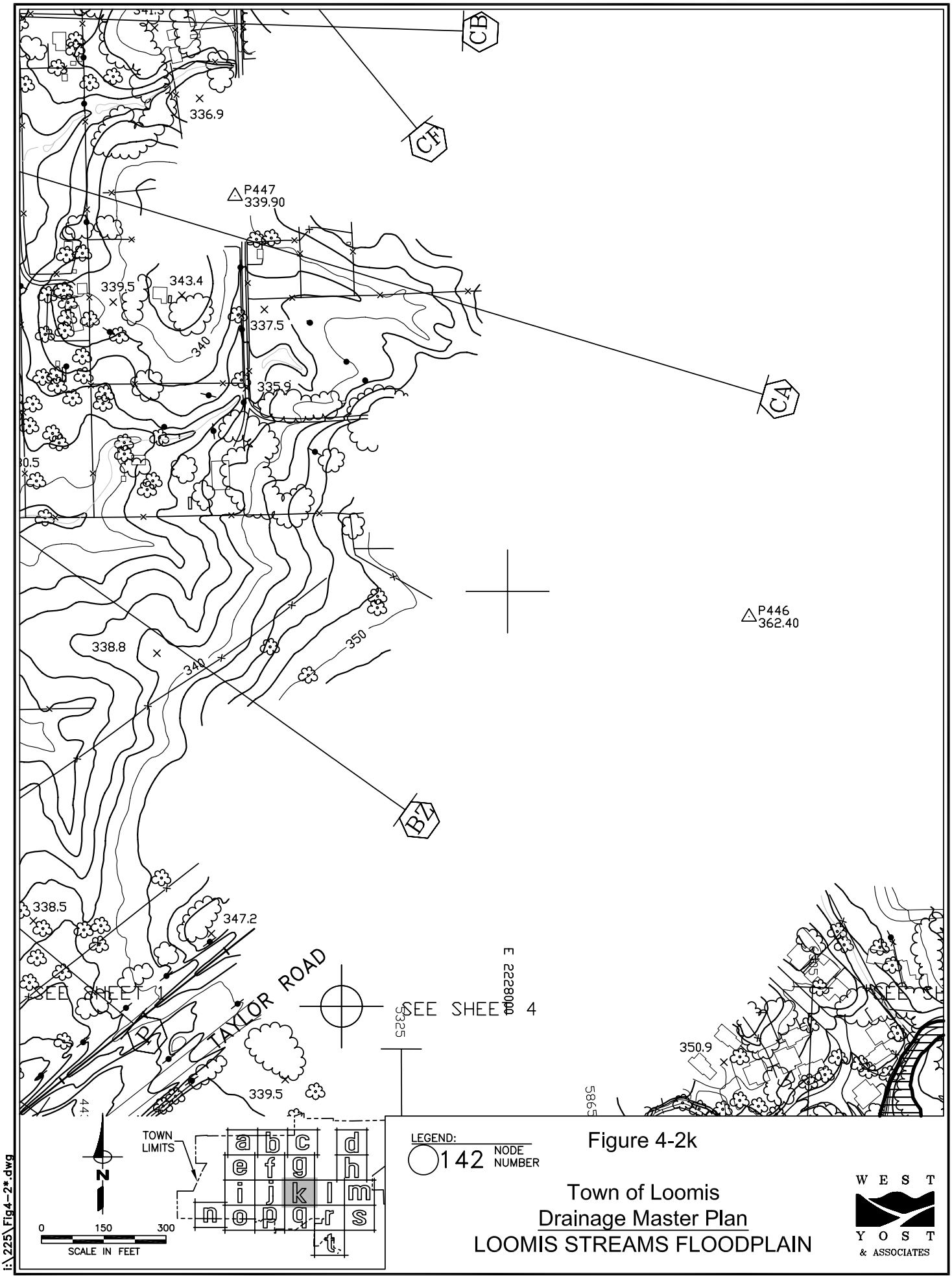

Figure 4-2k

Town of Loomis
Drainage Master Plan
LOOMIS STREAMS FLOODPLAIN

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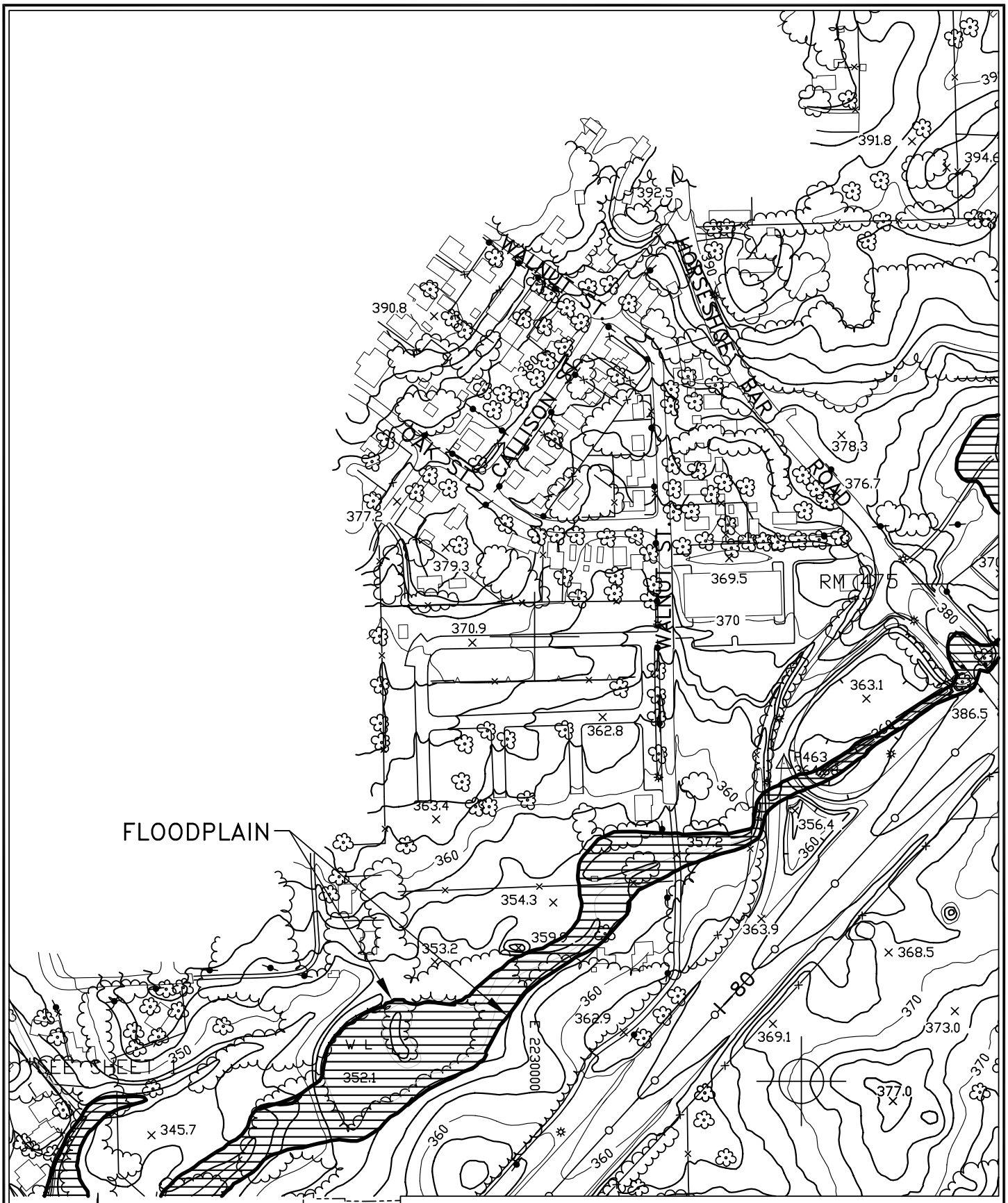

Figure 4-2l

Town of Loomis
Drainage Master Plan
LOOMIS STREAMS FLOODPLAIN

WEST YOST & ASSOCIATES

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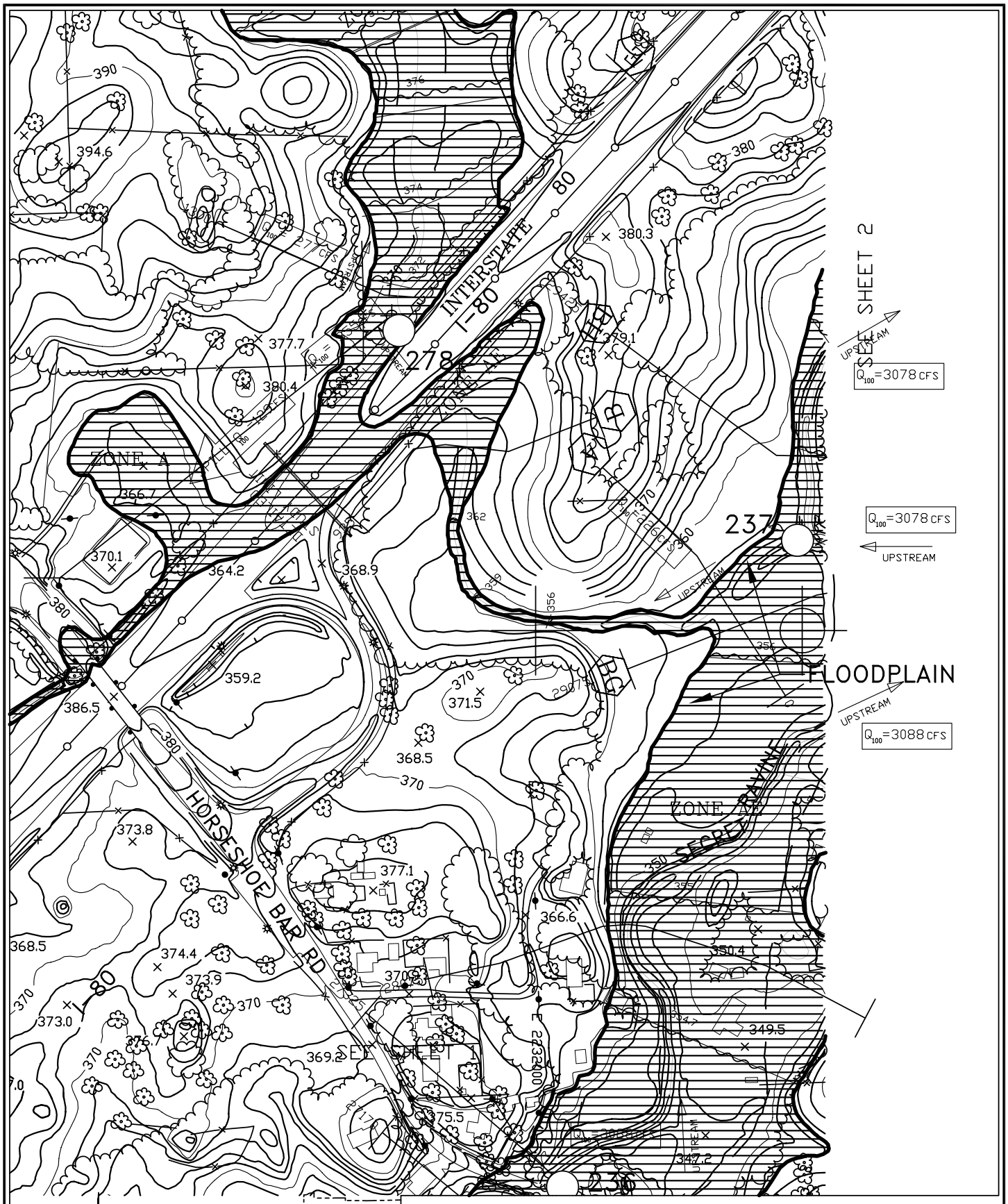

Figure 4-2m

Town of Loomis
Drainage Master Plan
LOOMIS STREAMS FLOODPLAIN

WEST YOST & ASSOCIATES

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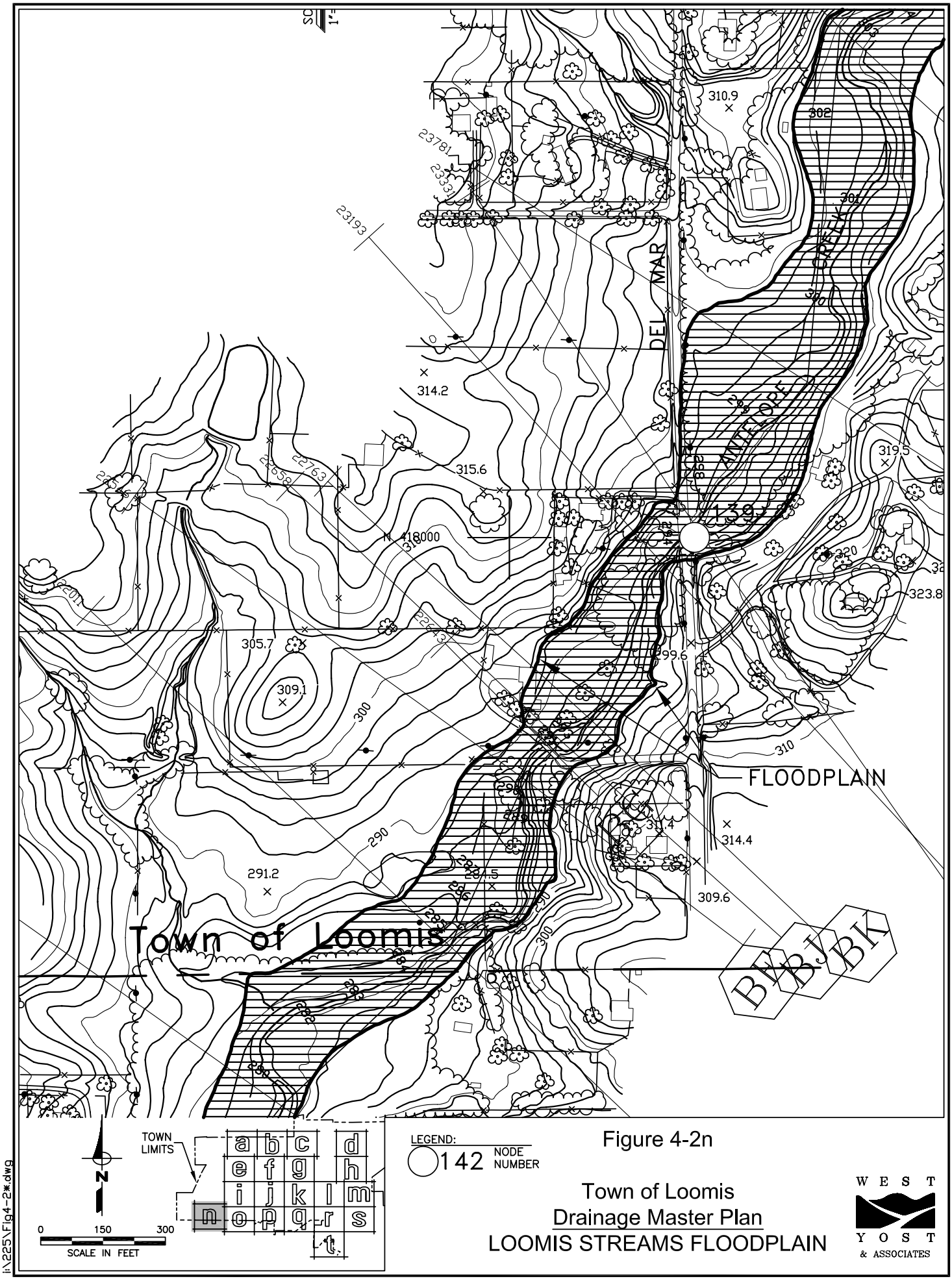

Figure 4-2n

Town of Loomis
Drainage Master Plan
LOOMIS STREAMS FLOODPLAIN

WEST YOST & ASSOCIATES

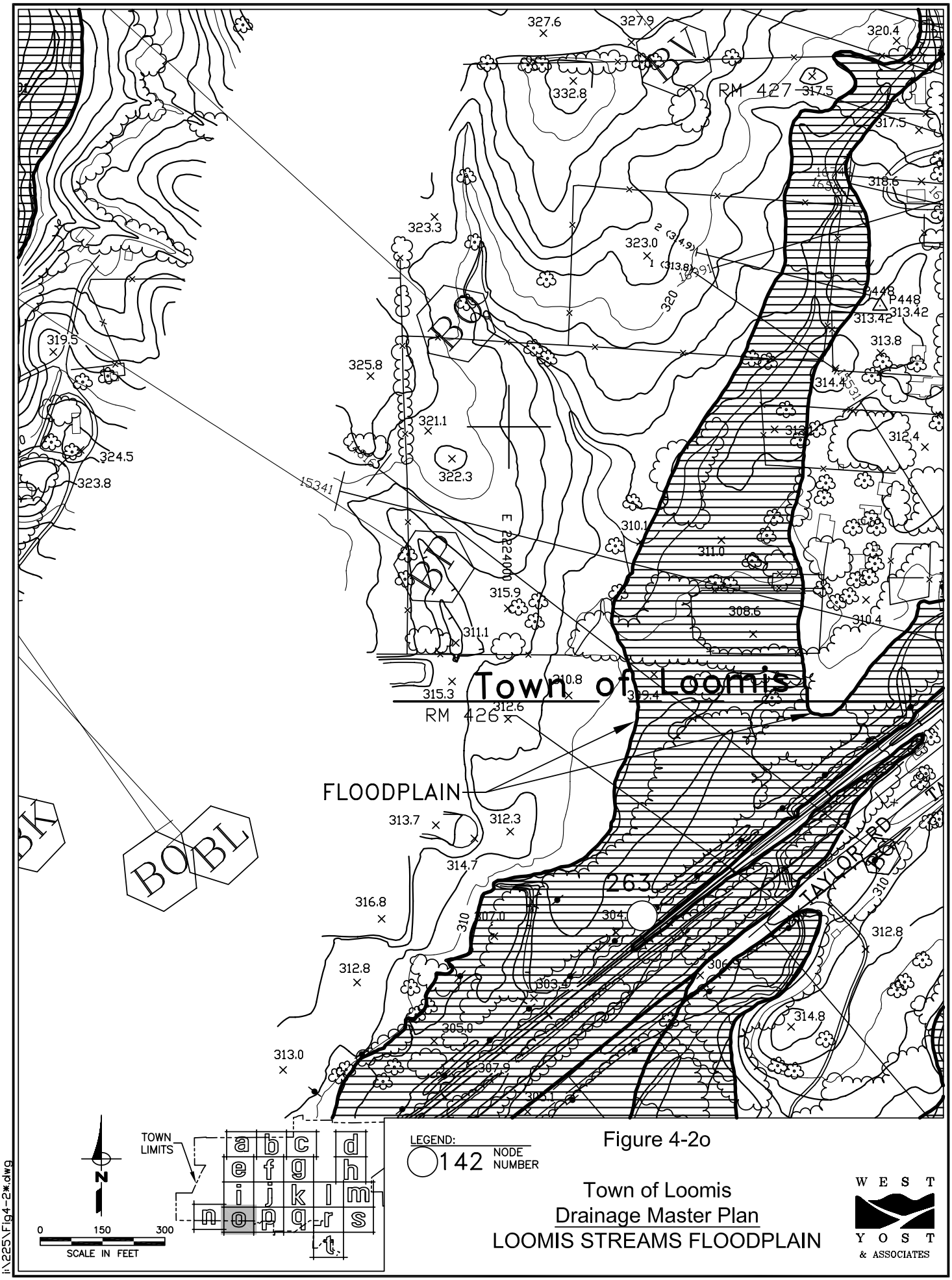

Figure 4-2o

Town of Loomis
Drainage Master Plan
LOOMIS STREAMS FLOODPLAIN

WEST YOST & ASSOCIATES

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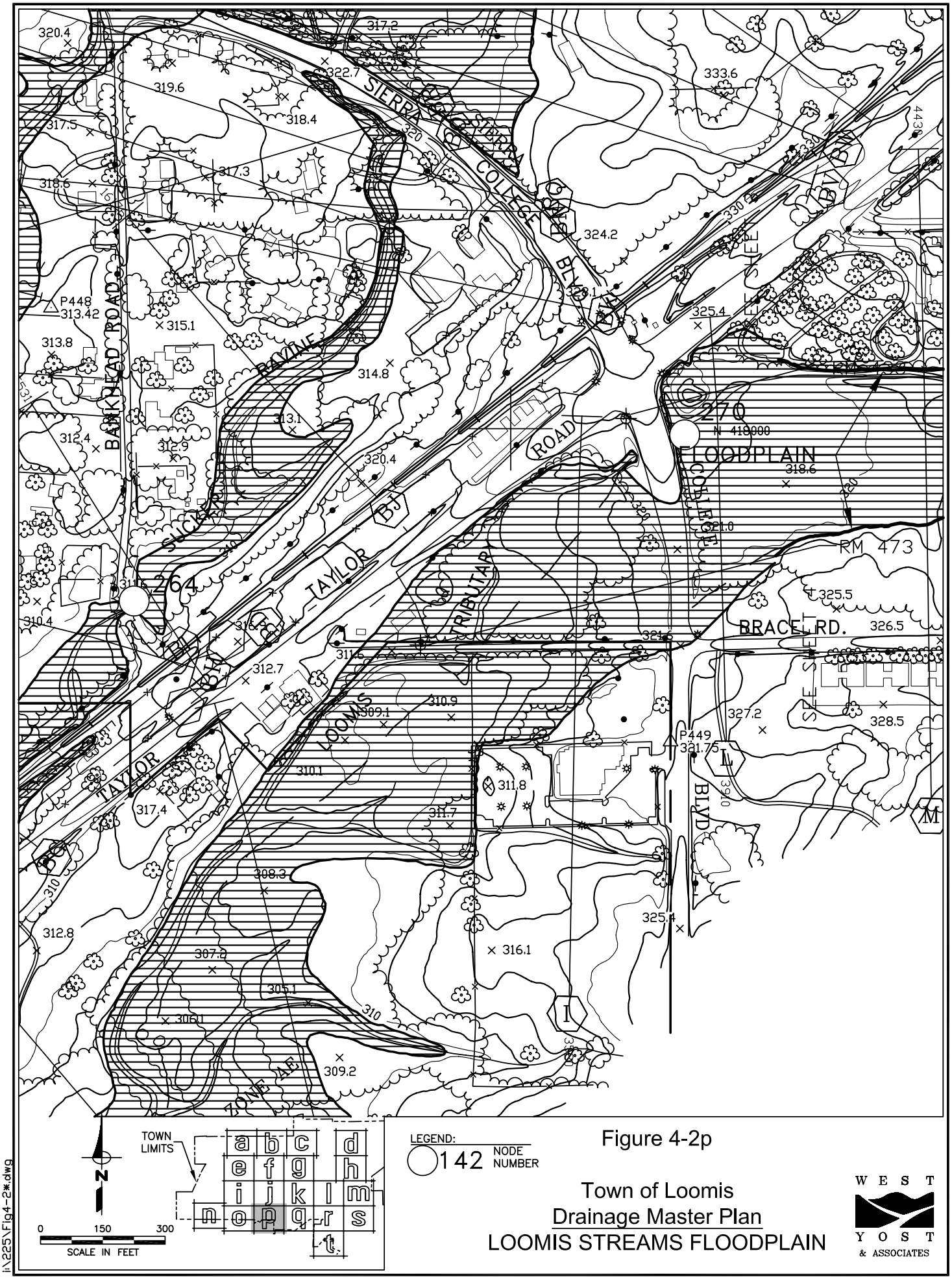

Figure 4-2p

Town of Loomis
Drainage Master Plan
LOOMIS STREAMS FLOODPLAIN

WEST YOST & ASSOCIATES

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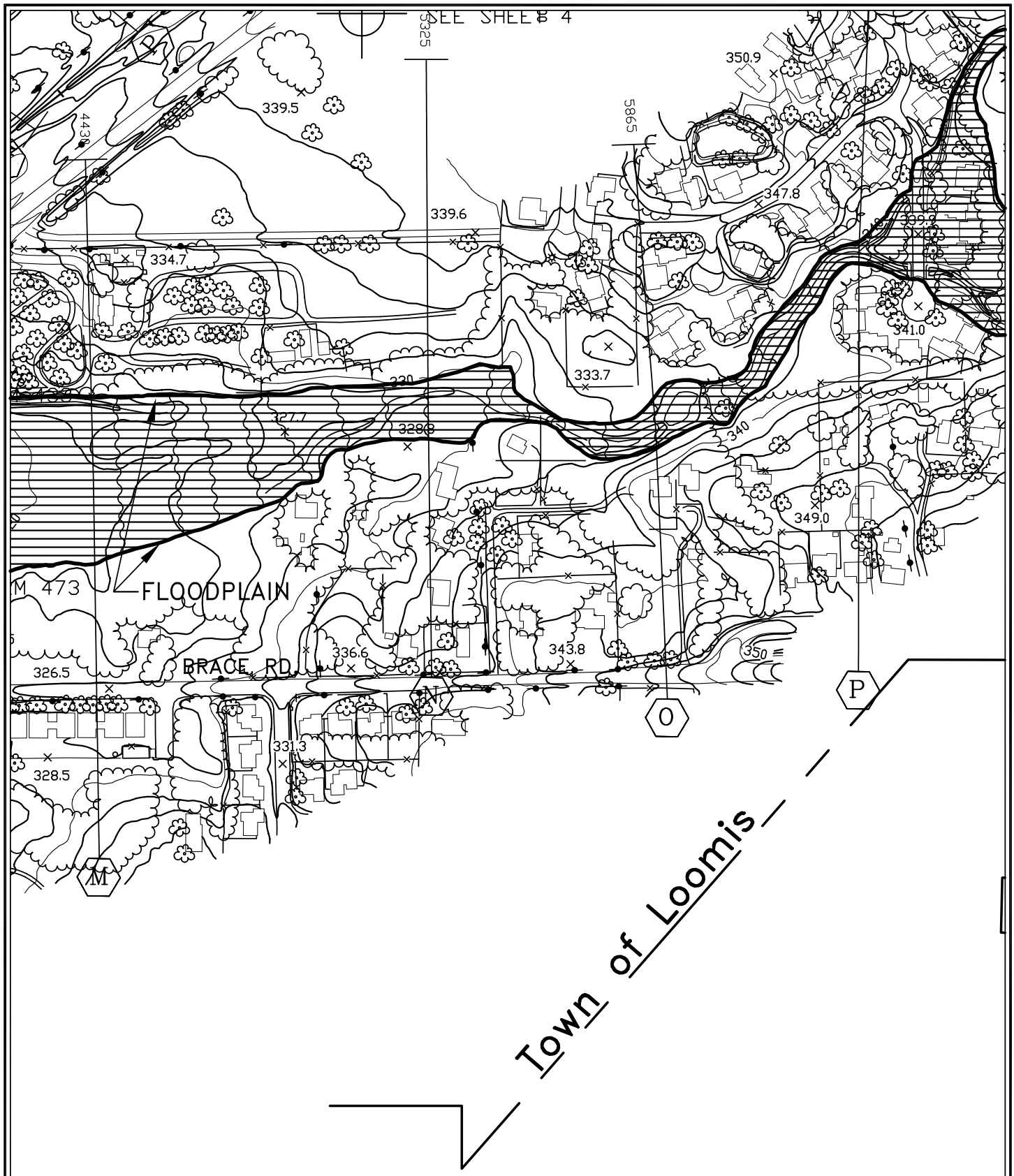

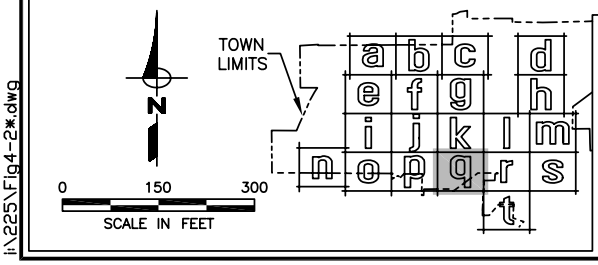

LEGEND:
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Figure 4-2q

Town of Loomis
Drainage Master Plan
LOOMIS STREAMS FLOODPLAIN

WEST YOST & ASSOCIATES

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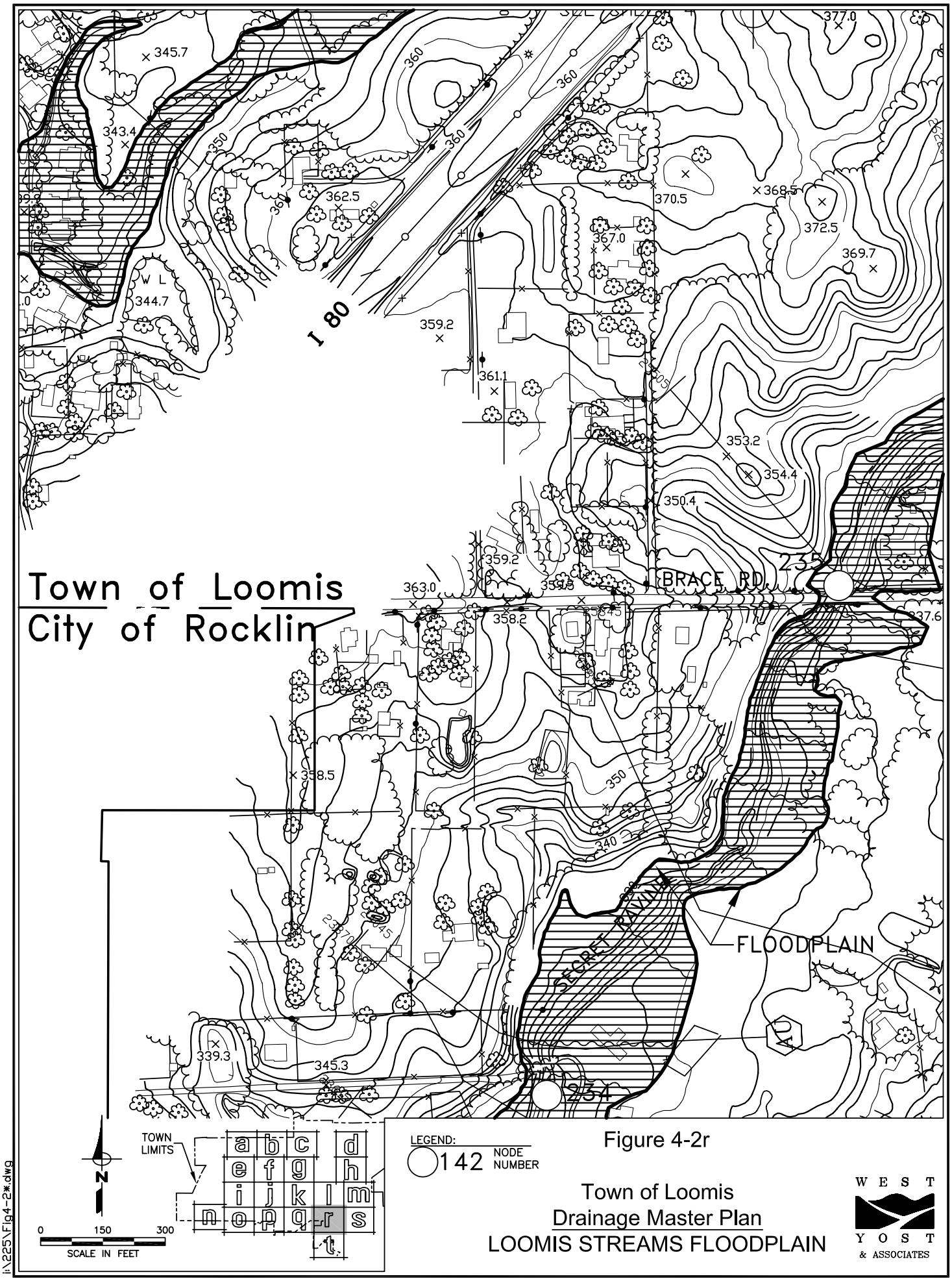

Figure 4-2r

Town of Loomis
Drainage Master Plan
LOOMIS STREAMS FLOODPLAIN

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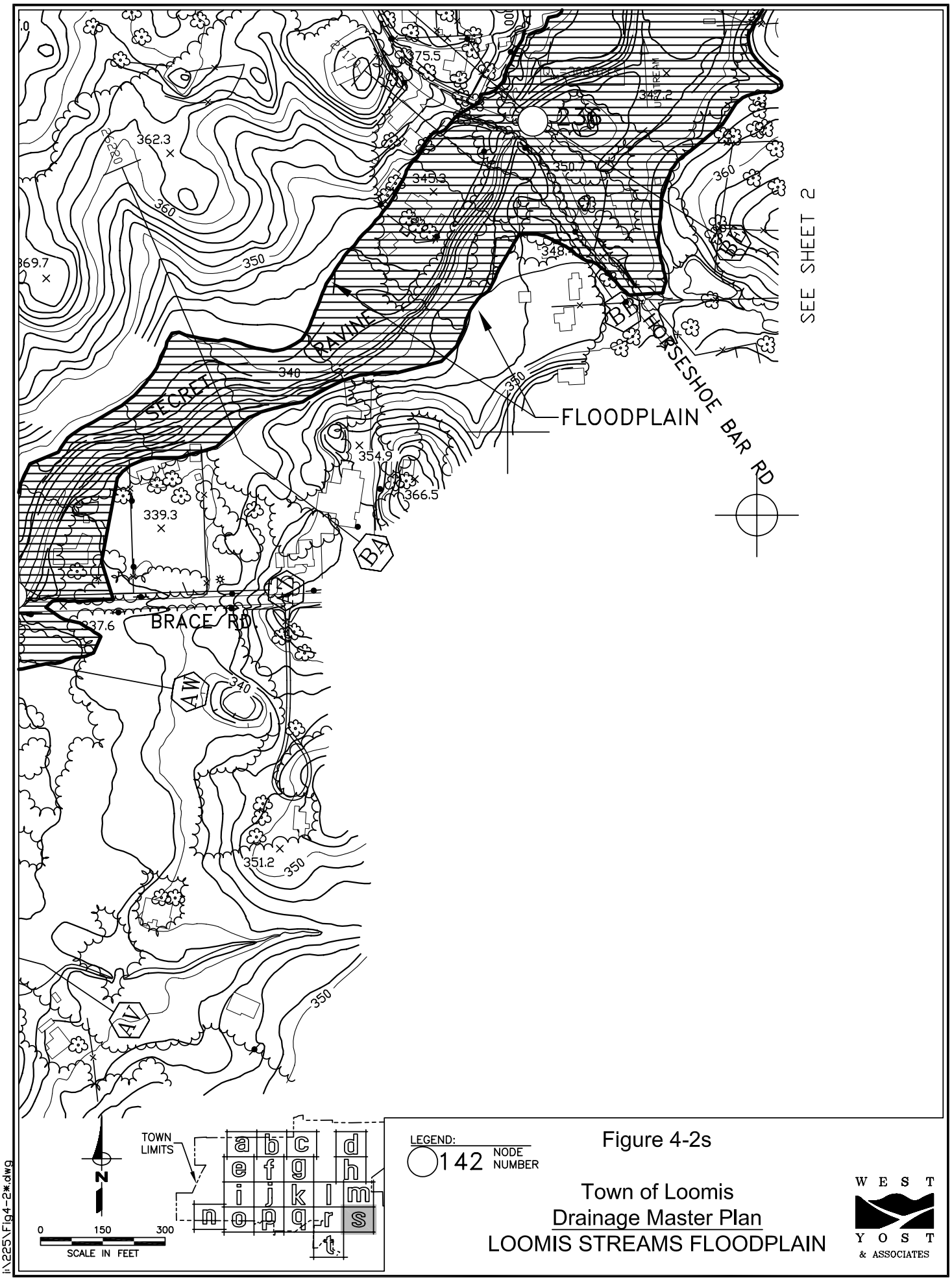

Figure 4-2s

Town of Loomis
Drainage Master Plan
LOOMIS STREAMS FLOODPLAIN

WEST YOST & ASSOCIATES

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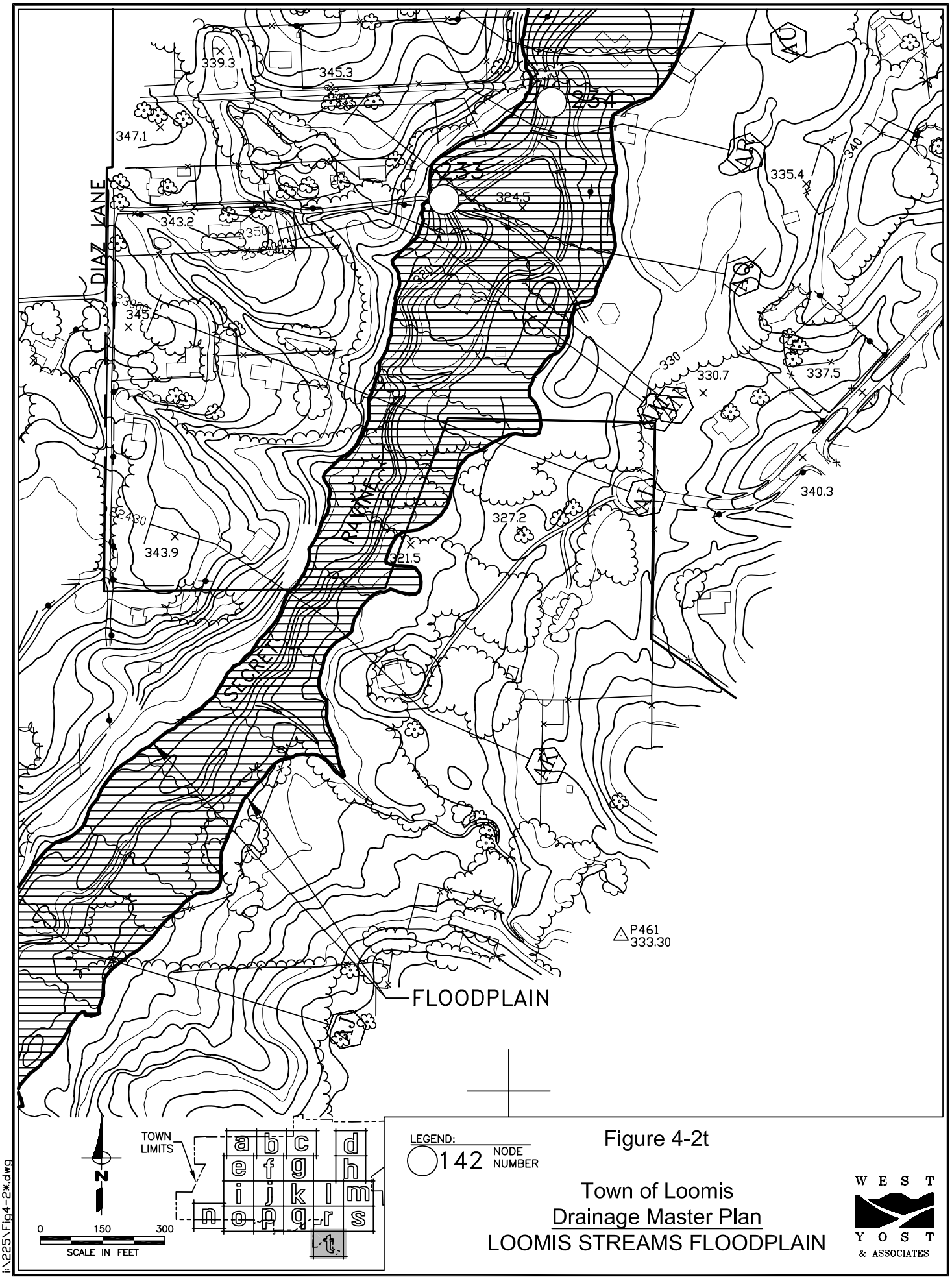

Figure 4-2t

Town of Loomis
Drainage Master Plan
LOOMIS STREAMS FLOODPLAIN

CHAPTER 5. STORM DRAINS

The purpose of this chapter is to summarize the review and evaluation of the Town of Loomis' (Loomis) storm drain facilities. This analysis was performed for the 2001 Drainage Master Plan. The storm drain facilities review included:

- Identification of storm drains
- Identification areas of concern based on citizen complaints and reports from maintenance personnel
- Evaluation of the areas of concern by computations and field reconnaissance
- Recommendation of improvements

Loomis has limited areas with storm drains, which is the result of having a hilly topography with many streams and drainage swales providing for natural runoff. The limited use of storm drains also comes from a history of rural land uses and large parcels and lots. The trend is for more areas of the town to have storm drains with the development of more traditional subdivisions.

Loomis' storm drain development criteria are based on the Placer County Flood Control and Water Conservation District (District) Stormwater Management Manual (Manual). The District's Manual requires new storm drain facilities be designed to convey the runoff from a 10-year storm event. To construct a storm drain system that meets this objective throughout Loomis would be very expensive, but remains a long-term goal.

Analysis showed that most storm drains were adequately sized to carry the design runoff. Localized areas experience some nuisance ponding during intense rainfall periods, but the ponding is generally non-damaging. Therefore, this chapter is divided into two sections. The first section discusses those areas where flooding problems have been identified and the storm drain facilities may be inadequate. The second section describes those areas where the storm drain system appears to adequately collect and convey the design runoff. The locations of the storm drain systems that were evaluated as part of the storm drain master are shown in Figure 5-1.

COST ESTIMATES

The estimates for probable project costs for the recommended storm drain improvements have been developed using calculated quantities and unit cost values. The estimated construction cost includes a 35 percent estimating contingency and a construction contingency of 10 percent to account for details of the recommended projects that have not been specifically identified in the cost estimate and for variability in contractor bidding.

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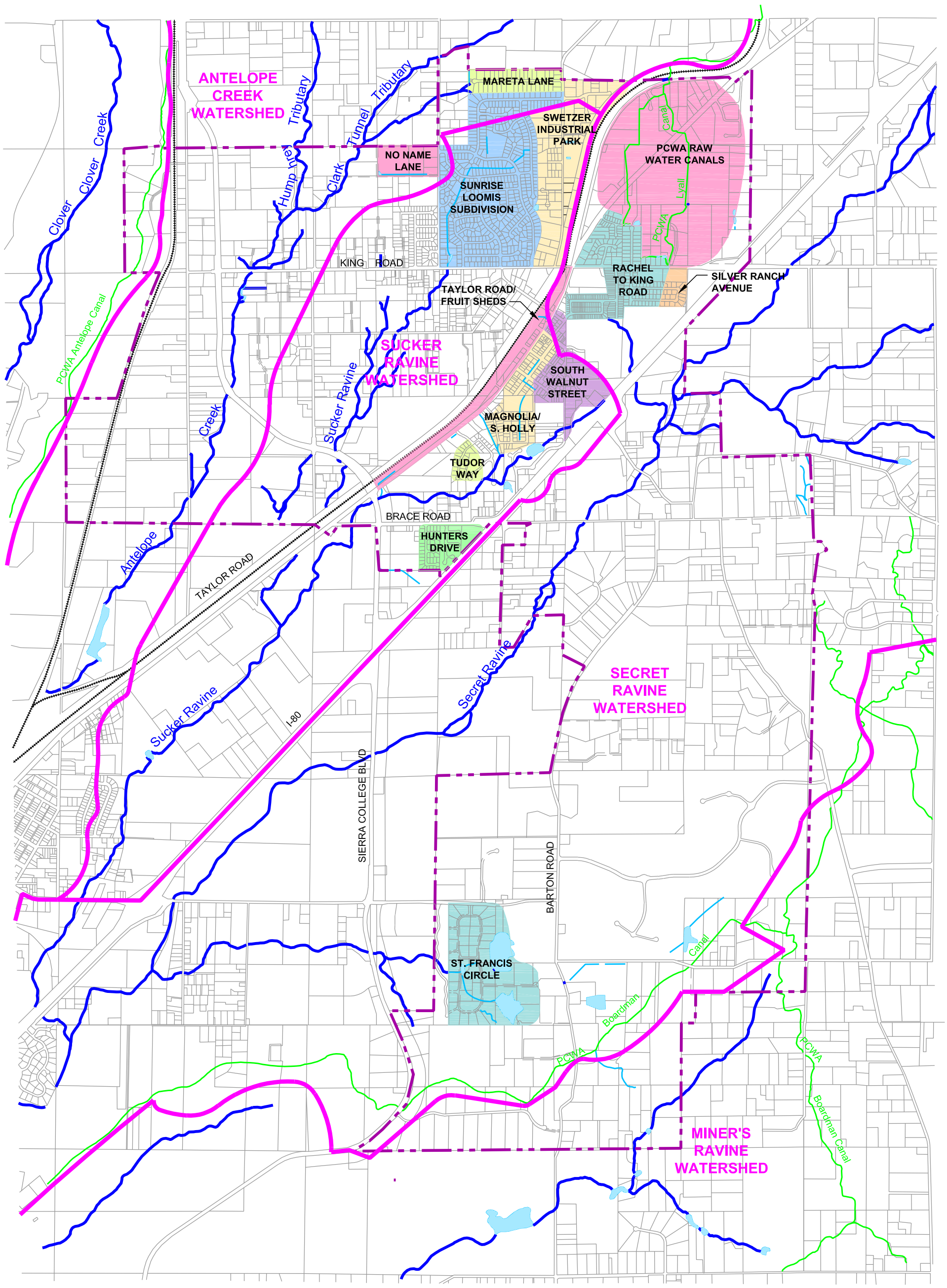

LEGEND

- STREAM/CHANNEL
- TOWN LIMITS
- MAJOR WATERSHED BOUNDARY
- POND OR DETENTION BASIN
- PCWA IRRIGATION CANAL

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0 1000 2000
SCALE IN FEET

Figure 5-1

Town of Loomis
Drainage Master Plan
STORM DRAIN SYSTEM
& AREAS OF CONCERN

WEST YOST ASSOCIATES
Consulting Engineers

The total estimated capital cost for the recommended projects were developed from the construction cost estimates by adding the following costs to the construction costs:

Engineering, including pre-design and design at 11 percent

Construction Management, Surveying, and Geotechnical at 12 percent

City Cost, including admin., plan check, etc. at 5 percent

Environmental Review (and permitting as necessary) at 5 percent

Project Contingency at 5 percent

The cost estimates presented in this document are planning level estimates of project costs to be used for master planning purposes only and are appropriate for overall budgeting. However, the estimated costs require refinement as more information becomes available during the preliminary and final design phases. Furthermore, these estimates of construction costs has been made without detailed engineering data and developed using known cost for similar facilities, scale-up and scale-down factors, cost curves and generic cost guides. It is normally expected that an estimate of this type would be accurate within a range of plus 30 percent to minus 15 percent. This means that bids can be expected to fall within 30 percent over the estimates to 15 percent under the estimates.

Unit costs for developing estimated construction costs of improvements are based on information from other storm drain master plans developed by West Yost Associates (WYA), recent bid results, and WYA experience. A summary of the unit cost for storm drain facilities is provided in Table 5-1. All costs have been updated to a December 2007 Engineering News Record (ENR) 20 cities construction cost index of 8089.

Table 5-1. Unit Costs for Drainage System Improvements[(a)]

Item	Unit	Stable Soil Condition	Additive Items for Unit Cost	
		<15’ Cut	Pavement Removal & Replacement	Removal of Existing Storm Drains
12” SD Pipe	$/LF	37	10	9
15” SD Pipe	$/LF	47	12	11
18” SD Pipe	$/LF	58	13	12
21” SD Pipe	$/LF	74	14	13
24” SD Pipe	$/LF	84	15	14
27” SD Pipe	$/LF	102	17	15
30” SD Pipe	$/LF	117	18	16
36” SD Pipe	$/LF	161	20	18
42” SD Pipe	$/LF	205	23	20
48” SD Pipe	$/LF	241	25	23

Table 5-1. Unit Costs for Drainage System Improvements[(a)], cont'd…

Item	Unit	Stable Soil Condition	Additive Items for Unit Cost	
		<15' Cut	Pavement Removal & Replacement	Removal of Existing Storm Drains
54" SD Pipe	$/LF	309	28	25
60" SD Pipe	$/LF	372	30	27
72" SD Pipe	$/LF	515	35	31
Drain Inlets	$ ea	4,000	—	450
Manholes	$ ea	4,000	—	450

(a) Based on Engineering New Record 20-Cities Average Construction Cost Index of 8089 (December 2007).

AREAS OF CONCERN

The areas which have identified drainage concerns are listed below. Refer to Figure 5-1 for their locations.

Swetzer Industrial Park

Sunrise Loomis Subdivision

Taylor Road / Fruit Sheds Area

Magnolia / South Holly Area

No Name Lane

PCWA Raw Water Ditches and Canals

Each of the identified areas of concern is discussed below. The discussion includes a description of the existing facilities, evaluation of problems, and recommended improvements.

Swetzer Industrial Park

The Swetzer Industrial Park comprises 29 acres along both sides of Swetzer Road from Angelo Court on the north to King Road on the south. The Union Pacific Railroad tracks are the eastern boundary and the Sunrise-Loomis Subdivision is along the west property line. The Enterprise Court area drains north to Angelo Court. The property south of Enterprise Court drains from east to west across the Swetzer Industrial Park toward the Sunrise-Loomis Subdivision. Ground elevations range from 433 feet on the east to 388 feet on the west. The general ground slope is relatively steep, about four percent.

Drainage is collected in a pipe system within each business site. Runoff from the several industrial sites ends up in the storm drain system between the industrial park and the Sunrise-Loomis subdivision. Runoff from east of Swetzer Road crosses the road in pipes or on the surface and passes through properties along the west side. It combines with runoff from the west side properties and flows into the Sunrise-Loomis storm drains. Individual site storm drains appear to work well for design flows. Some reduction of developed flows to pre-development flows is achieved with detention ponds or underground pipe storage.

Subbasin designations, S-1 through S-5, are shown on Figure 5-2. The most northern subbasin, S-1, includes the Enterprise Court area that drains north to Angelo Court. It is uncertain where the storm drain system for this area discharges. There have been no reported problems and the storm drains appear to be adequate to convey design flows.

The remainder of the Swetzer Industrial Park is divided into four smaller subbasins. Runoff from each subbasin discharges to the ponding areas and then drains to storm drains within the Sunrise-Loomis residential subdivision. Subbasin S-2 drains 19 acres to a storm drain system that includes two 60-inch storm drains that are used as detention cells to reduce peak flows before discharging into the Sunrise-Loomis storm drain system. The runoff from S-2 eventually drains to a 21-inch pipe that flows between homes to the Kathy Way storm drain. This drain discharges to the open drainage channel that begins at Kathy Way.

Subbasin S-3, further south along Swetzer Road, drains 13 acres to an 18-inch pipe tributary to Kathy Way, then to the Sparas Street drain and ultimately to the drainage channel downstream of its crossing of Arcadia Avenue. The storm drain system on the eastern side of Subbasin S-3 includes three 36-inch pipes that detain peak flows before discharging to 6-inch pipes. The flows cross Swetzer Road through a 24-inch pipe and continue west to the Kathy Way storm drain system.

Subbasin S-4 drains 13 acres through a series of storm drains that flow to a detention basin that outfalls to the Corwin Court drain, then to King Road and west to Sucker Ravine. Immediately north of King Road, the S-5 subbasin drains 7 acres south to the same King Road drain.

Runoff from the Subbasin S-2 and S-3 is controlled by underground detention storage. Water is stored in oversized storm drains before flowing to smaller storm drains, thus reducing peak flows. These storage cells were constructed as part of development within the industrial park. Detention storage was recommended in the 2001 Drainage Master Plan to reduce peak flows under developed conditions to pre-development conditions. In Subbasin S-2, two 60-inch storm drains were constructed within the storm drain system to function as detention storage cells. In Subbasin S-3, twin 48-inch pipes were installed as detention storage cells.

In the south half the industrial park, there are two detention areas. The basin in S-4 between Arcadia Drive and Swetzer Court is reportedly frequently filled to capacity. When filled, runoff backs up in the storm drains resulting in increased flow to the downstream storm drain facilities. Installing a larger outlet pipe would increase flows to the downstream storm drains. Therefore, the only solution is to enlarge the detention basin by 0.1 ac-ft and raise the outlet structure grate.

The southernmost basin in S-5 appears to be adequate in passing design flows.

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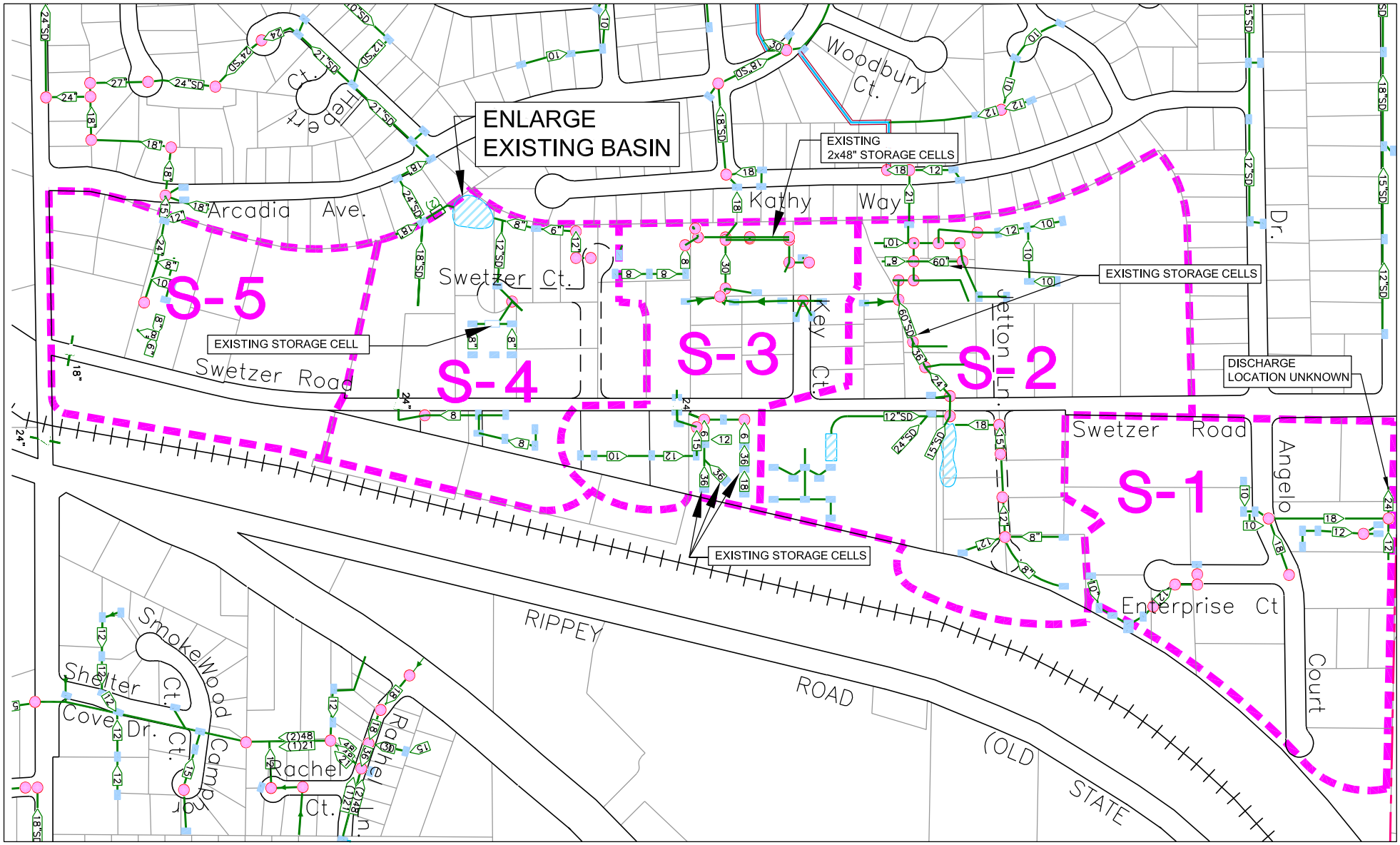

LEGEND

- NATURAL STREAM
- DRAINAGE DITCH/SWALE
- CONCRETE LINED CHANNEL
- SUB-BASIN BOUNDARY
- POND OR DETENTION BASIN
- DRAINAGE MAINTENANCE HOLE
- DRAINAGE INLET
- 18" CULVERT
- 15"SD STORM DRAIN PIPE WITH SIZE AND DIRECTION
- SIZE UNKNOWN

N

0 250 500
SCALE IN FEET

Figure 5-2

Town of Loomis
Drainage Master Plan
SWETZER INDUSTRIAL AREA

WEST YOST ASSOCIATES
Consulting Engineers

The recommended improvements in the Swetzer Industrial Park and their estimated costs are shown in Table 5-2.

Table 5-2. Summary of Recommended Improvements and Estimated Costs for the Swetzer Industrial Park

Item	Cost, dollars
S-4 – Tri-City Self Storage Basin	
Enlarge detention basin	26,000
TOTAL	26,000

Sunrise-Loomis Subdivision

The Sunrise-Loomis Subdivision is a 173-acre single-family home development north of King Road between Humphrey Road on the west and Kathy Way on the east. On the north, the area is bounded by homes along Angelo Drive. Most of Sunrise-Loomis is situated at the headwaters of Sucker Ravine. The Sunrise-Loomis area and the drainage system is shown in Figure 5-3.

The area drains to a system of storm drains and drainage channels that discharge to Sucker Ravine or to Antelope Creek. Angelo Drive along the northern boundary drains west across Humphrey Road to the Tunnel Road Tributary of Antelope Creek. The southeastern 11 acres between Corwin Court, Craig Court and Arcadia Avenue drain south to King Road and then west in a 30-inch pipe to Sucker Ravine. The remainder of the Sunrise-Loomis Subdivision drains directly to Sucker Ravine.

Storm drains are relatively short and drain local areas to open drainage channels or to Sucker Ravine. Most drain pipes range in size from 12 to 24 inches with the King Road drain being 30 inches in diameter. Refer to Figure 5-3.

A concrete lined drainage channel begins at Kathy Way and follows property lines crossing under Arcadia Avenue. It then flows west between back yards and crosses Sparas Street. The concrete channel transitions to the unlined Sucker Ravine channel about 440 feet downstream of Sparas Street. This earthen channel is about 20 feet wide and flows through a small pond and then under King Road. Ten storm drains discharge into the channel.

During the review and analysis of this area for the 2001 Drainage Master Plan, several obvious problems were identified. Particularly in the older areas just north of King Road, several locations have small drain inlets that do not pick up a significant portion of the gutter flow. Also, in the lower channel reach high water backs up in storm drain outlets. The addition of flap gates will keep channel water from flowing onto residential streets.

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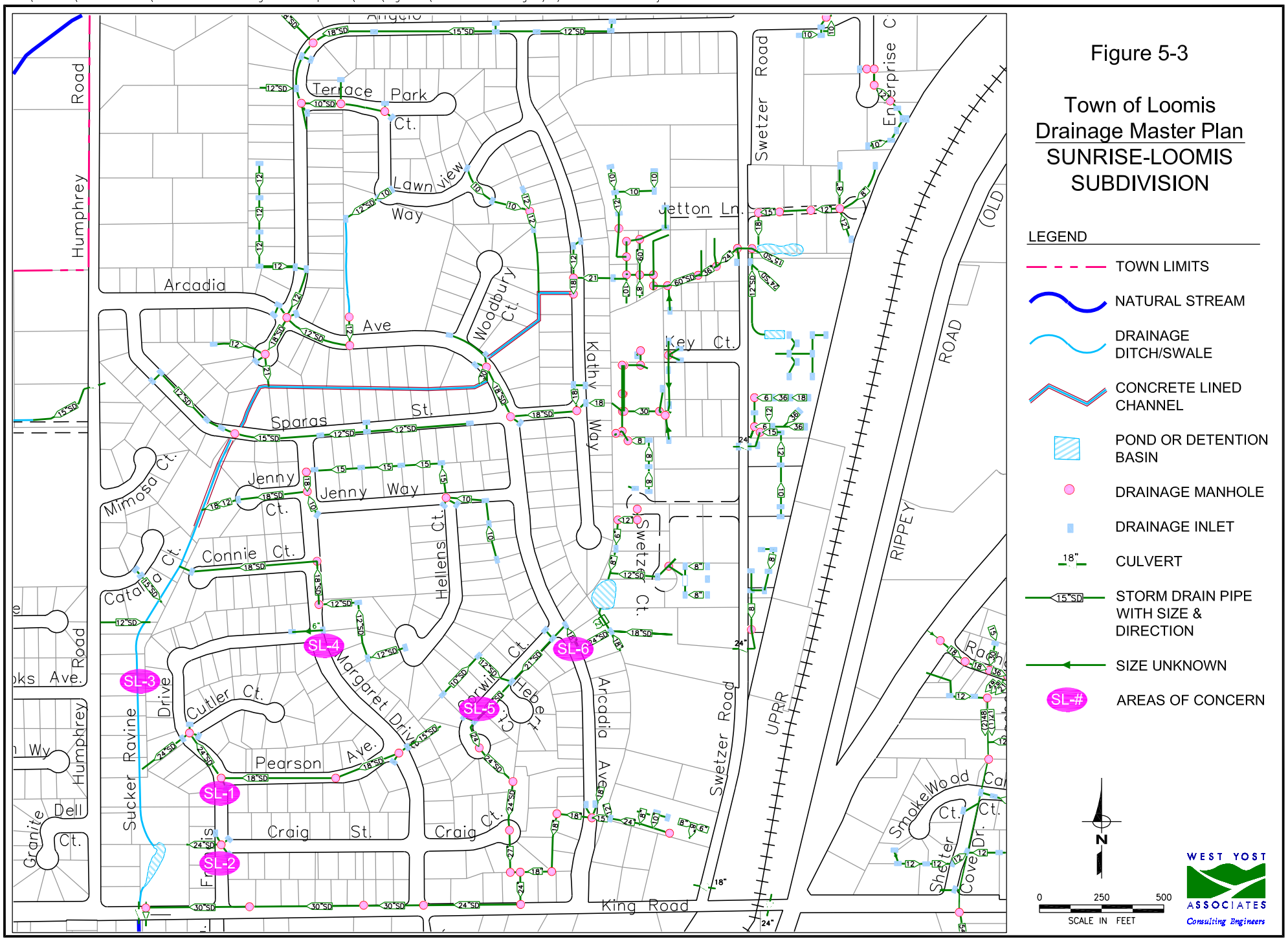

The Sucker Ravine watershed and channel were modeled using the HEC-1 and HEC-RAS program. Results were consistent with water surface elevations used in the design of the subdivision. The problem remains, however, that high flows in the channel cause water to back up in storm drains and streets.

Off-site runoff enters the area from the Swetzer Industrial Park at three locations. A 21-inch pipe and an 18-inch pipe connect to the storm drains along Kathy Way and an 18-inch pipe connects at Arcadia Avenue. Runoff from the northern part of Swetzer Industrial Park is detained in underground storage cells at the east boundary of the Sunrise-Loomis subdivision. When sufficient head builds up the runoff drains into the Sunrise-Loomis subdivision. Runoff from the southern part of Sunrise-Loomis flows through a detention pond. In the 2001 Drainage Master Plan, enlarging this pond by 0.1 ac-ft was recommended.

In spite of having a storm drain and drainage channel system, the Sunrise-Loomis Subdivision generates a number of calls and complaints. Some of the more serious problem areas are shown in Figure 5-3. None appear to life threatening or cause heavy structural damage to homes. They are, however, nuisances to homeowners and need to be addressed as part of the Drainage Master Plan.

Problem areas SL1 and SL2 were addressed in the 2001 Drainage Master Plan. These areas are shown on Figure 5-3. Since 2001, recommended improvements presented in the 2001 Drainage Master Plan were implemented. For SL1 at Pearson Avenue and Francis Drive, the undersized inlet was replaced with a large, curb type inlet to reduce excess runoff flowing to Margaret Drive. Flooding at SL2, located at the intersection of Craig Street and Francis Drive, was mitigated by replacing three undersized inlets with large, curb type inlets, and replacing undersized outfall pipe.

Some of the repetitive problem areas include:

<u>SL3-Sucker Ravine between Sparas Street and King Road</u>

Problem:	Sucker Ravine flooding of backyards beyond the established floodplain.
	Existing Facilities: Natural creek channel with overbank grading. The 440 feet of channel downstream of Sparas Street is concrete lined. A 0.4-acre pond in the creek channel is located about 100 feet upstream of King Road.
Proposed Improvement:	It is important to maintain the Sucker Ravine channel clear of debris and excessive vegetative growth. The Town maintains concrete channel and south of the 24-inch storm drain outlet. The channel upstream of the 24-inch outlet to the concrete lined channel is privately owned and maintained. When possible, the Town will make an effort to direct property owners to maintain the channel.

SL4-Intersection of Margaret Drive and Francis Drive

Problem:	Minor nuisance flooding
Existing Facilities:	Drain inlet on east side of Margaret Drive. Runoff drains west in a 6-inch pipe for 150 feet and bubbles up and flows down Francis Drive.
Proposed Improvement:	Connect drain inlet to existing manhole with a new 12-inch pipe

SL5-Corwin Court west of Hebert Street

Problem:	Properties along the west side of Corwin Court are flooded by flow from a low drain inlet. Also, flow is bypassing and not entering the inlet. A drain inlet is located in the center of a driveway and ponding causes flow into the property.
Exiting Facilities:	Homes on Corwin Court are lower than the street. Flow from the drain inlet flows through a 12-inch pipe to a 24-inch storm drain.
Proposed Improvement:	Relocate the drain inlet and new pipe to the side of the driveway. Reconstruct with a large curb type inlet. Reconstruct the curb with a vertical 6-inch curb.

SL6-Tri-City Self Storage and Arcadia Avenue

Problem:	After the detention basin fills, the storm drain system backs up and spills from the Tri-City parking lot through residential property to the west.
Existing Facilities:	Small detention basin with 18-inch inlet pipes from three directions and 24-inch outlet pipe to west.
Proposed Improvement:	Replace the 18-inch pipe along Arcadia Avenue with a 24-inch pipe. Reconstruct curb along parking lot with a higher curb. An alternative would be to construct a 24-inch storm drain south along Arcadia to King Road and west on King connecting with the existing 30-inch drain. This would also alleviate the Corwin Court problems as well.

A summary of the recommended improvements and estimated costs are shown in Table 5-3.

Table 5-3. Planning-level Cost Estimate for Sunrise-Loomis Subdivision

Item No.	Item Description	Unit of Measure	Estimated Quantity	Unit Cost [a]	Total Cost
SL3- Sucker Ravine Between Sparas Steet and King Road[c]					
1	Remove Vegetative Growth	Lump Sum	1	7,000	7,000
Total Estimated Capital Cost for SL3 (rounded)					7,000
SL4- Margaret Drive and Francis Drive					
1	Mobilization/Demobilization	Lump Sum	1	1,000	1,000
2	Construct 12-inch Drain	Linear Feet	125	37	4,625
Subtotal 1 (rounded)					6,000
Estimating Contingency (35%)					2,100
Subtotal 2 (rounded)					8,000
Construction Contingency (10%)					600
Total Estimated Construction Cost for SL4 (rounded)					9,000
Engineering (Pre-design & Design) (11%)					990
Construction Management, Surveying, Geotechnical (12%)					1,080
City Costs (including Admin., Plan Check, etc.) (10%)					900
Environmental Documentation and Permitting Costs (5%)					450
Project Contingency (5%)					450
Total Estimated Capital Cost for SL4 (rounded) [b]					13,000
SL5- Corwin Court West of Hebert Street					
1	Mobilization/Demobilization	Lump Sum	1	1,000	1,000
2	Construct 12-inch Drain	Linear Feet	75	37	2,775
3	Drain Inlet	Each	1	4,000	4,000
4	Reconstruct Curb	Lump Sum	1	2,600	2,600
Subtotal 1 (rounded)					10,000
Estimating Contingency (35%)					3,500
Subtotal 2 (rounded)					14,000
Construction Contingency (10%)					1,000
Total Estimated Construction Cost for SL5 (rounded)					15,000
Engineering (Pre-design & Design) (11%)					1,650
Construction Management, Surveying, Geotechnical (12%)					1,800
City Costs (including Admin., Plan Check, etc.) (10%)					1,500
Environmental Documentation and Permitting Costs (5%)					750
Project Contingency (5%)					750
Total Estimated Capital Cost for SL5 (rounded) [b]					22,000

Table 5-3. Planning-level Cost Estimate for Sunrise-Loomis Subdivision (cont'd)

Item No.	Item Description	Unit of Measure	Estimated Quantity	Unit Cost [a]	Total Cost
SL6- Tri-City Self Storage & Arcadia Avenue					
1	Mobilization/Demobilization	Lump Sum	1	2,000	2,000
2	Replace 18-inch pipe with 24-inch	Linear Feet	150	84	12,600
3	Reconstruct Curb	Lump Sum	1	2,600	2,600
Subtotal 1 (rounded)					17,000
Estimating Contingency (35%)					5,950
Subtotal 2 (rounded)					23,000
Construction Contingency (10%)					1,700
Total Estimated Construction Cost for SL6 (rounded)					25,000
Engineering (Pre-design & Design) (11%)					2,750
Total Estimated Capital Cost for Phase II (rounded) [b]					3,000
City Costs (including Admin., Plan Check, etc.) (10%)					2,500
Environmental Documentation and Permitting Costs (5%)					1,250
Project Contingency (5%)					1,250
Total Estimated Capital Cost for Phase SL6 (rounded) [b]					36,000
Total Project Cost for the Magnolia / S. Holly Area Drainage Improvements					**78,000**

(a) Based on Engineering News Record 20-Cities Average Construction Cost Index of 8089 (December 2007).

(b) Project costs do **not** include Inflation.

(c) Project to be completed by City; therefore, contigencies were not included.

Taylor Road / Fruit Sheds Area

The Fruit Sheds along Taylor Road have been a part of the history of Loomis for many years. They are located on the northwest side of the street between King Road and Shawn Way and are bordered on the west by the railroad tracks and the east by Taylor Road. Figure 5-4 shows the existing storm drain facilities along Taylor Road and in the Fruit Shed area.

Runoff enters the shed area from the north under King Road and directly from Taylor Road. The principal flooding comes along Taylor Road where there is no curb or sidewalk and the site is lower than the street. Curb and gutters along Taylor Road are in disrepair or are non-existent allowing street flow to spread onto the shed area. The fruit shed drainage basin is not large, only about 27 acres.

There are two storm drains serving the Fruit Sheds. One of the drains is north of Webb Street and has two drain inlets; one of the inlets is on the east side of Taylor Road and a second inlet is in the fruit shed parking lot. This fruit shed was also designed to hold stormwater in its sub-basement. A second drain south of Webb Street begins east of Taylor Road crosses under the road and has a drain inlet in an open area. It then continues under the railroad. There is no other evidence of storm drains in the Fruit Sheds area.

Flooding within the Fruit Sheds comes from three sources. Direct rainfall on the site, flow from the north along the railroad tracks and flow from Taylor Street. Rainfall on site can be controlled with a drainage system and is the responsibility of the landowner. Runoff flowing along the tracks can be collected in a storm drain. There is designed storage under the most northern fruit shed, which provides some relief.

Recommended Improvements

The drainage solution that has served this area for years is not acceptable now. Previously, drainage was allowed to pond and later run off with minimal problems. The basement of the most northern shed was used for storage of runoff. Several storm drains in the area have unknown connections and outlets. There are reports that some pipe segments have been removed.

A solution for the broader Taylor Road drainage needs, including the Fruit Sheds, would be the installation of a storm drain along Taylor Road that would discharge into Secret Ravine. This drain would collect Taylor Road drainage as well as drainage from adjacent properties from King Road to Circle Drive. The Taylor Road drain is the ultimate solution. This will be a costly improvement, also including curbs and gutters, drain inlets and drains from connecting streets and some private properties.

These improvements would be phased to address the immediate problem in the Fruit Sheds area and then later the drain would be continued further west along Taylor Road. Phase I improvements would be limited to the Fruit Sheds area and would include curb and gutter along Taylor Road that keep the Taylor Road runoff within the street. A new storm drain would be installed along Taylor Road from King Road to Walnut Street. Under Phase I the proposed storm drain would discharge under the railroad to an existing swale on the west side of the railroad. Figure 5-4 shows the proposed storm drain along Taylor Road.

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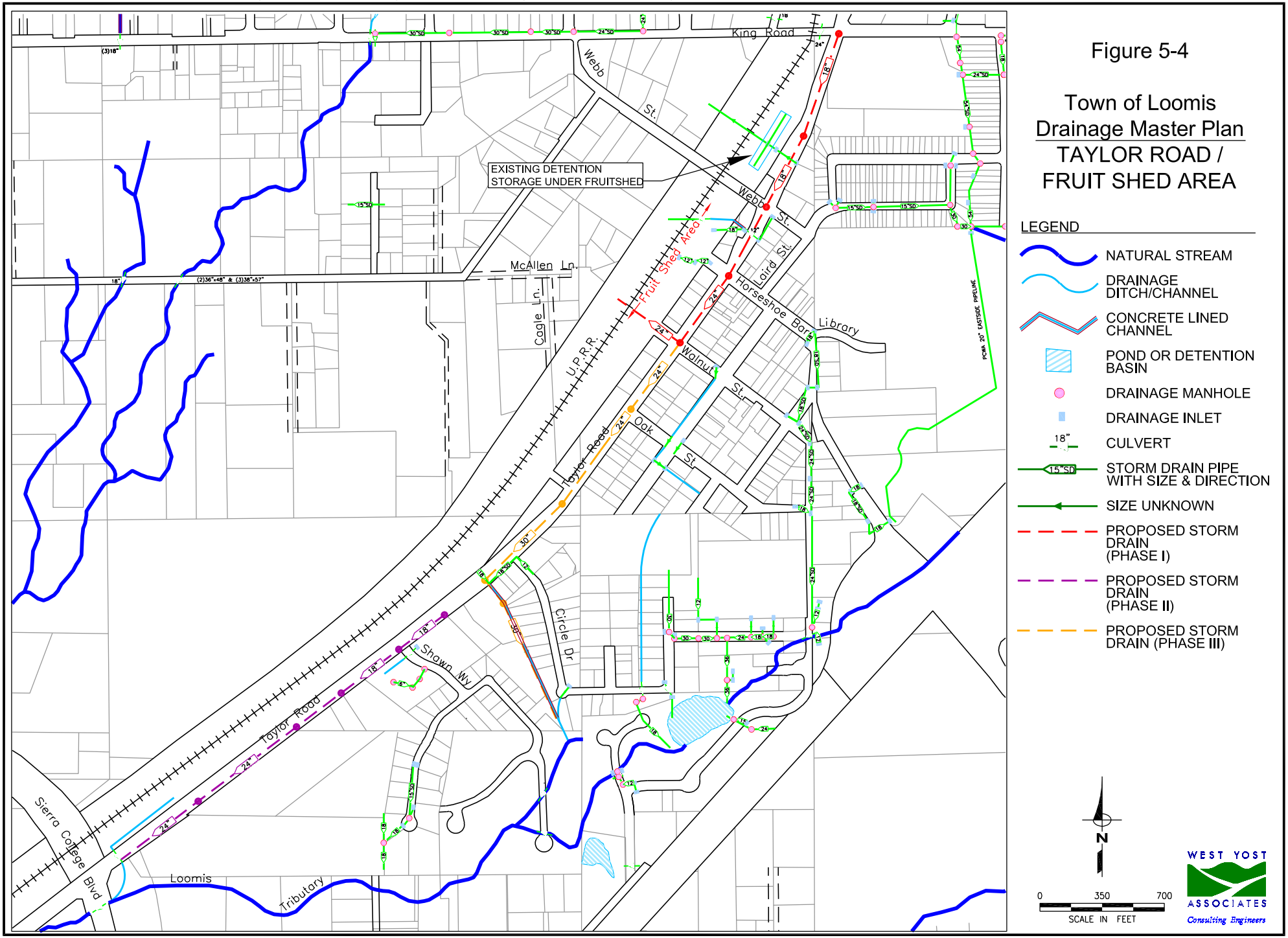

Phase II improvements would install a storm drain along Taylor Road from just north of Shawn Way to Sierra College Boulevard and discharge into the Loomis Tributary. The proposed improvements would include curb and gutter along Taylor Road, drain inlets, and drains from connecting streets. Portions of the proposed improvements could be installed a part of development projects along Taylor Road.

Phase III improvements would continue the Phase I storm drain improvements south along Taylor Road to just west of Circle Drive to an existing concrete lined v-ditch. The concrete v-ditch would be replaced with a storm drain pipe and discharge into a tributary to Secret Ravine. Phase III improvements would include additional curb and gutter along Taylor Road, drain inlets, and drains from connecting streets.

A summary of the recommended improvements and estimated costs for all phases of the Taylor Road storm drainage improvements are shown in Table 5-4. The proposed improvements are shown in Figure 5-4.

Magnolia / South Holly Area Drainage

The Magnolia / South Holly drainage basin is in the Loomis Tributary to Sucker Ravine watershed and includes 118 acres draining to the detention basin located at the end of South Walnut. The northern and eastern shed, including the Raley's Shopping Center and I-80 drainage, flows to the creek at South Walnut Street. Additional runoff enters the basin from the Secret Ravine overflow that works its way past the Raley’s Shopping Center and flows to the detention basin. The western and southern subsheds, including the mobile home park, South Holly Street, and Circle Drive, drain to the basin through several swales and channels and through a 36-inch drain pipe. Figure 5-5 shows the existing storm drain facilities in the Magnolia / South Holly area.

Runoff from the northern part of the shed flows overland along Magnolia Avenue from the Walnut Street – Oak Street area. Without storm drains, surface flows become significant as they approach the Circle Drive area.

Some flooding has occurred along South Holly Street and Circle Drive. Alternative solutions include a new pipeline that would collect runoff from north of the mobile home park and convey it to the basin. Other alternatives include improving the drainage channel between South Holly Street and Circle Drive and constructing a new pipe down South Holly Street.

Circle Drive and South Holly Street have a drainage system that consists of overland flow and roadside ditches. Roads and homes have little elevation difference and even minor flooding quickly spreads throughout the area. A piped storm drain with curb and gutter would be costly and benefit a relatively few properties.

Table 5-4. Planning-level Cost Estimate for Taylor Road / Fruitshed Area

Item No.	Item Description	Unit of Measure	Estimated Quantity	Unit Cost [a]	Total Cost
Phase I Improvements					
1	Mobilization/Demobilization	Lump Sum	1	41,000	41,000
2	Water Pollution Control	Lump Sum	1	3,000	3,000
3	Traffic Control	Lump Sum	1	15,000	15,000
4	18-inch Storm Drain	Linear Feet	1,500	70	105,000
5	24-inch Storm Drain	Linear Feet	900	98	88,200
6	12-inch Connecting Storm Drains	Linear Feet	600	46	27,600
7	Drain Inlets	Each	12	4,000	48,000
8	Manholes	Each	6	4,000	24,000
9	Curb & Gutter	Linear Feet	4,000	20	80,000
10	Outlet Structure & Rip Rap	Lump Sum	1	10,000	10,000
11	Remove Existing SD Facilities	Lump Sum	1	20,000	20,000
Subtotal 1 (rounded)					462,000
Estimating Contingency (35%)					161,700
Subtotal 2 (rounded)					624,000
Construction Contingency (10%)					46,200
Total Estimated Construction Cost for Phase I (rounded)					670,000
Engineering (Pre-design & Design) (11%)					73,700
Construction Management, Surveying, Geotechnical (12%)					80,400
City Costs (including Admin., Plan Check, etc.) (10%)					67,000
Environmental Documentation and Permitting Costs (5%)					33,500
Project Contingency (5%)					33,500
Total Estimated Capital Cost for Phase I (rounded) [b]					959,000
Phase II Improvements					
1	Mobilization/Demobilization	Lump Sum	1	42,000	42,000
2	Water Pollution Control	Lump Sum	1	3,000	3,000
3	Traffic Control	Lump Sum	1	15,000	15,000
4	18-inch Storm Drain	Linear Feet	1,050	70	73,500
5	24-inch Storm Drain	Linear Feet	1,240	98	121,520
6	12-inch Connecting Storm Drains	Linear Feet	600	46	27,600
7	Drain Inlets	Each	12	4,000	48,000
8	Manholes	Each	6	4,000	24,000
9	Curb & Gutter	Linear Feet	5,100	20	102,000
10	Outlet Structure & Rip Rap	Lump Sum	1	10,000	10,000
11	Remove Existing SD Facilities	Lump Sum	1	15,000	15,000
Subtotal 1 (rounded)					482,000
Estimating Contingency (35%)					168,700
Subtotal 2 (rounded)					651,000
Construction Contingency (10%)					48,200
Total Estimated Construction Cost for Phase II (rounded)					699,000
Engineering (Pre-design & Design) (11%)					73,700
Construction Management, Surveying, Geotechnical (12%)					80,400
City Costs (including Admin., Plan Check, etc.) (10%)					67,000
Environmental Documentation and Permitting Costs (5%)					33,500
Project Contingency (5%)					33,500
Total Estimated Capital Cost for Phase II (rounded) [b]					988,000
Phase III Improvements					
1	Mobilization/Demobilization	Lump Sum	1	49,000	49,000
2	Water Pollution Control	Lump Sum	1	5,000	5,000
3	Traffic Control	Lump Sum	1	15,000	15,000
4	24-inch Storm Drain	Linear Feet	1,125	98	110,250
5	30-inch Storm Drain	Linear Feet	1,490	133	198,170
6	12-inch Connecting Storm Drains	Linear Feet	500	46	23,000
7	Drain Inlets	Each	10	4,000	40,000
8	Manholes	Each	5	4,000	20,000
9	Curb & Gutter	Linear Feet	3,800	20	76,000
10	Outlet Structure & Rip Rap	Lump Sum	1	10,000	10,000
11	Remove Existing SD Facilities	Lump Sum	1	10,000	10,000
Subtotal 1 (rounded)					556,000
Estimating Contingency (35%)					194,600
Subtotal 2 (rounded)					751,000
Construction Contingency (10%)					55,600
Total Estimated Construction Cost for Phase III (rounded)					807,000
Engineering (Pre-design & Design) (11%)					73,700
Construction Management, Surveying, Geotechnical (12%)					80,400
City Costs (including Admin., Plan Check, etc.) (10%)					67,000
Environmental Documentation and Permitting Costs (5%)					33,500
Project Contingency (5%)					33,500
Total Estimated Capital Cost for Phase III (rounded) [b]					1,096,000
Total Project Cost for Taylor Road / Fruitshed Area Drainage Improvements					**3,043,000**

(a) Based on Engineering News Record 20-Cities Average Construction Cost Index of 8089 (December 2007).

(b) Project costs do **not** include Inflation.

Solutions to flooding problems include alternative storm drain alignments through the mobile home park or west of South Holly Street. The mobile home park alignment is preferred as the drain could pick up runoff north of the park, from the park, and runoff from South Holly Street to the west. The South Holly Street alignment would collect most runoff from the north. This alignment would then connect to the existing 30-inch drain stubbed from the Heritage Park Subdivision. Runoff generated by the mobile home park is collected and conveyed by small concrete drainage swales running north to south down the park's interior roads. The swales discharge into inlets constructed with the Heritage Park development. Nevertheless, the owners of the mobile home park do not want the storm drain system routed through their property; therefore, the South Holly Street alignment is recommended. Refer to Figure 5-5.

Phase I improvements include drain inlets and storm drains along Magnolia Street and down Oak Street that discharge into an existing drainage swale along the east side of Holly Street. The proposed drainage improvements would replace aging storm drains that run through private properties between Magnolia Street and Holly Street.

Phase II improvements would extend the Phase I improvements along Magnolia Street to the south. The proposed improvements include two drain inlets and a 12-inch storm drain connecting to the Phase I improvements.

Phase III improvements would continue the Phase I storm drain improvements south along Holly Street to South Holly Street and connect to an existing 30-inch storm drain in South Holly Street.

A summary of the estimated costs for the Magnolia / South Holly storm drain alignment is shown in Table 5-5.

No Name Lane

The area near the intersection of Humphrey Road and No Name Lane has historically been subject to nuisance flooding. Construction on school district property north of No Name Lane included storm drain facilities that protect the property. A stormwater detention basin was constructed in the southwest corner of the site. The outfall weir spills into a wetland and flows along the road to a culvert. The flow continues west into a tributary of Antelope Creek. Figure 5-6 shows the location of the existing detention basin, wetlands and other storm drain facilities.

Concern has been raised about the occasional flooding of the roadway near the corner of No Name Lane. Silt buildup in the detention basin and importation of fill material for the school playing fields have rendered the detention basin ineffective. Further, the culvert downstream of the detention basin has been plugged by an adjacent property owner. It is recommended that the silt buildup in the detention basin be removed and that the culverts downstream of the basin be unplugged. Additionally, these facilities must be maintained in the future for these drainage facilities to be effective for flood protection.

Placer County Water Agency Canals

Placer County Water Agency (PCWA) is responsible for providing water to the Town of Loomis. A portion of the PCWA water supply network consists of open channels, which are located in the northeastern section of Loomis. Figure 5-7 shows the existing PCWA canal system within the Loomis limits.

Table 5-5. Planning-level Cost Estimate for Magnolia / South Holly Area

Item No.	Item Description	Unit of Measure	Estimated Quantity	Unit Cost [(a)]	Total Cost
Phase I Improvements					
1	Mobilization/Demobilization	Lump Sum	1	17,000	17,000
2	Water Pollution Control	Lump Sum	1	2,500	2,500
3	Traffic Control	Lump Sum	1	6,000	6,000
4	18-inch Storm Drain	Linear Feet	40	70	2,800
5	24-inch Storm Drain	Linear Feet	455	133	60,515
6	12-inch Connecting Storm Drains	Linear Feet	350	46	16,100
7	Drain Inlets	Each	8	4,000	32,000
8	Manholes	Each	5	4,000	20,000
9	Concrete Junction/Outlet Box	Each	1	20,000	20,000
10	Rock Slope Protection	Cubic Yards	100	100	10,000
11	Remove Existing SD Facilities	Linear Feet	60	20	1,200
Subtotal 1 (rounded)					188,000
Estimating Contingency (35%)					65,800
Subtotal 2 (rounded)					254,000
Construction Contingency (10%)					18,800
Total Estimated Construction Cost for Phase I (rounded)					273,000
Engineering (Pre-design & Design) (11%)					30,030
Construction Management, Surveying, Geotechnical (12%)					32,760
City Costs (including Admin., Plan Check, etc.) (10%)					27,300
Environmental Documentation and Permitting Costs (5%)					13,650
Project Contingency (5%)					13,650
Total Estimated Capital Cost for Phase I (rounded) [(b)]					391,000
Phase II Improvements					
1	Mobilization/Demobilization	Lump Sum	1	4,000	4,000
2	Water Pollution Control	Lump Sum	1	1,000	1,000
3	Traffic Control	Lump Sum	1	2,000	2,000
4	12-inch Storm Drain	Linear Feet	315	46	14,490
5	Drain Inlets	Each	2	4,000	8,000
6	Manholes	Each	1	4,000	4,000
7	Remove Existing SD Facilities	Lump Sum	1	5,000	5,000
Subtotal 1 (rounded)					38,000
Estimating Contingency (35%)					13,300
Subtotal 2 (rounded)					51,000
Construction Contingency (10%)					3,800
Total Estimated Construction Cost for Phase II (rounded)					55,000
Engineering (Pre-design & Design) (11%)					6,050
Construction Management, Surveying, Geotechnical (12%)					6,600
City Costs (including Admin., Plan Check, etc.) (10%)					5,500
Environmental Documentation and Permitting Costs (5%)					2,750
Project Contingency (5%)					2,750
Total Estimated Capital Cost for Phase II (rounded) [b]					79,000
Phase III Improvements					
1	Mobilization/Demobilization	Lump Sum	1	13,000	13,000
2	Water Pollution Control	Lump Sum	1	5,000	5,000
3	Traffic Control	Lump Sum	1	2,000	2,000
4	24-inch Storm Drain	Linear Feet	435	98	42,630
5	30-inch Storm Drain	Linear Feet	150	133	19,950
6	12-inch Connecting Storm Drains	Linear Feet	260	46	11,960
7	Drain Inlets	Each	6	4,000	24,000
8	Manholes	Each	3	4,000	12,000
9	Outlet Structure & Rip Rap	Lump Sum	1	10,000	10,000
Subtotal 1 (rounded)					141,000
Estimating Contingency (35%)					49,350
Subtotal 2 (rounded)					190,000
Construction Contingency (10%)					14,100
Total Estimated Construction Cost for Phase III (rounded)					204,000
Engineering (Pre-design & Design) (11%)					22,440
Construction Management, Surveying, Geotechnical (12%)					24,480
City Costs (including Admin., Plan Check, etc.) (10%)					20,400
Environmental Documentation and Permitting Costs (5%)					10,200
Project Contingency (5%)					10,200
Total Estimated Capital Cost for Phase III (rounded) [b]					292,000
Total Project Cost for the Magnolia / South Holly Area Drainage Improvements					**762,000**

(a) Based on Engineering News Record 20-Cities Average Construction Cost Index of 8089 (December 2007)

(b) Project costs do not include Inflation.

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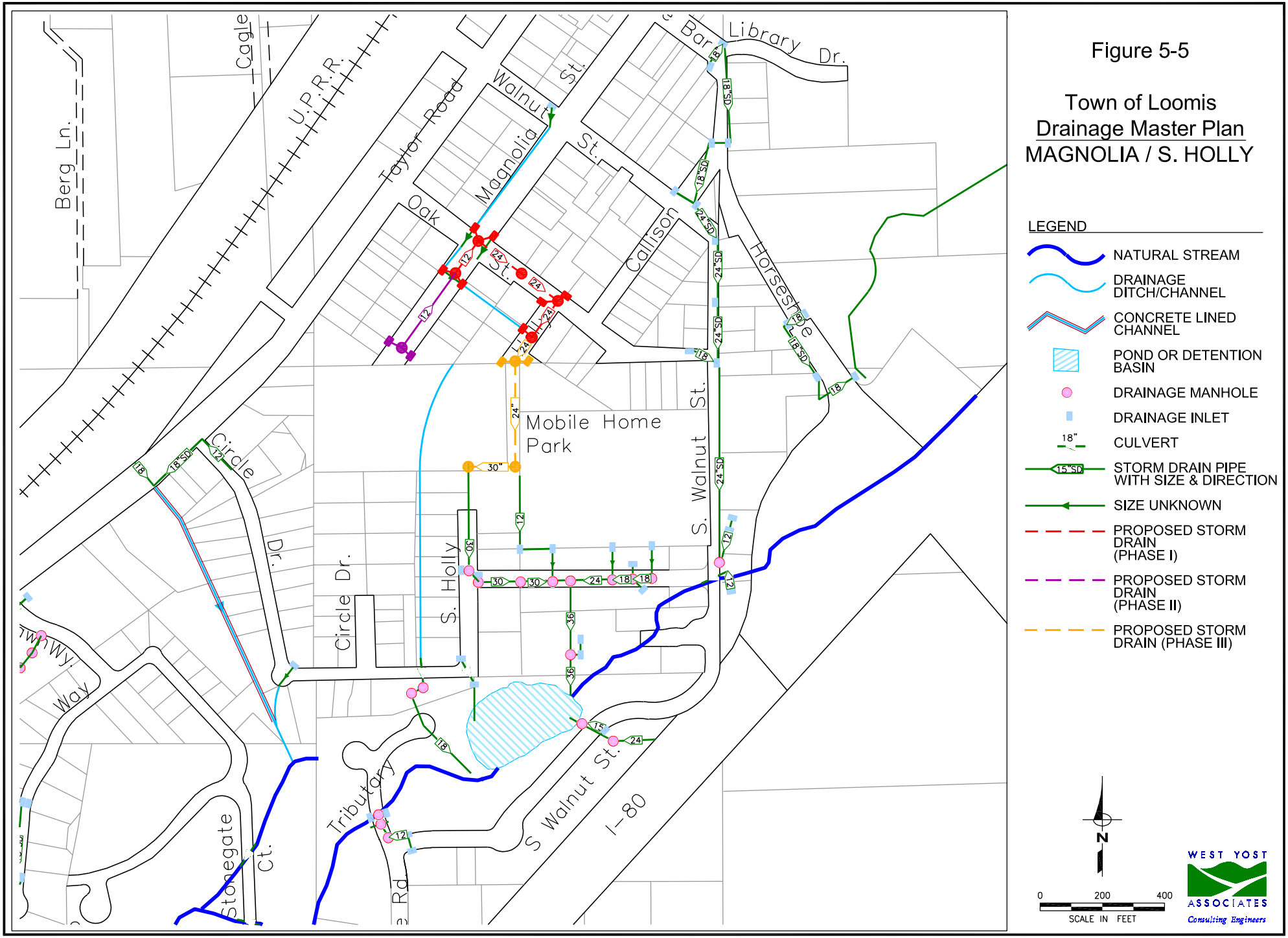

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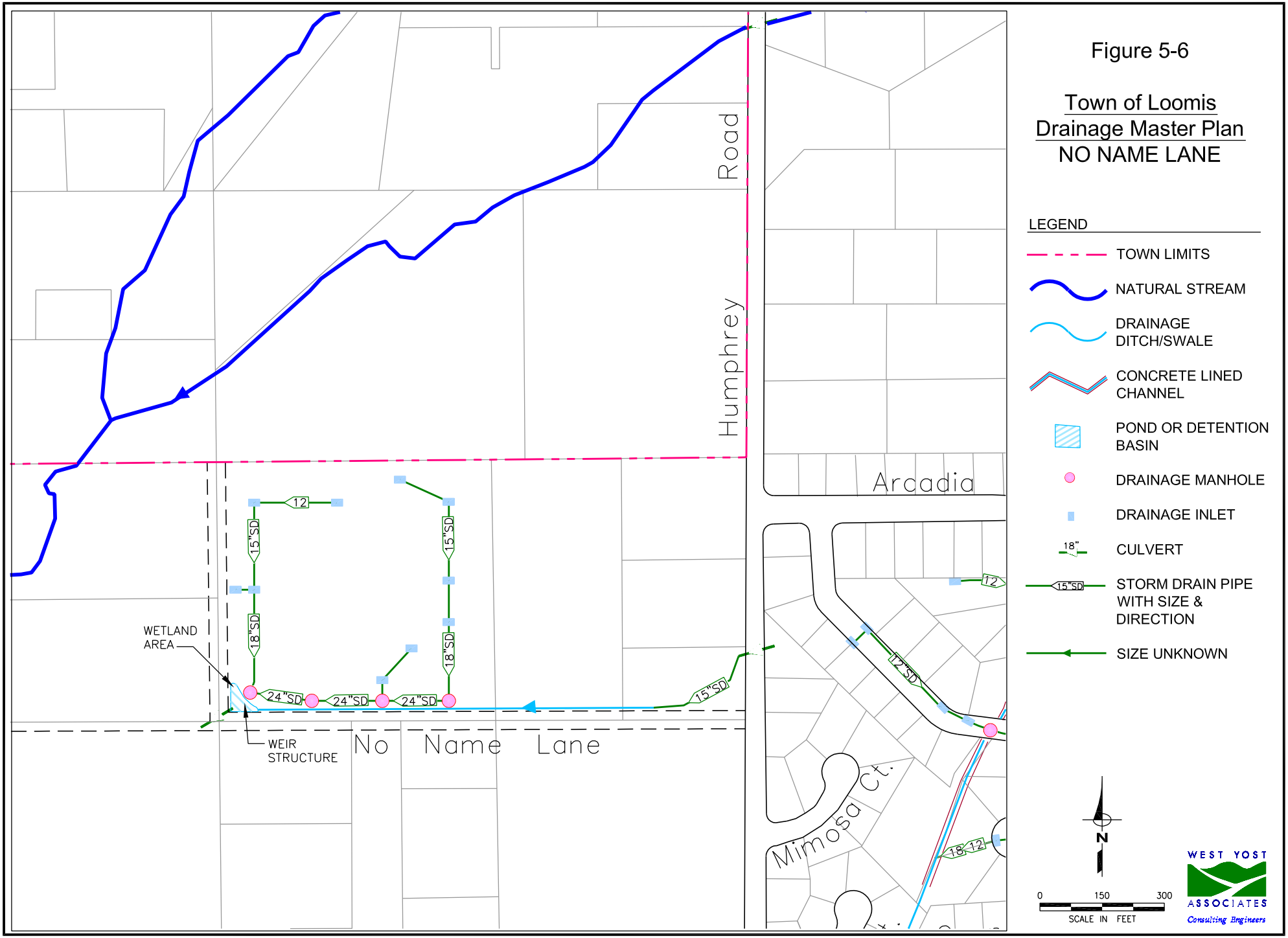
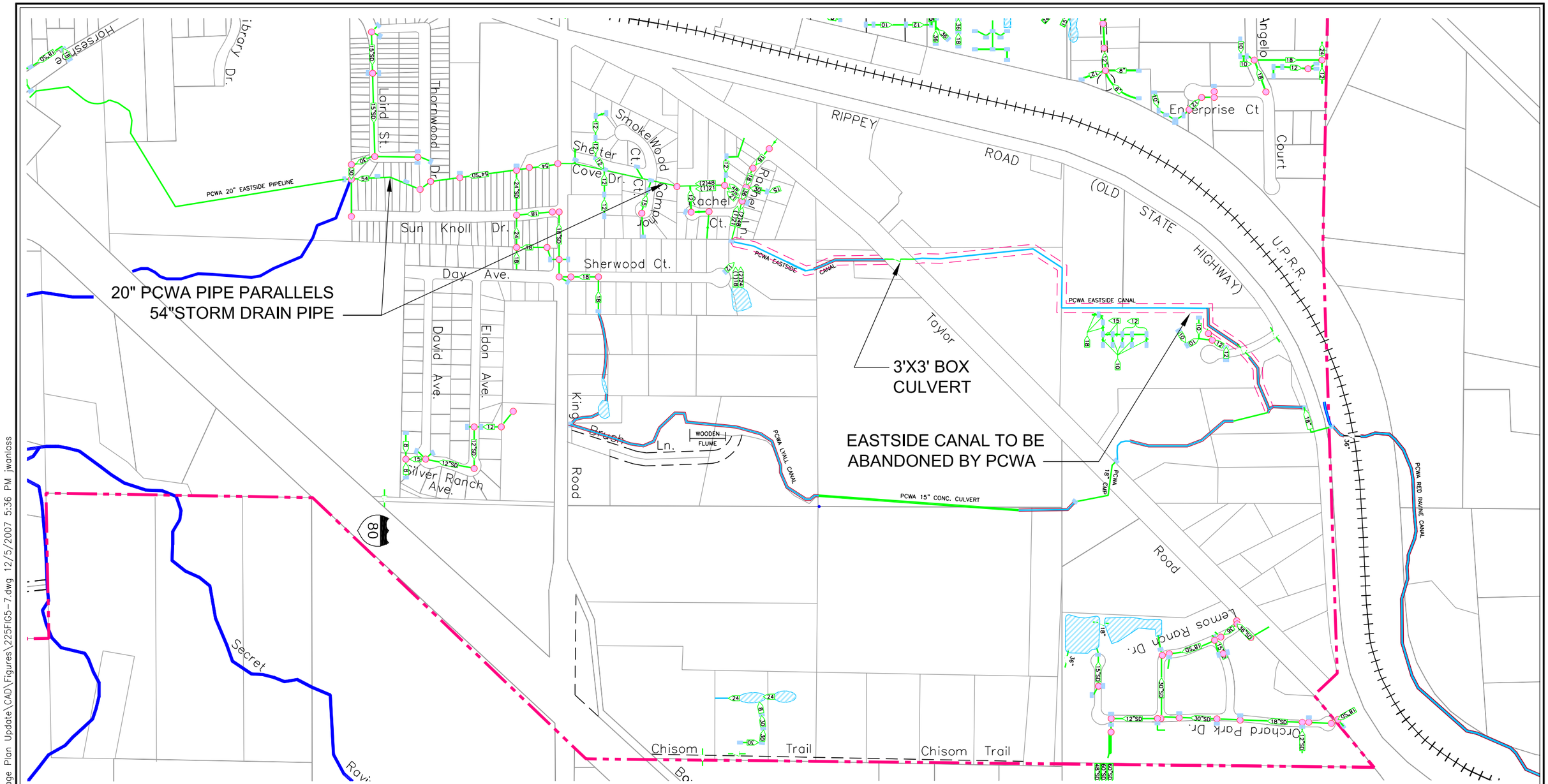


Figure 5-6

Town of Loomis
Drainage Master Plan
NO NAME LANE



LEGEND

- TOWN LIMITS
- NATURAL STREAM
- DRAINAGE DITCH/CHANNEL
- CONCRETE LINED CHANNEL
- POND OR DETENTION BASIN
- DRAINAGE MANHOLE
- DRAINAGE INLET
- 18" CULVERT
- 15"SD STORM DRAIN PIPE WITH SIZE & DIRECTION
- SIZE UNKNOWN
- ABANDONED CANAL

N

0 300 600
SCALE IN FEET

Figure 5-7

Town of Loomis
Drainage Master Plan
PLACER COUNTY
WATER AGENCY
CANALS

WEST YOST ASSOCIATES
Consulting Engineers

N:\Clients\225 Loomis\00-05-06 Drainage Plan Update\CAD\Figures\225FIG5-7.dwg 12/5/2007 5:36 PM jwanlass

The canal system in the Loomis includes both concrete lined and earthen channels. Little data exists on the canal systems that were constructed in the 19th century by private interests for mining and agricultural purposes. These canals are little more than a ditch, with an average bottom width of 1.5 feet, a depth of one to two feet and a capacity of only about 4 cfs.

North of the Loomis limits the canal system follows the Union Pacific Railroad and is called the Red Ravine Canal. Approximately 1,600 feet west of the intersection of Taylor Road and Rippey Road, the canal crosses under the railroad tracks, enters the Loomis limits and crosses under Rippey Road. Just south of Rippey Road the canal divides into two canals. The branch to the east is the Lyall Canal and the branch to the west is the Eastside Canal.

North of Taylor Road, both canals are concrete lined except for small sections just upstream of Taylor Road. Neither canal appears to receive much storm runoff. Just south of Taylor Road the Eastside Canal passes between two existing buildings and is concrete lined. The canal then continues on through a natural drainage swale to Rachel Lane. At Rachel Lane the flow enters a combined piped system. The storm drainage consists of twin 48-inch pipes and the PCWA system consists of a 21-inch pipe. The PCWA pipe follows the alignment of the storm drain system to south of Laird Street. The PCWA system then continues south in a 20-inch pipeline called the Eastside Pipeline.

South of Taylor Road the Lyall Canal traverses through several sections of concrete lined channel, 1,000 feet of 15-inch concrete pipe, and over a wooden flume to King Road. From King Road the canal runs to the west through two small ponds and finally discharges into an 18-inch storm drain pipe just east of Sherwood Court. The Lyall Canal does not appear to receive much storm runoff over its entire length.

Currently PCWA plans to abandon the Eastside Canal and divert the flow to the Lyall Canal. Various improvements are needed along the Lyall Canal before it can convey the additional flow from the Eastside Canal. When the improvements are completed the PCWA water and the Loomis storm drain system will be completely separate and PCWA will no longer maintain the Eastside Canal. When PCWA abandons the Eastside Canal, it is recommended that easement rights be transferred to Loomis and that Loomis then maintain the channel.

OTHER STORM DRAIN FACILITIES

The following storm drain facilities were also evaluated, but appear to adequately collect and convey the storm runoff. These areas have no reported complaints or problems; therefore, no improvements are recommended.

Mareta Lane

Tudor Way

South Walnut Street

Hunters Drive

St. Francis Circle

Rachel Lane to King Road

Silver Ranch Avenue

Each of these storm drain systems is briefly described below and shown in Figure 5-1.

Mareta Lane

Mareta Lane area is a small 18-acre single-family subdivision north of the Sunrise-Loomis subdivision between Humphrey Road on the west and Swetzer Road on the east. On the north, the area is bounded by the Loomis limits. Some of the lots along Angelo Drive, in the Sunrise-Loomis Subdivision, drain to the Mareta Lane storm drain system. Some of the northern lots along Mareta Lane drain to the north and offsite.

The subdivision is drained by a single storm drain, which runs the nearly the entire length of Mareta Lane. The storm drain pipes range is size from 12 to 24 inches and discharge into a small creek just west of Mareta Lane, which drains to the west across Humphrey Road to the Tunnel Road Tributary to Antelope Creek. Sheet 4, Appendix C of the Drainage System Maps show the existing storm drain facilities.

Rachel Lane to King Road

The Rachel Lane to King Road area consists of several small single-family subdivisions totaling over 50 acres. The watershed is situated between Taylor Road to the west and I-80 to the east. The storm drains convey the Loomis Tributary through the subdivisions.

The area is drained by large storm drains, which also collect and convey offsite storm runoff and spill water from the PCWA canals. The headwater for the storm drain systems is at the east end of Rachel Lane. The off-site storm waters are collected by twin 48-inch pipes and the PCWA water is conveyed by a 21-inch pipe, both pipelines drain west down Rachel Lane to Rachel Court. The pipelines then head south down Rachel Court, between property lines, to Shelter Cove Drive and continue south down Shelter Cove Drive to King Road. Just upstream of King Road the twin 48-inch pipes transition into twin 49-inch by 33-inch pipes, and downstream of King Road the pipeline transitions into a single 54-inch pipeline. The 54-inch line continues south, along the western property lines of the residential properties on the west side of Sun Knoll Drive, to the Loomis Tributary. Sheet 11, Appendix C of the Drainage System Maps show the existing storm drain facilities.

Silver Ranch Avenue

The Silver Ranch Avenue area consists of a small single-family subdivision of less than 10 acres, south of King Road. The area is bounded by Day Avenue on the west and open space to the south and east. Half the subdivision drains to the Rachel Lane to King Road storm drain system, via an 18-inch pipe at Day Avenue; while the other half of the subdivision drains east to the Silver Ranch Avenue storm drain system.

The Silver Ranch Avenue storm drain system consists of drains ranging in size from 12 to 15 inches. The system discharges south of the David Avenue and Silver Ranch Avenue intersection into a small drainage swale and then drains to the east, toward I-80. Sheet 11, Appendix C of the Drainage System Maps show the existing storm drain facilities.

South Walnut Street

The South Walnut Street area is a mixture of commercial and residential development; however, most of the area is residential. The area is located downtown and is bounded by Laird Street and Horseshoe Bar Road to the north, Magnolia Street to the west, Horseshoe Bar Road to the east, and the Loomis Tributary to the south.

The area comprises about 18 acres and is drained by small roadside drainage ditches and culverts, which drain to South Walnut Street where drainage is collected and conveyed by storm drains to the Loomis Tributary. The storm drain system along South Walnut Street starts at Horseshoe Bar Road and Library Drive with an 18-inch pipe and flows south to a 24-inch pipe and ultimately to the Loomis Tributary. Sheets 5 and 6, Appendix C, of the Drainage System Maps show the existing storm drain facilities.

Tudor Way

The Tudor Way area is a small single family development surrounded by open space and commercial development and is situated east of Sierra College Boulevard, south of Taylor Road, west of Circle Drive, and north of Brace Road and I-80.

The watershed consists of about 8 acres and is drained to the Loomis Tributary by a small storm drain located at the southern half of Tudor Way. A 15-inch drain conveys runoff to the end of Tudor Way and is then conveyed by an 18-inch pipe to the Loomis Tributary. Sheet 6, Appendix C, of the Drainage System Maps show the existing storm drain facilities.

Hunters Drive

The Hunters Drive area is another small single-family development south of Brace Road, situated between Sierra College Boulevard and I-80. The area consists of about 14 acres of on-site development and 15 acres of off-site drainage.

The area is drained by an on-site storm drain system, which discharges into an off-site road side ditch. Both on-site and off-site drainage are collected and conveyed by a 24-inch drain along Elm Court and Hunters Drive. The storm drain system discharges off-site about 130 feet south of Brace Road and west of Hunters Drive. The runoff, once off-site, is directed to a road site ditch along the south side of Brace Road and ultimately discharges into the Loomis Tributary. Sheet 6, Appendix C, of the Drainage System Maps show the existing storm drain facilities.

The on-site storm drains are adequately sized to convey the design flows. Nevertheless, the downstream off-site channels and culverts must be maintained and kept free of debris for the drains to function effectively.

St. Francis Circle

The St. Francis Circle area is a single-family executive development located in the southern section of Loomis. The development is situated south of Rocklin Road, north of Ridge Park Drive, east of Sierra College Boulevard, and west of Barton Road.

The drainage system for this area consists of a series of culverts which direct runoff to the west to a tributary of Secret Ravine. The development has several large watersheds to the east. Runoff from the two watersheds just east of the development are routed through detention basins and then routed through the development via open channels with large 43-inch by 27-inch culvert crossings. Another watershed to the southeast is routed through the development via 43-inch by 27-inch culvert crossings and combines with one of the discharge channels from the detention basins. Sheets 8 and 9, Appendix C, of the Drainage System Maps show the existing storm drain facilities.

The drainage system is functional and adequately sized provided the culverts, open channels and the detention basin spillways are maintained free of debris and obstructions.

CHAPTER 6. MAINTENANCE

Maintenance activities are an important component of the overall drainage system functionality. Well-maintained drainage systems will be able to convey the runoff from storm events with minimal damage to property and storm drain facilities. For storm drainage systems to function properly both regularly scheduled and unscheduled maintenance activities are necessary, and funds must be provided for both.

Loomis' existing maintenance program activities include the following:

- Clearing existing open channels of debris and excessive vegetative growth
- Clearing of roadside ditches and swales
- Removal of debris from inlet grates and storm drain pipes
- Regular inspection of routine problem areas
- Replacement of inadequate drainage facilities

To date the majority of the maintenance activities have been focused on existing problems areas where regular flooding occurs. However, flooding problems can be avoided with regular maintenance of storm drain facilities. The objective of the maintenance activities should be to have the drainage systems repaired, cleaned, and ready before the next the rainy season arrives.

MAINTENANCE PROGRAM

The maintenance program includes the five main sections listed below:

- Inspection program
- Annual service and maintenance
- Review of future projects
- Repair and replace deteriorated facilities
- Education

Inspection Program

A routine maintenance inspection program should be established and conducted on an annual basis. When annual inspection programs are in place many potential drainage programs are identified before flooding and/or damage occur. The following could be used as a guideline for establishing an inspection program:

- Annual inspections should be conducted in the spring on the all the drainage facilities to determine the coming years maintenance activities and priorities
- Inspections should also be conducted after every major storm event for those areas that have experienced historical flooding or other drainage problems

- Inspections should be documented and include the following items:
    1. Location of facility
    2. Size and type of facility
    3. Date of inspection
    4. Major and minor deficiencies
    5. Possible future problems
- Documentation must be kept current
- Repair work should be recorded when completed

Annual Service and Maintenance

Maintenance of drainage facilities falls into two categories, scheduled and unscheduled maintenance activities. Unscheduled maintenance activities typically follow inspection of facilities or when flooding occurs. This section outlines scheduled maintenance activities that should take place on an annual basis. Loomis' storm drain facilities include both open channel and piped facilities. Maintenance activities for each are discussed below.

Open Channels

To facilitate the maintenance of the open channels drainage easements or right-of-way should be obtained by Loomis for major channels within Loomis where possible. The following activities should be performed by Loomis' maintenance personnel or work crews from the California Conservation Corps:

1. Removal of excessive vegetative growth, include weed control
2. Removal of debris from channel section, maintenance roads, inlet pipes, and trash racks
3. Removal of excessive silt which will alter or adversely effect the hydraulic performance of the channel and structures within the channel
4. Repair damaged access trails and roads where applicable
5. Removal of debris, silt, and vegetation from around bridge and culvert sections.

Loomis has obtained a Memorandum of Understanding with the California Department of Fish and Game to allow routine maintenance activities in unimproved and improved channels. A copy of this agreement is included in Appendix B.

Piped Drainage Facilities

Several areas of Loomis have piped drainage facilities, as described in Chapter 5. The following maintenance activities should be conducted in those areas that are served by piped drainage facilities:

1. Curb inlet cleaning – inlets must be free of debris covering the grate, or lodged in the inlet. Silt should also be removed from inlets.

2. Debris control – trash rack and inlet and outlet pipe openings should be kept free debris.

Review of Future Projects

Review of future projects should ensure maintenance activities are facilitated. Consideration of maintenance issues during the design stages will extend the life-cycle, lessen the maintenance costs through the life-cycle, and improve overall performance the drainage facilities. Maintenance issues which should be considered during the design stages include the following:

- Maintenance access to channels, inlets, basins, and manholes should be provided and adequate
- Channel side slopes should be steep enough to drain to channel and gentle enough to allow vegetation growth and maintenance to occur
- Areas of potential erosion must be adequately protected
- Toe of slopes should be protected from scour and general degradation
- Trash racks should be provided to catch debris from entering piped systems
- Sediment traps could reduce downstream maintenance problems

Repair and Replace Deteriorated Facilities

As the drainage facilities near the end of their life-cycle they begin to deteriorate and require repair or replacement. With regular inspection, maintenance personnel will know when drainage facilities need repair or replacement. If problems are repaired promptly, the facilities can be returned to service with little threat of further damage or failure.

Most of Loomis is still served by drainage swales, roadside ditches and culverts. Some of these facilities are in need of repair and in many cases replacement. Loomis, where possible, should begin an annual replacement program. The downtown area has many culverts that are plugged and do not function. This area should be targeted for repair as soon as funding permits.

Education

Most of Loomis is still rural and does not have significant drainage systems. These areas are drained by drainage swales, roadside ditches and culverts. These rural systems are dependant on regular maintenance and repair or replacement as needed. Rural areas typically do not have a formal street section with curb and gutter, which convey the storm waters if the storm drains fail. Therefore, if a culvert becomes plugged or a ditch blocked, flood waters have no means for conveyance of runoff and flooding occurs. Thus, regular maintenance of the ditches and culverts becomes even more critical.

Many of these rural areas are not the responsibility of Loomis; however, Loomis receives many complaints of flooding problems. To assist Loomis and its residents in minimizing damage and inconvenience from flooding, an education program to inform residents of their responsibility to maintain the drainage on their property and to urge them to notify Loomis of potential problems in their neighborhoods. The goal of the education program would be to minimize the impacts to drainage capacity due to vegetation growth, debris, and litter. The education program could also include information on maintaining the quality of runoff in the streams and creeks by not dumping household and garden wastes in the storm drain facilities.

STORM WATER MANAGEMENT

Loomis is currently implementing the National Pollutant Discharge Elimination System (NPDES) General Permit. One of the permit requirements was to develop a Storm Water Management Program (SWMP). The California Regional Water Quality Control Board deemed that the SWMP met the requirements of the General Permit and Federal Phase II Storm Water Regulations. The program includes the following storm water pollution control measures:

- Public Education and Outreach
- Public Involvement and Participation
- Illicit Discharge Detection and Elimination
- Construction Site Storm Water Runoff Control
- Post Construction Storm Water Management
- Pollution Prevention/Good Housekeeping for Municipal Operations
- Monitoring and Reporting

The California Stormwater Quality Association (CASQA) – Stormwater Best Management Practices Handbooks (2003) provide further information on implementation of storm water pollution control measures or Best Management Practices (BMPs). The CASQA Handbooks can be either ordered or viewed online at www.cabmphandbooks.com.

CHAPTER 7. CAPITAL IMPROVEMENT PROGRAM

This chapter presents the recommended capital improvement program for the Town of Loomis (Loomis) storm drain system. Storm drain deficiencies and the recommended improvements have been discussed in previous chapters.

An Environmental Impact Report (EIR) was not prepared with this Drainage Master Plan update. Environmental documents will have to be prepared for each recommended project prior to construction.

The cost estimates are master planning level estimates. Detailed estimates will be prepared as projects advance through preliminary design and preparation of plans and specifications. The cost estimates presented in this chapter are for decision making and budgeting purposes. The improvements address the most critical drainage deficiencies.

COST ESTIMATES

Capital cost estimates are based on information from other storm drain master plans developed by WYA and recent bid results. All costs have been updated to the December 2007 Engineering News Record (ENR) 20-City Construction Cost Index (CCI) of 8089.

The estimates for probable construction costs include a 10 percent construction contingency, and a 35 percent estimating contingency. The total capital costs, shown in Table 7-1, include 38 percent for engineering costs, administration, legal, and environmental permitting costs.

The cost estimates presented in this document are planning level estimates of project costs to be used for master planning purposes only and are appropriate for overall budgeting. However, the estimated costs require refinement as more information becomes available during the preliminary and final design phases. Furthermore, these estimates of construction costs has been made without detailed engineering data and developed using known cost for similar facilities, scale-up and scale-down factors, cost curves and generic cost guides. It is normally expected that an estimate of this type would be accurate within a range of plus 30 percent to minus 15 percent. This means that bids can be expected to fall within 30 percent over the estimates to 15 percent under the estimates.

Table 7-1 is a summary of the recommended capital improvement program for storm drain facilities described in Chapter 5.

Table 7-1. Recommended Capital Improvement Program for Storm Drain Facilities

Location	Improvements	Capital Cost, dollars(1)
Sucker Ravine, between King Rd. & Sparas St.	Removal of vegetative overgrowth	7,000
Margaret Dr. & Francis Dr.	Construct 12-inch drain	13,000
Corwin Ct. west of Hebert St.	Construct drain inlets & drain, reconstruct curb	22,000
Tri-city Self Storage & Arcadia Ave.	Replace 18” drain with 24” drain, reconstruct curb	36,000
Tri-City Self Storage Detention Basin	Enlarge detention basin	26,000
Taylor Road / Fruit Sheds Area – Phase I Improvements	Construct storm drain system with curb & gutter for fruit shed area across railroad tracks	959,000
Taylor Road / Fruit Sheds Area – Phase II Improvements	Construct storm drain system with curb & gutter	988,000
Taylor Road / Fruit Sheds Area – Phase III Improvements	Continuation of Phase I - construct storm drain system with curb & gutter.	1,096,000
Magnolia / S. Holly Street – Phase I Improvements	Construct storm drain system	391,000
Magnolia / S. Holly Street – Phase II Improvements	Continuation of Phase I – construct 12-inch storm drain and drain inlets	79,000
Magnolia / S. Holly Street – Phase III Improvements	Connect Phase I & II improvement to existing storm drain	292,000
Total		3,909,000

(1) Rounded to nearest $1,000.

In Chapter 4, the bridge and culvert crossings of the major streams in Loomis were described and evaluated. A series of bridges and culverts were identified as needing to be enlarged to eliminate the restriction to the 100-year flood flows. The crossings in need of being replaced are listed in Table 7-2. The Brace Road Bridge over Secret Ravine should be replaced as soon as funding is available. This crossing was identified as a project included in the Dry Creek Watershed Flood Control Plan. Loomis should work with Placer County to get this project constructed. The other crossings listed should be replaced, but are not a critical priority. These crossings and others noted in Chapter 4 can be replaced when widened or replaced for reasons other than flood control. The costs for these bridge and culvert projects are based on information obtained from the Dry Creek Watershed Flood Control Plan report.

Table 7-2 Recommended Capital Improvement Program for Bridges and Culverts

Location	Improvements	Capital Cost, dollars
Secret Ravine at Brace Road(1)	Replace bridge/culvert	133,000
Antelope Creek at King Road	Replace bridge/culvert	78,000
Secret Ravine at Glade Lane	Replace bridge/culvert	78,000
Sucker Ravine at King Road	Construct additional culvert	65,000
Total Bridges & Culverts		272,000

(1) This project is included in Dry Creek Watershed Flood Control Plan

The total estimated cost for the recommended capital improvement program is $4,315,000

FINANCING ALTERNATIVE AND RESOURCES

This section outlines potential financing sources that may fund the proposed capital improvement projects.

A number of funding sources are available to Loomis for construction of drainage projects. The ultimate mix of financing alternatives will be determined based on final technical analysis of costs, benefits and burdens. In addition, implementing some of the financing alternatives described below require voter approval. The ability to use these alternatives is then a function of the perceived need for the improvements by registered voters and/or property owners within the Town. Listed below are some of the possible funding sources with a brief description of each.

State and Federal Grants and Loans – State or Federal grants and loans are periodically available for the construction of public facilities, such as storm drain improvements. However, these funding sources generally result from statewide voter approved bond issues or the implementation of a specific State or Federal program. Therefore, the availability of this source is limited. In the event of a flooding disaster, State or Federal funding assistance programs could benefit Loomis.

Assessment Districts – An assessment district could be used to fund drainage facilities. Loomis could create a special assessment district that defines both the area to benefit from the drainage improvements and the properties that will pay for the improvements. Each benefiting property within the district would be assessed a share of the cost of the drainage improvements to the benefit it receives from those improvements. A simple majority vote is required to create the drainage assessment district.

Parcel Charges or Drainage Fees – A charge or fee could be assessed to each property within Loomis. The charge per parcel could be based on the total parcel area and percent impervious area. Once established, the charge could be collected along with the regular property taxes. A simple majority vote is required to establish the charge.

Sales Tax Revenues – Drainage improvement projects could in part be supported by an increase in the sales taxes. Revenues from a sales tax could be used to support a bond issue. A two-thirds majority of the votes cast is required to authorize a sales tax increase.

Mello-Roos Community Facility Districts – California's Mello-Roos Community Facilities Act of 1982 allows for the creation of a special district authorized to levy a special tax and issue tax-exempt bonds to finance public facilities. A two-thirds voter approval is required.

General Obligation Bonds – The one percent limit on property tax may be overriden by Loomis through a two-thirds voter approval. The additional property taxes would then be used to find debt service of General Obligation (GO) bonds. GO bonds are the least costly form of long-term public borrowing, because the bonds are secured by the unlimited taxing power of the issuer. Additionally, GO bonds do not require a reserve fund; thereby, reducing the size of the issue.

Dedications and Exactions – Developers may be required to dedicate land or make cash payments for public facilities required or affected by their projects as a condition of approval, under the Subdivision Map Act. Cash contributions are made for other public facilities that are directly required to serve the project.

Development Agreements – A development agreement is a contract between a public agency and a developer that provides the developer with assurances that the land use entitlements for a project will not be changed in the future, and that specifies public sector commitments to financing, phasing, and other elements of project implementation. In return, the developer may be asked to make financial commitments beyond those that could be justified through typical subdivision ordinance dedications, exactions, or impact fees. This financing method could be used by Loomis to fund some of the proposed capital improvement projects.

Development Impact Fees – Loomis could adopt a development impact fee that would require new development to pay for the benefits received from new storm drainage improvements. A new development impact fee may be enacted through adoption of an ordinance. The ordinance would allow Loomis to adopt a fee schedule consistent with supporting technical analysis and findings. Such fees do not require a public vote to be enacted, but they do require public hearings.

These alternative funding sources are included here to provide general information on potential means to finance the recommended drainage improvements. A financing plan for drainage improvements is needed prior to implementing these projects.

CHAPTER 8. REFERENCES

Crawford Multari Clark & Mohr, et al. *Town of Loomis General Plan, Planning Commission Recommendation - DRAFT*. April 2000.

James M. Montgomery for the Placer County Flood Control and Water Conservation District and Sacramento County Water Agency. *Dry Creek Watershed Flood Control Plan.* April 1992

Placer County Flood Control and Water Conservation District. *Stormwater Management Manual.* September 1, 1990.

U.S. Federal Emergency Management Agency, Federal Insurance Administration. *Flood Insurance Study, Placer County, California and Incorporated Areas, vol. 1 & 2.* Revised: June 8, 1998.

U.S. Federal Emergency Management Agency, Federal Insurance Administration. *HEC-2 Input Data Listings for Secrete Ravine and Antelope Creek.* May 1994.

Psomas & Associates for the Town of Loomis. *Town of Loomis General Plan 1998 Map.* Revised January 1997.

Placer County Water Agency. *Water Distribution Maps, Drawings 30-A-(1-16) & 25-B-(1-16).* 1996-2000.

Philip Williams & Associates, Ltd. *Placer County FEMA Project, Secret Ravine and Antelope Creek Work Maps.* March 1994.

APPENDIX A

W E S T
Y O S T
& ASSOCIATES
Consulting Engineers

1990 10th Anniversary 2000

TECHNICAL MEMORANDUM NO. 1

DATE: September 15, 2000 Project No.: 225-00-01.02

TO: Brian Fragiao
Town of Loomis

FROM: Steve Dalrymple SD
Jeff Wanless

SUBJECT: Storm Drain Database

INTRODUCTION

This Technical Memorandum (TM) presents the information and data compiled on storm drain facilities and runoff in the Town of Loomis (Town). One of the major components of a storm drainage master plan is the development of a storm drain facilities and hydrologic database.

The specific assignment was to review available mapping, files and reports and to conduct a field survey to collect additional drainage system data. This information was compiled into the form of a digitized AutoCAD overlay of the storm drain facilities and added to the Town's existing AutoCAD base map. The existing drainage files and reports were cataloged.

The type of storm drain data included with the drainage system overlay includes the following:

- Locations of individual drain lines, with pipe size and direction of flow indication.
- Manhole and drainage inlet location with rim and invert elevation where data was available.
- Major bridge and culvert locations with creek flowline elevations and flow opening dimensions.
- Watershed boundaries.
- Open channel locations.
- Location of detention basins and ponds.
- 100- and 500-year FEMA floodplains boundaries.

1260 Lake Boulevard, Suite 240 Davis, California 95616 Phone 530 756-5905 Fax 530 756-5991 email: mail@westyost.com

SOURCE OF INFORMATION AND DATA

Information and data were compiled and collected from several different sources. The drainage base map was developed from information and data obtained from four main sources:

1. Information and data provided by the Town.
2. Data obtained from the Placer County Flood Control and Water Conservation District (PCFCWCD) used in the FEMA Flood Insurance Study for Placer County.
3. Information obtained from the Placer County Water Agency regarding their facilities.
4. Field surveys conducted by West Yost & Associates as part the drainage master plan.

The base map used for the drainage database was created by the Psomas & Associates for the Town's General Plan. This base map includes roads, property lines, location of major creeks, and the Town's General Plan or land use designations.

The information provided by the Town is divided into three categories: drainage reports, "as-built" plans, and discussions with Town personnel. The majority of data used for the drainage base map was obtained from the drainage reports and the "as-built" improvement plans.

The available drainage reports for various projects throughout the Town were cataloged and are summarized in Table 1, attached. These drainage reports contain information such as estimated runoff created by or flowing through the proposed projects, the proposed drainage system, watershed boundaries, hydrologic and hydraulic modeling files, storm drain system calculations, and site plans. The storm drain facilities and watershed boundaries available from this data were added to the Town base map. Not all reports contained information regarding the proposed storm drain system or upstream watershed. In some cases the information contained in the drainage reports was very limited.

The vast majority of storm drain facility data and information was obtained from the "as-built" improvement plans for commercial and residential development. This information contained storm drain location and size, manhole and drain inlet locations with rim and invert elevations. The "as-built" plans were not cataloged. However, it is recommended that as part of the continuing need to improve and update the overall database, these plans should be cataloged by the Town.

The 100- and 500-year floodplain boundaries were obtained from the FEMA flood insurance study completed for PCFCWCD. These boundaries were developed using the US Army Corps of Engineering's HEC-1 and HEC-2 hydrologic and hydraulic computer modeling programs. The resulting water surface or floodplain boundaries for Antelope Creek, Sucker Ravine, Loomis Tributary, and Secret Ravine are illustrated in several AutoCAD files. The modeling files and AutoCAD files are summarized in Table 2, attached.

Water distribution facilities which traverse the Town and supply water to its residents are operated and maintained by the Placer County Water Agency (PCWA). Several of these facilities

have potential impacts on the Town's drainage system. Therefore, these canals and pipelines, mostly located in the northeastern section of town, were added to the drainage base map. The associated maps and digital files obtained from PCWA are summarized in Table 2.

There were several miscellaneous files and reports collected as part of the information and data collecting process for the drainage master plan and drainage utility mapping. Most of the information collected has been discussed above or will be discussed in later technical memoranda. Table 2 summarizes the information and data collected.

A field survey was conducted to both obtain critical data that was missing or unavailable and to provide more detailed information in areas of interest or where there is identified or potential flooding problems and/or concerns. Examples of survey data collected are flowline elevations and dimensions of major bridges and culverts, rim and flowline elevations of critical manholes and drain inlets, location of open channels, determination of overland flow patterns and verifications of pipe locations and sizes.

Location of watershed boundaries was determined from existing as-built plans and drainage reports. For critical areas, where shed boundaries could not be determined from existing plans and reports, shed boundaries were determined from field surveys and observations. For all other areas, shed boundaries were not determined at this time. The creation of a detailed topographical base map will tremendously aid in the determination of watershed boundaries for all of the Loomis area.

The data and information collecting effort was focused on the more urban areas of the Town. These areas contain the most readily available information and pose the greatest potential for flooding problems. Where the information was easily obtainable in rural areas of the Town, the data was added to the storm drain database. Collecting all data on existing storm drain facilities in both the rural and urban parts of town would involve a substantial surveying effort requiring significant time and expense beyond the current scope and budget. This is especially true for the rural areas where storm drain facilities are spread over an extensive area.

RECOMMENDATIONS

A storm drain facilities and hydrologic database is a critical component for municipal storm drainage management. Significant effort is required to maintain and update the database as new information on existing facilities becomes available and as new storm drain facilities are installed. Recommendations have been prepared that will help enhance the drainage database.

1. Although most of the Town's drainage facilities are included with the digital storm drain overlay, it was not feasible within the current scope and budget to collect data for all of the existing facilities. Therefore, the Town should continue to gather information and update the drainage database. In addition to gathering information on existing facilities information regarding new storm drain systems should also be collected and added to the storm drain database. Updating the database, when information becomes available, includes both the digital base map and the catalog database.

2. The absence of a detailed topographical base map made determination of watershed boundaries and overland flow patterns difficult. A detailed digital topographical base map of the Town would significantly enhance the drainage facilities database and provide a solid base for the Town's general base map.

3. The as-built plans should be cataloged by the Town.

SRD:JW:kjb

Attachments

Table 1. Summary of Project Drainage Reports

No.	Project Name	Date	Description of Information
1	McDonalds's Restaurant	Jun-96	Drainage Report & Appendix w/ HEC-1 & HEC-2 models and SD system calc's. **Actual site in Rocklin.**
2	Sherwood Estates	Jun-96	Storm drainage calculations w/ off-site shed map
3	Loomis Acres	Sep-89	Storm drainage calculations w/ on & off-site shed map
4	Live Oak Estates	Mar-75	Drainage report with calculations for pipes. No SD data.
5	Swetzer Business Center	Oct-89	Drainage Study with on & off-site shed maps.
		Oct-91	Grading & Drainage plan - provides pipe data.
6	Stonegate Unit 2	Apr-87	Drainage Report w/ shed map & storm drain (SD) calc's
7	Stadelhofer Project	Jun-90	Drainage Study with shed map for upstream shed
		Jun-90	HEC-2 runs to determine 100-yr Flood plain for the 10 acre site
8	Hunters Crossing II	Oct-89	Drainage Map & calc's for tentative map
9	Harris Industrial Park	1990-91	Drainage study, detention basin sizing calc's & a site plan
10	GrayStone Manor	Jan-84	Survey for SD for Pearson & Francis Dr.
11	Sunrise Loomis	Dec-86	HEC-2 output for Humphrey Rd drainage channel
		Nov-88	Letter for SD dedication to Town
		Feb-83	Humphrey Rd. / Humphrey Estates 100-yr drainage calc's.
		Jul-83	Letter to Board regarding Humphrey Rd. drainage projected alternatives & funding (from: John Maccoun)
		1985-86	Various exhibits and shed maps
		Aug-86	Drainage study of Sucker Ravine downstream of Sunrise-Loomis
		Feb-87	Memo regarding Humphrey Rd. drainage problem
12	Loomis Creek Prof. Plaza	May-91	Shed map and calc's (commercial site, no SD system)
13	Heather Heights	Dec-87	Storm sewer design calculations
14	Dean's Industrial Park	Dec-90	Drainage plan with calculations. No system data.
15	Circle Drive	Nov-96	Photographs of drainage & small pond
		Feb-97	Surveying notes & computations printouts
		Oct-88	On-site drainage plan for commercial development @ Circle Dr. & Taylor Rd.
		Sep-93	Circle Drive drainage improvement plan (location uncertain)
			Aerial photograph for area to pond
		Apr-84	Culvert calc. For 18" CMP (Joe Millman project)
16	Curnutt Parcel Map	Apr-86	Drainage calc's for culvert sizing @ Saunders Rd.
17	De Anza Estates	Jun-87	Shed map for Helen's Ct & Speaths Wy south of Helen's Ct
		Feb-88	Shed map & SD data for Terrace Park & Lawnview Wy.
		Sep-79	Master Drainage Plan
18	Heritage Park Subdivision	Oct-96	Heritage Park / Nazarene District Office Off-site SD profile
		Dec-91	Wetland Assessment & Delineation
		Aug-92	Preliminary Site Plan
		Oct-97	Drainage report - include shed maps & HEC-1 runs
19	Saint Francis Woods	May-89	Drainage Study - w/ shed map & SD system schematic. Includes the 100-yr flood plain
20	Nazarene Church District Office	Jun-96	Drainage Narrative w/ shed map
		Feb-97	Revised Drainage Narrative w/ HEC-2 run & Culvert calc's
		Jun-96	On-site drainage plan for commercial site
21	T-Com Park	Mar-99	Drainage report with shed map. No SD data.
22	Loomis Union School District	1996-97	HEC-1 analysis for area around No Name Ln & Humphrey Rd. HEC-RAS model for channel. Letters regarding flooding problems. Grading plans for School detention pond.
		Sep-96	Drainage calculations - SD system, open channel & storage

Table 1. Summary of Project Drainage Reports, cont'd...

No.	Project Name	Date	Description of Information
23	Rachel Estates	Aug-91	Drainage Report (includes preliminary drainage map)
		Jul-91	Drainage Report (first submittal)
		Mar-92	FEMA - Request for Map Revision involving fill & information
		Jul-91	Preliminary engineers estimate
		1991	Environmental Documentation for ACOE & Fish & Game
		8/91, 1/00	Correspondence from residents regarding flood insurance
24	Antelope Creek	Jul-88	Creek crossing calculations south of Del Mar Ave.
		Oct-86	HEC-2 models for existing & improved channel
25	Don Benedict	Jan-88	Drainage map & calc's for 2 parcels along Humphrey Rd.
26	Holly Street	Mar-97	Preliminary storm drain improvement plan w/ shed map
27	Bokman Property	May-96	Tentative Map Drainage Study (includes on/off-site shed map)
		May-95	HEC-1 model for on and off-site sheds (100-yr 24-hr event)
		Mar-96	HEC-2 model for 100-yr flood plain
28	Taylor Road Self-Storage	Jul-98	Drainage Report
		Oct-98	Pre- & Post-Development Drainage Maps
29	Cedar Oaks Estates	Apr-87	Drainage calc's w/ shed map & SD calc's.
30	Keller Parcel Map	Jul-96	Flood Plain Study
31	Raley's Shopping Center	Mar-96	Drainage Design Report & Supplement w/ HEC-1 models
32	Colony Lane Culvert	Sep-90	Culvert sizing calc's with aerial photo (showing shed boundary)
33			
34	D. Short	Aug-91	Culvert sizing calc's with shed map
35			
36	Trax - Parcel 3 off Swetzer Ct.	Dec-97	Detention required calculations - used chambers on-site
37			Sketch of proposed SD line south of Holly st. see No. 26
38	Iranshahi Tentative Parcel Map	Oct-91	Tentative Map w/ topography (no drainage information)
39	Enterprise Ct. - Lot 15	May-97	Drainage calculations & approx. vicinity map
40	Rossi (Loomis) cup 93-23	Jun-94	Drainage calculations, plan with some existing & proposed SD
41	Marty/Longhoffer Parcel Map	Jan-88	Drainage calc's with shed boundary
		Nov-87	Drainage Path Study
42	Huppe Moore Lndscp Co.	Mar-95	Site plan - No SD facilities (end of Enterprise Ct.)
43	Saint Francis Woods		Drainage Study map of Item No. 19 (see above)
44	McBroon Parcel Map	Jan-88	Drainage easement sizing
45	Loomis Senior Cara Villa	Aug-98	Drainage report, on-site storage calc's.
46	EACS Development - S. Walnut	May-00	Drainage report, includes site plan & cost estimate

Table 2. Summary of Miscellaneous Files and Reports Pertaining to Drainage within the Loomis Area

Name of File or Document	File Date	Type of file	Description
Town of Loomis General Plan (Psomas & Associates):			
GP-sht1.dwg	Nov-99	CAD file	Plot file. Xref's Gen-plan & Loomis drawings.
Gen-plan.dwg	Nov-99	CAD file	Shading only of Land Use designations.
Loomis.dwg	Nov-99	CAD-file	City Base map includes roads and property lines.
Water Supply and Distribution System (Placer County Water Agency):			
025b002y.dwg	Sep-99	CAD file	PCWA water distribution system for Loomis area. Index map for Drawing No. 25-B-…, northwestern portion of Loomis.
25-B-(1-16)	1996-99	Drawings	PCWA water distribution system for northeastern portion of Loomis.
030a0075.dwg	May-00	CAD file	PCWA water distribution system for Loomis area. Index map for Drawing No. 30-A-…, northeastern portion of Loomis.
30-A-(1-16)	1996-00	Drawings	PCWA water distribution system for northwestern portion of Loomis.
Placer County FEMA Project (Placer County Flood Control & Water Conservation District)			
Secretz1.dwg	May-94	CAD file	FEMA FIS maps for Secret Ravine, Sucker Ravine and Loomis Tributary. Shows 100-year floodplain and topography along creeks.
Secret2.dwg		CAD file	
Secretz3.dwg	May-94	CAD file	
Secretz4.dwg	Apr-94	CAD file	
Secretz5.dwg	Jun-94	CAD file	
Secret6.dwg		CAD file	
Secretz7.dwg	May-94	CAD file	
Secretz8.dwg	Jun-94	CAD file	
Antelop1.dwg		CAD file	FEMA FIS maps for Antelope Creek and Clover Valley Creek. Shows 100-year floodplain and topography along creeks.
Antelop2.dwg		CAD file	
Anteloz3.dwg	May-94	CAD file	
Antelop4.dwg		CAD file	
Antelop5.dwg		CAD file	
Anteloz6.dwg	Apr-94	CAD file	
Anteloz7.dwg	Jun-94	CAD file	
Anteloz8.dwg	Jun-94	CAD file	
Antelope.dat	May-94	HEC-2 input	Antelope Creek from Roseville/Rocklin City limits to Citrus Colony Rd.
Antre1.dat	May-94	HEC-2 input	Antelope Creek restudy - Starts at Dry Creek/Miners Ravine Confluence.
Antre2.dat	May-94	HEC-2 input	Antelope Creek restudy. From upstream end of antre1.dat to Roseville/Rocklin City boundary.
Antrib.dat	May-94	HEC-2 input	Antelope Crk tributary from Antelope Crk confluence to Humphrey Rd.
Left.dat	May-94	HEC-2 input	left channel around island at Paragon Ct. development for split flow analysis of Antelope Creek. Use w/ Right.dat
Right.dat	May-94	HEC-2 input	right channel around island at Paragon Ct. development for split flow analysis of Antelope Creek. Use w/ Left.dat.
Wiwall.dat	May-94	HEC-2 input	Antelope Creek with floodwall at Paragon Ct assumed intact.
secretfn2	May-94	HEC-2 input	Secret Ravine from City of Roseville/Rocklin limits to south of King Road
secretfn.out		HEC-2 output	Output file for secretfn2, above
Dry Creek Watershed Flood Control Plan (James M. Montgomery):			
Final Report	Apr-92	Document	JMM Dry Creek Watershed Flood Control Plan
Roads.dwg	Sep-91	CAD file	Road/street layout
Sheds.dwg	Sep-91	CAD file	Shed boundaries
Creeks.dwg	Sep-91	CAD file	Creeks and tributaries
Drycreek.dwg		CAD file	Outline map showing rivers and main roads, includes flood mitigation measure. Drycreek watershed.
compcrfl.out	Oct-91	Text file	Summary table comparing 100-yr peak flows from HEC-1 models for several water coarse.
hnbdvrnn.hc1	Jan-91	HEC-1 input	100-yr future (buildout) flows with no local or regional detention basins
hndblcmx.hc1	May-91	HEC-1 input	100-yr future (buildout) flows with local or regional detention basins
hnlcldb2.hc1	Apr-91	HEC-1 input	100-yr future (buildout) flows with local and no regional detention basins

Table 2. Summary of Miscellaneous Files and Reports, cont'd...

Name of File or Document	File Date	Type of file	Description
futd.h1i	Mar-92	HEC-1 input	Same as HNBDVRNN.hc1, with minor revision for DSS output.
futf.h1i	Mar-92	HEC-1 input	Same as HNDBLCMX.hc1, revised DETB12 (Linda Cr tributary at Oak Ave).
futg.h1i	Mar-92	HEC-1 input	Same as FUTF.h1i, but with without regional detention on Antelope Creek at Delmar Ave.
detb12.h1i	Mar-92	HEC-1 input	Routing through detention basin, Linda Crk at Oak Ave.
prob1.h1i	Feb-91	HEC-1 input	Miscellaneous hydrologic modeling files for the Dry Creek water. Specific description and/or use uncertain.
vernon.hc1	Feb-91	HEC-1 input	
vnntowtt.h1i	Feb-91	HEC-1 input	
futd.out	Mar-92	HEC-1 output	
riolinda.fxd	Mar-92	HEC-1 output	
vernon.fxd	Feb-91	HEC-1 output	
wattdcc9.fxd	Feb-91	HEC-1 output	
dcfut.dss	Mar-92	HEC-DSS	
dry.dcs	Feb-91		
dry.dss	Feb-91	HEC-DSS	
drycr.dss	Feb-91	HEC-DSS	
drydr.dsc	Feb-91		
dspmac	Mar-92	Macro file	
tst.dss	Feb-91	HEC-DSS	
fixform.exe	Aug-90	Program file	
PG&E:			
Canal Maps	Sep-76	Drawings	Canal locations for northeastern section of Loomis (same as PCWA drawings)
South Pacific Railroad:			
Construction plan	pre-1915	Drawings	Construction drawing for railroad line west of Taylor Road
Caltrans:			
Construction plan	1915-36	Drawings	Construction drawings for Taylor Road (old state highway)

APPENDIX B

State of California - The Resources Agency
DEPARTMENT OF FISH AND GAME
Sacramento Valley - Central Sierra Region
1701 Nimbus Road, Suite A
Rancho Cordova, CA 95670
(916) 358-2900

ARNOLD SCHWARZENEGGER, Governor

RECEIVED
MAR 11 2008
TOWN OF LOOMIS

"NOTICE OF EXEMPTION"

The Department has determined that your project as described in the subject Lake or Streambed Alteration Agreement is exempt from the California Environmental Quality Act (CEQA), and will file a notice of Exemption for your project. The Notice will be filed with the Office of Planning and Research, as required by CEQA. The Department's compliance with CEQA may be legally challenged for 35 days following the filing of the Notice of Exemption.

This completes the Department's agreement process. You may proceed with your project according to the terms and provisions of your Streambed Alteration Agreement if you have obtained all other permits required from local, other State, and Federal agencies.

(12/01/03)

Notification No. 1600-2008-0014-R2

STREAMBED ALTERATION AGREEMENT BETWEEN CALIFORNIA DEPARTMENT OF FISH AND GAME AND THE TOWN OF LOOMIS FOR ROUTINE MAINTENANCE OF STREAM CHANNELS AND DRAINAGE FACILITIES WITHIN Town

This Streambed Alteration Agreement ("Agreement") is entered into between the California Department of Fish and Game ("DFG") and the Town of Loomis (**"Town"**).

RECITALS

WHEREAS, DFG is the trustee for fish and wildlife resources of the State of California; and

WHEREAS, Fish and Game Code section 1602 requires an entity to notify DFG before: 1) substantially diverting or obstructing the natural flow of a river, stream, or lake; 2) substantially changing the bed, channel, or bank of any river, stream, or lake; 3) using any material from the bed, channel, or bank of any river, stream, or lake; 4) depositing or disposing of debris, waste, or other material containing crumbled, flaked, or ground pavement where it may pass into any river, stream, or lake; and

WHEREAS, Fish and Game Code section 1602 requires DFG to issue a lake or streambed alteration agreement ("agreement") to an entity if DFG determines that the project described in the entity's notification could substantially adversely affect fish and wildlife resources; and

WHEREAS, the purpose of an agreement is to protect fish and wildlife resources by incorporating into the project reasonable measures necessary to protect those resources; and

WHEREAS, the **Town** notified DFG about routine maintenance projects it intends to perform in the stream channels in the **Town** to maintain the designed capacity of channels and other physical structures to protect the **Town's** investments, to prevent the loss of life and property; and

WHEREAS, DFG determined that an agreement is required to perform such routine maintenance projects because they could substantially adversely affect fish and wildlife resources in the **Town** ; and to promote the efficient and wise use or disposal of water and

WHEREAS, this Agreement authorizes the **Town** to perform specified routine maintenance projects in the **Town** , and requires the **Town** to comply with general and

specific measures when performing such projects to prevent any substantial adverse impacts to fish and wildlife resources in the **Town** ; and

WHEREAS, this Agreement does not apply to emergency work the **Town** must perform to protect life or property as described in Fish and Game Code section 1610;

NOW, THEREFORE, DFG and the **Town** agree that this Agreement satisfies the requirements in Fish and Game Code section 1602, and agree further as follows:

I. DEFINITIONS

"Day" means workday (based on a five day work week), unless otherwise specified.

"Diameter breast height" ("dbh") means the diameter of a tree trunk at a distance measured 4½ feet above grade.

"Emergency" has the same definition as in Public Resources Code section 21060.3, specifically "a sudden, unexpected occurrence, involving a clear and imminent danger, demanding immediate action to prevent or mitigate loss of, or damage to, life, health, property, or essential public services."

"Heavy equipment work" means work that involves the use of backhoes, front-end loaders, bulldozers, excavators, and other heavy, mechanized equipment used to control vegetation; to remove sediment, large woody debris, and beaver dams; to place large rocks; and to grade.

"Low flow area" means generally the flowing portion of the channel during low flow conditions.

"Routine maintenance work" means work performed regularly (i.e., every one to five years) in the stream zones within those areas identified in Exhibits 1 and 2. The **Town** performs routine maintenance work to maintain the functional and structural integrity of its facilities. Routine maintenance work, as described in this Agreement and identified in Exhibit 2, includes, but is not limited to, the following: removing debris, sediment, vegetation, rubbish, downed trees, and other material that could obstruct the natural flow; controlling weeds, grasses, emergent vegetation, and woody vegetation; repairing gates, barricades, and small structures; washing and painting bridges; making repairs to control erosion and stabilize banks; repairing culverts; conducting minor geotechnical sampling; and other work necessary to maintain the functional and structural integrity of Town or Town facilities.

"Special status species" means any species defined in CEQA Guidelines section 15380 (Cal. Code Regs., tit. 14, § 15380); species that are fully protected under the Fish and Game Code; species protected under the Migratory Bird Treaty Act (16 U.S.C. § 703 et seq.); and/or species identified by DFG or other state and federal resource agencies as a species of special concern. Such species include, but are not limited to, the following: Swainson's hawk (*Buteo swainsoni*); Valley elderberry longhorn beetle (*Desmocerus californicus*

dimorphus); Northern harrier (Circus cyaneus); Foothill yellow-legged frog (Rana boylii); Red-legged frog (*Rana draytonii*); Western pond turtle (Clemmys marmorata); Tricolored Blackbirds *(Agelaius tricolor);* vernal pool tadpole shrimp (*Lepidurus packardi).*

"Stream" means a channel, seep, pond, waterway, or area in the **Town** where the **Town** may perform the routine maintenance projects covered by this Agreement, all of which are identified in Exhibit 1. "Stream" includes perennial, intermittent, ephemeral streams and man-made channels that deliver or drain water for roadside ditches or agricultural purposes. "Stream zone" means that portion of the stream channel through which water and sediment flow, have flowed, or are capable of flowing. The stream zone is delineated by the top of the bank or the outer edge of any riparian vegetation, whichever is more landward.

"Thinning" means the selective cutting of smaller individual trees, leaving larger individual trees to provide canopy.

II. NOTIFICATION PROCEDURE

Except as specified in Section II.A or II.B below, the **Town** is not required to notify DFG to obtain an agreement or other authorization before beginning any routine maintenance project identified in or authorized by this Agreement.

A. Notification to DFG by the **Town**

1. Routine maintenance work: 10 days prior to commencing routine maintenance work, the **Town** shall complete and submit to DFG a Verification Request Form ("VRF") as attached hereto as Attachment A for routine maintenance work. The **Town** shall send the VRF by email to the he person(s) specified by DFG" provided to the **Town**. In addition to the VRF, the **Town** shall email supporting documents for the maintenance activity, such as photos, drawings and/or maps. In the event that the **Town** delays the project start date specified in the VRF by more than 10 days, the **Town** shall submit a revised VRF before beginning the project.

2. Urgent maintenance work: A minimum of 2 days prior to beginning urgent maintenance work covered by this Agreement, the **Town** shall complete a VRF and send it by email to the person(s) specified by DFG. For purposes of this Agreement, "urgent maintenance work" is routine maintenance work the **Town** must expedite based on the limited availability of work crews, the need for specialized equipment, anticipated weather conditions, and other limiting factors. In addition to the VRF, the Town shall email supporting documents for the maintenance activity, such as photos, drawings and/or maps.

3. Emergency work: The Agreement does not apply to emergency work by the **Town**. The **Town** shall complete any emergency work in

accordance with Fish and Game Code section 1610, except that the **Town** shall comply with the notice requirement in section 1610 by completing the emergency form found on the Department's website: http://www.dfg.ca.gov/habcon/1600/Forms.html and sending it by email to the person(s) specified by DFG within 14 days of beginning the emergency work.

4. Maintenance work not covered by this Agreement: Maintenance work not covered by or consistent with this Agreement shall include any routine maintenance work not identified in Exhibits 1 and 2, regardless of whether the work is otherwise consistent with this Agreement. For routine maintenance work not covered by this Agreement and subject to Fish and Game Code section 1602, the **Town** shall notify DFG in accordance with that section before beginning the work. See the Department website http://www.dfg.ca.gov/habcon/1600.html for instructions and forms for submitting notification to the Department

B. DFG Response to Notification by the **Town**

1. Upon receipt of a VRF for routine or urgent maintenance work, DFG shall submit the VRF to appropriate DFG personnel. DFG may acknowledge receipt of any VRF the **Town** submits in the form of an email response to the **Town** contact person identified in the VRF. However, such acknowledgement shall not be deemed an approval by DFG that the **Town** may begin the work described in the VRF.

2. DFG shall determine if the routine maintenance work described in the VRF is covered by and consistent with this Agreement.

3. If DFG determines that the work described in the VRF is consistent with and covered by this Agreement, DFG may either: (a) send by email a notice of concurrence to the **Town** contact person identified in the VRF and all the **Town** employees on the email distribution stating that it may proceed with the work described in the VRF, in which case DFG must send the notice prior to the proposed start date in the VRF; or (b) allow the 10 day (for routine maintenance work) or minimum 2-day (for urgent maintenance work) comment period to elapse. Upon receipt of a notice of concurrence, or if DFG does not submit a notice of concurrence, upon expiration of the applicable comment period, the **Town** may begin the work described in the VRF, provided it does so in accordance with the terms and conditions in this Agreement.

4. If DFG determines that the routine maintenance work described in the VRF is consistent with and covered by this Agreement, but notwithstanding such consistency additional measures (i.e., measures not included in this Agreement) need to be incorporated into the work to

adequately protect fish and wildlife resources, DFG shall specify those measures in its notice of concurrence. Upon receipt of such concurrence, the **Town** may begin the work, provided it does so in accordance with this Agreement and the additional measures in the notice of concurrence.

5. If DFG determines that the routine maintenance work described in the VRF is not covered by or consistent with this Agreement, DFG shall send by email a notice of non-concurrence to the **Town** contact person identified in the VRF and all the **Town** employees on the email distribution, in which case DFG must send the notice prior to the proposed start date in the VRF. If DFG submits a notice of non-concurrence, DFG shall specify the basis for its inconsistency determination and describe the actions the **Town** will need to take before it may begin the work. Such actions DFG may recommend include, but are not limited to, the following:

   a. augmenting the VRF by submitting to DFG information sufficient to allow DFG to develop additional measures needed to protect fish and wildlife resources;

   b. working with DFG to augment Exhibits 1 or 2;

   c. separately notifying DFG in accordance with Fish and Game Code section 1602 and Section II.A.4 of this Agreement (above); or

   d. working with DFG to amend this Agreement.

   If DFG does not respond within the 10 day (for routine maintenance work) or minimum 2-day (for urgent maintenance work) comment period, the **Town** may begin the work described in the VRF upon expiration of the applicable comment period.

C. Field Confirmation of VRF

1. The **Town** shall ensure that a copy of any completed VRF is readily available on site, even if DFG did not respond to it before the start date in the VRF. If DFG responded to the VRF before the start date, the **Town** shall ensure that a copy of DFG's response is also readily available on site.

2. A copy of a completed VRF and any response to it by DFG shall be presented to any DFG employee upon request.

III. AUTHORIZED MAINTENANCE WORK

The **Town** may perform the maintenance work described below without further notifying DFG, or obtaining a separate agreement from DFG, provided that the **Town** : 1) limits the work to within those areas identified in Exhibits 1 and 2; and 2) completes the work in accordance with the terms and conditions specified herein.

A. Debris or obstruction removal. The **Town** may remove debris, trash, rubbish, beaver dams, flood-deposited woody and herbaceous vegetation, downed trees, dead trees which are in clear danger of falling in or across a channel, branches, and associated debris that substantially obstruct **(or could obstruct)** water flow, reduce channel capacity, accelerate erosion, damage concrete box culverts, metal culverts, or bridge structures.

B. Silt, sand, or sediment removal. The **Town** may remove or displace silt, sand, gravel, or sediment in the immediate vicinity (i.e., within 50 feet) of man-made facilities or structures that substantially obstruct water flow, reduce channel capacity, accelerate erosion, damage concrete box culverts, metal culverts, or bridge structures, or could do so.

C. Vegetation control in channels. The **Town** may cut, mow, disc, bulldoze, or spray herbicides on grasses, shrubs, and woody growth to maintain the designed capacity of floodways. The **Town** may cut, trim, or remove the lower branches of large trees to facilitate site inspections and maintain channel capacity. The **Town** may remove dead trees, dying trees, and new trees less than 4-inches dbh to maintain channel capacity and prevent erosion. The **Town** may remove non-native vegetation (e.g., giant reed (a.k.a. "false bamboo"), Chinese tallow, red sesbania, Spanish bloom, Tree-of-heaven, black locust, tree tobacco, castor bean, pampas grass, eucalyptus, tamarisk, water hyacinth, and acacia) to maintain channel capacity and improve native habitat.

D. Repair of previous erosion control work. The **Town** may repair previous erosion control work, including, but not limited to, failed rock, sacked concrete, or gabion sections. Such work shall not extend beyond 50 linear feet of the existing revetted area.

E. Minor erosion control work. The **Town** may slope, place earthen fill, install rocks and gabions, or take other necessary measures to control erosion on previously unrevetted areas. Such work shall not exceed 50 linear feet in length.

F. Bridge washing and painting. The **Town** may clean, wash, and paint structures within a stream zone, provided containment measures are used to prevent deleterious material from entering state waters and avoid adverse impacts to fish and wildlife resources.

IV. CONDITIONS

A. The **Town** shall act as the lead Town under CEQA for any maintenance work covered by this Agreement that it undertakes.

B. The **Town** shall complete the maintenance work covered by this Agreement in accordance with the following conditions and time periods, and any other time periods specified in this Agreement:

1. The **Town** shall perform the maintenance work at a time and in a manner that minimizes adverse impacts to fish and wildlife resources and provides for the protection and continuance of those resources.

2. The **Town** shall time the maintenance work with an awareness of precipitation and other events that could increase stream flows.

3. The **Town** shall time the maintenance work with awareness of the amount of time and materials necessary to implement erosion control measures. The **Town** shall cease the maintenance work and implement all reasonable erosion control measures before all storm events.

4. The **Town** shall perform routine maintenance work which includes grading, placement of fill, placement of rock slope protection materials, and restrict other earth moving work within the stream zone within the following time period: May 15 to October 15.

5. The **Town** may remove debris in critical locations, such as bridges, gates, culverts, and channels, where such removal is necessary to avoid imminent flooding or damage to the **Town** structures and facilities at any time.

6. The **Town** may control vegetation by using hand tools to selectively trim, "limb-up," or cut-down vegetation and by selectively spraying herbicides to control woody and brushy vegetation only during the following time period: August 15 to March 1.

7. The **Town** may control woody and brushy vegetation by mechanical means (e.g., by brush hog, excavator, grading, or similar equipment) only during the following time period: August 15 to October 15.

8. The **Town** may cut, trim, or remove downed trees and dead or live trees that are in clear danger of falling in or across a channel that will significantly reduce channel capacity, accelerate erosion, or otherwise cause an emergency at any time.

9. The **Town** may control vegetation by pre- and post-emergent herbicide spraying on regularly maintained channel slopes only during the time

periods recommended by the California Department of Pesticide Regulation.

10. The **Town** may request DFG to allow it to work outside the time periods listed above in paragraphs 1 through 10 by submitting to DFG a written variance request that contains the following information: 1) the work location; 2) the name of the stream or watercourse near or within which the **Town** intends to perform the work; 3) a description of the work the **Town** intends to perform; 4) the amount of time the **Town** will need to complete the work described in the variance request; and 5) the name and telephone number of the **Town** contact person for the work. DFG may make approval of a variance request contingent on an agreement by the **Town** to complete a biological survey (in accordance with paragraph 11 below); to employ a biological monitor (in accordance with paragraph 12 below); or to incorporate additional measures as part of the proposed work, if DFG determines that the work could adversely affect nesting birds or special status species. DFG shall approve or disapprove a variance request at its sole discretion within 10 days of its receipt, unless DFG has directed the **Town** to complete a biological survey (see paragraph 11 below).

11. If DFG requires the **Town** to complete a biological survey before approving a variance request, the **Town** shall employ a qualified biologist to survey the work area to verify the presence or absence of nesting birds or special status species. The survey shall be performed no more than 14 calendar days prior to beginning the maintenance work. The biologist shall survey the entire work area and the 50-foot "buffer" adjacent to and around the work area. After the **Town** completes the survey, it shall submit a written report to DFG that describes the biologist's survey protocols and findings, together with a copy of its original variance request. Within 10 days of receiving the survey report and variance request, DFG shall notify the **Town** by email, fax, or regular mail that it approves or disapproves the variance request. Failure by DFG to notify the **Town** within the 10-day period shall not be deemed an approval by DFG of the **Town** variance request. In the event DFG does not notify the **Town** within the 10-day period, the **Town** should contact DFG to inquire about the status of the variance request.

12. If DFG requires the **Town** have a qualified biologist on site to monitor the maintenance work described in a variance request as a condition of approving the request, DFG may require the **Town** to have the monitor on site before, during, and after the maintenance work. If a monitor is used, the **Town** shall cease any maintenance work if the monitor determines that doing so is necessary to prevent harm to nesting birds, special status species, or any other fish and wildlife resource. The monitor shall notify the DFG employee who approved the variance

request of any work stoppage as soon as practicable. The **Town** may resume work after the monitor determines that doing so will not cause harm to nesting birds, special status species, or any other fish and wildlife resource. If the **Town** wants to employ a monitor when performing the maintenance work described in a variance request, the **Town** should indicate its preference in the request.

C. The **Town** shall complete maintenance work on the projects identified in Exhibit 1 in accordance with the descriptions found in Exhibit 2. The **Town** may not modify any of the projects identified in Exhibit 1 or any of the descriptions included in Exhibit 2 unless it first notifies DFG and DFG, at its sole discretion, approves the modification. DFG and the **Town** shall resolve any disputes regarding any proposed modifications to Exhibits 1 and 2 in accordance with Section XII of this Agreement.

D. Prior to beginning any maintenance work under this Agreement, the **Town** maintenance supervisors and crews who will be completing such work shall be trained by a qualified biologist to identify and avoid harm to special status species and their habitat.

E. Some of the **Town** projects this Agreement covers are within the known home range of species that are fully protected under the Fish and Game Code or listed under the California Endangered Species Act ("CESA") (Fish & G. Code, § 2050 et seq.) and/or the Endangered Species Act (16 U.S.C. § 1531 et seq.). The work periods listed in this Agreement are intended to avoid adverse impacts to those species. However, DFG may impose additional measures on any maintenance work covered by this Agreement if DFG determines that such measures are necessary to protect a fully protected or listed species from harm.

F. If the **Town** encounters a fully protected or listed species while performing maintenance work, the **Town** shall suspend all work until the fully protected or listed species has left the work area. The **Town** shall notify DFG of all confirmed observations of any fully protected or listed species in or adjacent to any work area covered by this Agreement. This Agreement does not authorize the **Town** to take, incidentally or otherwise, any fully protected or listed species, as "take" is defined in the "fully protected" statutes in the Fish and Game Code, CESA, or the Endangered Species Act. DFG may suspend or revoke this Agreement for any unauthorized take by the **Town** of a fully protected or listed species while performing any maintenance work authorized by this Agreement.

G. Notwithstanding this Section IV, in work areas where special status species are likely to occur, a qualified the **Town** biologist shall conduct appropriate surveys to determine whether such species are present. The **Town** shall not begin work until a qualified biologist determines that the work will not result in the take of such species or otherwise substantially adversely affect them.

H. If prior to beginning maintenance work or while in the process conducting maintenance, the **Town** discovers active nests or nesting behaviors, DFG must be notified prior to further action. The **Town** may be required to create exclusion zones of 75 to 1500 feet depending on the species observed. The exclusion zone must be maintained until birds have fledged or nest is abandoned.

I. The **Town** shall avoid maintenance work on bridges between February 15 and September 30 if doing such work could disturb known roosting sites for bats.

J. If the **Town** encounters any wildlife during any maintenance work covered by this Agreement, it shall cease the work until the wildlife has left the work area. If necessary, the **Town** may attempt to flush, haze, or herd the wildlife in a safe direction away from the work area, provided the wildlife is not a fully protected or listed species. If the wildlife is a fully protected or listed species, the **Town** shall comply with paragraph F above.

K. The **Town** shall not use heavy equipment in standing or flowing water unless DFG approves such work. If standing or flowing water is present or reasonably anticipated, the Town shall submit to DFG a detailed water diversion or de-watering plan. De-watering may be accomplished by using gravel bags, port-a-dams, water bladder dams, K-rails, or driven sheet metal coffer dams.

L. The **Town** may cut, trim, spray with herbicides, or remove only that vegetation that obstructs stream flow or significantly reduces channel flood flow capacity. Reasonable precautions shall be taken to avoid other damage to non-target vegetation by persons or equipment. The **Town** may not remove roots and stumps without first consulting with DFG.

M. The **Town** shall clear stream channels in such a manner that it avoids trees greater than 4 inches dbh. The **Town** may trim such trees as necessary to gain access to maintenance areas, but it may not remove such trees without first consulting with DFG. The Town may remove trees less than 4 inches dbh without first consulting with DFG.

N. Recruitment of single trunk species of trees (e.g., oak, sycamore, cottonwood, Gooding willow, and alders) within or adjacent to stream channels is important for the replacement of trees that die or are removed by natural or man-made causes. Where limited tree growth does not substantially interfere with channel capacity or function, the **Town** shall allow young trees to grow. The **Town** may thin young trees only where tree density is likely to cause future problems with regard to stream channel capacity and design function of the state highway structure.

O. The **Town** may trim the lower branches of large trees growing within a stream

channel from ground level to a distance of 6 feet above ground level. The 4 inch dbh restriction in paragraph Q above shall not apply to low-hanging limbs that block water flow, catch debris, or otherwise compromise the designed flow of the channel.

P. In areas where small trees growing densely on both sides of the watercourse create water flow passage problems, thinning of those trees might be an appropriate maintenance technique. If the **Town** intends to cut trees and shrub brush along a stream, it shall do so in an alternating pattern by cutting on one side of the stream one year and the other side of the stream the following year, except that in doing so, the Town shall avoid removing all vegetation along long reaches of a stream bank (i.e., greater than 200 feet long), and shall leave isolated patches of vegetated habitat to serve as nesting and cover material. The **Town** shall employ this maintenance technique only with specific notice to and concurrence by DFG.

Q. Elderberry bushes shall be trimmed or removed only in accordance with United States Fish and Wildlife Service protocol.

R. The **Town** may chemically treat or remove the following non-native plants without restriction: giant reed (a.k.a. "false bamboo"), Chinese tallow, red sesbania, Spanish bloom, Tree-of-heaven, black locust, tree tobacco, castor bean, pampas grass, eucalyptus, tamarisk, and acacia. The **Town** may add other invasive non-native plants to this list if approved by DFG.

S. The **Town** may only use herbicides registered with the California Department of Pesticide Regulation. The **Town** shall apply herbicides in accordance with regulations established by that department and in accordance with labeled instructions. Upon request, the **Town** shall make available to DFG labeled instructions for any herbicides used by the **Town** in performing maintenance work. The **Town** shall report immediately to DFG the killing of any non-plant aquatic life caused by the use or spilling of any herbicide, pesticide, or other chemical.

T. The **Town** shall remove all trash and man-made debris collected in the channel. Any organic debris collected in the channel may be cut into appropriate sizes to be chipped and scattered as mulch at maintenance areas, removed from the channel, or burned in stationed debris piles.

U. The **Town** shall prevent chemicals, paint, oil, gas, and other petroleum products, and other substances that could be deleterious to aquatic life from contaminating the soil and/or entering waters of the state. The **Town** shall immediately remove such substances from any place where it could enter waters of the state and/or adversely affect fish and wildlife resources. The **Town** shall attempt to contain any releases or spills of such substances, and shall report the release or spill as soon as possible to Placer County Office of

Emergency Services at 530-886-5300.

V. The **Town** shall be responsible for providing the Department entry to any work area. The **Town** shall provide DFG keys for all locked gates and fences that restrict public access to maintenance work areas. The **Town** agrees that DFG may inspect maintenance work areas at any time without first notifying, or obtaining consent from the **Town** . If work is ongoing during the time of the inspection, DFG shall make contact with the supervisor/lead worker so the crew is aware that others are on site. DFG shall report to the **Town** any problems it discovers during its inspection.

W. If DFG determines that conditions have arisen or changed in such a manner that the work covered by this Agreement could adversely affect fish and wildlife resources, upon notice by DFG, the **Town** shall temporarily stop the work until corrective measures are taken in consultation with DFG.

X. Vehicles shall be reasonably free of external petroleum residue. Any equipment or vehicles driven and/or operated adjacent to a stream shall be checked and maintained daily to prevent leaks of materials that, if introduced into the water, could be deleterious to aquatic life. Vehicles shall be moved away from the stream prior to refueling and lubricating.

Y. Staging and storage areas for equipment, materials, fuels, lubricants, and solvents shall be located in areas where such materials if spilled shall not enter the stream zone. Stationary equipment such as motors, pumps, generators, compressors, and welders located within or adjacent to the stream shall be positioned over drip-pans.

Z. The **Town** may sandblast, paint, and chip and use gunite, as necessary, provided that materials are contained or placed where they will not enter or be washed into a stream. Chipped paint and rebound materials shall be removed and disposed of in accordance with local, state, and federal law.

AA. The **Town** and all of its contractors shall be subject to the water pollution regulations found in the Fish and Game Code sections 5650 and 12015.

V. SUBMITTALS

A. The **Town** shall send or deliver all non-VRF submittals (e.g., standard 1602 notifications, annual reports, fees, and photographs) to the following address:

Department of Fish and Game
Sacramento Valley - Central Sierra Region
Attn: Lake or Streambed Alteration Program
1701 Nimbus Road
Rancho Cordova, California 95670

(916) 358-2929 (telephone)
(916) 358-2912 (fax)

B. The **Town** shall send all VRF submittals to the person(s) specified by DFG. DFG and the **Town** shall update the distribution list as needed, modify the revision date accordingly, and provide each other with a copy of the most current list.

VI. REPORTING

The **Town** shall provide a written report to DFG on or before July 1 each year. The report shall include a brief description of the projects completed and a complete list of each location/facility where the **Town** performed routine maintenance work during the previous fiscal year (i.e., July 1 through June 30). To the extent feasible, the **Town** shall submit pre- and post-project photographs with the annual report. The photographs shall be labeled and formatted for placement in Exhibit 1. The report shall reference this Agreement by title and by notification number **1600-2008-0014-R2.**

VII. FEES

The fees referenced below are based on the current fee schedule. These fees are subject to change. The **Town** shall pay the appropriate fee from the existing fee schedule at the time the specific fee is paid.

A. Initial Notification Fee

The **Town** shall pay DFG the initial notification fee of $1,200.00.

B. Subsequent Fees

The **Town** shall also pay a lump sum to DFG at the end of each fiscal year when it submits its annual report based on the total number of routine maintenance projects undertaken by the **Town** (which shall be equal to the number of VRFs submitted to DFG during the fiscal year) and the following fee schedule:

$100.00 for each maintenance project (VRF submitted)

A. Amendment Fee

The **Town** may request the Department to make a **minor amendment** to this Agreement. A minor amendment is one that would not significantly modify the scope or nature of any project covered by this Agreement or any measure included in this Agreement to protect fish and wildlife resources.

(1) $150.00

The **Town** may request the Department to make a **major amendment** to this Agreement. A major amendment is one that would significantly modify the scope or nature of any project covered by this Agreement or any measure included in this Agreement to protect fish and wildlife resources, or require additional environmental review pursuant to section 21000 *et seq.* of the Public Resources Code or section 15000 *et seq.* of title 14 of the California Code of Regulations.

(1) $500.00

B. Renewal Fee

The fee to renew (i.e., extend) this Agreement shall be $200.00.

VIII. OTHER PERMIT REQUIREMENTS

The **Town** shall notify DFG if it discovers a conflict between any of the terms and conditions of this Agreement and those that another local, state, or federal governmental Town might impose under the laws and regulations it administers and enforces.

IX. AMENDMENT

A. This Agreement may be amended or modified at any time by mutual written agreement executed by DFG and the **Town**. Any proposal to amend or modify this Agreement shall be submitted for review and approval by the Regional Manager, or the Regional Manager's designee, for DFG and the **Town**, unless otherwise specified.

B. Notwithstanding paragraph A above, upon review and approval by a DFG staff person in the Lake and Streambed Alteration Program, the **Town** may add other state highway projects and work areas to Exhibit 1 after the effective date of this Agreement, in which case all provisions of this Agreement shall apply to the added projects. DFG may impose additional conditions on the **Town** when performing routine maintenance work on structures in work areas added to Exhibit 1 after the effective date of this Agreement.

C. Notwithstanding paragraph A above, DFG and the **Town** may modify the distribution list at any time, provided that DFG or the **Town** indicates on the list the date it was modified, and thereafter provides the other party a copy of the list, as modified.

D. DFG and the **Town** shall meet in each January or at some other mutually agreed to time to discuss this Agreement. Both parties should be prepared to propose any amendments to this Agreement at the meeting.

X. TERMINATION

This Agreement shall remain in effect until it expires or is terminated in writing by DFG or the **Town**. Termination shall become effective 30 days after receipt of the termination notice by the other party. In the event this Agreement is terminated, the **Town** may complete any maintenance work that DFG approved prior to the date of the termination notice.

XI. RENEWALS

This Agreement may be renewed at the end of its term for another period of up to 5 years in accordance with Fish and Game Code section 1605, subdivisions (a) through (e). DFG's decision whether to grant a request to extend this Agreement shall be based in part on a review of the annual reports submitted by the **Town** under Section VI of this Agreement. Notwithstanding Fish and Game Code section 1605, subdivisions (a) through (e), DFG may deny a request by the **Town** to renew this Agreement if DFG determines that the **Town** has failed to fully comply with one or more material terms and conditions of this Agreement. DFG shall not renew this Agreement until it has complied with CEQA, if such compliance is necessary.

XII. DISPUTE RESOLUTION

DFG and the **Town** shall attempt to resolve any alleged violation of Fish and Game Code Section 1600 et seq. or any disagreement between DFG and the **Town** regarding this Agreement at the field staff level. If DFG concludes that the **Town** is failing, or has failed to, comply with Fish and Game Code section 1600 et seq. or the terms and conditions of this Agreement, DFG shall notify the **Town**, either verbally or in writing, of the work constituting the asserted violation and the **Town** shall immediately suspend the work, unless the work is emergency work necessary to protect life or property. As expeditiously as possible after the suspension occurs (in the case of an asserted violation) or if field staff cannot resolve an issue (in the case of a disagreement), DFG staff shall inform the Assistant Chief and Regional Manager of the suspension (in the case of an asserted violation), or the Regional Manager only (in the case of a disagreement), and the **Town** staff shall inform the **Town Public Works Director (Brian Fragiao)**. The Regional Manager and the **Town Public Works Director** shall thereafter commence the following dispute resolution process:

A. The Regional Manager shall contact the **Town Public Works Director** in an effort to mutually resolve the asserted violation or disagreement. DFG and the **Town** shall address whether the **Town** was in compliance with Fish and Game Code section 1600 et seq. or this Agreement; whether this Agreement should be modified, suspended, or revoked; whether the **Town** should provide restitution for damage caused to fish and wildlife resources, if any damage occurred; and/or any other relevant issues.

B. If the Regional Manager and the **Town Public Works Director** are unable to resolve the asserted violation or disagreement within 7 days of the meeting to

discuss the matter, the Regional Manager and **Town Public Works Director** shall elevate the matter to a DFG Deputy Director and the **Town 's Manager**.

C. If the Deputy Directors are unable to mutually resolve the asserted violation or disagreement within 7 days of the meeting to discuss the matter, they shall refer the asserted violation or disagreement to the Directors and **the Town's Council**.

DFG shall exercise its authority in a manner intended to encourage resolution, settlement, and compromise of all asserted violations or disagreements in an effort to avoid seeking prosecution. However, nothing in this Agreement compromises DFG's authority and responsibilities under the Fish and Game Code or other state laws or regulations.

XIII. ENTIRE AGREEMENT

This Agreement, which includes Exhibits 1 and 2 and Attachments A and B, constitute the entire Agreement. This Agreement supersedes the following active Streambed Alteration Agreements: **Memorandum of Understanding between the Town and California Department of Fish and Game (1600-2008-0014 -R2)**. These agreements shall terminate upon the effective date of this Agreement.

XIV. EFFECTIVE DATE AND TERM

This agreement shall become effective on the date of last signature below, and shall expire five years from the date of last signature below, unless it is terminated at an earlier date or renewed prior to its expiration.

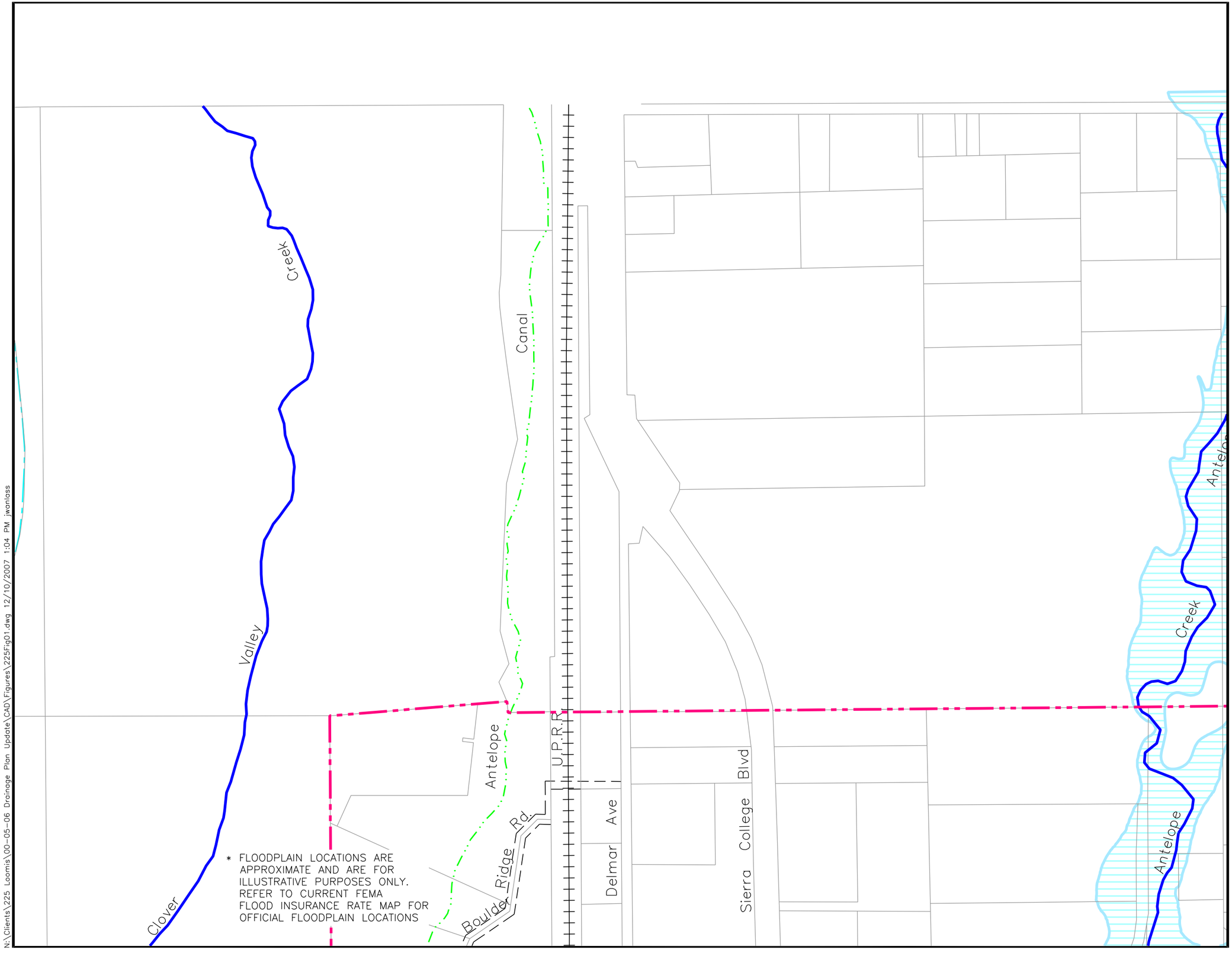
Town of Loomis

[Perry Beck, Town Manager] Date: 2/25/08

CALIFORNIA DEPARTMENT OF FISH AND GAME

Sandra Morey, Regional Manager
Sacramento Valley - Central Sierra Region Date: 3/6/08

APPENDIX C



Town of LOOMIS

DRAINAGE MASTER PLAN

DRAINAGE SYSTEM MAP

SHEET 1 OF 15

LEGEND

- TOWN LIMITS
- CITY LIMITS
- DRAINAGE SHED BOUNDARY
- NATURAL STREAM
- DRAINAGE DITCH/SWALE
- CONCRETE LINED CHANNEL
- POND OR DETENTION BASIN
- DRAINAGE MAINTENANCE HOLE
- DRAINAGE INLET
- 18" CULVERT
- 15"SD STORM DRAIN PIPE WITH SIZE & DIRECTION
- SIZE UNKNOWN
- BRIDGE CROSSING
- 100-YEAR FLOODPLAIN*

1	4	10
2	5	11
3	6	12
	7	13
	8	14
	9	15

SHEET INDEX

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SCALE IN FEET

WEST YOST ASSOCIATES
Consulting Engineers

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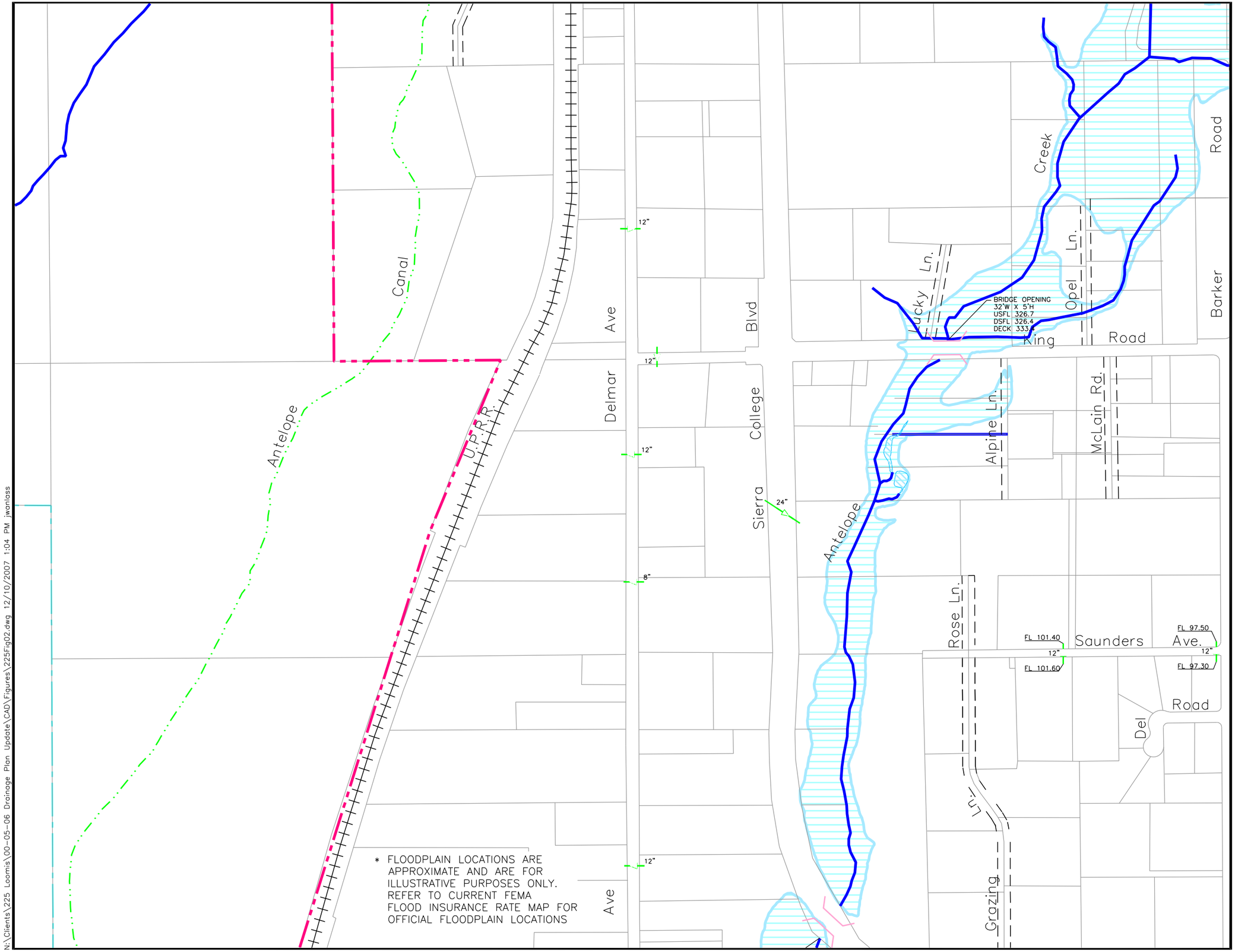

Town of LOOMIS

DRAINAGE MASTER PLAN

DRAINAGE SYSTEM MAP

SHEET 2 OF 15

LEGEND

- TOWN LIMITS
- CITY LIMITS
- DRAINAGE SHED BOUNDARY
- NATURAL STREAM
- DRAINAGE DITCH/SWALE
- CONCRETE LINED CHANNEL
- POND OR DETENTION BASIN
- DRAINAGE MAINTENANCE HOLE
- DRAINAGE INLET
- CULVERT (18")
- STORM DRAIN PIPE WITH SIZE & DIRECTION (15"SD)
- SIZE UNKNOWN
- BRIDGE CROSSING
- 100-YEAR FLOODPLAIN*

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2	5	11
3	6	12
	7	13
	8	14
	9	15

SHEET INDEX

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SCALE IN FEET

WEST YOST ASSOCIATES
Consulting Engineers

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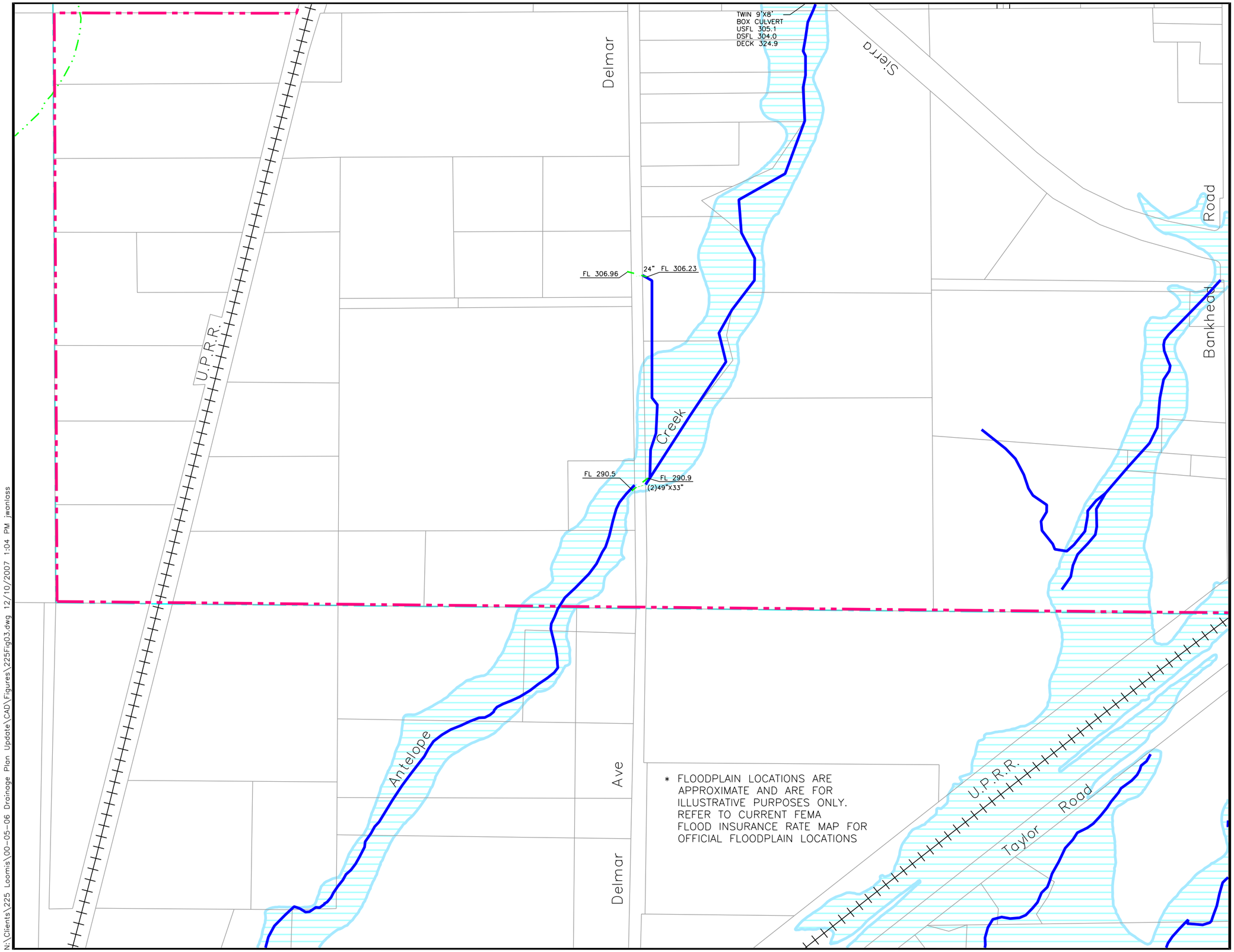

Town of LOOMIS

DRAINAGE MASTER PLAN

DRAINAGE SYSTEM MAP

SHEET 3 OF 15

LEGEND

- TOWN LIMITS
- CITY LIMITS
- DRAINAGE SHED BOUNDARY
- NATURAL STREAM
- DRAINAGE DITCH/SWALE
- CONCRETE LINED CHANNEL
- POND OR DETENTION BASIN
- DRAINAGE MAINTENANCE HOLE
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- 18" CULVERT
- 15"SD STORM DRAIN PIPE WITH SIZE & DIRECTION
- SIZE UNKNOWN
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- 100-YEAR FLOODPLAIN*

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	9	15

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SCALE IN FEET

WEST YOST ASSOCIATES
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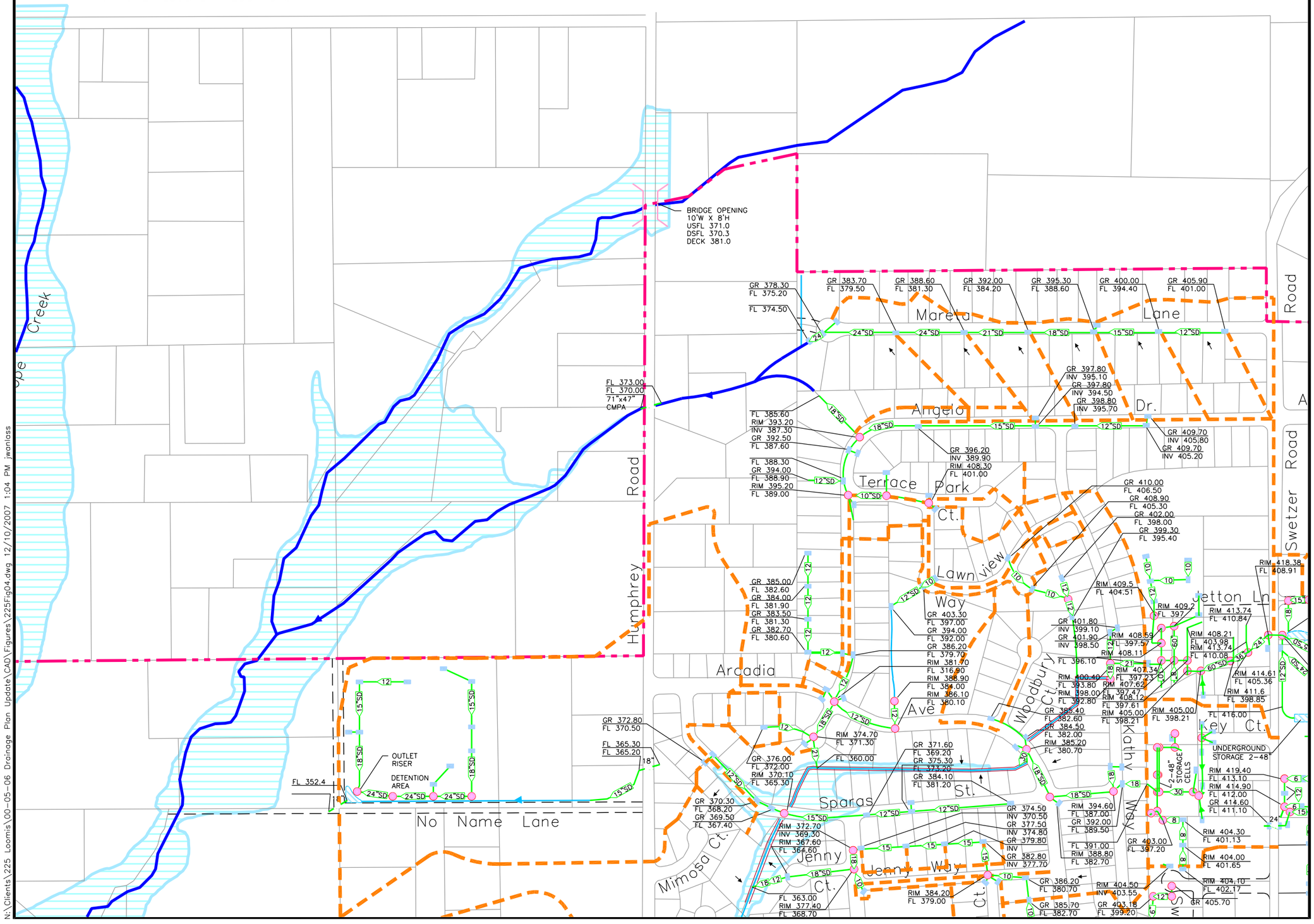
* FLOODPLAIN LOCATIONS ARE APPROXIMATE AND ARE FOR ILLUSTRATIVE PURPOSES ONLY. REFER TO CURRENT FEMA FLOOD INSURANCE RATE MAP FOR OFFICIAL FLOODPLAIN LOCATIONS



Town of LOOMIS

DRAINAGE MASTER PLAN

DRAINAGE SYSTEM MAP

SHEET 4 OF 15

LEGEND

- TOWN LIMITS
- CITY LIMITS
- DRAINAGE SHED BOUNDARY
- NATURAL STREAM
- DRAINAGE DITCH/SWALE
- CONCRETE LINED CHANNEL
- POND OR DETENTION BASIN
- DRAINAGE MAINTENANCE HOLE
- DRAINAGE INLET
- CULVERT
- STORM DRAIN PIPE WITH SIZE & DIRECTION
- SIZE UNKNOWN
- BRIDGE CROSSING
- 100-YEAR FLOODPLAIN*

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	7	13
	8	14
	9	15

SHEET INDEX

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SCALE IN FEET

WEST YOST ASSOCIATES
Consulting Engineers

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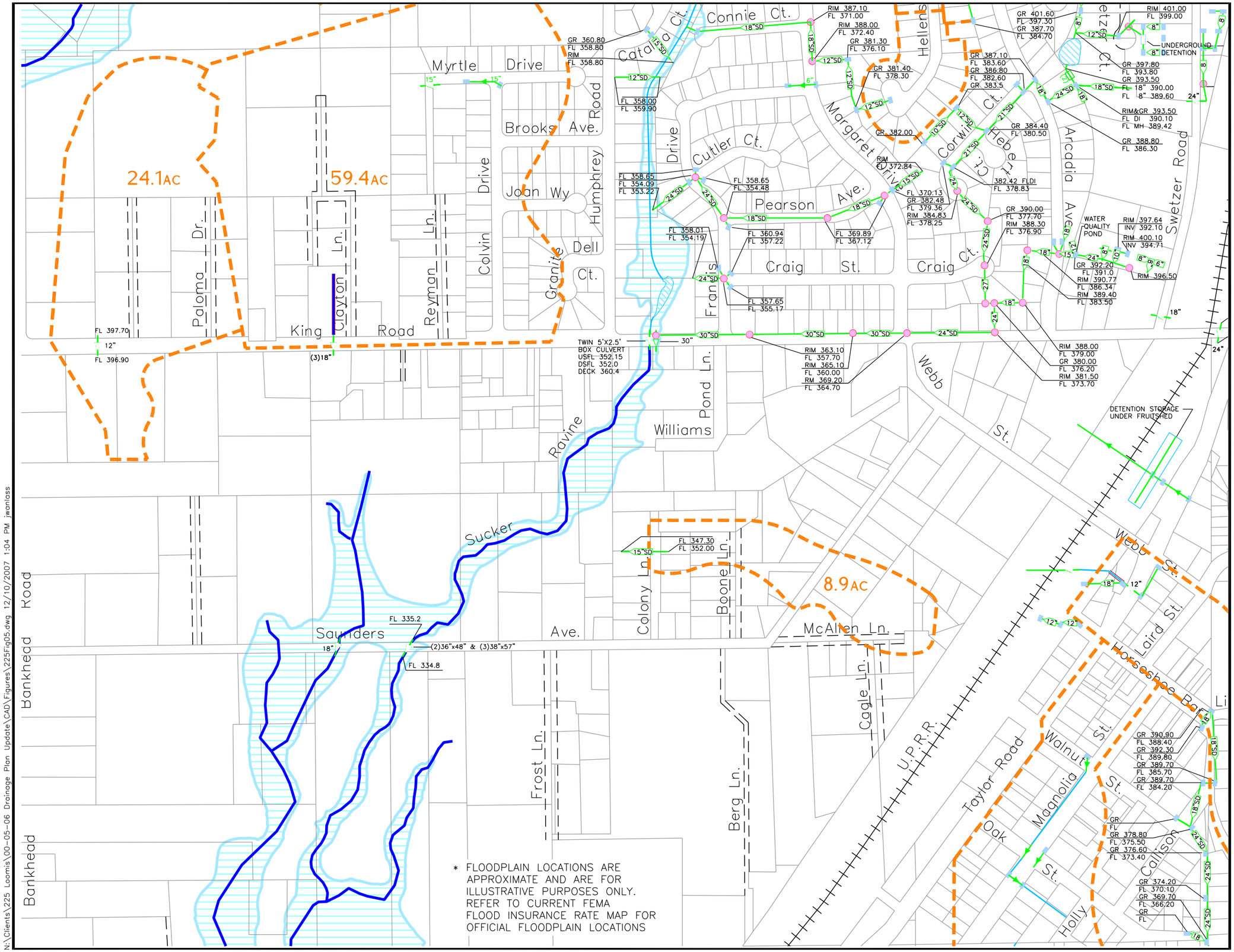

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Town of LOOMIS

DRAINAGE MASTER PLAN

DRAINAGE SYSTEM MAP

SHEET 5 OF 15

LEGEND

- TOWN LIMITS
- CITY LIMITS
- DRAINAGE SHED BOUNDARY
- NATURAL STREAM
- DRAINAGE DITCH/SWALE
- CONCRETE LINED CHANNEL
- POND OR DETENTION BASIN
- DRAINAGE MAINTENANCE HOLE
- DRAINAGE INLET
- CULVERT
- STORM DRAIN PIPE WITH SIZE & DIRECTION
- SIZE UNKNOWN
- BRIDGE CROSSING
- 100-YEAR FLOODPLAIN*

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3	6	12
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	8	14
	9	15

SHEET INDEX

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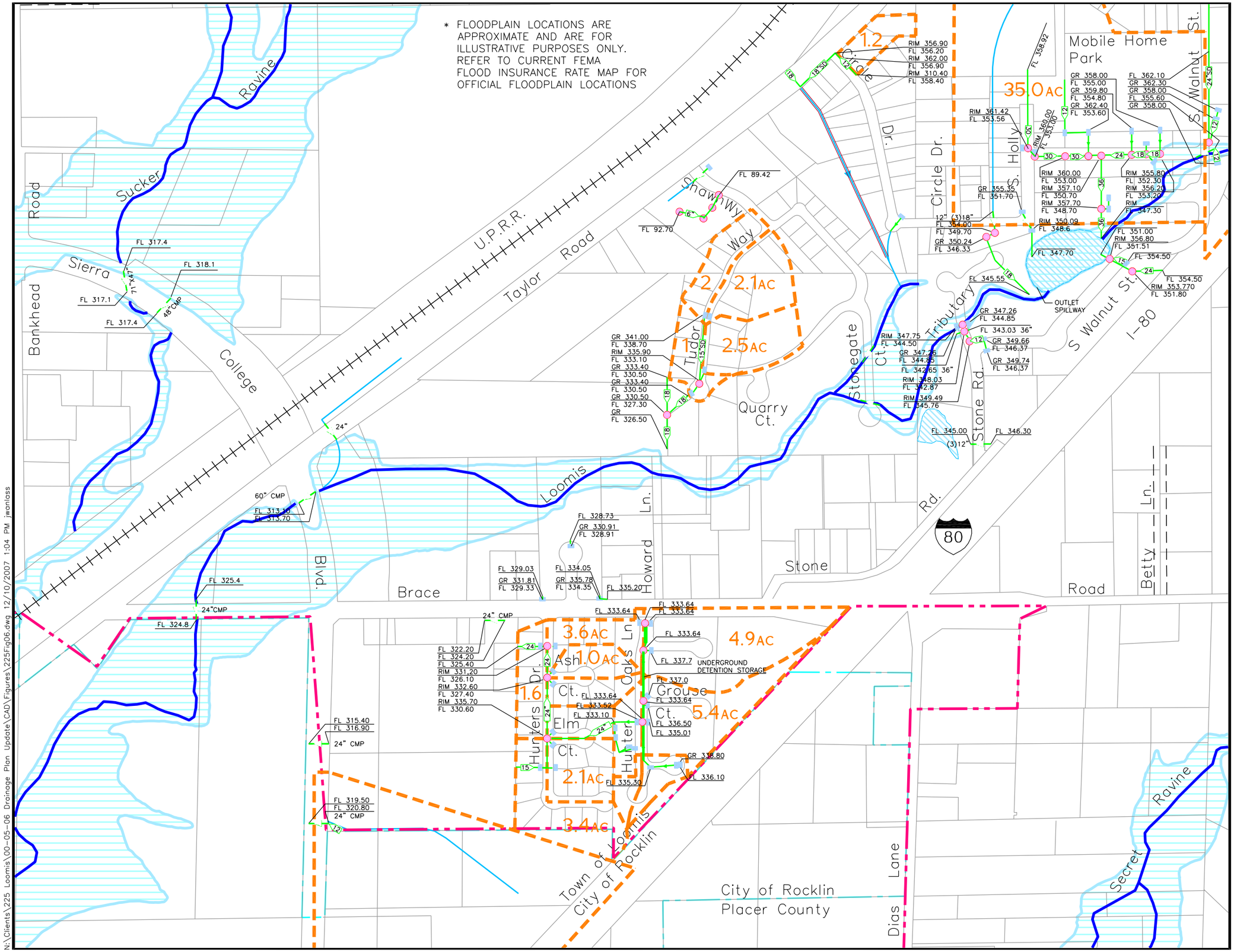
SCALE IN FEET

WEST YOST ASSOCIATES
Consulting Engineers



Town of LOOMIS

DRAINAGE MASTER PLAN

DRAINAGE SYSTEM MAP

SHEET 6 OF 15

LEGEND

- TOWN LIMITS
- CITY LIMITS
- DRAINAGE SHED BOUNDARY
- NATURAL STREAM
- DRAINAGE DITCH/SWALE
- CONCRETE LINED CHANNEL
- POND OR DETENTION BASIN
- DRAINAGE MAINTENANCE HOLE
- DRAINAGE INLET
- CULVERT
- STORM DRAIN PIPE WITH SIZE & DIRECTION
- SIZE UNKNOWN
- BRIDGE CROSSING
- 100-YEAR FLOODPLAIN*

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	9	15

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SCALE IN FEET

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Consulting Engineers

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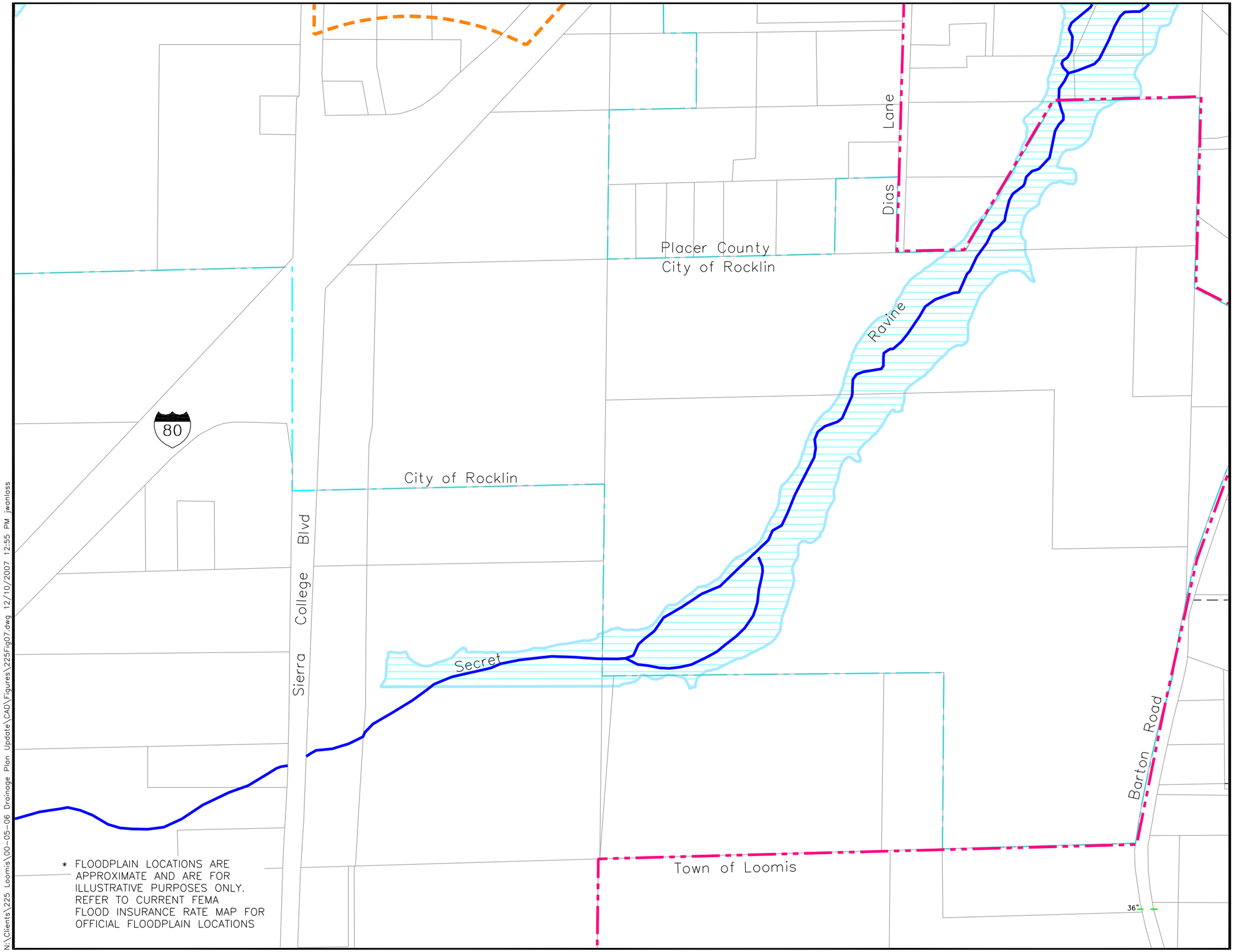

* FLOODPLAIN LOCATIONS ARE APPROXIMATE AND ARE FOR ILLUSTRATIVE PURPOSES ONLY. REFER TO CURRENT FEMA FLOOD INSURANCE RATE MAP FOR OFFICIAL FLOODPLAIN LOCATIONS

Town of LOOMIS

DRAINAGE MASTER PLAN

DRAINAGE SYSTEM MAP

SHEET 7 OF 15

LEGEND

- TOWN LIMITS
- CITY LIMITS
- DRAINAGE SHED BOUNDARY
- NATURAL STREAM
- DRAINAGE DITCH/SWALE
- CONCRETE LINED CHANNEL
- POND OR DETENTION BASIN
- DRAINAGE MAINTENANCE HOLE
- DRAINAGE INLET
- CULVERT (18")
- STORM DRAIN PIPE WITH SIZE & DIRECTION (15"SD)
- SIZE UNKNOWN
- BRIDGE CROSSING
- 100-YEAR FLOODPLAIN*

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	8	14
	9	15

SHEET INDEX

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SCALE IN FEET

WEST YOST ASSOCIATES
Consulting Engineers

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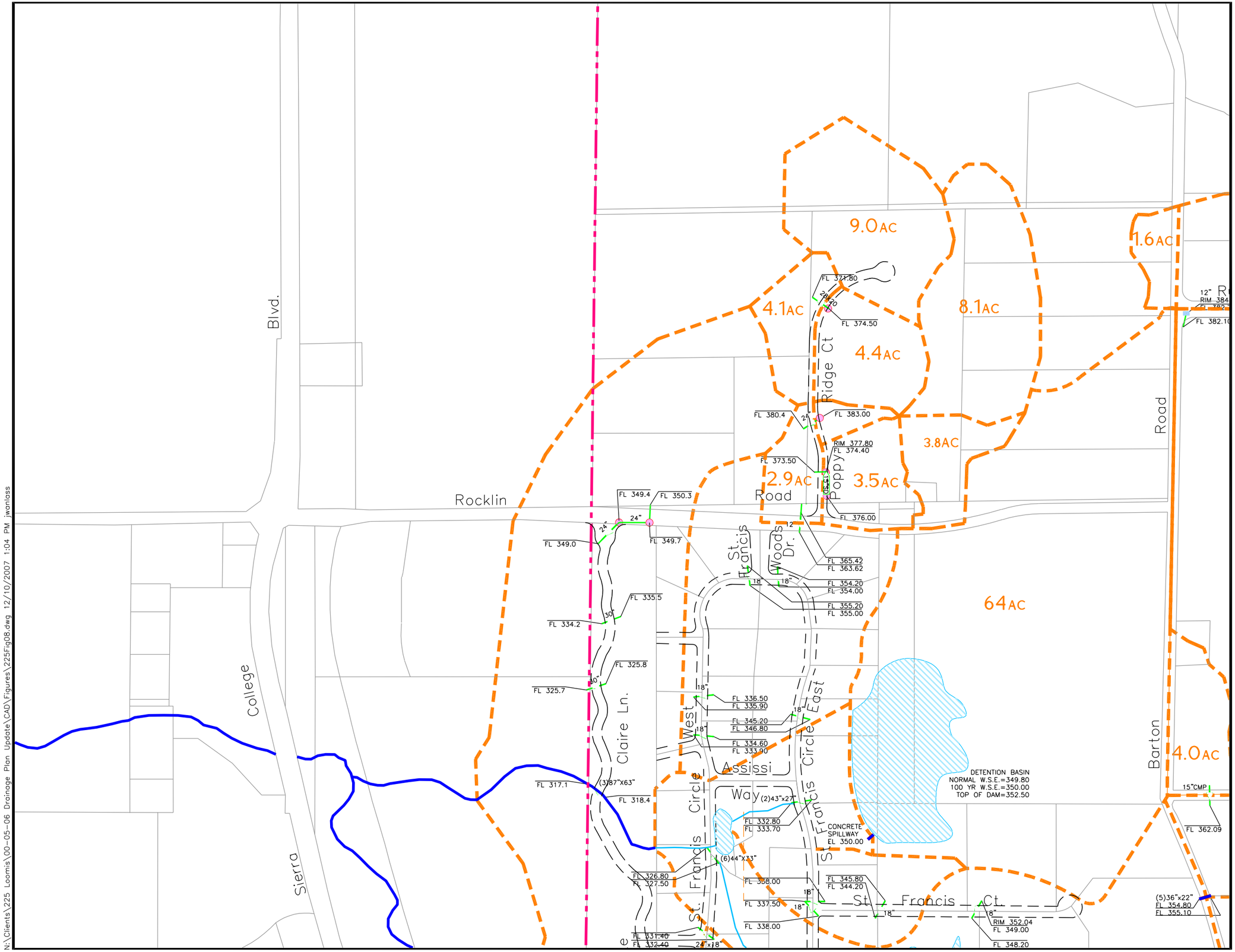

Town of LOOMIS

DRAINAGE MASTER PLAN

DRAINAGE SYSTEM MAP

SHEET 8 OF 15

LEGEND

- TOWN LIMITS
- CITY LIMITS
- DRAINAGE SHED BOUNDARY
- NATURAL STREAM
- DRAINAGE DITCH/SWALE
- CONCRETE LINED CHANNEL
- POND OR DETENTION BASIN
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- DRAINAGE INLET
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- BRIDGE CROSSING
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	8	14
	9	15

SHEET INDEX

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SCALE IN FEET

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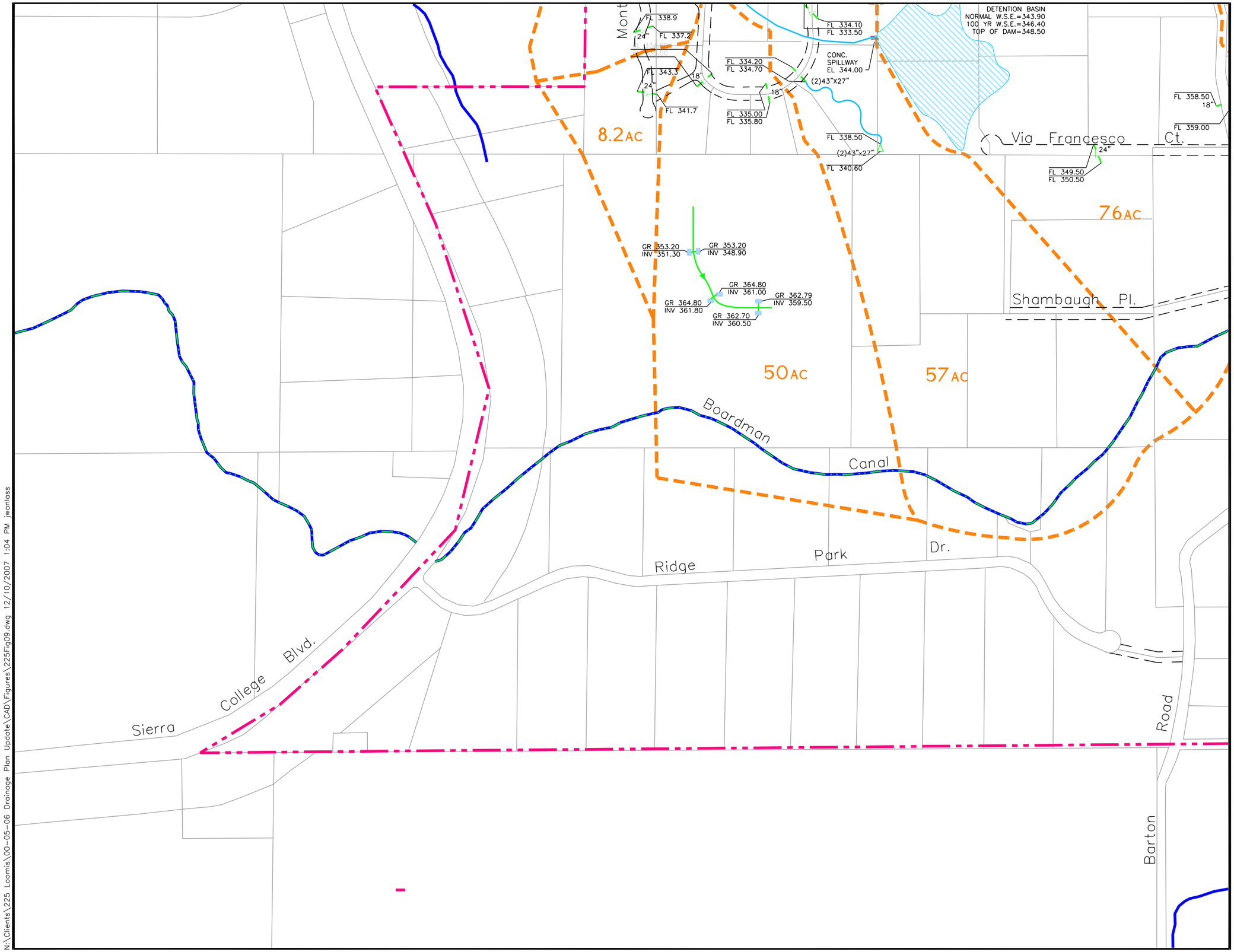

Town of LOOMIS

DRAINAGE MASTER PLAN

DRAINAGE SYSTEM MAP

SHEET 9 OF 15

LEGEND

- TOWN LIMITS
- CITY LIMITS
- DRAINAGE SHED BOUNDARY
- NATURAL STREAM
- DRAINAGE DITCH/SWALE
- CONCRETE LINED CHANNEL
- POND OR DETENTION BASIN
- DRAINAGE MAINTENANCE HOLE
- DRAINAGE INLET
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	8	14
	9	15

SHEET INDEX

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SCALE IN FEET

WEST YOST ASSOCIATES
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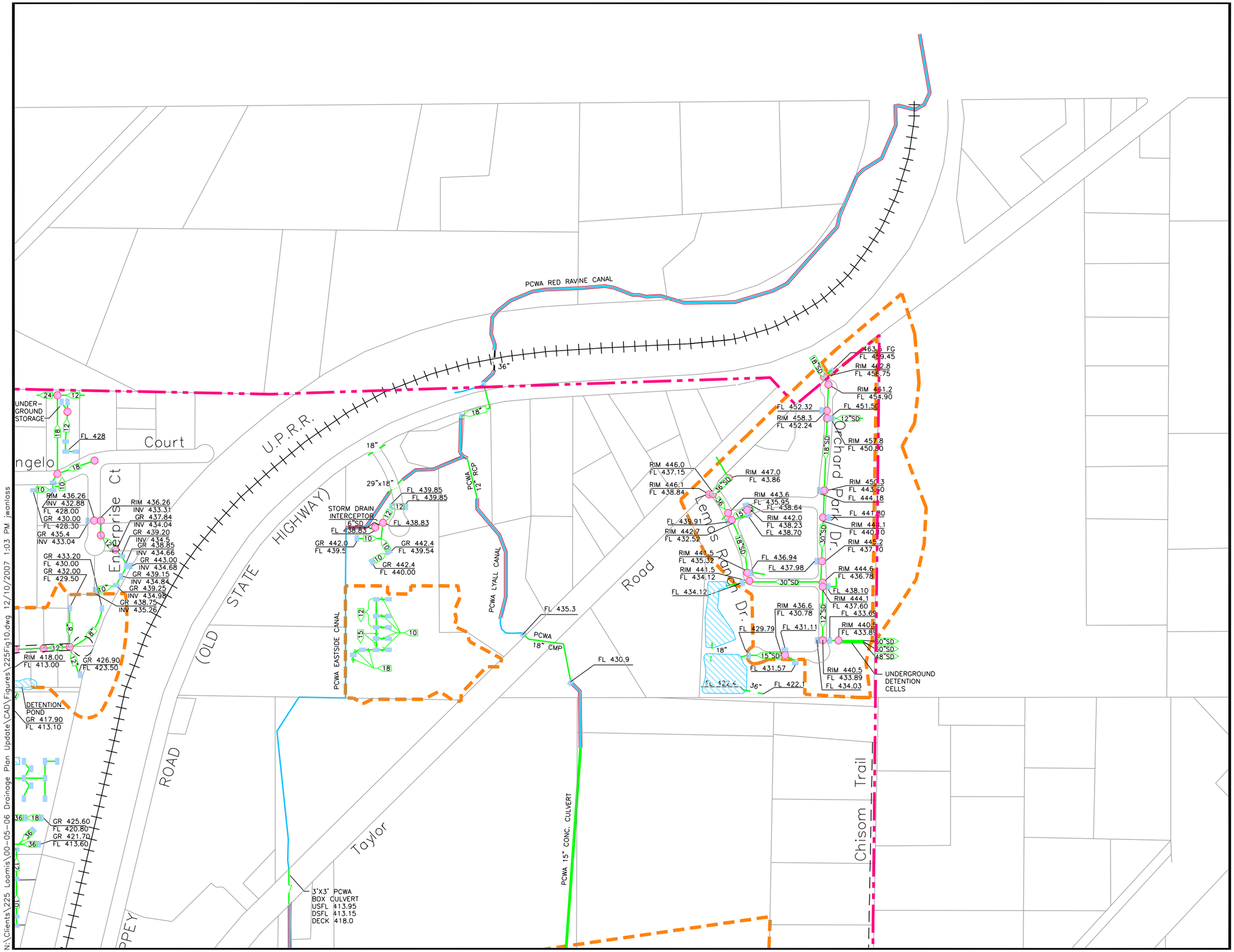
Town of LOOMIS

DRAINAGE MASTER PLAN

DRAINAGE SYSTEM MAP

SHEET 10 OF 15



LEGEND

- TOWN LIMITS
- CITY LIMITS
- DRAINAGE SHED BOUNDARY
- NATURAL STREAM
- DRAINAGE DITCH/SWALE
- CONCRETE LINED CHANNEL
- POND OR DETENTION BASIN
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- BRIDGE CROSSING
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	8	14
	9	15

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SCALE IN FEET

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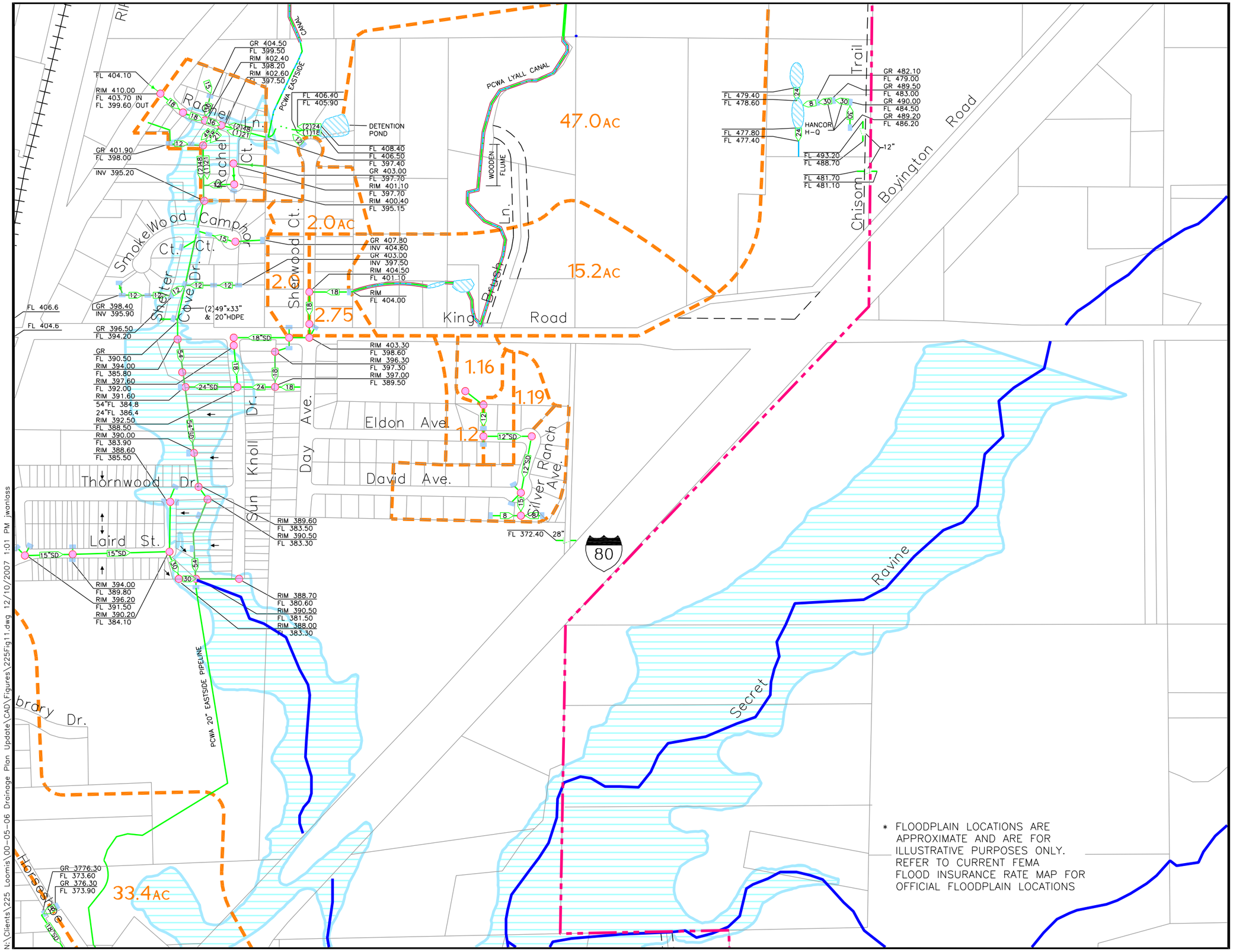
Town of LOOMIS

DRAINAGE MASTER PLAN

DRAINAGE SYSTEM MAP

SHEET 11 OF 15



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LEGEND

- TOWN LIMITS
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- CONCRETE LINED CHANNEL
- POND OR DETENTION BASIN
- DRAINAGE MAINTENANCE HOLE
- DRAINAGE INLET
- CULVERT (18")
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- SIZE UNKNOWN
- BRIDGE CROSSING
- 100-YEAR FLOODPLAIN*

1	4	10
2	5	11
3	6	12
	7	13
	8	14
	9	15

SHEET INDEX

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SCALE IN FEET

WEST YOST ASSOCIATES
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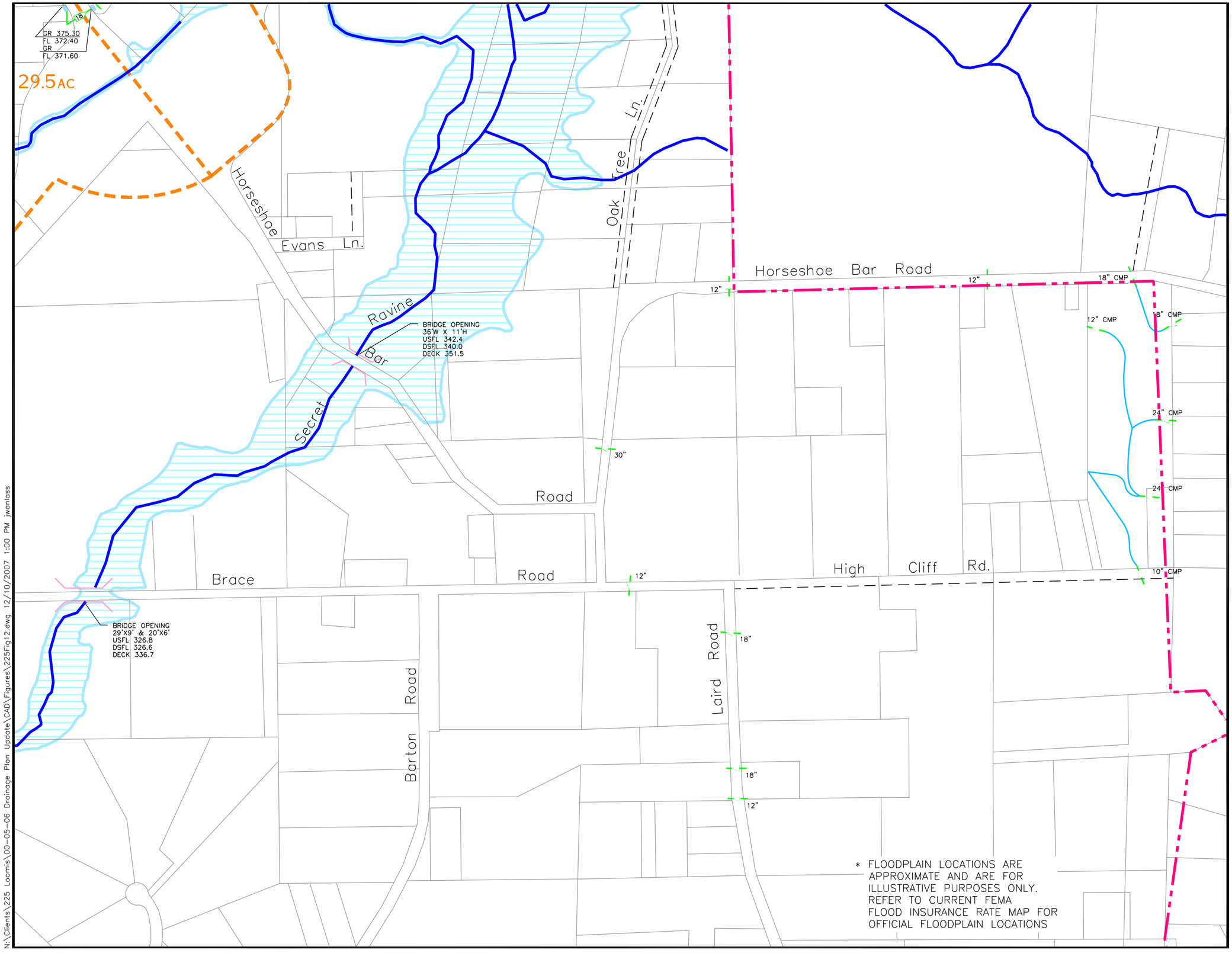

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Town of LOOMIS

DRAINAGE MASTER PLAN

DRAINAGE SYSTEM MAP

SHEET 12 OF 15

LEGEND

- TOWN LIMITS
- CITY LIMITS
- DRAINAGE SHED BOUNDARY
- NATURAL STREAM
- DRAINAGE DITCH/SWALE
- CONCRETE LINED CHANNEL
- POND OR DETENTION BASIN
- DRAINAGE MAINTENANCE HOLE
- DRAINAGE INLET
- CULVERT (18")
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1	4	10
2	5	11
3	6	12
	7	13
	8	14
	9	15

SHEET INDEX

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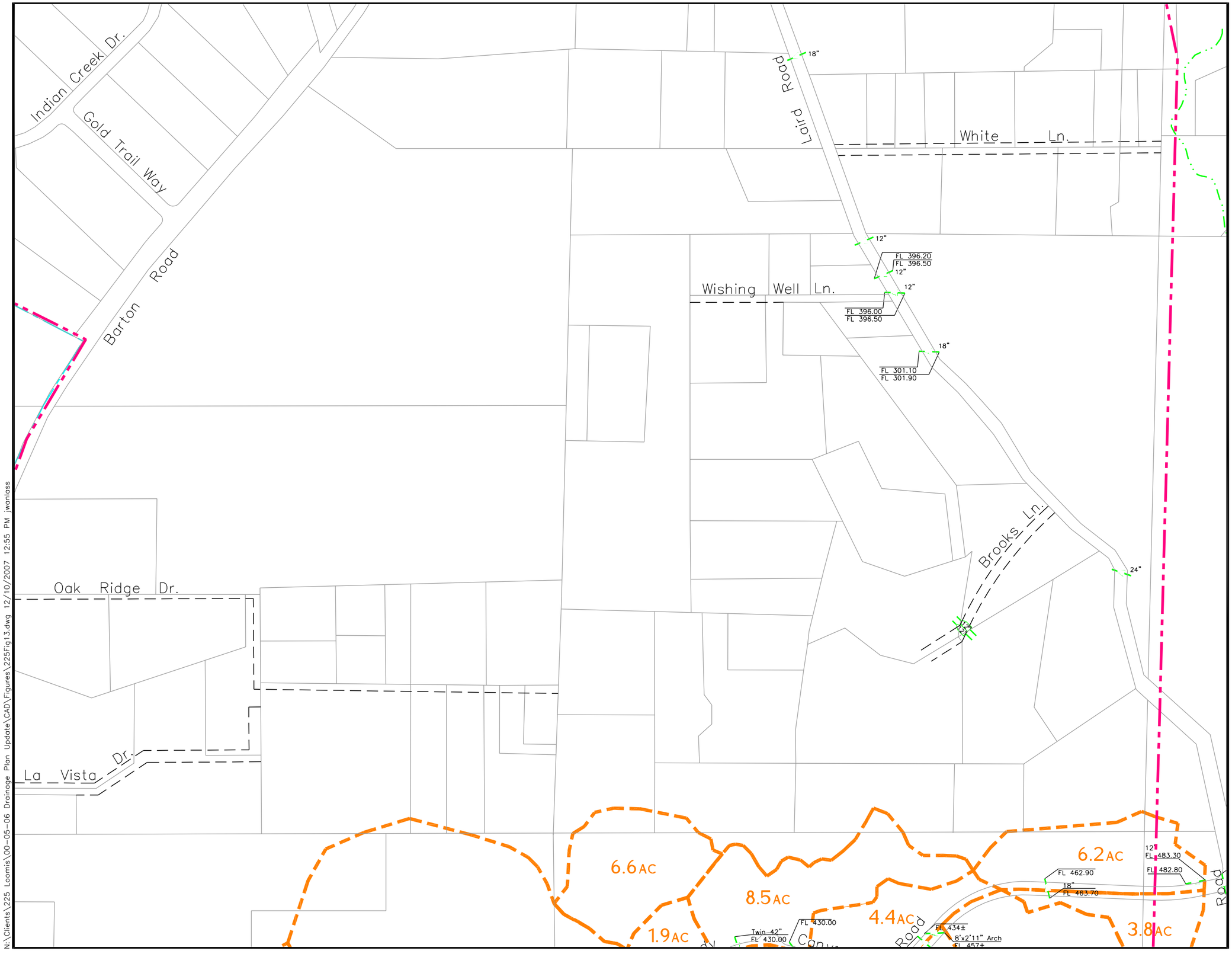
SCALE IN FEET

WEST YOST ASSOCIATES
Consulting Engineers



Town of LOOMIS

DRAINAGE MASTER PLAN

DRAINAGE SYSTEM MAP

SHEET 13 OF 15

LEGEND

- TOWN LIMITS
- CITY LIMITS
- DRAINAGE SHED BOUNDARY
- NATURAL STREAM
- DRAINAGE DITCH/SWALE
- CONCRETE LINED CHANNEL
- POND OR DETENTION BASIN
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	8	14
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SCALE IN FEET

WEST YOST ASSOCIATES
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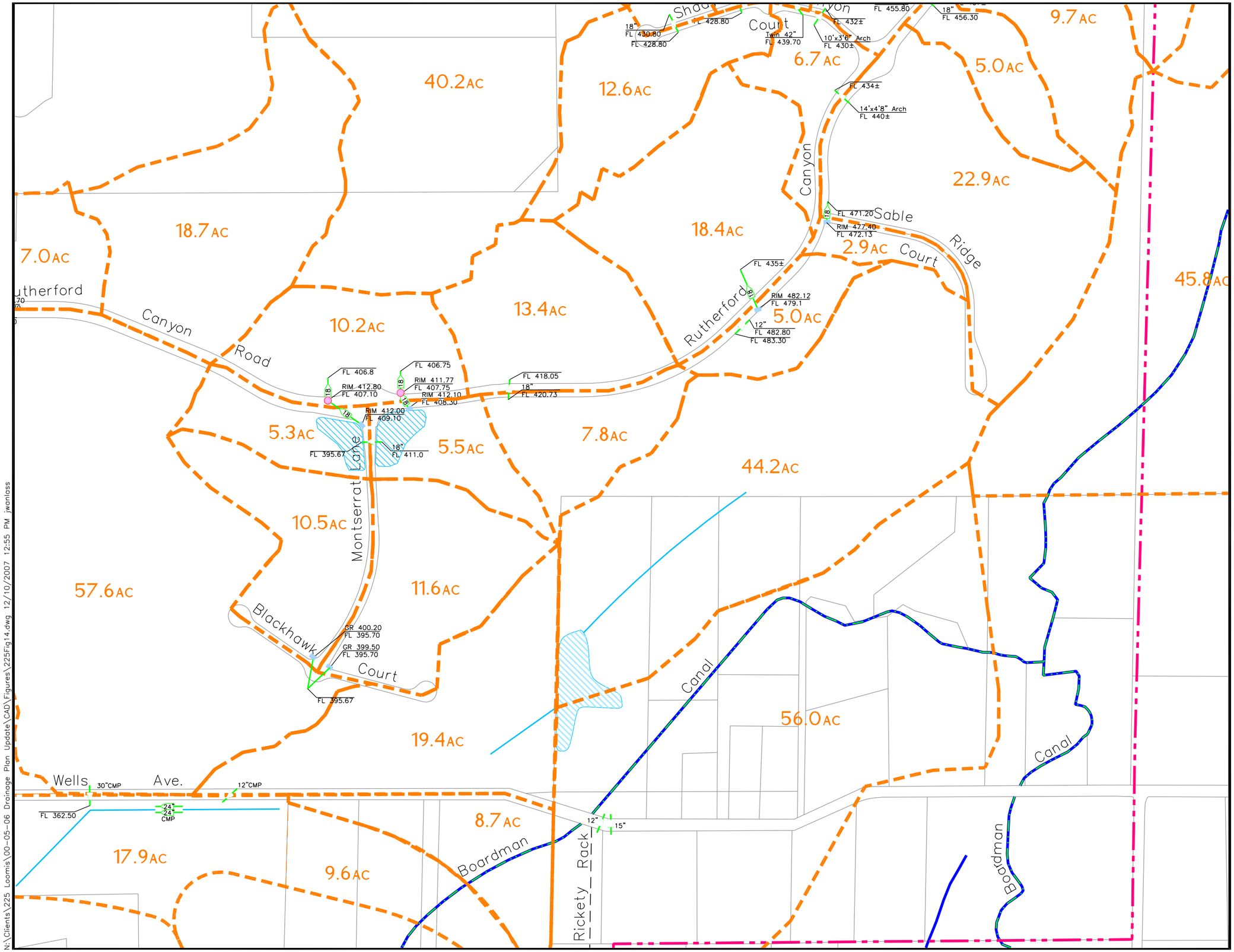

Town of LOOMIS

DRAINAGE MASTER PLAN

DRAINAGE SYSTEM MAP

SHEET 14 OF 15

LEGEND

- TOWN LIMITS
- CITY LIMITS
- DRAINAGE SHED BOUNDARY
- NATURAL STREAM
- DRAINAGE DITCH/SWALE
- CONCRETE LINED CHANNEL
- POND OR DETENTION BASIN
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- DRAINAGE INLET
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- SIZE UNKNOWN
- BRIDGE CROSSING
- 100-YEAR FLOODPLAIN*

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	7	13
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	9	15

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SCALE IN FEET

WEST YOST ASSOCIATES
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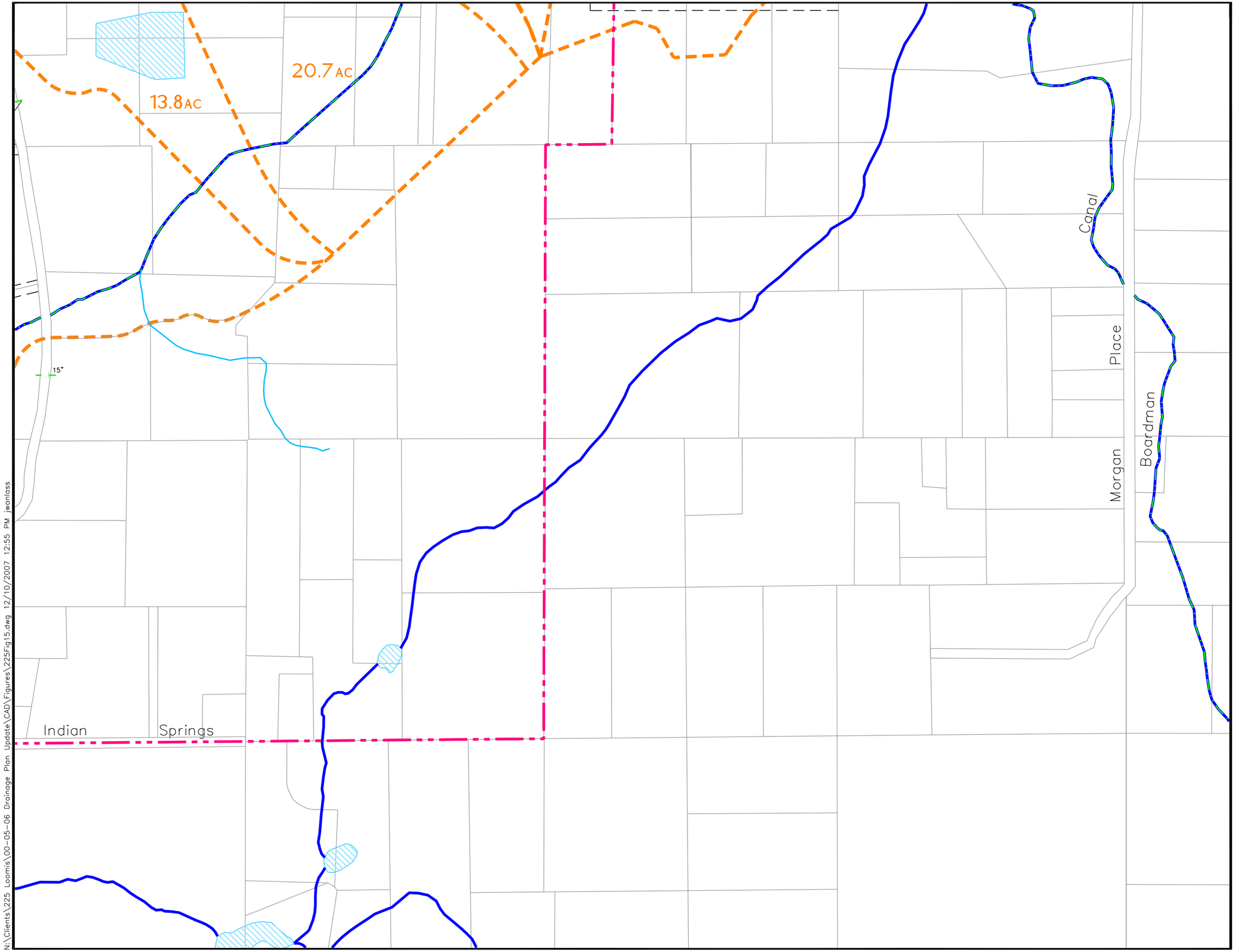

Town of LOOMIS

DRAINAGE MASTER PLAN

DRAINAGE SYSTEM MAP

SHEET 15 OF 15

LEGEND

- TOWN LIMITS
- CITY LIMITS
- DRAINAGE SHED BOUNDARY
- NATURAL STREAM
- DRAINAGE DITCH/SWALE
- CONCRETE LINED CHANNEL
- POND OR DETENTION BASIN
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SCALE IN FEET

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